**The Chaetognatha Community of the Agulhas Current:
Its structure and related properties.**

James H. Stone

"To the lover of prescribed routine methods with the certainty of safe results the study of ecology is not to be recommended." (after Tansley, from Elton, 1938).

A thesis submitted to the Faculty of Science, University of Cape Town, in candidacy for the degree of Ph.D., 1965.

The copyright of this thesis vests in the author. No quotation from it or information derived from it is to be published without full acknowledgement of the source. The thesis is to be used for private study or non-commercial research purposes only.

Published by the University of Cape Town (UCT) in terms of the non-exclusive license granted to UCT by the author.

- Table of Contents -

Part I -- The Text

A. Summary	1 - 2
B. Guide to use of this thesis	2 - 3
C. Introduction	3 - 4
D. Material and methods	5 - 7
E. Results	7-114
Section 1 - The hydrographical background	7-15
General features	7-9
Summer survey	10-11
Autumn survey	11-13
Winter survey	13-15
Section 2 - Species distributions and abundances	15-79
Notes on organization and presentation	15-16
Taxonomic notes	16-19
Individual species	19-76
<u>S. enflata</u>	19-26
<u>S. minima</u>	26-32
<u>S. serratodentata</u>	32-36
<u>P. draco</u>	36-40
<u>S. friderici</u>	40-44
<u>S. decipiens</u>	44-47
<u>S. lyra</u>	47-51
<u>S. regularis/neglecta</u>	51-54
<u>K. subtilis</u>	54-57
<u>S. hexaptera</u>	57-61
<u>S. bipunctata</u>	61-64
<u>K. pacifica</u>	64-67
<u>S. robusta/ferox</u>	67-70
<u>S. bedoti</u>	70-73
<u>E. hamata</u>	73-74
<u>S. pulchra</u>	74-75
<u>S. planctonis</u>	75
<u>S. maxima</u>	75-76
Summary for all species	76-79
Section 3 - Recurrent groups	80-94
General features	80-82
N70V-groups	82-90
All surveys	82-87
Summer survey	87-88
Autumn survey	88-89
Winter survey	89-90
N100B-groups	90-91
N100H-groups	91-92
Discussion and summary	92-94
Section 4 - Fecundity	94-99
Introduction	94
Assumptions	94-95
General features	95
Individual species	96-98
Discussion	98-99
Summary	99
Section 5 - Food	99-106
Literature background	99-100
Assumptions	100-101
General features	101-103
Individual species	103-106
Summary	106
Section 6 - Competition and Polemics	106-114
Introduction	106-108
Evidence for competition	108-114

F. Discussion and conclusions	114-118
G. Acknowledgements	118
H. References	i-vi

Part II -- Appendix of data

Section 1 - Data on the hydrographical background . .	<u>1-30</u>
Figures A1-1 to A1-14	<u>1-21</u>
Tables A1-1 to A1-8	22-30
Section 2 - Data on species distributions and abundances	<u>31-222</u>
Tables A2-1 to A2-192	31-222
Section 3 - Data on recurrent groups	<u>223-249</u>
Figures A3-1 to A3-20	223-242
Tables A3-1 to A3-7	243-249
Section 4 - Data on Fecundity	<u>250-260</u>
Tables A4-1 to A4-12	250-260
Section 5 - Data on food	<u>261-279</u>
Tables A5-1 to A5-15	261-279
Section 6 - Data on competition	<u>280</u>
Table A6-1	280

The section numbers given in Part II correspond to the same section numbers used in the text, E-Results.

PART I.

A. Summary

A study has been made of a select group of marine zooplankton--the Chaetognatha. The analysis was done from a community viewpoint, that is, an objective technique was used to identify related groups of the Chaetognatha and these groups were then correlated with the distribution, abundance and fecundity of the individual species and with the existing hydrographical conditions. Competitive relationships among the species for habitats and niches were also examined. The results were as follows:

1. Identification of recurrent groups of chaetognaths was done by the Fager technique. From the N70V data, three groups were formed; a main group of nine species, an associate group of three species and one associate species.
2. The main group of nine species was distributed as a unit almost solely in the upper 200 meters of oceanic waters and occurred in neritic waters only when one to several species were absent. Each species of this group was by its distribution and abundance an inhabitant of oceanic waters and each showed--except those species found in deeper waters--a positive correlation with the ingression and regression of the Agulhas current into the neritic area.
3. The associate group of three species was found mostly at stations having mixed-water conditions. The "best" of these stations, as determined by a test for concordance, were strikingly located along a line where mixing between neritic waters and the Agulhas current was most likely to occur. Each species of this group was by its distribution and abundance an inhabitant of oceanic and neritic waters.
4. The associate species, S. decipiens, was an oceanic beast distinctive by its vertical distribution; it was a mesoplanktonic species, inhabiting waters of >200 meters in depth.
5. Neritic individuals of only one species (S. enflata) of the main group had significantly more eggs than oceanic individuals. For the remaining species of the main group, there was either no differences in egg numbers between neritic and oceanic individuals or the oceanic individuals contained significantly more eggs than neritic individuals (for S. serrato-dentata only).
6. Neritic individuals of all three species of the associate group contained significantly more eggs than oceanic individuals.
7. Because the neritic area had a more variable environment than the ocean--physical and biological--it is suggested

that fecundity is an adaptative trait and is a suitable index for environmental conditions.

8. The principal prey of the chaetognaths was copepods but cannibalism was highly developed. Indeed, for two of the larger species, cannibalism was particularly evident suggesting that they may function as 2nd-order carnivores.

9. Some evidence was presented which suggested that competition might occur between S. enflata and S. friderici in the neritic area but the evidence was compromised because a change in the physical environment (temperature) usually occurred at the same time.

10. Because chaetognaths are morphologically and functionally very similar, the habitats and niches of the individual species were examined in some detail. Even though a considerable amount of overlap existed among the species for the habitats and niches, there was much nonoverlap in regard to the following: horizontal distribution; vertical distribution; abundances; size relationships among the species; food diversity allowing for some specialization in feeding habits but not in rigid manner; and structural aspects of the food chain itself among the chaetognaths (see No. 8 above).

11. Differences were not evident in the horizontal distribution between adults and juveniles of the same species. But juveniles of most species occupied a slightly higher vertical stratum than adults and some used slightly smaller organisms for food.

12. The neritic area, depending on the season, had a chaetognath community almost identical in structure to that of the ocean. The most apparent exception to this was those species found in the deeper waters; they were excluded from the neritic area. Thus the populations of the neritic area have their origin from the Agulhas current and it is possible to interpret the changes in their structure as a succession. The cycle of this succession in the neritic area can be outlined as follows:

A general recruitment of species kinds and numbers from the Agulhas current during summer and autumn, followed by a sharp reduction in species kinds and numbers during the winter due to a change in the physical environment.

B. Guide to the use of this thesis.

This thesis is divided into two parts:

Part I -- the text

This part includes only those data especially pertinent to the discussion and if they are given in tabular form they are prefixed with the term "text".

For example, text-table 1, etc.

Part II - Appendix of data.

This part includes only the data which are applicable to the section on results. All Figures and Tables are prefixed with the letter "A" which stands for appendix. For example, Table A2-1 stands for the first table of section 2 given in the appendix.

G. Introduction

In order to understand the distribution and abundance of a particular animal, the ecologist does well to study the activities of the animal in the laboratory and field alike. On logical grounds alone, however, this approach is incomplete, for these activities occur within a context--the community. A complete picture on the problems of animal kinds and numbers is possible only by considering both aspects; the animal's activities and the context in which they occur (see Elton & Miller, 1954). For this reason, the present study uses a community framework in the analysis of a select group of the marine zooplankton--the chaetognatha.

This view or dogma is not seriously challenged by any worker. The actual application of the community concept is, however, vigorously disputed (page 4, Andrewartha and Birch, 1954). The dissatisfaction of the critics stems from the compromises and emphasis made by most community studies. Nevertheless, compromises are necessary because a complete community analysis is virtually impossible; this is due to the sheer bulk (in numbers) of animal populations, the taxonomical problems and the physical and intellectual limitations of the worker himself.

Attempts to define "community" are diverse (eg. Allee, et al., 1949; Andrewartha and Birch, 1954; Macfayden, 1957; and Odum, 1962). These definitions range from a meaning which is all-embracing in its content to one which is strictly operational and requires only that species co-occur.

The word "community" will not be formally defined for this study, though objective techniques are used in the following sections to identify a community (Fager 1957 and 1963A).

There are two aspects to any community study: structure and function. Formal separation of one from the other is easy but it is, in fact, artificial. In community studies of marine zooplankton, both aspects are relatively unexplored. Workers using the functional approach have concentrated on quantifying the conditions of oceanic food-chains and the success of their attempts, as measured by predictive models,

is, in some cases, strikingly good (Cushing, 1958; Riley, 1963). The structural aspects of a community study depends, by necessity, on the existing knowledge of systematics and species distribution, and as a result much remains to be done in order to reach this starting point for community work. Existing studies have shown: the existence of neritic and oceanic communities (Glover, 1961; Williamson, 1961); the origin, extent and direction of intruding waters (Russell, 1939; Fraser, 1952; Hardy, 1956; etc.); and the restriction of communities to certain water masses (Redfield, 1941; Fager and McGowan, 1963). The objective of most of these studies was to find correlations among the community, the hydrography and fishery conditions. They are, therefore, limited within the scope of events usually considered as part of a community but this does not imply condemnation rather it indicates the immensity of the task involved in a community analysis. The present study is, also, limited in scope but some additional population parameters have been estimated in an attempt to show that the community concept is a fruitful and viable approach which can be used to understand the ecology of an animal, in addition to understanding or indicating environmental (hydrographical) conditions.

In 1958, the Institute of Oceanography, University of Cape Town, undertook a physical and biological survey of the Agulhas current. The survey area was sampled from eight lines of stations (Fig. A1-1), each of which transected a neritic area and part of the general ocean. The primary question of the present study was to determine, in a descriptive way, the communities of each area and how they differed (if they did) from one another. More specific objectives of this study were as follows:

- (1) To determine the kinds and numbers of the chaetognaths found in the research area;
- (2) to relate the distribution of each species to the prevailing hydrographical conditions;
- (3) to determine, as far as possible, those physical factors which limit the distribution of each species;
- (4) to find out what adaptations are made by the various species in order to live in a particular environment;
- (5) to identify and describe recurrent groups (communities) of chaetognath species so as to allow a comparison with its results and the data gathered on the individual species, and to enumerate structural differences between the neritic and oceanic communities;
- (6) to enumerate inter-and intraspecific differences of habitats and niches which "allow" the coexistence of the species as a sympatric group.

D. Materials and methods

To establish the objectives of this study various types of data were necessary, in particular: zooplankton samples and hydrographical data from the research area; the number and kinds of chaetognaths found; the fecundity values for the individual chaetognaths species; and the number and kinds of prey used by the chaetognaths. The manner in which these data were gathered and analyzed is described in the following sections.

General sampling

Zooplankton and hydrographical data were collected in the Agulhas current during three surveys in 1958 by the Institute of Oceanography, University of Cape Town (Fig. A1-1). The dates of the surveys were as follows: late summer, 24th February to 7th March; late autumn, 12th to 27th May; late winter, 4th to 23rd August. Collections were made from the hydrographical vessel of the South African Navy, the S. A. S. Natal. Mr. P. Zoutendyk collected the data.

A total of 16 stations were made during the summer survey; 34 stations during the autumn survey, and 34 stations during the winter survey (Figs. A1-3, A1-7, and A1-11). The sequence of station numbers is given in Table A1-8 and these correspond to the station numbers given on the maps of the research area for each survey (ibid.) and the temperature profiles for each line. All stations occurring in depths of approximately 200-meters or less were considered neritic but three additional stations, outside this limit, Port Alfred 81, Cape Seal 50 and 92 were also categorized as neritic on the basis of their temperature and salinity values (see section on the hydrographical background).

The zooplankton nets were of the Discovery pattern. They were as follows: the N70-nets, fished vertically and closed at intervals of 100 to 0, 200 to 100 and 400 to 200 meters (a few nets failed to close but the data were accordingly corrected, see Table A2-22); the N100-nets, one series fished obliquely through 150 meters (deepest vertical depth of about 110 meters) for an average period of 12 minutes, and another series fished horizontally, 0 to 5 meters, for an average period of 10 minutes. A full description of these nets is given by Kemp, et al (1929) but briefly the N70-nets are designed to sample quantitatively microplankton and the smaller-sized organisms of the macroplankton whereas the N100-nets are designed to sample only the macroplankton. The actual operation of the nets was in accordance with their design.

Physical data--temperature and salinities--were also collected at each station to a maximum depth of 500 meters.

Generally, these samples were from the following depth intervals; 0, 10, 20, 30, 40, 50, 75, 100, 150, 175[±] (not always taken), 200, 250[±], 300, 350, 400, 450[±] (not always taken) and 500[±] meters. The temperature profiles and salinities given in the data appendix are based on the values obtained from the above intervals. For more specific and detailed information the reader is referred to Zoutendyk, 1960.

Extraction and identification of material

All chaetognaths were removed from the above samples (N70V and N100-samples) and species identification was made for all individuals possible (see Table A2-1). Individuals of each species were placed into separate vials for each sample and counts of total individuals, adult and juvenile, were made. Identification and counts were checked at least twice. An individual was considered to be a juvenile if it had no ovaries and/or no seminal vesicles (see Hyman, 1959).

Group analysis

The Fager technique was used to identify recurrent groups of chaetognath species. This consists of an objective set of rules which forms groups out of species which frequently occur together. The term "frequently" is defined in a formal manner (see Fager, 1963A and B; and Results, Section 3). This technique was programmed for the computer of the University of Cape Town, an I.C.T. 1301. The program was written by Mr. G. B. Brundrit, of Applied Mathematics, University of Cape Town.

Fecundity measurements

The material used for this part of the study came mostly from the N100-collections but some also came from the N70V-collections (Table A4-1). The reason for this is due to the fact that the N100-nets captured larger, and hence more mature individuals than the N70V's. All mature individuals of each species were removed from the samples and measured for total length by means of a calibrated ocular micrometer, fitted into a dissecting microscope. The animals were grouped into 1.0 mm length-classes as no technique was found to distinguish true age classes. Eggs were counted by a hand tabulator while observing the same under a compound microscope at 100x; each mature individual was mounted on a glass slide in a small amount of glycerine-formalin solution and gently covered with a coverslip. As a result, the eggs in each ovary were spread into one layer and errors in the countings were small. An animal was considered mature if its ovaries contained some "enlarged" distinct eggs. The term "enlarged" is not defined quantitatively in the literature (eg. Dunbar, 1962; Thomson,

1947) but the size ranges of "enlarged" eggs, in the present material, are given for each species in Table A4-1. Neither neritic nor oceanic individuals of any one species seemed to have predominately larger or smaller eggs, though variability exists among the species.

Food analysis

After the initial species identification and enumeration all specimens which were observed to contain various items within their intestines were removed. Because chaetognaths are essentially transparent and the remains of prey were often in pieces, the identification of the prey was found to be facilitated by leaving them in the intestine of the predator. Thus, each chaetognath with its intestinal contents was placed on a glass slide in a small amount of glycerine-formalin solution. Identification was made at 100x, though oil immersion (~1000x) was necessary for some prey. I have mainly followed the taxonomy of Tanaka (1960) for the copepod genera and species of Corycaeus, Corycella and Oncaea; others taxonomical authors used for the copepods were Dakin and Colefax (1940), Giesbrecht (1898) and Wilson (1932). Various statistics on the predator and prey were collected (in addition to genera and species); they were: total length, width (widest part), maturity, prey position in the intestine, and of course, station number, depth and net used.

E. Results - Section 1. The hydrographical background General features

The survey area transects a neritic area and a part of the general oceanic area--the southwest Indian ocean (Fig. A1-1).

The neritic area is roughly delineated by the coastline and the outer edge of the continental shelf, i.e., where the water depth is approximately 200 meters. The width of this shelf is variable; it is three miles wide off Durban and about thirty miles wide off Port Elizabeth. The sea bottom slopes very gently from the coastline to the 200-meter line but thereafter depths of 1000 and 2000 meters are reached very rapidly.

The dominant feature of the survey area is the Agulhas current. It is a system of warm water which is, according to Darbyshire (1964), divided into two parts: the cool Agulhas water with temperatures between 17° to 20°C; and the warm Agulhas water with temperatures > 20°C. The origin of this current is usually set at the location where the Mozambique current and part of the South Equatorial current merge. The latter

current is presumably deflected to this southern location by the east coast of Madagascar (Both of these aspects are controversial, however). As the Agulhas current moves south it approaches the east coast of Africa very closely and, in particular, it flows along the coast of South Africa from Zululand (just north of Durban) to Port Elizabeth. The actual core of the current, however, follows very closely the outer edge of the continental shelf. Indeed, so close to the coastline is the set of the current that it can and often does make incursions into the neritic area.

The means by which these meanders are accomplished are several (Mallory, 1961): local topography, especially between Durban and Port Shepstone, causing a part of the current to be deflected landward; general and local meteorological conditions which can set up winds of sufficient force to induce part of the current in a landward direction; and variations in the strength of the Agulhas current due to seasonal changes, for example, the strongest currents usually occur during the months of February to April (Africa Pilot, 1954; Darbyshire, 1964) and, as a result, most of the continental shelf is often inundated by oceanic waters.

These meanders of the Agulhas current are, however, not confined solely to the neritic area but are evident also in the oceanic area; this is especially true for the outermost oceanic stations, particularly between Durban and Port St. Johns. The seaward limit of the Agulhas current is not defined either by the Africa Pilot (1954) or Darbyshire (1964).

The intrusion of oceanic waters into the neritic area causes a certain amount of mixing between the two areas but each maintains a distinct water mass (Fig. A1-2). The neritic area is noteworthy, further, by virtue of the following: a more or less confined body of cold water ($< 17^{\circ}\text{C}$); a counter-current of sporadic occurrences in location and time; upwelling which is also limited in location and time; and a postulated divergence zone or mixed area between it and the oceanic area (Clowes, 1950).

The cold water of the neritic area ($< 17^{\circ}\text{C}$) usually lies between Port St. Johns and Cape Seal, generally below the surface layers (at the 20 to 40 meter level) but, depending on the season, it can rise to the surface. When it does appear at the surface it apparently contributes to the counter-current as this also is a body of relatively cold water (Mallory, 1961).

The existence of the counter-current is well known by mariners of the area but due to recent work (Anderson, 1961;

Harris, 1964) it is now possible to consider the hypothesis that there may be at least two separate counter-currents (Day, personal conversation). One of these may function between the Durban-Port Shepstone area and the other between Port St. Johns-Port Elizabeth, but probably the latter starts farther west near Cape Agulhas. The net effect of both currents--a northward movement--would be the same for a mariner, hence a possible reason for it not having been considered before. Certainly temperatures, given in Table A1-2 (cf. Table A1-1 for station numbers), show that a difference exists between the two areas. For the circulation cell between Durban and Port Shepstone the casual mechanisms are tied to the topography and winds of that area (Mallory, 1961; Harris, 1964). But the mechanisms for the more southerly circulation cell are less well known, though again meteorological conditions are suggested to be important (Mallory, 1961).

Isolated incidences of upwelling are known to occur within the survey area especially between East London and Port Elizabeth; they are related to the subsurface cold-water and also to the counter-current. Upwelling is most likely to occur during winter conditions because prevailing meteorological conditions favor winds blowing in a seaward direction, also the strength of the Agulhas current is weakest during this season and the likelihood of it making large intrusions into the neritic area are reduced.

With the occurrence of a counter-current there should be, at least in theory, a divergence zone between it and the Agulhas current (Clowes, 1950). This remains to be demonstrated. The existence of such a zone, if it is present at all is most likely, however, to exist during winter conditions. For it is during winter that the Agulhas current is weakest and that the neritic area is best defined. These aspects are discussed in detail for the separate surveys in the sections to follow.

In summary, the survey area is characterized by the following: (1) The Agulhas current. A system of warm water originating in the tropics of the Indian Ocean. It can cover the shelf area off South Africa at any one location but seasonal changes affect the extent of the intrusions. (2) A neritic area. This area is distinct from the oceanic area by virtue of its topography, its general water mass, occasional counter-currents, and a body of cold water ($<17^{\circ}\text{C}$) which is closely associated with the counter-current and upwelling.

The data upon which the discussion to follow is based unless indicated otherwise are taken or derived from Zoutendyk, 1960. The interpretation and presentation of these data are my own.

Summer survey

Because the number of stations made during the summer survey is about half that made on each of the latter surveys, the data are not as extensive as for the other surveys. Nevertheless, many of the salient features of the research area can readily be seen.

Station locations and numbers are given in Fig. A1-3. Off Durban, Port St. Johns and East London there are one neritic and two oceanic stations, whereas only one station (neritic) is present off Port Shepstone. There are, however, two neritic and four oceanic stations off Port Elizabeth. In general, all stations occurring in depths of 200 meters or less are categorized as neritic.

Warm water is present at all oceanic stations: at the surface, the maximum temperature is 27.1°C at Durban 4 and the minimum is 21.6°C at Port Elizabeth 16; at the 100-meter level, the maximum temperature is 22.3°C at Durban 4 and the minimum is 18.4°C at East London 9 (Table A1-3). Vertical profiles of isotherms (Fig. A1-4 A-D) show the presence of this warm water more effectively; the 20°C isotherm is in most cases at the 100-meter level but occasionally at the 150-meter level (Durban 4). This warm water mass is designated the Agulhas current (Africa Pilot, 1954). Some authors (Darbyshire, 1964) use a broader definition for the Agulhas current and include all water of the area which is 17°C and over. The 17°C isotherm lies, for the outermost stations, between 200 and 250 meters but it rises to about 150 meters at the innermost oceanic stations (Fig. A1-4).

Dynamic heights were computed for these data and the results are given in Fig. A1-5 (Zoutendyk, unpublished data). The picture which emerges is one that shows the Agulhas current flowing more or less parallel to the coast, particularly along the continental shelf. There are, however, some indications of eddies developing at the outer stations of East London and Port Elizabeth.

Water at the neritic stations is generally less saline (Table A1-4) than that of the oceanic stations, but despite these lower values there is no doubt that much of this neritic water originates from the Agulhas current. The best indication of this suggestion comes from temperatures; all surface

temperatures at neritic stations are over 20°C. (Table A1-3). Further, the temperature profiles (Fig. A1-4 A-D) for these stations show, with the exception of Port Elizabeth 11 and the lower 100 meters of Port Elizabeth 12, that the entire water column of each station is effected by the Agulhas current (this is using Darbyshire's temperature criterion for the Agulhas current, i.e., 17°C and over). The effect of the Agulhas current on neritic stations becomes less, however, as the current progresses southward along the coast for the layer of warm water (> 20°C) becomes thinner (compare temperature profiles of each line of stations, Fig. A1-4 A-D). This is most probably the effect of the broadening of the continental shelf and Coriolis force which result in a deflection of the Agulhas current away from the coast.

The low-salinity value for the neritic station off Durban (Table A1-4) seems to be anomalous but it is likely this indicates the extensive freshwater runoff so characteristic of that area. (Africa Pilot, 1954). The water could also retain its salinity characteristics as a result of the coastal configuration near Durban which shields it from the full effects of the Agulhas current (Mallory, 1961).

Despite the rather extensive overlap by the Agulhas current into the neritic area, the two areas still exhibit distinct water masses (Fig. A1-6). In addition to this, in the neritic area there is a further distinctive water mass; it is a water mass of very low temperatures and salinities (13.3°C and 35.1‰, see Table A1-3 and Fig. A1-6). This body of water is present off Port Elizabeth 11 at the 40 to 50 meter level (Fig. A1-4D). The origin of this cold water is controversial and at least one worker (Darbyshire, 1964) considers it to be in this position as a result of displacement by the Agulhas current; an upwelling mechanism being discounted. Certainly no upwelling is apparent, at the very surface, during the summer conditions (Africa Pilot, 1954; Mallory, 1961).

In summary: (1) The Agulhas current makes intrusions at all neritic stations for this survey. (2) The cold water of the neritic area is confined to the subsurface waters of Port Elizabeth 11.

Autumn survey

In general, the hydrographical conditions for the second survey are quite similar, if not almost identical, to those of the first survey. This is not surprising since the Africa Pilot (1954, page 41) states that "summer conditions" extend approximately from November to April. The dates of the second

survey are 12th to 27th May, and hence are not a great deal later than summer conditions. The amount of data collected is, however, almost twice that of the first survey as four additional lines have been made and one extra oceanic station on each line, except for the Port Elizabeth line which is the same. Again all stations occurring in depths of ≤ 200 meters are considered neritic. Station locations and numbers are given in Fig. A1-7.

Dynamic heights were computed from these data and again the Agulhas current is clearly defined (Fig. A1-8); it sets approximately parallel to the coast and shows definite eddy formations at all outer oceanic stations; the current attains its maximum strength as it moves away from the coast off Port Elizabeth.

The oceanic temperatures for the autumn survey are not quite as high as those of the summer survey--a surface maximum of 25.3°C for autumn as compared to 27.1°C for summer. However, the temperatures at the 100-meter level (Table A1-5) appear to be slightly higher than those of the summer survey. Temperature profiles (Fig. A1-9 A-H) again show that the 20°C isotherm is always at or just below the 100-meter level. Temperatures of 19.2°C and 19.9°C were recorded at 100 meters at the outer two stations of East London but these values differ only slightly from 20°C . Further, the 17°C isotherm is, for the outer stations, at the 200 to 250 meter level, and shows a rise at the innermost oceanic stations.

All the neritic stations are again strongly influenced by the surface layers of the Agulhas current and the extra data from the increased number of lines and stations make it quite clear that this is not a spurious condition. For example, the neritic stations off Durban, Port Shepstone and Port St. Johns show Agulhas water throughout the entire water column; all temperatures being $\geq 20^{\circ}\text{C}$ (Table A1-5). At the remaining stations, however, the thickness of this Agulhas current water is more variable and reduced at some (Fig. A1-9 A-H); at Bashee 29, it covers only the top 20 meters; at East London 33, it covers the entire depth if one uses Darbyshire's temperature criterion of $\geq 17^{\circ}\text{C}$ but if one uses the $\geq 20^{\circ}\text{C}$ isotherm then it covers only the top 20 meters; at Port Alfred 37, the 20°C isotherm covers the top 20 meters, the 17°C isotherm extends to 40 meters; and finally, at Port Elizabeth 41 and 42, it covers the top 20 and 50 meters, respectively. This is again using the widest temperature criterion, i.e., $\geq 17^{\circ}\text{C}$. The extra line off Cape Seal is neritic in location and character but is, for this survey,

covered with a thin layer of Agulhas water. The temperature profile for this line (Fig. A1-9H) shows also how the bulk of the Agulhas current ($\geq 20^{\circ}\text{C}$) has turned away from the coast.

Salinities (Table A1-6) are slightly less for the neritic waters and the neritic station of Durban appears to be more in concert with the other coastal stations than it was during the summer survey.

The water mass of the neritic area is distinct from that of the ocean (Fig. A1-10) but the body of very cold water in that area is now more extensive in its horizontal coverage than for summer (Table A1-5). In addition, a pocket of cold water-- 13.5°C at 40 meters off Bashee--seems to be separated from a similar body of cold water off Port Elizabeth and Cape Seal (Fig. A1-9D and Table A1-5). Perhaps this represents the remnant of a previous intrusion of cold counter-current into the Bashee area which is being progressively destroyed by the mixing action of the Agulhas current or of upwelling which has not reached the surface layers.

The data do not indicate any upwelling, at least at the very surface, but temperatures do show a difference between the neritic areas of Durban-Port Shepstone and Port St. Johns-Cape Seal (Table A1-5).

In summary: (1) Water of the Agulhas current intrudes at all neritic stations--this affects the entire water column of the northern stations and becomes less as the current proceeds south. (2) The cold water of the neritic area is always subsurface and extends a bit farther to the north than it did during the summer survey.

Winter survey

The outstanding feature of the hydrographical conditions for the winter survey is that the influence of the Agulhas current upon the neritic area is greatly reduced. It is well documented that the Agulhas current undergoes a general weakening during the winter months and hence is less influential on neritic waters (Africa Pilot, 1954; Darbyshire, 1964). Also the prevailing meteorological conditions of winter are such that upwelling can occur which is an additional factor causing distinctive neritic conditions (Africa Pilot, 1954; Mallory, 1961). Regardless of the actual causes, cold water is present in the neritic area; it is present at the surface and widely distributed horizontally. Station locations and numbers are given in Fig. A1-11.

From the dynamic heights computed (Fig. A1-12) for this survey it is apparent that once again the Agulhas current maintains an almost parallel set to the coast but its strength is considerably reduced--a maximum of 25 cm/sec. is attained

compared to a maximum for the autumn survey of 60 cm/sec. Eddy formations are not so prevalent, as found for the autumn survey, but they still are very pronounced between Durban and Port St. Johns. The oceanic temperatures are generally lower than for the other surveys; at the surface the temperature maximum is 21.7°C at Durban 61 and the minimum is 19.4°C at Bashee 74. At the 100-meter level most temperatures are still over 20°C but the lowest value is 18.7°C (Table A1-7). The 20°C isotherm for this survey shows more variability in its depth (Fig. A1-13 A-H) than for the other surveys: off Durban, it is at and sometimes slightly deeper than the 100-meter level; off Port Shepstone and Port St. Johns, it is approximately at the 100-meter level for the inner stations but rises to the surface at the outermost stations; off Bashee, it is at the 50-meter level and rises to the surface at the outermost stations; off East London, it is, for all oceanic stations, at about the 75-meter level; off Port Alfred, it is at 30 meters at Station 80 and 50 meters at Station 79 (it should be noted that Station 81 is classified, for this survey, as neritic); off Port Elizabeth, it is at the 50-meter level for the inner stations and 100-meter level for the two outermost stations. The 17°C isotherm shows little variation from the other surveys, that is, it lies at about 200 to 250 meters but rises rapidly as it gets closer to the shore.

The neritic stations off Durban and Port Shepstone (Table A1-7) are by Darbyshire's temperature criterion ($\geq 17^\circ\text{C}$) completely overrun by the Agulhas current, as the entire water column of each station is 19.9°C or greater. The first indication of a temperature change in the neritic area occurs off Port St. Johns where the temperature at the bottom is 15.2°C. Nonetheless, water of 18.1°C is still present at the surface. All stations south of Port St. Johns, however, show cold water from surface to bottom (Table A1-7 and Fig. A1-13 C-H)--the only exceptions are the surface readings of Port Alfred 82 and 81, 17.9°C and 19.7°C, respectively, and Cape Seal 89, at 19.8°C. Thus most of the neritic stations possess water distinctly different from the warm Agulhas current, and hence, in terms of their temperature regime, are markedly different from the oceanic stations. The neritic stations off Durban, Port Shepstone, Port Alfred 81 and Cape Seal 89 are the only exceptions.

The water masses, as distinguished by the individual temperature and salinity values (Fig. A1-14), are sharply separated from one another.

The wide expanse of the cold, neritic water, both in a vertical and horizontal sense, suggests that upwelling has occurred. Further, it is possible to speculate that the extension of this cold water, north to Port St. Johns, (compare the cold water distribution in neritic areas for other surveys) represents the effect of a cold counter-current.

Salinities are relatively constant at oceanic stations (Table A1-8) ranging only from 35.3‰ to 35.6‰ from surface to bottom.

Salinities at neritic stations are also narrow in range but the values of Port Elizabeth 83, and Cape Seal 91 and 90 are considerably reduced. Although the remaining values differ from one another by only 0.1‰, the highest surface value (35.4‰) occurs off Durban and Port Shepstone and the remaining neritic stations (except Port Alfred 81 and Cape Seal 89 which are closest to the core of the Agulhas current) are either 35.2‰ or 35.3‰. This certainly is not indicative of extensive upwelling but it does show that a definite change has occurred (Table A1-8).

In summary: (1) The effects of the Agulhas current on the neritic area is reduced, only the neritic stations off Durban, Port Shepstone, Port Alfred 81 and Cape Seal 89 show oceanic water; (2) The distribution of the cold water found in the neritic area is much wider than for the other surveys--it extends to Port St. Johns--and it is present at the surface which suggests limited upwelling.

E. Results - Section 2. Species distribution and abundance Notes on organization and presentation of data

This section gives the species found, their distributions, and their abundances.

Table A2-1 gives the total species and abundances for the three net collections analysed from the Agulhas current. Eighteen species were found to occur in the survey area. The results for each species and the discussion of them are presented in the following manner:

- (1) Résumé A general statement of the data for each species.
 - (2) Data A presentation of the data for each species as indicated by the following:
 - (N70V-nets) } These include: presence and absence; number of individuals per unit volume; a percentage-rank for each station and area, neritic and oceanic.
 - (N100B-nets) }
 - (N100H-nets) }
- (Population composition)

- (3) Literature The general distribution of each species as revealed by the available literature and the correspondence with the present data.

The abundances from the N70V-nets are expressed by the mean number of individuals per 100m³ of water filtered per depth of water column sampled. Since no flow-meter was used on these surveys the amount of water filtered by each net is assumed to be proportional to the area of the net's mouth (0.385m²) times the length of the water column sampled. From this value the number of individuals per cubic meter of water filtered was computed for each depth interval sampled, i.e., 100-0, 200-100, 400-200 meters and 400-0 meters if the net failed to close. The values for all intervals at one station were then summed and this was then divided by the depth of the water column sampled to give the mean number of individuals per cubic meter of water filtered for the sampled water column. In order to use integral expressions the final value was multiplied by 100 to give the mean number of individuals per 100m³ of water filtered per sampled water column.

The abundances for the N100-nets were expressed in a slightly different manner. For these nets also, no flow-meter was used. The N100H-nets were hauled for an average period of 10 minutes while the N100B-nets were hauled for an average period of 12 minutes. Therefore in order to obtain comparable values for both collections, all abundances for both N100-nets are expressed by the number of individuals per haul per 10 minutes.

Percentage-ranks were calculated from the relative abundance from the particular set of samples indicated. For example, in Table A2-1, E. enflata was found to constitute 25.4% of the N70V collections and was accordingly 1st-rank species, etc.

Definitions: Euplankton--upper part = 100 to 0 meters, and lower part = 200 to 100 meters. Mesoplankton-- ≥ 200 meters. Percentage-ranks--percentages of total relative abundance and then the rank of each by their percentage.

Taxonomic notes

The taxonomy of the chaetognaths is in a fair state of development, at least compared to other animal groups. Indeed, one might conclude just on the basis of the size of the phylum itself--some 80 species now recognized (David, 1963)--that all the major classificatory problems have been solved. But this is simply not the case and to emphasize this point, I would like to discuss some of the taxonomic problems which vexed me during the course of the present study.

The major taxonomic problem existing on the Chaetognatha is the identification of juveniles. This is most apparent from the present study as 15.4% (8807 individuals) of the total specimens could not be identified because most of them were juveniles (Table A2-1). Species descriptions, keys for identification and taxonomic revisions are usually based on adult (mature) morphology (eg. Ritter-Zahony, 1911; Michael, 1928; Fraser, 1952; Sund, 1959; Alvarino, 1962; and etc.). When various aspects of juvenile morphology are included (Thomson, 1947; Tokioka, 1952, and 1959; Sund, 1959) the overlap of such measurements between closely related species is considerable. My criticism is this: the crucial parts of identification keys are based on mature morphology and if a juvenile specimen cannot be initially identified then any attempt to fit it into a particular species category is subject to a great amount of error, especially when the characters used for identification show a large degree of overlap. Of course, for some species, i.e., S. enflata, P. draco and S. hexaptera, juvenile identification is no problem but for the other species, discussed below, the difficulties are often pronounced. To be sure, it is easier to point out this problem than to solve it but it is certainly a problem worthy of the considerations of any systematist.

Specific taxonomic problems are as follows:

S. serratodentata

The disposition of this species, is in my opinion, a problem second only to juvenile identification. The dilemma is whether it consists of one species as treated by David (1963) or five to six species as treated by Alvarino (1961) and Tokioka (1963). Odds favor the latter judgement because the major differences among the "species" are most evident at the mature, adult level. Again, however, when a scheme of classification applicable to all individuals is given (eg. Tokioka, 1952) the degree of morphological overlap, is great. This is the reason I have followed David's judgement and lumped all specimens into one species heading. When there was no doubt about the identification I kept a separate tally, for example, in Table A2-1 S. serratodentata is also enumerated into the categories atlantica and pacifica.

Tokioka (1963) suggests that a subgenera be set up for these related "species" but no workable scheme is presented for the juveniles and they constitute what I consider to be the central part of the problem.

S. regularis/neglecta

Here again, the adults of these species are easily dif-

ferentiated. In particular, S. neglecta is usually larger, has more posterior teeth, and no collarette--as compared to S. regularis. But teeth are subject to damage and loss as is the collarette. Hence, one cannot always be certain, even with adults which species is involved. The characters of the juveniles show much overlap, except in the number of posterior teeth (see p. 373-376 Tokioka, 1959).

When no doubt existed about the identification, however, I kept a separate tally. For example, in Table A2-1, S. regularis/neglecta is enumerated as far as was possible into the two species categories but because some doubt existed on some of the juveniles both are treated here under one species heading.

S. robusta/ferox

Alvarino (1962) gives a taxonomic revision of both species which is easily applied to adult specimens. But because of the juvenile problem I have treated both under a single species heading, though approximate numerical counts are given for each in Table A2-1.

S. minima

In the latter section devoted to the distribution of this species it will be shown that its population composition was composed mainly of adults (91.8% adults to 8.2% juveniles). Other workers (Furnestin, 1962) have also remarked on this skewed population composition. I feel confident that some of the very small, unidentified specimens of the present material (Table A2-1) are this species but an objective and useable criterion is needed in order to be certain about this.

K. subtilis and K. pacifica

No taxonomic problems exist here for adult specimens and in general for the present material. I did not encounter many problems of juvenile identification. Therefore these species are treated separately but again the juvenile problem remained to be clearly defined.

S. friderici

This species is closely related to S. tenuis, a sister species. Some authors (Sund, 1959) have treated them as a single species but a majority of the specimens in the present material fitted into the category of S. friderici, as defined by Tokioka (1959). The juveniles, for lack of a better method, were assumed to be of the same species as the adults.

S. enflata

Doncaster, (1903) described a species, similar to S. enflata, from the Indian Ocean. He called it S. gardineri.

Later workers (Tokioa, 1959) regard it as only a form of S. enflata which differs by its greater length and longer ovaries. I found seven specimens which correspond to the form gardineri and all were from the neritic stations off Port Elizabeth and Cape Seal lines (autumn and winter surveys only). I consider these seven specimens simply large S. enflata and not a distinct form. The fact that gardineri is larger, and has longer ovaries is undoubtedly related to the temperature history of the animal and the available food (see Stone, in press).

Individual species

Sagitta enflata Grassi

Résumé

This species was found at all stations except Cape Seal 92 (Table A2-24). All nets--N70Vs, N100Bs and N100Hs--showed that it is a resident of both the neritic and oceanic areas and the dominant species (or among them) of each area.

In the ocean, it lives primarily in the epiplankton, especially the upper 100 meters or less. Survey to survey, this species was fairly constant in its abundance but a maximum occurred during the autumn survey.

In the neritic area, its distribution was in marked contrast to that of the ocean: its numbers were greater and more variable; and a sharp reduction in its abundance occurred during the winter survey--the survey when the effects of the Agulhas current upon the neritic area were attenuated (see Hydrographical section). Further, the species is apparently limited in its neritic distribution by the presence of cold water ($< 17^{\circ}\text{C}$) and/or the presence of another chaetognath, S. friderici.

The population composition of S. enflata was 50.6% adults to 49.4% juveniles. A change in this adult to juvenile percentage-ratio occurred during the winter survey; the ratio was then about 60%:40% for both the neritic and oceanic populations. Both adults and juveniles, however, followed the pattern of distribution and abundance as indicated by the data for all individuals. There was some indication that juveniles occurred more often than adults within the upper layers of water.

Data

(N70V-nets)

Medians, ranges, and the number of individuals per 100m³ per survey are given in Table A2-25.

Maximal numbers were found at neritic stations during the summer survey; the median value was 70l $\frac{1}{2}$ individuals/100m³.

At oceanic stations, this species was not as abundant as in the neritic area; median values/100m³ were smaller by a factor of 3 to 35 times. In addition, its oceanic density was

less variable than in the neritic area and differences in numbers among the surveys were small. Maximal numbers in this area were found during the winter survey.

The bulk of the oceanic population of S. enflata was found in samples from the upper epiplankton (Text-Table 1). This, of course, applies only to daytime hours (roughly, between 0600 and 1800 hours, local time) as samples were not collected at night.

Text-Table 1. The vertical distribution of S. enflata at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

<u>Depth in Meters</u>	<u>Summer</u>	<u>Autumn</u>	<u>Winter</u>	<u>All Surveys</u>
100-0	84.6% (269)	80.7% (799)	61.2% (504)	73.8% (1572)
200-100	10.7% (34)	16.6% (166)	34.2% (281)	22.6% (481)
400-200	4.7% (15)	2.7% (24)	4.6% (38)	3.6% (77)
Totals:	100.0% (318)	100.0% (989)	100.0% (823)	100.0% (2130)

It is evident from these data that more than 60% of S. enflata's population occurred in the upper 100 meters. A change in the vertical distribution of this species occurred during the winter survey as a larger portion (38%) of its population extended below 100 meters than during the other surveys.

The percentage-ranks of S. enflata, as computed from the data of the N70V-nets, are given in Tables A2-3 to A2-9. In terms of percentage, S. enflata was invariably the dominant species in neritic waters and among the dominants in the ocean (Dominant means: a species or those species which make up the first 50% of the total individuals; see Table A2-1).

At oceanic stations: During the summer survey, S. enflata was less dominant at the more southerly lines of East London and Port Elizabeth; during the autumn survey, S. enflata was less dominant from the Bashee line south to the Port Elizabeth line; and during the winter survey, S. enflata underwent a general reduction in its percentage-ranks but there were no trends consistent with the geography (Tables A2-7, A2-8 and A2-9).

At neritic stations the percentage-ranks of S. enflata show several features: a reduction at the more southerly stations, particularly during the winter survey; and an increase at those stations which did not have oceanic water (Agulhas current), or cold water ($< 17^{\circ}\text{C}$), or the presence of another chaetognath, S. friderici.

The percentage-ranks for neritic stations are considered now in detail for each survey: During the summer survey (Table A2-4), S. enflata had a high percentage-rank ($> 50\%$)

at all neritic stations except Port Shepstone 1 and Port Elizabeth 11. (at these, about 16%). Port Shepstone 1 was, at this time, completely inundated by the Agulhas current whereas Port Elizabeth 11 was definitely neritic in its physical makeup but it had a body of cold water ($\leq 17^{\circ}\text{C}$) present at the 40-meter level. Furthermore, S. friderici increased its percentage-rank to 82% (1st-rank) at the latter station which is significant when compared to other stations, where it was always less than 6% and of a low rank. During the autumn survey (Table A2-5), the percentage-ranks of S. enflata were reduced at Port Elizabeth 41 and Cape Seal 47; at these stations the percentage of the species was $< 15\%$ while at the other stations it was usually $> 40\%$. Cold water ($< 17^{\circ}\text{C}$) was present at both of these stations and S. friderici made a corresponding increase in its percentage-rank. However, S. friderici decreased in its percentage-rank at Cape Seal 50 apparently as a result of the influx of oceanic waters. During the winter survey (Table A2-6), S. enflata underwent a reduction in its percentage-rank at Port Alfred 81, Port Elizabeth 84 and 83 and Cape Seal 92 and 91 and 90. An examination of the temperature profiles of these stations (Fig. A1-13 F, G and H) shows that each had a body of cold water present ($< 17^{\circ}\text{C}$). Also, S. friderici increased its percentage-rank at most of these stations, in particular, at Port Elizabeth 84, Cape Seal 92 and 91.

The role of S. friderici increases and that of S. enflata decreases as one proceeds west of the Cape Seal line. This is confirmed from the work of David (1963) from the Benguela current where S. friderici was 2nd-rank (58.5%) species and S. enflata 11 $\frac{1}{2}$ th-rank ($< 0.5\%$) species. The data given in Table A2-2 also demonstrates this in a limited way. These data are from a 24-hour station situated over the Agulhas bank (west of Cape Seal) approximately midway between Cape Town and Port Elizabeth (exact location: $36^{\circ}29'S$ by $21^{\circ}11'E$). S. enflata had a much reduced role at this station, 4th-rank (13.4%) species, and just as important, S. friderici was the 1st-rank (35.9%) species. This station was neritic in character and had a body of cold water ($< 17^{\circ}\text{C}$) present at the 40-meter level and below.

If one assumes that S. enflata is primarily of Indian Ocean origin, at least for the present collections, then its abundances should follow the flow pattern of the Agulhas current. In particular, maximal abundances should occur at those neritic stations which are more readily affected by the Agulhas current; such as those off Durban, Port Shepstone, Port St.

Johns, Bashee and the outermost station of Cape Seal. The abundances of S. enflata at these stations were tabulated and are given in Text-Table 2. These data clearly show that > 70% of S. enflata's population, at neritic stations, was found at those stations which showed the greatest influence from the Agulhas current.

Text-Table 2. The relative abundances and percentages of S. enflata for the neritic stations off Durban, Port Shepstone, Port St. Johns, Bashee and Cape Seal (N70V-nets).

	A. Total relative abundances for select neritic stations as indicated above.	B. Column A as a percentage of all neritic station totals.	C. Column A as a percentage of neritic and oceanic stations totals.
Summer	1118	78.3% (1426)	61.8% (1803)
Autumn	694	62.1% (1111)	29.9% (2316)
Winter	364	85.6% (426)	28.4% (1284)
All surveys	2176	73.2% (2963)	40.1% (5403)

(N100B-nets)

Medians, ranges and number of individuals/haul/10 minutes are given in Table A2-26.

Because these nets were fished obliquely through 150 meters of water, which corresponds to a vertical depth of about 110 meters, they were not used at most neritic station due to the inadequate depth. Nevertheless, the data are of value for confirmation of oceanic trends and for comparison with the N100H-data.

At those few neritic stations made with this net the species was usually more abundant than at oceanic stations.

At oceanic stations maximal numbers occurred during the autumn survey; the median value was 54 individuals/haul/10 minutes. A comparison of these data with the N100H-nets (Table A2-27) shows no major differences, indeed, one is struck by their close similarity; median values for each survey are roughly the same and both sets of data indicate maximal abundance occurred during the autumn survey.

Percentage-ranks of S. enflata, computed from the data of the N100B-nets, are given in Tables A2-10 to A2-13. At neritic stations, S. enflata was the dominant species and among the dominants at oceanic stations; for all surveys combined it was 1st-rank (53.7%) species at neritic stations and 1st-rank (22.3%) species at oceanic stations. For similar data from the N70V-nets, S. enflata was 1st-rank (47.6%) species in neritic waters but 3rd-rank (16.2%) species in the ocean. This discrepancy of oceanic rank between the two nets is mostly

likely a reflection of the gear used and not an indication that S. enflata changed or assumed a different role in the community (cf. Tables A2-3 and A2-10).

(N100H-nets)

Medians, ranges and number of individuals/haul/10 minutes are given in Table A2-27.

S. enflata was, by these nets, most abundant at the neritic stations and maximal numbers occurred in this area during the summer survey. This corresponds with the N70V-data. During the winter survey, this species underwent a sharp reduction in its abundance; its median value was 36 individuals/haul/10 minutes as compared to 159 and 80½ individuals/haul/10 minutes during the summer and autumn survey respectively. This pattern is also identical to that of the N70V-data.

At oceanic stations, two hauls did not contain this species but otherwise the number of individuals found were roughly equivalent to the N100B-data. Moreover, maximal numbers occurred, as with the N100B-data, during the autumn survey.

The strong representation made by S. enflata in terms of its abundances in these collections suggests that it is an inhabitant to a significant extent in the surface layers (0 to 5 meters).

The percentage-ranks of S. enflata as computed from the data of the N100H-nets, are given in Tables A2-14 to A2-20. These data show, as did the data of the other nets, that S. enflata was the dominant neritic and oceanic species; it was 1st-rank (31.0%^{and 58.6%} in neritic^{and oceanic} waters (Table A2-14). But unlike the data of the N70V-nets, no geographic trends were indicated at the oceanic stations but, as already pointed out, the species had slightly higher ranks by the data of these nets as compared to the data of the N70V-nets.

At neritic stations, the percentage-rank of S. enflata followed the flow pattern of the Agulhas current and/or the position of another chaetognath S. friderici--similar to the N70V-data. During the summer survey, S. enflata underwent a reduction of its percentage-rank at Port Elizabeth 11. During the autumn survey, it decreased in percentage-rank at Port Elizabeth 41, Cape Seal 48 and 50. The percentage-rank of S. friderici increased at each of these stations. During the winter survey, S. enflata decreased in percentage-rank at Bashee 71, East London 78, Port Elizabeth 84 and Cape Seal 90. All of these stations, had a body of cold water (<17°C) present and S. friderici made a corresponding increase at each of them.

(Population composition)

The data for the population composition of S. enflata are given in Table A2-28.

For all collections (N70V-nets), the adult to juvenile percentage-ratio was 55.5% to 45.0%. A breakdown of this data for the neritic and oceanic areas indicates no major changes in the population composition existed between the two areas; this is true for the data from all the nets. Seasonally, however, the adult to juvenile percentage-ratio changed during the winter survey to about 60.0% to 40.0%.

Abundances for adults and juveniles, by each net used, are given in Tables A2-29 to A2-34. Without any variation, the pattern showed by both the adults and juveniles is that which was given previously for the combined data of all individuals. For example, the N70V-nets indicate a maximal abundance for adults and juveniles of S. enflata occurred during the summer survey at the neritic stations, which is exactly the same as indicated by the combined data, etc.

The vertical distribution for adults and juveniles are given in Text-Table 3.

Text-Table 3. The vertical distribution of adult (A) and juvenile (B) S. enflata at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

<u>Depth in Meters</u>	<u>Summer</u>	<u>Autumn</u>	<u>Winter</u>	<u>All Surveys</u>
A. Adults				
100-0	82.0% (114)	71.9% (498)	54.0% (293)	65.8% (905)
200-100	13.7% (19)	25.4% (176)	39.5% (214)	29.8% (409)
400-200	4.3% (6)	2.7% (19)	6.5% (35)	4.4% (60)
Totals:	100.0% (139)	100.0% (693)	100.0% (542)	100.0% (1374)
B. Juveniles				
100-0	85.8% (145)	78.0% (301)	63.2% (175)	74.5% (621)
200-100	8.8% (15)	20.7% (80)	35.8% (99)	23.3% (194)
400-200	5.4% (9)	1.3% (5)	1.0% (3)	2.2% (17)
Totals:	100.0% (169)	100.0% (386)	100.0% (277)	100.0% (832)

Both adults and juveniles were found in slightly deeper water during the winter survey. More interesting, however, are the differences in the vertical distribution of adults and juveniles; more juveniles were distributed closer to the surface than the adults.

Literature

Ritter-Zahony (1911) found S. enflata off Durban—he called the station Port Natal but this is a synonym for Durban—

and also at stations of approximately the same latitude between 40°E and 60°E longitudes. His specimens were mainly from vertical hauls, though off Durban, surface captures were made. He gives no indication of abundances but his statement on the general ecology of this species is of interest (p. 57-58); therein he clearly states that the occurrence of S. enflata is limited (enschränken) by cold water, in particular, he notes that it was absent in the cold Benguela current.

S. enflata is well known as a warm-water cosmopolitan and Tokioka (1962) regards it as the most common species in off-shore waters of the Indian Ocean. In addition, he points out that S. enflata is the "dominant-most" chaetognath for many inshore areas, such as, along the Indian coasts. David's data (1963) from the Indian Ocean--along a transect of the 90° meridian--certainly confirms the former contention.

Throughout the Pacific Ocean, (David, 1963) S. enflata is also the dominant species; this is true, also, for some of the inshore areas as well, such as, Peru (Bieri, 1957), and Chile (Fagetti, 1958). Fagetti's work is of special interest since she gives some temperature readings and all species abundances for each station. She found S. enflata throughout the survey area (off the Chilean coast). The temperature range of the survey area was 11.2° to 23.0°C † and S. enflata was present at cold and warm water stations. Some stations had a sharp thermocline, for example, 25.4°C at the surface to 11.5°C at 200 meters, and, as a result, one cannot always be certain where her specimens came from in regard to the thermocline. In addition, she lists only relative abundances; no corrections were given for, presumably, time differences in fishing by the nets, and/or for the amount of water filtered. At any rate, I found no statistical relationships in her data, which were significant, between the number of S. enflata present and temperature values. This suggests, at least for her data, that these factors are independent. A further comparison was made of her data by converting them to percentage-ranks for each species (similar to that done in Tables A2-1 to A2-20). When this was done, S. enflata was found to make up 50% of the totals at neritic stations and among those making up the first 50% of the totals at the oceanic stations. Also, the percentage-ranks of S. enflata did not decrease in the presence of cold water at either neritic or oceanic stations. Finally, Fagetti listed no other neritic species; this fact

† The tables of data in her paper give the temperature range for S. enflata as 10.6° to 24.0°C .

may be significant.

David (1963) has worked some collections from the Peru current, presumably found at locations just north of Fagetti's survey area but no location is given, and his data show that S. enflata was the 1st-rank species (53.0% of a total of 23,145 individuals). However, he did find one species (S. peruviana; 3rd-rank and 4.8%) which closely resembles S. friderici and, according to Sund (1964) is a neritic species for that area. Sund's material came from an area approximately bound by 2°N-25°N latitudes and 95°W longitude on the coast of South American just north of Fagetti's survey area. Along the western coast of Africa the community position of S. enflata is markedly different from that of the Peru current. For example, in the Benguela current, David (1963) found S. enflata was 11¹/₂th-rank species and made up 1% of the total collection (28,268 individuals), whereas S. friderici was 2nd-rank species and made up 19.4% of the total. But north of the Benguela current, Furnestin (1962) found S. friderici invariably the dominant species over S. enflata at coastal stations. Again the temperatures were both warm ($\geq 17^{\circ}\text{C}$) and cold ($< 17^{\circ}\text{C}$) at many of the stations.

From the present study and the literature the data are very suggestive that competition occurs between S. enflata and S. friderici. Further, that this co-action seems to occur along an environmental gradient (temperature) between their horizontal distributions is what one would expect a priori. But because of the complexity and polemics surrounding the concept of competition and the indirect nature of the evidence, it is perhaps best to conclude that the limiting factor in the distribution of each species is temperature and to suggest as a research project for the future, a more detailed analysis of the distribution of each species. It would be especially pertinent/where^{to find} the population of each species is primarily located in regard to the thermocline.

Sagitta minima Grassi

Résumé

This species was found at all oceanic stations except at Durban 4. In neritic waters its distribution was less consistent but it was still found at 23 out of 31 neritic stations (Table A2-35).

Within the survey area S. minima is an oceanic species and lives predominately in the upper 100 meters but not in the surface layers (0 to 5 meters). As the dominant species in the ocean it was most abundant during the autumn and winter surveys.

Among the nets used there were considerable differences in the number of individuals captured but this is most probably a reflection of the size of this species as it is small and slender; the average length of 179 mature individuals was 5.7 mm. The data from the larger-mesh nets, the N100's, are probably, therefore of limited value in the analysis of the species distribution. Notwithstanding these limitations, the distribution and abundance of this species did not seem to follow the flow pattern of the Agulhas current.

A preponderance of adults over juveniles were found; the adult to juvenile percentage-ratio was 91.9% to 8.1%. This situation is most probably due to the inadequate literature on juvenile systematics (see Taxonomic notes). The separate pattern of distribution and abundance for adults (juvenile data is much too limited to judge by) followed, as would be expected, that indicated by the data of all individuals. The juveniles were found slightly higher in their vertical stratification than the adults.

Data

(N70V-nets)

Medians, ranges and number of individuals per 100m³ per survey are given in Table A2-36.

Maximal abundance occurred during the summer survey at neritic stations; the median value was 110 individuals/100m³. However, this value should be taken as an indication of the degree the neritic area was influenced by the Agulhas current, during the summer survey, and not that the species prefers a neritic milieu. Further, at those neritic stations which showed the least amount of oceanic influx, i.e., East London 8 and Port Elizabeth 11, S. minima was not present (see Hydrographical section, especially Figure A1-4). Other supporting evidence for this suggestion comes from the neritic stations of the autumn and winter surveys, which had substantially lower numbers of this species; median values/100m³ were 11 and 15 for autumn and winter, respectively. It can be noted that the winter values are not much different from those of the autumn survey as would be expected due to the hydrographical changes. Thus a reduction in numbers could be anticipated if recruitment of the species was solely via the Agulhas current.

At the oceanic stations, abundance was lowest during the summer survey; the median number of individuals/100m³ was 14. The median values of the autumn and winter surveys were approximately the same; median numbers of individuals/100m³ were 32 and 33, respectively. The range of values found in the ocean

were just as variable as those for the neritic area.

The vertical distribution of S. minima is given in Text-Table 4. These data show, at least for daytime hours, that it is an epiplanktonic species. The winter data are in variance to those for the other surveys as a greater portion of the population was at the 200-100-meter level.

Text-Table 4. The vertical distribution of S. minima at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

<u>Depth in Meters</u>	<u>Summer</u>	<u>Autumn</u>	<u>Winter</u>	<u>All Surveys</u>
100-0	76.2% (138)	80.4% (928)	55.6% (1075)	65.5% (2141)
200-100	16.0 (29)	17.4% (201)	44.0% (852)	33.1% (1082)
400-200	7.8% (14)	2.2% (25)	0.4% (8)	1.4% (47)
Totals:	100.0% (181)	100.0% (1154)	100.0% (1935)	100.0% (3270)

By percentage-ranks (Table A2-3) S. minima was the dominant species, for all surveys, at oceanic stations. It makes up 17.1% to 29.4% of the total oceanic collections and was 1st- to 3rd-rank.

The percentage-ranks for this species at neritic stations was quite variable during the summer survey (Table A2-4); it was 1st and 2nd rank at Port Shepstone 1 and Port Elizabeth 12, respectively. These stations, however, are considered more oceanic in character than neritic (See S. enflata and Hydrographical section, especially Fig. A1-4). At the remaining stations during summer, S. minima was of low percentage or rank, i.e., $\leq 8.3\%$ and/or 8th-rank. During the autumn survey (Table A2-5), the species assumed a higher rank at the more southerly stations of Port Elizabeth 42 and at all Cape Seal stations. Similarly, for the winter survey (Table A2-6), there was a slight tendency for the species to have higher ranks at the southerly stations but the rather small number of individuals captured makes this a tentative suggestion only.

In the ocean (Tables A2-7, A2-8, and A2-9), the percentage-ranks for this species during the summer varied between $< 1\%$ to 21.2% and between 10th and 1st ranks. During autumn and winter surveys, however, the species had higher percentages, up to 36.5% of the totals, and higher ranks, usually first to second. The increase of abundance during the winter survey is especially apparent.

(N100B-nets)

The abundances obtained by these nets (Table A2-37) from oceanic stations are in accordance with those of the N70V-nets. The lowest median value was during the summer survey with $3\frac{1}{2}$

individuals/haul/10 minutes and the highest values were during the autumn and winter surveys with 8 and 6½ individuals/haul/10 minutes, respectively.

But for any one line, S. minima never amounted to over 10% of the totals, and indeed, for all season (that is, lumping all line-data together Table A2-10) S. minima was never more than 7% of the totals (Tables A2-10 through A2-13).

Despite the paucity of the data from neritic stations it is evident that S. minima is primarily an oceanic species. But some caution is necessary in the interpretation of these data since sampling of this species may not have been adequately performed by this net.

(N100H-nets)

These data (Table A2-38), while demonstrating again that S. minima may not be efficiently sampled by the N100-nets, do indicate that the species is not a surface dweller (0 to 5 meters). This is confirmed by the N100B-data, which are directly comparable in values to the N100H's. Thus the N100B-data are 3 to 18 times greater than the N100H-data. (cf. Tables A2-37 and A2-38).

(Population composition)

The data for the population composition of S. minima are given in the Table A2-39.

For any one survey and for either the neritic or oceanic areas the adult to juvenile percentage-ratio was usually about 80.0% to 20.0%. This may, however, indicate that the technique of identification used did not vary.

The adult abundances of S. minima are given in Tables A2-40, A2-42 and A2-44. These data show a direct parallel to that indicated above for the combined data of all individuals.

The vertical distributions for adults and juveniles are given in Text-Table 5.

Text-Table 5. The vertical distribution of adults (A) and juveniles (B) of S. minima at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

<u>Depth in Meters</u>	<u>Summer</u>	<u>Autumn</u>	<u>Winter</u>	<u>All Surveys</u>
A. Adults				
100-0	77.4% (134)	80.2% (858)	53.4% (927)	64.4%(1919)
200-100	15.0% (26)	17.2% (184)	46.3% (803)	34.0%(1013)
400-200	7.6% (13)	2.6% (27)	0.3% (8)	1.6%(48)
Totals:	100.0% (173)	100.0% (1069)	100.0% (1738)	100.0%(2980)
B. Juveniles				
100-0	50.0% (4)	81.4% (70)	75.0% (148)	76.4%(222)
200-100	37.5% (3)	18.6% (16)	25.0% (49)	23.4%(68)
400-200	12.5% (1)	0.0 (0)	0.0% (0)	0.2%(1)
Totals:	100.0% (8)	100.0% (86)	100.0% (197)	100.0%(291)

Despite the limited juvenile data there is an indication that the juvenile population was confined to a slightly higher level than the adult population. The data for any particular survey, however, are too few for such conclusions.

Literature

This species was recorded in the Indian Ocean by Ritter-Zahony (1911) from horizontal hauls and from several vertical hauls (depths not given); they were taken at stations in the area bound by the 25°S and 27°S latitudes and just south of Madagascar. He states (p. 61) that S. minima was one of the more abundant species--no reason are given to support this claim--and that the reasons for its rather meager abundances in his collections were probably due to the following: (1) it is a small-sized species and (2) the juveniles of the species are most difficult to recognize. The latter has already been pointed out in the previous notes on taxonomic problems. Certainly, for the present material, S. minima is the dominant chaetognath in the Agulhas current off South Africa.

In the Indian Ocean, S. minima is distinctly rare; it made up 1% (12th rank) of David's (1963) collections (10,315 individuals), from stations along the 90°E meridian. Also, Alvarino (1964B) found it to occur in (apparently) small numbers in a series of samples from a wide expanse of the Indian Ocean (an area bound by 8°S-40°S latitudes and 60°E-120°E longitudes).

For the Pacific Ocean, Bieri (1959) states that S. minima is a mesoplanktonic species (100 to 300 meters) and is prevalent in mixed-water areas over the continental shelf. However, the percentage-rank of this species is usually <0.5% throughout the Pacific except in the waters about Japan where it constitutes about 10% of the chaetognath fauna (data cited from David, 1963).

The distribution of this species in the Atlantic Ocean is also puzzling: in the Florida current, it is 3rd rank-6.3% (Owre, 1960) and according to Pierce and Wass (1962) it is particularly abundant over the shelf of the same area. The percentage-rank of S. minima in the Benguela current is approximately the same as for the Florida current, cf. 5.6% (5th-rank) to 6.3% (3rd-rank), respectively (David, 1963).

But in rather warm water along the coast of west Africa (i.e., between 15°N-15°S latitudes), Furnestin (1962) also found this species to be rather rare, averaging usually 1% of the total collection. She did note further that the population was usually made up heavily of adults; 5 adults to every 1 juvenile (83.4% to 16.6%). She considers this species

to be most common over the continental slope.

In summary, S. minima has been characterized as follows: a mixed-water species; a mesoplanktonic species in its vertical distribution; and a coastal species particularly abundant over the continental shelf.

From the literature cited above, S. minima can be considered to be "at home" in a cold current such as the Benguela current (5.6% of the total) but equally as well "at home" in a warm current i.e., the Agulhas current (18.4% of the total; see Table A2-1). The dilemma is to explain why this species is rather rare in waters of the mid-Indian Ocean, which is the source of the Agulhas current and yet it is the dominant species of the Agulhas current off South Africa. I have examined a series of samples made over a 24-hour period, during December, 1962, at a location over the Agulhas bank and roughly equidistant from the Benguela current and the Agulhas current (36°S by 21°11'E). At this station, S. minima made up 21.8% and was 2nd-rank of this collection (Table A2-2) and because December is included in the season during which the Agulhas current is known to flow over the Agulhas bank and very likely into the Benguela current (M. Darbyshire, 1963), these data suggest recruitment of this species from the Agulhas current to the Benguela current can occur. However, this may not be one-way process since the neritic stations for the winter survey (Table A2-36) do not show any differences with respect to the autumn survey. In particular, it would be expected that the abundance of S. minima would decrease (but it did not) in the neritic waters during winter as the influence of the Agulhas current on the neritic area is lessened. This assumes that the origin of the cold water in the neritic area is from the Atlantic.

But another way of interpreting these data lies in the vertical distribution of the species. During the winter survey, a greater part of the population of this species was found to extend below 100 meters, whereas for the previous survey the population was predominantly in the upper 100 meters (Text-Table 4). Isolated upwelling did occur in the neritic waters during the winter survey and S. minima was found at those neritic stations whose hydrographical make-up suggested upwelling, for example: East London 78; Port Elizabeth 84 and 83; and all stations of the Cape Seal line (see Hydrographical section, winter survey).

Finally, it must be emphasized that the problems in the overall distribution of S. minima are in large part a reflection of the type of nets used, for example: the N100B's most certainly do not give a true picture of this species community standing. In general, the nets used, mesh size and/or literature

references to their description are inadequately stated in most publications.

Sagitta serratodentata Krohn

Résumé

This species was found widely throughout the survey area, both in neritic waters and in the ocean. It was present at all oceanic stations and absent from only three neritic stations; Port Elizabeth 11 and Cape Seal 47 and 92 (Table A2-46).

S. serratodentata is an ocean-living species. For the present material, its greatest abundance was during the winter survey. But caution is necessary in the interpretation of these data as the oceanic values are much lower than the neritic values for the summer and autumn survey; however, this is taken as corroborative evidence of the hydrographical conditions existing during those surveys. It is expected, therefore, that the neritic stations would have the greatest abundance during the summer and autumn survey due to the intrusion of the Agulhas current and also to the fact that these stations are, naturally, very much shallower in depth. Further, the sharp decline in abundances at neritic stations for the winter survey is in accord with this suggestion, as a general weakening of the Agulhas current occurred during that survey.

Vertically, the population of S. serratodentata was distributed mainly within the upper 100-meters, but as for some of the other species, some of its population extended into slightly deeper water during the winter survey. That the population of many species showed a different vertical distribution during the winter survey is not regarded as an artifact of sampling, indeed, the number of samples taken during the winter survey between 200 to 100 meters was less than for the autumn survey; 18 samples were taken during the winter survey compared to 21 during the autumn survey from this interval (see Table A2-22).

The population composition for S. serratodentata was found to be 51.6% adults to 48.4% juveniles. During the winter survey, a sharp change in the number of juveniles occurred in the neritic area as the adult to juvenile percentage-ratio was found to be 84.6% to 15.4%. The separate pattern of adult and juvenile distribution and abundance, however, followed that as indicated by the data of all individuals. The bulk of the juvenile population occurred nearer to the surface layers than did the adult populations.

Data

(N70V-nets)

Medians, ranges and numbers of individuals/100m³ are given in Table A2-47.

Median values were greater at the neritic stations during the summer and autumn surveys, 25 and 34 individuals/100m³, respectively, compared to the corresponding values of 16 and 28½ for the oceanic stations. During the winter survey, however, the median number of individuals/100m³ was 11½ which is a reduction from the previous surveys by a factor of 2x to 3x; furthermore, the median value for the oceanic stations of the winter survey was 34 individuals/100m³, the maximum for that area.

The data in Text-Table 6 indicates that S. serratodentata is an epiplanktonic species, as approximately 60% of its population was always found above the 100-meter level. A change was evident, however, during the winter survey as more of the population (42% as compared to 38% and 30% for the other surveys) extended below the 100-meter level.

Text-Table 6. The vertical distribution of S. serratodentata at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

<u>Depth in Meters</u>	<u>Summer</u>	<u>Autumn</u>	<u>Winter</u>	<u>All Surveys</u>
100-0	61.1% (145)	69.3% (682)	58.1% (752)	62.7% (1579)
200-100	17.8% (42)	23.1% (228)	35.0% (453)	28.7% (723)
400-200	21.1% (50)	7.6% (75)	6.9% (90)	8.6% (215)
Totals:	100.0% (237)	100.0% (985)	100.0% (1295)	100.0% (2517)

The percentage-ranks of S. serratodentata (Table A2-3) show that it was the 2nd-rank species in the oceanic and 3rd-rank species in neritic waters. The same type data, but given for each line per survey, indicate, however, that it is an oceanic species. Consider, for example, only the neritic stations: during the summer survey (Table A2-4), it was 4th-rank at both Port Shepstone 1 and Port Elizabeth 12 (13.0% and 3.7%, respectively) and 5th-rank at Port St. Johns (3.8%) while for the other stations it is either of very low rank or 1.0% of the total abundance; during the autumn survey (Table A2-5), its percentage-ranks were greater at those "outermost or seaward" neritic stations, namely, Port Shepstone 21, Port Elizabeth 42 and Cape Seal 49, and 50; during the winter survey (Table A2-6), this effect is even more marked. The stations showing this are Port Alfred 82, Port Elizabeth 83 and Cape Seal 90 and 89.

A further comparison of the above data with the oceanic values shows (Tables A2-7, A2-8 and A2-9): (1) S. serratodentata's percentage value in the ocean is almost always >10% (15 out of 18 times); (2) S. serratodentata's rank in the ocean

is greater and less variable (1st to 4th) than for the neritic area.

(N100B-nets)

Abundances from these nets are given in Table A2-48. They show a season maximum, by median values, for the winter survey, i.e., 38 individuals/haul/10 minutes. This confirms the oceanic values given by the H70V-nets.

The percentage-ranks by these data show that S. serratodentata is 3rd rank species (18.1%) in the ocean (Table A2-10). The same type of data given for total individuals (Table A2-1) indicate this species is also 3rd rank for the data from each of the nets.

(N100H-nets)

Abundances from these nets are given in Table A2-49. They indicate, in concert with the other nets, a maximal abundance at the oceanic stations for the winter survey; 20 individuals/haul/10 minutes compared to the corresponding values for the summer and autumn surveys of 3 and 9½.

The neritic data do not differ greatly season to season: 3½, 3½ and 6 individuals/haul/10 minutes for summer, autumn and winter surveys, respectively.

Because these data are directly comparable to those of the N100B-nets, this species can be considered to inhabit the surfact layers (0 to 5 meters) to some extent. In general, however, the N100H-data are smaller than those of the N100B-data, this is, more apparent from the following Text-Table 7.

Text-Table 7. Median number of individuals/haul/10 minutes for oceanic stations.

<u>Survey</u>	<u>N100H-nets</u>	<u>N100B-nets</u>	<u>Difference</u>
Summer	3	7	2.5x
Autumn	9½	33	3.5x
Winter	20	38	1.9x

Percentage-ranks by these data (Table A2-14) show the species was 2nd-rank (18.4%) in the ocean and 3rd-rank (4.8%) in neritic waters. The change the species made in neritic waters follows again the intrusion pattern of the Agulhas current (Tables A2-15 to A2-17), but these data do not show this as clearly as do the H70V-data.

(Population composition)

The data for the population composition of S. serratodentata are given in the Table A2-50. For all collections (H70V-nets), the adults to juvenile percentage-ratio was 51.6% to 48.4%. Between the neritic and oceanic areas a sharp change in the number of juveniles was evident during the winter survey in the

neritic area; the adult to juvenile percentage-ratio was 84.6% to 15.4% compared to corresponding oceanic values of 49.9% to 50.1%.

The abundances, for adults and juveniles, by each net used are given in Tables A2-51 to A2-56. Again, the basic pattern of distribution and abundance for adults and juveniles (separately) are parallel to those given for the combined data of all individuals.

The vertical distribution of adults and juveniles are given in Text-Table 8.

Text-Table 8. The vertical distribution of Adult (A) and juvenile (B) S. serratodentata at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

<u>Depth in Meters</u>	<u>Summer</u>	<u>Autumn</u>	<u>Winter</u>	<u>All Surveys</u>
A. Adults				
100-0	53.7% (73)	58.2% (289)	47.3% (288)	52.4% (650)
200-100	16.9% (23)	28.1% (139)	42.4% (258)	33.9% (420)
400-200	29.4% (40)	13.7% (68)	10.3% (63)	13.7% (171)
Totals:	100.0% (136)	100.0% (496)	100.0% (609)	100.0% (1241)
B. Juveniles				
100-0	71.3% (72)	81.9% (393)	64.2% (464)	71.3% (929)
200-100	18.8% (19)	16.0% (77)	31.8% (230)	25.0% (326)
400-200	9.9% (10)	2.1% (10)	4.0% (28)	3.7% (48)
Totals:	100.0% (101)	100.0% (480)	100.0% (722)	100.0% (1303)

Both sets of data show for each survey and for combined data that the juvenile population occurred more predominately in the upper 100 meters than the adult populations. There is also evidence that the populations, both adult and juvenile, underwent a slight deepening during the winter survey.

Literature

Ritter-Zahony (1911) recorded this species from Port Natal in a surface haul. He states, however, that it is a meso-planktonic species which can extend into epiplanktonic levels; this was based on knowledge from other samples obtained in the Atlantic, Southern and Indian Oceans.

There is no doubt from the present material that S. serratodentata is an important member of the chaetognath community in the Agulhas current. Further, I have found among the adults specimens of this material representatives of the following

- "forms" of this species:
- (1) S. serratodentata atlantica
 - (2) S. serratodentata pacifica
 - (3) S. serratodentata tasmanica (rare)
 - (4) S. serratodentata bierli (?)
 - (5) S. serratodentata pseudopacifica (?)

The first three listed forms have also been found in

collections, examined by me, from the Benguela current near Cape Town. All forms but pacifica have been recorded by Furnestin (1962) from coastal samples obtained north of the Benguela (15°N and 15°S latitudes). The distribution of each form, in the present collection, did not show fidelity to any particular area. This was most evident from the forms atlantica and pacifica, as they were the most abundant forms, but I feel, more data are needed to resolve ^{the} distribution of this species and, in particular, additional taxonomic work should be done--especially on the juveniles.

David (1963), who apparently places all forms of this species under the one heading of S. serratodentata, claims that it is a mixed-water species. Most certainly, his data show that this species is one of the dominants in many of the world's oceans, excepting the Arctic and Antarctic. Also, he cites data which show that S. serratodentata is a dominant species in colder waters. This can be illustrated, in a limited way, by the data in Text Table 9.

Text-Table 9. Percentage-ranks for S. serratodentata in various collections from different locations

<u>Benguela current</u> (David, 1963)	<u>Agulhas Bank</u> (24-hour series from Table A2-2)	<u>Agulhas current</u> (N70V-nets)
58.5% (1st-rank)	18.1% (3rd-rank)	14.1% (3rd-rank)

Alvarino (1964B) was unable to give a clear picture of this species distribution in the Indian Ocean, but she did find the forms pacifica and tasmanica.

Pterosagitta draco Krohn

Résumé

This species was found at all oceanic stations. At neritic stations, it was found at 26 out of a possible 31 stations--three of the absences occurred during the winter survey (Table A2-57).

P. draco is a resident of the ocean and its distributional pattern is similar to S. serratodentata, S. bipunctata and also to a limited extent to S. enflata and S. hexaptera.

The neritic stations for the summer and autumn survey show the greatest abundances but a marked reduction occurred at these stations during the winter survey. The maximum for oceanic stations occurred during the winter survey. This pattern of distribution is considered to be the result of the hydrographical conditions as strong oceanic influences were present at neritic stations during the summer and autumn survey but a weakening of this effect occurred during the winter

survey (see section on Hydrographical background).

P. draco is an epiplanktonic species, living mainly in the upper 100-meters. It is similar to some other species in that it had a deeper vertical distribution during the winter survey.

The population composition of P. draco was found to be 24.9% adults to 75.1% juveniles. In the neritic waters there was a slight increase (percentage-wise) of juveniles. Survey changes in composition were, however, slight. The distribution of adults and juveniles were essentially as indicated for the combined data of all individuals. Juveniles showed a slightly higher vertical distribution than the adults.

Data

(N70V-nets)

Medians, ranges and number of individuals/100m³ are given in Table A2-58.

In the ocean, median values/100m³ were not greatly different: summer--11 individuals/100m³; autumn--18½ individuals/100m³; and winter--16 individuals/100m³.

In neritic waters the corresponding values were: 43 individuals/100m³ during summer; 31 individuals/100m³ during autumn; and 7 individuals/100m³ during winter. It is also significant that six out of eight total negative records for this species in neritic waters occurred during the winter survey. Further, those stations with no individuals (see Table A2-58) had a distinctly different physical regime from those which had positive records for this species (see section on Hydrographical background regarding these stations).

P. draco is epiplanktonic in its vertical distribution. This is evident from Text-Table 10 which shows that >70% of its population occurred above 100 meters. The winter population, however, was distributed slightly deeper than those populations of previous surveys.

Text-Table 10. The vertical distribution of P. draco at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

<u>Depth in Meters</u>	<u>Summer</u>	<u>Autumn</u>	<u>Winter</u>	<u>All Surveys</u>
100-0	75.6% (108)	85.7% (572)	66.0% (342)	77.0% (1022)
200-100	17.4% (25)	12.4% (84)	30.3% (157)	20.0% (266)
400-200	7.0% (10)	1.9% (13)	3.7% (19)	3.0% (42)
Totals:	100.0% (143)	100.0% (669)	100.0% (518)	100.0% (1330)

For all surveys, P. draco was the 4th-rank species in the ocean and 6th-rank in neritic waters (Table A2-3), however, because of the heavy influences of the Agulhas current on neritic

regions during the first two surveys, it is felt that the neritic rank is slightly exaggerated. This becomes more evident when the survey percentages per line are examined. At neritic stations only, for example: summer survey--P. draco was $\geq 4.9\%$ and > 6 th-rank at Port Shepstone 1, Port St. Johns 5 and Port Elizabeth 12, but $< 1\%$ and usually < 6 th-rank at all other stations (Table A2-4); autumn survey--similarly, P. draco is $\geq 9\%$ at Durban 17, Port Shepstone 21, and Cape Seal 48, 49, 50 and $< 5\%$ at all others (Table A2-5); and winter survey--shows the same effect, that is a pronounced reduction in percentage-rank at the "more" neritic stations (Table A2-6). The point to be emphasized from these data is that P. draco was more abundant or of higher rank at those stations showing a greater amount of oceanic influences.

The same type of data for the oceanic stations (Tables A2-7, A2-8 and A2-9) is considerably less variable than the neritic data; P. draco ranged between 2nd and 7th rank but more generally between 4th to 6th rank and $> 10\%$ of the totals. (N100B-nets)

Abundances by these nets are given in Table A2-59. A maximum occurred during the autumn survey at oceanic stations, which confirms the findings of the other nets.

Because these data are comparable to the N100H-data it can be suggested that P. draco lives in the ocean throughout, at least, a 110-meter water column. But because the N100H-values are smaller, the species most probably has a population maximum below the surface layers (0 to 5 meters).

The percentage-rank of P. draco by these nets are slightly higher than those of the N70V's (Tables A2-10 through A2-13), especially at the oceanic stations. Its overall rank, for all surveys, in the ocean is 2nd (21.6%) and 6th (4.1%) in neritic waters. This trend is evident for each survey (cf. Tables A2-10 and A2-3). Perhaps the differences between the two nets is only a reflection of the sampling gear used. P. draco is a relatively small-sized species--average size of 308 individuals was 6.4 mm--but it is a sturdy species in girth, at least compared to other small species like S. minima. At any rate, the N100B-nets indicate that this species may be more dominant in the chaetognath community than indicated by the N70V-nets.

(N100H-nets)

The data, as collected by the N100H-nets, are given in Table A2-60.

The median values were higher at the oceanic stations and maximal abundances occurred during the autumn survey.

The values from the neritic stations during the winter survey decreased compared to the other surveys; the winter median value was $1\frac{1}{2}$ individual/haul/10 minutes while the corresponding values for summer and autumn are $2\frac{1}{2}$ individuals/haul/10 minutes and 12, respectively.

(Population composition)

The data for the population composition of P. draco are given in Tables A2-61. By the N70V-nets the population consisted mainly of juveniles; 24.9% adults to 75.1% juveniles. But the N100H-nets (Table A2-61) show an adult to juvenile percentage-ratio of 50.0% to 50.0%. This may imply that the adult population was not adequately sampled by the N70V-nets. Survey to survey, however, for either neritic or oceanic areas, no major changes in population composition were found.

Abundances for adults and juveniles are given for each net in Tables A2-62 to A2-67. The pattern of adult and juvenile distribution was in accord to that given for the combined data of all individuals. But there is one exception to this in the N70V-data, which shows that the maximum occurred during different surveys than for the combined data (cf. Tables A2-58 with A2-62 and A2-63).

The vertical distribution for adults and juveniles are given in Text-Table 11.

Text-Table 11. The vertical distribution of adults (A) and juvenile (B) P. draco at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

<u>Depth in Meters</u>	<u>Summer</u>	<u>Autumn</u>	<u>Winter</u>	<u>All Surveys</u>
A. Adults				
100-0	81.8% (45)	80.7% (134)	54.3% (63)	71.8% (242)
200-100	7.3% (4)	13.9% (23)	40.5% (47)	21.9% (74)
400-200	10.9% (6)	5.4% (9)	5.2% (6)	6.3% (21)
Totals:	100.0% (55)	100.0% (166)	100.0% (116)	100.0% (337)
B. Juveniles				
100-0	71.6% (63)	86.9% (438)	165.0% (279)	76.3% (780)
200-100	23.9% (21)	12.1% (61)	32.0% (138)	21.6% (220)
400-200	4.5% (4)	1.0% (5)	3.0% (13)	2.1% (22)
Totals:	100.0% (88)	100.0% (504)	100.0% (430)	100.0% (1022)

The difference between the vertical distribution of adults and juveniles are not as consistent as for previous species, but ignoring the data for the summer survey, which are limited, the data for the other two surveys show that more juveniles occurred in the upper 100-meters. For the combined data of all surveys a slight difference (about 4%) is evident between adult and juvenile vertical distribution.

Literature

Ritter-Zahony (1911) did not find this species in the Agulhas current but it was present at other stations in the Indian Ocean (in an area roughly circumscribed by 25° - 30° S latitudes and 40° - 60° E longitudes). In his collections he found this species in vertical hauls and "twice" in surface hauls. He lists it as an upper, epiplanktonic species.

In the Indian Ocean, David (1963) found P. draco to be the 4th-rank species (9.3% of 23,145 total individuals). Alvarino (1964B) found it widely spread throughout the Indian Ocean.

Bieri (1959) gives the distribution of this species as one which followed very closely the distribution of S. hexaptera and S. pacifica (serratodentata); they all inhabited warm water masses from the equatorial and central Pacific areas.

P. draco was rather insignificantly represented in coastal samples north of the Benguela current (15° N to 15° S; Furnestin, 1962). But the same author lists it as a species common to the slope of the continental shelf.

In general, P. draco is an epiplanktonic oceanic species which Hyman (1959) suggests is limited to the confines of the isotherms 15° C to 25° C.

Sagitta friderici Ritter-Zahony

Résumé

This species was absent from only four out of a total of 31 neritic stations (13%). Its distribution, via presence and absence, in the ocean was more spotty as it was absent from 21 out of a total of 53 oceanic stations (40%; Table A2-68).

This is a neritic species and probably lives to a large extent in the surface waters (0 to 5 meters). It was the dominant species in neritic waters--with, of course, S. enflata--and particularly so in cold waters ($<17^{\circ}$ C). Because of the species sharp preference for neritic waters it is possible to consider its oceanic occurrences as the result of seaward transport. Within the survey area, this most probably occurred by the eddy system previously described in the Hydrographical section.

All nets indicate that the population composition of S. friderici was about 80.0% adults to 20.0% juveniles. Survey changes in composition were not apparent but the NIOOH-nets show a slight increase in the percentage of adults. Both adults and juveniles show the same pattern of distribution and abundance as the combined data of all individuals. The data are too few for any statement on adult and juvenile vertical distribution.

Data
(N70V-nets)

Medians, ranges and number of individuals/100m³ are given in Table A2-69. These data illustrate the very abrupt difference in the horizontal distribution of this species, it was extremely rare in the ocean. Indeed, the oceanic abundances can be, for all purposes, ignored.

Maximal abundance occurred during the autumn survey; the median value/100m³ was 81 compared to 57 and 33½ individuals/100m³ for summer and winter, respectively. The greatest abundances within the neritic area were, however, sharply restricted to the stations off Port Elizabeth and Cape Seal. The total abundances for these stations are given below in Text-Table 12.

Text-Table 12. The relative abundances and percentages of S. friderici for the neritic stations of Port Elizabeth (11, 41, 84) and Cape Seal (47, 48, 49 and 92, 91, 90).

	A	B	C
Surveys	Total relative abundances for select neritic stations as indicated above	Percentages of Column A totals of neritic station totals	Percentage of column A totals of neritic and oceanic stations totals
Summer	215	79.0% (272)	77.9% (276)
Autumn	850	89.8% (948)	89.4% (951)
Winter	292	86.5% (339)	85.7% (341)
All surveys	1357	87.6% (1559)	86.5% (1568)

It can be seen that the population of S. friderici, in addition to being confined to neritic water, was heavily concentrated at the more southerly stations. Each of these stations showed, at least, several layers of cold water (< 17°C) during each of the surveys. This species was less abundant/100m³ during the winter survey but it had a wider horizontal distribution, at least compared to the autumn survey, for it reached the waters off Durban.

The percentage-ranks for S. friderici are given in Tables A2-3 through A2-6. By these data, for this species it is the 2nd-rank (25.0%) species in the neritic waters as compared to 15th-rank (< 1%) in the ocean (for all surveys). A breakdown of these data, by surveys shows that the species followed the hydrographical pattern already outlined. During the summer survey (Table A2-4), it was the 1st-rank (82%) species at Port Elizabeth 11, which was a cold-water station, but it never made up more than 6% of the total population at the other stations. During the autumn survey (Table A2-5), it was the 1st-rank species at Port Elizabeth 41, Cape Seal 47, with per-

centages of 91.9% and 77.5%, respectively. In addition, it was the 2nd-rank species at Bashee 29, Port Alfred 37 and Cape Seal 48 and 49. During the winter survey (Table A2-6) it was the 1st-rank species at Port Elizabeth 84, 83 and Cape Seal 92 and 91 with percentages of 68.2%, 25.8%, 98.4% and 86.5%, respectively. The reduction of the percentage-rank for another species, S. enflata, at these stations was discussed previously.

S. friderici never, at oceanic stations, made up more than 0.7% of the totals nor achieved a rank greater than 10th. (Tables A2-7 through A2-9).

(N100B-nets)

The neritic data are extremely limited in scope by these nets but they do show maximal abundances occurred during the autumn survey (Table A2-70). This is similar to the N70V-data.

The oceanic data are striking, however, for they show, beyond doubt, the exclusion of this species from the ocean.

(N100H-nets)

Medians, ranges and number of individuals are given in Table A2-71. Greatest abundances were present at the neritic stations off Port Elizabeth and Cape Seal. Indeed, for all surveys, over 95% (1473 individuals) of the total neritic population was restricted to these stations.

The autumn survey had a maximal abundance which is in concert with the other nets. This species is apparently, by these data, a surface dweller (0 to 5 meters) to a considerable extent.

The oceanic abundances are sporadic and widely distributed, and though they cannot be directly related to the eddy system (previously described in Hydrographical section) it is reasonable to assume that the presence of this species at oceanic stations was the result of some type of seaward transport. Also, the fact that the oceanic values for these nets are roughly of the order of 2 to 3x greater than the values of the N100B-nets may indicate that the eddy currents probably occurred to a large extent within the surface layers.

The percentage-ranks of S. friderici are given in Table A2-3. It was the 2nd-rank species (25.0%) in neritic waters and the 7th-rank species (<1%) in the ocean. A survey breakdown, by stations (Tables A2-14 through A2-17), show that this species followed the hydrographical pattern already discussed. The neritic stations of Port Elizabeth (41 and 84) and Cape Seal (47, 48, 49 and 92, 91, 90) show a striking increase in the abundance of this species.

(Population composition)

The data for the population composition of S. friderici are given in Tables A2-72. By the N70V-nets the composition

of the neritic population (oceanic values are too limited for discussion), was quite constant season to season. The adult to juvenile percentage-ratios were 83.1% to 16.9% (summer survey), 81.0% to 19.0% (autumn survey) and 84.4% to 15.6% (winter survey).

Abundances for adults and juveniles are given for each net in Tables A2-73 to A2-78. The separate patterns of distribution and abundance for adults and juveniles were the same as that given for the combined data of all individuals. One exception to this is the N70V-data for juveniles which show their maximal abundances occurred during a different survey than the data (cf. Tables A2-69 with A2-74) for all individuals.

The vertical distribution for S. friderici is not given as almost all samples collected in the neritic waters were not closed but usually fished from bottom to top.

Literature

S. friderici has not been recorded previously in the Agulhas current and whether its presence at other coastal locations in the Indian Ocean is controversial. There is uncertainty because an allied species S. tenuis has been found along the west coast of India (cited in Tokioka, 1959; see also Taxonomic notes).

Along the western coasts in the Atlantic, S. friderici has been found from the Bay of Biscay to Cape Town (David, 1963) but it is invariably more dominant in colder waters such as the Benguela current (David, 1963; Heydorn, 1959). Farnestin (1962) gives some data in which the same interpretation is possible; S. friderici was dominant at a majority of stations having cold water ($<17^{\circ}\text{C}$ in the upper 100 meters) and when this did not occur S. enflata was the dominant species.

In the Pacific, S. friderici is a neritic or near-shore species and Bieri (1957) claims that the presence of this species is correlated with upwelling--particularly off California, Peru and Chile--and with cold waters (but cold water is not defined).

Because S. friderici predominates along the western coasts of Africa and because it has not been recorded in the Indian Ocean it is safest to assume that its population in the survey area is recruited from the Atlantic. This assumption could be deduced from the literature alone but further credence for it comes from the species distribution cited above, that is, the maximum abundances for this species occur at the more southerly stations. In addition, at a 24-hour station over the Agulhas bank which lies approximately equidistant between the Agulhas current and the Benguela current (about 21°E longitude),

S. friderici was the 1st-rank species (35.9%; see Table A2-2).

Sagitta decipiens Fowler

Résumé

This species has a distinct predilection for the oceanic area. It was found at most oceanic stations but was absent from four. In neritic waters, it occurred at only nine out of a possible 31 stations and four of these were under oceanic influences; these stations were Port Elizabeth 12, Port Alfred 82 and Cape Seal 49 and 50. (Table A2-79).

Maximal numbers occurred during the autumn survey and, for the depths sampled, the species had a preference for waters below 200 meters. The small number of specimens captured by the N100B-nets also reflects the vertical distribution of this species.

Two of the N100H-samples are of special interest; those from the neritic stations of Port St. Johns 67 and Bashee 71, (winter survey). S. decipiens was comparatively abundant at these stations, i.e., 8 and 13 individuals/haul/10 minutes, respectively. Because the hydrographical structure of the neritic water during the winter survey--and hence these stations--is very suggestive of upwelling and because S. decipiens is definitely a mesoplanktonic species, its presence at these stations can be taken as further evidence of upwelling. Other species which also showed this effect are: S. minima, K. subtilis, S. lyra and S. maxima.

The population composition for S. decipiens was 45.5% adults to 54.5% juveniles. In the ocean the adult to juvenile percentage-ratio did not change appreciably for any one survey. The neritic data are too limited for discussion. The vertical distribution of juveniles was markedly different from the adults as large portions of their population were confined to the upper 100 meters.

Data

(N70V-nets)

Medians, ranges and number of individuals/100m³ are given in Table A2-80. Maximal abundances occurred at oceanic stations and for these stations the species was most abundant during the autumn survey; the median value was 23 individuals/100m³ for autumn as compared to the corresponding values for summer and winter of 12 and 15, respectively.

S. decipiens was not present at most neritic stations and those stations where it did occur were strongly effected by the Agulhas current. Specifically, during the summer survey, it was found only at Port Shepstone 1 and Port Elizabeth 12

and both of these stations showed much oceanic influence (see Hydrographical section). During the autumn survey, it was found only at Port Shepstone 21, Bashee 29 and Cape Seal 50. During the winter survey, it was found only at Port Alfred 81.

The significant aspect of the neritic distribution of this species is its absence at stations off East London, Port Elizabeth and Cape Seal. Off East London, it will be recalled, the Agulhas current is turning away from the shore as a result of the widening of the shelf and coriolis force, hence those stations south of East London and closest to the coast would be least affected by the Agulhas current. This would be particularly so for water at the 200 meter level and below, that is, where S. decipiens primarily resides (see below).

The vertical distribution of S. decipiens is given in Text-Table 13. It was found mainly below the 200 meter level. There were no indications that the population of this species, as for others, occurred in a deeper level during the winter survey, however, some of the summer population apparently extended closer to the surface layers but the sample was quite small for any definitive statements. The fact that S. decipiens shows much distinct vertical stratification and also that it is excluded from neritic waters, lends much credibility to the hydrographical data already presented.

Text-Table 13. The vertical distribution of S. decipiens at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

Depth in Meters	Summer	Autumn	Winter	All Surveys
100-0	25.9% (30)	3.8% (25)	11.6% (40)	8.5% (95)
200-100	26.7% (31)	28.4% (188)	28.1% (97)	28.1% (316)
400-200	47.4% (55)	67.8% (449)	60.3% (208)	63.4% (712)
Totals:	100.0% (116)	100.0% (662)	100.0% (345)	100.0% (1123)

The percentage-ranks (Table A2-3) for S. decipiens show it to be the 5th-rank species in the ocean (8.4%) and 10th-rank species (1.3%) in neritic waters. At neritic stations during each survey it was of high rank only at those stations which had oceanic water. For example: during the summer survey (Table A2-4) it was the 2nd-rank species (15.6%) at Port Shepstone 1; during the autumn survey (Table A2-5), it was the 4th-rank species (5.2%) at Cape Seal 50; and during the winter survey (Table A2-6), it was the 3rd-rank species (14.2%) at Port Alfred 81. For the remaining neritic stations it was never greater than 9th-rank (or >1%). This pattern of distribution

is, of course, identical to that given by its abundances.
(N100B-nets)

S. decipiens was not adequately sampled by these nets. This is because these nets were not fished deep enough (~ 110 meters) to encounter the main part of the species population (see Table A2-81).

(N100H-nets)

There were only five positive records of S. decipiens out of a possible 76 from these nets (Table A2-82). Two of these were from the neritic stations of Port St. Johns 67 and Bashee 71 during the winter survey; the abundances were 13 and 8 individuals/haul/10 minutes, respectively. These records, plus the known vertical distribution of this species, are highly suggestive of the occurrence of upwelling. This is further substantiated by the hydrographical conditions found during the winter survey (see Hydrography section; also the Résumé statement on this species).

(Population composition)

The data for the population composition of S. decipiens are given in Table A2-83. The neritic data for this species are too limited to use but the oceanic data show the adult to juvenile percentage-ratio was quite constant survey to survey; for example: summer survey, 50.0% to 50.0%; autumn survey, 40.8% to 59.2%; and winter survey, 50.8% to 49.2%. The N100-nets captured a larger percentage of adults but this is to be expected from their design (see section on Methods and materials and/or Kemp, et al., 1929).

Abundances are given in Tables A2-84 through A2-89 but only those of the N70V-nets are of value (A2-84 and A2-85) because it was the only net which sampled waters deep enough to encounter this species. The separate patterns of distribution and abundances for adults and juveniles followed exactly that of the combined data of all individuals.

The vertical distribution of adults and juveniles are given in Text-Table 14. The data show rather wide differences between the vertical distribution of adults and juveniles. For all surveys 42.0% of the juvenile population was above 200-meters whereas only 27.4% of the adult population was above the same level. This same trend was evident seasonally during the autumn and winter surveys but the data from the summer survey did not indicate this. Perhaps this is due to the smaller sample taken during the summer survey.

Text-Table 14. The vertical distribution of adults (A) and juveniles (B) S. decipiens at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

<u>Depth in Meters</u>	<u>Summer</u>	<u>Autumn</u>	<u>Winter</u>	<u>All Surveys</u>
A. adults				
100-0	25.3% (21)	4.5% (12)	12.2% (23)	10.3% (56)
200-100	10.8% (9)	18.0% (49)	18.6% (35)	17.1% (93)
400-200	63.9% (53)	77.5% (211)	69.2% (130)	72.6% (394)
Totals:	100.0% (83)	100.0% (272)	100.0% (188)	100.0% (543)
B. Juveniles				
100-0	12.0% (10)	4.4% (17)	9.3% (17)	6.7% (44)
200-100	19.3% (16)	33.0% (129)	47.6% (87)	35.3% (232)
400-200	68.7% (57)	62.6% (245)	43.1% (79)	58.0% (381)
Totals:	100.0% (83)	100.0% (391)	100.0% (183)	100.0% (657)

Literature

Ritter-Zahony (1911) found S. decipiens in the Indian Ocean at various stations in an area roughly circumscribed by 25°S-30°S latitudes and 40°E-73°E longitudes. He did not find any in the few samples he made from the Agulhas current. He classifies S. decipiens as mesoplanktonic as it was most frequent in hauls from 400 meters or lower.

Alvarino (1964B) suggests the population of S. decipiens in the Indian Ocean connects with those of the Pacific by way of the Indonesian seas. She (1964A) also lists it as a mesoplanktonic species which inhabits the water layers between 200 to 1000 meters, but usually in the upper layers of this stratum.

In general, S. decipiens lives at intermediate depths and is widely distributed throughout the world. But it is excluded apparently from the waters of the Antarctic, though David (1963) found some specimens extending 200 to 300 miles beyond the subtropical convergence (40°S latitude).

Furnestin (1962) did not find any specimens of this species in her oceanic hauls from the Atlantic Ocean north of the Benguela current but this is most likely because her hauls did not go deep enough to encounter it. In the Benguela current, David (1963) found S. decipiens to be the 4-th-rank (5.9%) species.

Sagitta lyra Krohn

Résumé

This species was found at all oceanic stations except Port St. Johns 6 and 7. It was rarely found at neritic stations--only at 9 out of a possible 31 stations--and those stations, where it was found, generally showed heavy oceanic influences (Table A2-90).

S. lyra, an oceanic species, was most abundant during the winter survey. It was found predominately in the upper 100 meters but underwent considerable change in its vertical distribution from survey to survey; for example: during the summer survey, >50% of its population was in the upper 100-meters, while during the winter survey >50% of its population was below the 100-meter level.

One of the occurrences of this species at East London 78, a neritic station, is suggestive of upwelling (see other species, S. minima, S. decipiens, S. pulchra and S. maxima, in this regard). This species did not undergo, however, any marked change in its neritic abundances during the winter survey but this may be a reflection of its generally low abundances, its avoidance of inshore waters, and its deeper vertical distribution.

It is stressed that, for all collections, the composition of S. lyra's population was mainly of juveniles and sub-adults. This is apparent from the adult to juvenile percentage-ratio of 24.6% to 75.4%. No individuals with enlarged, mature eggs were found. But for the present material a difference was present in the juveniles vertical distribution as compared to the adults; they were more common in the upper 100 meters than the adults.

Date

(N70V-nets)

Medians, ranges and number of individuals/100m³ for S. lyra are given in Table A2-91.

S. lyra was most abundant at oceanic stations; the median values/100m³ for summer, autumn and winter were 7, 8½ and 13, respectively, as compared to the corresponding neritic values of 4, 3½ and 9.

Over one-half of the neritic occurrences--five out of a total of eight--were at stations which showed oceanic influences. For example: during the summer survey, it was found at Port Shepstone 1 and Port Elizabeth 12; during the autumn survey it was found at Port Elizabeth 42; and finally during the winter survey it was found at Port Alfred 81 and Cape Seal 89. (See section on Hydrographical background for these stations). The occurrence of the species at East London 78, during the winter survey, may be indicative of upwelling since this species resides somewhat in the lower epiplankton (see below).

S. lyra was mainly epiplanktonic in its vertical distribution. During the winter survey 70% of the total population of this species was present between 200 and 400 meters whereas only 45% and 48% of the population was present at that level

during the summer and autumn surveys, respectively (Text-Table 15).

Text-Table 15. The vertical distribution of S. lyra at oceanic stations. Relative abundances are enclosed by parentheses.

Nets which failed to close are not included.

<u>Depth in Meters</u>	<u>Summer</u>	<u>Autumn</u>	<u>Winter</u>	<u>All Surveys</u>
100-0	55.1% (43)	51.6% (145)	30.0% (112)	41.0% (300)
200-100	19.2% (15)	31.3% (88)	56.1% (209)	42.6% (312)
v400-200	25.7% (20)	17.1% (48)	13.9% (52)	16.4% (120)
Totals:	100.0% (78)	100.0% (281)	100.0% (373)	100.0% (732)

It should be emphasized that these data presumably apply only to a part of S. lyra's population, i.e., that part in the upper 400 meters, as the composition of the population was mainly juveniles and some sub-adults; no mature adults with enlarged eggs were found.

The percentage-ranks for S. lyra are given in Table A2-3. This species was 6th-rank (5.5%) in the ocean and 13-rank (0.4%) in neritic waters. During individual surveys (Tables A2-7 to A2-9), S. lyra maintained relatively the same percentage-ranks in the ocean, but in neritic waters (Tables A2-4 to A2-6) its percentage-ranks were very variable.

Thus at neritic stations: during the summer survey (Table A2-4), S. lyra was of importance at only Port Shepstone 1 and Port Elizabeth 12, i.e., 11th-rank (1.3%) and 11-rank (0.6%), respectively; during the autumn survey (Table A2-5) the samples were too small and the data too few to use; during the winter survey (Table A2-6) it was important only at Port Alfred 81 (6th-rank - 3.4%), Cape Seal 89 (11-rank - 1.4%) and at East London 78 (3rd-rank - 11.7%).

(N100B-nets)

Abundances by these nets are given in Table A2-92. In contrast to a maximum during the winter survey as indicated by the N70V-nets, these data show maximal abundances during the autumn survey. Because these nets may not have sampled the population of S. lyra as adequately as the N70V-nets (they did not go much below 110 meters), the latter nets probably give a more representative picture of the species. (See Table A2-1 which gives total relative abundances). This is especially true during the winter survey when the population of the species was mainly below 200 meters, hence out of the range of N100B-nets.

The percentage-ranks for S. lyra by these nets (Tables A2-10 to A2-13) were slightly lower than for the N70V-data and again this is most likely due to the reason discussed above, i.e., depth sampled.

(N100H-nets)

S. lyra was captured by these nets in only five out of a total of 76 possible hauls, and all of these were at oceanic stations (Table A2-93). The data are, therefore, too few to indicate population trends but they most certainly imply that this species avoids the surface layers (0 to 5 meters). This is not an artifact of sampling since S. lyra is rather a large species; the average length of 38 individuals was 13.4 mm (Table A5-15).

(Population composition)

The data for the population composition of S. lyra are given in Table A2-94. The adult to juvenile percentage-ratios in the ocean were: during the summer survey, 9.6% to 90.4%; during the autumn survey 23.0% to 77.0%; and during the winter survey, 29.2% to 70.8%. Thus a change in population composition occurred during the summer survey but this is quite tentative as the samples were small.

The abundances for either the adults or juveniles (Tables A2-95 to A2-100) were very small and for this reason show no great similarity to the combined data of all individuals.

The vertical distribution of adults and juveniles are given in Text-Table 16.

Text-Table 16. The vertical distribution of adults (A) and juveniles (B) S. lyra at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

<u>Depth in Meters</u>	<u>Summer</u>	<u>Autumn</u>	<u>Winter</u>	<u>All Surveys</u>
<u>A. Adults</u>				
100-0	0.0% (0)	26.6% (17)	19.5% (23)	21.3% (40)
200-100	33.3% (2)	24.9% (16)	56.0% (66)	44.7% (84)
400-200	66.7% (4)	48.5% (31)	24.5% (29)	34.0% (64)
Totals:	100.0% (6)	100.0% (64)	100.0% (118)	100.0% (188)
<u>B. Juveniles</u>				
100-0	60.6% (43)	25.4% (28)	31.1% (89)	34.3% (160)
200-100	16.9% (12)	59.1% (65)	60.8% (174)	53.7% (251)
400-200	22.5% (16)	15.5% (17)	8.1% (23)	12.0% (56)
Totals:	100.0% (71)	100.0% (110)	100.0% (286)	100.0% (467)

For all surveys, 88% of the juvenile population was in the upper 200 meters while 66% of the adult population was in the same water stratum. The data for each survey show the difference between adult and juvenile vertical distribution.

Literature

Ritter-Zahony (1911) did not find S. lyra in the Agulhas current but he did find it at other stations in the Indian

Ocean (the area is approximately 28°-35°S latitudes and 40°-70°E longitudes). He listed it as an epi- to mesoplanktonic species but more limited to the lower part of the epiplankton.

Alvarino (1964B) found this species in the mid-Indian Ocean region and regards it as a cosmopolitan species. The same author (1964A) considers S. lyra to be epiplanktonic (upper 200 meters) in its vertical distribution. David (1963) found it to be the 8th-rank species in his Indian Ocean collections (2.2% of 10,315 individuals) but he classifies it as a species which inhabits intermediate depths (200-750 meters).

Along the western coast of Africa, Furnestin (1962) found only 23 specimens of S. lyra, the majority of which came from deeper water of about 1000 meters. However, most of her stations were coastal (north of the Benguela current) and so she regards it as one which commonly lives in deeper waters.

Sagitta regularis/neglecta Aida

Résumé

This species is a resident of both oceanic and neritic areas. It was found at most oceanic stations, 42 out of a possible 53 stations, and at most neritic stations, 26 out of a possible 31 (Table A2-101).

This species was most abundant in neritic waters and showed a maximum during the autumn survey. However, because it is a small species, both in length and girth (see Table A5-15), the N100-data are for the most part negative and only N70V-data are available to judge changes in its abundances.

S. regularis/neglecta is an epipelagic species, and it shows a pattern of distribution and abundance similar to the following species: K. pacifica; S. robusta/ferox; S. bedoti and to some extent S. enflata.

During the winter survey the median number of individuals/100m³ at neritic stations was greatly reduced from those of the autumn survey, hence the abundances of the species followed the flow pattern of the Agulhas current.

The adult to juvenile percentage-ratio was, for all surveys, 56.1% to 43.9% but considerable seasonal changes were evident in both neritic and oceanic areas. Within the limits of the data, the juveniles were distributed closer to the surface layers than the adults.

Data

(N70V-nets)

Medians, ranges and abundances/100m³ of S. regularis/neglecta are given in Table A2-102.

Greatest abundances were at neritic stations: summer median,

16 individuals/100m³; autumn median, 53½ individuals/100m³; and winter median, 20 individuals/100m³.

In the ocean, the summer data were distinctly lower than for the other surveys, but this may be only a reflection of the fewer stations made during that time.

Only a few specimens of S. neglecta (at least recognizable) were found, i.e., 13 specimens, and nine of these were from neritic stations.

S. regularis/neglecta is an epiplanktonic species, residing in the upper 100 meters (Text-Table 17).

Text-Table 17. The vertical distribution of S. regularis/neglecta at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

Depths in Meters	Summer	Autumn	Winter	All Surveys
100-0	64.3% (9)	90.8% (187)	74.0% (136)	82.1% (332)
200-100	21.4% (3)	5.8% (12)	22.2% (41)	13.9% (56)
400-200	14.3% (2)	3.4% (7)	3.8% (7)	4.0% (16)
Totals:	100.0% (14)	100.0% (206)	100.0% (184)	100.0% (404)

The percentage-ranks for S. regularis/neglecta were, for all surveys, 3rd rank (5.3%) in neritic waters and 9th rank (3.0%) in oceanic waters (Table A2-3). By these nets, there are some differences among the distribution of this species and K. pacifica, S. robusta/ferox and S. bedoti. In particular, on a survey basis; S. regularis/neglecta did not follow the hydrographical conditions in the neritic waters as closely as did the other species. Also, during the winter survey (Table A2-6), S. regularis/neglecta had fewer absences than the other species; 4 for S. regularis/neglecta and 8, 10 and 9 for the other species, respectively. At those stations where S. regularis/neglecta was present its average rank was 3rd but for the other named species, the average rank was 8th, 6th and 8th, respectively.

In addition, S. regularis/neglecta was the 5th-rank (21%) species over the Agulhas bank whereas the other three species (K. pacifica, S. robusta/ferox and S. bedoti) were either absent or of low rank, 11th to 15th and <1% of the total (Table A2-2).

(N100B-nets)

Only 17 specimens were captured by these nets (Table A2-103).

(N100H-nets)

Only three specimens were captured by these nets (Table A2-104).

(Population composition)

The population composition for S. regularis/neglecta is given in Table A2-105. By percentages, from the N70V-nets, the oceanic data show an adult to juvenile percentage-ratio of 48.9% to 51.1% whereas the neritic area data show the ratio of 66.6% to 33.4%. The neritic values during the winter survey seem to indicate proportionally more adults than juveniles (73.8% adults to 26.2% juveniles).

For the N70V-nets only (Tables A2-106 to A2-107), the separate patterns of distribution and abundance for adults and juveniles followed the outline above for the combined data of all individuals.

The vertical distribution of adults and juveniles are given in Text-Table 18.

Text-Table 18. The vertical distribution of adult (A) and juvenile (B) S. regularis/neglecta at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

<u>Depth in Meters</u>	<u>Summer</u>	<u>Autumn</u>	<u>Winter</u>	<u>All Surveys</u>
A. Adults				
100-0	50.0% (4)	89.1% (74)	67.2% (80)	75.2% (158)
200-100	37.5% (3)	6.1% (5)	28.6% (34)	20.0% (42)
400-200	12.5% (1)	4.8% (4)	4.2% (5)	4.8% (10)
Totals:	100.0% (8)	100.0% (83)	100.0% (119)	100.0% (210)
B. Juveniles				
100-0	83.2% (5)	91.2% (113)	81.1% (56)	87.5% (174)
200-100	0.0% (0)	6.4% (8)	15.9% (11)	9.5% (19)
400-200	16.8% (1)	2.4% (3)	3.0% (2)	3.0% (6)
Totals:	100.0% (6)	100.0% (124)	100.0% (69)	100.0% (199)

A slight difference is evident between the vertical distribution of adults and juveniles as slightly more juveniles (98%) than adults (95%) were found in the upper 200 meters.

Literature

Ritter-Zahony (1911) recorded this species from the Agulhas current off Port Natal (S. regularis). He considers S. regularis unique to the Indo-Pacific area and to other areas, at least temporarily, when the temperatures are suitable (see S. bedoti, discussion). He categorizes S. bedoti, S. neglecta and S. pulchra as species exhibiting a similar distribution.

David, (1963) classified S. neglecta as a species characteristic of mixed waters or nearshore waters which is in accord with the present (but very limited) data, as the majority of specimens of S. neglecta were found at neritic stations. S. regularis, however, in the same collection from the Indian Ocean (David, 1963) was the 14th-rank species (4.6% out of

10,315 individuals) and S. neglecta was of the 15th-rank (40.5% of total). This would imply that S. regularis is an oceanic species. But Alvarino (1964B) found only S. neglecta in mid-central Indian Ocean; she gives no abundances, however.

Bieri (1959) apparently considers S. regularis, for the Pacific, as an oceanic beast and S. neglecta as an inshore or neritic species.

Furnestin (1962) did not find either S. regularis or S. neglecta north of the Benguela current in coastal samples (between 15°N and 15°S) off west Africa. Therefore, these species are presumably limited to the Indo-Pacific Oceans. However, S. regularis can reach in very limited numbers the Benguela current (see Table A2-2; and Heydorn, 1957).

Krohnitta Subtilis (Grassi)

Résumé

K. subtilis was found at all oceanic stations except Port St. Johns 6. Its presence in neritic waters was very irregular; it was found at only 14 out of a possible 31 stations (Table A2-112).

This is an oceanic species and the present data indicate that its abundances were always greater in the ocean. It is an epiplanktonic species in its vertical distribution restricted more to the lower parts (200-100). The data for each net show maximal abundances occurred during different surveys; this may be a reflection of the species rather erratic vertical distribution. The N70V-data are, therefore, most likely to give a true indication of the community standing of this species, since they were fished through deeper levels. The distribution and abundance of this species did not follow the flow pattern of the Agulhas current.

More adults (71.5%) than juveniles (28.5%) made up the population of this species. Furthermore, this ratio did not differ radically survey to survey. The vertical distribution of the juveniles differed from that of the adults as more juveniles occurred in the upper 100 meters.

Data

(N70V-nets)

Medians, ranges and abundances/100m³ are given in Table A2-113.

Median values/100m³ in neritic waters were less than those of the ocean by a factor of about two. Indeed, the number of individuals captured at each neritic station was very low; they ranged from 2 to 7 individuals/100m³. The only exception to this was at Durban 17 (autumn survey). The distribution and abundance of this species in neritic waters did not follow the

hydrographical conditions, as no differences were apparent between the autumn and winter survey (cf. respective median values, i.e., 5 and 5 individuals/100m³).

The oceanic values were relatively constant survey to survey. Median values were: during the summer survey, 8 individuals/100m³; during the autumn survey, 8 individuals/100m³; and during the winter survey, 9 individuals/100m³.

The population of K. subtilis was found to range throughout the entire winter column (Text-Table 19). During the summer survey, the population was mainly in the upper 100 meters but during the autumn survey and winter survey the population was predominately below 100 meters. However, samples for the summer survey were rather low and caution should be used in their interpretation. At any rate, K. subtilis was an epiplanktonic species in the survey area but sometimes extended into deeper waters, i. e., > 200 meters, hence a mesoplanktonic species at times.

Text-Table 19. The vertical distribution of K. subtilis at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

Depth in Meters	Summer	Autumn	Winter	All Surveys
100-0	51.6% (49)	13.5% (38)	19.8% (56)	21.7% (143)
200-100	24.2% (23)	46.3% (130)	65.4% (185)	51.2% (338)
400-200	24.2% (23)	40.2% (113)	14.8% (42)	27.1% (178)
Totals:	100.0% (95)	100.0% (281)	100.0% (283)	100.0% (659)

K. subtilis did not, as plainly as other species, show the effects of intrusion and/or exclusion from the neritic waters as a result of the vagaries of the Agulhas current. This is very likely due to the vertical distribution of this species (cf. S. decipiens), that is, the major portion of its population was well below those layers which "washed" the neritic area, particularly during the winter survey.

As a result, the percentage-ranks for this species in neritic waters are extremely variable: during the summer survey (Table A2-4), it was only just evident at Port Shepstone 1 (1.3%--11th-rank) and at Port Elizabeth 12 (0.2%--13th-rank); during the autumn survey (Table A2-5), it was only >1% of the totals at Durban 17 and Cape Seal 50; and during the winter survey (Table A2-6) it was present only at Port Elizabeth 84 and 82. All of these stations except Durban 17 and Port Shepstone 1 had sufficient deep water and hence this could account for the presence of K. subtilis. The percentages, for the winter survey (cited above) were based on one specimen each, and similarly, for the other surveys very few individuals were actually present, hence caution is necessary in their interpretation.

The overall rank (Table A2-3) of K. subtilis in the ocean was 7th but for each survey (Tables A2-7 to A2-9) the most commonly held rank was 6th.

(N100B-nets)

Medians, ranges and abundances/haul/10 minutes are given in Table A2-114. K. subtilis was fairly well represented in these collections and maximal numbers occurred during the winter survey; the median value was 13 individuals/haul/10 minutes whereas the corresponding values for summer and autumn surveys were 5 and 7, respectively.

(N100H-nets)

Medians, ranges and abundances/haul/10 minutes are given in Table A2-115. Only five records exist for the oceanic stations and three of these were during the autumn survey. By comparing these data with the N100B-data it can be stated that K. subtilis is definitely not a surface dweller (0 to 5 meters).

There were only three neritic records and all were during the winter survey; they were from Durban 59, Port St. Johns 67 and Port Elizabeth 83. These records might be indicative of upwelling within the neritic area in view of the vertical distribution of the species and its apparent general avoidance of the surface layers. Port St. Johns 67 has already been referred to, in the section on the Hydrographical background as a station which had upwelling characteristics.

(Population composition)

The data for the population composition of K. subtilis are given in Table A2-116. The adult to juvenile percentage-ratios were fairly constant survey to survey in the ocean: during the summer survey it was 62.5% to 37.5%; during the autumn survey it was 72.4% to 27.6%; and during the winter survey the ratio was 75.1% to 24.9%. The summer survey had, however, more juveniles.

The pattern of distribution and abundance for adults and juveniles followed very closely that indicated for the combined data of all individuals (cf. particularly, Tables A2-113 with A2-117 and through A2-122).

The vertical distribution of adults and juveniles are given in Text-Table 20. These data show that more juveniles than adults were present in the upper 100 meters. This was true for the separate surveys, also. The data of the autumn survey show that the adult population was slightly deeper, mostly >200 meters, during that period.

Text Table 20. The vertical distribution of Adult (A) and juvenile (B) K. subtilis at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

<u>Depth in Meters</u>	<u>Summer</u>	<u>Autumn</u>	<u>Winter</u>	<u>All Surveys</u>
A. Adults				
100-0	47.5% (28)	11.0% (23)	18.2% (41)	18.7% (92)
200-100	25.4% (15)	42.8% (89)	66.2% (149)	51.4% (253)
400-200	27.1% (16)	46.2% (96)	15.6% (35)	29.9% (147)
Totals:	100.0% (59)	100.0% (208)	100.0% (225)	100.0% (492)
B. Juveniles				
100-0	58.3% (21)	20.6% (15)	25.4% (19)	29.9% (55)
200-100	22.2% (8)	56.2% (41)	65.3% (49)	53.3% (98)
400-200	19.5% (7)	23.2% (17)	9.3% (7)	16.8% (31)
Totals:	100.0% (36)	100.0% (73)	100.0% (75)	100.0% (184)

Literature

Ritter-Zahony (1911) found K. subtilis at the surface in a night haul off Port Natal. It was also present in vertical hauls in many of his stations in the Indian Ocean. He claims it is a mesoplanktonic species in warm regions.

Alverino (1964B) found this species in the mid-Indian Ocean and David (1963) found it to be the 10th-rank species in his collections (1.5% out of 10,315 individuals) from the same general area.

Bieri's (1959) work in the Pacific also suggests that K. subtilis is a mesoplanktonic species. The review on the Chaetognatha by Hyman (1959) states that it is an epiplanktonic to mesoplanktonic species.

Furnestin (1962) found it, but only as a rare-occurring species, among her coastal samples, north of the Benguela current, from the west African coast (between 15°N to 15°S latitudes). It never amounted to more than 1% of the total individuals collected. She classifies it as a mesoplanktonic species.

Sagitta hexaptera d'Orbigny

Résumé

This species was found at all oceanic stations. Its neritic distribution, on a presence and absence basis, was wide spread (Table A2-123). However, when the abundances are considered, more individuals per unit volume--for all nets used--were found in the oceanic area.

Maximal numbers occurred, depending on the net, during different surveys. This may be the result of differential capture. The average size of S. hexaptera was 17.1 mm, hence it is one of the larger species. The abundances given by the N70V-

nets are probably, therefore, an understatement of the species community standing. Both N100-nets show that maximum numbers occurred during the autumn survey.

The species was epiplanktonic in its vertical distribution but was apparently capable of using the entire 200-meter water column, including the surface layers (0 to 5 meters) as its habitat.

During the winter survey, its abundances were reduced at the neritic stations which is in accord with the hydrographical conditions.

The population composition of S. hexaptera was mainly sub-adult and only a very few individuals with mature, enlarged eggs were found. However, its composition was 40.1% adults to 59.9% juveniles and the juveniles occurred nearer the surface layers.

Data

(N70V-nets)

Medians, ranges and abundances/100m³ are given in Table A2-124. At oceanic stations, the median values were not greatly different from survey to survey; 6, 8 and 9 individuals/100m³ for summer, autumn and winter, respectively.

At the neritic stations during the winter survey the species was slightly less abundant than during the other surveys. It is appropriate also to point out that no individuals were found at the following neritic stations: East London (8, 33, 78); Port Alfred (37, 82); Port Elizabeth (11, 41, 84); and Cape Seal (47, 48, 92, 91). Each of these stations was for its particular line, the closest to the shore and hence if recruitment of a species was made solely from oceanic waters, negative records of the species would be expected at these locations.

The vertical distribution of S. hexaptera is given in Text-Table 21. S. hexaptera ranged from the surface layers (see N100H-nets) throughout to the 200 meter level. During the summer survey, it was more confined to the upper 100 meters but the number of individuals sampled was quite small. No great differences existed between the autumn and winter surveys.

Text-Table 21. The vertical distribution of S. hexaptera at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

<u>Depth in Meters</u>	<u>Summer</u>	<u>Autumn</u>	<u>Winter</u>	<u>All Surveys</u>
100-0	60.3% (41)	48.0% (128)	42.6% (106)	47.0% (275)
200-100	22.0% (15)	43.0% (115)	48.6% (121)	43.0% (251)
400-200	17.7% (12)	9.0% (24)	8.8% (22)	10.0% (58)
Totals:	100.0% (68)	100.0% (267)	100.0% (249)	100.0% (584)

Percentage-wise S. hexaptera was for all surveys, the 8th-rank (4.3%) species in oceanic waters (Table A2-3).

It's rank in neritic waters was usually 11th or lower and usually where it assumed a higher rank, the stations were those which were under the influence of the Agulhas current. For example: during the summer survey (Table A2-4) Port Shepstone 1 and Port Elizabeth 12; during the autumn survey (Table A2-5), Durban 17, Port Shepstone 21 and Cape Seal 50; and during the winter survey (Table A2-6), Port Alfred 81 and Port Elizabeth 83.
(N100B-nets)

Abundances/haul/10 minutes by the N100B-nets are given in Table A2-125. Abundances are larger by these nets than those of the N100Hs (cf. Tables A2-126 to A2-127). However, both nets show that maximal abundances occurred during the autumn survey. The median values were $16\frac{1}{2}$, 35, and 23/100m³ during the summer, autumn and winter surveys, respectively.

The percentage-rank of S. hexaptera, at oceanic stations, was 4th-rank (13.2%) for all surveys (Table A2-10). This was a considerably higher rank than that shown for this species by the N70V-data (i.e., 10th-rank). Because S. hexaptera is large (Table A5-15), it was probably more adequately sampled by the N100-nets.

(N100H-nets)

Abundances/haul/10 minutes are given in Table A2-126. The median values per season were by these nets lower than the N100B-nets by a factor of $2\frac{1}{2}x$ to $8x$ but they still indicate that S. hexaptera was, to some extent, a surface dweller (0 to 5 meters).

Maximal abundances were at oceanic stations and the autumn survey had the largest median value: 12 individuals/haul/10 minutes compared to the corresponding values for the summer and winter survey of 2 and 9, respectively.

The neritic population data was smaller than that of the ocean but during the winter survey its abundances were reduced; 1 individual/haul/10 minutes compared to the medians of the autumn survey of 5 individuals/haul/10 minutes. The neritic records of the winter survey at Port St. Johns 67 and Bashee 71 may suggest the occurrence of upwelling in view of the rather wide-ranging vertical distribution of this species.

(Population composition)

The data for the population composition of S. hexaptera are given in Table A2-127. The adult to juvenile percentage-ratios were as follows at oceanic stations: during the summer survey, 41.6% to 58.4%; during the autumn survey, 37.8% to

52.2%; and during the winter survey 41.7% to 58.3%. The N100-nets also show that a rather constant population occurred in the ocean; for example: for N100Hs the ratio was 57.3% adults to 42.7% juveniles and for the N100Bs the ratio was 50.0% adults to 50.0% juveniles.

The patterns of distribution and abundance for adults and juveniles show, as do most of the other species, almost a mirror-image of the trends of the combined data for all individuals (Tables A2-128 to A2-133).

The vertical distribution of adults and juveniles are given in Text-Table 22.

A

Text-Table 22. The vertical distribution of adult (A) and juvenile (B) S. hexaptera at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

<u>Depth in Meters</u>	<u>Summer</u>	<u>Autumn</u>	<u>Winter</u>	<u>All Surveys</u>
A. Adults				
100-0	64.0% (16)	53.5% (53)	36.9% (41)	46.8% (110)
200-100	16.0% (4)	35.4% (35)	46.8% (52)	38.8% (91)
400-200	20.0% (5)	11.1% (11)	16.3% (18)	14.4% (34)
Totals:	100.0% (25)	100.0% (99)	100.0% (111)	100.0% (235)
B. Juveniles				
100-0	58.1% (25)	44.3% (75)	55.4% (86)	50.7% (186)
200-100	25.6% (11)	48.0% (81)	41.9% (65)	42.8% (157)
400-200	16.3% (7)	7.7% (13)	2.7% (4)	6.5% (24)
Totals:	100.0% (43)	100.0% (169)	100.0% (155)	100.0% (367)

The combined data for all surveys and those of each survey show that a difference existed between the juvenile and adult vertical distribution. About 93.5% of the juvenile population was above the 200-meter level while 85.6% of the adult population was found in the same stratum. This difference, though not great, was apparent and consistent from survey to survey.

Literature

Ritter-Zahony (1911) found S. hexaptera in surface hauls off Port Natal. Juveniles were present mostly in his surface hauls and so he considered that most of the population of the species was present in the lower epipelagic to mesopelagic levels.

In the Indian Ocean, Alvarino (1964B) indicates, in a very general way, that the distribution of this species was more extensive in cold waters than S. enflata. She (Alvarino, 1964A) found the vertical distribution of this species was predominately in the lower levels of the epipelagic (150 to 200 meters) to the upper mesopelagic (200-100 meters).

In the Pacific, Bieri (1959) found that this species

was distributed very similarly to that of three other species, i.e., S. enflata, S. pacifica (serratodentata), and P. draco. They were all, more or less, confined to the warm water masses of the equatorial and central Pacific areas.

Furnest (1962) collected only a few specimens of this species off the west coast of Africa (north of the Benguela current) but generally these were from her few oceanic stations. Owre (1960) also regards it as an oceanic species near Florida in the north Atlantic.

Sagitta bipunctata Quoy et Gaimard

Résumé

This species was found at all oceanic stations except Durban 17. In neritic waters it was absent from 10 out of a possible 31 stations, and seven of these occurred during the winter survey when the influence of the Agulhas current on the neritic waters was greatly reduced (see section on Hydrographical background). Hence its distribution followed the flow pattern of the Agulhas current (Table A2-134).

It is an epiplanktonic species and to some extent dwells in the surface layers (0 to 5 meters). The winter data show that the population was slightly lower within the epiplanktonic layers than during the other surveys.

This species was most abundant (by N100-data) during the autumn survey and by these same data it had more important a role in the community than indicated by the N70V-data (See Table A2-1); this effect is undoubtedly due to size differences in the specimens captured by the two nets.

By N70V-data the adult to juvenile percentage-ratio was 32.9% to 67.1% whereas by the N100H-data it was 76.3% to 23.7%. This serves to emphasize what was stated in the previous paragraph. The data on the vertical distribution of adults and juveniles, separately, showed that the adults (rather than the juveniles) occurred closer to the surface.

Data

(N70V-nets)

Medians, ranges and abundances/100m³ are given in Table A2-135.

At neritic stations, during the summer survey a maximum of 13 individuals/100m³ occurred but there were only two positive records made during this survey so it is safer to consider only the data from the other surveys. These data indicate, in particular, that S. bipunctata was more prevalent in oceanic waters. There was a marked exclusion of this species from the neritic waters during the winter survey.

In the ocean, it was most abundant during the winter survey by these nets (cf. with N100-nets, Tables A2-136 and A2-137).

The vertical distribution of S. bipunctata is given in Text-Table 23. It was an epipelanktonic species but its population was sometimes found in deeper waters^{as} during the winter survey.

Text-Table 23. The vertical distribution of S. bipunctata at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

<u>Depth in Meters</u>	<u>Summer</u>	<u>Autumn</u>	<u>Winter</u>	<u>All Surveys</u>
100-0	56.2% (9)	54.1% (92)	26.0% (60)	38.6% (161)
200-100	25.0% (4)	39.4% (67)	48.9% (113)	44.1% (184)
400-200	18.8% (3)	6.5% (11)	25.1% (58)	17.3% (72)
Totals:	100.0% (16)	100.0% (170)	100.0% (231)	100.0% (417)

The percentage-ranks of S. bipunctata are given in Table A2-3. By these nets, it was distinctly an oceanic species. Its percentage-ranks were in agreement with the hydrographical conditions. Thus, during the winter survey (Table A2-6) its percentage-ranks was >9th-rank (0.0%) only at those stations which showed some oceanic influences. These stations were Durban 59, Port Alfred 81 and Cape Seal 89.

(N100B-nets)

The abundances/haul/10 minutes for this species are given in Table A2-136.

The median values/haul/10 minutes for the summer, autumn and winter surveys were 7, 20 and 7½, respectively.

The percentage-rank of this species in the ocean was 5th-rank (6.8%) for all surveys (Table A2-10).

(N100H-nets)

The abundances/haul/10 minutes for this species are given in Table A2-137.

These data show very clearly that S. bipunctata was an oceanic species; all median values per survey were greater in the ocean than at neritic stations. The maximal abundances were during the autumn survey.

The distribution of the species in neritic waters followed the hydrographical conditions already cited, that is, an exclusion of the species from the neritic area occurred during the winter survey. But presence and absence data, alone, indicate this (see zero values in Table A2-137), for 7 of its total (13) absences occurred in neritic waters during the winter survey.

The percentage-ranks for this species were higher by these nets (Table A2-1) than for the N100Bs and N70Vs; it was 4-th

rank (10.8%) for all surveys. These data may indicate that the population of this species resided more in the surface layers (0 to 5 meters) than in deeper waters. Again, it can be emphasized that the N100-nets selectively sampled larger-sized animals hence giving them a "higher" rank in the community.

(Population Composition)

The data for the population composition of S. bipunctata are given in Table A2-138. Considerable variation was present among the adult to juvenile percentage-ratios in the ocean for the N70V-data, for example: during the summer survey, it was 73.7% to 26.3%; during the autumn survey, it was 45.6% to 54.4%; and during the winter survey, it was 11.7% to 88.3%. The N100-data had distinctly less variability.

The patterns of distribution and abundance for adults and juveniles was essentially that as outlined for the combined data of all individuals. This is, however, less true for the N70V-data than the N100-data (Tables A2-139 to A2-144).

Vertical distribution of adults and juveniles are given in Text-Table 24.

Text-Table 24. The vertical distribution of adult (A) and juvenile (B) S. bipunctata at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

<u>Depth in Meters</u>	<u>Summer</u>	<u>Autumn</u>	<u>Winter</u>	<u>All Surveys</u>
A. Adults				
100-0	69.3% (9)	65.4% (53)	55.6% (15)	63.6% (77)
200-100	30.7% (4)	27.2% (22)	29.6% (8)	28.1% (34)
400-200	0.0% (0)	7.4% (6)	14.8% (4)	8.3% (10)
Totals:	100.0% (13)	100.0% (81)	100.0% (27)	100.0% (121)
B. Juveniles				
100-0	0.0% (0)	43.8% (39)	24.4% (145)	30.3% (84)
200-100	25.0% (1)	49.4% (44)	47.8% (88)	48.0% (133)
400-200	75.0% (3)	6.8% (6)	27.8% (51)	21.7% (60)
Totals:	100.0% (4)	100.0% (89)	100.0% (184)	100.0% (277)

The data are in variance to those given for the previous species as they show that the adult population maintained a slightly higher vertical level than the juvenile population. This may, however, be an artifact as the samples were not very large and the N70V-nets may have not captured a true representation of adult specimens.

Literature

Ritter-Zahony (1911) found this species at Port Natal from vertical and surface hauls and at other locations in the Indian Ocean. He states that it is an epiplanktonic species

which resides in the upper layers. Cleve (1908) found it common off the coast of South Africa, from False Bay to Mossel Bay. Alvarino (1964B) who considers S. bipunctata as a cosmopolitan (common to Atlantic, Indian and Pacific Oceans) found it in the mid-Indian Ocean. David (1963) found it was the 3rd-rank species (at the 90°E longitude; 10.5% of 10,315 individuals) in the Indian Ocean.

But in the cold Benguela current David (1963) found it was greatly reduced in rank, i.e., 11th-rank (<0.5% of 28,268 individuals).

Bieri (1959), who lists this species as S. californica found it wide spread throughout the Pacific.

It was a rare species in Furnestin's (1962) coastal samples along west Africa, as it constituted only <1% of her total collection. She considers it an oceanic species and epiplanktonic in its vertical distribution. Hyman's (1959) review states that Oye^{*}(1918) found S. bipunctata to be partial to waters of lower salinity.

Krohnitta pacifica (Aida)

Résumé

This species was a resident of both the neritic and oceanic areas. It was found at most oceanic stations, i.e., at 42 out of a possible 53 stations. In neritic waters, it was found at 23 out of a possible 31 stations but most of its absences occurred during the winter survey (Table A2-145).

K. pacifica was most abundant at neritic stations but underwent a reduction during the winter survey. Thus, this species followed the flow pattern of the Agulhas current (see section on Hydrographical background).

The distribution of this species closely parallels that of S. regularis/neglecta, S. robusta/ferox and S. bedoti and to some extent S. enflata.

The population composition was predominately of adults; 94.9% to 5.1% juveniles. This probably reflects the systematic state of the juveniles. The pattern of distribution and abundance of the adults was similar, therefore, to that of the combined data.

Data

(N70V-nets)

Medians, ranges and abundances/100m³ are given in Table A2-146.

The median values, at the neritic stations, were: 10 individuals/100m³ during the summer survey; 11½ individuals/100m³

* Original paper not available to the writer.

during the autumn survey; and 6 individuals/100m³ during the winter survey. The corresponding values for the oceanic stations are 1, 1 and 2 individuals/100m³, respectively.

K. pacifica was absent from 8 out of 13 neritic stations during the winter survey and, in general, it was less abundant during this period. The exclusion of this species from the neritic waters during the winter survey was no doubt the result of the existing hydrographical conditions (see zero counts in Table A2-146).

The vertical distribution of K. pacifica is given in Text-Table 25. K. pacifica is primarily an epiplanktonic species. By these data, there is also some indication that the population extended into deeper waters during the winter survey but the actual samples were small.

Text-Table 25. The vertical distribution of K. pacifica at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

<u>Depth in Meters</u>	<u>Summer</u>	<u>Autumn</u>	<u>Winter</u>	<u>All Surveys</u>
100-0	33.3% (1)	90.7% (49)	67.7% (46)	77.0% (96)
200-100	33.3% (1)	9.3% (5)	27.9% (19)	20.0% (25)
400-200	33.3% (1)	0.0% (0)	4.4% (3)	3.0% (4)
Totals:	100.0% (3)	100.0% (54)	100.0% (68)	100.0% (125)

The percentage-ranks of K. pacifica (Table A2-3) show that it had a higher rank in neritic waters (7th rank--1.8%) than in the ocean (12 rank--0.9%).

The same type of data, on a survey basis, shows the same trend. In addition, the data for each survey suggest that this species achieved a higher percentage at mixed-water (neritic) stations, for example: during the summer survey (Table A2-4), K. pacifica achieved its highest percentage (2.3%) at Port Elizabeth 12; during the autumn survey (Table A2-5), it was highest at Port Elizabeth 42; and finally during the winter survey (Table A2-6), it was highest at Durban 59, Port Alfred 81 and Cape Seal 90 and 89. Most of these stations were either the outermost neritic stations or under heavy influence from the Agulhas current (see section on Hydrographical background).
(N100B-nets)

The abundances/haul/10 minutes by this net are given in Table A2-147. The abundances are too low and few to indicate any seasonal or geographical trends.

(N100H-nets)

The abundances/haul/10 minutes by these nets are given in Table A2-148. As for the N100Bs, these nets data are too few

and small to use but because the N100's nets are comparable it is possible to suggest that the species inhabits, to some extent, the surface layers (0 to 5 meters).

(Population composition)

The data for the population composition of K. pacifica are given in Table A2-149. The adult to juvenile percentage-ratios (Table A2-7) show that slightly more juveniles occurred at the oceanic stations, but caution is necessary because of the few data.

Similarly, the pattern of juvenile distribution and abundance is dubious because of the few data. However, the distribution and abundance for the adults were identical to that given for the combined data (Tables A2-150 to A2-155).

The vertical distribution of adults and juveniles are given in Text-Table 26.

Text-Table 26. The vertical distribution of adult (A) and juvenile (B) K. pacifica at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

<u>Depth in Meters</u>	<u>Summer</u>	<u>Autumn</u>	<u>Winter</u>	<u>All Surveys</u>
A. Adults				
100-0	33.3% (1)	88.6% (39)	64.8% (46)	72.9% (86)
200-100	33.3% (1)	11.4% (5)	31.0% (22)	23.7% (28)
400-200	33.3% (1)	0.0% (0)	4.2% (3)	3.4% (4)
Totals:	100.0% (3)	100.0% (44)	100.0% (71)	100.0% (118)
B. Juveniles				
100-0	0.0% (0)	100.0% (9)	0.0% (0)	100.0% (9)
200-100	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)
400-200	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)
Totals:	0.0% (0)	100.0% (9)	0.0% (0)	100.0% (9)

The data for the juveniles are very limited but all juveniles were found in the upper 100-meters. The adult vertical distribution is, for the most part, identical to that of the combined data for all individuals (cf. Text-Table 25 and 26).

Literature

Ritter-Zahony (1911) did not find this species in the Agulhas current or in any of his collections. It is quite possible that he lumped it with its sister-species K. subtilis (see Taxonomic notes).

It was recorded from the Indian Ocean by David (1963), in tropical waters, along the 90°E meridian. Similarly, it was recorded from the Indonesian area, near Flores Island (Alvarino, 1964B). Bierl (1959) recorded it in the Pacific.

Off the west coast of Africa (between 15°N and 15°S), north of the Benguela current, Furnestin (1962) found this species

rather prevalent in coastal samples. She classifies it as an epiplanktonic species which is common to neritic waters and usually found in the presence of S. enflata, S. friderici and S. hispida. It is, however, absent in the Benguela current (David, 1963) but a few specimens may get into the current as some individuals show at times over the Agulhas bank (Table A2-2).

Sagitta robusta/ferox Doncaster

Résumé

This species was a resident, at least according to abundances, to both the neritic and oceanic areas. It was found at 50 out of a possible 53 oceanic stations. At neritic stations, it was found at 23 out of a possible 31 stations (Table A2-156).

Greatest abundances occurred at neritic stations during the summer survey and, following the hydrographical conditions already outlined, there was a reduction in its numbers, at these stations, during the winter survey.

S. robusta/ferox was an epiplanktonic species, living primarily in the upper 100 meters but during the winter survey it extended into slightly deeper waters.

The pattern of distribution and abundance for this species follows that for S. regularis/neglecta, K. pacifica and S. ledoti and to some extent S. enflata.

The population composition of S. robusta/ferox was 44.2% adults to 55.8% juveniles. The neritic area exhibited a rather constant ratio of adult to juveniles, survey to survey, whereas the data of the oceanic area are variable. This species, as S. bipunctata, did not show a distinct difference in the vertical distribution between its adult and juvenile population.

Data

(N70V-nets)

Medians, ranges and abundances/100m³ are given in Table A2-157.

It was most abundant at neritic stations during the summer survey; the median value was 24 individuals/100m³. During the winter survey, the median value was 2 individuals/100m³. It is appropriate to note that this species was present only at three neritic stations during the winter survey, i.e., Durban 59, Port Alfred 81 and Cape Seal 89. These stations are for this period, among those most susceptible to the influence of the Agulhas current (see section on Hydrographical background).

Oceanic abundances were lower by a factor of at least 7x than those of the neritic waters, but during the winter

survey the neritic and oceanic numbers were about equal; the median values/100m³ were 2.

S. robusta/ferox was primarily an epiplanktonic species in its vertical distribution (Text-Table 27) but was found deeper within the epiplanktonic layers (upper 200meters) during the winter survey.

Text-Table 27. The vertical distribution of S. robusta/ferox at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

Depth in Meters	Summer	Autumn	Winter	All Surveys
100-0	90.0% (27)	82.3% (51)	47.4% (27)	70.5% (105)
200-100	10.0% (3)	11.3% (7)	48.1% (28)	25.5% (38)
400-200	0.0% (0)	6.4% (4)	3.5% (2)	4.0% (6)
Totals:	100.0% (30)	100.0% (62)	100.0% (57)	100.0% (149)

The percentage-ranks for this species show that it was 9th rank (1.4%) in neritic waters and 11th rank (1.2%) in the ocean (Table A2-3). For the separate surveys (Tables A2-4 to A2-9), it was always of higher percentage-rank in the neritic area than in the ocean.

(N100B-nets)

Abundances by these nets are given in Table A2-158. The median value/100m³ were: during the summer survey, 9; during the autumn survey, 8; and during the winter survey, 7.

The percentage-ranks for the species are much higher by these nets than for the N70V-nets, for example, in neritic waters it was 4th rank (6.5%) and 7th rank (3.9%) in the ocean. (cf. above N70V percentage-ranks, and Table A2-10). This increase in percentage-ranks may be accounted for by the fact that these nets collected a more representative sample of the population of S. ferox than did the N70V's. S. ferox made up 84.7% in N100B-nets compared to 53.1% in the N70V's (Table A2-1). Also, S. ferox is, comparatively speaking, one of the larger species. The average length of 68 mature S. ferox was 14.4 mm, whereas the average length of 21 mature S. robusta was 10.8 mm (Table A5-15).

This suggestions applies equally to the data of the N100H-nets since they also show a higher percentage-rank for S. robusta/ferox than that of the N70V-nets.

(N100H-nets)

Abundances by these nets are given in Table A2-159. The median values for the neritic stations were greater than those of the ocean and maximal abundances occurred during the summer and autumn survey. The winter survey showed a dramatic reduction in abundances, i.e., 1½ individuals/haul/10 minutes while

the corresponding values for the summer and autumn survey were 12 and 14½, respectively.

The percentage-ranks, by these nets, followed the pattern indicated by the N100B-nets, which is outlined above.

(Population composition)

The data for the population composition of S. robusta/ferox are given in Table A2-160. The adult to juvenile percentage-ratios for the oceanic area were: during the summer survey, 52.4% to 47.6% during the autumn survey, 36.6% to 63.4%; and during the winter survey, 17.9% to 82.1%. This rather dramatic change in population composition may be the result of the systematic problems still existing for the juveniles of this species. But the population composition at neritic stations was seasonally, rather constant, about 60% adults to 40% juveniles.

There was no difference in the distribution of adults and juveniles as both reflect the changes already indicated by the combined data of all individuals (cf. Tables A2-157 with A2-161 to A2-166).

The vertical distribution of adults and juveniles is given in Text-Table 28.

Text Table 28. The vertical distribution of adult (A) and juvenile (B) S. robusta/ferox at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

<u>Depth in Meters</u>	<u>Summer</u>	<u>Autumn</u>	<u>Winter</u>	<u>All Surveys</u>
A. Adults				
100-0	90.0% (27)	66.7% (16)	58.3% (7)	75.7% (50)
200-100	10.0% (3)	20.8% (5)	41.7% (5)	19.7% (13)
400-200	0.0% (0)	12.5% (3)	0.0% (0)	4.6% (3)
Totals:	100.0% (30)	100.0% (24)	100.0% (12)	100.0% (66)
B. Juveniles				
100-0	84.6% (11)	92.1% (35)	43.5% (20)	68.1% (66)
200-100	15.4% (2)	5.3% (2)	52.2% (24)	28.8% (28)
400-200	0.0% (0)	2.6% (1)	4.3% (2)	3.1% (3)
Totals:	100.0% (13)	100.0% (38)	100.0% (46)	100.0% (97)

The seasonal data are generally too few to use for conclusive statements but the data for all surveys combined indicate 96% of the juvenile population was above the 100-meter level whereas 94% of the adult population was present at the same level but this trend is not consistent for each survey.

Literature

Ritter-Zahony (1911) found S. robusta in a surface haul off Port Natal, made during the night. He also found it in vertical hauls, at other locations, but its abundances were always less at the surface (S. ferox is listed by Ritter-Zahony, 1911, as

a synonym for S. robusta). The other locations where the species was found by Ritter-Zahony include the Indian Ocean--east of the Agulhas current--and in the Atlantic Ocean, north of the equator. Alvarino (1964B) found both S. robusta and S. ferox in her Indian Ocean samples; S. robusta was more confined to equatorial waters than S. ferox, and the latter species was spread further south.

Bieri (1959) lists S. robusta as an equatorial, west-central species in the Pacific and S. ferox as a species with a wide but "confused" distribution. Alvarino (1962) suggests, for the Pacific area, both species are equatorial in their distribution but S. robusta spreads further eastward and is less patchy in its continuity than S. ferox. Further, she states S. ferox occurred more often in the upper layers.

Furnestin (1962) did not find this species in her coastal collections off west Africa, north of the Benguela current. Nor did David (1963), find it in the Benguela current. That it can and does go around the Cape of Good Hope is confirmed by my examinations of a few samples taken by the South African Fisheries and by other workers (Heydorn, 1959; see also Table A2-2). Hyman (1959), however, cites it as a species unique to the Indo-Pacific area.

Sagitta bedoti Béraneck

Résumé

This species was a resident to both the oceanic and neritic areas. It was found at 38 out of 53 oceanic stations and at 18 out of 31 neritic stations (Table A2-167).

It was most abundant at neritic stations but because it is restricted to the Indo-Pacific area, and hence a warm-water species, it was excluded from these stations during the winter survey. During the winter survey the Agulhas current did not intrude into the neritic waters as extensively as it did during the other surveys (see section on Hydrographical background).

By total relative abundance, this species (177 specimens, N70V) is a rare species. It lives primarily in the upper 100 meters (epiplankton) but also to some extent in the surface layers (0 to 5 meters). The overall distribution of this species resembles very closely, that of S. regularis/neglecta, K. pacifica, S. robusta/ferox and to a certain extent, S. enflata.

The available data, which is quite limited, show that the population composition of S. bedoti was 68.4% adults to 31.6% juveniles. The distribution of adults and juveniles was no different from that of all individuals. All juveniles were found in the upper 100 meters.

Data

(N70V-nets)

Medians, ranges and abundances/100m³ are given in Table A2-168. The neritic stations consistently show, for all surveys, the greatest abundances; these values were from 6x to 10x greater than the oceanic values. The median values for these stations were 21, 13 and 6½ individuals/100m³ for the respective surveys of summer, autumn, and winter. The corresponding oceanic values were 2, 1½ and < 1 individuals/100m³.

The neritic stations of winter are of special interest as they show that S. bedoti was present only at Durban 59, Port Shepstone 63, Port Alfred 81 and Cape Seal 89. Thus, the species was found only at those stations which were among those most likely to show the effects of the Agulhas current. This suggests that this species is restricted to the warm waters of the Agulhas current and probably thus the Indian Ocean.

The vertical distribution of S. bedoti is given in Text-Table 29. The data are too few for conclusive statements.

Text-Table 29. The vertical distribution of S. bedoti at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

<u>Depth in Meters</u>	<u>Summer</u>	<u>Autumn</u>	<u>Winter</u>	<u>All Surveys</u>
100-0	100.0% (13)	95.5% (21)	77.8% (7)	93.0% (41)
200-100	0.0% (0)	4.5% (1)	11.1% (1)	4.5% (2)
400-200	0.0% (0)	0.0% (0)	11.1% (1)	2.5% (1)
Totals:	100.0% (13)	100.0% (22)	100.0% (9)	100.0% (44)

The percentage-ranks (Table A2-3) for S. bedoti show that it had higher rank (7th rank, 1.8%) in neritic waters than in the ocean (13th rank, 0.4%). Also, these data indicate more clearly than the abundances that the species was excluded from neritic waters during the winter survey (Tables A2-3 to A2-6).

(N100B-nets)

Abundances/haul/10 minutes by these nets are given in Table A2-169. By these nets, S. bedoti was found at 29 out of 51 oceanic stations (43%). But the data are too few to indicate seasonal trends.

(N100H-nets)

Here also, the data are too few and small to discuss seasonal changes, however, they do indicate that the species inhabits the surface layers (0 to 5 meters) and prefers neritic waters.

(Population composition)

(Table A2-170).

The data for the population composition of S. bedoti are given in Table A2-171. The neritic population composition was 69.3% adults to 30.7% juveniles and that of the ocean was 66.7%

adults to 33.3% juveniles. But the seasonal breakdown of this data show much variation, probably because of the small numbers involved.

The adult and juvenile pattern of distribution are similar to that of all individuals (Tables A2-172 to A2-177).

The vertical distribution of adults and juveniles are given in Text-Table 30.

Text-Table 30. The vertical distribution of adult (A) and juvenile (B) *S. bedoti* at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

Depth in Meters	Summer	Autumn	Winter	All Surveys
A. Adults				
100-0	100.0% (9)	92.4% (12)	75.0% (6)	90.0% (27)
200-100	0.0% (0)	7.6% (1)	12.5% (1)	6.7% (2)
400-200	0.0% (0)	0.0% (0)	12.5% (1)	3.3% (1)
Totals:	100.0% (9)	100.0% (13)	100.0% (8)	100.0% (30)
B. Juveniles				
100-0	100.0% (4)	100.0% (9)	100.0% (1)	100.0% (14)
200-100	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)
400-200	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)
Totals:	100.0% (4)	100.0% (9)	100.0% (1)	100.0% (14)

Literature

Ritter-Zahony (1911) found this species in the Agulhas current off Port Natal. He considers it a species unique to the upper layers of warm water. However, he notes that it could possibly occur in areas generally characterized by cold water, but only under special conditions, such as those found at times over the Agulhas bank where mixing can and does occur. It is appropriate to note, at this time, Table A2-2 which gives the percentage-ranks of species at the 24-hour station. This station was located over the Agulhas bank (approximately 21°E longitude) about midway between Cape Town and Port Elizabeth. *S. bedoti* was the 6th-rank species (1.9%) at this station, and because these samples were taken during the summer, the conditions which Ritter-Zahony suggested are undoubtedly met. In particular, some of the Agulhas current has flooded over the Agulhas bank; that this can happen is well known (Africa Pilot, 1954; M. Darbyshire, 1963).

Tokioka (1962) considers that the distribution of this species as problematic as it has been recorded in offshore waters of the Indian Ocean but it occurs in the Pacific solely as an inshore species (Bieri, 1959). In general, these authors find that this species was not very abundant (also see David, 1963). Tokioka (1959) gives considerable data on the distri-

bution of S. bedoti, some of which can be summarized as follows: (1) It is an epiplanktonic species, most abundant above 50 meters. (2) It is widely distributed in the Indian Ocean but not very abundant (usually $\leq 10\%$ of totals). (3) It is a mixed-water species, common along coasts and water boundary areas--but it can survive in oceanic waters. (4) He proposes to treat waters which show a high percentage of S. bedoti as distinct from oceanic waters and to call them "bedoti-water".

S. bedoti has not been recorded in areas other than the Indo-Pacific (Hyman, 1959).

Eukrohnia hamata (Mübius)

Résumé

This was a rare occurring species (Table A2-178). The total number of specimens was 31. It is listed in the literature as an oceanic species with a preference for depths greater than those sampled (>400 meters) by the present collections. As a result, little can be said about its abundance other than 87% of the total specimens were found during the autumn survey and more than 90% of the total specimens were from the 400-200 meter level.

(N70V-nets)

Abundances/100m³ by these nets are given in Table A2-179. Thirty of the 31 total specimens were captured by these nets and only three came from neritic waters; the remaining individuals occurred at oceanic stations. Greatest abundances were found during the autumn survey.

The vertical distribution of E. hamata is given in Text-Table 31. These data, despite their limited nature, show clearly that the species was mesoplanktonic in its vertical distribution. This applies only to the survey area and only for daytime hours (0600 to 1800 hours, local time).

Text Table 31. The vertical distribution of E. hamata at oceanic stations. Relative abundances are enclosed by parentheses. Nets which failed to close are not included.

<u>Depth in Meters</u>	<u>Summer</u>	<u>Autumn</u>	<u>Winter</u>	<u>All Surveys</u>
100-0	0.0% (0)	4.2% (1)	0.0% (0)	3.7% (1)
200-100	0.0% (0)	4.2% (1)	0.0% (0)	3.7% (1)
400-200	100.0% (1)	91.6% (22)	100.0% (2)	92.6% (25)
Totals:	100.0% (1)	100.0% (24)	100.0% (2)	100.0% (27)

(N100B-nets)

Abundances/haul/10 minutes by these nets are given in Table A2-180. Only one specimen, a juvenile, was captured by these nets. It was found at a neritic station, Port Alfred 81, during the winter survey. This station had mixed-water present

and was under considerable oceanic influence.

(N100H-nets)

No specimens were captured by this net.

(Population composition)

The distribution and abundance of adult and juvenile specimens are given in Tables A2-181 and A2-182. The data are too few to indicate any general trends.

Literature

E. hamata was not found in the Agulhas current by Ritter-Zahony (1911) though it was found by him at other stations in the Atlantic and southern ocean, especially at depths between 1500 to 3000 meters. It is not apparent from his report if similar deep hauls were attempted in the Agulhas current. However Cleve (1908), found a single specimen, 12 miles off Port Shepstone, in a sample hauled through 1000 meters; he lists this species under the synonym Krohnia hamata (Möbius).

Alvarino (1964A) has shown that the vertical distribution of this species is related to that latitude where it is found; it is very near the surface at higher latitudes and gets progressively deeper, toward the tropics. David (1963), also mentions the unique vertical distribution of this species. He regards the species as the most cosmopolitan of all chaetognaths.

Sagitta pulchra Doncaster

Résumé

This was a rare species but was found most abundantly at neritic stations (Table A2-183). Of the total 20 specimens found, the majority (17) were captured by N100-nets.

It is known to be a neritic or mixed-water species and endemic to the Indo-Pacific Oceans.

Data

(N70V-nets)

The species was found at Bashee 71 only (Table A2-184).

(N100B-nets)

The species was found only at three out of a possible 51 oceanic stations. These stations were: Durban 3, 4 and 17 (Table A2-185).

(N100H-nets)

The species was found only at the stations of Port Shepstone 21 and Bashee 71, both neritic stations. The specimens were adult animals (Table A2-185).

(Population composition)

The distribution and abundance of adults and juveniles are given in Table A2-187 to A2-192. The data are too few to use in any analysis.

Literature

Ritter-Zahony (1911) did not find S. pulchra in the Agulhas current but postulated that because it was a warm-water species that it would follow the distribution pattern of S. bedoti, S. neglecta and S. regularis. To some extent, this is true as it is a neritic or mixed-water species (see the analysis of the distribution of the other species mentioned) and is restricted to Indo-Pacific waters.

It has been recorded in the Indian Ocean by Alvarino (1964B) and by David (1963). The data of the latter author show that it was always one of the rare species, that is, it was less than 1% of the total collection.

For the Pacific water masses, Bieri (1959) considers it to be a neritic to mixed-water species, but apparently, due to the species rarity, he says little in regard to its distribution--other than it seems to be anti-equatorial.

Sagitta planctonis Steinhaus

Data

This was a rare species. Only two specimens were found, both at Durban 18. They were captured in the surface waters (0 to 5 meters) by a N100H-net.

Literature

Ritter-Zahony (1911) found this species at stations in the Atlantic and Antarctic but not in the Agulhas current. It was, however, recorded in the Indian Ocean by Alvarino (1964B). She lists it as a mesoplanktonic species which more or less was confined to the northern part of the west wind drift but on one occasion found as far north as 22°S. Bieri (1959) also found it to be a mesoplanktonic species in the Pacific.

The taxonomy of this species is problematical. David (1956) has proposed a solution; he suggests that S. planctonis is a surface dwelling form found in tropical and subtropical waters (Steinhaus, ^{*}1896--cited in David, 1956--found S. planctonis in the Agulhas current).

It is difficult to deduce or even suggest the role of S. planctonis in the present material, in view of its rarity, the taxonomic problem, and the conflicting literature.

Sagitta maxima Conant

Data

Only a single juvenile specimen of this species was found. It was from Port St. Johns 67, a neritic station. The specimen was captured by a N100H-net (0 to 5 meters).

* Original paper not available to the writer.

Literature

Ritter-Zahony (1911) found this species only in the southern ocean. It was from stations south of 40°S latitude. He states (p. 56) that juveniles of this species usually are found in the surface layers but only in cold regions or equivalently in cold waters.

David (1963), though he regards S. maxima as a cosmopolitan, expresses some doubts as to whether this species exists at all in the Indian Ocean. A more recent investigation in this area by Alvarino (1964B), (covering roughly an area bound by 8°S to 42°S latitudes and 60°E to 120°E longitudes) did not reveal the presence of this species and many of her samples were from moderately deep water, i.e., ≤ 2060 meters.

S. maxima, similar to E. hamata, shows pronounced differences in its vertical distribution as a function of its latitude; thus, it is found nearer the surface in cold waters relative to its position in warm waters (David, 1963; Alvarino, 1964A).

One aspect of this species distribution is noted by Alvarino (1964A); it is usually found in surface waters where upwelling has occurred. Its presence, therefore in the neritic waters of the survey area is additional evidence that some upwelling occurred, and it confirms the suggestion and observations of others (Mallory, 1961; see section on Hydrographical background) that the winter season is the most likely period for such a phenomenon.

Summary of all species distributions and abundances.

A considerable amount of data has been presented on the distribution and abundance of each species and, when it was possible, comparisons of similarities and dissimilarities were made among the species.

It is desirable now, however, to extract those common elements on the distribution and abundance of the various species. This is done with the aim of determining what generalizations are possible on these data. It should be born in mind that any one species is not necessarily exclusive to the organization rubrics used below.

Consider the following:

(1) Species showing similarities in their horizontal distribution.

(A) Oceanic species

Exclusives

S. minima
S. serratodentata
P. draco
S. decipiens
S. lyra
K. subtilis
S. hexaptera
S. bipunctata
E. hamata (limited data)
S. maxima (limited data)
S. planctonis (limited data)

Inclusives

S. enflata
S. regularis/neglecta
K. pacifica
S. robusta/ferox
S. bedoti

(B) Neritic species

Exclusives

S. friderici
S. pulchra (limited data)

Inclusives

S. enflata
S. regularis/neglecta
K. pacifica
S. robusta/ferox
S. bedoti

Those species designated as "inclusives" can tolerate apparently mixed-water conditions.

(2) Species distribution as related to the flow pattern of the Agulhas current

(A) Coincident to:

S. enflata
S. serratodentata
P. draco
S. regularis/neglecta
S. hexaptera
S. bipunctata
K. pacifica
S. robusta/ferox
S. bedoti

(B) Noncoincident to:

S. friderici
S. minima
S. decipiens
S. lyra
K. subtilis

The data for E. hamata, S. pulchra, S. planctonis and S. maxima are too few to indicate hydrographical conditions.

(3) Species showing similarity in their vertical distribution

(A) Upper epiplankton
100-0 meters

S. enflata
S. minima
S. serratodentata
P. draco
S. regularis/neglecta
K. pacifica
S. robusta/ferox
S. bedoti

(B) Lower epiplankton
200-100 meters but
also spread to surface

S. lyra
K. subtilis
S. hexaptera
S. bipunctata

(C) Mesoplankton $\geq$ 200 meters

S. decipiens
E. hamata (limited data)

(3) continued.

(D) The vertical distribution of species during the winter survey

Species found in relative- ly deeper waters	Species which showed no change.
<i>S. enflata</i>	<i>S. decipiens</i>
<i>S. minima</i>	<i>K. subtilis</i>
<i>S. serratodentata</i>	<i>S. hexaptera</i>
<i>P. draco</i>	
<i>S. lyra</i>	
<i>S. regularis/neglecta</i>	
<i>S. bipunctata</i>	
<i>K. pacifica</i>	
<i>S. robusta/ferox</i>	
<i>S. bedoti</i> (limited data)	

It is noteworthy to compare these lists with those items (2), i.e., the flow pattern of the Agulhas current, especially those four species which did not seem to follow the hydrographical conditions. Three of these species (*S. decipiens*, *S. lyra*, *K. subtilis*), were found in the lower level of the epiplankton and the fourth species (*S. minima*) was found in deeper waters during the winter survey. These data strongly suggest that the vertical distribution of these species was not suitable for each to show a distributional pattern identical or closely corresponding to the flow pattern of the Agulhas current.

(4) Species indicating upwelling

S. maxima
S. decipiens
S. lyra
K. subtilis
S. minima (?)

(5) Surveys of maximum abundances for each species (see also Table A2-23).

	Summer Survey	Autumn Survey	Winter Survey
<i>S. enflata</i>	Neritic area for all nets	Oceanic area for two nets	
<i>S. minima</i>		for 1 net	
<i>S. serrato.</i>			for all nets
<i>P. draco</i>		for all nets	
<i>S. friderici</i>		for all nets	
<i>S. decipiens</i>		for 1 net	
<i>S. lyra</i>		for 1 net	for 1 net
<i>S. reg./neg.</i>	Neritic area for 1 net		Oceanic area for 1 net
<i>K. subtilis</i>		for 1 net	
<i>S. hexaptera</i>		for 2 nets	
<i>S. bipunct.</i>		for 2 nets	
<i>K. pacifica</i>		Neritic area for 1 net	for 2 nets (?)
<i>S. rob/ferox</i>	Neritic area Oceanic area for 2 nets		
<i>S. bedoti</i>	Neritic-all nets Oceanic-2 nets		

(6) General distribution of species for the literature

(A) Cosmopolitan

S. enflata
S. serratodentata
P. draco
S. hexaptera
E. hamata
S. maxima

"Less" cosmopolitan

S. minima
S. friderici
S. decipiens
S. lyra
K. subtilis
S. bipunctata
S. planctonis

(B) Indo-Pacific

S. regularis/neglecta
S. bedoti
S. pulchra
S. robusta/ferox
K. pacifica (? see
Furnestin, 1962 and
Alvarino, 1964B)

(7) Similarities in population composition for various species

(A) Species whose adult and
juvenile distribution are
similar to all individuals:

S. enflata
S. serratodentata
P. draco
S. decipiens
S. regularis/neglecta
K. subtilis
S. hexaptera
S. bipunctata
K. pacifica
S. robusta/ferox
S. bedoti

(B) Species whose juven-
iles were distributed
higher (vertically)
than the adults:

S. enflata
S. minima
S. serratodentata
P. draco
S. decipiens
S. lyra
S. regularis/neglecta
K. subtilis
S. hexaptera
S. bedoti (limited
data)

(C) Species whose adults
were distributed
higher (vertically)
than the juveniles

S. bipunctata
S. robusta/ferox

I had expected a different horizontal distribution between adults and juveniles of many of the species. But, as seen above, this did not bear out. There are strong theoretical reasons (Margalef, 1963) that this would be so and perhaps the different vertical distribution cited above is an expression of this. A posteriori, it now seems, however, that great differences in the horizontal distribution between adults and juveniles would not be in agreement with the known hydrographical conditions. That is, it would not seem reasonable that only juveniles, for example, would be swept into the neritic area, unless, of course, pronounced differences in vertical distribution were evident—and they were not.

E. Results - Section 3. Recurrent Groups

The distribution and abundance of many of the species described in the previous section followed the flow-pattern of the Agulhas current, especially in the neritic area where it makes ingressions and regressions. These species were: S. enflata, S. serratodentata, P. draco, S. hexaptera, S. regularis/neglecta, S. bedoti, S. bipunctata, K. pacifica, S. robusta/ferox. There are however, some species which did not show this effect, i.e., S. minima, S. lyra, K. subtilis and S. decipiens. That these latter species did not follow the general hydrographical conditions as closely as the others may be in fact a reflection of their deeper vertical distribution, which is, indeed, the case for S. decipiens. But the other three species were spread about equally throughout the upper 200 meters and, as a result, one cannot always be certain just what factor was involved for a particular species.

If one uses several species--as a sort of group indicator--it is possible to obtain further evidence not only about the character of the physical environment but also information about the biotic relationships within the community. Techniques by which individual species can be grouped into assemblies are many; among these are grouping by correlation coefficients, diversity indexes, 2 x 2 contingency tables, etc. (See Fager, 1963A). One author (Fager 1957, 1963A, 1963B) has devised a grouping procedure, which is used in the present study, based on the geometric mean of the proportion of jointed occurrences, corrected for sample size:

$$J / \sqrt{N_a N_b} - \frac{1}{2} \sqrt{N_b} \geq \text{cutoff point};$$

where J equals the number of joint occurrences of Species a and b; N_a is the total number of occurrences of Species a; N_b the total number of occurrences of Species b; and species are assigned to the letter so that $N_a \leq N_b$. The value of this expression is compared to an arbitrary cutoff point and if it is greater or equal to it then the two species are said to have affinity. The value of this cutoff point can vary from 0.0, when all species used form one group, to 1.0 when each species used forms a separate group. Fager (1963B) has used the cutoff value of 0.5 with some success and for the present study the 0.5 cutoff value was also used. After determining the one forms groups by certain counting rules (given in Fager, 1957).

The simplest way to justify the use of the arbitrary cutoff point is as follows: All attempts to understand nature are made via generalization. If one cannot generalize his data in some way, then no one can understand such data or else

it simply stands as compendium of undigested facts. Generalizations about nature are usually made in terms of averages or general trends (statistical terms such as the mean, the median, etc. also fall into this category). Thus the above arbitrary cutoff point is based on nothing more than this concept of expressing the general trend of association among the species studied.

The Fager-technique is difficult to compute by hand for a large amount of data and so it was programed for the computer of the University of Cape Town, an I.C.T.-1301. The results are given in Figure A3-1.

Among the groups formed from the data of each net, i.e., N70V's, N100B's and N100H's, certain common elements exist. They are: (1) Five species are common to all groups: S. enflata, S. serratodentata, P. draco, S. hexaptera and S. bipunctata. All species are oceanic and one of them, S. enflata, shows some degree of success in the neritic area. S. regularis/neglecta, by abundances, also shows success in the neritic area but due to the taxonomical problem (see Taxonomical notes, section 2) it is felt only one of these species is a neritic beast, i.e., S. neglecta. S. neglecta is a rare species. Further, all of the species are epiplanktonic; S. enflata, S. serratodentata and P. draco live predominately in the upper epiplankton (100-0 meters), while S. hexaptera and S. bipunctata live about equally throughout the epiplankton (200-0 meters)—see Section 2. (2) Many of the changes or differences among groups between nets are a reflection of the different sample technique used, i.e., vertical, horizontal, oblique hauling and gear size. For example: the associate group of three species for the N70V-data, S. bedoti, K. pacifica and S. robusta/ferox, are part of the main group in the N100B-data but S. bedoti and K. pacifica are associates in the N100H grouping.

A large main group of eleven species is formed by the N100B-data. These nets were not closed but towed obliquely through 150 meters of water but the deepest vertical depth reached was about 110 meters. Thus these nets cut across the "habitats" of both the upper and lower epiplankton. S. decipiens occurred mostly below the vertical range of these nets, this was not the case for K. subtilis and S. lyra.

For the N100H-data, S. decipiens, K. subtilis and S. lyra do not even show affinities which would be expected since they do not inhabit the surface layers (0 to 5 meters). Thus it appears that the greater number of N70 vertical samples allowed for a more accurate separation and grouping of species. Further-

more, the mesh-size differences among the nets probably caused some discrepancy in the groups formed especially in the inclusion or exclusion of the smaller sized species; for example: S. minima as between N70V and N100H; S. regularis/neglecta as between N70V and both N100 nets.

N70V-Groups

Sixteen species were found in these collections and the Fager-technique dissected out three recurrent groups; a main group of nine species, an associate group of three species, and an associate species; three species showed no affinities (Fig. A3-1). These groups represent the data from all samples collected during the three surveys.

Intergroup relationships are expressed by the number of observed affinities to the total possible affinities (see Fig. A3-1). The main group of nine species is related to the associate group of three species by 20 out of 27 possible affinities. No affinities exist between the associate species, S. decipiens and the associate group of three species.

S. decipiens, the associate species, has affinities with S. minima, S. serratodentata, S. enflata and P. draco; all species of the main group. These four species constitute the four most abundant species in the main group (Table A3-3). Additionally, S. decipiens has affinities with S. hexaptera, K. subtilis, and S. lyra. These latter three species are distinctive because of their deeper vertical distribution; S. hexaptera resides in the upper and lower epiplankton, 47% and 43% of its population, respectively; K. subtilis resides primarily in the lower epiplankton, 52% of its population; and S. lyra resides in the upper and lower epiplankton, 41% and 43% of its population, respectively. The main point of these data is they show that each of the three species is also a resident to deeper waters and since S. decipiens is a mesoplanktonic species it would follow just from their vertical distribution that affinities between all four species should exist.

The affinity pattern of interrelationships between the associate group of three species and the main group shows: S. bedoti has affinities only with K. pacifica and S. robusta/ferox and these two species have affinities with all species except K. subtilis and S. lyra (and of course, those species not showing any affinities). The data of section 2 established that K. subtilis and S. lyra were found mainly in the lower part of the epiplankton whereas the three members of the associate group were inhabitants of the surface layers (0 to 5 meters).

The affinities for species of the main group are not as

revealing as are their nonaffinities. All nine species show no affinities to S. friderici, the neritic species, and no affinities with S. bedoti, a mixed-water species. Further, K. subtilis and S. lyra have no affinities with K. pacifica and S. robusta/ferox. S. regularis/neglecta and S. bipunctata have no affinities with S. decipiens. In short, a consistent pattern of nonaffinities exists; they are between the oceanic species and the neritic species; between the oceanic species and one mixed-water species (S. bedoti); to some extent between (lower) ^{between} epiplanktonic species and surface dwellers; and to some extent/the mesoplanktonic species, S. decipiens, and epiplanktonic species.

When the groups are considered separately it is possible to classify them further according to their habitat distribution. The main group of nine species is a group of oceanic species all of which reside in the epiplankton--upper and lower levels. Only three of these species, S. minima, S. lyra and K. subtilis, did not show a positive correlation with the flow-pattern of the Agulhas current into the neritic area. This may be, as already stated, the result of their preference for deep waters. The associate group, i.e., S. bedoti, K. pacifica and S. robusta/ferox, are mixed-water species. They are inhabitants of oceanic and neritic waters, hence can survive mixed-water conditions.

The distribution of the N70V-main group is given in Fig. A3-2. Appropriate legends are listed to show its distribution as a complete group with all species present and its distribution with one, and two species missing. Certain patterns of distribution are evident: (1) The main group, with all species present, is confined to the oceanic stations and, though not evident on the diagram, to the upper 200 meters (see Text-Table 32).

Text-Table 32. The vertical distribution of the main group of nine species from the N70V-data of all surveys.

<u>Depth in Meters</u>	<u>Occurrences of Main Group</u>
100-0	15
200-100	8
400-200	1
* 400-0	4
Total:	28 samples

15 } 82% of totals
8 }

*Nets which failed to close.

(2) The main group occurred at neritic stations only when one and two of its members were absent. In particular, it was found at those neritic stations most susceptible to intrusions of the

Agulhas current, i.e., off Durban, Port Shepstone and Port St. Johns. The shelf at these stations is quite narrow but it broadens out off Bashee, East London and Port Alfred. Further the occurrence of the group at the outermost neritic stations of Port Elizabeth and Cape Seal suggest again that the Agulhas current cannot readily extend into the innermost stations of these lines. It is well to emphasize that these groups are the combination of data for all surveys and thus give a "static" picture for all the surveys--or the year.

The distribution of the associate group of three species is given in Figure A3-3. Those stations at which this group occurred were mainly mixed-water stations (Text-Table 33). All temperature and salinity values for each station were plotted for (values taken from Zoutendyk, 1960) and envelopes were drawn to separate the oceanic and neritic values (see Figs. A1-2, A1-6, A1-10 and A1-14). The values of some stations, however, were not always restricted to one ^{envelope} and these stations were classified as "mixed" water stations.

Text-Table 33. The occurrence of the associate group of three species formed from N70V-data, for all surveys, at certain stations.

Station Type *		Number of Occurrences	
Mixed	Oceanic Stations 5	5 Oceanic	21.7%
	Oceanic Stations } 7	14 Mixed	60.9%
	Neritic Stations } 7		
	Neritic Stations 4	4 Neritic	17.4%
	Totals: 23	23	100.0%

* (Determined from their temperature and salinity values).

The single species associate, S. decipiens, is an oceanic species and mesoplanktonic in its vertical distribution; 63.4% of its total relative abundance was found at the 200-400 meter level (see S. decipiens in section 2 for further discussion).

A strong point in favor of the Fager technique is that first it identifies the group and then it provides techniques by which to analyze them. The species members of such groups maybe either positively or negatively correlated. One such test suggested by Fager (1957) is that for concordance; species are assumed to be most abundant where they find the most suitable habitat. The test for concordance is a nonparametric ranking-technique which uses all the data for its decision. Thus for both the main group and the associate group of three species, the relative abundances of each species were ranked within the set of samples each group occurred. For the main group ranking was done within those samples in which all individuals species

occurred, i.e., 28 samples. The nine species showed significant concordance ($p < 0.01$). The distribution of the samples showing the largest abundances, and hence those which were 1st ranked, or in a sense the "best" samples, are shown in Fig. A3-4. Eight of the samples occurred at the outermost oceanic stations whereas the remaining six occurred at the innermost oceanic stations. It is interesting to recall that eddy-formations were particularly developed at the outermost oceanic stations (see section on the Hydrographical background).

Similarly, the associate group of three species (S. bedoti, K. pacifica and S. robusta/ferox) showed significant concordance with its samples ($p < 0.01$). The occurrence of the "best" half of these samples is plotted in Fig. A3-5. Aside from the two oceanic stations of Durban 19 and East London 34 the "best" stations were neritic, i.e., Port St. Johns 5, Bashee 29, East London 33, Port Alfred 81, Port Elizabeth 12 and 42 and Cape Seal 49 and 89. It is evident from Fig. A3-5 that these stations lie in an area where mixing between the Agulhas current and neritic waters would be most likely to occur.

Various statistics for each species were gathered; they are given in Tables A3-1 to A3-7.

For the main group of nine species, 101 samples were the basis for the following statistics; total relative abundances; frequency; range of abundances and median, average rank; dispersion; dominance and population composition (following mostly Pager, 1963A and B). It should be emphasized, as Payer himself has done (1963B), that these measurements are only relative and do not take into account other organisms present in the samples.

In Table A3-1, it can be seen that all the species of the main group were found in over 50% of the samples and though not given in the Table, seven of these species were found at over 85% of the stations. By total relative abundances (in Table A2-1), S. enflata was the 1st ranked species but the surprising feature of the main group is that S. minima was the most abundant species and it was the most dominant species (45%). However, because S. minima occurred in 77% (compared to 98% for S. enflata) of the total samples (101) and because its index of dispersion was quite high (83, as compared with 32 for S. enflata; the expected index for both was 1) it is possible to consider that this species was more clumped and restricted in its distribution than S. enflata. Data from section 2 supports this hypothesis as S. enflata is a neritic and oceanic beast whereas S. minima resides only in the ocean. Furthermore, the average rank for S. enflata was slightly lower than for S. minima (range and median values also give the same indication).

The population composition of S. minima was mainly of adults, i.e., 91.2%. This could well be a taxonomic problem rather than a true indication of population trends (see Taxonomic notes in section 2). For some other species, the population composition was the reverse of S. minima, for example, the population of P. draco was made up of 75.5% juveniles. S. lyra and S. hexaptera also showed a fairly large proportion of juveniles, 80.6% and 63.0%, respectively, but more significant, the mature individuals of these latter two species were mainly subadults, that is, few or no "distinct" eggs were seen in any of the individuals. The main vertical distribution of the population of each of these species probably, therefore, lies deeper than 400 meters which was the maximum depth sampled for zooplankton during each survey. Further, the general position that these two species occupied in the community is also of interest; they were relatively rare but widely distributed (see statistics on abundance, frequency and dominance, etc.) and evidence in a later section will be given which suggests these species function as 2nd order carnivores.

S. enflata was the only species to show maximal population during the winter survey. Four other species, P. draco, S. hexaptera, S. regularis/neglecta and S. bipunctata, were about equally abundant during autumn and winter surveys. The remaining species, S. minima, S. serratodentata, S. lyra and K. subtilis had a maximum during the winter survey. In most cases, these patterns of abundances corresponded to the data given for the individual species in section 2 and direct correspondence, as would be expected, is shown with the N70V-data.

Rank correlations (Spearman's Test; Tate and Clelland, 1957) were computed between each possible pair of species of the main group and the results are given in Table A3-2. All relationships were positive except between K. subtilis and S. regularis/neglecta but this was not significant at the 5% level. These relationships are also expressed diagrammatically in Table A3-2. One interesting aspect of these data is that five species (S. minima, S. enflata, S. serratodentata, P. draco and S. regularis/neglecta), which were more restricted to the upper meters, showed a significant relationship to another at the 1% level and three species (S. lyra, S. hexaptera and K. subtilis) showed varying levels of significant relationships to the first five species. The latter three species occurred (section 2) vertically, throughout the upper 200 meters. There is the possibility that these relationships are simply an expression of the different relative abundances for each species and indeed, that

all the statistics thus far presented only reflect the relative abundances. But this is not always consistent, for example, a significant relationship exists between the 8th-rank species, S. regularis/neglecta, and the four species which are the most abundant, also the statistics for dominance do not always show a consistent pattern with the relative abundances.

The Fager-technique was also used on the same data (N70V) but for each survey. The resulting groups are given in Fig. A3-6.

Changes in species composition are evident but common elements still persist from one survey to another (compare Tables A3-1 and A3-3, A3-4 and A3-5). They are: (1) the distribution of the main group, for each survey, is almost exclusively oceanic and in the upper 200 meters (see Fig. A3-7, A3-10, A3-14). (2) Four species are consistently part of the main group from survey to survey, they are: S. minima, S. enflata, S. serratodentata and P. draco. (3) S. friderici, the neritic species, shows no affinities with any species for any particular survey. (4) For each survey, there are two associate groups. One of these groups is always made up of mixed-water species and the other group, for the autumn and winter surveys are composed of species which show a deeper vertical distribution. (5) The grouping, in general, for the winter survey shows the greatest similarity to those groups formed when the data from all surveys are combined (cf. Figs. A3-1 and A3-6).

Groups for the summer survey (N70V-data)

The groups and their relationships between the species are given in Fig. A3-6 and the statistics for the main group are given in Table A3-3.

Fourteen species were found among the 36 samples for the summer survey and eight of these formed the main group. All of the eight species were epiplanktonic, living in the upper 200 meters, and oceanic in their living preferences; but for the exception of S. decipiens. This latter species is definitely a mesoplanktonic species. Its inclusion within the main group is not easily explained, but its vertical distribution was slightly higher during the summer survey (see Text-Table 13).

The associate group has two members, S. regularis/neglecta and S. robusta/ferox. Both of these species on the basis of their distribution and abundances (section 2) can be considered as mixed-water species. The group is related to the main group by 10 out of 16 possible affinities.

The lone associate species, S. bipunctata had affinities

with only S. enflata and S. serratodentata. During the summer survey, S. friderici, S. bedoti and K. pacifica had no affinities.

The statistics for the main group (Table A3-3) are more limited on this survey than for the others and as a result some of the anomalies cited above may be a reflection of a paucity of data. In general, the statistics follow the relative abundances, for example, S. enflata is most abundant, 1st-rank and the most dominant species. S. minima is generally of low rank and with a (comparatively) high index of dispersion again possibly suggesting a clumped distribution. The population composition and statistics of each species follows that given for the combined data of all surveys, except the population of S. lyra and S. hexaptera were made up of a greater proportion of juveniles.

The distribution of the main group is given in Fig. A3-7 and only two neritic occurrences are indicated. They are at the neritic stations Port Shepstone 1 and Port Elizabeth 12, both of which were highly susceptible to an influx of the Agulhas current. The distribution of the associate group of mixed-water species is given in Fig. A3-8 and all stations, where it occurred, were mixed-water or neritic stations except the oceanic station of Port Elizabeth 14.

The main group was tested for concordance, as explained previously, and the result was significant at the 1% level. The distribution of those stations having the "best" samples is given in Fig. A3-9. The "best" samples are concentrated on the Port Elizabeth line. Concordance for the associate group of two mixed-water species was not significant at the 1% level.

Groups for the Autumn survey (N70V-data)

The groups and the relationship between the species are given in Fig. A3-6, and the statistics for the main group are given in Table A3-4.

Fifteen species were found among the 80 samples of the autumn survey and eight of these species formed the main group. Comparing the main group of this survey with the main group of the summer survey it can be seen that five species are common to both: they are; S. minima, S. enflata, S. serratodentata, P. draco and S. hexaptera. There is also a close similarity to the main group (seven species the same) formed from the combined data of all surveys.

The associate group of three species, S. decipiens, S. lyra and K. subtilis has 16 out of a possible 24 affinities with the main group. S. decipiens is a mesoplanktonic species

and the other two are species which range throughout the upper 200 meters (see section 2), thus it is reasonable to assume the association of these three species is due to their vertical distribution.

The other associate group, S. robusta/ferox and S. bedoti is related to the main group by eight out of a possible 16 affinities. Again, these two species are considered to be inhabitants of neritic and oceanic waters.

The statistics for the main group are given in Table A3-4. These are based on the 44 samples of the possible 80, i.e., oceanic stations of the upper 200 meters. S. minima is the most abundant species and the dominant species among these samples but S. serratodentata and S. enflata have a lower average rank. (lower rank implies greater abundances).

The distribution of the main group is given in Fig. A3-10. The main group was found always at oceanic stations in the upper 200 meters, except for the neritic stations, Durban 17, Port Shepstone 21 and Cape Seal 49 and 50. These stations had a great deal of Agulhas water present at this time (see section 1 on Hydrography). The distribution of the associate group of three species (S. decipiens, K. subtilis and S. lyra) was entirely oceanic and was below 100 meters in 30 out of 33 samples (Fig. A3-11).

The main group of eight species was tested for concordance and the result was significant at the 1% level. The distribution of those stations having the "best" samples is given in Fig. A3-12. The "best" samples were widely distributed but most occurred in the ocean and at the more northerly stations of Durban to Port St. Johns. Concordance for the associate group of three species was also significant at 1%. The distribution of the "best" samples of this group is given in Fig. A3-13. No pattern is evident, except they are oceanic.

Groups for the winter survey (N70V-data)

The groups and relationships between the species are given in Fig. A3-6, and the statistics for the main group are given in Table A3-5.

Sixteen species were found among the 75 samples for the winter survey and nine of these formed the main group. The main group is exactly the one formed by using the data of all surveys (cf. Fig. A3-1 and A3-6). All species are epiplanktonic, oceanic and occupy the upper 200 meters.

The associate group of two species, K. pacifica and S. robusta/ferox is a group of species which inhabit mixed neritic and oceanic waters. It is related to the main group by nine out of a possible 18 affinities.

The lone associate species, S. decipiens, is a meso-planktonic species. It is related to the main group by seven out of a possible nine affinities.

The statistics for the main group (Table A3-5) show S. minima to be the most abundant and dominant species but S. serratodentata has a lower rank. The other statistics follow, roughly, the pattern of the relative abundances.

The distribution of the main group is given in Fig. A3-14. All occurrences of the main group were at oceanic stations. This is rather satisfactory evidence to use in corroboration with the hydrographical data already cited, in particular, that the Agulhas current does not make ingression into the neritic are during the winter. The distribution of the associate group is given in Fig. A3-15; it occurs mostly at oceanic stations but also at some neritic stations.

The main group was tested for concordance and the result was significant at the 1% level. The distribution of the "best" samples (Fig. A3-6) is mainly at the outermost oceanic stations. The concordance of the associate group of two species was not significant at the 5% level.

Groups for the N100B-data (All surveys)

The groups formed from the data of the N100B-nets, all surveys combined, are given in Fig. A3-1.

The main group is composed of 11 species. It includes all of the species of the main group of the N70V-data except S. regularis/neglecta, and all the mixed-water species, i.e., S. bedoti, K. pacifica and S. robusta/ferox. Three things are important about the nets used for these collections. (1) Because of the inadequate depth at most neritic stations these nets were not operated at most neritic stations, hence one could not expect a segregation of those species which inhabit mixed-water and neritic waters. (2) These nets were hauled obliquely (45°) through 150 meters of water thus the deepest vertical depth they reached was about 110 meters, therefore, the nets fished through all of the upper epiplankton (100-0 meters) and only part (~10 meters) of the lower epiplankton (200-100 meters). A segregation of species occurring throughout the upper 200 meters (i.e., S. lyra, K. subtilis and S. hexaptera) from those species more or less restricted to the upper 100 meters is not to be expected. (3) These nets are of large mesh, hence they underestimate the abundance and/or position of smaller-sized species.

The lone associate species, S. decipiens, is a meso-planktonic species. It is related to the main group by seven out of a possible 11 affinities. More specifically,

S. decipiens has affinities with S. enflata, P. draco, S. serratodentata, S. hexaptera and S. minima. These species were among the most abundant or cosmopolitan species (Table A3-6). Further, S. decipiens has affinities with K. subtilis and S. lyra; both species ranged throughout the upper 200 meters (see section 2).

The distribution of the main group is given in Fig. A3-17; it was found only at oceanic stations. The data were tested for concordance and the result was significant at the 1% level. The distribution of the "best" samples is given in Figure 3-18 but no pattern is evident.

Statistics for the main group are given in Table A3-6. Especially noteworthy are the indexes of dispersion and population compositions. S. minima had a high index of dispersion but because mesh of net is quite large the net probably underestimated its population. This is born out by the relatively large percentage of adults found for all species by these nets.

Groups for the N100H-data (All surveys)

The groups formed from the data of the N100H-nets, all surveys combined, are given in Fig. A3-1.

The main group is composed of seven species. The most notable change, aside from the number of species included, is the inclusion of S. friderici, the neritic species. Of the 76 horizontal samples taken, 29 (38%) were from neritic stations. In section 2 evidence was given that the following species were inhabitants, to some extent of the surface layers (0 to 5 meters), i.e., S. enflata, S. friderici, S. bipunctata, and S. robusta/ferox.

There are three separate associate species, i.e., S. minima, S. bedoti and K. pacifica. S. minima has only 2 (out of 7) affinities with the main group and the other species have six out of a possible seven affinities.

The species showing no affinities are: S. decipiens, K. subtilis, S. lyra, S. regularis/neglecta, S. pulchra, S. planctonis and S. maxima. For the first three species this is undoubtedly a reflection of their deeper vertical distribution. For S. regularis/neglecta it is perhaps a size effect, it is a smaller-sized species compared to the others, i.e., the average size of 30 individuals was 5.0 mm (see Table A5-15). The latter three species were extremely rare.

The distribution of the sample where all individuals of the main group were found is given in Fig. A3-19. These are four neritic occurrences; i.e., Durban 17, Port St. Johns 25, Bashee 29 and Cape Seal 89. The stations, as pointed out

previously are all very susceptible to intrusions by the Agulhas current.

The main group was tested for significance over the samples (15) where all species were present. The result was significant at the 1% level. The distribution of the "beast" samples showed (Fig. A3-20) no discernible pattern but two neritic stations are included; they are Durban 17 and Bashee 29.

Statistics for each species are given in Table A3-7. The statistics for S. friderici are of interest; this species has, comparatively, a higher index of dispersion to the other (the next larger value was for S. enflata). Also, S. friderici was a dominant species in only nine of the 76 samples and it was the second most abundant species of this group. These data imply that S. friderici had a clumped distribution. The evidence in section 2 also bears out this suggestion as it was a neritic beast.

Discussion and summary

The Fager-technique initially uses only the presence and absence of the species. There are some (Cassie, 1961) who feel that a considerable amount of information is lost by this method. Fager admits (1963A) that for rare species this could very well happen. Certainly the results of the present study indicate that rare species are excluded in the case of every set of data used (Fig. A3-1), for example, in the case of the N70V's and N100B's: E. hamata and S. pulchra and in the case of the N100H's: S. pulchra, S. planctonis and S. maxima. I feel, however, that these species would have been excluded by any technique used for a community scheme, simply because of their rarity. This does not imply that rare species have a less important role to play in a community, rather it means the available techniques for studying rare species are inadequate.

A point in favor of the Fager technique, however, is not only the good correspondence of the groups with their known environmental preferences, but, for the N70V-data, the exclusion of the neritic species, S. friderici from any group. I regard this as significant, for the abundance of S. friderici placed it as the 5th-rank species (Table A2-1) yet by presence and absence it was not associated with any other species.

When groups were formed from the combined data from the N70V-nets the resulting distribution was rather static in that it did not show the ingression and regression of the Agulhas current into the neritic area. This was shown only by considering the distribution of the main group of nine species when one to several species were absent. Perhaps a

more dynamic view of the hydrography was obtained by considering the groups formed from the data of each survey. For these, the distribution of the main group of species showed that they were present at various neritic stations during the summer and autumn surveys but this was not so during the winter survey, which is in accord with the existing hydrographical conditions. The weakness of the seasonal data was the number of samples was less and the rather disappointing results from the tests for concordance which implied that the Fager-technique probably has a critical level for input information, i.e., the number of samples needed.

Prior to the formation of the groups I made up a subjective grouping on the basis of what I knew about the distribution and abundance of the species themselves. The correspondence was good in some cases but in wide variance for other cases. It might well be claimed by a critic that because of the close similarity of morphology and function of the chaetognath species, the number of plausible groupings would be rather large and hence in a sense, the groups presented are fortuitous. Of course, I think this is not true and for a number of reasons: the good correspondence between the group distribution and their species numbers distribution; and the rather close similarity of the groups formed for each survey, etc. (more evidence in a later section will be given on fecundity).

Only one study exists in the literature which has used the technique (Fager & McGowan, 1963). This study used the data on chaetognaths, Euphausiids and pteropods from the North Pacific. Because of the size of the area^{and because} there was more data from different groups, a direct comparison is not possible. There are, however, certain similarities between it and the present study. Of the seven groups formulated for the north Pacific, one group (Group I) has four chaetognaths species in it which are among the main group for the N70V-data of the present study. These species are: S. pacifica (serratodentata), S. enflata, P. draco and S. hexaptera. It was shown in section 2, that each of these species had a pattern in its distribution and abundance which resembled one another (see especially P. draco in section 2).

In summary then, the N70V-data give the most representative group; a main group of nine species, living primarily in the ocean and in epiplanktonic waters; an associate group of three species showing preference for mixed-water conditions; and an associate group of one species, which was a mesoplanktonic beast. These groups had a good correspondence with the existing hydrographical conditions. There were limitations, however:

the number of samples used; the type of gear and its operation (Lohmann's Dictum); some of the statistics gathered merely followed the pattern of relative abundances; and the role of rare species was not adequately defined.

E. Results - Section 4 - Pecundity

Introduction

If an animal carries out all life functions, in particular reproduction, within a certain area, then such an animal is said to be adapted to the environment of that area. This is self-evident. The manner in which the necessary adaptations express themselves is, however, not at all self-evident.

One population parameter, the intrinsic rate of natural increase, r , can be considered the net effect of all environmental influences (Cole, 1957). The utility of such a measure is obvious but the statistics required to estimate r are difficult to obtain for natural populations. A compromise to this impasse is possible if one uses, as an index to environmental conditions, another population parameter which is related to r (Edmondson, 1962, 1964); the parameter used in this study is fecundity.

The previous sections on (1) hydrography, (2) species distributions and abundances, and (3) recurrent groups, all clearly indicate the existence of at least two distinct areas within the confines of the survey--distinct in terms of both their physical and biological characteristics. The aim of this section is to determine if the populations of the various species of chaetognaths reflect these environmental differences by differences in the number of eggs per individual per area and also if these data bear any relationship to the identified recurrent groups of chaetognaths.

Assumptions

In this case, that is, on the relationship between fecundity and environmental conditions, certain assumptions are made, some of which cannot be justified as the result of inadequate data and/or knowledge. These aspects have been discussed previously (Stone, in press), however, for completeness sake, the assumptions are as follows: (1) No major taxonomical problems exist among the species studied. There is no great danger in making this assumption as all species descriptions are based on adult morphology, hence mature and usually egg-bearing individuals (see also section 2, Taxonomic notes). (2) The criteria used for judging maturity and age classes are correctly determined. (3) No differences exist in the growth rate between the neritic and oceanic populations through overtimes and/or timelags. (4) The period of turnover, for the two areas, is the same or does not affect the results.

The results are given in summary form in Table A4-1 and for each species in Tables A4-2 through A4-12.

Differences in the number of eggs per individual between the two areas were tested by the Mann-Whitney U test (Tate and Clelland, 1957). The U test is a nonparametric ranking-technique with, at least, 90% of the efficiency of its parametric counterpart (the t test); furthermore, it uses all the data for its decision.

General Features

The data of Table A4-1 are abridged and some of the listed p-values were obtained by pooling the data from individuals of different length-classes, hence reserved judgement is necessary for some of the species listed; this is clearly indicated, however, in the discussion to follow on each species. But before discussing the results of each species certain general features can be pointed out.

First, neritic individuals of 4 species (S. enflata, K. pacifica, S. bedoti, and S. robusta) contained significantly more eggs than corresponding individuals from the ocean. It is interesting to recall, at this time, that all 4 of these species were, by their distribution and abundance (section 2), inhabitants of both neritic or oceanic waters and further, that the latter three species formed, for the N70V-data, the associate group which was distributed mainly in mixed waters (section 3). Second, for the remaining 7 species (S. minima, S. serratodentata, P. draco, K. subtilis, S. regularis, S. bipunctata and S. ferox), the neritic individuals did not show a significant difference in the number of eggs they contained compared to the oceanic individuals and, indeed, the oceanic individuals of one species (S. serratodentata) contained significantly more eggs than the corresponding neritic individuals. Again the data of section 2 are pertinent as they showed that each of these 7 species was oceanic in their living preferences. Also 6 of these species (except S. ferox) were members of the main group of nine species, N70V-data, formed in section 3 (see Table A3-1). This main group of 9 species, it will be recalled, was distributed solely in oceanic waters.

Individuals species

S. enflata

The results are given in Table A4-2, and are from Stone (in press). They are organized, for each area, as combined data for all surveys (Part A) and as data for each survey (Part B, C and D).

The combined data for all surveys (Part A) show that for

each length-class, 10.0 mm to 15.0 mm the difference in egg numbers per individual is significant at the 1% level. The neritic individuals contained more eggs than the oceanic individuals. Two categories of length-class, 7 to 8.0 mm and 9.0 mm did not show a significant difference ($0.05 < p < 0.15$). However, the sample of neritic individuals for the 7 to 8.0 mm length-class was quite small.

The details of these data have been already discussed (Stone, in press). It is appropriate to mention, however, that the summer survey (Table A4-2, part B) did not indicate a significant difference in egg numbers per individual between the two areas. Because of the rather good laboratory evidence for various marine zooplankters (Marshall & Orr, 1955; cited in McLaren, 1963) which have shown that fecundity is a function of food, it was suggested the data simply reflected the existing food conditions (see Table A2-21); in particular, the standing crop values for the summer survey in the ocean were quite high which could mean that oceanic individuals would channel more of their "surplus" food into reproduction and hence would not be as likely, as those oceanic individuals captured during the later surveys, (cf. parts B, C, and D of Table A4-2), to show a difference in egg numbers per individual.

Additionally, a positive correlation (significant at the 1% level) was found between the number of S. enflata and the standing crop. But a complication was present as a multiple regression analysis revealed significant correlations between egg number, food (standing crop), and temperature. Therefore, it cannot be stated categorically that food was the primary factor involved in the resulting differences in egg numbers per individual per area.

K. pacifica

The results are given in Table A4-3. Only 15 neritic and 39 oceanic individuals were found to be mature enough for egg counts.

These 44 individuals were divided into three length-classes, i.e., 5.0 mm, 6.0 mm and 7.0 mm and sufficient data exists only for the latter two length classes to perform the statistical analysis. Thus, for the 6.0 and 7.0 mm length-classes the Mann-Whitney U test (Tate and Clelland, 1957) shows that the neritic individuals contained more eggs than the corresponding oceanic individuals; the results are significant at the 0.01 and 0.0146 levels, respectively.

S. bedoti

The results are given in Table A4-4. Sixty-five individuals were found to be mature enough for egg counts.

Sufficient data exists only for the two length-classes, i.e., 9.0 mm and 10.0 mm, to perform the statistical analysis. For these two length-classes, the Mann-Whitney U test (Tate and Clelland, 1957) shows that neritic individuals contained more eggs than corresponding oceanic individuals; the results are significant at the 0.01 and 0.1164 levels, respectively.

The data of the 10.0 mm length-class only approaches a significant level ($p = 0.1164$) and because it consisted of rather small numbers and few length-classes the data were pooled and then tested. The pooled data are significant at the 1% level; neritic individuals contain more eggs than oceanic individuals.

S. robusta

The results are given in Table A4-5. Only 22 individuals were found to be mature enough for egg counts and for the one length-class (10.0 mm) with sufficient data for the statistical analysis no differences in egg numbers were found between neritic and oceanic individuals ($p = 0.7718$). But the data were pooled because of the small samples of mature individuals and the small number of length-classes (five length-classes; from 9.0 to 13.0 mm) and the differences in eggs between neritic and oceanic individuals was then apparent. The results are significant at the 0.0292 level.

P. draco

The results are given in Table A4-6. Three hundred and fifty-three mature individuals were found for analysis and most of these were between 5.0 and 7.0 mm in length. Each of the three length-classes showed no differences in egg numbers between neritic and oceanic individuals; the p-values are 0.234, 0.8026 and 0.8776, respectively.

S. bipunctata

The results are given in Table A4-7. A total of 346 mature individuals were found for analysis. Most of these were between 8.0 and 11.0 mm in length.

The difference in egg numbers between neritic and oceanic individuals is not significant for the 8.0, 9.0 and 11.0 mm. length-classes but it is significant for the 10.0 mm length-class at the 0.0264 level.

S. serratodentata

The results are given in Table A4-8 and are presented for each form, i.e., atlantic and pacifica, separately.

Both sets of data are limited but for honey form: the evidence suggests that oceanic individuals contained more eggs than neritic individuals. At any rate, in no case did neritic individuals contain significantly more eggs.

S. minima

The results are given in Table A4-9. One hundred and seventy-nine mature individuals were found and for individual length-classes or the pooled data no significant differences were found in egg numbers per individual between the neritic and oceanic areas. (The pooled p-value is 0.337; and for the 5.0 and 6.0 mm length-classes, the p-values are 0.9736 and 0.5552, respectively).

S. ferox

The results are given in Table A4-10. Sixty-eight mature individuals of this species were found for analysis.

The pooled data of six length-classes did not show a significant difference in egg numbers between neritic and oceanic individuals ($p = 0.2802$), however one length-class, 15.0 mm, approached a significant level ($p = 0.0424$).

K. subtilis

The results are given in Table A4-11. Thirty-eight mature individuals of this species were found and only three came from neritic waters.

The pooled data of the five length-classes did not show a significant difference in egg numbers between neritic and oceanic individuals ($p = 0.18$).

S. regularis (and S. neglecta)

The results are given in Table A4-12. Thirty mature individuals of S. regularis and only three mature individuals of S. neglecta were found.

The pooled data of S. regularis did not show any significant differences in egg numbers between neritic and oceanic individuals.

Discussion

The causal factors for the difference in egg numbers per individual have been discussed in detail for one species, S. enflata (Stone, in press).

The results for this species were analyzed more completely than for the other species simply because more data existed on it. In general, however, the explanation for the other species (I believe) are the same.

The most obvious differences between the oceanic and neritic areas are temperature (see Hydrographical background) and food (Table A2-21). The neritic area has colder water and more food unit/volume than does the ocean. Which factor, temperature or food, is more important in egg production could not be resolved (see above and Stone, in press). Steeman-Nielsen (1961) has presented some strong theoretical data which show that individuals living in an eutrophic area (such as the neritic area in

the present study), would produce more eggs than corresponding (in age) individuals found in an oligotrophic area (such as the oceanic area was in the present study). It is attractive, therefore, to postulate that the existing differences in fecundity of the various species is the result of more food/unit volume and the adaptativeness of those species. But because of the complicating aspects of temperature and the fact that for some organisms fecundity is not directly related to environmental conditions it cannot be stated that this is the only plausible explanation. This dilemma could be resolved, however, by computing the intrinsic rate of natural increase, r , for each species, but this remains for future research.

Summary

Neritic individuals of those species which were inhabitants of oceanic and neritic waters contained significantly more eggs than corresponding oceanic individuals. This was not true for species which inhabited solely oceanic waters.

These data were in close correspondence with the recurrent groups formed from the N70V-data. Namely, for the main group of nine species, neritic individuals of only one species (S. enflata) contained significantly more eggs than corresponding oceanic individuals--for the remaining species there was no difference in egg numbers per individual per area. The neritic individuals of the associate group of three species (mixed-water) all contained significantly more eggs than corresponding oceanic individuals.

Artifacts exist in this part of the study. Some of these are: small samples of mature individuals for some species; the temperature differences between the two areas--neritic and oceanic--which could result in the population of each area having different growth rates, etc.; time lag, undoubtedly the condition of an animal at time x is more closely correlated with conditions of a previous time y (see Deevey, 1960); and this aspect, could be eliminated by planning the proper sampling regime, in particular, sampling more often and at closer time intervals; and finally, age classes determination, etc.

E. Results - Section 5 - Food

Literature background

Chaetognaths are generally acknowledged to be predaceous carnivores which feed mainly on copepods. The evidence upon which this conclusion is based is not extensive and generally qualitative in detail.

The work of Lebour (1922, 1923) on the food of planktonic organisms--including chaetognaths--still remains, in many ways,

a prototype for present studies. The bulk of her work is, to be sure, qualitative but she did make some attempts to quantify it. Those quantitative data, applicable to chaetognaths, were extracted from her work and are given in Table A5-1. Also, included in the same Table (A5-1) are data from David (1955). Both sets of data show, very clearly, that copepods are the principal prey of chaetognaths and that cannibalism is a highly developed trait.

Other reports also cite copepods and chaetognaths as the principal prey but the data are strictly qualitative (Kielhorn, 1952; Caabro, 1955; and Croce, 1963). The latter author (Croce, 1963) gives a more varied list of prey, however; he includes protozoans, coelenterates, copepods, other crustacea, mollusca, chaetognaths, tunicates (salps) and pisces.

Laboratory studies on chaetognaths are few because of the difficulty of maintaining them under artificial conditions. Parry (1944) managed to keep a few individuals of S. setosa alive in the laboratory long enough to claim that a difference existed in their feeding activities under light and dark conditions; those kept in the dark fed (6 out of 47), whereas those kept in the light did not feed (0 out of 27). Recently (Reeve, 1964), a neritic form, S. hispida, was maintained in the laboratory for over two weeks. This author demonstrated; large Sagittae eat more than small Sagittae; feeding activity is slightly greater during the night; and that a maximum rate of food ingestion might exist for the species studied. These results are extremely interesting but should be repeated on a larger scale, and if possible, for a longer period of time.

It is obvious that many questions remain to be posed and answered concerning the feeding habits of chaetognaths. Some of these queries which the present data attempt to clarify are: what do chaetognaths of the Agulhas current feed on and how do the results compare with the food of chaetognaths from other areas? Are certain prey selectively used by various chaetognaths species? Does the size of the chaetognath species bear any relation to the prey used? Are the cannibalistic tendencies of chaetognaths more pronounced in some species than in others?

Assumptions

In the analysis of the data to follow, certain assumptions are made. Explicitly they are: (1) The records obtained are representative of the feeding habits of the chaetognatha community from the Agulhas current. In particular, it is assumed that no great differences exist between day and night feeding since all the samples were collected between the daytime hours of 0600 to 1800 (local time). Such judgements must be very

cautious ones, however, in view of the experimental evidence cited above and the well known phenomenon of vertical migration. (2) The gut contents obtained are not the results of collecting and/or preservation. No records were kept if the prey was not, at least, inside the intestine of the chaetognath. The process and time required for digestion in chaetognaths are inadequately known and it is assumed that the amount of time from capture to preservation (up to 20 minutes for some nets) was not sufficient for the prey to reach the intestine, and, in particular, the most posterior end of the intestine. The data of the literature on this point vary, for example, Grey (1930) by watching the ingestion of S. friderici by S. enflata claims that within eight minutes the prey reached the posterior end of the intestine and then it was moved up and down the intestine for another 12 minutes, by which time digestion was completed, except for the harder parts. But Parry (1944) states that food "passes steadily down to the posterior regions of the intestine" and the total time from ingestion to defaecation was of the order of three to four hours. A single observation was made by David (1955) on the ingestion of a live Euphausiid by S. gazellae. He found that it took the prey about ten minutes to reach the middle of the intestine and therefore passage was "much slower". The total time required for the prey to reach the posterior end of the intestine was about one hour. These differences in time, of course, could be a reflection of the fact that some organisms are digested more rapidly than others.

In any one sample of the present material most of the individuals showed no trace of gut contents, indeed, the identified contents constituted only about 3% of the total individuals found. This suggests, to me, if feeding is a function of capture and/or preservation, more individuals would show this effect but this is not proven.

(3) Differential digestion among various types of prey did not occur or if it did this did not affect the results. It is quite evident that certain soft-bodied creatures such as, larval forms of plutei and annelids, etc, medusea, and so forth, would not show up or remain in the intestine as readily as those forms which possess hard morphological parts.

General Features

The chaetognaths from which the intestinal contents were obtained were solely from the present collections, that is, from the N70V-nets (26.7%); from the N100B-nets (44.6%); and the N100H-nets (28.7%). From these percentages, it is evident that most of the records of intestinal contents are from the N100-nets. A numerical distribution of all identified, intestinal

contents is given in Table A5-2. The majority of the records are from oceanic stations and most of these were found during the autumn and winter survey.

The organisms found in varying numbers of intestines of 15 species of chaetognaths are given in Table A5-3. Of the 1394 prey-organisms, which were identified at least to genus, 83.6% were copepods, 12.1% were other chaetognaths and 4.3% were other planktonic organisms.

For the first eight species listed (Table A5-4) there exist adequate data for making general comparisons. The principal prey for each of these eight species are copepods, indeed, copepods amount to over 75% of the diet for six of these species. These six species are: S. enflata, P. draco, S. bipunctata, S. serratodentata, S. robusta and S. friderici. Two species, i.e., S. hexaptera and S. lyra, feed on copepods 59.6% and 45.2% of the time, respectively. But these two species are noteworthy, further, by the fact that they show a large percentage of feeding on other chaetognaths (Table A5-5); for example, S. hexaptera, 31.7% of its prey was other chaetognaths, and for S. lyra, 47.6% of its prey was other chaetognaths, whereas for any of the other six chaetognath species this percentage is never greater than 25%. It can be added at this point that S. hexaptera and S. lyra are, respectively, 1st and 3rd largest chaetognaths of the present collection (Table A5-15).

The copepods which were found as prey, are given by genera—a total of 19—in Table A5-5). This methods of presentation of convenient only because of records made at the specific level (Table A5-3) tend to spread out the data so much they they obscure any general tendencies. This is not meant to imply that the generic level has functional significance in nature, though one could argue this point from these data[†]. The genera Corycella and Oncaea make up 29.9% and 25.0%, respectively, of the total intestinal contents identified. Other important genera, but to a less degree, are Undinula, Corycaeus, Eucalanus, Microsetella, Gandacia and Centropages. All chaetognath species use, therefore,

* It is hard for me to imagine that a particular chaetognath would refuse any prey of suitable size which happened within range of its sensory mechanisms. Furthermore, since the species of copepods of a particular genus, such as Oncaea, Corycella and Corycaeus do not differ greatly in size and because the greatest difference in size occurs between the genera it is quite plausible that the prey are "picked" by size and hence genera.

very much the same kind of food but the degree of coincidence is not rigid and the diversity of food types--about 10 genera of copepods used per chaetognath species--is quite wide.

The data on feeding habits of each chaetognath species are too few to indicate that feeding is related to standing crop values (cf. Tables A5-3 and A2-21) and no statistical relationships were found by using the combined data, that is, all intestinal contents. There exists, however, some data which suggest that feeding by chaetognaths may be selective. These are given in Table A5-6 which shows the total number of organisms found in a series of five samples made at one oceanic station (NGY 19). This station was analyzed in this manner because a large number of chaetognaths with gut contents were found there (see Table A5-2, Durban 19, oceanic, Autumn survey). Also given in Table A5-6 are the prey found in the chaetognaths of that station. By inspection alone, it is evident that S. bipunctata fed mostly on Corycella concinnus but more important there were many types of organisms which would have served, just as suitable, as food. For example: Oithona, Oncaea, Rhincalanus, etc., but these foods were either not used or to a very limited degree. Furthermore, a comparison of the ranks of the nine items found in the guts of the chaetognaths and the ranks of the same nine items found in the five plankton samples was made by using a ranking test (Kendall's Tau; Tate and Clelland, 1957). The correlation is not significant ($p > 0.20$) which indicates that no statistical relationship exists between the contents of the five plankton samples and the gut contents of the chaetognaths from the same samples. Obviously more work is necessary to make these data more meaningful but this is an interesting point for future research.

Individual species

The results for the individual species are given below.

S. enflata

A total of 375 intestinal contents was found in S. enflata. Copepods made up 85.1% of this total, chaetognaths 10.4%, and other groups 4.5% (Table A5-4).

The principal genera of copepods taken as prey by this chaetognath were Oncaea (29.9%), Corycella (22.7%), Eucalanus (9.3%) and Corycaeus (7.5%) (Table A5-5).

Various statistics of both S. enflata and its prey are given in Table A5-7. The mean length of all prey was 1.14 mm but only very slight differences were evident between the prey of adult and juvenile S. enflata; the adults can use, apparently, larger prey than the juveniles. Multiple prey was found in S. enflata 45 times (12.0%) and these were mainly made up of

two individuals. The presence of prey was found to be widely distributed at both the neritic and oceanic stations; prey was found at 18 out of 31 neritic stations and at 41 out of 53 oceanic stations.

P. draco

A total of 337 organisms were found in the intestine of P. draco. Copepods made up 81.3% of this total, chaetognaths 12.5%, and other groups 6.2% (Table A5-4).

The principal genera of copepods taken as prey by this chaetognath were Oncaea (41.5%), Corycella (23.7%), and Microsetella (11.6%) (Table A5-5). Also, a preponderance of one chaetognath species, S. serratodentata was found in the gut of P. draco (Table A5-3).

The statistics of both P. draco and its prey are given in Table A5-8. The mean length of all prey was 0.93 mm and juveniles seem to have slightly larger gut contents than adults but because a large proportion of the population (75.1%) was made up of juveniles, this may be a sampling error (see P. draco in section 2). Multiple prey was found only 21 times in P. draco (6.2% of the total) and these were mainly of two individuals. Prey was found almost entirely at oceanic stations; prey was found at 5 out of 31 neritic stations and at 48 out of 53 oceanic stations.

S. bipunctata

A total of 240 intestinal contents was found in S. bipunctata. Copepods made up 92.1% of this total, chaetognaths 6.7%, and other groups 1.3% (Table A5-4).

The principal genera of copepods taken as prey by this chaetognath were Corycella (71.3%), Corycaeus (9.2%) and Oncaea (7.1%) (Table A5-5). One copepod species was particularly (apparently) preferred by S. bipunctata; it was Corycella concinna which made up 37.6% of all copepods found in the intestine of this chaetognath.

Statistics for S. bipunctata and its prey are given in Table A5-9. The mean length of all prey was found to be 0.91 mm. A total of 34 occurrences of multiple prey was found (14.2% of the total), mostly of two individuals. The prey was mostly from oceanic stations, i.e., 36 out of a possible 53 stations.

S. serratodentata

A total of 168 intestinal contents was found in S. serratodentata. Copepods made up 98.2% of this total, chaetognaths 1.2%, and other groups 0.6% (Table A5-4).

The principal genera of copepods taken as prey by this chaetognath were Undinula (35.7%), Corycella (26.2%) and Centropages (10.1%) (Table A5-5). The identification of Undinula was

particularly confident due to some of the distinctive morphological characteristics of its species (Dakin and Colfax, 1940).

Statistics for S. serratodentata and its prey are given in Table A5-10. The mean length of all prey was 1.05 mm and the adult predators had slightly longer prey. Only 5 (3.0%) multiple prey contents were found in S. serratodentata. The geographical distribution of the prey was mainly from oceanic stations; 34 out of 53 possible oceanic stations.

S. hexaptera

A total of 104 intestinal contents were found in S. hexaptera. Copepods made up 59.6% of this total, chaetognaths 31.7% and other groups 8.7% (Table A5-4).

The principal genera of copepods taken as prey by this chaetognath were Oncaea (24.0%), Eucalanus (12.5%) and Corycella (10.6%) (Table A5-5). It is interesting to note that more ostracods were found in this species than for the other chaetognaths species. The chaetognath species found within the intestine of S. hexaptera were, specifically, very diverse; 9 species were identified.

The statistics of S. hexaptera and its prey are given in Table A5-11. This was the largest chaetognath of the present collection; 17.1 mm was the average length of 44 individuals (Table A5-15). The average length of its prey, 21 mm, was also one of the largest values for prey size. Multiple prey was found 15 times (14.4% of the total). The prey was found mainly in individuals from oceanic stations; 32 out of a possible 53 oceanic stations.

S. robusta

Only 44 intestinal contents were identified in this species. Copepods made up 77.3% of this total, the rest was of chaetognaths, 22.7% (Table A5-4).

The principal genera of copepods taken as prey by S. robusta were Corycella (18.2%), Oncaea (13.6%), Microsetella (11.4%), Gandacia (11.4%) and Corycaeus (9.1%) (Table A5-5).

Statistics of S. robusta and its prey are given in Table A4-12. Mean length of prey was 1.14 mm. Only 6.8% of the total intestinal contents were of multiple prey.

S. lyra

Only 42 intestinal contents were found in S. lyra. Copepods made up 45.2% of this total, chaetognaths 47.6%, and other groups 7.2% (Table A5-4).

The principal genus of copepods taken as prey by this chaetognath was Oncaea (23.8%) (Table A5-5).

Statistics of S. lyra and its prey are given in Table A5-13. This is the third largest species of the present collection;

13.4 mm was the average length of 38 individuals (Table A5-15). The mean length of the prey was 2.22 mm. This is the largest mean size for the prey found in all chaetognath species. Multiple prey was quite prevalent for the limited data found; 21.4% of the total intestinal contents (11) in this species were of more than one prey.

S. friderici

Forty-one intestinal contents were found in S. friderici. Copepods made up 90.2% of this total, chaetognaths 7.5%, and other groups 2.4% (Table A5-4).

The principal genera of copepods represented as prey in this chaetognath were, Undinula (34.1%), Corycella (14.6%) and to some extent Corycaeus and Centropages (Table A5-5).

Statistics of S. friderici and its prey are given in Table A4-14. The mean length of the prey was 1.35 mm. Multiple prey contents were rare (4.9% of the total) but the data are few.

The remaining species of chaetognaths, i.e., S. ferox, S. decipiens, S. bedoti, S. minima, K. subtilis, S. regularis and S. planctonis for which prey was found are given in detail in Table A5-3. The data are too few for these species for making any comparison, but the chief prey for each one are copepods and chaetognaths (Table A5-4).

Summary

(1) The chaetognaths of the Agulhas current subsist mainly on copepods and chaetognaths during daytime hours (0600 to 1800, local time).

(2) The copepods used as prey are, in a sense, sharply restricted to the genera of Corycella and Oncaea. These copepods are rather small. Tanaka (1960) gives the size range of the species of Corycella from 0.67 mm to 1.10 mm and of the species of Oncaea from 0.48 to 1.39 mm.

(3) On the other hand the species of copepods used as prey were quite diverse and much nonoverlap existed. Specificity in feeding^{is} suggested by some data but the diversity of food type seems more important.

(4) The larger-sized species of chaetognaths were more cannibalistic, had more multiple prey, and fed on larger organisms than did the smaller-sized species of chaetognaths.

E. Results - Section 6 - Competition and Polemics

Introduction

The importance of competition as a molding force in the pattern of animal distribution and abundance is not disputed when considered within the limits of a deductive model, argument (Hairston, et al, 1960) or a laboratory study (many cited

in Slobodkin, 1961). Controversy arises, however, in determining the extent of its role in natural populations (Andrewartha and Birch, 1954).

For natural populations one can either make direct observations of competition occurring between species and measure the resulting effects (Reynoldson, 1964; Connell, 1961), which incidentally is most difficult to do, or one can assume that competition holds as an axiom and applies only to certain communities. Such communities, as described by Hutchinson (1953), are called equilibrium communities. This means that conditions for time x are essentially the same as for later time y . One particularly elegant study on the natural populations of warblers (MacArthur, 1958) makes this assumption (but the author demonstrated the validity of the assumption in a later paper, i.e., MacArthur, 1960) and ascribes the interspecific differences existing among the species as a means by which competition was reduced or avoided. It cannot be denied, of course, that very distinct differences existed among the coexisting warblers (*ibid*) in terms of their habitats and niches, indeed, this very type of data constitute a considerable amount of those given in the present study.

But by making the assumption that competition holds an axiom in certain communities one opens himself to the dangers of circular reasoning (Mayr, 1963). For example, if one finds related species co-occurring in an equilibrium community it is very inviting, indeed, to ascribe the existing differences among the species to the effects of competition, or more generally, to Gause's principle or the competitive exclusion principle (Hardin, 1960). Further if the coexisting species do not seem to have areas of nonoverlap then it is very convenient to label the situation as a nonequilibrium community or that it does not apply to certain trophic levels (such as herbivores, see Hairston, et al, 1960).

Nonetheless, there are those (Slobodkin, 1961; Hardin, 1960) who have stated in compelling terms that such a rigid interpretation of the principle of animal exclusion is self-defeating. It is their thesis that a principle is never proved or disproved by empirical facts, rather its purpose is to be used as a model against which the empirical facts are compared and the goodness or discrepancy of fit are the appropriate items to discuss—not the philosophical aspects of the principle itself.

This section, therefore, gathers together certain empirical data which suggest in a very indirect way (as no direct observations were made on the behavior of chaetognaths) that the

principle of competitive exclusion holds for the chaetognath community of the ocean but not for the neritic community. It is emphasized, however, that such a conclusion is controversial and one can only speculate as to the extent and rate of competition among the populations studied.

Evidence for competition

The indirect evidence that the effects of competition are avoided or lessened comes from three sources: (1) the differentiation of species habitats; (2) the differentiation of species niches; and (3) the morphological differences among the species.

In regard to habitats, the emphasis thus far has been on the similarity of where the various species live. In particular, the nine species were found to be rather close in their living preferences; they were the species of the main group for the N70V-data, ie., Text-Table 34.

Text-Table 34. The main group, by the Fager-technique, formed from the N70V-data. For these species asterisked considerable data exists in the present study (section 5) on their feeding habits.

<u>S. minima</u>	* <u>P. draco</u>	<u>K. subtilis</u>
* <u>S. serratodentata</u>	* <u>S. lyra</u>	<u>S. regularis/neglecta</u>
* <u>S. enflata</u>	* <u>S. hexaptera</u>	* <u>S. bipunctata</u>

These were found to be oceanic species living mainly in the upper 200 meters (see section 2 and 3). In a horizontal sense, two species, S. enflata and S. regularis/neglecta, spread with some success into the neritic area. Success being defined in terms of their abundances (see section 2) and their fecundity (see section 5). In a vertical sense, four species, were found to range throughout the upper 200 meters whereas the other five species were essentially restricted to the upper 100 meters. Given small depth intervals, in which the nets are closed, I am confident that this vertical distribution would be resolved to an even finer degree. It should be stressed that this coincidence and overlap of habitats is not a sharp one, but rather it is statistical in nature.

If one now considers the abundance of the species in Text-Table 34 (see section 3, Table A3-1) but coupled with those distribution patterns outlined above, then the evidence that competition is lessened or avoided becomes even stronger. That is, species that are equivalently abundant would be more likely to be in competition than those with varying abundances.

In regard to the species niches the copepod genera of Oncaea and Corycella were found to be the principal food used

by the chaetognaths of the Agulhas current. But again a wide diversity of food types per species was found. For example the asterisk species in the previous Text-Table 34 can be considered as follows in Text-Table 35.

Text-Table 35. The principal prey of six chaetognath species presented in an abridged fashion.

Prey	<u>S. serrato.</u>	<u>S. enflata</u>	<u>P. draco</u>	<u>S. lyra</u>	<u>S. hexaptera</u>	<u>S. biannet.</u>
Centropages	10.1%					
Corycaeus		7.5%				9.2%
Corycella	26.2%	22.7%	23.7%		10.6%	71.3%
Eucalanus		9.3%			12.5%	
Microsetella			11.6%			
Oncaea		29.9%	41.5%	23.0%	24.0%	7.1%
Undinula	35.7%					
Other	1.2%	10.4%	12.5%	47.6%	31.7%	6.7%
Chaetognaths						

These data illustrate again that there are multiple ways by which the chaetognaths could eat and avoid competition but in addition there was much overlap among the species and possibly the development of some specialization of feeding habits. Further, the higher degree of cannibalism shown by S. lyra and S. hexaptera, both large sized chaetognaths, suggests that they may function as a kind of 2nd-order carnivores, in the chaetognath community of the ocean. Most certainly these data fit well with existing theoretical knowledge, that is, a stable community (the ocean) is characterized by a food chain with multiple outlets. This idea has been formalized by MacArthur, (1955). I am only too aware that this suggestion about avoiding competition via a diverse food web is not conclusive, indeed, nothing is given in the present study about the density (abundance) per unit volume of the prey organisms. This, however, remains as a future research project.

Again, by considering the niche diversity coupled with the habitat diversity and the species abundances it is evident that the ways in which a chaetognath species could avoid competition are many.

In regard to the morphological differences among the chaetognaths species considerable nonoverlap exists. Hutchinson has found (1959) a constant morphological relationship among sympatric groups of birds and mammals. The ratio was of the order of 1.28. A similar type of ratio was computed for the species of Text-Table 34 and the results are given in Text-Table 36.

Text-Table 36. Ratios of total length in mm of chaetognaths, smaller species to larger species, for species of the main group from the N70V-data. Species lengths are given in Table A5-15.

	mean length In mm	1	2	3	4	5	6	7	8	9
1 S. minima	(5.7)		1.63	2.15	1.21	2.35	3.00	2.00	1.00	1.85
2 S. serrato.	(9.3)			1.32	1.34	1.44	1.83	1.22	1.63	1.14
3 S. enflata	(12.3)				1.78	1.09	1.39	1.08	2.15	1.16
4 P. draco	(6.9)					1.94	2.47	1.65	1.21	1.53
5 S. lyra	(13.4)						1.28	1.17	2.35	1.26
6 S. hexaptera	(17.1)							1.50	3.00	1.61
7 K. subtilis	(11.4)								2.00	1.07
8 S. reg/neg.	(5.7)*									1.86
9 S. bipunct.	(10.6)									
* combined mean of S. regularis/neglecta					Overall mean = 1.65 Range = 1.00-3.00					

Hutchinson (ibid) used skull breadth for the mammal ratios and the culmen for bird ratios. He interpreted the rather constant ratio (mean of 1.28) as a amount of difference necessary for two species to co-occur. The values given above, range from 1.00 to 3.00 whereas those from Hutchinson (ibid) range from 1.1 to 1.4. Perhaps total length is not as appropriate a measure for an index of co-existence. However by considering the following groups of species (Text-Table 37) as more sympatric than the whole group given in Text-Table 36, the correspondence between their ratios and those computed by Hutchinson are much closer.

Text-Table 37. Ratios of total length of chaetognath species when considered as two separate, sympatric groups of species.

Upper (200-0)					
Epiplanktonic Species	1	2	3	4	
1 S. lyra		1.17	1.28	1.26	
2 K. subtilis			1.50	1.07	
3 S. hexaptera				1.61	
4 S. bipunctata					
Mean = 1.58		Range = 1.07 - 1.61			
Lower (100-0)					
Epiplanktonic species	1	2	3	4	5
1 S. minima		1.63	2.15	1.21	1.00
2 S. serratodentata			1.32	1.34	1.63
3 S. enflata				1.78	2.15
4 P. draco					1.21
5 S. regularis/neglecta					
Mean = 1.54		Range = 1.00 - 2.15			

All of the previous data have reference only to the oceanic community; it is appropriate now to attempt an comparison of the neritic community with that of the ocean. For this, MacArthur's (1957) "broken stick" model is used. This model is a formalization of Gause's principle, it assumes that the species divide ^{*}up their environment, in a random manner, among themselves and what is divided is no longer available to any other species. This is formally expressed by the following:

$$\frac{N}{S} \sum_{j=1}^h \left(\frac{1}{S-j+1} \right) = \text{the } r^{\text{th}} \text{ rarest species;}$$

where S is the total number of species and N is the total abundance.

It is possible to test the goodness of fit of the empirical data to MacArthur's model. Various tests are suggested by King (1964). The one used here was devised by Hairston (1959) and it enables one to compute the theoretical variance for the MacArthur model. Thus by comparing the observed variance to the expected variance one obtains a ratio and the closer this ratio is to 1, the better the fit to the model. The expected or theoretical variance is given by the following expression:

$$S^2 = \left[\frac{N^2}{S^3} \sum_{j=1}^S \left(\frac{1}{S-j+1} \right) \right] - \frac{N^2}{S^2}$$

The terms of the expression are the same as those given in the above formalization by MacArthur.

The detailed results of these computations are given in Table A6-1. Ratios were computed for each survey, each line of stations and for neritic and oceanic areas.

For all samples combined, the ratios were:

N70V-data — 1.69

N100B-data — 2.06

N100H-data — 4.29

Main group of nine species — 1.30

These data show that the N70V-community (and/or Fager's main group of nine species) have a better fit to MacArthur's model than the N100-nets. The N70V neritic and oceanic ratios were: all neritic samples — 5.17 ; all oceanic samples — 1.55 . Further, the breakdown of these data by lines and surveys shows that in every case (Table A6-1) the neritic ratios are higher than those of the ocean.

MacArthur (1957) has found good fits for various communities of birds, so has Kohn (1959) for gastropods, and Turner (1961) for snakes. The most complete review on the use of the model given is by King (1964). But the model has not gone unchallenged,

* Generally, food and space are the items considered to be divided among the species.

Hairston (1959) cites data for soil arthropods which gives a poor correspondence. MacArthur (1960) considers a marked deviation from the expected ratio of 1 as an indication that the samples came from more than one type of environment or community whereas Hairston claims the opposite effect; that is, by combining samples from different communities Hairston got better fits than when the samples of one community were used. He interpreted this effect as a sign of organization, that is, by combining samples of two communities the organization is decreased and hence increases the random element which gives a better fit to MacArthur's model.

Data from Table A6-1 have been presented in Text-Table 38 in an effort to see if the Hairston or MacArthur explanation was correct for the chaetognaths of the Agulhas current.

Text-Table 38. Variance ratios (observed variance/expected variance for MacArthur's model) for (A) summer survey (B) autumn survey and (C) winter survey; N70V-data.

A. Summer survey (Overall ratio = 3.42)

Station and/or line of stations	Neritic Area	Oceanic Area
Durban	9.95	2.97
Port Shepstone	1.58	—
Port St. Johns	7.08	3.40
East London	9.03	1.19
Port Elizabeth	3.59	1.18
Mean	6.25	2.19
Combined	7.27	1.35

B. Autumn Survey (Overall ratio = 1.35)

Durban	5.52	1.83
Port Shepstone	2.78	1.44
Port St. Johns	6.08	1.19
Bashee	7.71	0.85
East London	6.74	1.11
Port Alfred	3.01	1.62
Port Elizabeth	6.18	1.83
Cape Seal	4.23	—
Mean	5.27	1.41
Combined	4.85	1.38

C. Winter survey (Overall ratio = 1.79)

Durban	3.57	1.23
Port Shepstone	3.45	1.07
Port St. Johns	6.02	2.46
Bashee	2.88	2.14
East London	1.64	2.10
Port Alfred	2.08	1.07
Port Elizabeth	5.03	1.51
Cape Seal	4.50	—
Mean	3.65	1.65
Combined	2.88	2.02

By lumping the data, an overall ratio was obtained, for example, 3.42 and 1.35 (ect.) for the summer and autumn surveys, respectively. By Hairston's view, the lumped ratio should be less than the mean of either area, for example, compare the summer overall ratio of 3.42 to the neritic mean ratio of 6.25 and the oceanic mean ratio of 2.19. It lies in between the two values but it is not less than either of them. For the autumn survey, however, the overall ratio is less than either mean ratio. The overall ratio for the winter survey lies between the two mean ratios. Thus, Hairston's suggestion is borne out only by the data of the autumn survey.

I interpret these ratios as indicating the diversity of the environment. Specifically, it has been shown that the neritic area is more variable in its physical and biological parameters--this is true for coastal areas in general (Flemming, 1957). The oceanic area is, of course, less variable and more constant. The smaller ratio for this area would imply that competition is by far a more important process in an oceanic community than in a neritic community. Hence, the good fits to the model for the oceanic area and the poor fits for the neritic area.

MacArthur (1960) further elaborated on his model by stating that it was applicable only to equilibrium species. Others (Kohn, 1959; Turner, 1961) have assumed this. In cases like those of the chaetognaths of the present study, it is, of course, impossible to produce censuses over many years to ascertain whether the species are in equilibrium or not. More of interest was MacArthur's (ibid) statement that opportunistic species would not give good fits to his model. Such species are those that respond quickly to environmental changes. Certainly some of these chaetognath species which inhabit neritic or mixed-water (eg. S. enflata, S. bedoti, K. pacifica and S. robusta) fulfill this definition. Furthermore, their response to environmental changes is presumable through reproduction (as MacArthur states) as the neritic individuals of the above four species contained significantly more eggs than corresponding oceanic individuals (section 4). The point is: the neritic area is mainly characterized by opportunistic species for which competition is a relatively unimportant factor in their distribution (see also Hutchinson, 1953 and fugitive species), hence such species would not give good fits to MacArthur's model--which they did not. Conversely, the oceanic area is relatively stable and characterized by equilibrium species which give good fits for MacArthur's model--which they did.

The data from either of the N100-nets gave rather poor fits to MacArthur's model. Because it has been shown that these nets captured only part of the population of the chaetognaths (the larger specimens) and because they were not fished through the entire water column, it is felt that their variance with the MacArthur's model is a result of their inadequate sampling of the community. (see also, King, 1964).

F. Discussion and Conclusions

(The Significance of a Community Analysis)

It has been the thesis of the present work that a community analysis yields, by its very nature, more information on the distribution and abundance of various animal species and on their physical environment than could be obtained by considering these aspects separately.

It should be emphasized that this approach in no way avoids the study of the properties of the individual species, indeed, the bulk of the data, presented here, have been gathered for each species in the traditional and descriptive ways of the autecologist. The difference of approach lies only in the manner in which the data are synthesized.

To expand on this point, but not to belabor the data already presented, consider the following specific examples. Of the 18 species of chaetognaths found in the research area, nine species followed, as indicated by their distribution and abundance, the flow-pattern of the Agulhas current, and for those species which did not show this effect the explanation was found to be either due to a deeper vertical distribution, or distinct horizontal distribution (for the neritic species), and/or general rarity. There was no way a priori to suggest this correlation between the species distribution and abundance and the hydrographical conditions. Further, to suggest such happenings by using one or only a few of the species would have been impossible or, at the most, very untenable. This, of course, has been realized by many workers (Fraser, 1952; Bary, 1963 A, B, C and 1964; Johnson and Brinton, 1963; etc.). But these workers have used the community concept only in an implicit way and have not identified the existing community by objective techniques. This has not hindered the value of their work, but it may have decreased the scope or extent to which their data might have applied. Thus in the present study, communities or groups were identified, and these groups showed a striking correspondence to the distribution and abundance of the individual species which made them up (Specifically: a group of nine species of oceanic and epiplanktonic preferences; a group of

three mixed-water species, and an associate mesoplanktonic species). This strongly suggests that the species were resetting similarly to their environment which could not have been predicted a priori. In addition, fecundity was found to be a function of the environment of the individual species and this was in turn extremely close in agreement with the above-mentioned groupings.

It is appropriate to mention, at this time, that even though a great deal of satisfactory evidence emerged which favored the use of the community concept in the interpretation of animal distribution and abundance, the study is an incomplete one, with many unexplored possibilities. Aside from the element of chance, some of the deficiencies are as follows: (1) Artificial versus natural groups. Probably no groups will ever be "the" natural group, this is due to many things among which are the type of sampling gear used (this was confirmed by the different groups formed from the data of each net), the manner of sampling (vertical, oblique, horizontal and time of sampling--daytime, etc.), the organisms sampled (adults, juveniles, mobile forms, etc.) and etc. (2) Implied physiological ecology. To ascribe the differences in the distribution and abundance between two species by means of their vertical distribution and/or reproductive habits, etc., says nothing about the physiological or sensory mechanisms which would seem to be necessary to insure the separation of the species and/or communities into the various water masses or vertical levels. (3) Loss of information. The community concept has been severely criticized because it tends to blend the dissimilarities of related species into a common pattern and hence cannot adequately dissect out these existing differences. The Fager-technique itself is based mainly on the presence and absence of a species and does not take into consideration (initially anyway) the differences between the abundances of the species. Further the role of the rare species is most likely to be underestimated and to say that such species are "less important" ^{because of} their rarity is quite wrong. (4) Statistics and their usefulness. It has been shown that many of the statistics, gathered for each species, were inadequate and usually followed the information implied from the species relative abundances. (5) Seasons and species groups. The expression of groups from the data of each survey was rather unsatisfactory and the correspondence between these groups and their environment was not as good as when the combined data was used. This may suggest that the Fager-technique is limited and needs a minimal number of samples to work with so as to produce reasonable results. This probably applies, however, to any

grouping technique thus far devised. (6) Adult and juvenile data. It is probably a truism that adults and juveniles have different functions in a community, indeed, just from their size differences alone this could be deduced. Adults were differentiated from juveniles, in the present study, solely on the basis of the presence of ovaries and/or seminal vesicles. For the most part this is quite satisfactory but occasionally a specimen would be found which was by total length undoubtedly an adult but it possessed no reproductive structures. Though such a specimen was classified as a juvenile, its condition was most probably that between fully reproductive states. To resolve this would require the control of a laboratory study but it might be also done by more extensive sampling. (7) Fecundity assumptions. These have been discussed previously. This approach seems to be a promising one, and since the essence of the scientific method is to procure more precise information but with less work (if possible), this technique seems to fulfill such prerequisites. The question now is just how close and confident is the correlation between egg numbers per individual and environmental conditions. (8) Retrospective analysis. The analysis for this study has been done in retrospect, that is, after the actual sampling program was completed. With a concerted effort by all people involved a sampling program could be devised to eliminate built in bias. For example, it could not be determined which factor--food or temperature--was the primary factor behind egg production (Stone, in press). Other studies (Deevey, 1960) have demonstrated the importance of this by showing a better correlation exists between zooplankters and their environmental conditions, a month prior to their actual capture of the beast than to ^{the} environment at the time of capture.

Community comparisons

Throughout the presentation of the results the data were organized into two major parts--those from the neritic area and those from the ocean. It is appropriate now to compare the communities of each area.

To begin, in species composition there was really only one chaetognath community and it was found in both areas. This, community was made up of those species which formed the various groups from the N70V-data for all surveys (see section 3). A comparison of the community structure of both areas demonstrates this; during summer and autumn conditions the species makeup of the two areas was essentially the same (except for the deeper-water species). A quick way of seeing this is to examine (Table A6-1) the species numbers for each line for each area. An abridged form of this is given in Text-Table 39.

Text-Table 39. Species composition for each line of stations per survey (derived from Table A6-1).

Line of Stations	Summer Survey		Autumn Survey		Winter Survey	
	Neritic	Oceanic	Neritic	Oceanic	Neritic	Oceanic
Durban	10	11	10	13	10	15
Port Shep.	12	--	10	14	6	12
Port St. Johns	12	12	8	14	5	13
Bashee	--	--	11	14	3	14
E. London	6	14	11	14	5	12
Port Alfred	--	--	6	14	13	9
Port Eliza.	13	13	13	14	9	13
Cape Seal	--	--	14	--	12	--
Mean number of species	11	12	10	14	8	13

However, marked change between the two areas, in their species makeup, is evident during the winter survey. This is not to say that there were no sharp differences in abundances among the population of the two areas (section 2 demonstrated this aspect) and this points up the fact that structure should be considered in ^{as}diverse or varied ways as possible.

Nevertheless an analogy can be made that the happenings in the neritic area constitute a sort or type of succession. Summer and autumn conditions maintain the "climax" community which is almost oceanic in structure (but not quite) and the winter conditions cause a breakdown of this "climax" community to a community strictly neritic in character, that is, a preponderance of species which can withstand the changed conditions--and then the pattern repeats itself.

Intra- and Interspecific Relationships

The emphasis has been made, up until now, that the various chaetognath species, which co-occur, are reacting similarly to their environment. But the point can be made now that species which are morphologically and functionally similar should show some limitations in the degree of overlap among themselves. In short, what are the provisions for the coexistence of the chaetognath species.

There are many (see section 6) and these include: differences in horizontal distribution; differences in vertical distribution; differences in abundances; differences in species size; differences in organisms used as prey; and differences in the population composition.

Future Work

Future work should be done with the present results acting as a guide.

- (1) Sampling at each station should be done with multiple nets; with closing nets at smaller intervals, say every 50 meters; to a greater depth, 500 meters or even 1000 meters; during daytime hours only; repeated more often, particularly the physical data, say at monthly intervals; closing nets used above and below a sharp thermocline, for example, up to and from the 17°C isotherm.
- (2) More population parameters should be attempted rather than strictly distribution and abundance. These would include population size (morphological structure) differences, reproductive differences and feeding differences.
- (3) Finally, the study should continue to add other plankton groups to the community. That is, more groups should be analyzed so as to achieve a truly community viewpoint.

G. Acknowledgements

By their very nature, acknowledgements tend to be stereotypical and perfunctory. Most certainly this is not the intent of the gratitude to be expressed here. I wish to thank the following people and/or organizations for advice and aid received: Professor J. H. Day, for providing me with the opportunity to do the work and criticisms of a stimulating sort thereafter;

Peter Zoutendyk, for doing the actual work of making the collections and moreso for the compilation of the physical data resulting therefrom and for providing me with much of his unpublished data without which much of this work would have been impossible;

Mr. Baxter and the C. S. I. R., for providing the funds necessary for some of my travel expenses and for my salary during my stay in South Africa;

G. B. Brundrit, for writing a program for the Fager technique and a program for observed variance/expected variance of MacArthur's Model;

A. E. Heydorn, for allowing me unlimited access to otherwise unavailable literature in the form of his private reprints;

A. M. Shipley, for writing a special variance program;

Mr. Finnegan and the Olivetti Company for letting me use a special typewriter and calculator;

To: A. Alvarino, R. Bieri, P. David, E. Fager, P. Frank, J. Fraser, B. Ketchum, O. Tanaka, and T. Tokioka for solicited reprints and/or various types of advice;

To: my friends and colleagues of the Department of Zoology, University of Cape Town (Especially, Miss Denholm, R. Dick, A. Savage and Miss Faal) for serving as "sounding posts" for some of my ideas.

H. References

- Admiralty, 1954. "Africa Pilot". Vol. III. Hydrographic Dept., Admiralty. Eleventh Edition, London. 551 pp.
- Allee, W. C., A. E. Emerson, O. Park, T. Park and Karl P. Schmidt. 1949. "Principles of Animal Ecology". Philadelphia: W. B. Saunders Co., pp. 436-597.
- Alvarino, A. 1961. "Two new chaetognaths from the Pacific". Pacific Science 15 (1):67-77.
1962. "Taxonomic revision of *Sagitta robusta* and *Sagitta ferox* Doncaster and notes on their distribution in the Pacific". Pacific Science 16 (2): 186-201.
- 1964A. "Bathymetric distribution of Chaetognaths". Pacific Science 18 (1): 64-82.
- 1964B. "The Chaetognatha of the Monsoon Expedition in the Indian Ocean". Pacific Science 18 (3): 336-348.
- Anderson, F. P. 1961. "The use of drift cards to deduce currents along the Natal coast". C.S.I.R. Symposium: Marine studies off the Natal coast. No. S2, pp. 40-45.
- Andrewartha H. G. and L. C. Birch. 1954. "The distribution and abundance of animals". Chicago: Univ. of Chicago Press. 782 pp.
- Bary, B. McK. 1963. "Temperature, salinity and plankton in the eastern North Atlantic and coastal waters of Britain, 1957. I. The characterization and distribution of surface waters." Journal of Fisheries Research Board of Canada. 20: No. 3, pp. 789-829.
1963. "Temperature, salinity and plankton in the eastern North Atlantic and coastal waters of Britain, 1957. II. The relationships between species and water bodies". Journal of Fisheries Research Board of Canada. 20: No. 4, pp. 1031-1065.
1963. "Temperature, salinity and plankton in the eastern North Atlantic and coastal waters of Britain, 1957. III. The distribution of zooplankton in relation to water bodies". Journal of Fisheries Research Board of Canada. 20: No. 6, pp. 1519-1548.
1964. "Temperature, salinity and plankton in the eastern North Atlantic and coastal waters of Britain, 1957. IV. The species relationship to the water body; its role in distribution and in selecting and using indicator species". Journal of Fisheries Research Board of Canada. 21: No. 1, pp. 183-202.
- Bieri, R. 1957. "The Chaetognath fauna off Peru in 1941". Pacific Science 11(3): pp. 255-264.
- Bieri, R. 1959. "The distribution of the planktonic chaetognaths in the Pacific and their relationship to the water masses". Limnology and Oceanography, 4 (1): pp. 1-28.
- Birch, L.C. 1948. "The intrinsic rate of natural increase of an insect population". Jr. of Animal Ecology 17: pp. 15-26.
- Birch, L.C. 1957. "The meanings of competition." Amer. Nat. 91: pp. 5-18.
- Cassie, R. M. 1961. "The correlation coefficient as an index of ecological affinities in plankton populations". Mem. Ist. Ital. Idrobiol. 13: pp. 151-177.
- Cleve, P. T. 1905. "The plankton of the South African seas". I. Copepoda. Vol. 3: pp. 177-210.

- Cleve, P. T. 1908. "The plankton of the South African seas". II. Vermes. Vol. 4: pp. 125-128.
- Clowes, A. J. 1950. "An introduction to the hydrology of South African waters. Investigations report No. 12, Division of Fisheries, Union of South Africa, Pretoria. 47 pp.
- Connell, J. H. 1961. "The influence of interspecific competition and other factors on the distribution of the barnacle Chthamalus stellatus". Ecology 42 (4) pp. 710-723.
- Groce, N. A. 1963. "Osservazioni Sull'Alimentazione Di Sagitta". Rapports et Proces-Verbaux des Des Reunions 17 (2): pp. 627-630.
- Cushing, D. H. 1958. "The seasonal variation in oceanic production as a problem in population dynamics". Jr. Du Conseil 24(3): 455-464.
- Dakin, W. J. and A. N. Colefax. 1940. "The plankton of the Australian coastal waters off New South Wales" Part I. Publication of the Univ. of Sidney, Dept. of Zoology, Monograph No. 1: pp. 1-215.
- Darbyshire, J. 1964. "A hydrological investigation of the Agulhas current area". Deep-Sea Research 11: pp. 781-815.
- Darbyshire, M. 1963. "Computed surface currents off the Cape of Good Hope". Deep-Sea Research 10: pp. 623-632.
- David, P. M. 1955. "The distribution of Sagitta gazellae Ritter-Zahony". Discovery Reports No. 27. pp. 235-278.
1958. "The distribution of the Chaetognatha of the Southern Ocean". Discovery Reports No. 29: pp. 199-228.
1963. "Some aspects of speciation in the Chaetognatha". Speciation in the Sea. Systematics Association Publication No. 5: pp. 129-143.
- Deevey, G. B. 1960. "Relative effects of temperature and food on seasonal variations in length of marine Copepods in some eastern American and western European waters". Bulletin of Bingham Oceanographic Collection, Yale University. No. 17: pp. 54-86.
- Doncaster, L. 1903. "Chaetognatha, with a note on the variation and distribution of the group". In: The fauna and geography of the Maldive and Lacadive Archipelagoes. J. S. Gardiner, Editor. Cambridge Univ. Press, 1: pp. 209-218.
- Dunbar, M. T. 1962. "The life cycle of S. elegans in Arctic and subarctic seas, and the modifying effects of hydrographic differences in the environment". Jr. Mar. Res. 20: pp. 76-91.
- Edmondson, W. T. 1962. "Food supply and reproduction of zooplankton in relation to phytoplankton populations. Cons. Int. Explor. Mer. Rapp. et Proc-Verb. 153: pp. 137-141.
1964. "The rate of egg production by rotifers and copepods in natural populations as controlled by food and temperature". Verh. Internat. Verlin. Limnol. 15: pp. 673-675.
- Elton, C. S. 1938. "Animal Ecology". Sedgwick & Jackson, London. 209 pp.

- Elton, C. E. and R. S. Millter. 1954. "The ecological survey of animal communities: with a practical system of classifying habitats by structural characters". *Jr. of Ecology* 42: pp. 460-496.
- Fager, E. W. 1957. "Determination and analysis of recurrent groups". *Ecology* 38 (4): pp. 586-595.
- 1963A. "Communities of organisms". *The Sea*, Vol. 2. Editor M. H. Hill. Interscience Publishers (John Wiley & Sons) New York. pp. 415-437.
- Fager, E. W. and J. A. McGowan. 1963B. "Zooplankton species groups in the north Pacific". *Science* 140 (3566): pp. 453-460.
- Fagetti, E. 1958. "Investigaciones sobre quetognatos colectados, Especialmente, Frente a la Costa Central Y Norte de Chile". *Revista de Biología Marina* 3: pp. 25-82.
- Fleming, R. H. 1957. "General features of the ocean." Chapter 5 in *Treatise on Marine Ecology and Paleoecology*, Vol. I, Ecology, Editor J. W. Hedgpeth. *Geol. Soc. Amer. Memoir* 67: pp. 87-108.
- Fraser, J. H. 1952. "The chaetognatha and other zooplankton of the Scottish area and their value as biological indicators of hydrographical conditions". *Scottish Home Department. Marine Research No. 2*: pp. 1-52. Edinburgh: HMSO.
- Furnestin, M. 1952. "Chaetognates des Côtes Africaines" *Expédition Océanographique Belge dans les Eaux Côtières Africaines de L'Atlantique Sud (1948-1949)* Vol. 3, Fascicule 9. pp. 1-54.
- Giesbrecht, W. 1898. "Systematik und Faunistik der pelagischen Copepoden der Golfes von Neapel". *Flora and Fauna des Golfes von Neapel*, Monograph, XIX.
- Glover, R. S. 1961. "Biogeographical boundaries: The shapes of distribution". In: *Oceanography No. 67 of A.A. A. S. Washington D. C.* Editor M. Sears. pp. 201-228.
- Grey, B. B. 1930. "Chaetognatha from the Society Islands". *Proceeding Royal Society of Queensland* 42: pp. 62-67.
- Hardin, G. 1960. "The competitive exclusion principle". *Science* 131: pp. 1291-1297.
- Hairton, W. G. 1959. "Species abundance and community organization". *Ecology* 40: pp. 404-416.
- Hardy, A. C. 1956. "The Open Sea, its natural history: The world of plankton". Collins, London. 355 pp.
- Harris, T.F.W. 1964. "Notes on Natal coast waters". *So. African Jr. of Science* 60(8): pp. 237-241.
- Heydorn, A.E.F. 1959. "The chaetognatha off the west coast of the Union of South Africa". *Union of South Africa Dept. of Commerce & Industries, Division of Fisheries Investigational Report* 36: pp. 1-56.
- Hutchinson, G. E. 1953. "The concept of pattern in ecology". *Proceeding of the Academy of Natural Sciences; Philadelphia* 105: pp. 1-12.
1959. "The Homage to Santa Rosalia or why are there so many kinds of animals?". *The American Naturalist* 43: pp. 145-149.
- Hymen, L.H. 1959. "The Invertebrates: Smaller Coelomate groups". Vol. 5, pp. 1-71.

- Johnson, M. W. and E. Brinton. 1963. "Biological species, water-masses and currents". The Sea, Editor M. N. Hill. Vol. 2, Interscience Publishers, New York, pp. 381-414.
- Kemp, S. A., A. C. Hardy and N. A. MacKintosh. 1929. "The discovery investigations. Objects, equipment and methods." Cambridge, University Press. Discovery Report 1: pp. 143-232.
- Kielhorn, W. 1952. "Biology of the surface zooplankton of boreo-arctic Atlantic Ocean". Jour. Fisheries Research Board of Canada. 9(5): pp. 223-264.
- King, C. E. 1964. "Relative abundance of species and MacArthur's Model". Ecology 45(4): pp. 716-727.
- Kohn, A. J. 1959. "The ecology of *Conus* in Hawaii". Ecology Monograph 29(1): pp. 47-90.
- MacArthur, R. 1955. "Fluctuations of animal populations, and a measure of community stability". Ecology 36 (2): pp. 533-536.
1957. "On the relative abundance of bird species". Proc. Nat. Acad. Sciences U.S., 43: pp. 293-295.
1958. "Population ecology of some warblers of northeastern coniferous forests". Ecology 39: pp. 599-619.
1960. "On the relative abundance of species". The American Naturalist 44: pp. 25-36.
- Macfadyen, A. 1957. "Animal Ecology: Aims and methods". Sir Isaac Pitman & Sons Ltd., London pp. 230-247.
- Mallory, J. K. 1961. "Bathymetric and hydrographic aspects of marine studies off the Natal coast". C.S.I.R. Symposium: Marine studies off the Natal coast. No. S2, 31-39 pp.
- Margalef, R. D. 1963. "On certain unifying principles in Ecology". Amer. Nat. 97: pp. 357-374.
- Marshall, S. M. and A. P. Orr. 1955. "The biology of a marine Copepod." Oliver & Boyd; London. 188 pp.
- Mayr, E. 1963. "Animal species and evolution". Harvard Univ. Cambridge. pp. 59-88.
- Michael, E. L. 1928. "Report on the chaetognaths collected by the United States Fisheries steamer "Albatross" during the Philippine Expedition, 1907-1910". Smithsonian Inst. United States National Museum. Bulletin 100, Vol. 1 (Part 4): pp. 235-277.
- Odum, E. P. 1962. "Relationships between structure and function in the ecosystem". Japanese Jr. of Ecology 12(3): pp. 108-118.
- Owre, H. E. 1960. "Plankton of the Florida current. Part VII. The Chaetognaths". Bulletin of Marine Science of the Gulf and Caribbean 10(3): pp. 255-322.
- Parry, D. A. 1944. "Structure and function of gut in *Spadella cephaloptera* and *Sagitta setosa*". Jr. Mar. Biol. Assoc. 26: pp. 16-36.
- Pierce, E. L. and M. L. Wass. 1962. "Chaetognaths from the Florida current and coastal waters of the southeastern Atlantic states". Bulletin of Marine Science of the Gulf and Caribbean 12(3): pp. 403-431.

- Redfield, A. C. 1941. "The effect of circulation of water on the distribution of the calanoid community of the Gulf of Maine". Biol. Bull. Woods Hole 80: pp. 86-110.
- Reeve, M. R. 1964. "Feeding of zooplankton with special reference to some experiments with Sagitta". Nature 201(4915): pp. 211-213.
- Reynoldson, T. B. 1964. "Evidence for intraspecific competition in field populations of triclad". British Ecological Society Jubilee Symposium. Supplement to Jr. of Ecology and Jr. of Animal Ecology 33. Editors: A. M. Macfayden and P. J. Newfould. pp. 187-201.
- Riley, G. A. 1963. "Theory of food-chain relations in the ocean". In: The Sea, Vol. 2, Editor, M.N. Hill. Interscience Publishers, New York. pp. 438-463.
- Ritter-Zahony, R. 1911. "Revision Des Chaetognathen" Deutsche Südpolar-Expedition (1901-1903). XIII Band, Zoologie XIII Band. pp. 71.
- Russell, F. S. 1939. "Hydrographical and biological conditions in the North Sea as indicated by plankton organisms". Jr. Cons. Int. Explor. Mer. 14: pp. 171-192.
- Slobodkin, L. B. 1961. "Growth and regulation of animal populations". New York, Holt, Rinehart and Winston. 184 pp.
- Steemann-Nielsen, E. 1961. "The relationships between phytoplankton and zooplankton in the sea". Symposium on Zooplankton production; Copenhagen No. 4.
- Stone, James H. (in press) "The distribution and fecundity of Sagitta enflata Grassi in the Agulhas current". Jr. Animal Ecology.
- Sund, P. N. 1959. "A key to the Chaetognatha of the tropical eastern Pacific Ocean". Pacific Science 13(3): pp. 269-285.
1961. "Two new species of Chaetognatha from the waters off Peru". Pacific Science 15(1): pp. 105-111
1964. "The chaetognaths of the waters of the Peru region". Inter-Amer. Trop. Tuna Comm. Bull. Vol. 5 (4): pp. 115-188.
- Tanaka, O. 1960. "Pelagic Copepoda" Special publications from the Seto Marine Biological Laboratory. Biological results of the Japanese Antarctic Research Expedition. 10: pp. 1-95 (plus plates).
- Tate, M. E. and R. C. Clelland (1957. "Nonparametric and short-cut statistics". Interstate Printers and Publishers, Inc. Danville, Illinois. 171 pp.
- Thomson, J. M. 1947. "The Chaetognatha of southeastern Australia". C.S.I.R. Bulletin 222. Division of Fisheries Report No. 14, Melbourne, Government Printers 43 pp.
- Tokioka, T. 1952. "Chaetognaths of the Indo-Pacific" Annotationes Zoologicae Japonenses 25(1-2): pp. 307-316.
1959. "Observations on the taxonomy and distribution of chaetognaths of the north Pacific". Publication of the Seto Marine Biological Laboratory 7(3): pp. 349-456.
1962. "The outline of the investigations made on chaetognaths of the Indian Ocean." Information Bulletin on Planktology, Japan No. 8: pp. 5-11.

- Tokioka, T. and D. Pathansali. 1963. "Another new chaetognath from Malay waters, with a proposal of grouping some species of *Sagitta* into subgenera." Seto Marine Biological Laboratory 11(1):pp. 119-123.
- Turner, F. B. 1961. "The relative abundance of snake species". Ecology 42(3): pp. 600-602.
- Williamson, M. H. 1961. "A ecological survey of a Scottish Herring Fisher. Part III. Changes in the plankton during the period 1949 to 1959". Bulletin of Marine Ecology. 5(47): pp. 207-223.
- Wilson, C. B. 1932. "The copepods of the Woods Hole region Massachusetts". Smithsonian Inst., United States National Museum Bulletin 158. 623 pp. Washington, D. C.: U. S. Government Printing Office.
- Zoutendyk, P. 1960. "Hydrographic and plankton data collected in the Agulhas current during I. G. Y., University of Cape Town, Dept. of Oceanography Publ. No. 1. 92 pp.

Reference addendum

- Caabro, J. A. S. 1955. "Chaetognatos de Los Mares Cubanos". Memorias de La Culana de Historia Natural. pp. 125-180.
- Cole, L. C. 1957. "Sketches of general and comparative demography". Cold Springs Harbor Symposia on Quantitative Biology. Long Island Biol. Assoc., Cold Springs Harbor, N.Y., 22: pp. 1-15.
- David, P. M. 1956. "*Sagitta planctonis* and related forms". Bulletin of the British Museum (Natural History) Zoology 4(8): pp. 435-451.
- Hairston, N. G., F. E. Smith and L. B. Slobodkin, 1960. "Community structure, population control and competition". The American Naturalist 94: pp. 421-425.
- Lebour, M. V. 1922. "Food of plankton organisms". Jr. Mar. Biol. Ass. 12: pp. 644-677.
1923. "Food of plankton organisms II". Jr. Mar. Biol. Ass. 13: pp. 70-92.
- McLaren, J. A. 1963. "Effects of temperature on growth of zooplankton and the adaptive value of vertical migration". Jr. Fish. Res. Canada, 20: pp. 685-727.

Part II

Appendix of Data

Figure A1-1. Station locations for all surveys of the Agulhas current in 1958. Those marked with an o were made during three surveys and those marked with an • were made during two surveys. Distance between stations was approximately 20 to 25 miles.

NERITIC

OCEANIC

Figure 13-2. Temperature and salinity envelopes for all stations of the survey of the Atlantic current in 1956. 1957. The red line denotes values from 20 to 0 meters, and broken (dashed) values from 20 to 200 meters (data from 1956-57, 1958).

27
26
25
24
23
22
21
20
19
18
17
16°C
15
14
13
12
11
10
9
8
7
6
5

34.4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 35.0 ‰

Figure A1-3. Stations locations and numbers for summer survey of the Agulhas current in 1958. Neritic stations are enclosed by parentheses. Distance between stations is 20 to 25 miles (Data from Zoutendyk, 1960).

Figures A1-4 A & B. Temperature profiles for Durban and Port St. Johns lines during the summer survey of the Agulhas current in 1958. Neritic stations enclosed by parentheses (Data from Zoutendyk, 1960).

Figure A1-4 C & D. Temperature profiles for East London and Port Elizabeth lines during the summer survey of the Agulhas current in 1958. Neritic stations enclosed by parentheses (Data from Zoutendyk, 1960).

Figure 11-6. Temperature and salinity envelopes for the summer survey of the Agulhas current in 1950. Above the red line denotes water from 90 to 0 meters, and below denotes values from 90 to 150 meters (Data from Zantonikh, 1950).

Figure A1-7. Station locations and numbers for the autumn survey of the Agulhas current in 1958. Neritic stations enclosed by parentheses. Distance between stations 20 to 25 miles (Data from Zoutendyk, 1960).

Figure A1-8. Dynamic topology - surface to 400db. For autumn survey of the Agulhas current in 1958. (from Darbyshire, 1964).

~~Figure A1-9 A & B.~~ Temperature profiles for Durban and Port Shepstone lines during the autumn survey of the Agulhas current in 1958. Neritic stations enclosed by parentheses (data from Zoutendyk, 1960).

Figure A1-9 C & D. Temperature profiles for Port St. Johns and Bashee lines during the autumn survey of the Agulhas current in 1958. Neritic stations enclosed by parentheses (data from Zoutendyk, 1960).

Figure A1-9 E & F. Temperature profiles for East London and Port Alfred lines during the autumn survey of the Agulhas current in 1958. Neritic stations enclosed by parentheses. (data from Zoutendyk, 1960).

Figure A1-9 G & H. Temperature profiles for Port Elizabeth and Cape Seal lines during the autumn survey of the Agulhas current in 1958. Neritic stations enclosed by parentheses (data from Zoutendyk, 1960).

Figure 11-11. Temperature and
 salinity conditions for the eastern
 survey of the Gulf Stream in
 1950. Above the red line denotes
 values from 50 to 0 meters, and be-
 low denotes values from 50 to 500 meters
 (Data from McIntyre, 1950).

Figure A1-11. Station locations and numbers for the winter survey of the Agulhas current in 1958. Neritic stations are enclosed by parentheses. Distance between stations is 20 to 25 miles (data from Zoutendyk, 1960).

Figure A1-12. Dynamic topology - surface to 400 db.
for winter survey of the Agulhas current in 1958
(from Parbyschiro, 1964).

Figure A1-13 A & B. Temperature profiles of Durban and Port Shepstone lines during the winter survey of the Agulhas current in 1958. Neritic stations enclosed by parentheses (data from Zoutendyk, 1960).

Figure A1-13 C & D. Temperature profiles for Port St. Johns and Bashee lines during the winter survey of the Agulhas current in 1958. Neritic stations enclosed by parentheses (data from Zoutendyk, 1960).

Figure A1-13 E & F. Temperature profiles for East London and Port Alfred lines during the winter survey of the Agulhas current in 1958. Neritic stations enclosed by parentheses (data from Zoutendyk, 1960).

Figure A1-13 G & H. Temperature profiles of Port Elizabeth and Cape Seal lines during the winter survey of the Agulhas current in 1958. Neritic stations enclosed by parentheses (data from Zoutendyk, 1960).

Figure A1-14. Temperature and salinity envelopes for the winter survey of the Agulhas current in 1958. Above the red line denotes values from 50 to 0 meters, and below denotes values from 50 to 500 meters (data from Zentendyk, 1960).

Table A1-1. Station numbers for each survey of the Agulhas current in 1958 (Zoutendyk, 1960).

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	2			3	4		
Port Shepstone	1						
Port St. Johns	5			6	7		
East London	8			9	10		
Port Elizabeth	11	12		13	14	15	16
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	17				18	19	20
Port Shepstone	21				22	23	24
Port St. Johns	25				26	27	28
Bashee	29				30	31	32
East London	33				34	35	36
Port Alfred	37				38	39	40
Port Elizabeth	41	42			43	44	45
Cape Seal	47	48	49	50			46
Range _____				Range _____			
Median _____				Median _____			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	59				60	61	62
Port Shepstone	63				64	65	66
Port St. Johns	67				68	69	70
Bashee	71				72	73	74
East London	78				77	76	75
Port Alfred	82	81				80	79
Port Elizabeth	84	83			85	86	87
Cape Seal	92	91	90	89			88
Range _____				Range _____			
Median _____				Median _____			

Table Al-2. Mean temperatures °C for upper 100 meters or less for all surveys of the Agulhas current in 1958. Compare with Table Al-1 for station numbers (Zoutendyk, 1960).

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	22.8				23.7	25.9		
Port Shepstone	23.5							
Port St. Johns	22.1				24.3	24.8		
East London	19.5				24.2	23.3		
Port Elizabeth	18.1	21.8			23.7	22.8	21.4	21.0
	Range 13.3-25.6				Range 18.4-27.1			
Overall mean	20.9 20.9				23.6 23.6			

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	24.5				24.4	24.6	23.2	
Port Shepstone	24.4				24.4	23.9	24.1	
Port St. Johns	21.8				24.0	22.8	22.4	
Bashee	19.1				24.2	23.2	22.6	
East London	19.8				23.8	22.0	20.7	
Port Alfred	19.0				24.2	22.0	20.5	
Port Elizabeth	16.9	19.5			23.1	22.6	20.8	20.6
Cape Seal	17.2	16.7	17.5	16.2				
	Range 10.0-24.6				Range 19.2-25.4			
Overall mean	19.4 19.4				23.5 23.5			

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	20.2				21.3	21.4	21.1	
Port Shepstone	20.1				21.2	20.8	19.9	
Port St. Johns	16.4				21.0	21.0	19.6	
Bashee	14.8				20.8	20.1	22.0	
East London	14.6				20.7	20.4	20.1	
Port Alfred	14.9	17.0				20.0	19.9	
Port Elizabeth	15.7	14.6			20.3	20.1	20.7	20.6
Cape Seal	15.4	14.3	14.7	18.1				
	Range 9.6-20.1				Range 18.7-21.7			
Overall mean	16.4 16.4				20.4 20.4			

Table A1-2 (Continued)

<u>ALL SURVEYS</u>		
	<u>Neritic Stations</u>	<u>Oceanic Stations</u>
<u>Durban</u>	22.3	23.2
<u>Port Shepstone</u>	22.9	22.4
<u>Port St. Johns</u>	20.4	22.9
<u>Bashee</u>	17.0	21.7
<u>East London</u>	18.2	21.9
<u>Port Alfred</u>	17.1	21.3
<u>Port Elizabeth</u>	17.9	21.5
<u>Cape Seal</u>	16.2	
<u>Range</u>	9.6-25.6	18.4-27.1
<u>Overall Mean</u>	18.9	22.5

Table A1-3. Temperature values °C for summer survey of the Agulhas current in 1958: (.) at surface, and (.) at 100 meters for oceanic stations, near bottom for neritic stations. Compare with Table A1-1 for station numbers. (Montenay, 1960).

(A) Surface		SUMMER SURVEY							
	Neritic Stations				Oceanic Stations				
	1	2	3	4	1	2	3	4	
Durban	23.4				26.0	27.1			
Port Shepstone	25.6								
Port St. Johns	25.5				26.4	26.2			
East London	21.4				26.1	24.2			
Port Elizabeth	20.7	24.3			25.5	23.8	22.2	21.6	
Range _____					Range _____				
Median _____					Median _____				

(B) 100 meters or less		AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations				
	1	2	3	4	1	2	3	4	
Durban	22.0				19.9	22.3			
Port Shepstone	20.5								
Port St. Johns	18.3				19.7	20.1			
Bashee									
East London	17.4				18.4	19.8			
Port Alfred									
Port Elizabeth	13.3	17.5			19.7	19.5	18.7	18.6	
Cape Seal									
Range _____					Range _____				
Median _____					Median _____				

		WINTER SURVEY							
	Neritic Stations				Oceanic Stations				
	1	2	3	4	1	2	3	4	
Durban									
Port Shepstone									
Port St. Johns									
Bashee									
East London									
Port Alfred									
Port Elizabeth									
Cape Seal									
Range _____					Range _____				
Median _____					Median _____				

Table A1-4. Salinity values for summer survey of the Agulhas current in 1958: (A) at the surface, and (B) at 100 meters., for oceanic stations, near bottom for neritic stations. Compare with Table A1-1 for station numbers (Zoutendyk, 1960).

<u>(A) Surface ‰</u>		<u>SUMMER SURVEY</u>							
		Neritic Stations				Oceanic Stations			
		1	2			1	2	3	4
Durban	34.9					35.4	35.4		
Port Shepstone	35.3								
Port St. Johns	35.2					35.5	35.3		
East London	35.2					35.5	35.5		
Port Elizabeth	35.3	35.3				35.4	35.5	35.5	
		Range _____				Range _____			
		Median _____				Median _____			

<u>(B) 100 meters or less ‰</u>		<u>Autumn Survey</u>							
		Neritic Stations				Oceanic Stations			
		1	2	3	4	1	2	3	4
Durban	35.1					35.4	35.4		
Port Shepstone	35.3								
Port St. Johns	35.4					35.4	35.4		
Bashee									
East London	35.4					35.5	35.4		
Port Alfred	35.1	35.3				35.4	35.5	35.5	35.5
Port Elizabeth									
Cape Seal									
		Range _____				Range _____			
		Median _____				Median _____			

		<u>WINTER SURVEY</u>							
		Neritic Stations				Oceanic Stations			
		1	2	3	4	1	2	3	4
Durban									
Port Shepstone									
Port St. Johns									
Bashee									
East London									
Port Alfred									
Port Elizabeth									
Cape Seal									
		Range _____				Range _____			
		Median _____				Median _____			

Table A1-5. Temperature values °C for autumn survey of the Agulhas current in 1958: (A) at surface, and (B) at 100 meters for oceanic stations, near bottom for neritic stations. Compare with Table A1-1 for station numbers. (Zoutendyk, 1960).

<u>SUMMER SURVEY</u>								
Neritic Stations				Oceanic Stations				
	1	2			1	2	3	4
Durban								
Port Shepstone								
Port St. Johns								
East London								
Port Elizabeth								
Range _____				Range _____				
Median _____				Median _____				

(A) Surface	XXXXXXXXXX AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	24.6				25.3	25.2	24.8	
Port Shepstone	24.5				25.1	24.6	24.8	
Port St. Johns	22.5				25.1	24.4	24.2	
Bashee	22.5				25.2	24.0	24.2	
East London	21.5				24.4	23.8	20.8	
Port Alfred	20.6				24.4	24.4	20.6	
Port Elizabeth	17.5	23.3			24.2	23.5	21.3	20.9
Cape Seal	18.0	19.4	21.3	21.3				
Range _____				Range _____				
Median _____				Median _____				

(B) 100 meters or less

WINTER SURVEY

	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	24.3					20.6	21.6	20.8	
Port Shepstone	24.3					21.3	21.4	21.3	
Port St. Johns	20.5					20.6	21.2	20.9	
Bashee	13.5					20.8	20.6	20.9	
East London	17.9					20.8	19.2	19.9	
Port Alfred	17.0					22.3	20.5	20.1	
Port Elizabeth	16.7	12.2				20.0	20.5	20.5	20.4
Cape Seal	15.5	10.1	11.9	10.9					

Range _____

Median _____

Range _____

Median _____

Table A1-6. Salinity values for autumn survey of the Agulhas current in 1958: (A) at surface, and (B) at 100 meters for oceanic stations, near bottom for neritic stations. Compare with Table A1-1 for station numbers. (Zoutendyk, 1960).

SUMMER SURVEY								
Neritic Stations				Oceanic Stations				
	1	2			1	2	3	4
Durban								
Port Shepstone								
Port St. Johns								
East London								
Port Elizabeth								
Range _____				Range _____				
Median _____				Median _____				

(A) Surface ‰	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	35.2				35.0	35.3	35.3	
Port Shepstone	35.2				35.3	35.4	35.4	
Port St. Johns	35.3				35.3	35.4	35.4	
Bashee	35.1				35.2	35.4	35.3	
East London	35.3				35.4	35.4	35.5	
Port Alfred	35.2				35.3	35.5	35.5	
Port Elizabeth	35.2	35.2			35.4	35.4	35.5	35.5
Cape Seal	35.3	35.3	35.3	35.2				
Range _____				Range _____				
Median _____				Median _____				

(B) 100 meters or less ‰	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	35.2				35.3	35.3	35.4	
Port Shepstone	35.3				35.3	35.4	35.3	
Port St. Johns	35.2				35.4	35.5	35.5	
Bashee	35.2				35.4	35.4	35.5	
East London	35.3				35.3	35.4	35.5	
Port Alfred	35.2				35.3	35.5	35.5	
Port Elizabeth	35.2	35.0			35.4	35.5	35.5	35.5
Cape Seal	35.1	34.8	35.0	35.0				
Range _____				Range _____				
Median _____				Median _____				

Table A1-7. Temperature values °C for winter survey of the Agulhas current in 1958: (A) at surface, and (B) at 100 meters for oceanic stations, near bottom for neritic stations. Compare with Table A1-1 for station numbers. (Zoutendyk, 1960).

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban								
Port Shepstone								
Port St. Johns								
East London								
Port Elizabeth								
	Range _____				Range _____			
	Median _____				Median _____			

(A) Surface	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	20.4				21.4	21.7	21.3	
Port Shepstone	20.1				21.2	21.3	20.0	
Port St. Johns	18.1				21.1	21.3	19.9	
Bashee	15.3				21.1	20.8	19.4	
East London	15.0				21.3	21.1	20.4	
Port Alfred	17.9	19.7				20.5	20.1	
Port Elizabeth	15.9	16.3			20.7	20.5	20.9	20.7
Cape Seal	15.9	16.0	16.2	19.8				
	Range _____				Range _____			
	Median _____				Median _____			

(B) 100 meters or less	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	19.9				21.3	20.8	20.3	
Port Shepstone	20.1				20.9	20.0	19.6	
Port St. Johns	15.2				20.2	20.0	19.1	
Bashee	14.4				19.9	18.7	19.1	
East London	14.2				18.7	19.0	19.2	
Port Alfred	13.0	13.3				19.4	19.1	
Port Elizabeth	15.4	9.6			18.8	19.0	20.1	20.0
Cape Seal	15.2	10.5	10.7	14.3				
	Range _____				Range _____			
	Median _____				Median _____			

Table Al-8. Salinity values for winter survey of the Agulhas current in 1958: (A) at surface, and (B) at 100 meters for oceanic stations, near bottom for neritic stations. Compare with Table Al-1 for station numbers. (Zoutendyk, 1960).

SUMMER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2			1	2	3	4	
Durban									
Port Shepstone									
Port St. Johns									
East London									
Port Elizabeth									
Range _____					Range _____				
Median _____					Median _____				

(A) Surface ‰	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	35.4				35.4	35.5	35.5	
Port Shepstone	35.4				35.4	35.4	35.5	
Port St. Johns	35.3				35.5	35.5	35.5	
Bashee	35.3				35.4	35.5	35.5	
East London	35.3				35.4	35.5	35.5	
Port Alfred	35.3	35.4				35.5	35.5	
Port Elizabeth	35.3	35.3			35.5	35.5	35.5	35.5
Cape Seal	35.2	35.3	35.3	35.4				
Range _____				Range _____				
Median _____				Median _____				

(B) 100 meters or less ‰	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	35.4				35.4	35.3	35.4	
Port Shepstone	35.4				35.4	35.5	35.5	
Port St. Johns	35.2				35.4	35.6	35.6	
Bashee	35.3				35.5	35.6	35.5	
East London	35.2				35.5	35.5	35.5	
Port Alfred	35.2	35.2				35.5	35.5	
Port Elizabeth	35.3	34.8			35.5	35.5	35.5	35.5
Cape Seal	35.2	34.9	34.9	35.1				
Range _____				Range _____				
Median _____				Median _____				

Table A2-1. Total individuals, for each 'NGY' net used, by relative abundances and percentage-ranks.

Total Individuals				Percentages of Total										
		N70V	N100B	N100H		N70V	N100B	N100H						
S.enflata		5403	3835	5300		25.4	25.4	44.1						
S.minima		3908	770	39		18.4	5.1	0.3						
S.serrato.	ATLANTICA ~ ± PACIFIC ~ ±	3001	2581	1432	302 ~ 60 100 ~ 29 28 ~ 11	14.1	17.1	11.9						
P.draco		1715	2980	1152		8.1	19.7	9.6						
S.friderici		1568	227	1447		7.4	1.5	12.0						
S.decipiens		1344	105	26		6.3	0.7	0.2						
S.lyra		848	436	8		4.0	2.9	0.07						
S.reg/neglecta	REGALANIS NEGLECTA	777	17	5	764 13 16 3	3.7	0.1	0.04					Individuals not identified: juveniles, broken and damaged.	
K.subtilis		776	470	26		3.7	3.1	0.2						
S.hexaptera		676	1827	596		3.2	12.1	5.0						
S.bipunctata		493	957	1299		2.3	6.3	10.8			N70V:	6518		
K.pacifica		256	69	46		1.2	0.5	0.4			N100B: }			
S.rob/ferox	ROUSTA FEROX	260	631	572	121 138 54 132 440	1.2	4.2	4.8			N100H: }	2289		
S.bedoti		177	198	68		0.8	1.3	0.6				8807		
E.hamata		30	1	0		0.1	0.01							
S.pulchra		3	9	8		0.01	0.06	0.07						
S.planctonis		0	0	2				0.02						
S.maxima		0	0	1				0.01						
XXXXXX:														
XXXXXXXX:	TOTALS	21,235	15,113	12,027		100.0	100.0	100.0						
No. individ- uals:	Identified	48,375												

Table A2-2. Relative abundances and percentages of species from 24-hour station. Location, over the Agulhas Bank 36°29'S by 21°11'E.

	Individuals	Percentages
<i>S. friderici</i>	1181	35.9
<i>S. minima</i>	718	21.8
<i>S. serratodentata</i>	594	18.1
<i>S. enflata</i>	442	13.4
<i>S. reg/neglecta</i>	71	2.1
<i>S. bedoti</i>	63	1.9
<i>P. draco</i>	54	1.6
<i>S. decipiens</i>	47	1.4
<i>K. subtilis</i>	30	0.9
<i>S. lyra</i>	28	0.9
<i>S. rob/ferox</i>	26	0.8
<i>S. hexaptera</i>	18	0.5
<i>E. hamata</i>	18	0.5
<i>S. bipunctata</i>	4	0.1
<i>K. pacifica</i>	1	0.03
Totals:	3295	99.9

Table A2-3. Percentage-ranks of relative abundances of various species for N70V-nets. All stations.

	Summer Survey				Autumn Survey				Winter Survey				All Surveys			
	Neritic		Oceanic		Neritic		Oceanic		Neritic		Oceanic		Neritic		Oceanic	
<i>S.enflata</i>	64.5	1	19.9	1	41.2	1	18.4	2	32.9	1	13.0	3	47.6	1	16.2	3
<i>S.minima</i>	8.4	3	17.1	3	2.1	6	20.5	1	4.7	5	29.4	1	4.9	5	24.0	1
<i>S.serrato.</i>	2.3	6	17.6	2	4.5	4	15.4	3	12.0	3	20.2	2	5.3	3½	17.8	2
<i>P.draco</i>	2.9	5	11.1	4	4.2	5	11.4	4	2.5	7½	8.3	4	3.4	6	10.0	4
<i>S.friderici</i>	12.3	2	0.2	15	35.1	2	0.06	15	26.0	2	0.03	13½	25.0	2	0.07	15
<i>S.decipiens</i>	0.7	10	8.8	5	0.4	12	11.1	5	4.2	6	5.6	6	1.3	10	8.4	5
<i>S.lyra</i>	0.3	12	6.0	7	0.07	15	4.7	7	1.3	9	6.1	5	0.4	13	5.5	6
<i>S.reg/neglecta</i>	1.4	8	1.6	11	6.4	3	3.5	8	9.6	4	2.9	10	5.3	3½	3.0	9½
<i>K.subtilis</i>	0.1	14	6.8	6	0.4	12	5.0	6	0.2	14½	4.6	7	0.2	14	5.1	7
<i>S.hexaptera</i>	0.5	11	4.7	8	0.4	12	4.4	9	0.8	12	4.1	8	0.5	12	4.3	8
<i>S.bipunctata</i>	0.2	13	2.0	10	0.8	10	2.8	10	1.2	10	3.5	9	0.7	11	3.0	9½
<i>K.pacifica</i>	1.0	9	0.3	13	2.0	7	1.0	12	2.5	7½	1.8	11	1.8	7½	0.9	12
<i>S.rob/ferox</i>	1.9	7	2.2	9	1.4	8	1.1	11	0.5	13	0.9	12	1.4	9	1.2	11
<i>S.bedoti</i>	3.4	4	1.4	12	1.0	9	0.4	13½	1.0	11	0.01	15	1.8	7½	0.4	13
<i>E.hamata</i>	0.0	15½	0.5	14	0.1	14	0.4	13½	0.0	16	0.03	13½	0.05	15½	0.2	14
<i>S.pulchra</i>	0.0	15½	0.0	16	0.0	16	0.0	16	0.2	14½	0.0	16	0.05	15½	0.0	16
<i>S.planctonis</i>																
<i>S.maxima</i>																
Based on No.samples:	7		29		15		65		17		58		39		152	
No. individ- uals:	2210		1892		2700		6563		1301		6569		6211		15,024	

Table A2-4. Percentage-ranks of relative abundances of various species for N70V-nets. Neritic stations of summer survey.

	Durban 2		Port Shepstone 1		Port St. Johns 5		East London 8		Port Eliza. 11		Port Eliza. 12	
<i>S. enflata</i>	85.2	1	15.6	2½	68.5	1	95.4	1	15.7	2	52.1	1
<i>S. minima</i>	0.4	8	31.2	1	8.3	2	0.0	11½	0.0	11½	23.2	2
<i>S. serrato.</i>	0.2	9	13.0	4	3.8	5	0.9	4	0.0	11½	3.7	4
<i>P. draco</i>	0.7	6	5.2	6	4.9	3	0.0	11½	0.4	5	6.4	3
<i>S. friderici</i>	5.0	2½	5.2	6	2.5	7	0.0	11½	82.0	1	1.4	9
<i>S. decipiens</i>	0.0	13½	15.6	2½	0.0	14½	0.0	11½	0.0	11½	0.6	11½
<i>S. lyra</i>	0.0	13½	1.3	11	0.05	11	0.0	11½	0.0	11½	0.6	11½
<i>S. reg/neglecta</i>	0.9	5	2.6	8½	2.5	7	1.4	2	0.0	11½	1.6	8
<i>K. subtilis</i>	0.01	10	1.3	11	0.0	14½	0.0	11½	0.0	11½	0.2	13
<i>S. hexaptera</i>	0.6	7	2.6	8½	0.03	12	0.0	11½	0.0	11½	0.9	10
<i>S. bipunctata</i>	0.0	13½	0.0	14½	0.06	10	0.9	4	0.0	11½	0.0	15
<i>K. pacifica</i>	1.4	4	1.3	11	1.6	9	0.9	4	0.4	5	2.3	7
<i>S. rob/ferox</i>	0.0	13½	0.0	14½	2.5	7	0.5	6	1.1	3	3.5	5
<i>S. bedoti</i>	5.0	2½	5.2	6	4.1	4	0.0	11½	0.4	5	3.1	6
<i>E. hamata</i>	0.0	13½	0.0	14½	0.0	14½	0.0	11½	0.0	11½	0.0	15
<i>S. pulchra</i>	0.0	13½	0.0	14½	0.0	14½	0.0	11½	0.0	11½	0.0	15
<i>S. planctonis</i>												
<i>S. maxima</i>												
Based on No. samples:	1		1		1		1		1		2	
No. individuals:	701		77		445		213		262		512	

Table A2-5. Percentage-ranks of relative abundances of various species for N70V-nets. Neritic stations of autumn survey.

	Port Durban		Port Shep.		PortSt. Johns		Bashee		East London		Port Alfred		Port Eliza.		Port Eliza.		Cape Seal		Cape Seal		Cape Seal		Cape Seal	
<i>S. enflata</i>	646	1	461	1	740	1	736	1	690	1	488	1	52	2	541	1	151	2	286	1	413	1	569	1
<i>S. minima</i>	04	10	154	2½	09	7½	04	9½	00	14	00	11½	03	5	36	6	13	5	41	6	28	5	39	6
<i>S. serrato.</i>	18	5½	154	2½	36	4½	34	5	69	3	24	4½	10	4	91	4	00	12	65	5	59	3	78	2
<i>P. draco</i>	147	2	120	4	36	4½	43	4	09	9½	24	4½	02	6½	12	9	00	12	98	4	55	4	72	3
<i>S. friderici</i>	00	13½	00	13½	00	12½	59	2	09	9½	416	2	919	1	100	3	775	1	254	2	340	2	33	7
<i>S. decipiens</i>	00	13½	09	9½	00	12½	04	9½	00	14	00	11½	00	12	00	15	00	12	00	12½	00	14½	52	4½
<i>S. lyra</i>	00	13½	00	13½	00	12½	00	14	09	9½	00	11½	00	12	02	12	00	12	00	12½	00	14½	00	15½
<i>S. reg/neglecta</i>	103	3	26	6	89	2	55	3	103	2	24	4½	15	3	119	2	29	3	189	3	18	8½	52	4½
<i>K. subtilis</i>	15	7	00	13½	00	12½	00	14	09	9½	00	11½	00	12	02	12	00	12	00	12½	09	10½	13	11
<i>S. hexaptera</i>	11	8½	26	6	09	7½	04	9½	00	14	00	11½	00	12	00	15	00	12	00	12½	09	10½	13	11
<i>S. bipunctata</i>	22	4	09	9½	00	12½	00	14	52	4	00	11½	00	12	07	10	04	6½	00	12½	05	12	20	9
<i>K. pacifica</i>	11	8½	26	6	18	6	30	6	17	6	24	4½	02	6½	50	5	04	6½	33	7½	23	6½	26	8
<i>S. rob/ferox</i>	18	5½	00	13½	00	12½	26	7	17	6	00	11½	00	12	26	7	21	4	33	7½	18	8½	07	13½
<i>S. bedoti</i>	00	13½	17	8	63	3	04	9½	17	6	00	11½	00	12	17	8	00	12	00	12½	23	6½	13	11
<i>E. hamata</i>	00	13½	00	13½	00	12½	00	14	00	14	00	11½	00	12	02	12	00	12	00	12½	00	14½	07	13½
<i>S. pulchra</i>	00	13½	00	13½	00	12½	00	14	00	14	00	11½	00	12	00	15	00	12	00	12½	00	14½	00	15½
<i>S. planctonis</i>																								
<i>S. maxima</i>																								
Based on No. samples:	1		1		1		1		1		1		1		2		1		1		1		3	
No. individuals:	273		117		112		235		116		84		611		422		237		122		218		153	

Table A2-6. Percentage-ranks of relative abundances of various species for N70V-nets. Neritic stations of winter survey.

	Durban		Port Shep.		Port St. Johns		Bashee		East London		Port Alfred		Port Alfred		Port Eliza.		Port Eliza.		Cape Seal		Cape Seal		Cape Seal		Cape Seal	
<i>S. enflata</i>	489	1	650	1	846	1	734	1	540	1	580	1	278	2	239	2	258	1½	00	9½	101	2	235	2	367	1
<i>S. minima</i>	00	13½	100	2½	00	11	00	10	117	3½	00	10	60	5	16	4	226	3	09	2	33	3	412	1	115	3
<i>S. serrato.</i>	61	4	50	5	58	2½	67	3	58	5	00	10	280	1	11	5	129	4	00	9½	00	10	118	3½	144	2
<i>P. draco</i>	26	6	50	5	00	11	00	10	00	11	00	10	31	7	00	12	32	6½	00	9½	00	10	59	5½	79	5
<i>S. friderici</i>	30	5	00	11½	58	2½	00	10	176	2	322	2	08	12	682	1	258	1½	984	1	865	1	00	11½	94	4
<i>S. decipiens</i>	00	13½	00	11½	00	11	00	10	00	11	00	10	142	3	00	12	00	12½	00	9½	00	10	00	11½	00	14½
<i>S. lyra</i>	00	13½	00	11½	00	11	00	10	117	3½	00	10	34	6	00	12	00	12½	00	9½	00	10	00	11½	14	11
<i>S. reg/neg.</i>	279	2	100	2½	20	4½	00	10	00	11	97	3	93	4	38	3	32	6½	00	9½	00	10	118	3½	65	6
<i>K. subtilis</i>	00	13½	00	11½	00	11	00	10	00	11	00	10	00	15	05	6½	32	6½	00	9½	00	10	00	11½	00	14½
<i>S. hexaptera</i>	04	10	00	11½	20	4½	00	10	00	11	00	10	13	11	00	12	32	6½	00	9½	00	10	00	11½	14	11
<i>S. bipunctata</i>	21	7	00	11½	00	11	00	10	00	11	00	10	23	8½	00	12	00	12½	00	9½	00	10	00	11½	14	11
<i>K. pacifica</i>	64	3	00	11½	00	11	00	10	00	11	00	10	23	8½	05	6½	00	12½	00	9½	00	10	59	5½	51	7
<i>S. rob/ferox</i>	13	8½	00	11½	00	11	00	10	00	11	00	10	06	13	00	12	00	12½	00	9½	00	10	00	11½	22	8½
<i>S. bedoti</i>	13	8½	50	5	00	11	00	10	00	11	00	10	16	10	00	12	00	12½	00	9½	00	10	00	11½	22	8½
<i>E. hamata</i>	00	13½	00	11½	00	11	00	10	00	11	00	10	00	15	00	12	00	12½	00	9½	00	10	00	11½	00	14½
<i>S. puclhra</i>	00	13½	00	11½	00	11	200	2	00	11	00	10	00	15	00	12	00	12½	00	9½	00	10	00	11½	00	14½
Based on																										
No. samples:	1		1		1		1		1		1		3		1		1		1		1		1		3	
No. individuals:	233		20		52		15		17		31		386		184		31		117		59		17		139	

Table A2-7. Percentage-ranks of relative abundances of various species for N70V-nets. All oceanic stations of summer survey.

	Durban		Port St. Johns		East London		Port Eliza.	
S.enflata	47.7	1	48.6	1	11.2	4	11.2	4
S.minima	0.9	10	9.7	3	21.2	1	20.7	2
S.serrato.	9.9	3	6.9	4	19.7	2	21.0	1
P.draco	12.4	2	13.0	2	13.7	3	9.0	7
S.friderici	0.0	14	0.5	12	0.0	15½	0.3	11½
S.decipiens	4.7	7	1.9	9	8.7	5	11.4	3
S.lyra	5.6	5½	0.0	14½	2.7	11	9.4	5
S.reg/neglecta	3.0	8	1.4	10	3.5	9	0.3	11½
K.subtilis	8.6	4	0.9	11	4.2	8	9.1	6
S.hexaptera	5.6	5½	5.6	5	4.8	6½	4.2	8
S.bipunctata	0.0	14	2.8	8	4.8	6½	0.7	10
K.pacifica	0.4	11	0.0	14½	0.6	13	0.0	14½
S.rob/ferox	1.5	9	3.7	7	1.7	12	2.4	9
S.bedoti	0.0	14	5.1	6	3.1	10	0.0	14½
E.hamata	0.0	14	0.0	14½	0.2	14	0.0	14½
S.pulchra	0.0	14	0.0	14½	0.0	15½	0.0	14½
S.planctonis								
S.maxima								
Based on No.samples:	6		5		6		12	
No. individ- uals:	233		216		519		924	

Table A2-8. Percentage-ranks of relative abundances of various species for N70V-nets. All oceanic stations of autumn survey.

	Durban		P. Shepstone		P. St. Johns		Bashee		E. London		P. Alfred		P. Elizabeth	
<i>S. enflata</i>	28.8	1	23.6	1	20.0	1	16.7	1	13.8	4	10.4	4	6.5	6
<i>S. minima</i>	24.6	2	17.9	2	16.7	3	11.9	5	15.0	3	24.8	1	28.5	1
<i>S. serrato.</i>	9.4	4	11.2	4	16.9	2	15.7	2	18.6	1	17.7	3	21.6	2
<i>P. draco</i>	12.0	3	16.5	3	12.0	4	12.5	4	8.0	5	6.0	6	9.0	4
<i>S. friderici</i>	0.0	15	0.0	15½	0.0	15½	0.0	15½	0.0	15½	0.7	10	0.0	15½
<i>S. decipiens</i>	5.5	5	9.2	5	10.9	5	12.7	3	18.4	2	18.4	2	10.9	3
<i>S. lyra</i>	2.9	9	3.1	9	4.8	7	6.2	8	3.1	9	5.1	7	7.9	5
<i>S. reg/neglecta</i>	3.4	7	4.6	7	3.8	8½	6.3	7	3.9	8	0.7	11	1.8	9
<i>K. subtilis</i>	3.4	7	3.9	8	5.1	6	6.5	6	6.7	6	8.8	5	4.5	8
<i>S. hexaptera</i>	3.4	7	5.9	6	2.9	10	5.4	9	2.8	10	4.7	8	5.9	7
<i>S. bipunctata</i>	2.2	11	2.5	10	3.8	8½	3.2	10	6.1	7	0.5	12½	1.5	10
<i>K. pacifica</i>	2.5	10	0.4	12	1.3	11	0.3	12½	0.9	12	0.2	14	0.6	12
<i>S. rob/ferox</i>	1.1	12	1.1	11	1.0	12	2.2	11	0.8	14	0.5	12½	0.9	11
<i>S. bedoti</i>	0.9	13	0.09	13½	0.4	13½	0.3	12½	0.9	12	0.0	15½	0.09	14
<i>E. hamata</i>	0.0	15	0.09	13½	0.4	13½	0.2	14	0.9	12	1.6	9	0.2	13
<i>S. pulchra</i>	0.0	15	0.0	15½	0.0	15½	0.0	15½	0.0	15½	0.0	15½	0.0	15½
<i>S. planctonis</i>														
<i>S. maxima</i>														
Based on	8		9		9		9		9		9		12	
No. samples:														
No. individuals:	1309		1076		1249		631		639		570		1089	

Table A2-9. Percentage-ranks of relative abundances of various species for N70V-nets. All oceanic stations of winter survey.

	Durban	P. Shepstone	P. St. Johns	Bashee	E. London	P. Alfred	P. Elizabeth							
S. enflata	18.1	1	15.4	2	9.0	4	11.0	3	13.5	3	8.4	5	14.9	3
S. minima	11.8	4	26.2	1	31.3	1	33.8	1	36.4	1	20.6	2	29.0	1
S. serrato.	17.8	2	14.8	3	30.3	2	15.6	2	19.3	2	26.2	1	17.3	2
P. draco	5.8	7½	6.6	6	9.6	3	8.3	5	8.7	4	9.4	4	8.5	4
S. friderici	0.2	14	0.0	14½	0.0	15	0.1	13	0.0	14½	0.0	13½	0.0	15
S. decipiens	17.2	3	6.2	8	3.1	9	6.8	7	4.8	5	21.5	3	2.8	10
S. lyra	5.8	7½	8.2	5	4.0	5	10.3	4	4.1	6	4.7	6	6.9	5
S. reg/neglecta	6.0	6	2.2	10	1.1	10	2.8	9	3.0	8	1.9	9½	4.0	8
K. subtilis	3.9	9	6.3	7	3.6	6½	7.5	6	2.3	10	2.8	7½	5.1	7
S. hexaptera	3.7	10	4.3	9	3.3	8	2.9	8	2.9	9	2.8	7½	6.1	6
S. bipunctata	6.8	5	9.1	4	3.6	6½	0.3	10½	3.6	7	0.0	13½	0.7	12
K. pacifica	1.9	11	0.5	11	0.9	11	0.3	10½	1.4	11	0.0	13½	1.5	11
S. rob/ferox	0.2	14	0.1	12	0.3	12	0.0	15½	0.2	12	1.9	9½	3.0	9
S. bedoti	0.4	12	0.0	14½	0.2	13	0.1	13	0.0	14½	0.0	13½	0.2	13
E. hamata	0.2	14	0.0	14½	0.0	15	0.1	13	0.0	14½	0.0	13½	0.0	15
S. pulchra	0.0	16	0.0	14½	0.0	15	0.0	15½	0.0	14½	0.0	13½	0.0	15
S. planctonis														
S. maxima														
Based on No. samples:	8	8	8	9	8	5	12							
No. individ- uals:	482	940	1597	691	1099	107	1653							

Table A2-10. Percentage-ranks of relative abundances of various species for N100B-nets.
All stations.

	Summer Survey				Autumn Survey				Winter Survey				All Surveys			
	Neritic		Oceanic		Neritic		Oceanic		Neritic		Oceanic		Neritic		Oceanic	
<i>S.enflata</i>	54.3	1	36.2	1	41.0	1	21.8	2	63.5	1	20.2	3	53.7	1	22.3	1
<i>S.minima</i>	0.4	10	1.7	10	0.7	10	6.8	6	2.1	7½	4.6	5	1.1	9½	5.6	6
<i>S.serrato.</i>	4.2	6½	7.1	5	5.5	4	13.0	4	15.5	2	26.5	1	8.9	3	18.1	3
<i>P.draco</i>	4.6	5	15.9	2	4.4	5	23.0	1	3.4	3	20.5	2	4.1	6	21.6	2
<i>S.friderici</i>	7.0	4	2.0	9	30.8	2	0.2	13	1.5	9	0.3	13	11.7	2	0.4	12½
<i>S.decipiens</i>	0.2	11½	1.4	11	0.9	9	0.8	11	0.7	12	0.5	10	0.6	11	0.7	11
<i>S.lyra</i>	0.0	14½	4.2	7	0.2	11½	2.9	8	1.0	10	3.4	7	0.5	12½	3.2	9
<i>S.reg/neglecta</i>	0.0	14½	0.0	15½	0.0	14½	0.04	14	0.7	12	0.2	14	0.3	14	0.1	14
<i>K.subtilis</i>	0.6	9	2.8	8	0.0	14½	2.8	9	0.7	12	4.3	6	0.5	12½	3.4	8
<i>S.hexaptera</i>	4.2	6½	13.1	3	1.8	8	13.7	3	2.1	7½	12.4	4	2.7	7	13.2	4
<i>S.bipunctata</i>	1.6	8	6.5	6	2.5	7	9.5	5	3.3	4	3.3	8	2.5	8	6.8	5
<i>K.pacifica</i>	0.2	11½	0.3	13	0.2	11½	0.4	12	2.4	6	0.4	11½	1.1	9½	0.4	12½
<i>S.rob/ferox</i>	12.0	2	7.2	4	8.7	3	4.2	7	0.2	14½	3.0	9	6.5	4	3.9	7
<i>S.bedoti</i>	11.6	3	1.3	12	3.2	6	1.0	10	2.7	5	0.4	11½	5.8	5	0.8	10
<i>E.hamata</i>	0.0	14½	0.0	15½	0.0	14½	0.0	15½	0.2	14½	0.0	15½	0.07	15	0.01	16
<i>S.pulchra</i>	0.0	14½	0.6	14	0.0	14½	0.0	15½	0.0	16	0.0	15½	0.0	16	0.07	15
<i>S.planctonis</i>																
<i>S.maxima</i>																
Based on No.samples:	1		8		3		22		3		21		7		51	
No. individ- uals:	498		1003		436		7142		583		5451		1517		13596	

Table A2-11. Percentage-ranks of relative abundances of various species for N100B-nets. All oceanic stations of Summer Survey

	Durban		Port St. Johns		Port Elizabeth	
<i>S. enflata</i>	43.9	1	66.3	1	17.8	2
<i>S. minima</i>	0.4	13	0.0	12	3.1	9
<i>S. serrato.</i>	1.3	10	1.6	7	12.4	4
<i>P. draco</i>	12.8	3	4.4	5	22.8	1
<i>S. friderici</i>	3.0	7½	2.8	6	1.2	12
<i>S. decipiens</i>	0.0	15	0.0	12	2.7	10
<i>S. lyra</i>	3.0	7½	0.0	12	6.8	6
<i>S. reg/neglecta</i>	0.0	15	0.0	12	0.0	15
<i>K. subtilis</i>	3.4	6	0.0	12	3.9	8
<i>S. hexaptera</i>	18.7	2	6.0	4	13.9	3
<i>S. bipunctata</i>	4.2	5	6.3	3	7.6	5
<i>K. pacifica</i>	0.9	11½	0.0	12	0.2	13
<i>S. rob/ferox</i>	5.5	4	12.7	2	5.4	7
<i>S. bedoti</i>	0.9	11½	0.0	12	2.1	11
<i>E. hamata</i>	0.0	15	0.0	12	0.0	15
<i>S. pulchra</i>	2.6	9	0.0	12	0.0	15
<i>S. planctonis</i>						
<i>S. maxima</i>						
Based on No. samples:	2		2		4	
No. individuals:	235		252		516	

Table A2-12. Percentage-ranks of relative abundances of various species for NIOOB-nets. All oceanic stations of autumn survey.

	Durban		Port Shepstone		Port St. Johns		Bashee		East London		Port Alfred		Port Elizabeth	
<i>S. enflata</i>	29.4	1	16.8	2	35.3	1	20.0	2	24.2	1	17.6	2	14.8	4
<i>S. minima</i>	4.0	6	18.9	1	1.9	9	2.8	7	6.1	6	6.7	5	5.4	6
<i>S. serrato.</i>	8.4	4	16.0	3	9.4	4	13.9	4	9.7	4	11.7	4	18.8	1
<i>P. draco</i>	26.6	2	11.8	6	22.8	2	25.9	1	20.6	2	35.9	1	18.2	2
<i>S. friderici</i>	0.2	14	0.3	9	0.0	14½	0.7	10	0.1	12½	0.08	12	0.0	14½
<i>S. decipiens</i>	0.2	14	0.0	13½	1.2	10	0.4	11	3.9	9	0.0	14½	0.6	10
<i>S. lyra</i>	2.2	9	0.0	13½	2.5	6½	3.2	6	5.5	8	1.7	9	5.1	7
<i>S. reg/neglecta</i>	0.2	14	0.0	10	0.0	14½	0.0	14½	0.0	15	0.0	14½	0.0	14½
<i>K. subtilis</i>	1.4	10	0.0	13½	2.1	8	1.9	8	7.9	5	2.2	7½	4.6	8
<i>S. hexaptera</i>	11.9	3	7.1	7	16.5	3	12.4	5	14.9	3	17.5	3	15.3	3
<i>S. bipunctata</i>	8.3	5	14.4	4	5.2	5	16.2	3	5.8	7	3.5	6	12.6	5
<i>K. pacifica</i>	0.6	11	0.0	13½	0.6	12	0.3	12	0.1	12½	0.3	11	0.5	11
<i>S. rob/ferox</i>	3.1	8	13.8	5	2.5	6½	1.4	9	1.0	10	2.2	7½	3.6	9
<i>S. bedoti</i>	3.3	7	0.6	8	0.9	11	0.0	14½	0.3	11	0.8	10	0.3	12
<i>E. hamata</i>	0.0	16	0.0	13½	0.0	14½	0.0	14½	0.0	15	0.0	14½	0.0	14½
<i>S. pulchra</i>	0.3	12	0.0	13½	0.0	14½	0.0	14½	0.0	15	0.0	14½	0.0	14½
<i>S. planctonis</i>														
<i>S. maxima</i>														
Based on No. samples:	3		3		3		3		3		3		4	
No. individuals:	1150		1055		801		715		787		1187		1447	

Table A2-13. Percentage-ranks of relative abundances of various species for N100B-nets. All oceanic stations for winter survey.

	Durban		Port Shepatone		Port St. Johns		Bashee		East London		Port Alfred		Port Elizabeth	
<i>S. enflata</i>	25.8	1	20.9	2	13.0	3	17.0	3	22.1	1½	14.2	2	22.2	2
<i>S. minima</i>	2.7	7	8.3	5	8.6	5	2.6	9	8.8	5	2.7	9	2.6	8
<i>S. serrato.</i>	25.6	2	15.5	4	35.2	1	29.9	1	22.1	1½	34.5	1	27.8	1
<i>P. draco</i>	22.0	3	22.2	1	21.4	2	22.1	2	15.7	3	13.6	3	22.0	3
<i>S. friderici</i>	0.0	15	0.7	9½	0.0	13	0.2	12	0.1	13	0.5	10½	0.3	11
<i>S. decipiens</i>	0.5	12	0.0	15	0.0	13	0.0	14½	0.4	10½	5.9	6	0.0	15
<i>S. lyra</i>	0.7	10	4.0	8	2.0	7½	5.1	5	3.9	9	8.8	5	1.6	9
<i>S. reg/neglecta</i>	0.5	12	0.1	12½	0.0	13	0.0	14½	0.0	15	0.0	14	0.3	12
<i>K. subtilis</i>	3.0	6	4.6	6	3.5	6	4.0	6	5.6	6	5.4	7	4.1	5
<i>S. hexaptera</i>	10.7	4	18.2	3	12.7	4	11.9	4	12.2	4	10.7	4	11.4	4
<i>S. bipunctata</i>	4.4	5	4.3	7	2.0	7½	2.8	8	4.3	7½	0.5	10½	3.1	7
<i>K. pacifica</i>	0.5	12	0.1	12½	0.0	13	0.3	11	0.4	10½	0.0	14	0.8	10
<i>S. rob/ferox</i>	1.5	9	0.7	9½	1.7	9	3.7	7	4.3	7½	3.2	8	3.5	6
<i>S. bedoti</i>	2.0	8	0.3	11	0.0	13	0.5	10	0.3	12	0.0	14	0.1	13
<i>E. hamata</i>	0.0	15	0.0	15	0.0	13	0.0	14½	0.0	15	0.0	14	0.0	15
<i>S. pulchra</i>	0.0	15	0.0	15	0.0	13	0.0	14½	0.0	15	0.0	14	0.0	15
<i>S. planctonis</i>														
<i>S. maxima</i>														
Based on No. samples:	3		3		3		3		3		2		4	
No. individuals:	596		677		347		1097		771		374		1589	

Table A2-14. Percentage-ranks of relative abundances of various species for N100H-nets.
All stations.

	Summer Survey				Autumn Survey				Winter Survey				All Surveys			
	Neritic		Oceanic		Neritic		Oceanic		Neritic		Oceanic		Neritic		Oceanic	
<i>S.enflata</i>	80.5	1	49.9	1	55.0	1	26.6	1	56.9	1	31.5	1	58.6	1	31.0	1
<i>S.minima</i>	0.0	13	0.0	14½	0.03	9	0.1	11½	0.3	11	1.6	8	0.6	9	0.09	11
<i>S.serrato.</i>	0.9	5½	4.7	5	4.5	3	15.0	4	6.9	3	31.4	2	4.8	3	18.4	2
<i>P.draco</i>	0.7	7	12.5	3	3.2	6	19.9	3	1.3	5½	9.7	4	2.2	6	16.2	4
<i>S.friderici</i>	6.7	3	2.4	7	26.6	2	0.6	7	26.9	2	1.8	7	24.0	2	1.2	7
<i>S.decipiens</i>	0.0	13	0.0	14½	0.0	14½	0.05	13½	1.2	7	0.02	10½	0.4	10	0.08	12
<i>S.lyra</i>	0.0	13	0.1	11	0.0	14½	0.1	11½	0.0	16½	0.01	13	0.0	16½	0.01	15
<i>S.reg/neglecta</i>	0.0	13	0.0	14½	0.0	14½	0.03	15	0.2	13	0.01	13	0.05	14	0.03	13½
<i>K.subtilis</i>	0.0	13	0.3	8½	0.0	14½	0.5	8½	0.3	11	0.01	13	0.09	13	0.3	10
<i>S.hexaptera</i>	0.0	13	2.5	6	1.9	7	8.9	5	1.3	5½	8.4	5	1.5	7	8.0	5
<i>S.bipunctata</i>	2.1	4	17.0	2	3.3	5	20.6	2	3.3	4	11.5	3	3.1	5	17.8	3
<i>K.pacifica</i>	0.1	8	0.3	8½	0.02	10½	0.4	10	0.3	11	0.9	9	0.2	11	0.5	8
<i>S.rob/ferox</i>	8.1	2	9.9	4	4.4	4	6.5	6	0.6	8½	2.4	6	3.6	4	5.8	6
<i>S.bedoti</i>	0.9	5½	0.5	10	0.8	8	0.5	8½	0.6	8½	0.02	10½	0.7	8	0.4	9
<i>E.hamata</i>	0.0	13	0.0	14½	0.02	10½	0.0	16½	0.1	14½	0.0	16	0.1	12	0.0	16½
<i>S.pulchra</i>	0.0	13	0.0	14½	0.0	14½	0.05	13½	0.0	16½	0.0	16	0.0	16½	0.03	13½
<i>S.planctonis</i>	0.0	13	0.0	14½	0.0	14½	0.0	16½	0.1	14½	0.0	16	0.01	15	0.0	16½
<i>S.maxima</i>																
Based on No.samples:	5		8		12		20		12		19		29		47	
No. individ- uals:	745		760		3138		3829		1811		1744		5721		6306	

Table A2-15. Percentage-ranks of relative abundances of various species for N100H-nets.
 Neritic stations of summer survey.

	Durban		Port St. Johns		East London		Port Elizabeth-1		Port Elizabeth-2	
<i>S. enflata</i>	92.4	1	57.1	1	100.0	1	7.5	2	59.0	1
<i>S. minima</i>	0.0	10½	0.0	12½	0.0	9½	0.0	10	0.0	12
<i>S. serrato.</i>	0.0	10½	6.3	4½	0.0	9½	0.0	10	1.0	6
<i>P. draco</i>	0.0	10½	1.6	6½	0.0	9½	0.0	10	1.4	5
<i>S. friderici</i>	7.2	2	7.9	3	0.0	9½	0.0	10	10.0	3
<i>S. decipiens</i>	0.0	10½	0.0	12½	0.0	9½	0.0	10	0.0	12
<i>S. lyra</i>	0.0	10½	0.0	12½	0.0	9½	0.0	10	0.0	12
<i>S. reg/neglecta</i>	0.0	10½	0.0	12½	0.0	9½	0.0	10	0.0	12
<i>K. subtilis</i>	0.0	10½	0.0	12½	0.0	9½	0.0	10	0.0	12
<i>S. hexaptera</i>	0.0	10½	0.0	12½	0.0	9½	0.0	10	0.0	12
<i>S. bipunctata</i>	0.0	10½	6.3	4½	0.0	9½	92.5	1	0.0	12
<i>K. pacifica</i>	0.0	10½	1.6	6½	0.0	9½	0.0	10	0.0	12
<i>S. rob/ferox</i>	0.5	3	19.1	2	0.0	9½	0.0	10	16.7	2
<i>S. bedoti</i>	0.0	10½	0.0	12½	0.0	9½	0.0	10	2.7	4
<i>E. hamata</i>										
<i>S. pulchra</i>	0.0	10½	0.0	12½	0.0	9½	0.0	10	0.0	12
<i>S. planctonis</i>	0.0	10½	0.0	12½	0.0	9½	0.0	10	0.0	12
<i>S. maxima</i>	0.0	10½	0.0	12½	0.0	9½	0.0	10	0.0	12
Based on No. samples:	1		1		1		1		1	
No. individuals:	220		63		159		13		290	

Table A2-16. Percentage-ranks of relative abundances of various species for N100H-nets. Neritic stations of autumn survey.

	Durban		Port Shep.		PortSt. Johns		Bashee		East London		Port Alfred		Port Eliza.		Port Eliza.		Cape Seal		Cape Seal		Cape Seal		Cape Seal	
<i>S.enflata</i>	675	1	567	1	906	1	625	1	810	1	368	2	48	2	787	1	358	2	88	2	383	2	68	5
<i>S.minima</i>	04	8	00	13	00	13	00	13	00	11	00	11½	00	11½	00	12½	00	10½	00	12	00	12½	00	12½
<i>S.serrato.</i>	31	5	202	2	01	7½	39	5½	10	4	00	11½	02	5	50	3	00	10½	05	5½	24	6	27	6½
<i>P.draco</i>	82	3½	82	3	16	5	63	3½	00	11	00	11½	02	5	12	7	00	10½	00	12	44	4	00	12½
<i>S.friderici</i>	07	7	00	13	01	7½	31	7	00	11	477	1	942	1	58	2	632	1	876	1	453	1	384	1
<i>S.decipiens</i>	00	13	00	13	00	13	00	13	00	11	00	11½	00	11½	00	12½	00	10½	00	12	00	12½	00	12½
<i>S.lyra</i>	00	13	00	13	00	13	00	13	00	11	00	11½	00	11½	00	12½	00	10½	00	12	00	12½	00	12½
<i>S.reg/neglecta</i>	00	13	00	13	00	13	00	13	00	11	00	11½	00	11½	00	12½	00	10½	00	12	00	12½	00	12½
<i>K.subtilis</i>	00	13	00	13	00	13	00	13	00	11	00	11½	00	11½	00	12½	00	10½	00	12	00	12½	00	12½
<i>S.hexaptera</i>	82	3½	49	5	13	4	39	5½	00	11	53	4	00	11½	00	12½	00	10½	05	5½	00	12½	27	6½
<i>S.bipunctata</i>	100	2	31	6	27	3	63	3½	00	11	53	4	05	3	39	4	00	10½	00	12	30	5	137	3
<i>K.pacifica</i>	00	13	00	13	00	13	00	13	00	11	00	11½	00	11½	19	6	00	10½	00	12	00	12½	00	12½
<i>S.rob/ferox</i>	19	6	53	4	31	2	133	2	140	2	53	4	02	5	35	5	10	3	14	3½	50	3	274	2
<i>S.bedoti</i>	00	13	04	8	03	6	08	8	50	3	00	11½	00	11½	00	12½	00	10½	14	3½	17	7	82	4
<i>E.hamata</i>																								
<i>S.pulchra</i>	00	13	12	7	00	13	00	13	00	11	00	11½	00	11½	00	12½	00	10½	00	12	00	12½	00	12½
<i>S.planctonis</i>	00	13	00	13	00	13	00	13	00	11	00	11½	00	11½	00	12½	00	10½	00	12	00	12½	00	12½
<i>S.maxima</i>	00	13	00	13	00	13	00	13	00	11	00	11½	00	11½	00	12½	00	10½	00	12	00	12½	00	12½
Based on No.samples:	1		1		1		1		1		1		1		1		1		1		1		1	
No. individ- uals:	257		511		764		128		101		19		416		259		95		217		298		73	

Table A2-17. Percentage-ranks of relative abundances of various species for N100H-nets. Neritic stations of winter survey.

	Durban		Port Shep.		Port St. Johns		Bashee		East London		Port Alfred		Port Alfred		Port Eliza.		Port Eliza.		Cape Seal		Cape Seal		Cape Seal	
<i>S.enflata</i>	525	1	946	1	656	1	263	2	391	2	610	1	710	1	103	2	538	1	400	1	250	2	704	1
<i>S.minima</i>	00	13	06	6	00	13	00	11½	17	5½	00	11½	00	12	00	10½	00	12	00	12	00	12	00	13½
<i>S.serrato.</i>	59	4	21	2	10	6	158	3	408	1	73	4	226	2	00	10½	26	4	200	3	00	12	98	2
<i>P.draco</i>	25	6	04	4½	00	13	00	11½	104	3	25	5	08	6	00	10½	00	12	200	3	00	12	13	7
<i>S.friderici</i>	68	3	00	13	156	2	00	11½	00	12½	146	2½	24	3	895	1	385	2	200	3	475	1	49	4
<i>S.decepiens</i>	00	13	00	13	135	3	421	1	00	12½	00	11½	00	12	00	10½	00	12	00	12	00	12	00	13½
<i>S.lyra</i>	00	13	00	13	00	13	00	11½	00	12½	00	11½	00	12	00	10½	00	12	00	12	00	12	00	13½
<i>S.reg/neglecta</i>	17	7	00	13	00	13	00	11½	00	12½	00	11½	00	12	00	10½	00	12	00	12	25	5½	00	13½
<i>K.subtilis</i>	09	8	00	13	10	6	00	11½	17	5½	00	11½	00	12	00	10½	26	4	00	12	00	12	00	13½
<i>S.hexaptera</i>	42	5	02	7½	10	6	53	5	52	4	00	11½	16	4½	00	10½	06	6	00	12	25	5½	27	5½
<i>S.bipunctata</i>	254	2	04	4½	00	13	00	11½	00	12½	146	2½	00	12	00	10½	00	12	00	12	175	3	67	3
<i>K.pacifica</i>	00	13	00	13	00	13	00	11½	00	12½	00	11½	16	4½	02	3	26	4	00	12	00	12	09	8½
<i>S.rob/ferox</i>	00	13	02	7½	10	6	00	11½	00	12½	00	11½	00	12	00	10½	00	12	00	12	50	4	27	5½
<i>S.bedoti</i>	00	13	15	3	00	13	00	11½	09	7	00	11½	00	12	00	10½	00	12	00	12	00	12	09	8½
<i>E.hamata</i>																								
<i>S.pulchra</i>	00	13	00	13	00	13	105	4	00	12½	00	11½	00	12	00	10½	00	12	00	12	00	12	00	13½
<i>S.planctonis</i>	00	13	00	13	00	13	00	11½	00	12½	00	11½	00	12	00	10½	00	12	00	12	00	12	00	13½
<i>S.maxima</i>	00	13	00	13	10	6	00	11½	00	12½	00	11½	00	12	00	10½	00	12	00	12	00	12	00	13½
Based on No.samples:	1		1		1		1		1		1		1		1		1		1		1		1	
No. individ- uals:	118		531		96		19		115		41		124		458		39		5		40		225	

Table A2-18. Percentage-ranks of relative abundances of various species for N100H-nets. All oceanic stations of summer survey.

	Durban		Port St. Johns		East London	P. Elizabeth		
<i>S. enflata</i>	75.0	1	54.1	1	11.8	2½	54.5	1
<i>S. minima</i>	0.0	11	0.0	13	0.0	12½	0.0	14
<i>S. serrato.</i>	1.0	4	1.9	7	11.8	2½	8.1	4
<i>P. draco</i>	0.0	11	23.1	2	4.7	5	1.8	6
<i>S. friderici</i>	0.0	11	3.8	5	2.4	6½	0.6	9
<i>S. decipiens</i>	0.0	11	0.0	13	0.0	12½	0.0	14
<i>S. lyra</i>	0.0	11	0.0	13	0.0	12½	0.6	9
<i>S. reg/neglecta</i>	0.0	11	0.0	13	0.0	12½	0.0	14
<i>K. subtilis</i>	0.0	11	0.0	13	0.0	12½	1.3	7
<i>S. hexaptera</i>	0.0	11	4.0	4	0.0	12½	2.5	5
<i>S. bipunctata</i>	19.0	2	2.4	6	61.4	1	14.4	3
<i>K. pacifica</i>	0.0	11	0.5	8	0.0	12½	0.0	14
<i>S. rob/ferox</i>	5.0	3	10.2	3	5.5	4	15.6	2
<i>S. bedoti</i>	0.0	11	0.0	13	2.4	6½	0.6	9
<i>E. hamata</i>								
<i>S. pulchra</i>	0.0	11	0.0	13	0.0	12½	0.0	14
<i>S. planctonis</i>	0.0	11	0.0	13	0.0	12½	0.0	14
<i>S. maxima</i>	0.0	11	0.0	13	0.0	12½	0.0	14
Based on No. samples:	1		2		2		3	
No. individuals:	100		373		127		160	

Table A2-19. Percentage-ranks of relative abundances of various species for N100H-nets. All oceanic stations of autumn survey.

	Durban	P. Shepstone		Port St. Johns		Bashee		East London		Port Alfred		Port Elizabeth		
S. enflata	34.8	2	18.5	3	47.4	1	28.3	1½	41.0	1	61.3	1	9.7	4
S. minima	0.0	14½	0.0	13½	0.0	14	0.0	13	0.0	14	0.5	9	0.3	10½
S. serrato.	6.5	4	17.9	4	10.5	4	7.2	6	12.2	4	1.0	8	24.2	2
P. draco	3.0	6	21.4	1	4.9	6	15.2	3	12.4	3	15.8	2	35.0	1
S. friderici	1.1	7	0.0	13½	0.2	9	1.9	7	0.0	14	2.4	6	0.3	10½
S. decipiens	0.2	10½	0.0	13½	0.2	9	0.0	13	0.0	14	0.0	13½	0.0	15
S. lyra	0.0	14½	0.0	13½	0.0	14	0.0	13	0.3	9	0.0	13½	0.3	10½
S. reg/neglecta	0.2	10½	0.0	13½	0.0	14	0.0	13	0.0	14	0.0	13½	0.0	15
K. subtilis	0.0	14½	3.8	7	0.0	14	0.0	13	0.3	9	0.0	13½	0.3	10½
S. hexaptera	3.6	5	21.1	2	11.2	3	10.7	4	9.3	5	11.0	3	7.1	5
S. bipunctata	41.8	1	11.0	5	18.8	2	28.3	1½	20.4	2	2.9	5	14.8	3
K. pacifica	0.0	14½	0.3	9	0.2	9	0.0	13	0.3	9	1.4	7	0.6	7½
S. rob/ferox	8.2	3	5.3	6	6.5	5	8.0	5	3.4	6	3.8	4	6.9	6
S. bedoti	0.3	8½	0.6	8	0.4	7	0.5	8	0.5	7	0.0	13½	0.6	7½
E. hamata														
S. pulchra	0.0	14½	0.0	13½	0.0	14	0.0	13	0.0	14	0.0	13½	0.0	15
S. planctonis	0.3	8½	0.0	13½	0.0	14	0.0	13	0.0	14	0.0	13½	0.0	15
S. maxima	0.0	14½	0.0	13½	0.0	14	0.0	13	0.0	14	0.0	13½	0.0	15
Based on No. samples:	3	2		3		3		3		2		4		
No. individ- uals:	633	318		447		375		378		209		1469		

Table A2-20. Percentage-ranks of relative abundances of various species for NIOOH-nets. All oceanic stations of winter survey.

	Durban		Port Shepatone		Port St.Johns		Bashee		East London		Port Alfred		Port Elizabeth	
<i>S.enflata</i>	41.0	1	38.3	1	27.6	2	39.5	1	15.0	3	26.7	2	31.4	1
<i>S.minima</i>	0.0	13	0.0	13	0.0	13	4.3	6	0.0	12½	1.1	7	4.4	5
<i>S.serrato.</i>	18.8	2	18.2	2	48.1	1	20.4	2	13.0	4	45.7	1	22.9	3
<i>P.draco</i>	9.0	5	7.5	5	4.6	5	9.9	4	0.0	12½	7.8	4	26.5	2
<i>S.friderici</i>	2.5	6	0.5	7½	0.0	13	3.0	7	19.0	2	0.0	13½	0.0	14
<i>S.decipiens</i>	0.0	13	0.0	13	0.0	13	0.0	14	0.0	12½	0.8	8	0.0	14
<i>S.lyra</i>	0.0	13	0.0	13	0.3	8	0.0	14	0.0	12½	0.0	13½	0.0	14
<i>S.reg/neglecta</i>	0.0	13	0.0	13	0.0	13	0.0	14	0.0	12½	0.3	9	0.0	14
<i>K.subtilis</i>	0.0	13	0.0	13	0.0	13	0.0	14	0.0	12½	0.0	13½	0.4	10
<i>S.hexaptera</i>	10.7	4	17.3	3	9.4	3	7.6	5	4.0	5½	3.6	5½	8.0	4
<i>S.bipunctata</i>	16.4	3	13.6	4	7.6	4	11.2	3	44.0	1	10.0	3	3.2	6
<i>K.pacifica</i>	0.8	7½	0.5	7½	0.7	7	2.6	8	2.0	7	0.0	13½	0.8	8½
<i>S.rob/ferox</i>	0.8	7½	4.2	6	1.8	6	1.3	9	4.0	5½	3.6	5½	1.6	7
<i>S.bedoti</i>	0.0	13	0.0	13	0.0	13	0.3	10	0.0	12½	0.0	13½	0.0	8½
<i>E.hamata</i>														
<i>S.pulchra</i>	0.0	13	0.0	13	0.0	13	0.0	14	0.0	12½	0.0	13½	0.0	14
<i>S.planctonis</i>	0.0	13	0.0	13	0.0	13	0.0	14	0.0	12½	0.0	13½	0.0	14
<i>S.maxima</i>	0.0	13	0.0	13	0.0	13	0.0	14	0.0	12½	0.0	13½	0.0	14
Based on No.samples:	3		3		3		3		3		2		2	
No. individ- uals:	122		214		395		304		101		359		249	

Table A2-21. Standing crop of zooplankton expressed in ml. plankton displacement volumes per 100 cubic meters of water. Data derived from Zoutendyk (1960). Neritic and oceanic stations correspond to Fig. A1, for example, the Port Elizabeth line has two neritic stations, or compared with Table A1-1 for station numbers.

Summer								
Neritic Stations				Oceanic Stations				
1	2			1	2	3	4	
Durban	96.0			2.6	3.9			
P. Shepstone	9.1							
P. St. Johns	13.0			3.9	3.9			
E. London	16.2							
P. Elizabeth	46.7	15.6		5.2	3.9	9.1	9.1	
Range		6.2-96.0			2.6-9.1			
Mean		31.1			5.2			

Autumn								
Neritic Stations				Oceanic Stations				
1	2	3	4	1	2	3	4	
Durban	17.6			4.7	4.7	5.2		
P. Shepstone	10.4			3.4	1.6	4.7		
P. St. Johns	15.7			3.4	3.9	2.3		
Bashee	13.9			2.3	2.3	2.9		
E. London	9.4			4.2	2.3			
P. Alfred	11.5			4.7	2.3	2.3		
P. Elizabeth	17.5	9.2		3.4	3.9	2.3	3.4	
Cape Seal	22.8	8.1	10.4	3.9				
Range		3.9-22.8			1.6-5.2			
Mean		12.5			3.8			

Winter								
Neritic Stations				Oceanic Stations				
1	2	3	4	1	2	3	4	
Durban	30.9			4.7				
P. Shepstone								
P. St. Johns				2.3	4.7			
Bashee				6.8				
E. London						3.4		
P. Alfred		7.3						
P. Elizabeth	26.6	4.9		5.2	2.9	4.2		
Cape Seal		6.5	10.2	3.4				
Range		3.4-30.9			2.3-6.8			
Mean		12.8			4.3			

All Surveys Means								
Neritic Stations				Oceanic Stations				
Durban	51.5			4.3				
P. Shepstone	9.7			3.2				
P. St. Johns	14.4			3.5				
Bashee	13.9			3.6				
E. London	7.8			3.3				
P. Alfred	9.4			3.1				
P. Elizabeth	20.0			4.8				
Cape Seal	9.5							
Range		3.4-96.0			1.6-9.1			
Mean		17.1			4.0			

Table A2-22. The number of N70V-nets per survey per depth interval fished in the Agulhas current, in 1958.

	Neritic			
	Summer	Autumn	Winter	
100-0	6	12	13	= 31
200-100	1	2	2	= 5
400-200	0	1	2	= 3
Totals:	7	15	17	= 39
	Oceanic			
	Summer	Autumn	Winter	
100-0	10	22	20	= 52
200-100	9	21	18	= 48
400-200	7	17	20	= 44
400-0	3	5	0	= 8
Totals:	29	65	58	=152
Total samples: 191				

Net-closure failure

Table A2-23. Relative abundances for each species by survey and depth interval. Totals enclosed by parentheses.

	Depth	Totals	Summer	Surveys Autumn	Winter
<u>S. enflata</u>	100-0	4380	1684	1775	921
	200-100	727	45 (1803)	367 (2316)	315 (1284)
	400-200	296	74	174	48
<u>S. minima</u>	100-0	2434	320	976	1138
	200-100	1196	32 (509)	312 (1401)	852 (1998)
	400-200	278	157	113	8
<u>S. friderici</u>	100-0	1528	275	927	326
	200-100	36	1 (276)	24 (951)	11 (341)
	400-200	4	0	0	4
<u>S. serrato.</u> <u>atlantica</u> <u>pacifica</u>	100-0	1794	195	774	825
	200-100	794	42 (384)	257 (1131)	495 (1486)
	400-200	413	147	100	166
<u>P. draco</u>	100-0	1226	173	684	369
	200-100	316	25 (276)	106 (860)	185 (579)
	400-200	173	78	70	25
<u>S. decipiens</u>	100-0	121	45	27	49
	200-100	350	31 (181)	193 (738)	126 (425)
	400-200	873	105	518	250
<u>S. hexaptera</u>	100-0	304	52	140	112
	200-100	270	15 (100)	117 (300)	138 (276)
	400-200	102	33	43	26
<u>K. subtilis</u>	100-0	156	52	46	58
	200-100	366	23 (131)	141 (343)	202 (302)
	400-200	254	56	156	42
<u>S. lyra</u>	100-0	313	49	147	117
	200-100	346	15 (120)	88 (307)	243 (421)
	400-200	189	56	72	61
<u>S. regularis/</u> <u>neglecta</u>	100-0	619	39	320	260
	200-100	100	4 (62)	51 (401)	45 (314)
	400-200	58	19	30	9
<u>S. bedoti</u>	100-0	150	88	42	20
	200-100	11	0 (102)	10 (53)	1 (22)
	400-200	16	14	1	1
<u>K. pacifica</u>	100-0	194	24	91	79
	200-100	51	1 (29)	28 (123)	22 (104)
	400-200	11	4	4	3
<u>S. robusta/</u> <u>ferox</u>	100-0	182	67	81	34
	200-100	51	6 (85)	15 (109)	30 (66)
	400-200	27	12	13	2
<u>S. bipunctata</u>	100-0	193	14	112	67
	200-100	188	5 (43)	67 (203)	116 (247)
	400-200	112	24	24	64
<u>E. hamata</u>	100-0	1	0	1	0
	200-100	2	0 (1)	2 (27)	0 (2)
	400-200	27	1	24	2
<u>S. pulchra</u>	100-0	3	0	0	3
	200-100	0	0 (0)	0 (0)	0 (3)
	400-200	0	0	0	0

Table A2-24. Presence (X) and absence (O) of *S. enflata* according to all nets used (N70V3, N100Bs, N100Hs). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	X			X	X		
Port Shepstone	X						
Port St. Johns	X			X	X		
East London	X			X	X		
Port Elizabeth	X	X		X	X	X	X
Range _____ Median _____				Range _____ Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	X				X	X	X
Port Shepstone	X				X	X	X
Port St. Johns	X				X	X	X
Bashee	X				X	X	X
East London	X				X	X	X
Port Alfred	X				X	X	X
Port Elizabeth	X	X			X	X	X
Cape Seal	X	X	X	X			
Range _____ Median _____				Range _____ Median _____			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	X				X	X	X
Port Shepstone	X				X	X	X
Port St. Johns	X				X	X	X
Bashee	X				X	X	X
East London	X				X	X	X
Port Alfred	X	X				X	X
Port Elizabeth	X	X			X	X	X
Cape Seal	O	X	X	X			
Range _____ Median _____				Range _____ Median _____			

Table A2-25. Abundances for *S. enflata* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
Neritic Stations				Oceanic Stations			
	1	2		1	2	3	4
Durban	4425			52	20		
Port Shepstone	31						
Port St. Johns	1586			3	87		
East London	1055			34	4		
Port Elizabeth	213	348		26	6	13	22
Range <u>31 to 4425</u>				Range <u>3 to 87</u>			
Median <u>701$\frac{1}{2}$</u>				Median <u>21</u>			

AUTUMN SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban	1140					116	102	27	
Port Shepstone	351					55	73	38	
Port St. Johns	722					126	27	11	
Bashee	1003					10	20	38	
East London	416					34	19	5	
Port Alfred	213					14	21	3	
Port Elizabeth	138	428				21	18	5	3
Cape Seal	230	91	234	57					
Range <u>57 to 1140</u>				Range <u>3 to 126</u>					
Median <u>292½</u>				Median <u>21</u>					

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	661					38	8	13	
Port Shepstone	113					40	102	3	
Port St. Johns	383					41	10	53	
Bashee	72					25	10	15	
East London	59					43	19	39	
Port Alfred	117	70					4	3	
Port Elizabeth	286	21				31	30	59	40
Cape Seal	0	16	10	33					
Range 10 to 661					Range 3 to 102				
Median 71					Median 30				

Table A2-26. Abundances for *S. enflata* expressed by number of individuals/haul/10 minutes (N100B-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban				10	76		
Port Shepstone							
Port St. Johns				7	132		
East London							
Port Elizabeth		221		34	3	25	14
Range <u>3 to 132</u>				Range <u>3 to 132</u>			
Median <u> </u>				Median <u>192</u>			

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						151	79	52	
Port Shepstone						52	49	47	
Port St. Johns						73	91	72	
Bashee						40	23	56	
East London						75	70	13	
Port Alfred						74	43	57	
Port Elizabeth						53	112	12	2
Cape Seal		16	58	75					
Range <u>16 to 75</u>						Range <u>2 to 151</u>			
Median <u>58</u>						Median <u>54</u>			

WINTER SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban						55	45	28	
Port Shepstone						69	33	17	
Port St. Johns						2	31	5	
Bashee						71	53	32	
East London						43	24	75	
Port Alfred		129					15	29	
Port Elizabeth		71				28	56	103	108
Cape Seal				106					
Range <u>71 to 129</u>					Range <u>2 to 108</u>				
Median <u>106</u>					Median <u>33</u>				

Table A2-27. Abundances for *S. enflata* expressed by number of individuals/haul/10 minutes (N100H-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	203			75			
Port Shepstone							
Port St. Johns	36			2	200		
East London	159			14	1		
Port Elizabeth	1	200		12		56	19
Range <u>1 to 203</u> Median <u>159</u>				Range <u>1 to 200</u> Median <u>18</u>			

AUTUMN SURVEY									
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	173					68	105	48	
Port Shepstone	290					1	58		
Port St. Johns	693					73	128	11	
Bashee	80					57	15	34	
East London	81					39	103	13	
Port Alfred	7					116	12		
Port Elizabeth	20	204				39	66	14	23
Cape Seal	34	19	114	5					
Range <u>5 to 693</u> Median <u>80½</u>						Range <u>1 to 128</u> Median <u>43½</u>			

WINTER SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban	62					4	14	32	
Port Shepstone	503					43	13	26	
Port St. Johns	63					18	40	51	
Bashee	5					58	62	0	
East London	8					7	0	45	
Port Alfred	25	88					57	39	
Port Elizabeth	47	21				39	39		
Cape Seal		2	10	158					
Range <u>2 to 503</u> Median <u>35</u>				Range <u>4 to 62</u> Median <u>39</u>					

Table A2-28. Population composition of S. enflata for all nets used. Relative abundances are enclosed by parentheses. N100B's oceanic only.

Neritic Area					Oceanic Area			
	Summer Survey	Autumn Survey	winter survey	All Surveys	Summer Survey	Autumn Survey	Winter Survey	All Surveys
<u>N70V-nets</u>								
Adults	<u>47.1%</u> (671)	<u>50.9%</u> (566)	<u>61.8%</u> (265)	<u>50.6%</u> (1502)	<u>48.5%</u> (183)	<u>59.5%</u> (717)	<u>66.4%</u> (568)	<u>60.2%</u> (1468)
Juveniles	<u>52.9%</u> (755)	<u>49.1%</u> (645)	<u>38.2%</u> (429)	<u>49.4%</u> (1464)	<u>51.5%</u> (194)	<u>40.5%</u> (488)	<u>33.6%</u> (287)	<u>39.8%</u> (969)
<u>N100B-nets</u>								
Adults					<u>73.7%</u> (462)	<u>69.6%</u> (1206)	<u>73.1%</u> (678)	<u>71.6%</u> (2746)
Juveniles					<u>26.3%</u> (165)	<u>30.4%</u> (528)	<u>26.9%</u> (396)	<u>28.4%</u> (1089)
<u>N100H-nets</u>								
Adults	<u>73.8%</u> (442)	<u>80.9%</u> (392)	<u>78.8%</u> (782)	<u>79.0%</u> (2616)	<u>78.1%</u> (296)	<u>77.4%</u> (792)	<u>76.8%</u> (451)	<u>77.4%</u> (1539)
Juveniles	<u>26.2%</u> (157)	<u>19.1%</u> (328)	<u>21.2%</u> (210)	<u>21.0%</u> (695)	<u>21.9%</u> (83)	<u>22.6%</u> (231)	<u>23.2%</u> (136)	<u>22.6%</u> (450)

Table A2-29. Abundances for Adult *S. enflata* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
Neritic Stations				Oceanic Stations			
	1	2		1	2	3	4
Durban	2470			15	15		
Port Shepstone	3						
Port St. Johns	640			0	40		
East London	380			23	3		
Port Elizabeth	140	148		15	2	8	10
Range <u>3 to 2470</u> Median <u>264</u>				Range <u>2 to 40</u> Median <u>15</u>			

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	429					84	60	17	
Port Shepstone	72					29	20	25	
Port St. Johns	209					63	18	8	
Bashee	395					8	15	22	
East London	281					26	13	3	
Port Alfred	62					10	15	3	
Port Elizabeth	129	274				12	13	3	3
Cape Seal	105	34	174	39					
Range <u>34 to 429</u> Median <u>151½</u>					Range <u>3 to 84</u> Median <u>15</u>				

WINTER SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban	419					21	8	12	
Port Shepstone	70					25	51	3	
Port St. Johns	174					31	7	40	
Bashee	65					14	7	9	
East London	33					33	16	12	
Port Alfred	104	42					3	3	
Port Elizabeth	253	21				19	21	48	28
Cape Seal	0	10	8	10					
Range 8 to 253 Median 53½					Range 3 to 51 Median 16				

Table A2-30. Abundances for juvenile *S. enflata* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
Neritic Stations				Oceanic Stations			
	1	2		1	2	3	4
Durban	1960			38	5		
Port Shepstone	29						
Port St. Johns	946			3	47		
East London	675			11	2		
Port Elizabeth	73	199		11	5	5	12
Range 29 to 1960				Range 2 to 47			
Median 437				Median 8			

AUTUMN SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban	715					32	43	10	
Port Shepstone	280					27	53	14	
Port St. Johns	514					63	9	3	
Bashee	610					3	6	16	
East London	141					8	6	3	
Port Alfred	151					4	7	0	
Port Elizabeth	9	145				9	5	3	0
Cape Seal	123	57	60	19					
Range 9 to 715				Range 3 to 63					
Median 143				Median 8½					

WINTER SURVEY								
Neritic Stations				Oceanic Stations				
	1	2	3	4	1	2	3	4
Durban	244				17	0	2	
Port Shepstone	44				16	51	0	
Port St. Johns	209				10	3	14	
Bashee	7				10	3	6	
East London	26				10	3	27	
Port Alfred	13	28				< 1	0	
Port Elizabeth	33	0			12	9	12	12
Cape Seal	0	5	3	23				
Range <u>3 to 244</u>				Range <u>< 1 to 51</u>				
Median <u>26</u>				Median <u>10</u>				

Table A2-31. Abundances for adult *S. enflata* expressed by number of individuals/haul/10 minutes (N100B-nets).

Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
Neritic Stations				Oceanic Stations			
1	2			1	2	3	4
Durban				8	43		
Port Shepstone							
Port St. Johns				6	88		
East London							
Port Elizabeth		178		28	2	23	10
Range _____				Range 2 to 88			
Median _____				Median 16½			

AUTUMN SURVEY							
Neritic Stations				Oceanic Stations			
1	2	3	4	1	2	3	4
Durban				74	48	38	
Port Shepstone				33	35	35	
Port St. Johns				47	74	67	
Bashee				27	18	33	
East London				63	49	11	
Port Alfred				53	21	46	
Port Elizabeth				42	78	12	3
Cape Seal		7	29	65			
Range 7 to 65				Range 3 to 78			
Median 29				Median 44			

WINTER SURVEY							
Neritic Stations				Oceanic Stations			
1	2	3	4	1	2	3	4
Durban				48	31	22	
Port Shepstone				41	21	14	
Port St. Johns				0	21	4	
Bashee				54	39	13	
East London				28	20	55	
Port Alfred		82			13	16	
Port Elizabeth		31		23	41	96	88
Cape Seal			96				
Range 31 to 96				Range 4 to 96			
Median 82				Median 25½			

Table A2-32. Abundances for juvenile *S. enflata* expressed by number of individuals/haul/10 minutes (H100B-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban				2	33		
Port Shepstone							
Port St. Johns				1	45		
East London							
Port Elizabeth		43		6	2	3	4
Range _____				Range 1 to 45			
Median _____				Median 3½			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					77	32	13
Port Shepstone					19	14	12
Port St. Johns					27	17	4
Bashee					13	5	23
East London					13	21	3
Port Alfred					22	22	12
Port Elizabeth					12	34	0
Cape Seal		9	29	10			
Range 9 to 29				Range 3 to 77			
Median 10				Median 15½			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					8	14	7
Port Shepstone					28	12	3
Port St. Johns					2	10	1
Bashee					17	13	19
East London					15	4	20
Port Alfred		47				2	13
Port Elizabeth		40			5	15	7
Cape Seal				10			
Range 10 to 47				Range 1 to 28			
Median 40				Median 12			

Table A2-33. Abundances for adult *C. enflata* expressed by number of individuals/haul/10 minutes (N100H-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
Neritic Stations				Oceanic Stations			
	1	2		1	2	3	4
Durban	191				57		
Port Shepstone							
Port St. Johns	30			2	145		
East London	120			10	1		
Port Elizabeth	1	100		9		54	18
Range <u>1 to 191</u> Median <u>100</u>				Range <u>1 to 145</u> Median <u>9</u>			

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	157					43	92	44	
Port Shepstone	218					1	33		
Port St. Johns	555					60	105	9	
Bashee	67					44	13	18	
East London	61					31	82	8	
Port Alfred	7					89	12		
Port Elizabeth	19	176				25	52	11	20
Cape Seal	33	6	78	5					
Range <u>5 to 565</u> Median <u>64</u>					Range <u>1 to 105</u> Median <u>32</u>				

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	35					4	13	28	
Port Shepstone	409					24	11	19	
Port St. Johns	48					10	22	44	
Bashee	3					33	59	0	
East London	6					6	0	35	
Port Alfred	14	85					54	27	
Port Elizabeth	41	1				31	31		
Cape Seal		2	8	130					
Range <u>1 to 409</u> Median <u>35</u>					Range <u>4 to 59</u> Median <u>27</u>				

Table 12-34. Abundances for juveniles *S. enflata* expressed by number of individuals/haul/10 minutes (NIOON-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	12				18		
Port Shepstone							
Port St. Johns	6			6	55		
East London	36			4	0		
Port Elizabeth	0	100		3		2	1
Range <u>6 to 100</u>				Range <u>1 to 55</u>			
Median <u>25</u>				Median <u>3</u>			

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	16					25	13	4	
Port Shepstone	72					0	25		
Port St. Johns	128					13	23	2	
Bashee	13					13	2	16	
East London	20					8	21	5	
Port Alfred	0					27	0		
Port Elizabeth	1	28				14	14	3	3
Cape Seal	1	13	36	0					
Range <u>1 to 128</u>					Range <u>2 to 27</u>				
Median <u>18</u>					Median <u>13</u>				

WINTER SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban	27					0	1	4	
Port Shepstone	94					19	2	7	
Port St. Johns	15					8	18	7	
Bashee	2					25	3	0	
East London	2					1	0	10	
Port Alfred	11	3					3	12	
Port Elizabeth	6	20				8	8		
Cape Seal		0	2	28					
Range <u>2 to 94</u>				Range <u>1 to 25</u>					
Median <u>11</u>				Median <u>7</u>					

Table A2-35. Presence (X) and absence (O) of *S. minima* according to all nets used (H70Vs, M100Bs, and M100Ms). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
Neritic Stations				Oceanic Stations			
	1	2		1	2	3	4
Durban	X			O	X		
Port Shepstone	X						
Port St. Johns	X			X	X		
East London	O			X	X		
Port Elizabeth	O	X		X	X	X	X
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	X					X	X	X	
Port Shepstone	X					X	X	X	
Port St. Johns	X					X	X	X	
Bashee	X					X	X	X	
East London	O					X	X	X	
Port Alfred	O					X	X	X	
Port Elizabeth	X	X				X	X	X	X
Cape Seal	X	X	X	X					
Range _____					Range _____				
Median _____					Median _____				

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	O					X	X	X	
Port Shepstone	X					X	X	X	
Port St. Johns	O					X	X	X	
Bashee	O					X	X	X	
East London	X					X	X	X	
Port Alfred	O	X					X	X	
Port Elizabeth	X	X				X	X	X	X
Cape Seal	X	X	X	X					
Range _____					Range _____				
Median _____					Median _____				

Table A2-36. Abundances for *S. minima* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	22			0	1		
Port Shepstone	62						
Port St. Johns	192			3	14		
East London	0			64	8		
Port Elizabeth	0	158		22	2	44	57
Range <u>22 to 192</u>				Range <u>1 to 64</u>			
Median <u>110</u>				Median <u>14</u>			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	7				112	64	33
Port Shepstone	117				34	74	17
Port St. Johns	9				77	33	26
Bashee	6				14	16	19
East London	0				6	20	37
Port Alfred	0				1	60	31
Port Elizabeth	9	29			26	39	110
Cape Seal	19	13	16	4			27
Range <u>4 to 117</u>				Range <u>1 to 112</u>			
Median <u>11</u>				Median <u>32</u>			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				29	7	3
Port Shepstone	17				21	258	11
Port St. Johns	0				7	10	308
Bashee	0				29	29	94
East London	13				58	62	155
Port Alfred	0	15				14	0
Port Elizabeth	20	18			37	60	119
Cape Seal	5	5	18	11			96
Range <u>5 to 20</u>				Range <u>3 to 258</u>			
Median <u>15</u>				Median <u>33</u>			

Table A2-37. Abundances for *S. minima* expressed by number of individuals/haul/10 minutes (FLOOD-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban				0	1		
Port Shepstone							
Port St. Johns				0	0		
East London							
Port Elizabeth		2		5	0	2	7
Range _____				Range 1 to 7			
Median _____				Median 3.5			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					23	7	8
Port Shepstone					3	0	163
Port St. Johns					3	8	2
Bashee					3	2	13
East London					5	0	35
Port Alfred					0	43	23
Port Elizabeth					4	40	16
Cape Seal		1	1	1			5
Range _____				Range 2 to 163			
Median _____				Median 8			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					2	7	5
Port Shepstone					17	14	16
Port St. Johns					2	18	6
Bashee					11	13	0
East London					3	2	52
Port Alfred		6				3	6
Port Elizabeth		3			3	13	6
Cape Seal				1			14
Range _____				Range 2 to 52			
Median _____				Median 6.5			

Table A2-38. Abundances for *S. minina* expressed by number of individuals/haul/10 minutes (H100H-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0				0		
Port Shepstone							
Port St. Johns	0			0	0		
East London	0			0	0		
Port Elizabeth	0	0		0		0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	1				0	0	0
Port Shepstone	0				0	0	
Port St. Johns	0				0	0	0
Bashee	0				0	0	0
East London	0				0	0	0
Port Alfred	0				0	1	
Port Elizabeth	0	0			0	1	2
Cape Seal	0	0	0	0			1
Range _____				Range _____			
Median _____				Median _____			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	3				0	0	0
Port St. Johns	0				0	0	0
Bashee	0				4	0	9
East London	0				0	0	2
Port Alfred	0	0				0	4
Port Elizabeth	0	0			2	9	
Cape Seal		0	0	0			
Range _____				Range 2 to 9			
Median _____				Median 4			

Table A2-39. Population composition of S. minima for all nets used. Relative abundances are enclosed by parentheses. N100B's oceanic only.

Neritic Area					Oceanic Area			
	Summer Survey	Autumn Survey	winter survey	All Surveys	Summer Survey	Autumn Survey	Winter Survey	All Surveys
<u>N70V-nets</u>								
Adults	<u>96.8%</u> (179)	<u>89.7%</u> (52)	<u>81.4%</u> (35)	<u>93.0%</u> (266)	<u>96.6%</u> (313)	<u>95.6%</u> (1234)	<u>89.9%</u> (1758)	<u>91.8%</u> (3325)
Juveniles	<u>3.2%</u> (6)	<u>10.3%</u> (6)	<u>18.6%</u> (8)	<u>7.0%</u> (20)	<u>3.4%</u> (11)	<u>4.4%</u> (89)	<u>10.1%</u> (197)	<u>8.2%</u> (297)
<u>N100B-nets</u>								
Adults					<u>84.2%</u> (16)	<u>81.9%</u> (400)	<u>85.6%</u> (225)	<u>83.2%</u> (641)
Juveniles					<u>15.8%</u> (3)	<u>18.1%</u> (85)	<u>14.4%</u> (38)	<u>16.8%</u> (129)
<u>N100H-nets</u>								
Adults	(0)	(1)	(3)	(4)	(0)	(5)	<u>80.0%</u> (24)	<u>82.9%</u> (29)
Juveniles	(0)	(0)	(0)	(0)	(0)	(0)	<u>20.0%</u> (6)	<u>17.1%</u> (6)

Table A2-40. Abundances for adult *S. minima* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	22			0	1		
Port Shepstone	60						
Port St. Johns	172			2	14		
East London	0			62	7		
Port Elizabeth	0	156		22	2	44	53
Range <u>22 to 172</u>				Range <u>1 to 62</u>			
Median <u>108</u>				Median <u>14</u>			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	7				112	64	33
Port Shepstone	84				33	51	14
Port St. Johns	9				68	34	26
Bashee	6				13	16	19
East London	0				6	16	36
Port Alfred	0				1	56	29
Port Elizabeth	9	26			26	37	101
Cape Seal	19	13	16	4			
Range <u>4 to 84</u>				Range <u>1 to 112</u>			
Median <u>11</u>				Median <u>31</u>			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				27	5	2
Port Shepstone	17				21	235	9
Port St. Johns	0				7	8	297
Bashee	0				29	26	79
East London	13				47	50	120
Port Alfred	0	12				14	0
Port Elizabeth	19	18			34	56	110
Cape Seal	5	5	18	9			
Range <u>5 to 19</u>				Range <u>2 to 297</u>			
Median <u>13</u>				Median <u>40½</u>			

Table A2-41. Abundances for juvenile S. minima expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0			0	0		
Port Shepstone	1			0	0		
Port St. Johns	21			1	0		
East London	0			2	<1		
Port Elizabeth	0	2		0	0	0	3
Range <u>1 to 21</u>				Range <u><1 to 3</u>			
Median <u>2</u>				Median <u>1½</u>			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				<1	0	0
Port Shepstone	33				<1	24	3
Port St. Johns	0				9	0	<1
Bashee	0				0	0	0
East London	0				0	4	<1
Port Alfred	0				0	4	2
Port Elizabeth	0	2			0	2	9
Cape Seal	0	0	0	0			
Range <u>2 to 33</u>				Range <u><1 to 24</u>			
Median <u>17½</u>				Median <u>2½</u>			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				3	2	<1
Port Shepstone	0				0	24	1
Port St. Johns	0				0	2	12
Bashee	0				<1	3	15
East London	0				11	10	36
Port Alfred	0	3				0	0
Port Elizabeth	0	0			3	4	8
Cape Seal	0	0	0	2			
Range <u>2 to 3</u>				Range <u><1 to 36</u>			
Median <u>2½</u>				Median <u>4</u>			

Table A2-42. Abundances for adult *S. minima* expressed by number of individuals/haul/10 minutes (NIOOS-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban				0	1		
Port Shepstone							
Port St. Johns				0	0		
East London							
Port Elizabeth		2		5	0	1	5
Range _____				Range 1 to 5			
Median _____				Median 3			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					21	6	7
Port Shepstone					3	0	122
Port St. Johns					2	8	2
Bashee					3	2	12
East London					4	0	25
Port Alfred					0	37	22
Port Elizabeth					3	35	16
Cape Seal		1	1	1			5
Range _____				Range 2 to 122			
Median _____				Median 7			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					2	7	4
Port Shepstone					15	13	14
Port St. Johns					2	14	4
Bashee					0	13	0
East London					3	2	43
Port Alfred		6				3	6
Port Elizabeth		3			3	12	6
Cape Seal				1			14
Range _____				Range 2 to 43			
Median _____				Median 6			

Table A2-43. Abundances for juvenile S. minima expressed by number of individuals/haul/10 minutes (NIOOB-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2			1	2	3	4	
Durban					0	0			
Port Shepstone									
Port St. Johns					0	0			
East London									
Port Elizabeth		6			0	0	1	2	
Range _____					Range _____				
Median _____					Median _____				

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						3	1	2	
Port Shepstone						0	0	41	
Port St. Johns						1	1	0	
Bashee						0	0	1	
East London						1	0	10	
Port Alfred						0	7	1	
Port Elizabeth						2	5	0	0
Cape Seal		0	0	0					

Range	_____
Median	_____

Range	1 to 41
Median	2

WINTER SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban						0	0	1	
Port Shepstone						2	2	2	
Port St. Johns						0	3	2	
Bashee						11	0	0	
East London						0	0	9	
Port Alfred		0					0	0	
Port Elizabeth		0				0	1	0	0
Cape Seal				0					

Range _____
Median _____

Range 1 to 11
Median 2

Table A2-44. Abundances for adult *S. minima* expressed by number of individuals/haul/10 minutes (N100H-nets). Compare with Table A1-1 for station numbers.

	<u>SUMMER SURVEY</u>							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	0					0		
Port Shepstone								
Port St. Johns	0				0	0		
East London	0				0	0		
Port Elizabeth	0				0		0	0
Range _____				Range _____				
Median _____				Median _____				

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	1					0	0	0	
Port Shepstone	0					0	0		
Port St. Johns	0					0	0	0	
Bashee	0					0	0	0	
East London	0					0	0	0	
Port Alfred	0					0	1		
Port Elizabeth	0	0				0	1	2	1
Cape Seal	0	0	0	0					

Range	_____
Median	_____

Range	1 to 2
Median	1

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	0					0	0	0	
Port Shepstone	3					0	0	0	
Port St. Johns	0					0	0	0	
Bashee	0					3	0	6	
East London	0					0	0	2	
Port Alfred	0	0					0	4	
Port Elizabeth	0	0				2	7		
Cape Seal		0	0	0					

Range _____
Median _____

Range 2 to 7
Median 3½

Table A2-45. Abundances for juvenile *S. minima* expressed by number of individuals/haul/10 minutes. (N100H-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0				0		
Port Shepstone							
Port St. Johns	0			0	0		
East London	0			0	0		
Port Elizabeth	0			0		0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	0				0	0	
Port St. Johns	0				0	0	0
Bashee	0				0	0	0
East London	0				0	0	0
Port Alfred	0				0	0	
Port Elizabeth	0	0			0	0	0
Cape Seal	0	0	0	0			
Range _____				Range _____			
Median _____				Median _____			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	0				0	0	0
Port St. Johns	0				0	0	0
Bashee	0				1	0	3
East London	0				0	0	0
Port Alfred	0	0				0	0
Port Elizabeth	0	0			0	2	
Cape Seal		0	0	0			
Range _____				Range <u>1 to 3</u>			
Median _____				Median <u>2</u>			

Table A2-46. Presence (X) and absence (O) of *S. serrato-dentata* according to all nets used (N70Vs, N100Bs, N100Hs). Compare with Table A1-1 for station numbers.

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	X				X	X		
Port Shepstone	X							
Port St. Johns	X				X	X		
East London	X				X	X		
Port Elizabeth	O	X			X	X	X	X
Range _____ Median _____				Range _____ Median _____				

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	X				X	X	X	
Port Shepstone	X				X	X	X	
Port St. Johns	X				X	X	X	
Bashee	X				X	X	X	
East London	X				X	X	X	
Port Alfred	X				X	X	X	
Port Elizabeth	X	X			X	X	X	X
Cape Seal	O	X	X	X				
Range _____ Median _____				Range _____ Median _____				

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	X				X	X	X	
Port Shepstone	X				X	X	X	
Port St. Johns	X				X	X	X	
Bashee	X				X	X	X	
East London	X				X	X	X	
Port Alfred	X	X				X	X	
Port Elizabeth	X	X			X	X	X	X
Cape Seal	O	X	X	X				
Range _____ Median _____				Range _____ Median _____				

Table A2-47. Abundances for *S. serratodentata* expressed by mean number of individuals/100m³/depth of water column sampled (W70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	15			6	9		
Port Shepstone	26						
Port St. Johns	88			3	10		
East London	10			38	29		
Port Elizabeth	0	25		16	16	35	60
Range <u>10 to 88</u>				Range <u>3 to 60</u>			
Median <u>25</u>				Median <u>16</u>			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	33				14	21	46
Port Shepstone	117				14	28	37
Port St. Johns	35				18	103	17
Bashee	46				6	22	37
East London	42				30	37	11
Port Alfred	10				3	29	34
Port Elizabeth	22	73			19	49	40
Cape Seal	0	21	34	8			45
Range <u>8 to 117</u>				Range <u>3 to 103</u>			
Median <u>34</u>				Median <u>28</u>			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	81				34	8	17
Port Shepstone	9				32	77	21
Port St. Johns	26				35	30	251
Bashee	7				24	16	31
East London	7				46	71	38
Port Alfred	0	71				16	3
Port Elizabeth	13	10			68	36	34
Cape Seal	0	0	5	13			48
Range <u>5 to 81</u>				Range <u>3 to 251</u>			
Median <u>11</u>				Median <u>34</u>			

Table A2-48. Abundances for *S. serratodentata* expressed by number of individuals/haul/10 minutes (N100B-nets). Compare with table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban				3	0		
Port Shepstone							
Port St. Johns				3	0		
East London							
Port Elizabeth		18		18	6	8	21
Range _____				Range 3 to 21			
Median _____				Median 7			

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						24	33	23	
Port Shepstone						2	67	73	
Port St. Johns						3	49	11	
Bashee						8	17	58	
East London						18	32	13	
Port Alfred						15	39	62	
Port Elizabeth						4	59	41	122
Cape Seal		1	4	15					
Range 1 to 15						Range 2 to 122			
Median 4						Median 33			

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						58	55	14	
Port Shepstone						26	24	38	
Port St. Johns						2	38	62	
Bashee						26	56	192	
East London						21	30	91	
Port Alfred		51					82	26	
Port Elizabeth		0				99	106	127	37
Cape Seal				24					
Range 24 to 51					Range 2 to 127				
Median 37½					Median 38				

Table 12-49. Abundances for *S. serratodentata* expressed by number of individuals/haul/10 minutes (W100H-nets). Compare with Table 11-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0				1		
Port Shepstone							
Port St. Johns	4			0	7		
East London	0			3	12		
Port Elizabeth	0	3		1		2	10
Range <u>3 to 7</u>				Range <u>1 to 10</u>			
Median <u>3</u>				Median <u>3</u>			

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	8					1	35	5	
Port Shepstone	103					0	57		
Port St. Johns	1					2	18	27	
Bashee	5					1	3	23	
East London	1					1	37	8	
Port Alfred	0					0	2		
Port Elizabeth	1	13				7	11	91	246
Cape Seal	0	1	7	2					
Range <u>1 to 103</u>						Range <u>1 to 246</u>			
Median <u>3½</u>						Median <u>9½</u>			

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	7					0	8	15	
Port Shepstone	11					4	10	25	
Port St. Johns	1					8	20	162	
Bashee	3					7	7	48	
East London	1					0	12	47	
Port Alfred	3	28					101	63	
Port Elizabeth	0	1				30	27		
Cape Seal		1	0	22					
Range <u>1 to 28</u>					Range <u>4 to 162</u>				
Median <u>6</u>					Median <u>20</u>				

Table A2-50. Population composition of *S. serratodentata* for all nets used. Relative abundances are enclosed by parentheses. N100B's oceanic only.

	Neritic Area				Oceanic Area			
	Summer Survey	Autumn Survey	winter survey	All Surveys	Summer Survey	Autumn Survey	Winter Survey	All Surveys
N70V-nets	52.0%	49.6%	84.6%	66.7%	51.7%	51.0%	45.8%	49.7%
Adults	(26)	(60)	(132)	(218)	(206)	(515)	(609)	(1330)
Juveniles	48.0%	50.4%	15.4%	33.3%	38.3%	49.0%	54.2%	50.3%
	(24)	(61)	(24)	(109)	(128)	(495)	(721)	(1344)
N100B-nets					69.6%	70.8%	73.3%	72.3%
Adults					(64)	(673)	(128)	(185)
Juveniles					30.4%	29.2%	26.7%	27.7%
					(28)	(277)	(411)	(716)
N100H-nets	57.2%	84.4%	69.4%	77.6%	80.6%	74.8%	82.9%	78.9%
Adults	(4)	(119)	(68)	(191)	(29)	(431)	(476)	(936)
Juveniles	42.8%	15.6%	30.6%	22.4%	19.4%	25.2%	17.1%	21.1%
	(3)	(22)	(30)	(55)	(7)	(145)	(98)	(250)

Table A2-51. Abundances for adult *S. serratodentata* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	7			6	6		
Port Shepstone	5						
Port St. Johns	47			2	7		
East London	5			27	23		
Port Elizabeth	0	17		5	10	24	28
Range <u>5 to 47</u>				Range <u>2 to 28</u>			
Median <u>7</u>				Median <u>6½</u>			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	13				10	7	24
Port Shepstone	52				6	8	20
Port St. Johns	26				7	60	12
Bashee	29				< 1	12	18
East London	16				17	18	5
Port Alfred	0				1	22	16
Port Elizabeth	0	28			13	22	23
Cape Seal	0	21	26	4			
Range <u>4 to 52</u>				Range <u><1 to 60</u>			
Median <u>26</u>				Median <u>14½</u>			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	81				9	7	10
Port Shepstone	9				23	39	17
Port St. Johns	26				24	19	111
Bashee	7				6	8	17
East London	7				21	23	15
Port Alfred	0	64				6	2
Port Elizabeth	7	8			29	9	26
Cape Seal	0	0	3	6			
Range <u>3 to 81</u>				Range <u>2 to 111</u>			
Median <u>7½</u>				Median <u>17</u>			

Table A2-52. Abundances for juvenile *S. serratodentata* expressed by number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	7			< 1	2		
Port Shepstone	21						
Port St. Johns	42			1	3		
East London	5			11	6		
Port Elizabeth	0	8		10	7	11	32
Range <u>5 to 42</u>				Range <u>< 1 to 32</u>			
Median <u>8</u>				Median <u>8</u>			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	20				4	14	22
Port Shepstone	65				8	20	17
Port St. Johns	9				12	43	4
Bashee	17				5	10	18
East London	25				13	20	6
Port Alfred	10				< 1	7	17
Port Elizabeth	22	44			6	28	18
Cape Seal	0	0	8	4			30
Range <u>4 to 65</u>				Range <u>< 1 to 43</u>			
Median <u>18½</u>				Median <u>13½</u>			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				25	1	6
Port Shepstone	0				10	38	3
Port St. Johns	0				11	11	140
Bashee	0				18	9	15
East London	0				25	48	21
Port Alfred	0	7				8	2
Port Elizabeth	7	3			41	27	8
Cape Seal	0	0	3	7			38
Range <u>3 to 7</u>				Range <u>1 to 140</u>			
Median <u>7</u>				Median <u>15</u>			

Table A2-53. Abundances for adult *S. serratodentata* expressed by number of individuals/haul/10 minutes (N100B-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY								
Neritic Stations				Oceanic Stations				
	1	2			1	2	3	4
Durban					1	0		
Port Shepstone								
Port St. Johns					3	0		
East London								
Port Elizabeth		16			8	4	5	17
Range _____				Range 1 to 17				
Median _____				Median 4½				

AUTUMN SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban						12	19	17	
Port Shepstone						2	59	62	
Port St. Johns						2	27	11	
Bashee						3	8	43	
East London						9	23	8	
Port Alfred						10	22	23	
Port Elizabeth						3	48	33	101
Cape Seal		0	3	14					

Range	_____	Range	2 to 101
Median	_____	Median	18

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						43	26	8	
Port Shepstone						15	10	15	
Port St. Johns						0	20	56	
Bashee						19	48	150	
East London						13	22	51	
Port Alfred		45					79	20	
Port Elizabeth		0				78	73	96	30
Cape Seal				23					

Range	_____
Median	_____

Range	8 to 150
Median	28

Table A2-54. Abundances for juvenile *S. serratodentata* expressed by number of individuals/haul/10 minutes (NIOOB-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban				2	0		
Port Shepstone							
Port St. Johns				0	0		
East London							
Port Elizabeth		2		11	2	3	4
Range _____				Range 2 to 11			
Median _____				Median 3			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					13	14	7
Port Shepstone					0	8	11
Port St. Johns					1	23	0
Bashee					6	8	15
East London					9	8	5
Port Alfred					5	17	38
Port Elizabeth					2	11	8
Cape Seal		1	1	1			
Range _____				Range 1 to 38			
Median _____				Median 8			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					15	29	7
Port Shepstone					11	14	23
Port St. Johns					2	18	6
Bashee					7	8	42
East London					8	8	40
Port Alfred		6				3	6
Port Elizabeth		0			21	33	31
Cape Seal				1			7
Range _____				Range 2 to 42			
Median _____				Median 11			

Table A2-55. Abundances for adult *S. serratodentata* expressed by number of individuals/haul/10 minutes (W100M-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0				1		
Port Shepstone							
Port St. Johns	4			0	7		
East London	0			1	9		
Port Elizabeth	0	0		1		1	9
Range _____				Range 1 to 9			
Median _____				Median 1			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	5				1	29	5
Port Shepstone	88				0	34	
Port St. Johns	1				2	9	26
Bashee	5				0	2	21
East London	1				1	31	5
Port Alfred	0				0	2	
Port Elizabeth	1	9			4	9	84
Cape Seal	0	1	7	2			165
Range 1 to 88				Range 1 to 165			
Median 3½				Median 9			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	6				0	6	9
Port Shepstone	9				4	6	15
Port St. Johns	1				7	14	151
Bashee	3				5	4	41
East London	1				0	2	32
Port Alfred	3	24				87	52
Port Elizabeth	0	1			20	21	
Cape Seal		1	0	19			
Range 1 to 24				Range 2 to 151			
Median 3				Median 14			

Table A2-55. Abundances for juvenile *S. serratodentata* expressed by number of individuals/haul/10 minutes (N100H-nets). Compare with Table A1-1 for station numbers.

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	0					0		
Port Shepstone								
Port St. Johns	0				0	0		
East London	0				2	3		
Port Elizabeth	0	3			0		1	1
Range _____				Range 1 to 3				
Median _____				Median 1 1/2				

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	3				0	6	0	
Port Shepstone	15				0	23		
Port St. Johns	0				0	9	1	
Bashee	0				1	1	2	
East London	0				0	6	3	
Port Alfred	0				0	0		
Port Elizabeth	0	4			3	2	7	81
Cape Seal	0	0	0	0				
Range 3 to 15				Range 1 to 81				
Median 4				Median 3				

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	1				0	2	6	
Port Shepstone	2				0	4	10	
Port St. Johns	0				1	6	11	
Bashee	0				2	3	7	
East London	0				0	10	15	
Port Alfred	0	4				14	11	
Port Elizabeth	0	0			10	6		
Cape Seal		0	0	3				
Range 1 to 4				Range 1 to 15				
Median 2 1/2				Median 6 1/2				

Table A2-57. Presence (X) and absence (O) of *P. draco* according to all nets used (N70Vs, N100Es, N100Hs). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	X			X	X		
Port Shepstone	X						
Port St. Johns	X			X	X		
East London	O			X	X		
Port Elizabeth	X	X		X	X	X	X
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	X				X	X	X
Port Shepstone	X				X	X	X
Port St. Johns	X				X	X	X
Bashee	X				X	X	X
East London	X				X	X	X
Port Alfred	X				X	X	X
Port Elizabeth	X	X			X	X	X
Cape Seal	O	X	X	X			
Range _____				Range _____			
Median _____				Median _____			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	X				X	X	X
Port Shepstone	X				X	X	X
Port St. Johns	O				X	X	X
Bashee	O				X	X	X
East London	X				X	X	X
Port Alfred	X	X				X	X
Port Elizabeth	O	X			X	X	X
Cape Seal	X	X	X	X			
Range _____				Range _____			
Median _____				Median _____			

Table A2-58. Abundances for *P. draco* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	37				10	9		
Port Shepstone	10							
Port St. Johns	114				3	20		
East London	0				39	7		
Port Elizabeth	5	43			16	3	15	22
	Range <u>5 to 114</u> Median <u>37</u>				Range <u>3 to 39</u> Median <u>13</u>			

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	273				29	33	41	
Port Shepstone	91				46	20	50	
Port St. Johns	35				38	50	11	
Bashee	58				9	18	25	
East London	5				14	14	5	
Port Alfred	10				3	9	11	
Port Elizabeth	4	10			13	14	18	19
Cape Seal	0	31	31	7				
	Range <u>4 to 273</u> Median <u>31</u>				Range <u>3 to 50</u> Median <u>18½</u>			

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	35				12	3	4	
Port Shepstone	9				7	61	3	
Port St. Johns	0				20	7	78	
Bashee	0				11	9	18	
East London	0				21	16	30	
Port Alfred	0	8				6	1	
Port Elizabeth	0	3			16	18	24	34
Cape Seal	5	0	3	7				
	Range <u>3 to 35</u> Median <u>7</u>				Range <u>1 to 78</u> Median <u>16</u>			

Table A2-59. Abundances for *P. draco* expressed by number of individuals/haul/10 minutes (N100B-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY								
Neritic Stations				Oceanic Stations				
	1	2			1	2	3	4
Durban					8	17		
Port Shepstone								
Port St. Johns					9	0		
East London								
Port Elizabeth		19			54	3	0	41
Range _____				Range 3 to 54				
Median _____				Median 12½				

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						63	93	98	
Port Shepstone						84	20	0	
Port St. Johns						24	80	42	
Bashee						32	72	51	
East London						13	60	62	
Port Alfred						27	68	259	
Port Elizabeth						23	92	90	14
Cape Seal		0	8	8					
Range _____					Range 13 to 259				
Median _____					Median 63				

WINTER SURVEY											
Neritic Stations				Oceanic Stations							
	1	2	3	4		1	2	3	4		
Durban						56	29	24			
Port Shepstone						46	33	46			
Port St. Johns						0	43	19			
Bashee						33	41	129			
East London						32	25	44			
Port Alfred		9					18	25			
Port Elizabeth		1				31	122	94	44		
Cape Seal				7							
Range				1 to 9				Range		18 to 129	
Median				7				Median		37	

Table A2-60. Abundances for P. draco expressed by number of individuals/haul/10 minutes (N100H-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0				0		
Port Shepstone							
Port St. Johns	1			0	86		
East London	0			5	1		
Port Elizabeth	0	4		0		0	3
Range <u>1 to 4</u>				Range <u>1 to 86</u>			
Median <u>2½</u>				Median <u>4</u>			

AUTUMN SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban	21					0	14	5	
Port Shepstone	42					0	68		
Port St. Johns	12					2	19	1	
Bashee	8					9	7	41	
East London	0					1	24	22	
Port Alfred	0					8	25		
Port Elizabeth	1	3				19	24	349	122
Cape Seal	0	0	13	0					
Range <u>1 to 42</u>				Range <u>1 to 349</u>					
Median <u>12</u>				Median <u>19</u>					

WINTER SURVEY									
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	3					0	0	11	
Port Shepstone	2					4	6	6	
Port St. Johns	0					8	2	8	
Bashee	0					19	8	3	
East London	0					0	0	12	
Port Alfred	1	1					6	22	
Port Elizabeth	0	0				20	46		
Cape Seal		1	0	3					
Range <u>1 to 3</u>						Range <u>2 to 46</u>			
Median <u>1½</u>						Median <u>8</u>			

Table A2-61. Population composition of P. draco for all nets used. Relative abundances are enclosed by parentheses. N100B's oceanic only.

Neritic Area					Oceanic Area			
	Summer Survey	Autumn Survey	winter survey	All Surveys	Summer Survey	Autumn Survey	Winter Survey	All Surveys
<u>N70V-nets</u>								
Adults	<u>23.1%</u> (15)	<u>17.5%</u> (20)	<u>18.8%</u> (6)	<u>19.4%</u> (41)	<u>36.0%</u> (76)	<u>26.0%</u> (194)	<u>21.2%</u> (116)	<u>25.7%</u> (386)
Juveniles	<u>76.9%</u> (50)	<u>82.5%</u> (94)	<u>81.2%</u> (26)	<u>80.6%</u> (170)	<u>64.0%</u> (135)	<u>74.0%</u> (552)	<u>78.8%</u> (431)	<u>74.3%</u> (1118)
<u>N100B-nets</u>								
Adults					<u>54.4%</u> (99)	<u>46.6%</u> (773)	<u>48.3%</u> (550)	<u>47.7%</u> (1422)
Juveniles					<u>45.6%</u> (83)	<u>53.4%</u> (887)	<u>51.7%</u> (588)	<u>52.3%</u> (1558)
<u>N100H-nets</u>								
Adults	(0)	<u>50.0%</u> (50)	<u>63.6%</u> (7)	<u>49.1%</u> (57)	<u>43.2%</u> (41)	<u>53.0%</u> (403)	<u>39.8%</u> (72)	<u>49.8%</u> (516)
Juveniles	(0)	<u>50.0%</u> (50)	<u>36.4%</u> (4)	<u>50.9%</u> (59)	<u>56.8%</u> (54)	<u>47.0%</u> (357)	<u>60.2%</u> (109)	<u>50.2%</u> (520)

Table A2-62. Abundances for adult *P. draco* expressed by mean number of individuals/100m³/depth of water column sampled (R70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY								
Neritic Stations				Oceanic Stations				
	1	2			1	2	3	4
Durban	22				0	2		
Port Shepstone	0							
Port St. Johns	21				0	17		
East London	0				11	4		
Port Elizabeth	0	11			5	1	5	9
Range <u>11 to 22</u>				Range <u>1 to 17</u>				
Median <u>21</u>				Median <u>5</u>				

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	59					14	11	7	
Port Shepstone	0					7	6	8	
Port St. Johns	0					10	12	2	
Bashee	29					2	4	5	
East London	0					4	5	3	
Port Alfred	0					1	3	2	
Port Elizabeth	0	6				0	4	7	11
Cape Seal	0	0	3	1					
Range <u>1 to 59</u>						Range <u>1 to 14</u>			
Median <u>6</u>						Median <u>5</u>			

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	17					0	2	4	
Port Shepstone	0					2	8	1	
Port St. Johns	0					11	3	13	
Bashee	0					1	2	4	
East London	0					3	1	6	
Port Alfred	0	2					0	0	
Port Elizabeth	0	0				1	3	14	7
Cape Seal	0	0	0	0					
Range <u>2 to 17</u>					Range <u>1 to 14</u>				
Median <u>9</u>					Median <u>3</u>				

Table A2-63. Abundances for juvenile *P. draco* expressed by mean number of individuals/100m³/depth of water column sampled (M70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	14			9	7		
Port Shepstone	10						
Port St. Johns	94			3	2		
East London	0			28	4		
Port Elizabeth	5	33		11	1	9	13
Range <u>5 to 94</u>				Range <u>1 to 28</u>			
Median <u>14</u>				Median <u>8</u>			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	214				15	22	33
Port Shepstone	91				38	14	42
Port St. Johns	35				27	38	9
Bashee	29				8	14	20
East London	5				11	9	2
Port Alfred	10				1	5	9
Port Elizabeth	4	4			13	7	11
Cape Seal	0	31	29	6			
Range <u>4 to 214</u>				Range <u>1 to 42</u>			
Median <u>29</u>				Median <u>12</u>			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	17				12	2	< 1
Port Shepstone	9				6	54	1
Port St. Johns	0				9	5	64
Bashee	0				10	7	14
East London	0				18	15	24
Port Alfred	0	6				6	1
Port Elizabeth	0	3			14	16	10
Cape Seal	5	0	3	7			
Range <u>3 to 17</u>				Range <u>< 1 to 64</u>			
Median <u>6</u>				Median <u>10</u>			

Table A2-64. Abundances for adult *P. draco* expressed by number of individuals/haul/10 minutes (NICOB-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY								
Neritic Stations				Oceanic Stations				
	1	2			1	2	3	4
Durban					7	12		
Port Shepstone								
Port St. Johns					3	0		
East London								
Port Elizabeth		11			20	1	0	29
Range _____				Range 1 to 29				
Median _____				Median 9½				

AUTUMN SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban						42	48	40	
Port Shepstone						48	11	0	
Port St. Johns						9	21	24	
Bashee						21	39	28	
East London						5	23	39	
Port Alfred						13	37	74	
Port Elizabeth						7	52	51	6
Cape Seal		0	3	5					
Range _____				Range <u>5 to 74</u>					
Median _____				Median <u>28</u>					

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						24	17	11	
Port Shepstone						25	8	15	
Port St. Johns						0	26	12	
Bashee						24	25	46	
East London						19	20	21	
Port Alfred		4					11	8	
Port Elizabeth		0				13	56	43	28
Cape Seal				3					
Range _____					Range 8 to 56				
Median _____					Median 19½				

Table A2-65. Abundances for juvenile *P. draco* expressed by number of individuals/haul/10 minutes (N100B-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
Neritic Stations				Oceanic Stations			
	1	2		1	2	3	4
Durban				2	5		
Port Shepstone							
Port St. Johns				6	0		
East London							
Port Elizabeth		8		34	2	0	12
Range _____				Range 2 to 34			
Median _____				Median 5½			

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						22	45	58	
Port Shepstone						37	9	0	
Port St. Johns						15	59	18	
Bashee						11	33	23	
East London						8	37	22	
Port Alfred						13	32	185	
Port Elizabeth						17	40	39	8
Cape Seal		0	6	3					
Range _____					Range 8 to 185				
Median _____					Median 23				

WINTER SURVEY

	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban					32	13	13	
Port Shepstone					21	25	31	
Port St. Johns					0	17	8	
Bashee					8	15	83	
East London					13	5	23	
Port Alfred		5				7	18	
Port Elizabeth		1			18	66	51	17
Cape Seal				3				

Range _____

Median _____

Range 5 to 83

Median 17½

Table A2-66. Abundances for adult *P. draco* expressed by number of individuals/haul/10 minutes (NIOOH-nets). Compare with Table A1-1 for station numbers.

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	0					0		
Port Shepstone								
Port St. Johns	0				0	35		
East London	0				3	1		
Port Elizabeth	0	0			0		0	2
Range _____				Range <u>1 to 35</u>				
Median _____				Median <u>2½</u>				

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	6				0	10	3	
Port Shepstone	25				0	38		
Port St. Johns	7				1	1	1	
Bashee	5				7	5	28	
East London	0				1	10	20	
Port Alfred	0				6	6		
Port Elizabeth	0	3			4	2	208	52
Cape Seal	0	0	4	0				
Range <u>3 to 25</u>				Range <u>1 to 208</u>				
Median <u>5½</u>				Median <u>6</u>				

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	2				0	0	5	
Port Shepstone	2				2	1	5	
Port St. Johns	0				8	1	4	
Bashee	0				9	0	0	
East London	0				0	0	4	
Port Alfred	0	0				4	6	
Port Elizabeth	0	0			7	16		
Cape Seal		1	0	2				
Range <u>1 to 2</u>				Range <u>1 to 16</u>				
Median <u>2</u>				Median <u>5</u>				

Table A2-67. Abundances for juvenile *P. draco* expressed by number of individuals/haul/10 minutes (N100H-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0				0		
Port Shepstone							
Port St. Johns	1			0	51		
East London	0			2	0		
Port Elizabeth	0	4		0		0	1
Range _____				Range <u>1 to 51</u>			
Median _____				Median <u>2</u>			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	15				0	4	2
Port Shepstone	17				0	30	
Port St. Johns	5				1	18	0
Bashee	3				2	2	13
East London	0				0	14	2
Port Alfred	0				2	19	
Port Elizabeth	1	0			15	22	141
Cape Seal	0	0	9	0			70
Range <u>1 to 17</u>				Range <u>1 to 141</u>			
Median <u>7</u>				Median <u>13</u>			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	1				0	0	6
Port Shepstone	0				2	5	1
Port St. Johns	0				0	1	4
Bashee	0				10	8	3
East London	0				0	0	8
Port Alfred	1	1				2	16
Port Elizabeth	0	0			13	30	
Cape Seal		0	0	1			
Range _____				Range <u>1 to 30</u>			
Median _____				Median <u>5</u>			

Table A2-68. Presence (X) and absence (O) of *S. friderici* according to all nets used (N70Vs, N100Bs, N100Hs). Compare with Table A1-1 for station numbers.

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	X				O	X		
Port Shepstone	X							
Port St. Johns	X				X	X		
East London	O				X	O		
Port Elizabeth	X	X			X	X	O	X
Range _____				Range _____				
Median _____				Median _____				

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	X				O	X	O	
Port Shepstone	O				O	X	X	
Port St. Johns	X				O	X	O	
Bashee	X				X	X	X	
East London	X				X	O	O	
Port Alfred	X				X	O	O	
Port Elizabeth	X	X			X	O	X	X
Cape Seal	X	X	X	X				
Range _____				Range _____				
Median _____				Median _____				

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	X				X	X	X	
Port Shepstone	O				O	X	X	
Port St. Johns	X				O	O	O	
Bashee	O				X	X	O	
East London	X				X	O	X	
Port Alfred	X	X				O	X	
Port Elizabeth	X	X			X	X	O	X
Cape Seal	X	X	X	X				
Range _____				Range _____				
Median _____				Median _____				

Table A2-69. Abundances for *S. friderici* expressed by mean number of individuals/100m³/depth of water column (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	259			0	0		
Port Shepstone	10						
Port St. Johns	57			< 1	0		
East London	0			0	0		
Port Elizabeth	1118	9		0	0	0	2
Range <u>9 to 1118</u>				Range _____			
Median <u>57</u>				Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	0				0	0	0
Port St. Johns	0				0	0	0
Bashee	81				0	0	0
East London	5				0	0	0
Port Alfred	182				3	0	0
Port Elizabeth	2430	80			0	0	0
Cape Seal	1180	81	192	3			
Range <u>3 to 2430</u>				Range _____			
Median <u>81</u>				Median _____			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	41				0	1	0
Port Shepstone	0				0	0	0
Port St. Johns	26				0	0	0
Bashee	0				< 1	0	0
East London	20				0	0	0
Port Alfred	65	2				0	0
Port Elizabeth	819	21			0	0	0
Cape Seal	598	133	0	9			
Range <u>2 to 819</u>				Range _____			
Median <u>33½</u>				Median _____			

Table A2-70. Abundances for *S. friderici* expressed by number of individuals/haul/10 minutes (N100B-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban				0	7		
Port Shepstone							
Port St. Johns				1	6		
East London							
Port Elizabeth		29		5	1	0	0
Range _____				Range 1 to 7			
Median _____				Median 5			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					0	2	0
Port Shepstone					0	1	2
Port St. Johns					0	0	0
Bashee					4	0	1
East London					1	0	0
Port Alfred					1	0	0
Port Elizabeth					1	0	0
Cape Seal		48	49	16			
Range 16 to 49				Range 1 to 4			
Median 48				Median 1			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					0	0	0
Port Shepstone					0	5	0
Port St. Johns					0	0	0
Bashee					1	1	0
East London					0	0	1
Port Alfred		3				0	2
Port Elizabeth		0			2	1	0
Cape Seal				5			
Range _____				Range 1 to 5			
Median _____				Median 1			

Table A2-71. Abundances for *S. friderici* expressed by number of individuals/haul/10 minutes (N100H-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	16				0		
Port Shepstone							
Port St. Johns	5			0	14		
East London	0			3	0		
Port Elizabeth	0	29		0		0	1
Range <u>5 to 29</u> Median <u>16</u>				Range <u>1 to 14</u> Median <u>3</u>			

AUTUMN SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban	2					0	7	0	
Port Shepstone	0					0	0		
Port St. Johns	1					0	1	0	
Bashee	4					5	1	1	
East London	0					0	0	0	
Port Alfred	9					5	0		
Port Elizabeth	391	15				0	0	2	2
Cape Seal	60	190	135	28					
Range <u>1 to 391</u> Median <u>21½</u>					Range <u>1 to 7</u> Median <u>2</u>				

WINTER SURVEY									
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	8					2	0	1	
Port Shepstone	0					0	0	1	
Port St. Johns	15					0	0	0	
Bashee	0					5	4	0	
East London	17					0	2	0	
Port Alfred	6	3					0	0	
Port Elizabeth	410	15				0	0		
Cape Seal		1	19	11					
Range <u>1 to 410</u> Median <u>11</u>					Range <u>1 to 5</u> Median <u>2</u>				

Table A2-72. Population composition of *S. friderici* for all nets used. Relative abundances enclosed by parentheses. N100B's oceanic only.

Neritic Area					Oceanic Area			
	Summer Survey	Autumn Survey	winter survey	All Surveys	Summer Survey	Autumn Survey	Winter Survey	All Surveys
<u>N70V-nets</u>								
Adults	<u>83.1%</u> (222)	<u>81.0%</u> (767)	<u>84.4%</u> (286)	<u>82.1%</u> (275)	(9)	(4)	(2)	(15)
Juveniles	<u>16.9%</u> (45)	<u>19.0%</u> (180)	<u>15.6%</u> (53)	<u>17.9%</u> (278)	(0)	(0)	(0)	(0)
<u>N100B-nets</u>								
Adults					<u>80.0%</u> (44)	<u>85.2%</u> (127)	<u>78.3%</u> (18)	<u>83.3%</u> (189)
Juveniles					<u>20.0%</u> (11)	<u>14.8%</u> (22)	<u>21.7%</u> (5)	<u>16.7%</u> (38)
<u>N100H-nets</u>								
Adults	<u>84.0%</u> (42)	<u>89.6%</u> (748)	<u>96.8%</u> (489)	<u>92.0%</u> (1279)	<u>55.6%</u> (10)	<u>91.7%</u> (22)	<u>80.0%</u> (12)	<u>77.2%</u> (44)
Juveniles	<u>16.0%</u> (8)	<u>10.4%</u> (87)	<u>3.2%</u> (16)	<u>8.0%</u> (111)	<u>44.4%</u> (8)	<u>8.3%</u> (2)	<u>20.0%</u> (3)	<u>22.8%</u> (13)

Table A2-73. Abundances for adult *S. friderici* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	170			0	0		
Port Shepstone	3						
Port St. Johns	0			<1	0		
East London	0			0	0		
Port Elizabeth	1030	6		0	0	0	2
Range <u>3 to 1030</u>				Range _____			
Median <u>88</u>				Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	0				0	0	0
Port St. Johns	0				0	0	0
Bashee	0				0	0	0
East London	5				0	0	0
Port Alfred	171				3	0	0
Port Elizabeth	2000	59			0	0	0
Cape Seal	972	73	138	2			
Range <u>2 to 2000</u>				Range _____			
Median <u>1054</u>				Median _____			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	6				0	1	0
Port Shepstone	0				0	0	0
Port St. Johns	9				0	0	0
Bashee	0				<1	0	0
East London	13				0	0	0
Port Alfred	39	2				0	0
Port Elizabeth	618	21			0	0	0
Cape Seal	561	132	0	8			
Range <u>2 to 618</u>				Range _____			
Median <u>17</u>				Median _____			

Table A2-74. Abundances for juvenile *S. friderici* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

	<u>SUMMER SURVEY</u>							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	81				0	0		
Port Shepstone	8							
Port St. Johns	57				0	0		
East London	0				0	0		
Port Elizabeth	88	3			0	0	0	0
Range <u>3 to 88</u>				Range _____				
Median <u>57</u>				Median _____				

	Neritic Stations				Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	0					0	0	0	
Port Shepstone	0					0	0	0	
Port St. Johns	0					0	0	0	
Bashee	81					0	0	0	
East London	0					0	0	0	
Port Alfred	10					0	0	0	
Port Elizabeth	414	19				0	0	0	0
Cape Seal	205	8	55	1					

Range 1 to 414
Median 37

Range _____
Median _____

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	35					0	0	0	
Port Shepstone	0					0	0	0	
Port St. Johns	17					0	0	0	
Bashee	0					0	0	0	
East London	7					0	0	0	
Port Alfred	26	< 1					0	0	
Port Elizabeth	201	0				0	0	0	0
Cape Seal	36	0	0	< 1					
Range < 1 to 201					Range _____				
Median 21 1/2					Median _____				

Table A2-75. Abundances for adult *S. friderici* expressed by number of individuals/haul/10 minutes (NIOCB-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban				0	4		
Port Shepstone							
Port St. Johns				1	3		
East London							
Port Elizabeth		26		2	1	0	0
Range _____				Range <u>1 to 4</u>			
Median _____				Median <u>2</u>			

AUTUMN SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban						0	2	0	
Port Shepstone						0	1	2	
Port St. Johns						0	0	0	
Bashee						1	0	1	
East London						1	0	0	
Port Alfred						1	0	0	
Port Elizabeth						1	0	0	2
Cape Seal		40	41	15					
Range <u>15 to 41</u>					Range <u>1 to 2</u>				
Median <u>40</u>					Median <u>1</u>				

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						0	0	0	
Port Shepstone						0	2	0	
Port St. Johns						0	0	0	
Bashee						1	1	0	
East London						0	0	1	
Port Alfred		3					0	2	
Port Elizabeth		0				2	1	0	1
Cape Seal				3					
Range _____					Range <u>1 to 2</u>				
Median _____					Median <u>1</u>				

Table A2-76. Abundances for juvenile *S. friderici* expressed by number of individuals/haul/10 minutes (N100B-nets). Compare with Table A1-1 for station numbers.

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban					0	2		
Port Shepstone								
Port St. Johns					0	2		
East London								
Port Elizabeth		3			3	0	0	0
Range _____				Range <u>2 to 3</u>				
Median _____				Median <u>2</u>				

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban					0	0	0	
Port Shepstone					0	0	0	
Port St. Johns					0	0	0	
Bashee					3	0	0	
East London					0	0	0	
Port Alfred					0	0	0	
Port Elizabeth					0	0	0	0
Cape Seal		8	8	1				
Range <u>1 to 8</u>				Range _____				
Median <u>1</u>				Median _____				

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban					0	0	0	
Port Shepstone					0	3	0	
Port St. Johns					0	0	0	
Bashee					0	0	0	
East London					0	0	0	
Port Alfred		0				0	0	
Port Elizabeth		0			0	0	0	0
Cape Seal				2				
Range _____				Range _____				
Median _____				Median _____				

Table A2-77. Abundances for adult *S. friderici* expressed by number of individuals/haul/10 minutes (N100H-nets). Compare with Table A1-1 for station numbers.

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	12					0		
Port Shepstone								
Port St. Johns	5				0	8		
East London	0				1	0		
Port Elizabeth	2	25			0		0	1
Range <u>5 to 25</u>				Range <u>1 to 8</u>				
Median <u>12</u>				Median <u>1</u>				

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	2				0	7	0	
Port Shepstone	0				0	0		
Port St. Johns	1				0	1	0	
Bashee	3				4	1	1	
East London	0				0	0	0	
Port Alfred	9				4	0		
Port Elizabeth	353	15			0	0	2	2
Cape Seal	56	169	113	27				
Range <u>1 to 353</u>				Range <u>1 to 7</u>				
Median <u>21</u>				Median <u>2</u>				

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	6				2	0	1	
Port Shepstone	0				0	0	1	
Port St. Johns	3				0	0	0	
Bashee	0				2	4	0	
East London	16				0	2	0	
Port Alfred	6	3				0	0	
Port Elizabeth	409	15			0	0		
Cape Seal		1	19	11				
Range <u>1 to 409</u>				Range <u>1 to 4</u>				
Median <u>8½</u>				Median <u>2</u>				

Table A2-78. Abundances for juvenile *S. friderici* expressed by number of individuals/haul/10 minutes (N100H-nets). Compare with Table A1-1 for station numbers.

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	4					0		
Port Shepstone								
Port St. Johns	0				0	6		
East London	0				2	0		
Port Elizabeth	0	4			0		0	0
Range _____				Range <u>2 to 6</u>				
Median _____				Median <u>4</u>				

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	0				0	0	0	
Port Shepstone	0				0	0		
Port St. Johns	0				0	0	0	
Bashee	1				1	0	0	
East London	0				0	0	0	
Port Alfred	0				1	0		
Port Elizabeth	38	0			0	0	0	0
Cape Seal	4	21	22	1				
Range <u>1 to 38</u>				Range _____				
Median <u>12½</u>				Median _____				

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	2				0	0	0	
Port Shepstone	0				0	0	0	
Port St. Johns	12				0	0	0	
Bashee	0				3	0	0	
East London	1				0	0	0	
Port Alfred	0	0				0	0	
Port Elizabeth	1	0			0	0		
Cape Seal		0	0	0				
Range <u>1 to 12</u>				Range _____				
Median <u>1½</u>				Median _____				

Table A2-79. Presence (X) and absence (O) of S. decipiens according to all nets (N70Vs, N100Bs, N100Hs). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	O			X	X		
Port Shepstone	X						
Port St. Johns	O			O	X		
East London	O			X	X		
Port Elizabeth	O	X		X	X	X	X
Range _____ Median _____				Range _____ Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	O				X	X	X
Port Shepstone	X				X	X	X
Port St. Johns	O				X	X	X
Bashee	X				X	X	X
East London	O				X	X	X
Port Alfred	O				O	X	X
Port Elizabeth	O	O			X	X	X
Cape Seal	O	O	X	X			
Range _____ Median _____				Range _____ Median _____			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	O				X	X	X
Port Shepstone	O				X	X	X
Port St. Johns	X				X	X	X
Bashee	X				X	O	X
East London	O				X	O	X
Port Alfred	O	X				X	X
Port Elizabeth	O	O			X	X	X
Cape Seal	O	O	O	O			
Range _____ Median _____				Range _____ Median _____			

Table A2-80. Abundances for *S. decipiens* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0			3	5		
Port Shepstone	31						
Port St. Johns	0			0	3		
East London	0			7	22		
Port Elizabeth	0	4		12	12	32	12
Range <u>4 to 31</u>				Range <u>3 to 32</u>			
Median <u>17½</u>				Median <u>12</u>			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	25	22
Port Shepstone	7				23	28	13
Port St. Johns	0				29	22	39
Bashee	6				11	23	18
East London	0				16	51	9
Port Alfred	0				0	43	26
Port Elizabeth	0	0			5	14	30
Cape Seal	0	0	0	5			29
Range <u>5 to 7</u>				Range <u>5 to 51</u>			
Median <u>6</u>				Median <u>23</u>			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				21	24	15
Port Shepstone	0				7	41	11
Port St. Johns	0				24	16	6
Bashee	0				20	0	10
East London	0				15	0	20
Port Alfred	0	36				13	3
Port Elizabeth	0	0			5	24	2
Cape Seal	0	0	0	0			< 1
Range _____				Range <u>1 to 41</u>			
Median _____				Median <u>15</u>			

Table A2-81. Abundances for *S. decipiens* expressed by number of individuals/haul/10 minutes (H100B-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
Neritic Stations				Oceanic Stations			
1	2			1	2	3	4
Durban				0	0		
Port Shepstone				0	0		
Port St. Johns							
East London							
Port Elizabeth		1		0	0	7	5
Range _____				Range 5 to 7			
Median _____				Median 6			

AUTUMN SURVEY							
Neritic Stations				Oceanic Stations			
1	2	3	4	1	2	3	4
Durban				2	0	0	
Port Shepstone				0	0	0	
Port St. Johns				0	4	4	
Bashee				0	0	3	
East London				0	19	7	
Port Alfred				0	0	0	
Port Elizabeth				1	0	6	0
Cape Seal		0	3	0			
Range _____				Range 1 to 19			
Median _____				Median 4			

WINTER SURVEY							
Neritic Stations				Oceanic Stations			
1	2	3	4	1	2	3	4
Durban				0	0	3	
Port Shepstone				0	0	0	
Port St. Johns				0	0	0	
Bashee				0	0	0	
East London				0	0	3	
Port Alfred		3			5	13	
Port Elizabeth		0		0	0	0	0
Cape Seal			0				
Range _____				Range 3 to 13			
Median _____				Median 4			

Table A2-82. Abundances for *S. decipiens* expressed by number of individuals/haul/10 minutes (1100H-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0				0		
Port Shepstone							
Port St. Johns	0			0	0		
East London	0			0	0		
Port Elizabeth	0	0		0		0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	0					1	0	0	
Port Shepstone	0					0	0		
Port St. Johns	0					0	1	0	
Bashee	0					0	0	0	
East London	0					0	0	0	
Port Alfred	0					0	0		
Port Elizabeth	0	0				0	0	0	0
Cape Seal	0	0	0	0					
Range _____					Range _____				
Median _____					Median _____				

WINTER SURVEY									
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	0					0	0	0	
Port Shepstone	0					0	0	0	
Port St. Johns	13					0	0	0	
Bashee	8					0	0	0	
East London	0					0	0	0	
Port Alfred	0	0					0	3	
Port Elizabeth	0	0				0	0		
Cape Seal		0	0	0					
Range _____						Range _____			
Median _____						Median _____			

Table A2-83. Population composition of *S. decipiens* for all nets used. Relative abundances are enclosed by parentheses. N100B's oceanic only.

Neritic Area					Oceanic Area			
	Summer Survey	Autumn Survey	winter survey	All Surveys	Summer Survey	Autumn Survey	Winter Survey	All Surveys
<u>N70V-nets</u>	<u>20.0%</u>	<u>60.0%</u>	<u>61.8%</u>	<u>53.8%</u>	<u>50.0%</u>	<u>40.8%</u>	<u>50.8%</u>	<u>44.9%</u>
Adults	(3)	(6)	(34)	(43)	(83)	(297)	(188)	(568)
Juveniles	<u>80.0%</u>	<u>40.0%</u>	<u>38.2%</u>	<u>46.2%</u>	<u>50.0%</u>	<u>59.2%</u>	<u>49.2%</u>	<u>55.1%</u>
	(12)	(4)	(21)	(37)	(83)	(431)	(182)	(696)
<u>N100B-nets</u>					<u>33.3%</u>	<u>39.7%</u>	<u>75.0%</u>	<u>49.5%</u>
Adults					(5)	(23)	(24)	(52)
Juveniles					<u>66.7%</u>	<u>60.3%</u>	<u>25.0%</u>	<u>50.5%</u>
					(10)	(35)	(8)	(53)
<u>N100H-nets</u>			<u>81.0%</u>	<u>81.0%</u>			<u>66.7%</u>	<u>80.0%</u>
Adults	(0)	(0)	(17)	(17)	(0)	(2)	(2)	(4)
Juveniles	(0)	(0)	<u>19.0%</u>	<u>19.0%</u>	(0)	(0)	<u>33.3%</u>	<u>20.0%</u>
			(4)	(4)			(1)	(1)

Table A2-84. Abundances for adult *S. decipiens* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	0				< 1	3		
Port Shepstone	3							
Port St. Johns	0				0	3		
East London	0				6	9		
Port Elizabeth	0	3			10	7	10	8
Range _____				Range <u>< 1 to 10</u>				
Median _____				Median <u>9</u>				

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	0				0	14	15	
Port Shepstone	7				7	9	3	
Port St. Johns	0				13	8	16	
Bashee	0				3	5	13	
East London	0				5	18	4	
Port Alfred	0				0	20	16	
Port Elizabeth	0	0			1	4	12	11
Cape Seal	0	0	0	3				
Range <u>3 to 7</u>				Range <u>1 to 20</u>				
Median <u>5</u>				Median <u>10</u>				

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	0				11	17	5	
Port Shepstone	0				5	12	5	
Port St. Johns	0				15	7	3	
Bashee	0				12	0	3	
East London	0				10	0	12	
Port Alfred	0	22				11	3	
Port Elizabeth	0	0			1	7	< 1	0
Cape Seal	0	0	0	0				
Range _____				Range <u>< 1 to 17</u>				
Median _____				Median <u>7</u>				

Table A2-85. Abundances for juvenile *S. decipiens* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	0				2	2		
Port Shepstone	29							
Port St. Johns	0				0	<1		
East London	0				1	14		
Port Elizabeth	0	2			2	6	24	4
Range <u>2 to 29</u>				Range <u><1 to 24</u>				
Median <u>15½</u>				Median <u>2</u>				

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	0				0	11	7	
Port Shepstone	0				16	19	11	
Port St. Johns	0				16	14	23	
Bashee	6				9	17	3	
East London	0				11	32	6	
Port Alfred	0				0	22	10	
Port Elizabeth	0	0			3	10	20	17
Cape Seal	0	0	0	2				
Range <u>2 to 6</u>				Range <u>3 to 32</u>				
Median <u>4</u>				Median <u>12½</u>				

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	0				10	7	12	
Port Shepstone	0				3	29	5	
Port St. Johns	0				9	9	3	
Bashee	0				9	0	7	
East London	0				5	0	9	
Port Alfred	0	14				2	0	
Port Elizabeth	0	0			3	17	<1	<1
Cape Seal	0	0	0	0				
Range _____				Range <u><1 to 29</u>				
Median _____				Median <u>7</u>				

Table A2-66. Abundances for adult *S. decipiens* expressed by number of individuals/haul/10 minutes (WICOE-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban				0	0		
Port Shepstone							
Port St. Johns				0	0		
East London							
Port Elizabeth		1		0	0	3	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban						1	0	0	
Port Shepstone						0	0	0	
Port St. Johns						0	3	0	
Bashee						0	0	0	
East London						0	6	5	
Port Alfred						0	0	0	
Port Elizabeth						0	0	3	0
Cape Seal		0	3	0					
Range _____				Range <u>1 to 6</u>					
Median _____				Median <u>3</u>					

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						0	0	0	
Port Shepstone						0	0	0	
Port St. Johns						0	0	0	
Bashee						0	0	0	
East London						0	0	2	
Port Alfred		3					3	12	
Port Elizabeth		0				0	0	0	0
Cape Seal				0					
Range _____					Range <u>2 to 12</u>				
Median _____					Median <u>3</u>				

Table A2-87. Abundances for juvenile *S. decipiens* expressed by number of individuals/haul/10 minutes (N100B-nets). Compare with Table A1-1 for station numbers.

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban					0	0		
Port Shepstone								
Port St. Johns					0	0		
East London								
Port Elizabeth		0			0	0	3	5
Range _____				Range <u>3 to 5</u>				
Median _____				Median <u>4</u>				

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban					1	0	0	
Port Shepstone					0	0	0	
Port St. Johns					0	2	4	
Bashee					0	0	3	
East London					0	13	2	
Port Alfred					0	0	0	
Port Elizabeth					1	0	3	0
Cape Seal		0	1	0				
Range _____				Range <u>1 to 13</u>				
Median _____				Median <u>2½</u>				

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban					0	0	3	
Port Shepstone					0	0	0	
Port St. Johns					0	0	0	
Bashee					0	0	0	
East London					0	0	1	
Port Alfred		0				2	2	
Port Elizabeth		0			0	0	0	0
Cape Seal				0				
Range _____				Range <u>1 to 3</u>				
Median _____				Median <u>2</u>				

Table A2-88. Abundances for adult *S. decipiens* expressed by number of individual/haul/10 minutes/ (N100H-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY								
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	0					0		
Port Shepstone								
Port St. Johns	0				0	0		
East London	0				0	0		
Port Elizabeth	0	0			0		0	0
Range _____					Range _____			
Median _____					Median _____			

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	0					1	0	0	
Port Shepstone	0					0	0		
Port St. Johns	0					0	1	0	
Bashee	0					0	0	0	
East London	0					0	0	0	
Port Alfred	0					0	0		
Port Elizabeth	0	0				0	0	0	0
Cape Seal	0	0	0	0					
Range _____					Range _____				
Median _____					Median _____				

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	0					0	0	0	
Port Shepstone	0					0	0	0	
Port St. Johns	10					0	0	0	
Bashee	7					0	0	0	
East London	0					0	0	0	
Port Alfred	0	0					0	2	
Port Elizabeth	0	0				0	0		
Cape Seal		0	0	0					
Range <u>7 to 10</u>					Range _____				
Median <u>8½</u>					Median _____				

Table A2-89. Abundances for juvenile *S. decipiens* expressed by number of individuals/haul/10 minutes (WLOOH-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY								
Neritic Stations				Oceanic Stations				
	1	2			1	2	3	4
Durban	0					0		
Port Shepstone								
Port St. Johns	0				0	0		
East London	0				0	0		
Port Elizabeth	0	0			0		0	0
Range _____				Range _____				
Median _____				Median _____				

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	0					0	0	0	
Port Shepstone	0					0	0		
Port St. Johns	0					0	0	0	
Bashee	0					0	0	0	
East London	0					0	0	0	
Port Alfred	0					0	0		
Port Elizabeth	0	0				0	0	0	0
Cape Seal	0	0	0	0					
Range _____					Range _____				
Median _____					Median _____				

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	0				0	0	0	
Port Shepstone	0				0	0	0	
Port St. Johns	3				0	0	0	
Bashee	1				0	0	0	
East London	0				0	0	0	
Port Alfred	0	0				0	1	
Port Elizabeth	0	0			0	0		
Cape Seal		0	0	0				
Range <u>1 to 3</u>				Range _____				
Median <u>2</u>				Median _____				

Table A2-90. Presence (X) and absence (O) of *S. lyra* according to all nets used (N70Vs, N100Bs, N100Hs). Compare with Table A1-1 for station numbers.

<u>SUMMER SURVEY</u>								
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	O				X	X		
Port Shepstone	X							
Port St. Johns	X				O	O		
East London	O				X	X		
Port Elizabeth	O	X			X	X	X	X
Range _____					Range _____			
Median _____					Median _____			

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	0				X	X	X	
Port Shepstone	0				X	X	X	
Port St. Johns	0				X	X	X	
Bashee	0				X	X	X	
East London	X				X	X	X	
Port Alfred	0				X	X	X	
Port Elizabeth	0	X			X	X	X	X
Cape Seal	0	0	0	X				
	Range _____				Range _____			
	Median _____				Median _____			

	<u>WINTER SURVEY</u>							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	0				X	X	X	
Port Shepstone	0				X	X	X	
Port St. Johns	0				X	X	X	
Bashee	0				X	X	X	
East London	X				X	X	X	
Port Alfred	0	X				X	X	
Port Elizabeth	0	0			X	X	X	X
Cape Seal	0	0	0	X				
	Range _____				Range _____			
	Median _____				Median _____			

Table A2-91. Abundances for *S. lyra* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0			7	2		
Port Shepstone	3						
Port St. Johns	10			0	0		
East London	0			3	7		
Port Elizabeth	0	4		3	18	21	16
Range <u>3 to 10</u>				Range <u>2 to 21</u>			
Median <u>4</u>				Median <u>7</u>			

AUTUMN SURVEY									
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	0					10	10	6	
Port Shepstone	0					8	9	6	
Port St. Johns	0					17	13	9	
Bashee	0					7	10	9	
East London	5					2	5	7	
Port Alfred	0					< 1	7	12	
Port Elizabeth	0	2				7	19	25	6
Cape Seal	0	0	0	0					
Range <u>2 to 5</u>						Range <u>< 1 to 25</u>			
Median <u>3½</u>						Median <u>8½</u>			

WINTER SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban	0					9	2	9	
Port Shepstone	0					18	46	10	
Port St. Johns	0					11	13	20	
Bashee	0					5	15	28	
East London	13					10	3	18	
Port Alfred	0	9					2	2	
Port Elizabeth	0	0				18	17	21	19
Cape Seal	0	0	0	2					
Range <u>2 to 13</u>				Range <u>2 to 46</u>					
Median <u>9</u>				Median <u>13</u>					

Table A2-92. Abundances for S. lyra expressed by number of individuals/haul/10 minutes (NIOOB-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
Neritic Stations				Oceanic Stations			
1	2			1	2	3	4
Durban				2	4		
Port Shepstone							
Port St. Johns				0	0		
East London							
Port Elizabeth		0		1	0	12	17
Range _____				Range <u>1 to 17</u>			
Median _____				Median <u>4</u>			

AUTUMN SURVEY							
Neritic Stations				Oceanic Stations			
1	2	3	4	1	2	3	4
Durban				0	0	21	
Port Shepstone				0	0	0	
Port St. Johns				1	12	4	
Bashee				1	0	18	
East London				1	11	24	
Port Alfred				3	7	8	
Port Elizabeth				3	27	27	5
Cape Seal		0	0	1			
Range _____				Range <u>1 to 27</u>			
Median _____				Median <u>7½</u>			

WINTER SURVEY							
Neritic Stations				Oceanic Stations			
1	2	3	4	1	2	3	4
Durban				0	2	2	
Port Shepstone				3	6	13	
Port St. Johns				3	3	1	
Bashee				3	23	22	
East London				2	3	21	
Port Alfred		5			11	17	
Port Elizabeth		0		8	3	4	8
Cape Seal			0				
Range _____				Range <u>1 to 23</u>			
Median _____				Median <u>3½</u>			

Table A2-93. Abundances for *S. lyra* expressed by number of individuals/haul/10 minutes (WLOOH-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0				0		
Port Shepstone							
Port St. Johns	0			0	0		
East London	0			0	0		
Port Elizabeth	0	0		0		0	1
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	0				0	0	
Port St. Johns	0				0	0	0
Bashee	0				0	0	0
East London	0				0	0	1
Port Alfred	0				0	0	
Port Elizabeth	0	0			1	0	4
Cape Seal	0	0	0	0			
Range _____				Range _____			
Median _____				Median _____			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	0				0	0	0
Port St. Johns	0				1	0	0
Bashee	0				0	0	0
East London	0				0	0	0
Port Alfred	0	0				0	0
Port Elizabeth	0	0			0	0	
Cape Seal		0	0	0			
Range _____				Range _____			
Median _____				Median _____			

Table A2-95. Abundances for adult *S. lyra* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	0				0	0		
Port Shepstone	3							
Port St. Johns	0				0	0		
East London	0				2	2		
Port Elizabeth	0	2			0	1	2	1
Range <u>2 to 3</u>				Range <u>1 to 2</u>				
Median <u>2½</u>				Median <u>2</u>				

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	0				0	<1	2	
Port Shepstone	0				0	<1	0	
Port St. Johns	0				1	3	6	
Bashee	0				0	2	3	
East London	0				<1	4	4	
Port Alfred	0				0	2	4	
Port Elizabeth	0	2			1	6	7	2
Cape Seal	0	0	0	0				
Range _____				Range <u><1 to 7</u>				
Median _____				Median <u>2</u>				

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	0				4	0	6	
Port Shepstone	0				1	9	5	
Port St. Johns	0				5	8	5	
Bashee	0				3	3	6	
East London	7				2	1	1	
Port Alfred	0	4				1	2	
Port Elizabeth	0	0			2	3	5	12
Cape Seal	0	0	0	0				
Range <u>4 to 7</u>				Range <u>1 to 12</u>				
Median <u>5½</u>				Median <u>3½</u>				

Table A2-96. Abundances for juvenile *S. lyra* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY								
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	0				5	2		
Port Shepstone	0							
Port St. Johns	10				0	0		
East London	0				1	5		
Port Elizabeth	0	3			3	17	19	14
Range <u>3 to 10</u>					Range <u>1 to 19</u>			
Median <u>6½</u>					Median <u>5</u>			

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	0					10	10	4	
Port Shepstone	0					8	8	6	
Port St. Johns	0					16	11	3	
Bashee	0					7	8	6	
East London	5					< 1	1	3	
Port Alfred	0					< 1	5	9	
Port Elizabeth	0	0				5	13	18	4
Cape Seal	0	0	0	0					

Range _____
Median _____

Range < 1 to 18
Median 7½

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	0				5	2	3	
Port Shepstone	0				16	36	5	
Port St. Johns	0				6	5	15	
Bashee	0				2	13	21	
East London	7				8	2	16	
Port Alfred	0	5				< 1	0	
Port Elizabeth	0	0			16	14	16	6
Cape Seal	0	0	0	2				
Range <u>2 to 7</u>				Range <u>< 1 to 36</u>				
Median <u>5</u>				Median <u>7</u>				

Table 12-97. Abundances for adult *S. lyra* expressed by number of individuals/haul/10 minutes (MICOD-notes). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban				0	0		
Port Shepstone							
Port St. Johns				0	0		
East London							
Port Elizabeth		0		0	0	0	1
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					0	0	0
Port Shepstone					0	0	0
Port St. Johns					0	0	2
Bashee					0	0	0
East London					0	9	5
Port Alfred					0	0	1
Port Elizabeth					1	1	19
Cape Seal		0	0	1			
Range _____				Range 1 to 19			
Median _____				Median 2			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					0	1	0
Port Shepstone					0	0	1
Port St. Johns					2	1	0
Bashee					0	1	0
East London					0	0	20
Port Alfred		1				3	2
Port Elizabeth		0			0	0	0
Cape Seal				0			
Range _____				Range 1 to 20			
Median _____				Median 1			

Table A2-98. Abundances for juvenile *S. lyra* expressed by number of individuals/haul/10 minutes (N100B-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban				2	4		
Port Shepstone							
Port St. Johns				0	0		
East London							
Port Elizabeth		0		1	0	12	16
Range _____				Range <u>1 to 16</u>			
Median _____				Median <u>4</u>			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					0	0	21
Port Shepstone					0	0	0
Port St. Johns					1	12	3
Bashee					1	0	18
East London					1	2	19
Port Alfred					3	7	7
Port Elizabeth					2	26	8
Cape Seal		0	0	0			5
Range _____				Range <u>1 to 26</u>			
Median _____				Median <u>6</u>			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					0	1	2
Port Shepstone					3	6	13
Port St. Johns					1	2	1
Bashee					3	22	22
East London					2	3	1
Port Alfred		4				8	15
Port Elizabeth		0			8	3	4
Cape Seal				0			8
Range _____				Range <u>1 to 22</u>			
Median _____				Median <u>3</u>			

Table A2-99. Abundances for adult *S. lyra* expressed by number of individuals/haul/10 minutes (MISOH-nots).
Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0				0		
Port Shepstone							
Port St. Johns	0			0	0		
East London	0			0	0		
Port Elizabeth	0			0		0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	0				0	0	
Port St. Johns	0				0	0	0
Bashee	0				0	0	0
East London	0				0	0	0
Port Alfred	0				0	0	
Port Elizabeth	0	0			1	0	0
Cape Seal	0	0	0	0			
Range _____				Range _____			
Median _____				Median _____			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	0				0	0	0
Port St. Johns	0				0	0	0
Bashee	0				0	0	0
East London	0				0	0	0
Port Alfred	0	0				0	0
Port Elizabeth	0	0			0	0	
Cape Seal		0	0	0			
Range _____				Range _____			
Median _____				Median _____			

Table A2-100. Abundances for juvenile S. lyra expressed by number of individuals/haul/10 minutes (WLOOH-nots). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0				0		
Port Shepstone							
Port St. Johns	0			0	0		
East London	0			0	0		
Port Elizabeth	0	0		0		0	1
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	0				0	0	
Port St. Johns	0				0	0	0
Bashee	0				0	0	0
East London	0				0	0	1
Port Alfred	0				0	0	
Port Elizabeth	0	0			0	0	4
Cape Seal	0	0	0	0			
Range _____				Range <u>1 to 4</u>			
Median _____				Median <u>2 1/2</u>			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	0				0	0	0
Port St. Johns	0				1	0	0
Bashee	0				0	0	0
East London	0				0	0	0
Port Alfred	0	0				0	0
Port Elizabeth	0	0			0	0	
Cape Seal		0	0	0			
Range _____				Range _____			
Median _____				Median _____			

Table A2-101. Presence (X) and absence (O) for *S. regularis/neglecta* according to all nets used (N70Vs, N100Bs, N100Hs). Compare with Table A1-1 for station numbers.

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	X				X	X		
Port Shepstone	X							
Port St. Johns	X				O	O		
East London	X				X	O		
Port Elizabeth	O	X			X	X	O	O
Range _____				Range _____				
Median _____				Median _____				

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	X				X	X	X	
Port Shepstone	X				X	X	X	
Port St. Johns	X				X	X	X	
Bashee	X				X	X	X	
East London	X				X	X	O	
Port Alfred	X				X	X	O	
Port Elizabeth	X	X			X	X	O	O
Cape Seal	X	X	X	X				
Range _____				Range _____				
Median _____				Median _____				

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	X				X	X	X	
Port Shepstone	X				X	X	X	
Port St. Johns	X				X	X	X	
Bashee	O				X	O	X	
East London	O				X	X	O	
Port Alfred	X	X				X	X	
Port Elizabeth	X	X			X	X	X	X
Cape Seal	O	O	X	X				
Range _____				Range _____				
Median _____				Median _____				

Table A2-102. Abundances for *S. regularis/neglecta* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets).

SUMMER SURVEY							
Neritic Stations				Oceanic Stations			
	1	2		1	2	3	4
Durban	52			4	1		
Port Shepstone	5						
Port St. Johns	57			0	3		
East London	16			12	0		
Port Elizabeth	0	11		1	1	0	0
Range <u>5 to 57</u>				Range <u>1 to 12</u>			
Median <u>16</u>				Median <u>2</u>			

AUTUMN SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban	182					0	22	7	
Port Shepstone	20					17	2	14	
Port St. Johns	87					22	7	<1	
Bashee	75					10	7	10	
East London	62					12	5	0	
Port Alfred	10					2	<1	0	
Port Elizabeth	39	100				5	8	0	0
Cape Seal	45	60	10	5					
Range 5 to 182				Range <1 to 22					
Median 53½				Median 7					

WINTER SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban	377					14	3	3	
Port Shepstone	17					7	12	2	
Port St. Johns	9					1	1	9	
Bashee	0					10	0	2	
East London	0					13	3	6	
Port Alfred	20	24					1	0	
Port Elizabeth	46	3				19	9	7	8
Cape Seal	0	0	5	6					
Range <u>3 to 377</u>					Range <u>1 to 19</u>				
Median <u>20</u>					Median <u>8</u>				

Table A2-103. Abundances for *S. regularis/neglecta* expressed by number of individuals/haul/10 minutes (N100B-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY								
Neritic Stations				Oceanic Stations				
	1	2			1	2	3	4
Durban					0	0		
Port Shepstone								
Port St. Johns					0	0		
East London								
Port Elizabeth		0			0	0	0	0
Range _____				Range _____				
Median _____				Median _____				

AUTUMN SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban						1	1	0	
Port Shepstone						1	0	0	
Port St. Johns						0	0	0	
Bashee						0	0	0	
East London						0	0	0	
Port Alfred						0	0	0	
Port Elizabeth						0	0	0	0
Cape Seal		0	0	0					
Range _____				Range _____					
Median _____				Median _____					

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						2	1	0	
Port Shepstone						0	1	0	
Port St. Johns						0	0	0	
Bashee						0	0	0	
East London						0	0	0	
Port Alfred		0					0	0	
Port Elizabeth		3				2	2	1	1
Cape Seal									
Range _____					Range <u>1 to 2</u>				
Median _____					Median <u>1</u>				

Table A2-104. Abundances for *S. regularis/neglecta* expressed by number of individuals/haul/10 minutes (W100H-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0				0		
Port Shepstone							
Port St. Johns	0			0	0		
East London	0			0	0		
Port Elizabeth	0	0		0		0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	1	0
Port Shepstone	0				0	0	
Port St. Johns	0				0	0	0
Bashee	0				0	0	0
East London	0				0	0	0
Port Alfred	0				0	0	
Port Elizabeth	0	0			0	0	0
Cape Seal	0	0	0	0			
Range _____				Range _____			
Median _____				Median _____			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	2				0	0	0
Port Shepstone	0				0	0	0
Port St. Johns	0				0	0	0
Bashee	0				0	0	0
East London	0				0	0	0
Port Alfred	0	0				0	1
Port Elizabeth	0	0			0	0	
Cape Seal		0	1	0			
Range _____				Range _____			
Median _____				Median _____			

Table A2-105. Population composition of *S. regularis/neglecta* for all nets used. Relative abundances are enclosed by parentheses. N100B's oceanic only.

	Neritic Area				Oceanic Area			
	Summer Survey	Autumn Survey	winter survey	All Surveys	Summer Survey	Autumn Survey	Winter Survey	All Surveys
<u>N70V-nets</u>	<u>53.1%</u>	<u>63.5%</u>	<u>73.8%</u>	<u>66.6%</u>	<u>70.0%</u>	<u>35.1%</u>	<u>63.3%</u>	<u>48.9%</u>
Adults	(17)	(101)	(93)	(211)	(21)	(85)	(119)	(225)
Juveniles	<u>46.9%</u>	<u>36.5%</u>	<u>26.2%</u>	<u>33.4%</u>	<u>30.0%</u>	<u>64.9%</u>	<u>36.7%</u>	<u>51.1%</u>
	(15)	(58)	(33)	(106)	(9)	(157)	(69)	(235)
<u>N100B-nets</u>						<u>66.7%</u>	<u>85.7%</u>	<u>82.4%</u>
Adults					(0)	(2)	(12)	(14)
Juveniles					(0)	<u>33.3%</u>	<u>14.3%</u>	<u>17.6%</u>
						(1)	(2)	(3)
<u>N100H-nets</u>			<u>66.7%</u>	<u>66.7%</u>				
Adults	(0)	(0)	(2)	(2)	(0)	(1)	(1)	(2)
Juveniles	(0)	(0)	<u>33.3%</u>	<u>33.3%</u>	(0)	(0)	(0)	(0)
			(1)	(1)				

Table A2-106. Abundances for adult *S. regularis/neglecta* expressed by mean number of individuals/100m³/depth of water column sampled (WCV-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
Neritic Stations				Oceanic Stations			
	1	2		1	2	3	4
Durban	22			2	1		
Port Shepstone	3						
Port St. Johns	36			0	3		
East London	0			9	0		
Port Elizabeth	0	8		0	1	0	0
Range <u>3 to 36</u>				Range <u>1 to 9</u>			
Median <u>15</u>				Median <u>2</u>			

AUTUMN SURVEY								
Neritic Stations				Oceanic Stations				
	1	2	3	4	1	2	3	4
Durban	104				0	10	2	
Port Shepstone	7				2	2	4	
Port St. Johns	26				4	3	0	
Bashee	46				3	3	5	
East London	42				6	1	0	
Port Alfred	10				2	0	0	
Port Elizabeth	26	52			2	6	0	0
Cape Seal	32	42	8	3				
Range <u>3 to 104</u>				Range <u>1 to 10</u>				
Median <u>29</u>				Median <u>3</u>				

WINTER SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban	342					12	3	2	
Port Shepstone	9					5	8	< 1	
Port St. Johns	0					0	1	7	
Bashee	0					3	0	0	
East London	0					10	3	1	
Port Alfred	7	12					< 1	0	
Port Elizabeth	39	3				12	5	7	4
Cape Seal	0	0	5	3					
Range 3 to 342				Range 1 to 12					
Median 8				Median 3					

Table A2-107. Abundances for juvenile *S. regularis/neglecta* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	30				2	0		
Port Shepstone	3							
Port St. Johns	21				0	0		
East London	16				4	0		
Port Elizabeth	0	3			1	0	0	0
Range <u>3 to 30</u>				Range <u>1 to 4</u>				
Median <u>16</u>				Median <u>2</u>				

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	78				0	10	5	
Port Shepstone	13				15	<1	10	
Port St. Johns	61				19	4	<1	
Bashee	29				7	3	5	
East London	21				6	3	0	
Port Alfred	0				0	<1	0	
Port Elizabeth	13	46			3	2	0	0
Cape Seal	13	18	3	2				
Range <u>2 to 78</u>				Range <u><1 to 19</u>				
Median <u>18</u>				Median <u>4½</u>				

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	35				3	0	<1	
Port Shepstone	9				2	4	<1	
Port St. Johns	9				<1	0	3	
Bashee	0				8	0	2	
East London	0				3	1	5	
Port Alfred	13	11				<1	0	
Port Elizabeth	7	0			7	4	0	4
Cape Seal	0	0	0	3				
Range <u>3 to 35</u>				Range <u><1 to 8</u>				
Median <u>9</u>				Median <u>3</u>				

Table A2-108. Abundances for adult *S. regularis/neglecta* expressed by number of individuals/haul/10 minutes (11003-note). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
Neritic Stations				Oceanic Stations			
1	2			1	2	3	4
Durban				0	0		
Port Shepstone							
Port St. Johns				0	0		
East London							
Port Elizabeth		0		0	0	0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY							
Neritic Stations				Oceanic Stations			
1	2	3	4	1	2	3	4
Durban				1	0	0	
Port Shepstone				1	0	0	
Port St. Johns				0	0	0	
Bashee				0	0	0	
East London				0	0	0	
Port Alfred				0	0	0	
Port Elizabeth				0	0	0	0
Cape Seal		0	0	0			
Range _____				Range _____			
Median _____				Median _____			

WINTER SURVEY							
Neritic Stations				Oceanic Stations			
1	2	3	4	1	2	3	4
Durban				2	1	0	
Port Shepstone				0	1	0	
Port St. Johns				0	0	0	
Bashee				0	0	0	
East London				0	0	0	
Port Alfred		0			0	0	
Port Elizabeth		3		1	2	1	1
Cape Seal			0				
Range _____				Range <u>1 to 2</u>			
Median _____				Median <u>1</u>			

Table A2-109. Abundances for juvenile S. regularis/neglecta expressed by number of individual/haul/10 minutes (N100B-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban				0	0		
Port Shepstone							
Port St. Johns				0	0		
East London							
Port Elizabeth				0	0	0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					0	1	0
Port Shepstone					0	0	0
Port St. Johns					0	0	0
Bashee					0	0	0
East London					0	0	0
Port Alfred					0	0	0
Port Elizabeth					0	0	0
Cape Seal		0	0	0			
Range _____				Range _____			
Median _____				Median _____			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					0	0	0
Port Shepstone					0	0	0
Port St. Johns					0	0	0
Bashee					0	0	0
East London					0	0	0
Port Alfred		0				0	0
Port Elizabeth		1			1	0	0
Cape Seal				0			
Range _____				Range _____			
Median _____				Median _____			

Table A2-110. Abundances for adult *S. regul'ris/neglecta* expressed by number of individuals/haul/10 minutes (1100H-nots). Compare with Table A1-1 for station numbers.

	<u>SUMMER SURVEY</u>							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	0					0		
Port Shepstone								
Port St. Johns	0				0	0		
East London	0				0	0		
Port Elizabeth	0	0			0		0	0
Range _____				Range _____				
Median _____				Median _____				

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	0					0	1	0	
Port Shepstone	0					0	0		
Port St. Johns	0					0	0	0	
Bashee	0					0	0	0	
East London	0					0	0	0	
Port Alfred	0					0	0		
Port Elizabeth	0	0				0	0	0	0
Cape Seal	0	0	0	0					
Range _____					Range _____				
Median _____					Median _____				

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	1					0	0	0	
Port Shepstone	0					0	0	0	
Port St. Johns	0					0	0	0	
Bashee	0					0	0	0	
East London	0					0	0	0	
Port Alfred	0	0					0	1	
Port Elizabeth	0	0				0	0		
Cape Seal		0	1	0					
Range _____					Range _____				
Median _____					Median _____				

Table A2-111. Abundances for juvenile *S. regularis/neglecta* expressed by number of individuals/haul/10 minutes (N100H-nets). Compare with Table A1-1 for station numbers.

<u>SUMMER SURVEY</u>								
Neritic Stations				Oceanic Stations				
	1	2			1	2	3	4
Durban	0					0		
Port Shepstone								
Port St. Johns	0				0	0		
East London	0				0	0		
Port Elizabeth	0	0			0		0	0
Range _____				Range _____				
Median _____				Median _____				

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	0					0	0	0	
Port Shepstone	0					0	0		
Port St. Johns	0					0	0	0	
Bashee	0					0	0	0	
East London	0					0	0	0	
Port Alfred	0					0	0		
Port Elizabeth	0	0				0	0	0	0
Cape Seal	0	0	0	0					
Range _____					Range _____				
Median _____					Median _____				

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	1					0	0	0	
Port Shepstone	0					0	0	0	
Port St. Johns	0					0	0	0	
Bashee	0					0	0	0	
East London	0					0	0	0	
Port Alfred	0	0					0	0	
Port Elizabeth	0	0				0	0		
Cape Seal		0	0	0					
Range _____					Range _____				
Median _____					Median _____				

Table A2-112. Presence (X) and absence (O) of *R. subtilis* according to all nets used (H70Vs, H100Bs, H100Ls). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	X			X	X		
Port Shepstone	X						
Port St. Johns	O			O	X		
East London	O			X	X		
Port Elizabeth	O	X		X	X	X	X
Range _____ Median _____				Range _____ Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	X				X	X	X
Port Shepstone	O				X	X	X
Port St. Johns	O				X	X	X
Bashee	O				X	X	X
East London	X				X	X	X
Port Alfred	O				X	X	X
Port Elizabeth	O	X			X	X	X
Cape Seal	O	O	X	X			
Range _____ Median _____				Range _____ Median _____			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	X				X	X	X
Port Shepstone	O				X	X	X
Port St. Johns	X				X	X	X
Bashee	O				X	X	X
East London	X				X	X	X
Port Alfred	O	X			X	X	X
Port Elizabeth	X	X			X	X	X
Cape Seal	O	O	O	O			
Range _____ Median _____				Range _____ Median _____			

Table A2-113. Abundances for *K. subtilis* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	7			9	5		
Port Shepstone	3						
Port St. Johns	0			0	2		
East London	0			8	7		
Port Elizabeth	0	2		4	20	15	17
Range <u>2 to 7</u> Median <u>3</u>				Range <u>2 to 20</u> Median <u>8</u>			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	26				7	17	6
Port Shepstone	0				11	8	8
Port St. Johns	0				21	5	16
Bashee	0				7	16	4
East London	5				10	14	4
Port Alfred	0				< 1	19	13
Port Elizabeth	0	2			9	7	10
Cape Seal	0	0	5	2			
Range <u>2 to 26</u> Median <u>5</u>				Range <u>< 1 to 21</u> Median <u>8</u>			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				4	3	7
Port Shepstone	0				13	25	13
Port St. Johns	0				10	16	15
Bashee	0				6	12	16
East London	0				5	3	9
Port Alfred	0	0				1	1
Port Elizabeth	7	3			20	22	8
Cape Seal	0	0	0	0			
Range <u>3 to 7</u> Median <u>5</u>				Range <u>1 to 25</u> Median <u>9</u>			

Table A2-114. Abundances for *K. subtilis* expressed by number of individuals/haul/10 minutes (NIOOB-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
Neritic Stations				Oceanic Stations			
1	2			1	2	3	4
Durban				0	7		
Port Shepstone							
Port St. Johns				0	0		
East London							
Port Elizabeth		3		1	0	5	11
Range _____				Range <u>1 to 11</u>			
Median _____				Median <u>6</u>			

AUTUMN SURVEY							
Neritic Stations				Oceanic Stations			
1	2	3	4	1	2	3	4
Durban				5	1	8	
Port Shepstone				0	0	0	
Port St. Johns				3	8	4	
Bashee				3	7	3	
East London				10	23	19	
Port Alfred				4	8	9	
Port Elizabeth				12	22	16	7
Cape Seal		0	0	0			
Range _____				Range <u>1 to 23</u>			
Median _____				Median <u>6</u>			

WINTER SURVEY							
Neritic Stations				Oceanic Stations			
1	2	3	4	1	2	3	4
Durban				0	11	4	
Port Shepstone				18	6	3	
Port St. Johns				0	10	0	
Bashee				20	11	6	
East London				4	4	28	
Port Alfred		3			3	13	
Port Elizabeth		0		12	0	12	31
Cape Seal			0				
Range _____				Range <u>3 to 31</u>			
Median _____				Median <u>11</u>			

Table A2-115. Abundances for *K. subtilis* expressed by number of individuals/haul/10 minutes (WIOOH-nets). Compare with Table A1-1 for station number.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0				0		
Port Shepstone							
Port St. Johns	0			0	0		
East London	0			0	0		
Port Elizabeth	0	0		0		0	2
Range _____ Median _____				Range _____ Median _____			

AUTUMN SURVEY									
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	0					0	0	0	
Port Shepstone	0					0	12		
Port St. Johns	0					0	0	0	
Bashee	0					0	0	0	
East London	0					0	0	1	
Port Alfred	0					0	0		
Port Elizabeth	0	0				0	0	5	0
Cape Seal	0	0	0	0					
Range _____						Range <u>1 to 12</u>			
Median _____						Median <u>5</u>			

WINTER SURVEY									
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	1					0	0	0	
Port Shepstone	0					0	0	0	
Port St. Johns	1					0	0	0	
Bashee	0					0	0	0	
East London	0					0	0	2	
Port Alfred	0	0					0	0	
Port Elizabeth	0	1				0	1		
Cape Seal		0	0	0					
Range _____ Median _____					Range _____ Median _____				

Table A2-116. Population composition of *K. subtilis* for all nets used. Relative abundances are enclosed by parentheses. N100B's oceanic only.

Neritic Area					Oceanic Area			
	Summer Survey	Autumn Survey	winter survey	All Surveys	Summer Survey	Autumn Survey	Winter Survey	All Surveys
<u>N70V-nets</u>								
Adults	<u>66.7%</u> (2)	<u>50.0%</u> (5)	(2)	<u>60.0%</u> (9)	<u>62.5%</u> (80)	<u>72.4%</u> (241)	<u>75.1%</u> (225)	<u>71.7%</u> (546)
Juveniles	<u>33.3%</u> (1)	<u>50.0%</u> (5)	(0)	<u>40.0%</u> (6)	<u>37.5%</u> (48)	<u>27.6%</u> (92)	<u>24.9%</u> (75)	<u>28.3%</u> (215)
<u>N100B-nets</u>								
Adults					<u>51.6%</u> (16)	<u>63.9%</u> (129)	<u>77.2%</u> (183)	<u>69.8%</u> (328)
Juveniles					<u>48.4%</u> (15)	<u>36.1%</u> (73)	<u>22.8%</u> (54)	<u>30.2%</u> (142)
<u>N100H-nets</u>								
Adults	(0)	<u>66.7%</u> (2)	<u>60.0%</u> (3)	<u>62.5%</u> (5)	(0)	<u>46.7%</u> (7)	(0)	<u>38.9%</u> (7)
Juveniles	(0)	<u>33.3%</u> (1)	<u>40.0%</u> (2)	<u>37.5%</u> (3)	(2)	<u>53.3%</u> (8)	(1)	<u>61.1%</u> (11)

Table A2-117. Abundances for adult *K. subtilis* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY								
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	0				7	3		
Port Shepstone	3							
Port St. Johns	0				0	2		
East London	0				8	5		
Port Elizabeth	0	2			1	7	6	13
Range <u>2 to 3</u>					Range <u>1 to 13</u>			
Median <u>3</u>					Median <u>6</u>			

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	0				6	11	4	
Port Shepstone	0				6	6	7	
Port St. Johns	0				14	5	12	
Bashee	0				6	10	4	
East London	5				7	9	2	
Port Alfred	0				< 1	16	13	
Port Elizabeth	0	2			4	6	7	5
Cape Seal	0	0	3	2				
Range <u>2 to 5</u>				Range <u>1 to 16</u>				
Median <u>2½</u>				Median <u>6</u>				

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	0					4	3	7	
Port Shepstone	0					11	17	6	
Port St. Johns	0					10	14	14	
Bashee	0					5	9	13	
East London	0					3	2	7	
Port Alfred	0	0					1	0	
Port Elizabeth	7	3				14	11	5	5
Cape Seal	0	0	0	0					
Range <u>3 to 7</u>					Range <u>1 to 17</u>				
Median <u>5</u>					Median <u>7</u>				

Table A2-118. Abundances for juvenile *K. subtilis* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	7			2	2		
Port Shepstone	0						
Port St. Johns	0			0	0		
East London	0			0	2		
Port Elizabeth	0	0		2	12	9	3
Range _____				Range 2 to 12			
Median _____				Median 2			

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	26					1	6	2	
Port Shepstone	0					7	2	2	
Port St. Johns	0					7	< 1	4	
Bashee	0					1	6	0	
East London	0					3	6	1	
Port Alfred	0					0	3	0	
Port Elizabeth	0	0				5	< 1	3	1
Cape Seal	0	0	3	0					
Range 3 to 26					Range < 1 to 7				
Median 14½					Median 3				

WINTER SURVEY									
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	0					< 1	0	0	
Port Shepstone	0					2	8	8	
Port St. Johns	0					0	1	< 1	
Bashee	0					2	3	3	
East London	0					2	1	2	
Port Alfred	0	0					0	1	
Port Elizabeth	0	0				7	9	3	1
Cape Seal	0	0	0	0					
Range _____						Range < 1 to 9			
Median _____						Median 2			

Table A2-119. Abundances for adult *M. subtilis* expressed by number of individuals/haul/10 minutes (100B-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban				0	3		
Port Shepstone							
Port St. Johns				0	0		
East London							
Port Elizabeth		2		1	0	3	4
Range _____				Range 1 to 4			
Median _____				Median 3			

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						3	1	3	
Port Shepstone						0	0	0	
Port St. Johns						3	5	4	
Bashee						3	3	1	
East London						5	8	11	
Port Alfred						4	3	7	
Port Elizabeth						7	19	13	5
Cape Seal		0	0	0					
Range _____					Range <u>1 to 19</u>				
Median _____					Median <u>4</u>				

WINTER SURVEY								
Neritic Stations				Oceanic Stations				
	1	2	3	4	1	2	3	4
Durban					0	8	3	
Port Shepstone					12	5	2	
Port St. Johns					0	7	0	
Bashee					17	8	2	
East London					3	3	21	
Port Alfred		3				3	12	
Port Elizabeth		0			10	0	12	24
Cape Seal				0				

Range	_____
Median	_____

Range	<u>2 to 24</u>
Median	<u>8</u>

Table A2-120. Abundances for juvenile *K. subtilis* expressed by number of individuals/haul/10 minutes (NICOB-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY								
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban					0	3		
Port Shepstone								
Port St. Johns					0	0		
East London								
Port Elizabeth		1			0	0	2	7
Range _____					Range 2 to 7			
Median _____					Median 3			

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						2	0	4	
Port Shepstone						0	0	0	
Port St. Johns						0	3	0	
Bashee						0	3	2	
East London						5	14	8	
Port Alfred						0	6	3	
Port Elizabeth						5	3	3	2
Cape Seal		0	0	0					
Range _____					Range 2 to 14				
Median _____					Median 3				

WINTER SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban						0	3	1	
Port Shepstone						6	1	1	
Port St. Johns						0	3	0	
Bashee						3	3	4	
East London						2	2	7	
Port Alfred		0					0	2	
Port Elizabeth		0				2	6	0	7
Cape Seal				0					

Range	_____
Median	_____

Range	<u>1 to 7</u>
Median	<u>3</u>

Table A2-121. Abundances for adult *M. subtilis* expressed by number of individuals/haul/10 minutes (WLOOH-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0				0		
Port Shepstone							
Port St. Johns	0			0	0		
East London	0			0	0		
Port Elizabeth	0	0		0		0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	0					0	0	0	
Port Shepstone	0					0	5		
Port St. Johns	0					0	0	0	
Bashee	0					0	0	0	
East London	0					0	0	1	
Port Alfred	0					0	0		
Port Elizabeth	0	0				0	0	3	0
Cape Seal	0	0	0	0					
Range _____					Range <u>1 to 5</u>				
Median _____					Median <u>3</u>				

WINTER SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban	1					0	0	0	
Port Shepstone	0					0	0	0	
Port St. Johns	1					0	0	0	
Bashee	0					0	0	0	
East London	0					0	0	0	
Port Alfred	0	0					0	0	
Port Elizabeth	0	1				0	0		
Cape Seal		0	0	0					
Range _____				Range _____					
Median _____				Median _____					

Table A2-122. Abundances for juvenile *K. subtilis* expressed by number of individuals/haul/10 minutes (F100H-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
Neritic Stations				Oceanic Stations			
	1	2		1	2	3	4
Durban	0				0		
Port Shepstone							
Port St. Johns	0			0	0		
East London	0			0	0		
Port Elizabeth	0	0		0		0	2
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	0					0	0	0	
Port Shepstone	0					0	7		
Port St. Johns	0					0	0	0	
Bashee	0					0	0	0	
East London	0					0	0	0	
Port Alfred	0					0	0		
Port Elizabeth	0	0				0	0	2	0
Cape Seal	0	0	0	0					
Range _____					Range <u>2 to 7</u>				
Median _____					Median <u>4½</u>				

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	0					0	0	0	
Port Shepstone	0					0	0	0	
Port St. Johns	0					0	0	0	
Bashee	0					0	0	0	
East London	0					0	0	2	
Port Alfred	0	0					0	0	
Port Elizabeth	0	0				0	1		
Cape Seal		0	0	0					
Range _____					Range _____				
Median _____					Median _____				

Table A2-123. Presence (X) and absence (O) of *E. hexaptera* according to all nets used (N70Vs, N100Bs, N100Hs). Compare with Table A1-1 for station numbers.

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	X				X	X		
Port Shepstone	X							
Port St. Johns	X				X	X		
East London	O				X	X		
Port Elizabeth	O	X			X	X	X	X
Range _____ Median _____				Range _____ Median _____				

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	X				X	X	X	
Port Shepstone	X				X	X	X	
Port St. Johns	X				X	X	X	
Bashee	X				X	X	X	
East London	O				X	X	X	
Port Alfred	X				X	X	X	
Port Elizabeth	O	O			X	X	X	X
Cape Seal	O	X	X	X				
Range _____ Median _____				Range _____ Median _____				

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	X				X	X	X	
Port Shepstone	X				X	X	X	
Port St. Johns	X				X	X	X	
Bashee	X				X	X	X	
East London	X				X	X	X	
Port Alfred	O	X				X	X	
Port Elizabeth	O	X			X	X	X	X
Cape Seal	O	O	X	X				
Range _____ Median _____				Range _____ Median _____				

Table A2-124. Abundances for *S. hexaptera* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	30			4	5		
Port Shepstone	5						
Port St. Johns	5			6	10		
East London	0			11	6		
Port Elizabeth	0	5		5	2	6	13
Range <u>5 to 30</u>				Range <u>2 to 13</u>			
Median <u>5</u>				Median <u>6</u>			

AUTUMN SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban	20					4	17	8	
Port Shepstone	20					8	25	8	
Port St. Johns	9					14	3	7	
Bashee	6					5	10	8	
East London	0					7	5	1	
Port Alfred	0					0	8	10	
Port Elizabeth	0	0				3	19	13	8
Cape Seal	0	0	5	1					
Range <u>1 to 20</u>				Range <u>1 to 25</u>					
Median <u>7½</u>				Median <u>8</u>					

WINTER SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban	6					3	0	9	
Port Shepstone	0					8	24	7	
Port St. Johns	9					19	11	9	
Bashee	0					3	3	8	
East London	0					10	1	10	
Port Alfred	0	3					2	0	
Port Elizabeth	0	3				21	14	15	16
Cape Seal	0	0	0	1					
Range <u>1 to 9</u>				Range <u>1 to 24</u>					
Median <u>3</u>				Median <u>9</u>					

Table A2-125. Abundance for *U. hexaptera* expressed by number of individuals/haul/10 minutes (MIOB-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban				13	23		
Port Shepstone							
Port St. Johns				13	0		
East London							
Port Elizabeth		18		20	0	11	29
Range _____				Range 11 to 29			
Median _____				Median 16½			

AUTUMN SURVEY										
Neritic Stations					Oceanic Stations					
	1	2	3	4		1	2	3	4	
Durban						44	30	40		
Port Shepstone						14	11	38		
Port St. Johns						32	48	31		
Bashee						3	30	37		
East London						18	37	43		
Port Alfred						18	78	77		
Port Elizabeth						10	73	68	33	
Cape Seal		0	1	6						
Range <u>1 to 6</u>						Range <u>8 to 78</u>				
Median <u>3½</u>						Median <u>35</u>				

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						7	21	26	
Port Shepstone						28	36	38	
Port St. Johns						0	24	13	
Bashee						18	22	69	
East London						16	17	46	
Port Alfred		4					13	15	
Port Elizabeth		0				13	33	62	43
Cape Seal				6					
Range <u>4 to 6</u>					Range <u>7 to 69</u>				
Median <u>5</u>					Median <u>23</u>				

Table A2-126. Abundances for *S. hexaptera* expressed by mean number of individuals/haul/10 minutes (W100H-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0				0		
Port Shepstone							
Port St. Johns	0			0	15		
East London	0			0	0		
Port Elizabeth	0	0		2		0	2
Range _____				Range <u>2 to 15</u>			
Median _____				Median <u>2</u>			

AUTUMN SURVEY									
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	21					3	2	18	
Port Shepstone	25					0	67		
Port St. Johns	10					2	33	15	
Bashee	5					4	6	30	
East London	0					1	12	22	
Port Alfred	1					17	6		
Port Elizabeth	0	0				5	8	53	38
Cape Seal	0	1	0	2					
Range <u>1 to 25</u>						Range <u>1 to 67</u>			
Median <u>5</u>						Median <u>12</u>			

WINTER SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban	5					0	1	12	
Port Shepstone	1					16	9	12	
Port St. Johns	1					3	11	23	
Bashee	1					7	2	14	
East London	0					0	4	6	
Port Alfred	0	2					8	5	
Port Elizabeth	0	0				0	11		
Cape Seal		0	1	6					
Range <u>1 to 6</u>				Range <u>1 to 23</u>					
Median <u>1</u>				Median <u>9</u>					

Table A2-127. Population composition of *S. hexaptera* for all nets used. Relative abundances are enclosed by parentheses. N100B's oceanic only.

Neritic Area					Oceanic Area			
	Summer Survey	Autumn Survey	winter survey	All Surveys	Summer Survey	Autumn Survey	Winter Survey	All Surveys
<u>N70V-nets</u>	<u>27.2%</u>	<u>41.7%</u>	<u>60.0%</u>	<u>42.4%</u>	<u>41.6%</u>	<u>37.8%</u>	<u>41.7%</u>	<u>40.0%</u>
Adults	(3)	(5)	(6)	(14)	(37)	(109)	(111)	(257)
Juveniles	<u>72.8%</u>	<u>58.3%</u>	<u>40.0%</u>	<u>57.6%</u>	<u>58.4%</u>	<u>62.2%</u>	<u>58.3%</u>	<u>60.0%</u>
	(8)	(7)	(4)	(19)	(52)	(179)	(155)	(386)
<u>N100B-nets</u>					<u>52.0%</u>	<u>47.7%</u>	<u>52.8%</u>	<u>50.0%</u>
Adults					(79)	(471)	(363)	(913)
Juveniles					<u>48.0%</u>	<u>52.3%</u>	<u>47.2%</u>	<u>50.0%</u>
					(73)	(516)	(325)	(914)
<u>N100H-nets</u>		<u>31.1%</u>	<u>70.6%</u>	<u>41.9%</u>	<u>42.1%</u>	<u>56.9%</u>	<u>60.1%</u>	<u>57.3%</u>
Adults	(0)	(14)	(12)	(26)	(8)	(206)	(92)	(306)
Juveniles	(0)	<u>68.9%</u>	<u>29.4%</u>	<u>58.1%</u>	<u>57.9%</u>	<u>43.1%</u>	<u>39.9%</u>	<u>42.7%</u>
		(31)	(5)	(36)	(11)	(156)	(61)	(228)

Table A2-128. Abundances for adult *S. hexaptera* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	15			< 1	3		
Port Shepstone	0						
Port St. Johns	0			0	2		
East London	0			8	2		
Port Elizabeth	0	2		4	0	3	3
Range <u>2 to 15</u>				Range <u>< 1 to 8</u>			
Median <u>8½</u>				Median <u>3½</u>			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	20				3	4	3
Port Shepstone	0				4	10	5
Port St. Johns	0				4	2	4
Bashee	0				< 1	2	5
East London	0				2	1	0
Port Alfred	0				0	2	4
Port Elizabeth	0	0			< 1	8	6
Cape Seal	0	0	3	< 1			
Range <u>< 1 to 20</u>				Range <u>< 1 to 10</u>			
Median <u>3</u>				Median <u>3½</u>			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	6				0	0	5
Port Shepstone	0				2	9	5
Port St. Johns	9				12	4	4
Bashee	0				0	0	5
East London	0				3	0	3
Port Alfred	0	2				< 1	0
Port Elizabeth	0	0			7	2	8
Cape Seal	0	0	0	< 1			
Range <u>< 1 to 9</u>				Range <u>< 1 to 12</u>			
Median <u>4</u>				Median <u>5</u>			

Table A2-129. Abundances for juvenile *S. hexaptera* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	14			3	1		
Port Shepstone	5						
Port St. Johns	5			0	9		
East London	0			3	4		
Port Elizabeth	0	4		2	2	3	10
Range <u>4 to 14</u>				Range <u>1 to 10</u>			
Median <u>5</u>				Median <u>3</u>			

AUTUMN SURVEY									
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	0					2	13	4	
Port Shepstone	20					5	16	3	
Port St. Johns	9					10	2	3	
Bashee	6					4	8	3	
East London	0					5	3	1	
Port Alfred	0					0	6	6	
Port Elizabeth	0	0				3	11	7	5
Cape Seal	0	0	3	<1					
Range <u><1 to 20</u>						Range <u>1 to 16</u>			
Median <u>6</u>						Median <u>5</u>			

WINTER SURVEY									
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	0					3	0	4	
Port Shepstone	0					5	16	1	
Port St. Johns	0					7	7	5	
Bashee	0					3	3	3	
East London	0					7	1	8	
Port Alfred	0	1					2	0	
Port Elizabeth	0	3				14	12	7	6
Cape Seal	0	0	0	< 1					
Range <u>1 to 3</u>						Range <u>1 to 16</u>			
Median <u>1</u>						Median <u>5</u>			

Table 12-130. Abundances for adult S. hexoptera expressed by number of individuals/mul/10 minutes (1100B-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban				2	7		
Port Shepstone							
Port St. Johns				5	0		
East London							
Port Elizabeth		15		12	0	6	13
Range _____			Range 5 to 13				
Median _____			Median 8				

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						10	13	17	
Port Shepstone						5	9	33	
Port St. Johns						11	22	10	
Bashee						5	15	16	
East London						13	13	25	
Port Alfred						11	29	32	
Port Elizabeth						5	23	34	22
Cape Seal		0	0	4					
Range _____					Range 5 to 34				
Median _____					Median 17				

WINTER SURVEY

	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban					7	13	13	
Port Shepstone					15	22	20	
Port St. Johns					0	15	3	
Bashee					8	8	36	
East London					11	9	12	
Port Alfred		3				12	10	
Port Elizabeth		0			7	21	29	25
Cape Seal				3				

Range _____

Median _____

Range 7 to 36

Median 13

Table A2-131. Abundances for juvenile *S. hexaptera* expressed by number of individuals/haul/10 minutes (N100B-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY								
Neritic Stations				Oceanic Stations				
	1	2			1	2	3	4
Durban					4	17		
Port Shepstone								
Port St. Johns					8	0		
East London								
Port Elizabeth		3			8	0	5	17
Range _____				Range 4 to 17				
Median _____				Median 8				

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						26	17	23	
Port Shepstone						9	2	5	
Port St. Johns						21	26	13	
Bashee						3	15	18	
East London						6	24	18	
Port Alfred						8	48	45	
Port Elizabeth						5	51	34	12
Cape Seal		0	1	2					
Range _____					Range <u>2 to 51</u>				
Median _____					Median <u>17½</u>				

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						0	8	13	
Port Shepstone						13	14	18	
Port St. Johns						0	9	10	
Bashee						9	13	33	
East London						5	8	34	
Port Alfred		1					7	5	
Port Elizabeth		0				7	13	33	18
Cape Seal				2					
Range _____					Range <u>5 to 34</u>				
Median _____					Median <u>13</u>				

Table A2-132. Abundances for adult *S. hexoptera* expressed by number of individuals/haul/10 minutes (WIOOH-nots). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0				0		
Port Shepstone							
Port St. Johns	0			0	8		
East London	0			0	0		
Port Elizabeth	0	0		0		0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	13					2	2	9	
Port Shepstone	10					0	7		
Port St. Johns	6					2	23	9	
Bashee	2					3	6	19	
East London	0					1	6	9	
Port Alfred	1					7	3		
Port Elizabeth	0	0				2	3	38	35
Cape Seal	0	0	0	2					
Range <u>1 to 13</u>					Range <u>1 to 35</u>				
Median <u>4</u>					Median <u>6</u>				

WINTER SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban	5					0	1	11	
Port Shepstone	1					8	4	6	
Port St. Johns	0					1	7	17	
Bashee	1					3	2	5	
East London	0					0	4	4	
Port Alfred	0	2					8	3	
Port Elizabeth	0	0				3	3		
Cape Seal		0	0	3					
Range <u>1 to 5</u>				Range <u>1 to 17</u>					
Median <u>2</u>				Median <u>4</u>					

Table A2-133. Abundances for juvenile *S. hexoptera* expressed by number of individuals/haul/10 minutes (1100H-nets). Compare with Table A1-1 for station numbers.

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	0					0		
Port Shepstone								
Port St. Johns	0				0	7		
East London	0				0	0		
Port Elizabeth	0	0			2		0	2
Range _____				Range 2 to 7				
Median _____				Median 2				

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	8				1	0	9	
Port Shepstone	15				0	60		
Port St. Johns	4				0	10	6	
Bashee	3				1	0	11	
East London	0				0	6	13	
Port Alfred	0				10	3		
Port Elizabeth	0	0			3	5	15	3
Cape Seal	0	1	0	0				
Range _____				Range 1 to 60				
Median _____				Median 6				

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	0				0	0	1	
Port Shepstone	0				8	5	4	
Port St. Johns	1				2	4	6	
Bashee	0				4	0	9	
East London	0				0	0	2	
Port Alfred	0	0				0	2	
Port Elizabeth	0	0			6	8		
Cape Seal		0	1	3				
Range _____				Range 1 to 9				
Median _____				Median 4				

Table A2-134. Presence (X) and absence (O) of *S. bipunctata* according to all nets used (N70Vs, N100Bs, N100Hs). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	O			X	X		
Port Shepstone	O						
Port St. Johns	X			X	X		
East London	X			X	X		
Port Elizabeth	X	X		X	X	X	X
Range _____ Median _____				Range _____ Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	X				O	X	X
Port Shepstone	X				X	X	X
Port St. Johns	X				X	X	X
Bashee	X				X	X	X
East London	X				X	X	X
Port Alfred	X				X	X	X
Port Elizabeth	X	X			X	X	X
Cape Seal	X	O	X	X			
Range _____ Median _____				Range _____ Median _____			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	X				X	X	X
Port Shepstone	X				X	X	X
Port St. Johns	O				X	X	X
Bashee	O				X	X	X
East London	O				X	X	X
Port Alfred	X	X				X	X
Port Elizabeth	O	O			X	X	X
Cape Seal	O	O	X	X			
Range _____ Median _____				Range _____ Median _____			

Table A2-135. Abundances for *S. bipunctata* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0			0	0		
Port Shepstone	0						
Port St. Johns	16			< 1	4		
East London	10			12	5		
Port Elizabeth	0	0		0	4	1	0
Range <u>10 to 16</u> Median <u>13</u>				Range <u>< 1 to 12</u> Median <u>4</u>			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	39				0	3	16
Port Shepstone	7				8	4	7
Port St. Johns	0				16	7	8
Bashee	0				< 1	8	5
East London	31				6	18	1
Port Alfred	0				1	< 1	0
Port Elizabeth	0	6			5	3	2
Cape Seal	6	0	3	2			
Range <u>2 to 39</u> Median <u>6</u>				Range <u>< 1 to 18</u> Median <u>5</u>			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	29				11	2	10
Port Shepstone	0				23	29	19
Port St. Johns	0				15	7	20
Bashee	0				< 1	0	< 1
East London	0				10	7	11
Port Alfred	0	6				0	0
Port Elizabeth	0	0			0	< 1	1
Cape Seal	0	0	0	1			
Range <u>1 to 29</u> Median <u>6</u>				Range <u>< 1 to 29</u> Median <u>10</u>			

Table A2-136. Abundances for *S. bipunctata* expressed by number of individuals/haul/10 minutes (N100B-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban				7	2		
Port Shepstone							
Port St. Johns				2	12		
East London							
Port Elizabeth		7		13	7	11	2
Range _____				Range <u>2 to 13</u>			
Median _____				Median <u>7</u>			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					0	58	21
Port Shepstone					11	83	33
Port St. Johns					11	21	3
Bashee					12	65	20
East London					3	30	5
Port Alfred					15	11	9
Port Elizabeth					17	63	21
Cape Seal		0	2	8			
Range <u>2 to 8</u>				Range <u>3 to 83</u>			
Median <u>5</u>				Median <u>20</u>			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					13	3	6
Port Shepstone					9	3	13
Port St. Johns					1	2	3
Bashee					3	16	8
East London					9	15	3
Port Alfred		8				2	0
Port Elizabeth		0			8	7	24
Cape Seal				8			
Range _____				Range <u>1 to 24</u>			
Median _____				Median <u>7½</u>			

Table A2-137. Abundances for *S. bipunctata* expressed by number of individuals/haul/10 minutes (MCOH-nets). Compare with Table A1-1 for station numbers.

	<u>SUMMER SURVEY</u>							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	0					19		
Port Shepstone								
Port St. Johns	4				0	9		
East London	0				10	68		
Port Elizabeth	12	0			6		13	4
Range <u>4 to 12</u>				Range <u>4 to 68</u>				
Median <u>8</u>				Median <u>10</u>				

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	26					0	233	31	
Port Shepstone	16					12	23		
Port St. Johns	21					22	55	7	
Bashee	8					6	46	52	
East London	0					0	59	18	
Port Alfred	1					6	0		
Port Elizabeth	2	10				21	98	4	94
Cape Seal	0	0	9	10					
Range <u>1 to 26</u>					Range <u>4 to 233</u>				
Median <u>10</u>					Median <u>23</u>				

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	30					8	7	5	
Port Shepstone	2					1	9	19	
Port St. Johns	0					2	7	21	
Bashee	0					3	25	6	
East London	0					4	40	0	
Port Alfred	6	0					27	10	
Port Elizabeth	0	0				3	5		
Cape Seal		0	7	15					
Range <u>2 to 30</u>					Range <u>1 to 40</u>				
Median <u>7</u>					Median <u>7</u>				

Table A2-138. Population composition of *S. bipunctata* for all nets used. Relative abundances are enclosed by parentheses. N100B's oceanic only.

Neritic Area				Oceanic Area				
	Summer Survey	Autumn Survey	winter survey	All Surveys	Summer Survey	Autumn Survey	Winter Survey	All Surveys
<u>N70V-nets</u>								
Adults	<u>40.0%</u> (2)	<u>66.7%</u> (14)	<u>50.0%</u> (8)	<u>57.1%</u> (24)	<u>73.7%</u> (28)	<u>45.6%</u> (83)	<u>11.7%</u> (27)	<u>30.6%</u> (138)
Juveniles	<u>60.0%</u> (3)	<u>33.3%</u> (7)	<u>50.0%</u> (8)	<u>42.9%</u> (18)	<u>26.3%</u> (10)	<u>54.4%</u> (99)	<u>88.3%</u> (204)	<u>69.4%</u> (313)
<u>N100B-nets</u>								
Adults					<u>68.5%</u> (50)	<u>69.6%</u> (478)	<u>59.9%</u> (118)	<u>67.5%</u> (646)
Juveniles					<u>31.5%</u> (23)	<u>30.4%</u> (209)	<u>40.1%</u> (79)	<u>32.5%</u> (311)
<u>N100H-nets</u>								
Adults	<u>68.8%</u> (11)	<u>81.6%</u> (84)	<u>68.3%</u> (41)	<u>76.0%</u> (136)	<u>78.3%</u> (101)	<u>75.9%</u> (599)	<u>76.7%</u> (155)	<u>76.3%</u> (855)
Juveniles	<u>31.2%</u> (5)	<u>18.4%</u> (19)	<u>31.7%</u> (19)	<u>24.0%</u> (43)	<u>21.7%</u> (28)	<u>24.1%</u> (190)	<u>23.3%</u> (47)	<u>23.7%</u> (265)

Table A2-139. Abundances for adult *S. bipunctata* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0			0	0		
Port Shepstone	0						
Port St. Johns	10			0	4		
East London	0			9	3		
Port Elizabeth	0	0		0	4	1	0
Range _____				Range 1 to 9			
Median _____				Median 4			

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	39					0	2	12	
Port Shepstone	7					2	<1	4	
Port St. Johns	0					6	5	1	
Bashee	0					0	6	3	
East London	10					3	2	0	
Port Alfred	0					1	0	0	
Port Elizabeth	0	4				2	3	2	<1
Cape Seal	6	0	0	<1					
Range <1 to 39						Range <1 to 6			
Median 6½						Median 2			

WINTER SURVEY									
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	17					0	1	< 1	
Port Shepstone	0					0	3	< 1	
Port St. Johns	0					3	< 1	4	
Bashee	0					0	0	0	
East London	0					< 1	4	1	
Port Alfred	0	2					0	0	
Port Elizabeth	0	0				0	< 1	1	0
Cape Seal	0	0	0	1					
Range <u>1 to 17</u>						Range <u>< 1 to 4</u>			
Median <u>2</u>						Median <u>1</u>			

Table A2-140. Abundances for juvenile *S. bipunctata* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	0				0	0		
Port Shepstone	0							
Port St. Johns	5				< 1	0		
East London	10				4	2		
Port Elizabeth	0	0			0	0	0	0
Range <u>5 to 10</u>				Range <u><1 to 4</u>				
Median <u>7</u>				Median <u>2</u>				

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	0				0	1	4	
Port Shepstone	0				6	4	3	
Port St. Johns	0				10	3	7	
Bashee	0				< 1	3	2	
East London	21				3	16	1	
Port Alfred	0				0	< 1	0	
Port Elizabeth	0	2			3	0	0	0
Cape Seal	0	0	3	< 1				
Range <u>< 1 to 21</u>				Range <u>< 1 to 16</u>				
Median <u>2</u>				Median <u>3</u>				

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	12				11	< 1	9	
Port Shepstone	0				23	26	18	
Port St. Johns	0				11	7	16	
Bashee	0				< 1	0	< 1	
East London	0				10	3	9	
Port Alfred	0	4				0	0	
Port Elizabeth	0	0			0	0	0	6
Cape Seal	0	0	0	0				
Range <u>4 to 12</u>				Range <u>< 1 to 26</u>				
Median <u>8</u>				Median <u>9</u>				

Table A2-141. Abundances for adult *M. bipunctata* expressed by number of individuals/haul/10 minutes (FLOOB-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban				7	2		
Port Shepstone							
Port St. Johns				2	6		
East London							
Port Elizabeth		4		8	5	6	1
Range _____				Range 1 to 8			
Median _____				Median 5			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					0	39	13
Port Shepstone					3	68	28
Port St. Johns					9	14	3
Bashee					8	46	11
East London					1	15	3
Port Alfred					9	4	7
Port Elizabeth					15	38	19
Cape Seal		0	2	5			37
Range _____				Range 1 to 68			
Median _____				Median 13			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					8	2	0
Port Shepstone					0	1	8
Port St. Johns					0	1	3
Bashee					3	13	3
East London					8	11	2
Port Alfred		6				1	0
Port Elizabeth		0			3	5	15
Cape Seal				6			3
Range _____				Range 1 to 15			
Median _____				Median 3			

Table A2-142. Abundances for juvenile *S. bipunctata* expressed by number of individuals/haul/10 minutes (N100B-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
Neritic Stations				Oceanic Stations			
1	2			1	2	3	4
Durban				0	0		
Port Shepstone							
Port St. Johns				0	3		
East London							
Port Elizabeth		3		6	2	5	1
Range _____				Range 1 to 6			
Median _____				Median 3			

AUTUMN SURVEY							
Neritic Stations				Oceanic Stations			
1	2	3	4	1	2	3	4
Durban				0	19	8	
Port Shepstone				8	15	5	
Port St. Johns				2	7	0	
Bashee				3	19	9	
East London				3	15	2	
Port Alfred				6	7	3	
Port Elizabeth				2	26	2	13
Cape Seal		0	0	3			
Range _____				Range 2 to 26			
Median _____				Median 7			

WINTER SURVEY							
Neritic Stations				Oceanic Stations			
1	2	3	4	1	2	3	4
Durban				6	1	6	
Port Shepstone				9	2	5	
Port St. Johns				1	1	0	
Bashee				0	3	4	
East London				2	4	2	
Port Alfred		3			1	0	
Port Elizabeth		0		5	2	9	0
Cape Seal			2				
Range _____				Range 1 to 9			
Median _____				Median 3			

Table A2-143. Abundances for adult *S. bignoniata* expressed by number of individuals/haul/10 minutes (1100M-nets). Compare with Table A1-1 for station numbers.

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	0					12		
Port Shepstone								
Port St. Johns	2				0	7		
East London	0				8	57		
Port Elizabeth	9	0			3		11	3
Range <u>2 to 9</u>				Range <u>3 to 57</u>				
Median <u>5</u>				Median <u>11</u>				

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	22				0	197	23	
Port Shepstone	11				0	15		
Port St. Johns	19				15	40	4	
Bashee	7				6	40	38	
East London	0				0	47	16	
Port Alfred	1				2	0		
Port Elizabeth	1	8			12	70	2	72
Cape Seal	0	0	6	9				
Range <u>1 to 22</u>				Range <u>2 to 197</u>				
Median <u>8</u>				Median <u>19</u>				

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	25				8	3	4	
Port Shepstone	2				1	5	17	
Port St. Johns	0				1	5	15	
Bashee	0				1	20	2	
East London	0				3	32	0	
Port Alfred	2	0				25	7	
Port Elizabeth	0	0			3	3		
Cape Seal		0	2	10				
Range <u>2 to 25</u>				Range <u>1 to 32</u>				
Median <u>2</u>				Median <u>4</u>				

Table A2-144. Abundances for juvenile *S. bipunctata* expressed by number of individuals/haul/10 minutes (N100H-nets). Compare with Table A1-1 for station numbers.

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	0					7		
Port Shepstone								
Port St. Johns	2				0	4		
East London	0				2	11		
Port Elizabeth	3	0			3		2	1
Range <u>2 to 3</u>				Range <u>1 to 11</u>				
Median <u>2½</u>				Median <u>3</u>				

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	4				0	36	8	
Port Shepstone	5				12	8		
Port St. Johns	2				7	15	3	
Bashee	1				0	8	14	
East London	0				0	12	2	
Port Alfred	0				4	0		
Port Elizabeth	1	2			9	28	2	22
Cape Seal	0	0	3	1				
Range <u>1 to 5</u>				Range <u>2 to 36</u>				
Median <u>2</u>				Median <u>8½</u>				

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	5				0	4	1	
Port Shepstone	0				0	4	2	
Port St. Johns	0				1	2	6	
Bashee	0				2	5	4	
East London	0				1	8	0	
Port Alfred	4	0				2	3	
Port Elizabeth	0	0			0	2		
Cape Seal		0	5	5				
Range <u>4 to 5</u>				Range <u>1 to 8</u>				
Median <u>5</u>				Median <u>2</u>				

Table A2-145. Presence (X) and absence (O) of *K. pacifica* according to all nets used (N70Vs, N100Bs, N100Hs). Compare with Table A1-1 for station numbers.

SUMMER SURVEY								
Neritic Stations				Oceanic Stations				
	1	2			1	2	3	4
Durban	0				X	X		
Port Shepstone	X							
Port St. Johns	X				0	X		
East London	X				X	0		
Port Elizabeth	X	X			X	0	0	0
Range _____				Range _____				
Median _____				Median _____				

	AUTUMN SURVEY								
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	X					X	X	X	
Port Shepstone	X					X	X	X	
Port St. Johns	X					X	X	X	
Bashee	X					X	X	X	
East London	X					X	X	0	
Port Alfred	X					X	X	0	
Port Elizabeth	X	X				X	X	0	X
Cape Seal	X	X	X	X					
	Range _____					Range _____			
	Median _____					Median _____			

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	X					X	X	X	
Port Shepstone	0					X	X	X	
Port St. Johns	0					X	X	X	
Bashee	0					X	X	0	
East London	0					X	X	X	
Port Alfred	0	X					0	0	
Port Elizabeth	X	X				X	X	X	X
Cape Seal	0	0	X	X					
Range _____					Range _____				
Median _____					Median _____				

Table A2-146. Abundances for *K. pacifica* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station number.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0			0	< 1		
Port Shepstone	3						
Port St. Johns	36			0	0		
East London	10			2	0		
Port Elizabeth	5	16		1	0	0	0
Range <u>3 to 36</u> Median <u>10</u>				Range <u>< 1 to 2</u> Median <u>1</u>			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	20				8	13	< 1
Port Shepstone	20				< 1	1	< 1
Port St. Johns	17				8	2	< 1
Bashee	41				0	< 1	< 1
East London	10				3	< 1	0
Port Alfred	10				0	< 1	0
Port Elizabeth	4	41			< 1	2	0
Cape Seal	6	10	13	3			2
Range <u>3 to 41</u> Median <u>11½</u>				Range <u>< 1 to 13</u> Median <u>< 1</u>			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	87				5	0	< 1
Port Shepstone	0				1	4	0
Port St. Johns	0				1	< 1	9
Bashee	0				1	0	0
East London	0				2	1	7
Port Alfred	0	6				0	0
Port Elizabeth	7	0			4	5	< 1
Cape Seal	0	0	3	5			7
Range <u>3 to 87</u> Median <u>6</u>				Range <u>< 1 to 9</u> Median <u>2</u>			

Table A2-147. Abundances for *K. pacifica* expressed by number of individuals/haul/10 minutes (N100B-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban				1	1		
Port Shepstone							
Port St. Johns				0	0		
East London							
Port Elizabeth		1		1	0	0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					0	5	1
Port Shepstone					0	0	1
Port St. Johns					1	3	0
Bashee					1	0	1
East London					1	0	0
Port Alfred					2	2	0
Port Elizabeth					3	3	0
Cape Seal		1	0	0			
Range _____				Range <u>1 to 5</u>			
Median _____				Median <u>1 1/2</u>			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					1	0	2
Port Shepstone					1	0	0
Port St. Johns					0	0	0
Bashee					3	0	0
East London					1	0	2
Port Alfred		7				0	0
Port Elizabeth		3			1	1	3
Cape Seal				3			
Range <u>3 to 7</u>				Range <u>1 to 7</u>			
Median <u>3</u>				Median <u>1 1/2</u>			

Table A2-148. Abundances for *K. pacifica* expressed by number of individuals/haul/10 minutes (NIOOH-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
Neritic Stations				Oceanic Stations			
	1	2		1	2	3	4
Durban	0				0		
Port Shepstone							
Port St. Johns	1			0	2		
East London	0			0	0		
Port Elizabeth	0	0		0		0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	0					0	0	0	
Port Shepstone	0					0	1		
Port St. Johns	0					0	1	0	
Bashee	0					0	0	0	
East London	0					1	0	0	
Port Alfred	0					3	0		
Port Elizabeth	0	5				4	4	0	1
Cape Seal	0	0	0	0					

Range	_____
Median	_____

Range	<u>1 to 4</u>
Median	<u>1</u>

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	0					0	1	0	
Port Shepstone	0					0	0	1	
Port St. Johns	0					0	0	3	
Bashee	0					7	1	0	
East London	1					0	1	0	
Port Alfred	0	2					0	0	
Port Elizabeth	1	1				0	2		
Cape Seal		0	0	2					
Range <u>1 to 2</u>					Range <u>1 to 7</u>				
Median <u>1</u>					Median <u>1</u>				

Table A2-149. Population composition of *K. pacifica* for all nets used. Relative abundances are enclosed by parentheses. N100B's oceanic only.

	Neritic Area				Oceanic Area			
	Summer Survey	Autumn Survey	winter survey	All Surveys	Summer Survey	Autumn Survey	Winter Survey	All Surveys
<u>N70V-nets</u>								
Adults	<u>95.7%</u> (22)	<u>94.5%</u> (52)	(33)	<u>96.4%</u> (107)	(6)	<u>86.8%</u> (59)	(71)	<u>93.8%</u> (136)
Juveniles	<u>4.3%</u> (1)	<u>5.5%</u> (3)	(0)	<u>3.6%</u> (4)	(0)	<u>13.2%</u> (9)	(0)	<u>6.2%</u> (9)
<u>N100B-nets</u>								
Adults					(4)	<u>96.4%</u> (27)	(37)	<u>98.6%</u> (68)
Juveniles					(0)	<u>3.6%</u> (1)	(0)	<u>1.4%</u> (1)
<u>N100H-nets</u>								
Adults	(1)	(5)	(7)	(13)	(3)	<u>93.3%</u> (19)	(16)	<u>97.0%</u> (32)
Juveniles	(0)	(0)	(0)	(0)	(0)	<u>6.7%</u> (1)	(0)	<u>3.3%</u> (1)

Table A2-150. Abundances for adult *K. pacifica* expressed by mean number of individuals/100m³/depth of water column sampled (W70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
Neritic Stations				Oceanic Stations			
	1	2		1	2	3	4
Durban	0			0	<1		
Port Shepstone	3						
Port St. Johns	36			0	0		
East London	10			2	0		
Port Elizabeth	5	15		1	0	0	0
Range <u>3 to 36</u>				Range <u><1 to 2</u>			
Median <u>10</u>				Median <u>1</u>			

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	20					8	7	<1	
Port Shepstone	20					<1	1	<1	
Port St. Johns	17					8	2	<1	
Bashee	41					0	<1	<1	
East London	10					3	<1	0	
Port Alfred	5					0	<1	0	
Port Elizabeth	4	36				<1	2	0	2
Cape Seal	6	10	13	3					
Range <u>3 to 41</u>					Range <u><1 to 8</u>				
Median <u>11½</u>					Median <u><1</u>				

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	87					5	0	<1	
Port Shepstone	0					1	4	0	
Port St. Johns	0					1	<1	9	
Bashee	0					1	0	0	
East London	0					2	1	7	
Port Alfred	0	6					0	0	
Port Elizabeth	7	0				4	5	<1	7
Cape Seal	0	0	3	5					
Range <u>3 to 87</u>					Range <u><1 to 9</u>				
Median <u>6</u>					Median <u>2</u>				

Table A2-151. Abundances for juvenile *K. pacifica* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0			0	0		
Port Shepstone	0						
Port St. Johns	0			0	0		
East London	0			0	0		
Port Elizabeth	0	2		0	0	0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	6	0
Port Shepstone	0				0	0	0
Port St. Johns	0				0	0	0
Bashee	0				0	0	0
East London	0				0	0	0
Port Alfred	5				0	0	0
Port Elizabeth	0	4			0	0	0
Cape Seal	0	0	0	0			
Range 4 to 5				Range _____			
Median 4½				Median _____			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	0				0	0	0
Port St. Johns	0				0	0	0
Bashee	0				0	0	0
East London	0				0	0	0
Port Alfred	0	0				0	0
Port Elizabeth	0	0			0	0	0
Cape Seal	0	0	0	0			
Range _____				Range _____			
Median _____				Median _____			

Table A2-152. Abundances for adult K. pacifica expressed by number of individuals/haul/10 minutes (1100B-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY								
Neritic Stations				Oceanic Stations				
	1	2			1	2	3	4
Durban					1	1		
Port Shepstone								
Port St. Johns					0	0		
East London								
Port Elizabeth		1			1	0	0	0
Range _____				Range _____				
Median _____				Median _____				

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						0	5	1	
Port Shepstone						0	0	1	
Port St. Johns						1	3	0	
Bashee						1	0	1	
East London						1	0	0	
Port Alfred						2	2	0	
Port Elizabeth						3	3	0	0
Cape Seal		1	0	0					
Range _____					Range <u>1 to 5</u>				
Median _____					Median <u>1½</u>				

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						1	0	2	
Port Shepstone						1	0	0	
Port St. Johns						0	0	0	
Bashee						3	0	0	
East London						1	0	2	
Port Alfred		7					0	0	
Port Elizabeth		3				1	1	3	7
Cape Seal				3					
Range <u>3 to 7</u>					Range <u>1 to 7</u>				
Median <u>3</u>					Median <u>1½</u>				

Table A2-153. Abundances for juvenile *M. pacifica* expressed by number of individuals/haul/10 minutes (100B-nets). Compare with Table A1-1 for station numbers.

<u>SUMMER SURVEY</u>								
Neritic Stations				Oceanic Stations				
	1	2			1	2	3	4
Durban					0	0		
Port Shepstone								
Port St. Johns					0	0		
East London								
Port Elizabeth		0			0	0	0	0
Range _____				Range _____				
Median _____				Median _____				

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						0	0	0	
Port Shepstone						0	0	0	
Port St. Johns						0	0	0	
Bashee						0	0	0	
East London						0	0	0	
Port Alfred						0	0	0	
Port Elizabeth						1	0	0	0
Cape Seal		0	0	0					
Range _____					Range _____				
Median _____					Median _____				

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						0	0	0	
Port Shepstone						0	0	0	
Port St. Johns						0	0	0	
Bashee						0	0	0	
East London						0	0	0	
Port Alfred		0					0	0	
Port Elizabeth		0				0	0	0	0
Cape Seal				0					
Range _____					Range _____				
Median _____					Median _____				

Table A2-154. Abundances for adult K. pacifica expressed by number of individuals/haul/10 minutes (100M-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0				0		
Port Shepstone							
Port St. Johns	1			0	2		
East London	0			0	0		
Port Elizabeth	0	0		0		0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY									
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	0					0	0	0	
Port Shepstone	0					0	1		
Port St. Johns	0					0	1	0	
Bashee	0					0	0	0	
East London	0					1	0	0	
Port Alfred	0					3	0		
Port Elizabeth	0	5				3	4	0	1
Cape Seal	0	0	0	0					
Range _____						Range <u>1 to 4</u>			
Median _____						Median <u>1</u>			

WINTER SURVEY									
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	0					0	1	0	
Port Shepstone	0					0	0	1	
Port St. Johns	0					0	0	3	
Bashee	0					7	1	0	
East London	1					0	1	0	
Port Alfred	0	2					0	0	
Port Elizabeth	1	1				0	2		
Cape Seal		0	0	2					
Range <u>1 to 2</u>						Range <u>1 to 7</u>			
Median <u>1</u>						Median <u>1</u>			

Table A2-155. Abundances for juvenile *K. pacifica* expressed by number of individuals/haul/10 minutes (N100H-nots). Compare with Table A1-1 for station numbers.

<u>SUMMER SURVEY</u>								
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	0					0		
Port Shepstone								
Port St. Johns	0				0	0		
East London	0				0	0		
Port Elizabeth	0	0			0		0	0
Range _____					Range _____			
Median _____					Median _____			

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	0					0	0	0	
Port Shepstone	0					0	0		
Port St. Johns	0					0	0	0	
Bashee	0					0	0	0	
East London	0					0	0	0	
Port Alfred	0					0	0		
Port Elizabeth	0	0				1	0	0	0
Cape Seal	0	0	0	0					
Range _____					Range _____				
Median _____					Median _____				

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	0				0	0	0	
Port Shepstone	0				0	0	0	
Port St. Johns	0				0	0	0	
Bashee	0				0	0	0	
East London	0				0	0	0	
Port Alfred	0	0				0	0	
Port Elizabeth	0	0			0	0		
Cape Seal		0	0	0				
Range _____				Range _____				
Median _____				Median _____				

Table A2-156. Presence (X) and absence (O) of *S. robusta/ferox* according to all nets used (N70Vs, N100Bs, N100Hs). Compare with Table A1-1 for station numbers.

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	X				O	X		
Port Shepstone	O							
Port St. Johns	X				O	X		
East London	X				X	X		
Port Elizabeth	X	X			X	X	X	X
Range _____ Median _____				Range _____ Median _____				

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	X				X	X	X	
Port Shepstone	X				X	X	X	
Port St. Johns	X				X	X	X	
Bashee	X				X	X	X	
East London	X				X	X	X	
Port Alfred	X				X	X	X	
Port Elizabeth	X	X			X	X	X	X
Cape Seal	X	X	X	X				
Range _____ Median _____				Range _____ Median _____				

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	X				X	O	X	
Port Shepstone	X				X	X	X	
Port St. Johns	X				X	X	X	
Bashee	O				X	X	X	
East London	O				X	X	X	
Port Alfred	O	X				X	X	
Port Elizabeth	O	O			X	X	X	X
Cape Seal	O	O	X	X				
Range _____ Median _____				Range _____ Median _____				

Table A2-157. Abundances for *S. robusta/ferox* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	74			0	2		
Port Shepstone	0						
Port St. Johns	57			0	7		
East London	5			6	0		
Port Elizabeth	16	24		4	6	< 1	4
Range <u>5 to 74</u> Median <u>24</u>				Range <u>< 1 to 7</u> Median <u>4</u>			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	33				< 1	8	1
Port Shepstone	0				2	1	5
Port St. Johns	0				5	3	0
Bashee	35				3	5	1
East London	10				3	0	0
Port Alfred	0				1	0	< 1
Port Elizabeth	0	21			2	1	< 1
Cape Seal	32	10	10	< 1			
Range <u>< 1 to 35</u> Median <u>15½</u>				Range <u>< 1 to 8</u> Median <u>2</u>			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	17				< 1	0	0
Port Shepstone	0				0	2	0
Port St. Johns	0				1	< 1	2
Bashee	0				0	0	0
East London	0				< 1	0	< 1
Port Alfred	0	1				0	0
Port Elizabeth	0	0	0	2	12	9	4
Cape Seal	0	0	0	2			
Range <u>1 to 17</u> Median <u>2</u>				Range <u>< 1 to 12</u> Median <u>2</u>			

Table A2-158. Abundances for *S. robusta/ferox* expressed by number of individuals/haul/10 minutes (N100B-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY								
Neritic Stations				Oceanic Stations				
	1	2			1	2	3	4
Durban					0	10		
Port Shepstone								
Port St. Johns					0	27		
East London								
Port Elizabeth		50			8	13	2	2
Range _____				Range 2 to 27				
Median _____				Median 9				

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						11	19	0	
Port Shepstone						9	33	80	
Port St. Johns						5	8	3	
Bashee						3	3	2	
East London						2	3	3	
Port Alfred						9	8	4	
Port Elizabeth						15	13	8	8
Cape Seal		0	5	27					
Range 5 to 27					Range 2 to 80				
Median 16					Median 8				

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						6	0	2	
Port Shepstone						1	0	3	
Port St. Johns						0	0	5	
Bashee						8	2	25	
East London						4	4	19	
Port Alfred		0					10	0	
Port Elizabeth		0				12	12	8	15
Cape Seal				1					

Range	_____
Median	_____

Range	<u>1 to 25</u>
Median	<u>7</u>

Table A2-159. Abundances for *S. robusta/ferox* expressed by number of individuals/haul/10 minutes (N100H-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	1				5		
Port Shepstone							
Port St. Johns	12			0	38		
East London	0			4	3		
Port Elizabeth	0	47		3		15	7
Range <u>1 to 47</u>				Range <u>3 to 38</u>			
Median <u>12</u>				Median <u>5</u>			

AUTUMN SURVEY									
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	5					4	48	0	
Port Shepstone	27					5	12		
Port St. Johns	24					5	17	5	
Bashee	17					5	7	18	
East London	14					1	12	0	
Port Alfred	1					4	4		
Port Elizabeth	1	9				11	17	35	38
Cape Seal	1	3	15	20					
Range <u>1 to 27</u>						Range <u>1 to 48</u>			
Median <u>14½</u>						Median <u>9</u>			

WINTER SURVEY									
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	0					1	0	0	
Port Shepstone	1					0	0	9	
Port St. Johns	1					1	0	6	
Bashee	0					0	3	1	
East London	0					0	4	0	
Port Alfred	0	0					6	7	
Port Elizabeth	0	0				2	2		
Cape Seal		0	2	6					
Range <u>1 to 6</u>						Range <u>1 to 9</u>			
Median <u>1½</u>						Median <u>3</u>			

Table A2-160. Population composition of S. robusta/ferox for all nets used. Relative abundances are enclosed by parentheses. N10 S's oceanic only.

	Neritic Area				Oceanic Area			
	Summer Survey	Autumn Survey	winter survey	All Surveys	Summer Survey	Autumn Survey	Winter Survey	All Surveys
<u>N70V-nets</u>	62.8	63.2	60.0	62.6	52.4	36.6	17.9	32.4
Adults	(27)	(24)	(6)	(57)	(22)	(26)	(10)	(58)
Juveniles	37.2	36.8	40.0	37.4	47.6	63.4	82.1	67.6
	(16)	(14)	(4)	(34)	(20)	(45)	(46)	(111)
<u>N100B-nets</u>					39.4	44.6	19.6	37.1
Adults					(52)	(150)	(32)	(234)
Juveniles					60.6	55.4	80.4	62.9
					(86)	(185)	(131)	(397)
<u>N100H-nets</u>	63.3	56.2	80.0	59.4	36.0	41.9	57.1	42.5
Adults	(38)	(77)	(8)	(123)	(27)	(104)	(24)	(155)
Juveniles	36.7	43.8	20.0	40.6	64.0	58.1	42.9	57.5
	(22)	(6)	(2)	(84)	(48)	(144)	(16)	(210)

Table A1-161. Abundances for adult *S. robusta/ferox* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	67				0	2		
Port Shepstone	0							
Port St. Johns	16				0	7		
East London	0				3	0		
Port Elizabeth	10	17			2	2	<1	0
Range 10 to 67				Range <1 to 7				
Median 16				Median 2				

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	13				<1	2	0	
Port Shepstone	0				0	1	1	
Port St. Johns	0				1	3	0	
Bashee	17				<1	1	1	
East London	5				0	0	0	
Port Alfred	0				<1	0	<1	
Port Elizabeth	0	16			<1	0	<1	2
Cape Seal	26	5	8	0				
Range 5 to 26				Range <1 to 3				
Median 13				Median 1				

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	6				0	0	0	
Port Shepstone	0				0	2	0	
Port St. Johns	0				1	<1	2	
Bashee	0				0	0	0	
East London	0				<1	0	<1	
Port Alfred	0	<1				0	0	
Port Elizabeth	0	0			0	0	3	0
Cape Seal	0	0	0	1				
Range <1 to 6				Range <1 to 3				
Median 1				Median 1				

Table A2-162. Abundances for juvenile *S. robusta/ferox* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
Neritic Stations				Oceanic Stations			
	1	2		1	2	3	4
Durban	7			0	0		
Port Shepstone	0						
Port St. Johns	42			0	0		
East London	5			3	0		
Port Elizabeth	5	7		3	4	0	4
Range <u>5 to 42</u> Median <u>7</u>				Range <u>3 to 4</u> Median <u>3½</u>			

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	20					0	6	1	
Port Shepstone	0					2	0	3	
Port St. Johns	0					4	< 1	0	
Bashee	17					2	4	0	
East London	5					3	0	0	
Port Alfred	0					< 1	0	0	
Port Elizabeth	0	4				1	1	0	< 1
Cape Seal	6	5	3	< 1					
Range < 1 to 20					Range < 1 to 4				
Median 5					Median 2				

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	12					<1	0	0	
Port Shepstone	0					0	0	0	
Port St. Johns	0					0	0	0	
Bashee	0					0	0	0	
East London	0					0	0	0	
Port Alfred	0	<1					0	0	
Port Elizabeth	0	0				12	9	<1	8
Cape Seal	0	0	0	<1					
Range <1 to 12 Median <1					Range <1 to 12 Median 8				

Table A2-153. Abundances for adult *S. robusta/terox* expressed by number of individuals/haul/10 minutes (H100B-net). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban				0	3		
Port Shepstone							
Port St. Johns				0	3		
East London							
Port Elizabeth		29		4	2	2	1
Range _____				Range 1 to 4			
Median _____				Median 2			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					5	8	0
Port Shepstone					3	14	38
Port St. Johns					1	4	1
Bashee					1	2	1
East London					1	2	0
Port Alfred					7	2	2
Port Elizabeth					0	5	4
Cape Seal		0	3	21			
Range _____				Range 1 to 38			
Median _____				Median 3			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					4	0	2
Port Shepstone					1	0	3
Port St. Johns					0	0	2
Bashee					1	2	3
East London					2	3	1
Port Alfred		0				0	0
Port Elizabeth		0			1	0	3
Cape Seal				0			
Range _____				Range 1 to 4			
Median _____				Median 2			

Table A2-164. Abundances for juvenile *S. robusta/ferox* expressed by number of individuals/haul/10 minutes (W100B-nets). Compare with Table A1-1 for Station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban				0	8		
Port Shepstone							
Port St. Johns				0	23		
East London							
Port Elizabeth		21		3	11	0	1
Range _____				Range 1 to 23			
Median _____				Median 8			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					6	12	0
Port Shepstone					7	18	43
Port St. Johns					4	4	3
Bashee					3	2	1
East London					1	1	3
Port Alfred					3	7	3
Port Elizabeth					15	8	3
Cape Seal		0	3	6			
Range _____				Range 1 to 43			
Median _____				Median 3			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					2	0	0
Port Shepstone					0	0	0
Port St. Johns					0	0	3
Bashee					7	0	22
East London					3	1	18
Port Alfred		0				10	0
Port Elizabeth		0			11	12	6
Cape Seal				1			15
Range _____				Range 1 to 22			
Median _____				Median 8			

Table A2-165. Abundances for adult *S. robusta/ferox* expressed by number of individuals/haul/10 minutes (N100H-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	1				3		
Port Shepstone							
Port St. Johns	4			0	10		
East London	0			1	3		
Port Elizabeth	0	33		0		8	2
Range <u>1 to 33</u>				Range <u>1 to 10</u>			
Median <u>4</u>				Median <u>3</u>			

AUTUMN SURVEY									
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	2					1	15	0	
Port Shepstone	10					0	2		
Port St. Johns	16					1	0	2	
Bashee	8					3	6	4	
East London	7					1	6	0	
Port Alfred	1					4	3		
Port Elizabeth	1	4				2	5	26	23
Cape Seal	1	2	6	19					
Range <u>1 to 19</u>						Range <u>1 to 26</u>			
Median <u>5</u>						Median <u>3½</u>			

WINTER SURVEY									
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	0					1	0	0	
Port Shepstone	1					6	0	6	
Port St. Johns	1					1	0	2	
Bashee	0					0	3	1	
East London	0					0	3	0	
Port Alfred	0	0					2	5	
Port Elizabeth	0	0				0	0		
Cape Seal		0	0	6					
Range <u>1 to 6</u>						Range <u>1 to 6</u>			
Median <u>1</u>						Median <u>2</u>			

Table A2-166. Abundances for juvenile S. robusta/ferox expressed by number of individuals/haul/10 minutes (N100H-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY								
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	0					2		
Port Shepstone								
Port St. Johns	8				0	28		
East London	0				3	0		
Port Elizabeth	0	14			3		7	5
Range <u>8 to 14</u>					Range <u>2 to 28</u>			
Median <u>11</u>					Median <u>4</u>			

AUTUMN SURVEY									
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	3					3	33	0	
Port Shepstone	17					5	10		
Port St. Johns	8					4	17	3	
Bashee	9					2	1	14	
East London	7					0	6	0	
Port Alfred	0					0	1		
Port Elizabeth	0	5				9	12	9	15
Cape Seal	0	1	9	1					
Range <u>1 to 17</u>						Range <u>1 to 33</u>			
Median <u>7</u>						Median <u>7½</u>			

WINTER SURVEY									
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	0					0	0	0	
Port Shepstone	0					0	0	3	
Port St. Johns	0					0	0	4	
Bashee	0					0	0	0	
East London	0					0	1	0	
Port Alfred	0	0					4	2	
Port Elizabeth	0	0				2	2		
Cape Seal		0	2	0					

Range	_____
Median	_____

Range	<u>1 to 4</u>
Median	<u>2</u>

Table 12-167. Presence (X) and absence (O) of *S. bodoti* according to all nets used (H70Vs, H100Bs, H100Ms). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	X			X	O		
Port Shepstone	X						
Port St. Johns	X			O	X		
East London	O			X	X		
Port Elizabeth	X	X		X	O	X	X
Range _____ Median _____				Range _____ Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	O				X	X	X
Port Shepstone	X				X	X	X
Port St. Johns	X				X	X	O
Bashee	X				X	X	X
East London	X				X	O	X
Port Alfred	O				X	X	X
Port Elizabeth	O	O			X	X	O
Cape Seal	X	X	X	X			
Range _____ Median _____				Range _____ Median _____			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	X				X	O	X
Port Shepstone	X				X	O	X
Port St. Johns	O				X	O	X
Bashee	O				X	O	X
East London	X				X	O	O
Port Alfred	O	X				O	O
Port Elizabeth	O	O			X	X	X
Cape Seal	O	O	O	X			
Range _____ Median _____				Range _____ Median _____			

Table A2-168. Abundances for *S. bedoti* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	266				0	0		
Port Shepstone	10							
Port St. Johns	94				0	10		
East London	0				9	1		
Port Elizabeth	5	21			0	0	0	0
Range <u>5 to 266</u>				Range <u>1 to 10</u>				
Median <u>21</u>				Median <u>9</u>				

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	0				4	4	<1	
Port Shepstone	13				1	0	0	
Port St. Johns	61				<1	2	0	
Bashee	6				0	0	1	
East London	10				4	0	0	
Port Alfred	0				0	0	0	
Port Elizabeth	0	13			0	0	0	<1
Cape Seal	0	0	13	1				
Range <u>1 to 61</u>				Range <u>< 1 to 4</u>				
Median <u>13</u>				Median <u>1</u>				

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	17				1	0	0	
Port Shepstone	9				0	0	0	
Port St. Johns	0				<1	0	2	
Bashee	0				<1	0	0	
East London	0				0	0	0	
Port Alfred	0	4				0	0	
Port Elizabeth	0	0			<1	<1	<1	0
Cape Seal	0	0	0	2				
Range <u>2 to 17</u>				Range <u>< 1 to 2</u>				
Median <u>6</u>				Median <u>< 1</u>				

Table A2-169. Abundances for S. bedoti expressed by number of individuals/haul/10 minutes (N100B-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban				2	0		
Port Shepstone							
Port St. Johns				0	0		
East London							
Port Elizabeth		48		2	0	4	3
Range _____				Range 2 to 4			
Median _____				Median 2			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					13	18	1
Port Shepstone					0	3	3
Port St. Johns					3	3	0
Bashee					3	1	2
East London					2	0	0
Port Alfred					6	1	1
Port Elizabeth					2	1	0
Cape Seal		2	0	10			
Range 2 to 10				Range 1 to 18			
Median 6				Median 2			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					8	0	3
Port Shepstone					1	0	1
Port St. Johns					0	0	0
Bashee					3	0	1
East London					0	2	0
Port Alfred		11				0	0
Port Elizabeth		0			0	0	2
Cape Seal				3			
Range 3 to 11				Range 1 to 8			
Median 7				Median 2			

Table A2-170. Abundances for *S. bedoti* expressed by number of individuals/haul/10 minutes (N100H-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0				0		
Port Shepstone							
Port St. Johns	0			0	0		
East London	0			3	0		
Port Elizabeth	0	7		0		1	0
Range _____				Range 1 to 3			
Median _____				Median 2			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	2	0
Port Shepstone	2				0	2	
Port St. Johns	2				0	2	0
Bashee	1				0	0	2
East London	5				0	0	2
Port Alfred	0				0	0	
Port Elizabeth	0	0			1	0	0
Cape Seal	0	3	5	6			8
Range 1 to 6				Range 1 to 8			
Median 3				Median 2			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	8				0	0	0
Port St. Johns	0				0	0	0
Bashee	0				1	0	0
East London	0				0	0	1
Port Alfred	0	0				0	0
Port Elizabeth	0	0			2	0	
Cape Seal		0	0	2			
Range 2 to 8				Range 1 to 2			
Median 5				Median 1			

Table A2-171. Population composition of *S. bedoti* for all nets used. Relative abundances are enclosed by parentheses. N100B's oceanic only.

	Neritic Area				Oceanic Area			
	Summer Survey	Autumn Survey	winter survey	All Surveys	Summer Survey	Autumn Survey	Winter Survey	All Surveys
<u>N70V-nets</u>								
Adults	<u>76.0%</u> (57)	<u>61.5%</u> (16)	<u>46.2%</u> (6)	<u>69.3%</u> (79)	<u>63.0%</u> (17)	<u>63.0%</u> (17)	<u>88.9%</u> (8)	<u>66.7%</u> (42)
Juveniles	<u>24.0%</u> (18)	<u>38.5%</u> (10)	<u>53.8%</u> (7)	<u>30.7%</u> (35)	<u>37.0%</u> (10)	<u>37.0%</u> (10)	<u>11.1%</u> (1)	<u>33.3%</u> (21)
<u>N100B-nets</u>								
Adults					<u>84.5%</u> (60)	<u>81.8%</u> (72)	<u>76.9%</u> (30)	<u>81.8%</u> (162)
Juveniles					<u>15.5%</u> (11)	<u>18.2%</u> (16)	<u>23.1%</u> (9)	<u>18.2%</u> (36)
<u>N100H-nets</u>								
Adults	(0)	<u>87.5%</u> (21)	<u>77.8%</u> (7)	<u>70.0%</u> (28)	<u>25.0%</u> (1)	(19)	<u>80.0%</u> (4)	<u>85.7%</u> (24)
Juveniles	(7)	<u>12.5%</u> (3)	<u>22.2%</u> (2)	<u>30.0%</u> (12)	<u>75.0%</u> (3)	(0)	<u>20.0%</u> (1)	<u>14.3%</u> (4)

Table A2-172. Abundances for adult *S. bedoti* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

	SUMMER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	236				0	0		
Port Shepstone	0							
Port St. Johns	73				0	6		
East London	0				5	<1		
Port Elizabeth	5	13			0	0	0	0
Range 5 to 236				Range <1 to 6				
Median 43				Median 5				

	AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	0				4	3	<1	
Port Shepstone	7				1	0	0	
Port St. Johns	26				<1	<1	0	
Bashee	0				0	0	<1	
East London	10				0	0	0	
Port Alfred	0				0	0	0	
Port Elizabeth	0	11			0	0	0	<1
Cape Seal	0	0	5	<1				
Range <1 to 26				Range <1 to 4				
Median 8½				Median <1				

	WINTER SURVEY							
	Neritic Stations				Oceanic Stations			
	1	2	3	4	1	2	3	4
Durban	12				<1	0	0	
Port Shepstone	9				0	0	0	
Port St. Johns	0				<1	0	2	
Bashee	0				<1	0	0	
East London	0				0	0	0	
Port Alfred	0	2				0	0	
Port Elizabeth	0	0			<1	<1	<1	0
Cape Seal	0	0	0	0				
Range 2 to 12				Range <1 to 2				
Median 9				Median <1				

Table A2-173. Abundances for juvenile *S. bedoti* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	30			0	0		
Port Shepstone	10						
Port St. Johns	21			0	3		
East London	0			4	0		
Port Elizabeth	0	8		0	0	0	0
Range 8 to 30				Range 3 to 4			
Median 15				Median 3			

AUTUMN SURVEY									
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	0					0	<1	0	
Port Shepstone	7					0	0	0	
Port St. Johns	35					<1	1	0	
Bashee	6					0	0	0	
East London	0					4	0	0	
Port Alfred	0					0	0	0	
Port Elizabeth	0	2				0	0	0	0
Cape Seal	0	0	8	0					
Range <u>2 to 35</u>						Range <u><1 to 4</u>			
Median <u>7</u>						Median <u>1</u>			

WINTER SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban	6					<1	0	0	
Port Shepstone	0					0	0	0	
Port St. Johns	0					0	0	0	
Bashee	0					0	0	0	
East London	0					0	0	0	
Port Alfred	0	2					0	0	
Port Elizabeth	0	0				0	0	0	0
Cape Seal	0	0	0	2					
Range <u>2 to 6</u>				Range <u> </u>					
Median <u>2</u>				Median <u> </u>					

Table A2-174. Abundances for adult *S. bedoti* expressed by number of individuals/haul/10 minutes (H100B-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban				2	0		
Port Shepstone							
Port St. Johns				0	0		
East London							
Port Elizabeth		41		1	0	3	3
Range _____				Range 1 to 3			
Median _____				Median 2			

AUTUMN SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban						12	14	1	
Port Shepstone						0	3	3	
Port St. Johns						3	3	0	
Bashee						3	1	2	
East London						1	0	0	
Port Alfred						2	1	1	
Port Elizabeth						2	1	0	2
Cape Seal		1	0	9					
Range _____				Range 1 to 14					
Median _____				Median 2					

WINTER SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban						7	0	3	
Port Shepstone						1	0	1	
Port St. Johns						0	0	0	
Bashee						3	0	1	
East London						0	2	0	
Port Alfred		7					0	0	
Port Elizabeth		0				0	0	2	0
Cape Seal				1					
Range _____				Range 1 to 7					
Median _____				Median 2					

Table A2-175. Abundances for juvenile S. bedoti expressed by number of individuals/haul/10 minutes (H100B-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban				0	0		
Port Shepstone							
Port St. Johns				0	0		
East London							
Port Elizabeth		8		1	0	1	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					2	3	0
Port Shepstone					0	0	1
Port St. Johns					0	1	0
Bashee					0	0	0
East London					1	0	0
Port Alfred					4	0	0
Port Elizabeth					0	0	0
Cape Seal		1	0	1			
Range _____				Range <u>1 to 4</u>			
Median _____				Median <u>1</u>			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					1	0	0
Port Shepstone					0	0	0
Port St. Johns					0	0	0
Bashee					1	0	0
East London					0	0	0
Port Alfred		4				0	0
Port Elizabeth		0			0	0	0
Cape Seal				2			
Range <u>2 to 4</u>				Range _____			
Median <u>3</u>				Median _____			

Table A2-176. Abundances for adult *S. bedoti* expressed by number of individuals/haul/10 minutes (N100H-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0				0		
Port Shepstone							
Port St. Johns	0			0	0		
East London	0			1	0		
Port Elizabeth	0	0		0		0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY								
Neritic Stations				Oceanic Stations				
	1	2	3	4	1	2	3	4
Durban	0				0	2	0	
Port Shepstone	2				0	2		
Port St. Johns	2				0	2	0	
Bashee	1				0	0	2	
East London	5				0	0	2	
Port Alfred	0				0	0		
Port Elizabeth	0	0			1	0	0	8
Cape Seal	0	0	5	6				
Range 1 to 6				Range 1 to 8				
Median 3½				Median 2				

WINTER SURVEY									
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	0					0	0	0	
Port Shepstone	5					0	0	0	
Port St. Johns	0					0	0	0	
Bashee	0					1	0	0	
East London	0					0	0	1	
Port Alfred	0	0					0	0	
Port Elizabeth	0	0				2	0		
Cape Seal		0	0	2					
Range <u>2 to 5</u>						Range <u>1 to 2</u>			
Median <u>3½</u>						Median <u>1</u>			

Table A2-177. Abundances for juvenile *S. bedoti* expressed by number of individuals/haul/10 minutes (N100H-nets). Compare with Table A1-1 for station numbers.

	<u>SUMMER SURVEY</u>							
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	0					0		
Port Shepstone								
Port St. Johns	0				0	0		
East London	0				2	0		
Port Elizabeth	0	7			0		0	1
Range _____				Range _____				
Median _____				Median _____				

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	0					0	0	0	
Port Shepstone	0					0	0		
Port St. Johns	0					0	0	0	
Bashee	0					0	0	0	
East London	0					0	0	0	
Port Alfred	0					0	0		
Port Elizabeth	0					0	0	0	0
Cape Seal	0	3	0	0					
Range _____					Range _____				
Median _____					Median _____				

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	0					0	0	0	
Port Shepstone	3					0	0	0	
Port St. Johns	0					0	0	0	
Bashee	0					0	0	0	
East London	0					0	0	0	
Port Alfred	0	0					0	0	
Port Elizabeth	0	0				0	0		
Cape Seal		0	0	0					
Range _____					Range _____				
Median _____					Median _____				

Table A2-178. Presence (X) and absence (0) of *E. hanata* according to all nets used (N70Vs, N100Bs, N100Hs). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0			0	0		
Port Shepstone	0						
Port St. Johns	0			0	0		
East London	0			X	0		
Port Elizabeth	0			0	0	0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	0				X	0	0
Port St. Johns	0				X	X	X
Bashee	0				0	0	X
East London	0				0	X	0
Port Alfred	0				0	X	X
Port Elizabeth	0	X			0	0	X
Cape Seal	0	0	0	X			0
Range _____				Range _____			
Median _____				Median _____			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	X	0
Port Shepstone	0				0	0	0
Port St. Johns	0				0	0	0
Bashee	0				X	0	0
East London	0				0	0	0
Port Alfred	0	X				0	0
Port Elizabeth	0	0			0	0	0
Cape Seal	0	0	0	0			0
Range _____				Range _____			
Median _____				Median _____			

Table A2-179. Abundances for *E. hamata* by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0			0	0		
Port Shepstone	0						
Port St. Johns	0			0	0		
East London	0			1	0		
Port Elizabeth	0	0		0	0	0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	0				1	0	0
Port St. Johns	0				1	1	< 1
Bashee	0				0	0	< 1
East London	0				0	4	0
Port Alfred	0				0	3	3
Port Elizabeth	0	2			0	0	2
Cape Seal	0	0	0	0			
Range _____				Range < 1 to 4			
Median _____				Median 1			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	1	0
Port Shepstone	0				0	0	0
Port St. Johns	0				0	0	0
Bashee	0				< 1	0	0
East London	0				0	0	0
Port Alfred	0	0				0	0
Port Elizabeth	0	0			0	0	0
Cape Seal	0	0	0	0			
Range _____				Range _____			
Median _____				Median _____			

Table A2-180. Abundances for *E. hamata* expressed by number of individuals/haul/10 minutes (N100B-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
Neritic Stations				Oceanic Stations			
1	2			1	2	3	4
Durban				0	0		
Port Shepstone							
Port St. Johns				C	0		
East London							
Port Elizabeth		0		0	0	0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY							
Neritic Stations				Oceanic Stations			
1	2	3	4	1	2	3	4
Durban				0	C	C	
Port Shepstone				0	0	0	
Port St. Johns				0	0	0	
Bashee				0	C	0	
East London				0	0	0	
Port Alfred				0	C	0	
Port Elizabeth				0	0	0	0
Cape Seal		0	0	0			
Range _____				Range _____			
Median _____				Median _____			

WINTER SURVEY							
Neritic Stations				Oceanic Stations			
1	2	3	4	1	2	3	4
Durban				0	0	0	
Port Shepstone				0	0	0	
Port St. Johns				0	0	0	
Bashee				0	0	0	
East London				0	0	0	
Port Alfred		1			0	0	
Port Elizabeth		0		0	0	0	0
Cape Seal			0				
Range _____				Range _____			
Median _____				Median _____			

Table 12-161. Abundances for adult *H. hutchinsoni* expressed by mean number of individuals/100±3/depth of water column sampled (WCV-note). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0			0	0		
Port Shepstone	0						
Port St. Johns	0			0	0		
East London	0			0	0		
Port Elizabeth	0	0		0	0	0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	0				0	0	0
Port St. Johns	0				1	0	0
Bashee	0				0	0	0
East London	0				0	0	0
Port Alfred	0				0	3	2
Port Elizabeth	0	0			0	0	<1
Cape Seal	0	0	0	2			
Range _____				Range <u>1 to 3</u>			
Median _____				Median <u>1.5</u>			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	1	0
Port Shepstone	0				0	0	0
Port St. Johns	0				0	0	0
Bashee	0				<1	0	0
East London	0				0	0	0
Port Alfred	0	0				0	0
Port Elizabeth	0	0				0	0
Cape Seal	0	0	0	0			
Range _____				Range _____			
Median _____				Median _____			

Table A2-182. Abundances for juvenile *E. harrata* expressed by mean number of individuals/100m³/depth of water column sampled (M70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0			0	0		
Port Shepstone	0						
Port St. Johns	0			0	0		
East London	0			1	0		
Port Elizabeth	0	0		0	0	0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY									
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	0					0	0	0	
Port Shepstone	0					0	0	1	
Port St. Johns	0					1	1	1	
Bashee	0					0	0	< 1	
East London	0					0	4	0	
Port Alfred	0					0	0	1	
Port Elizabeth	0	2				0	0	< 1	0
Cape Seal	0	0	0	0					
Range _____						Range < 1 to 4			
Median _____						Median 1			

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	0					0	0	0	
Port Shepstone	0					0	0	0	
Port St. Johns	0					0	0	0	
Bashee	0					0	0	0	
East London	0					0	0	0	
Port Alfred	0	0					0	0	
Port Elizabeth	0	0							0
Cape Seal	0	0	0	0					
Range _____					Range _____				
Median _____					Median _____				

Table A2-103. Presence (X) and absence (0) of *S. pulchra* according to all nets used (570Vs, W100Bs, W100Hs). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0			X	X		
Port Shepstone	0						
Port St. Johns	0			0	0		
East London	0			0	0		
Port Elizabeth	0	0		0	0	0	0
Range _____ Median _____				Range _____ Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				X	0	0
Port Shepstone	X				0	0	0
Port St. Johns	0				0	0	0
Bashee	0				0	0	0
East London	0				0	0	0
Port Alfred	0				0	0	0
Port Elizabeth	0	0			0	0	0
Cape Seal	0	0	0	0			
Range _____ Median _____				Range _____ Median _____			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	0				0	0	0
Port St. Johns	0				0	0	0
Bashee	X				0	0	0
East London	0				0	0	0
Port Alfred	0	0				0	0
Port Elizabeth	0	0			0	0	0
Cape Seal	0	0	0	0			
Range _____ Median _____				Range _____ Median _____			

Table A2-184. Abundances for *S. vulchra* by mean number of individuals/100m³/depth of water column sampled (1707-note). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0			0	0		
Port Shepstone	0						
Port St. Johns	0			0	0		
East London	0			0	0		
Port Elizabeth	0	0		0	0	0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	0				0	0	0
Port St. Johns	0				0	0	0
Bashee	0				0	0	0
East London	0				0	0	0
Port Alfred	0				0	0	0
Port Elizabeth	0	0			0	0	0
Cape Seal	0	0	0	0			
Range _____				Range _____			
Median _____				Median _____			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	0				0	0	0
Port St. Johns	0				0	0	0
Bashee	20				0	0	0
East London	0				0	0	0
Port Alfred	0	0				0	0
Port Elizabeth	0	0			0	0	0
Cape Seal	0	0	0	0			
Range _____				Range _____			
Median _____				Median _____			

Table A2-185. Abundances for *S. pulchra* expressed by number of individuals/haul/16 minutes (1100E-note). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
Neritic Stations				Oceanic Stations			
1	2			1	2	3	4
Durban				2	3		
Port Shepstone							
Port St. Johns				0	0		
East London							
Port Elizabeth		0		0	0	0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY							
Neritic Stations				Oceanic Stations			
1	2	3	4	1	2	3	4
Durban				3	0	0	
Port Shepstone				0	0	0	
Port St. Johns				0	0	0	
Bashee				0	0	0	
East London				0	0	0	
Port Alfred				0	0	0	
Port Elizabeth				0	0	0	0
Cape Seal		0	0	0			
Range _____				Range _____			
Median _____				Median _____			

WINTER SURVEY							
Neritic Stations				Oceanic Stations			
1	2	3	4	1	2	3	4
Durban				0	0	0	
Port Shepstone				0	0	0	
Port St. Johns				0	0	0	
Bashee				0	0	0	
East London				0	0	0	
Port Alfred		0			0	0	
Port Elizabeth		0		0	0	0	0
Cape Seal			0				
Range _____				Range _____			
Median _____				Median _____			

Table A2-185. Abundances for *S. macleura* expressed by number of individuals/haul/10 minutes (100H-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0				0		
Port Shepstone							
Port St. Johns	0			0	0		
East London	0			0	0		
Port Elizabeth	0	0		0		0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	6				0	0	
Port St. Johns	0				0	0	0
Bashee	0				0	0	0
East London	0				0	0	0
Port Alfred	0				0	0	
Port Elizabeth	0	0			0	0	0
Cape Seal	0	0	0	0			
Range _____				Range _____			
Median _____				Median _____			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	0				0	0	0
Port St. Johns	0				0	0	0
Bashee	2				0	0	0
East London	0				0	0	0
Port Alfred	0	0				0	0
Port Elizabeth	0	0			0	0	
Cape Seal		0	0	0			
Range _____				Range _____			
Median _____				Median _____			

Table A2-187. Abundances for adult *S. pulchra* expressed by mean number of individuals/100m³/depth of water column sampled (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0			0	0		
Port Shepstone	0						
Port St. Johns	0			0	0		
East London	0			0	0		
Port Elizabeth	0	0		0	0	0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	0				0	0	0
Port St. Johns	0				0	0	0
Bashee	0				0	0	0
East London	0				0	0	0
Port Alfred	0				0	0	0
Port Elizabeth	0	0			0	0	0
Cape Seal	0	0	0	0			
Range _____				Range _____			
Median _____				Median _____			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	0				0	0	0
Port St. Johns	0				0	0	0
Bashee	7				0	0	0
East London	0				0	0	0
Port Alfred	0	0				0	0
Port Elizabeth	0	0			0	0	0
Cape Seal	0	0	0	0			
Range _____				Range _____			
Median _____				Median _____			

Table A2-188. Abundances for juvenile S. pluchra expressed by mean number of individuals/100m³/depth of water column sampled. (N70V-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY								
Neritic Stations				Oceanic Stations				
	1	2			1	2	3	4
Durban	0				0	0		
Port Shepstone	0							
Port St. Johns	0				0	0		
East London	0				0	0		
Port Elizabeth	0	0			0	0	0	0
Range _____				Range _____				
Median _____				Median _____				

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	0					0	0	0	
Port Shepstone	0					0	0	0	
Port St. Johns	0					0	0	0	
Bashee	0					0	0	0	
East London	0					0	0	0	
Port Alfred	0					0	0	0	
Port Elizabeth	0	0				0	0	0	
Cape Seal	0	0	0	0					
Range _____					Range _____				
Median _____					Median _____				

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	0					0	0	0	
Port Shepstone	0					0	0	0	
Port St. Johns	0					0	0	0	
Bashee	13					0	0	0	
East London	0					0	0	0	
Port Alfred	0	0					0	0	
Port Elizabeth	0	0				0	0	0	0
Cape Seal	0	0	0	0					
Range _____					Range _____				
Median _____					Median _____				

Table A2-189. Abundances for adult *S. pulchra* expressed by number of individuals/haul/Lo

<u>SUMMER SURVEY</u>							
Neritic Stations				Oceanic Stations			
	1	2		1	2	3	4
Durban				1	0		
Port Shepstone							
Port St. Johns				0	0		
East London							
Port Elizabeth		0		0	0	0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						3	0	0	
Port Shepstone						0	0	0	
Port St. Johns						0	0	0	
Bashee						0	0	0	
East London						0	0	0	
Port Alfred						0	0	0	
Port Elizabeth						0	0	0	0
Cape Seal		0	0	0					
Range _____					Range _____				
Median _____					Median _____				

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban						0	0	0	
Port Shepstone						0	0	0	
Port St. Johns						0	0	0	
Bashee						0	0	0	
East London						0	0	0	
Port Alfred		0					0	0	
Port Elizabeth		0				0	0	0	
Cape Seal				0					
Range _____					Range _____				
Median _____					Median _____				

Table A2-190. Abundances for juvenile *S. pulchra* expressed by number of individuals/haul/10 minutes (N100B-nets). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban				1	3		
Port Shepstone							
Port St. Johns				0	0		
East London							
Port Elizabeth		0		0	0	0	0
Range _____ Median _____				Range _____ Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					0	0	0
Port Shepstone					0	0	0
Port St. Johns					0	0	0
Bashee					0	0	0
East London					0	0	0
Port Alfred					0	0	0
Port Elizabeth					0	0	0
Cape Seal		0	0	0			
Range _____ Median _____				Range _____ Median _____			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban					0	0	0
Port Shepstone					0	0	0
Port St. Johns					0	0	0
Bashee					0	0	0
East London					0	0	0
Port Alfred		0				0	0
Port Elizabeth		0			0	0	0
Cape Seal				0			
Range _____ Median _____				Range _____ Median _____			

Table A2-191. Abundances for adult *S. pulchra* expressed by number of individuals/haul/10 minutes (1100H-nots). Compare with Table A1-1 for station numbers.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	0				0		
Port Shepstone							
Port St. Johns	0			0	0		
East London	0			0	0		
Port Elizabeth	0	0		0		0	0
Range _____				Range _____			
Median _____				Median _____			

AUTUMN SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	6				0	0	
Port St. Johns	0				0	0	0
Bashee	0				0	0	0
East London	0				0	0	0
Port Alfred	0				0	0	
Port Elizabeth	0	0			0	0	0
Cape Seal	0	0	0	0			
Range _____				Range _____			
Median _____				Median _____			

WINTER SURVEY							
	Neritic Stations				Oceanic Stations		
	1	2	3	4	1	2	3
Durban	0				0	0	0
Port Shepstone	0				0	0	0
Port St. Johns	0				0	0	0
Bashee	1				0	0	0
East London	0				0	0	0
Port Alfred	0	0				0	0
Port Elizabeth	0	0			0	0	
Cape Seal		0	0	0			
Range _____				Range _____			
Median _____				Median _____			

Table A2-192. Abundances for juvenile *S. pulchra* expressed by number of individuals/haul/10 minutes (N100H-nets). Compare with Table A1-1 for station numbers.

<u>SUMMER SURVEY</u>								
	Neritic Stations				Oceanic Stations			
	1	2			1	2	3	4
Durban	0					0		
Port Shepstone								
Port St. Johns	0				0	0		
East London	0				0	0		
Port Elizabeth	0	0			0		0	0
Range _____					Range _____			
Median _____					Median _____			

AUTUMN SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	0					0	0	0	
Port Shepstone	0					0	0		
Port St. Johns	0					0	0	0	
Bashee	0					0	0	0	
East London	0					0	0	0	
Port Alfred	0					0	0		
Port Elizabeth	0	0				0	0	0	0
Cape Seal	0	0	0	0					
Range _____					Range _____				
Median _____					Median _____				

WINTER SURVEY									
Neritic Stations					Oceanic Stations				
	1	2	3	4		1	2	3	4
Durban	0					0	0	0	
Port Shepstone	0					0	0	0	
Port St. Johns	0					0	0	0	
Bashee	1					0	0	0	
East London	0					0	0	0	
Port Alfred	0	0					0	0	
Port Elizabeth	0	0				0	0		
Cape Seal		0	0	0					
Range _____					Range _____				
Median _____					Median _____				

Figure A3-1. Recurrent groups of chaetognaths from the Agulhas current during 1958. The Fager-technique (Fager, 1957, 1963) was used to identify the groups. A cutoff point of 0.50 was used and all individuals from all surveys were used. Fractions are the ratios of the number of affinities per species observed to the maximum number of possible affinities; affinities were determined by the expression given in the text.

Figure A3-2. The distribution of the main group of nine species. N70V-data for all surveys.

Figure A3-3. The distribution of the associate group of three species. N70V-data for all surveys.

Figure A3-4. The distribution of the "best" stations, as determined by a concordance test, of the main group of nine species, N70V-data for all surveys.

Figure A3-5. The distribution of the "best" stations, as determined by a concordance test, of the associate group of three species. N70V-data for all surveys.

Figure A3-6. Recurrent groups of chaetognaths from the Agulhas current during 1958. N70V-data was used from each survey. The Fager technique with a 0.50 cutoff point was used to identify the groups. Fractions are the ratios of the number of affinities per species observed to maximum number of possible affinities; affinities were determined by the expression given in the text.

Summer Survey
14 spp. -- 36 samples

No affinities:

S. friderici
S. bedoti
K. pacifica

Autumn Survey
15 spp. -- 80 samples

No affinities:

S. friderici
E. hamata

Winter Survey
16 spp. -- 75 samples

No affinities

S. friderici
S. bedoti
E. hamata
S. pulchra

Figure A3-7. The distribution of the main group of eight species. RN70V data for summer survey only.

Depth intervals where main group was found:

100-0	6
200-100	1
400-200	0
* 400-0	3

* Nets which failed to close.

Figure A3-8. The distribution of the associate group of two species. N70V-data for summer survey only.

Figure A3-9. The distribution of the "best" stations, as determined by a concordance test, of the main group of eight species. N70V-data for summer survey only.

Figure A3-10. The distribution of the main group of eight species. N70V-data for autumn survey only.

Depth interval where main group was found:	100-0	17
	200-100	1
	400-200	0
	* 400-0	1

* Nets which failed to close.

Figure A3-11. The distribution of the associate group of three species. N70V-data for autumn survey only.

Figure A3-12. The distribution of the "best" stations, as determined by a concordance test, of the main group of eight species, N70V-data for autumn survey only.

Figure A3-13. The distribution of the "best" stations, as determined by a concordance test, of the associate group of three species. N70V-data for autumn survey only.

Figure A3-14. The distribution of the main group of nine species. N70V-data for winter survey only.

Depth intervals where main group was found:

100-0	9
200-100	6
400-200	0
* 400-0	0

* Nets which failed to close.

Figure A3-15. The distribution of the associate group of two species. N70V-data for winter survey only.

Figure A3-16. The distribution of the "best" stations, as determined by a concordance test of the main group of nine species. N70V-data for winter survey.

Figure A3-17. The distribution of the main group of eleven species. N100B-data for all surveys.

Figure A3-18. The distribution of the "best" stations, as determined by a concordance test, of the main group of eleven species! N100B-data for all surveys.

Figure A3-19. The distribution of the main group of seven species. N100H-data for all surveys.

Figure A3-20. The distribution of the "best" stations, as determined by a concordance test, of the main group of seven species. N100H-data for all surveys.

Table A1-1. Various statistics for species of the main group from N70V-data, all surveys.
Formed only from samples of the upper 200 meters in the ocean.

Species	Total	Frequency (Proportion/sam- ples - %)	Relative Abundance		Average Rank 1 most 6 least	Dispersion (variance/ mean from Relative Abundances	Dominance Proportion -samples Species 50%	Area Vitality (Proportion samples)		M=mature IM=immature
			Range	Median				Adults-Juv.	% Juv.	
53 stations 101 samples 11,584										
1 <i>S. minima</i>	3324	77/101	1-414	23	3.7	83	45/101	3303-291	8.8%	Mostly M
2 <i>S. serrato.</i>	2337	98/101	1-212	10	2.8	46	41/101	1076-1261	54.2%	M + IM
3 <i>S. enflata</i>	2155	98/101	1-136	8	3.3	32	34/101	1302-853	39.6%	M + IM
4 <i>P. draco</i>	1336	86/101	1-75	8	4.6	18	9/101	327-1009	75.5%	M + IM
5 <i>S. lyra</i>	643	79/101	1-31	6	5.6	6	8/101	124-519	80.6%	No distinct eggs - IM
6 <i>S. hexaptera</i>	545	84/101	1-29	5	5.7	5	4/101	202-343	63.0%	Few distinct eggs - IM
7 <i>K. subtilis</i>	507	77/101	1-26	5	5.8	5	11/101	353-154	30.4%	M + IM
8 <i>S. reg/neglecta</i>	392	53/101	1-29	4	6.9	7	1/101	200-192	49.0%	M + IM
9 <i>S. bipunctata</i>	345	55/101	1-22	5	6.7	5	5/101	111-234	68.0%	M + IM
<u>Species</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	
<u>Adults</u>										
Summer survey	160	96	143	49	2	20	43	7	13	
Autumn survey	1143	434	626	168	33	89	120	79	75	
Winter survey	1730	546	533	110	89	93	190	114	23	
<u>Juveniles</u>										
Summer survey	7	91	160	84	56	36	29	5	1	
Autumn survey	87	476	409	508	200	156	57	120	83	
Winter survey	197	694	284	417	263	151	68	67	150	

Table A3-2. Interrelationships among members of the main group of 9 species from the N70V-data for all surveys. Values are levels of significance and * indicates no significant relationships.

	1	2	3	4	5	6	7	8	9
S. minima		0.01	0.01	0.01	0.01	0.05	*	0.01	*
S. serrato.			0.01	0.01	*	0.05	*	0.01	0.05
S. enflata				0.01	*	0.01	*	0.01	*
P. draco					0.05	0.01	*	0.01	0.05
S. lyra						0.01	0.05	*	*
S. hexaptera							0.01	*	0.05
K. subtilis								*	0.05
S. reg./neglec.									*
S. bipunctata									

Diagrammatically:

———— 0.01
 - - - - 0.05

Table A3-3. Various statistics for species of the main group from N70V-data, summer survey.
Formed only from samples of the upper 200 meters in the ocean.

Species	Total	Frequency	Relative		Average	Dispersion	Dominance	Area Vitality		M=mature IM= immature	
		(Proportion/19 Samples-%	Abundances	Rank-19 samples	(variance/ mean Poisson)from Relative Abundances	Proportion -samples Species %	(Proportion samples) Adults-Juv.	% Juv.			
19 samples	1037										
<i>S. enflata</i>	303	18/19	1-100	5½	2.8	51	8/19	143-160	100/303	52.9%	M + IM
<i>S. serrato.</i>	187	18/19	1-71	6½	2.9	25	6/19	96-91	91/187	48.6%	M + IM
<i>S. minima</i>	167	10/19	2-78	9	4.8	32	5/19	160-7	7/167	4.2%	Mostly M
<i>P. draco</i>	133	16/19	1-30	4½	3.7	9	1/19	49-84	84/133	63.1%	M + IM
<i>K. subtilis</i>	72	14/19	1-18	4	5.1	6	2/19	43-29	29/72	40.3%	M + IM
<i>S. decipiens</i>	61	12/19	1-16	7	5.2	5	1/19	30-31	31/61	50.9%	M + IM
<i>S. lyra</i>	58	11/19	1-14	4	5.6	4	1/19	2-56	56/58	96.7%	Mostly IM sub-adults
<i>S. hexaptera</i>	56	12/19	1-12	5	5.7	3	0/19	20-36	36/56	64.3%	Mostly IM sub-adults

Table A3-4. Various statistics for species of the main group from N70V-data, autumn survey.
Formed only from the samples of the upper 200 meters in the ocean.

Species	Total	Frequency	Relative		Average	Dispersion	Dominance	Area Vitality		M=mature IM=immature
		(Proportion/samples - %)	Range	Median	Rank 1 most 6 least	(variance/ mean from relative abundances	Proportion -samples Species 50% total	(Proportion samples) Adults-Juv.	% Juv.	
44 samples	4518									
<i>S. minima</i>	1230	34/44	1-154	28½	3.3	30	18/44	1143-87	7.0%	Mostly M
<i>S. enflata</i>	1036	42/44	1-136	10½	2.8	40	17/44	627-409	39.4%	M + IM
<i>S. serrato.</i>	910	42/44	2-130	14	2.7	26	15/44	434-476	52.4%	M + IM
<i>P. draco</i>	676	37/44	1-75	17	3.7	19	8/44	168-508	73.6%	M + IM
<i>S. hexaptera</i>	245	39/44	1-29	5	4.8	5	2/44	89-156	63.7%	Mostly IM sub-adults
<i>S. regularis</i>	199	22/44	1-29	7	5.9	7	1/44	79-120	60.8%	M + IM
<i>S. bipunctata</i>	158	25/44	1-20	5	5.9	5	2/44	75-83	52.5%	M + IM
<i>K. pacifica</i>	64	20/44	1-20	1+	6.9	7	0/44	55-9	14.1%	Mostly M

Table A3-5. Various statistics for species of the main group from N70V-data, winter survey.
Formed only from samples of the upper 200 meters in the ocean.

Species	Total	Frequency	Relative		Average	Dispersion	Dominance	Area Vitality		M=mature IM=immature
		(Proportion/38 samples-%	Range	Median	Rank 1 most 6 least	(variance/ mean from relative abundances	Proportion -samples Species 50% total	(Proportion Samples) Adults-Juv.	% Juv.	
38 samples	5719									
<i>S. minima</i>	1927	33/38	1-414	22	3.1	114	25/38	1730-197	10.2%	Mostly M
<i>S. serrato.</i>	1240	38/38	2-212	15	2.6	59	17/38	546-694	55.9%	M + IM
<i>S. enflata</i>	817	38/38	1-75	8½	3.4	21	10/38	533-284	34.7%	M + IM
<i>P. draco</i>	527	33/38	1-68	7	5.4	19	0/38	110-417	79.1%	M + IM
<i>S. lyra</i>	352	34/38	1-31	9	5.1	6	6/38	89-263	74.7%	Mostly IM
<i>K. subtilis</i>	258	32/38	1-26	5½	5.9	6	4/38	190-68	26.3%	M + IM
<i>S. hexaptera</i>	244	33/38	1-22	6	6.0	5	1/38	93-151	61.4%	Mostly IM sub-adults
<i>S. regularis</i>	181	24/38	1-28	4	6.9	6	0/38	114-67	37.0%	M + IM
<i>S. bipunctata</i>	173	23/38	1-22	6	6.7	4	1/38	23-150	86.7%	M + IM

Table A3-6. Various statistics for the species of the main group from N100B-data, all surveys.
Formed only from samples from oceanic stations.

Species	Total	Frequency	Relative		Average	Dispersion	Dominance	Area Vitality		M=mature IM=immature
		(Proportion/ 51 samples-%	Abundance	Median	Rank 1 most 9 least	(variance/ mean from relative abundances	Proportion -samples Species 50% total	(Proportion samples) Adults-Juv.	% Juv.	
51 samples 13,429										
S. enflata	3020	51/51	2-181	56	2.6	28	30/51	2157-863	28.5%	M + IM
P. draco	2918	47/51	4-311	50	2.8	44	31/51	1391-1527	52.3%	M + IM
S. serrato.	2446	49/51	2-230	31	3.5	43	16/51	1743-703	28.7%	M + IM
S. hexaptera	1786	48/51	8-93	34½	3.6	14	10/51	881-905	50.7%	M + IM
S. bipunctata	919	49/51	1-100	13	5.7	26	3/51	619-300	32.6%	M + IM
S. minima	753	42/51	1-195	8	6.9	54	2/51	624-129	17.1%	M
S. rob/ferox	532	43/51	1-96	9	7.1	20	2/51	171-361	67.8%	M
K. subtilis	463	40/51	1-37	9	7.3	6	0/51	322-141	30.4%	M + IM
S. lyra	429	41/51	1-32	6	7.5	10	2/51	82-347	80.8%	sub-adults and IM
S. bedoti	110	29/51	1-21	2	9.2	5	0/51	92-18	16.3%	M + IM
K. pacifica	53	25/51	1-8	1	9.9	1½	0/51	52-1	4.8%	Mostly M

Table A3-7. Various statistics for species of the main group from N100H-data, all surveys.
Formed from neritic and oceanic samples.

Species	Total	Frequency	Relative		Average	Dispersion	Dominance	Area Vitality	M=mature IM=immature	
		(Proportion/76 samples-%)	Range	Median	Rank 1 most 5 least	(variance/ mean from relative abundances)	Proportion 76 samples Species 50% total	(Proportion samples) Adults-Juv. % Juv.		
76 samples 11,798										
<u>S. enflata</u>	5300	74/76	1-693	39	1.7	160	49/76	4155-1145	21.6%	M < IM
<u>S. friderici</u>	1447	40/76	1-410	5	5.1	236	9/76	1323-124	8.5%	Mostly M sub-adults
<u>S. serrato.</u>	1430	64/76	1-246	7½	3.8	76	10/76	1127-305	21.3%	M < IM
<u>S. bipunctata</u>	1299	58/76	1-233	10	3.7	57	12/76	991-308	25.4%	M < IM
<u>P. draco</u>	1152	52/76	1-349	8	4.4	120	7/76	573-579	51.0%	M < IM
<u>S. hexaptera</u>	596	53/76	1-67	6	4.7	16	2/76	332-264	44.2%	Mostly sub- adults
<u>S. rob/ferox</u>	572	55/76	1-48	5	4.6	14	1/76	278-294	51.2%	M < IM

Table A4-1. Summary of fecundity studies made on mature individuals of various chaetognath species from neritic and oceanic areas.

Species	Material Source	No. individuals			Diameter size-range of eggs in mm.	Level of significance (Mann-Whitney U Test; Tate and Clelland, 1957).	Area where population showed most eggs per individual
		Neritic	Oceanic	Total			
* <i>S. enflata</i>	N100s	649	959	1608	0.10 to 0.32	$p < 0.01$	neritic > oceanic
<i>K. pacifica</i>	N100s	15	39	54	0.09 to 0.25	p ranges between 0.01 and 0.0146	neritic > oceanic
<i>S. bedoti</i>	N100s	17	24	41	0.16 to 0.27	$p < 0.01$	neritic > oceanic
<i>S. robusta</i>	N100s	12	10	22	0.11 to 0.23	$p = 0.0292$	neritic > oceanic
<i>P. draco</i>	N100s	20	333	353	** 0.09 to 0.41	p ranges between 0.2340 and 0.8776	neritic ~ oceanic
<i>S. bipunctata</i>	N100s	37	309	346	0.05 to 0.24	p ranges between 0.0264 to 0.6456	neritic ~ oceanic
<i>S. serratodentata</i>	N100s	14	185	199	0.07 to 0.25	atlantica $p < 0.01$ pacifica $p = 0.8886$	oceanic > neritic
<i>S. minima</i>	N100s	16	163	179	0.09 to 0.23	$p = 0.337$	neritic ~ oceanic
<i>S. ferox</i>	N100s	26	42	68	0.11 to 0.27	$p = 0.2802$	neritic ~ oceanic
<i>K. subtilis</i>	N100s	3	35	38	0.09 to 0.36	$p = 0.18$	neritic ~ oceanic
<i>S. regularis</i>	N70Vs N100s	11	19	30	0.07 to 0.20	$p = 0.6384$	neritic ~ oceanic

* Data from Stone - in press.

** Eggs not always spherical.

Table A4-2. Median values and ranges of egg numbers found in varying numbers of *S. enflata* Grassi by length classes for the two areas of study. Significant p-values were derived from the Mann-Whitney U test.

A. All surveys combined.

Length Class in mm.	<u>Neritic Area</u>			<u>Oceanic Area</u>			Level of significance (two-sided)
	Individuals	Egg numbers Medians	Range	Individuals	Egg numbers Medians	Range	
7-8	3	17	9-24	28	9.5	2-18	p = 0.091
9	22	11	3-28	94	9	2-20	p = 0.105
10	64	14	6-27	174	10	2-29	p < 0.01
11	63	19	5-51	177	11	2-36	p < 0.01
12	79	22	6-71	218	14	2-46	p < 0.01
13	87	33	4-87	133	19	3-57	p < 0.01
14	128	32	2-150	84	23	2-75	p < 0.01
15	101	51	5-124	42	19.5	3-50	p < 0.01
16	51	48	14-105	8	29.5	6-37	p < 0.01
17	25	66	7-149	1	--	--	--
18-20	26	76.5	18-142	--	--	--	--

Data from Stone, in press.

Table A4-2. continued

B. Summer Survey

Length Class in mm.	<u>Neritic Area</u>			<u>Oceanic Area</u>			Level of Significance (two-sided)
	Individuals	Medians	Egg numbers Range	Individuals	Medians	Egg numbers Range	
7-8	--	--	--	--	--	--	--
9	5	14	9-16	11	13	6-20	p = 0.734
10	19	13	10-30	25	13	4-29	p = 0.594
11	8	19.5	13-26	35	17	4-36	p = 0.173
12	20	23.5	11-70	49	20	5-39	p = 0.242
13	32	33	4-87	27	24	4-53	p = 0.059
14	53	30	2-79	21	26	6-38	p = 0.298
15	38	33	9-123	9	29	7-50	p = 0.230
16	14	57.5	21-105	5	34	24-37	p = 0.016
17	5	59	30-81	--	--	--	--
18-20	7	82	54-87	--	--	--	--

Table A4-2. continued

C. Autumn Survey							
Length Class in mm.	Neritic Area			Oceanic Area			Level of Significance (two-sided)
	Individuals	Egg Medians	Numbers Range	Individuals	Egg numbers Medians	Range	
7-8	1	--	--	24	9	2-17	---
9	12	11	3-28	62	8	2-19	$p < 0.01$
10	31	14	6-39	89	9	1-29	$p < 0.01$
11	35	20	5-51	90	12	2-32	$p < 0.01$
12	34	27	10-71	105	13.5	2-46	$p < 0.01$
13	37	33	8-87	65	18	5-57	$p < 0.01$
14	46	41.5	7-150	36	23	6-75	$p < 0.01$
15	34	52	5-124	14	15.5	3-42	$p < 0.01$
16	20	45	14-127	1	--	--	---
17	15	68	24-149	--	--	--	---
18	16	47	18-142	--	--	--	---

Table A4-2. continued

D. Winter Survey							
Length Class in mm.	Neritic Area			Oceanic Area			Level of Significance (two-sided)
	Individuals	Medians	Egg numbers Range	Individuals	Medians	Egg numbers Range	
7-8	2	13	9-17	3	11	10-18	p = 0.56
9	5	7	7-22	22	9.5	4-19	p = 0.97
10	14	14.5	7-29	59	9	1-23	p < 0.01
11	20	16	6-23	53	8	2-24	p < 0.01
12	25	18	6-46	65	11	4-34	p < 0.01
13	18	32	13-47	38	16	3-44	p < 0.01
14	29	32	11-59	28	13.5	2-45	p < 0.01
15	29	31	8-81	20	17.5	4-38	p < 0.01
16	17	44	14-87	2	13.5	6-21	p < 0.01
17	5	47	7-144	1	--	--	--
18-20	3	87	72-101	--	--	--	--

Table A4-3. Median values and ranges of egg numbers found in varying numbers of K. pacifica by length classes for the two areas of study. Significant p-values were derived from the Mann-Whitney U test.

Length Class in mm.	<u>Neritic Area</u>			<u>Oceanic Area</u>			Level of Significance (two-sided)
	Individuals	Median Egg Numbers	Range	Individuals	Median Egg Numbers	Range	
5.0	--	--	--	9	9	6-18	--
6.0	10	21	16-32	23	14	7-23	p < 0.01
7.0	5	26	19-29	7	19	14-20	p = 0.0146

Table A4-4. Median values and ranges of egg numbers found in varying numbers of S. bedoti by length classes for the two areas of study. Significant p-values were derived from the Mann-Whitney U test.

Length Class in mm.	<u>Neritic Area</u>			<u>Oceanic Area</u>			Level of Significance (two-sided)
	Individuals	Median Egg Numbers	Range	Individuals	Median Egg Numbers	Range	
8.0				1	37.....		--
9.0	10	40	28-56	9	29.5	23-32	p < 0.01
10.0	5	30	15-53	10	27.5	7-42	P = 0.1164
11.0	2	50	45-55	4	29.5	23-38	--
Pooled	17	41	15-56	24	28.5	7-42	p < 0.01

Table A4-5. Median values and ranges of egg numbers found in varying numbers of *S. robusta* by length classes for the two areas of study. Significant p-values were derived from the Mann-Whitney U test.

Length Class in mm.	Neritic Area			Oceanic Area			Level of Significance (two-sided)
	Individuals	Median	Egg Numbers Range	Individuals	Median	Egg Numbers Range	
9.0	1		24	4	45.5	32-61	--
10.0	4	78	46-87	4	79	68-87	p = 0.7718
11.0	5	87	78-131	--	--	--	--
12.0	1		93	2	26.5	25-28	--
13.0	1		100	--	--	--	--
Pooled	12	83	24-131	10	59.5	25-87	p = 0.0292

Table A4-6. Median values and ranges of egg numbers found in varying numbers of *P. draco* by length classes for the two areas of study. Significant p-values were derived from the Mann-Whitney U test.

Length Class in mm.	Neritic Area			Oceanic Area			Level of Significance (two-sided)
	Individuals	Median	Egg Numbers Range	Individuals	Median	Egg Numbers Range	
4.0	--	--	--	2	11.5	10-13	--
5.0	5	23	9-36	42	19.5	7-46	p = 0.2340
6.0	10	30.5	12-60	135	29	6-56	p = 0.8026
7.0	4	46.5	22-52	99	43	6-93	p = 0.8776
8.0	1		57	36	54	33-88	--
9.0	--	--	--	15	62	44-107	--
10.0	--	--	--	4	74.5	55-82	--

Table A4-7. Median values and ranges of egg numbers found in varying numbers of S. bipunctata by length classes for the two areas of study. Significant p-values were derived from the Mann-Whitney U test.

Length Class in mm.	<u>Neritic Area</u>			<u>Oceanic Area</u>			Level of Significance (two-sided)
	Individuals	Egg Median	Numbers Range	Individuals	Egg Median	Numbers Range	
7.0	1		15.....	3	18	13-22	--
8.0	3	17	16-26	21	15	10-32	p = 0.4066
9.0	8	18.5	10-39	76	17.5	7-42	p = 0.6456
10.0	12	24	15-38	92	20	6-60	p = 0.0264
11.0	11	28	10-47	62	23	7-43	p = 0.097
12.0	2	48.5	44-53	34	27.5	12-51	--
13.0	--	--	--	17	30	15-50	--
14.0	--	--	--	3	33	31-46	--
15.0	--	--	--	1		31.....	--

Table A4-8. Median values and ranges of egg numbers found in varying numbers of S. serratodentata by length classes for the two areas of study. Significant p-values were derived from the Mann-Whitney U test.

Length Class in mm.	<u>Neritic Area</u>			<u>Oceanic Area</u>			Level of Significance (two-sided)
	Individuals	Median Egg Numbers	Range	Individuals	Median Egg Numbers	Range	
<u>atlantica</u>							
6.0	--	---	---	1	10.....	---	---
7.0	--	---	---	17	25	8-51	---
8.0	4	18.5	11-29	73	36	10-64	p < 0.01
9.0	--	---	---	50	49	12-72	---
10.0	--	---	---	4	55.5	14-62	---
<u>pacifica</u>							
8.0	--	---	---	1	20.....	---	---
9.0	--	---	---	7	56	38-82	---
10.0	1	37.....	---	12	65.5	19-98	---
11.0	3	51	28-65	17	81	51-107	p = 0.034
12.0	5	85	68-94	3	90	56-98	p = 0.988
13.0	1	112.....	---	--	--	--	---
Pooled	10	69	28-112	40	71.5	19-107	p = 0.8886

Table A4-9. Median values and ranges of egg numbers found in varying numbers of S. minima by length classes for the two areas of study. Significant p-values were derived from the Mann-Whitney U test.

Length Class in mm.	Neritic Area			Oceanic Area			Level of Significance (two-sided)
	Individuals	Median	Range	Individuals	Median	Range	
4.0	1	5.....		4	6.5	5 to 8	--
5.0	7	6	5 to 10	111	7	3 to 13	p = 0.9736
6.0	7	9	7 to 11	46	8	3 to 16	p = 0.5552
7.0	1	12.....		2	6	4 to 8	--
Pooled	16	7.5	5 to 12	163	7	3 to 16	p = 0.337

Table A4-10. Median values and ranges of egg numbers found in varying numbers of S. ferrex by length classes for the two areas of study. Significant p-values were derived from the Mann-Whitney U test.

Length Class in mm.	Neritic Area			Oceanic Area			Level of Significance (two-sided)
	Individuals	Median	Range	Individuals	Median	Range	
11.0	--	--	--	1	69.....		--
12.0	3	102	89 to 105	6	77	54 to 124	p = 0.2006
13.0	9	128	81 to 148	9	97	57 to 178	p = 0.2846
14.0	8	138	102 to 171	5	128	113 to 232	p = 0.5620
15.0	3	171	153 to 207	14	134.5	94 to 221	p = 0.0424
16.0	1	171.....		7	135	110 to 221	--
17 to 18.0	2	132.5	130 to 135	--	--	--	--
Pooled	26	134.5	81 to 207	42	124	54 to 232	p = 0.2802

Table A4-11. Median values and ranges of egg numbers found in varying numbers of K. subtilis by length classes for the two areas of study. Significant p-values were derived from the Mann-Whitney U test.

Length Class in mm.	<u>Neritic Area</u>			<u>Oceanic Area</u>			Level of Significance (two-sided)
	Individuals	Egg Numbers Median	Range	Individuals	Egg Numbers Median	Range	
9.0	--	--	--	1	8.....	--	--
10.0	1	12.....		10	13.5	7-17	--
11.0	--	--	--	17	12	7-19	--
12.0	1	30.....		4	16	12-26	--
13.0	1	19.....		3	13	7-18	--
Pooled	3	19	12-30	35	12	7-26	p = 0.18

Table A4-12. Median values and ranges of egg numbers found in varying numbers of S. regularis/neglecta by length classes for the two areas of study. Significant p-values were derived from the Mann-Whitney U test.

Length Class in mm.	<u>Neritic Area</u>			<u>Oceanic Area</u>			Level of Significance (two-sided)
	Individuals	Egg numbers Median	Range	Individuals	Egg numbers Median	Range	
<u>regularis</u>							
3.0	3	8	4-9	--	--	--	--
4.0	1	18.....		4	9	7-16	--
5.0	7	23	6-34	14	16	6-22	p = 0.802
6.0	--	--	--	1	26.....	--	--
Pooled	11	18	4-34	19	15	6-26	p = 0.6384
<u>neglecta</u>							
6.0	3	39	28-51	--	--	--	--

Table A5-1. Frequency of occurrence of various types of organisms found in the intestine of: (A) S. bipunctata, data from Lebour (1922, 1923); and (B) S. gazellae, data from David (1955).

(A) Species	Group	Number	Percentage
Acartia spp.	Copepoda	2	}
Acartia Clausi	Copepoda	3	
Calanus spp.	Copepoda	1	
Calanus finmarchius	Copepoda	7	
Centropages spp.	Copepoda	1	
Centropages typius	Copepoda	2	
★Corycaeus anglicus	Copepoda	3	
★Pseudocalanus spp.	Copepoda	18	
Pseudocalanus elongatus	Copepoda	6	
Temora longicornis	Copepoda	3	
Copepods (unidentified)	Copepoda	6	68.4%
Sagitta spp.	Chaetognatha	1	}
Sagitta bipunctata	Chaetognatha	15	
Herring (juveniles)	Pisces	7	9.2%
Gebia larva	Miscellaneous	1	1.4%
Totals:		76	100.0%
(B) Species	Group	Number	Percentage
Calanus propinquus	Copepoda	2	}
Rhincalanus gigas	Copepoda	1	
Pleuromamma robusta	Copepoda	1	
Metridia gerlachi	Copepoda	1	
Calanus spp.	Copepoda	3	
Other Copepoda	Copepoda	11	42.2%
Thysanoessa macura	Euphausiaceae	2	}
Thysanoessa vicina	Euphausiaceae	1	
Thysanoessa sp.	Euphausiaceae	5	
Euphausiid larvae	Euphausiaceae	3	
Euphausiid spp.	Euphausiaceae	7	40.0%
Eukrohnia hamata	Chaetognatha	2	}
Chaetognatha spp.	Chaetognatha	4	
Primna macropa	Other Crustacea	1	}
"Large red Crustacean"	Other Crustacea	1	
Totals:		45	100.0%

★ These organisms were also listed qualitatively, in addition to the above numbers, by such terms as, many, several, few and frequently.

Table A5-2. Numerical distribution of all intestinal contents identified from chaetognaths of the present collections. The total tally is slightly less than that given in Table A5-4 because the location of some intestinal contents was not recorded.

SUMMER SURVEY							
	Neritic Stations			Oceanic Stations			
	1	2		1	2	3	4
Durban	3			1	6		
Port Shepstone							
Port St. Johns	2				11		
East London	7			4	2		
Port Elizabeth		28		16	5	16	17
Total:	Range 40			Range 78 = 118			
	Median			Median			

AUTUMN SURVEY									
Neritic Stations				Oceanic Stations					
	1	2	3	4		1	2	3	4
Durban	20					16	95	5	
Port Shepstone	2					20	25	18	
Port St. Johns	23					9	38	7	
Bashee	1					18	35	28	
East London	6					18	22	8	
Port Alfred	4					22	24	54	
Port Elizabeth	16	13				9	37	45	43
Cape Seal			12	14					
Total:	Range 111					Range 596 = 707			
	Median					Median			

WINTER SURVEY									
	Neritic Stations					Oceanic Stations			
	1	2	3	4		1	2	3	4
Durban	5					17	1	23	
Port Shepstone	5					7	12	11	
Port St. Johns	2					4	12	53	
Bashee	1					26	24	36	
East London	1					15	47	30	
Port Alfred	1	23					35	11	
Port Elizabeth	10					11	40	34	42
Cape Seal			1	4					
Total:	Range 53					Range 491 = 544			
All Surveys Totals:	Median 204					Median 1165 = 1369			

Table A5-3. Organisms found in the intestine of various chaetognath species arranged by species and their frequency of occurrence.

	<u>S. enflata</u>	<u>P. draco</u>	<u>S. bipunctata</u>	<u>S. serrato.</u>	<u>S. hexaptera</u>	<u>S. robusta</u>	<u>S. lyra</u>	<u>S. friderici</u>	<u>S. ferox</u>	<u>S. decipiens</u>	<u>S. bedoti</u>	<u>S. minima</u>	<u>K. subtilis</u>	<u>S. regularis</u>	<u>S. planctonis</u>
Acartia spp.	10	1													
Acartia danae		1													
Acrocalanus spp.				1											
Calanus spp.								1							
" australis					1										
" chilensis	1			2				1							
" finmarchius	2			1											
" pacificus								1							
Candacia spp.	11	1	7	4	3	5		2	2	1	2				
" catula				1	1										
Centropages spp. (chierchiae)	5	1	1	17		1		3	1						
" typicus	4	1						1							
" krøyeri	2														
" furcatus						1									
" bradyi					1										
Corycaeus spp.	12	3	7	1	1		1				1				
" agilis	3		2												
" andrewsi			1												
" asiaticus	1	1													
" clausi	1														
" crassiusculus			1			1									
" dahlī	3		4		2	1			1						
" danae	2														
" erythraeus	1		2	1	1					1					
" giebrechti	2	1	3			1									
" latus				1	1	1				1					
" pacificus	2	2	1	1	1			4							
" subtilis	1		1												
Corycella spp.	12	18	31	2		2				1					
" concinnus	28	5	83	3	1	3		4			1				1
" curtus			2												
" "2x"dakin	9	20	7	18											
" gibbulus	23		11			1		1							
" rostratus	13	37	37	21	5	1	1	1	2	1	3	1			
" "x"					5	1			1						

Continued on next page.

Table A5-3 - continued

	<u>S. enflata</u>	<u>P. draco</u>	<u>S. bipunctata</u>	<u>S. serrato.</u>	<u>S. hexaptera</u>	<u>S. robusta</u>	<u>S. lyra</u>	<u>S. friderici</u>	<u>S. ferox</u>	<u>S. decipiens</u>	<u>S. bedoti</u>	<u>S. minima</u>	<u>K. subtilis</u>	<u>S. regularis</u>	<u>S. planctonis</u>
Eucalanus spp.	13		2		7		1	1			1				
" attenuatus	16	1			5										
" elongatus	4														
" monachus	2				1										
Euchaeta spp.				1											
" norvegica					1										
Euterpina acutifrons	8	1				1		2							
Labidocera spp.							1								
Microsetella sp.	3	12				1									
" atlantica (?)	1														
" rosea	5	27				4									
Oithona spp.							1			1					
" tenuis	1														
Oncaea spp.	67	83	5	16	8	3	2		2	1				1	
" conifera	1	1			2		1								
" media	36	39	9	12	10	1	6			3					
" venusta	8	17	3	1	4	2	1		1						
" "3x" furcae				1	1										
Pleuromamma spp.					1	1	1			2	1				
" gracilis					1		1								
" robusta	1														
" xiphias	1														
Pseudodiaptomus spp.	1														
Rhincalanus spp.	1						1								
" cornutus					1										
" nasutus	1														
Sapphirina spp.								1							
Undinula spp.	1	1	1	46		1	1	14			1				
" darwini				14		1									
Eukrohnia hamata				(?)	1										
Krohnitta subtilis	2				2		2								
Pterosagitta draco					3										

Continued on next page.

Table A5-3 - Continued

	<u>S. enflata</u>	<u>P. draco</u>	<u>S. bipunctata</u>	<u>S. serrato.</u>	<u>S. hexaptera</u>	<u>S. robusta</u>	<u>S. lyra</u>	<u>S. friderici</u>	<u>S. ferox</u>	<u>S. decipiens</u>	<u>S. bedoti</u>	<u>S. minima</u>	<u>K. subtilis</u>	<u>S. regularis</u>	<u>S. planctonis</u>
Sagitta spp.	16	14	11	1	8	7	8			2					
" bedoti			1												
" bipunctata	1				1										
" decipiens						1	1								
" enflata	5	1			5		2	1							
" friderici	1														
" hexaptera					3		1	1							
" minima	3	1			2		4								
" reg/neglecta	2														
" robusta	1	1	1		3	1									
" serratodentata	8	25	3	1	5	1	2	1	2						
Decapod larva	1														
" (zoea) larva					1										
* "Eggs"	6	18													
Euphausiids	1	1	2				1	1	1				1		
"Stylocherion carinatum	1														
Fish larva	1														
Heteropoda							1								
Oikopleura	2						1					1			
Ostracoda	4	2	1	1	7										
Polychaeta					1										
" (Alciopidae)									1						
"(Syllidae)exoganel															

* Spherical objects resembling chaetognath eggs. They were definitely in the intestine and not the coelom. All were very similar.

Table A5-4. Frequency of occurrence that organisms of various groups were found in the intestine of various species of chaetognaths.

	Copepods		Chaetognaths		Miscellaneous	
<i>S.enflata</i>	319	(85.1%)	39	(10.4%)	17	(4.5%)
<i>P.draco</i>	274	(81.3%)	42	(12.5%)	21	(6.2%)
<i>S.bipunctata</i>	221	(92.1%)	16	(6.7%)	3	(1.2%)
<i>S.serrato.</i>	165	(98.2%)	2	(1.2%)	1	(0.6%)
<i>S.hexaptera</i>	62	(59.6%)	33	(31.7%)	9	(8.7%)
<i>S. robusta</i>	34	(77.3%)	10	(22.7%)	0	(0.0%)
<i>S.lyra</i>	19	(45.3%)	20	(47.6%)	3	(7.1%)
<i>S.friderici</i>	37	(90.2%)	3	(7.3%)	1	(2.5%)
<i>S.ferox</i>	10	(62.5%)	4	(25.0%)	2	(12.5%)
<i>S.decipiens</i>	12	(100.0%)	0	(0.0%)	0	(0.0%)
<i>S. bedoti</i>	10	(100.0%)	0	(0.0%)	0	(0.0%)
<i>S. minima</i>	1	(50.0%)	0	(0.0%)	1	(50.0%)
<i>K. subtilis</i>	0	(0.0%)	0	(0.0%)	0	(0.0%)
<i>S. regularis</i>	1	(100.0%)	0	(0.0%)	1	(100.0%)
<i>S. planctonis</i>	1	(100.0%)	0	(0.0%)	0	(0.0%)
Totals:	1166	(83.6%)	169	(12.1%)	59	(4.3%)

Table A5-5. Frequency of occurrence that organisms of various genera of copepods and others were found in the intestine of various species of chaetognaths.

	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
	<u>S. enflata</u>		<u>P. draco</u>		<u>S. binunct.</u>		<u>S. serrato.</u>		<u>S. hexaptera</u>		<u>S. robusta</u>		<u>S. lyra</u>		<u>S. friderici</u>		<u>S. ferox</u>		<u>S. decipiens</u>		<u>S. bedoti</u>		<u>S. minima</u>		<u>K. subtilis</u>		<u>S. regularis</u>		<u>S. planctonis</u>	
Acartia	10	27%	2	05	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-
Acrocalanus	0	-	0	-	0	-	1	06	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-
Calanus	3	08	0	-	0	-	3	18	1	10	0	-	0	-	3	73	0	-	0	-	0	-	0	-	0	-	0	-	0	-
Candacia	11	29	1	03	7	29	5	28	4	38	5	114	0	-	2	49	2	125	1	83	2	200	0	-	0	-	0	-	0	-
Centropages	11	29	2	05	1	04	17	101	1	10	2	45	0	-	4	98	1	63	0	-	0	-	0	-	0	-	0	-	0	-
Corycaeus	28	75	7	21	22	92	4	24	3	29	4	91	1	24	4	98	1	63	2	168	1	100	0	-	0	-	0	-	0	-
Corycella	85	227	80	237	171	713	44	262	11	106	8	182	1	24	6	146	3	188	2	168	4	400	1	500	0	-	0	-	1	100
Eucalanus	35	93	1	03	2	08	0	-	13	125	0	-	2	24	1	24	0	-	0	-	1	100	0	-	0	-	0	-	0	-
Euchaeta	0	-	0	-	0	-	1	06	1	10	0	-	0	0	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-
Euterpina	8	21	1	03	0	-	0	-	0	-	1	23	0	-	2	45	0	-	0	-	0	-	0	-	0	-	0	-	0	-
Labidocera	0	-	0	-	0	-	0	-	0	-	0	-	1	24	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-
Microsetella	9	24	39	116	0	-	0	-	0	-	5	114	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-
Oithona	1	03	0	-	0	-	0	-	0	-	0	-	1	24	0	-	0	-	1	83	0	-	0	-	0	-	0	-	0	-
Oncaea	112	299	140	415	17	71	30	179	25	240	6	136	10	238	0	-	3	188	4	333	0	-	0	-	0	-	1	100	0	-
Pleuromamma	2	05	0	-	0	-	0	-	2	19	1	23	2	47	0	-	0	-	2	168	1	100	0	-	0	-	0	-	0	-
Pseudodiaptomus	1	03	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-
Rhincalanus	2	05	0	-	0	-	0	-	1	10	0	-	1	24	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-
Sapphirina	0	-	0	-	0	-	0	-	0	-	0	-	0	-	1	24	0	-	0	-	0	-	0	-	0	-	0	-	0	-
Undinula	1	03	1	03	1	04	60	357	0	-	2	45	1	24	14	341	0	-	0	-	1	100	0	-	0	-	0	-	0	-
Chaetognaths	39	104	42	125	16	67	2	12	33	317	10	227	20	476	3	73	4	250	0	-	0	-	0	-	0	-	0	-	0	-
Misc. groups	17	45	21	62	3	13	1	06	9	87	0	-	3	72	1	24	2	125	0	-	0	-	1	500	1	100	0	-	0	-
Totals:	375		337		240		168		104		44		42		41		16		12		10		2		1		1		1	

Table A5-6. (A) Frequency of organisms found in five samples from station "NGY" 19 (Durban line, autumn survey).
(B) Frequency of organisms found in the intestine of chaetognaths from the same station (or five samples).

(A)	
I. Copepods	3986
<u>Candacia</u> spp. -----	78
<u>Centropages</u> spp. -----	11
<u>Copilea</u> spp. -----	16
<u>Corycaeus</u> spp. -----	50
<u>Corycella</u> spp. -----	145
<u>Eucalanus</u> spp. -----	202
<u>Euchaeta</u> spp. -----	209
<u>Haloptilus</u> spp. -----	2
<u>Labidocera</u> spp. -----	7
<u>Macrosetella</u> and/or <u>Microsetella</u> spp. -----	72
<u>Oithona</u> spp. -----	621
<u>Oncaea</u> spp. -----	477
<u>Pleuromamma</u> spp. -----	3
<u>Pontella</u> spp. -----	1
<u>Pontellopsis</u> spp. -----	1
<u>Rhincalanus</u> spp. -----	213
<u>Sapphirina</u> spp. -----	162
<u>Tisbe</u> spp. -----	6
<u>Small unidentified copepods</u> (≤ 2.0 mm) -----	1610
<u>Large unidentified copepods</u> (> 2.0 mm) -----	98
<u>Branchiura</u> -----	2
II. Chaetognaths	1383
<u>S. enflata</u> -----	357
<u>S. bipunctata</u> -----	308
<u>P. draco</u> -----	177
<u>S. serratodentata</u> -----	107
<u>S. minima</u> -----	106
<u>S. robusta/ferox</u> -----	83
<u>S. hexaptera</u> -----	64
<u>S. decipiens</u> -----	39
<u>S. regularis/neglecta</u> -----	36
<u>S. bedoti</u> -----	29
<u>K. pacifica</u> -----	26
<u>K. subtilis</u> -----	26
<u>S. lyra</u> -----	16
<u>S. friderici</u> -----	9

Continued on next page.

Table A5-6 continued

III. Other organisms	4469
(Some counts in this category were rough estimates only).	
<u>Dinoflagellates</u> -----	425
<u>Foraminifera</u> -----	261
<u>Radiolaris</u> -----	535
<u>Ctenophora</u> -----	1
<u>Siphonophora</u> -----	1197
<u>Medusae</u> -----	36
<u>Cyphonautes</u> -----	22
<u>Pteropods</u> -----	122
<u>Meteropods</u> -----	60
<u>Gastropods</u> -----	201
<u>Echinospira</u> -----	5
<u>Lamellibranchiata</u> -----	25
<u>Cephalopods</u> -----	5
<u>Polychaets</u> -----	165
<u>Ostracods</u> -----	300
<u>Musids</u> -----	1
<u>Amphipods</u> -----	77
<u>Euphausiids</u> -----	146
<u>Decapods (Larvae)</u> -----	109
<u>Decapods (Leucifer)</u> -----	85
<u>Stomatopods</u> -----	5
<u>Echinodermata Larvae</u> -----	120
<u>Salpa</u> -----	134
<u>Doliolum</u> -----	42
<u>Oikopleura</u> -----	212
<u>Fritillaria</u> -----	39
<u>Leptocephalus</u> -----	1
<u>Fish eggs</u> -----	38
<u>Fish larvae</u> -----	67
<u>Queries</u> -----	33

Continued on next page.

Table A5-6 continued

(B)		
(Prey found in 83 individuals of various (6) species of chaetognaths, mostly <u>S. bipunctata</u>).		
<u>Candacia</u> -----	1	1
<u>Centropages</u> -----	1	1
<u>Corycaeus</u> spp. -----	6	
<u>Corycaeus agilis</u> -----	2	
<u>Corycaeus dahl</u> i -----	1	
<u>Corycaeus erythraeus</u> -----	1	
<u>Corycaeus giebrechti</u> -----	1	
<u>Corycaeus subtilis</u> -----	1	12
<u>Corycella</u> spp. -----	12	
<u>Corycella concinnus</u> -----	34	
<u>Corycella gibbulus</u> -----	8	54
<u>Euchaeta</u> -----	1	1
<u>Microsetella atlantica</u> -----	1	
<u>Microsetella rosea</u> -----	2	3
<u>Oncaea</u> spp. -----	6	
<u>Oncaea media</u> -----	5	
<u>Oncaea venusta</u> -----	2	13
<u>Undinula</u> spp. -----	1	
<u>Undinula darwini</u> -----	1	2
<u>Sagitta</u> sp. -----	6	
<u>Sagitta enflata</u> -----	1	7

Table A5-7. Statistics of S. enflata and its prey.

Mean length of <u>S. enflata</u>	10.7 mm
Adults	11.5 mm
Juveniles..	8.6 mm
Mean head width of <u>S. enflata</u>	0.92 mm
Adults	1.00 mm
Juveniles..	0.77 mm
Mean length of prey	1.14 mm
in Adults	1.16 mm
in Juveniles..	1.11 mm
Mean width (widest part) of prey	0.38 mm
in Adults	0.42 mm
in Juveniles..	0.31 mm
Number of multiple prey in <u>S. enflata</u>	45
(12% of total intestinal contents)	
2 per predator .	30
3 per predator .	8
4 per predator .	2
5 per predator .	4
6 per predator .	1
Number of prey at posterior end of intestine	175
Number of stations (84 possible) where prey was	
found in <u>S. enflata</u>	59
Neritic stations (31).....	18
Oceanic stations (53).....	41

Table A5-8. Statistics of P. draco and its prey.

Mean length of <u>P. draco</u>	6.4 mm
Adults	7.1 mm
Juveniles	6.0 mm
Mean head width of <u>P. draco</u>	0.72 mm
Adults	0.80 mm
Juveniles	0.68 mm
Mean length of prey	0.93 mm
in Adults	0.90 mm
in Juveniles	0.94 mm
Mean width (widest part) of prey	0.29 mm
in Adults	0.29 mm
in Juveniles	0.25 mm
Number of multiple prey in <u>P. draco</u>	21
(6.2% of total intestinal contents)	
2 per predator	19
3 per predator	1
4 per predator	1
Number of prey at posterior end of intestine of <u>P. draco</u>	239
Number of stations (84 possible) where prey was found in <u>P. draco</u>	53
Neritic stations (31) ..	5
Oceanic stations (53) ..	48

Table A5-9. Statistics of S. bipunctata and its prey.

Mean length of <u>S. bipunctata</u>	9.4 mm
Adults	9.9 mm
Juveniles	7.6 mm
Mean head width of <u>S. bipunctata</u>	0.79 mm
Mean length of prey	0.91 mm
in Adults	0.87 mm
in Juveniles	1.05 mm
Mean width (widest part) of prey	0.29 mm
in Adults	0.27 mm
in Juveniles	0.34 mm
Number of multiple prey in <u>S. bipunctata</u>	34
(14.2% of total intestinal contents)	
2 per predator ..	23
3 per predator ..	4
4 per predator ..	5
6 per predator ..	1
8 per predator ..	1
Number of prey at posterior end of intestine of <u>S. bipunctata</u>	158
Number of stations (84 possible) where prey was found in <u>S. bipunctata</u>	42
Neritic stations (31)	6
Oceanic stations (53)	36

Table A5-10. Statistics of S. serratodentata and its prey.

Mean length of <u>S. serratodentata</u>	8.5 mm
Adults	8.8 mm
Juveniles	6.9 mm
Mean head width of <u>S. serratodentata</u>	0.55 mm
Adults	0.57 mm
Juveniles	0.46 mm
Mean length of prey	1.05 mm
in Adults	1.07 mm
in Juveniles	0.95 mm
Mean width (widest part) of prey	0.41 mm
in Adults	0.41 mm
in Juveniles	0.42 mm
Number of multiple prey in <u>S. serratodentata</u>	5
(3.0% of the total intestinal contents)	
2 per predator ..	4
3 per predator ..	1
Number of prey at posterior end of intestine of <u>S. serratodentata</u>	156
Number of stations (84 possible) where prey was found in <u>S. serratodentata</u>	39
Neritic stations (31)...	5
Oceanic stations (53)...	34

Table A5-11. Statistics of S. hexaptera and its prey

Mean length of <u>S. hexaptera</u>	17.1 mm
Adults	21.5 mm
Juveniles ..	12.2 mm
Mean head width of <u>S. hexaptera</u>	1.2 mm
Mean length of prey	2.1 mm
Mean width (widest part) of prey	0.4 mm
Number of multiple prey in <u>S. hexaptera</u>	15
(14.4% of the total intestinal contents)	
2 per predator	8
3 per predator	4
5 per predator	1
9 per predator	1
10 per predator	1
Number of prey at posterior end of intestine of	
<u>S. hexaptera</u>	43
Number of stations (84 possible) where prey was found	
in <u>S. hexaptera</u>	34
Neritic stations (31)	2
Oceanic Stations (53)	32

Table A5-12. Statistics of S. robusta and its prey.

Mean length of <u>S. robusta</u>	9.6 mm
Adults	10.6 mm
Juveniles .	8.2 mm
Mean head width of <u>S. robusta</u>	1.10 mm
Adults	1.20 mm
Juveniles .	0.95 mm
Mean length of prey	1.14 mm
in Adults	1.06 mm
in Juveniles .	1.29 mm
Mean width (widest part) of prey	0.45 mm
in Adults	0.44 mm
in Juveniles ..	0.47 mm
Number of multiple prey in <u>S. robusta</u>	3
(6.8% of the total intestinal contents)	
2 per predator	2
3 per predator	1
Number of prey at posterior end of intestine of <u>S. robusta</u>	36
Number of stations (84 possible) where prey was found in <u>S. robusta</u>	21
Neritic stations (31)	6
Oceanic stations (53)	15

Table A5-13. Statistics of S. lyra and its prey.

Mean length of <u>S. lyra</u>	13.4 mm
Adults	13.5 mm
Juveniles ..	12.0 mm
Mean head width of <u>S. lyra</u>	1.04 mm
Adults	1.04 mm
Juveniles ..	0.98 mm
Mean length of prey	2.22 mm
in Adults	2.29 mm
in Juveniles ..	0.80 mm
Mean width (widest part) of prey	0.39 mm
in Adults	0.38 mm
in Juveniles ..	0.50 mm
Number of multiple prey in <u>S. lyra</u>	9
(21.4% of the total intestinal contents)	
2 per predator	5
3 per predator	4
Number of prey at posterior end of intestine of <u>S. lyra</u>	11
Number of stations (84 possible) where prey was found	
in <u>S. lyra</u>	22
Neritic stations (31)	1
Oceanic stations (53)	21

Table A5-14. Statistics of S. friderici and its prey.

Mean length of <u>S. friderici</u>	12.6 mm
Adults ...	12.8 mm
Juveniles.	8.7 mm
Mean head width of <u>S. friderici</u>	0.75 mm
Mean length of prey	1.35 mm
Mean width (widest part) of prey	0.48 mm
Number of multiple prey in <u>S. friderici</u>	2
(4.9% of the total intestinal contents)	
2 per predator	2
Number of prey at posterior end of intestine of <u>S. friderici</u>	36
Number of stations (84 possible) where prey was found in <u>S. friderici</u>	13
Neritic stations (31)	11
Oceanic Stations (53)	2

Table A5-15. Lengths in mm of various Chaetognath species as computed from the individuals of the present collections.

	Mean Length in mm	No. Individuals	Comments
<u>S. hexaptera</u>	17.1	44	sub-adults
<u>S. ferox</u>	14.4	68	mature ind.
<u>S. lyra</u>	13.4	38	2 adults-36 juv.
<u>S. friderici</u>	12.8	38	sub-adults
<u>S. enflata</u>	12.3	318	mature ind.
<u>K. subtilis</u>	11.4	38	mature ind.
<u>S. robusta</u>	10.8	21	mature ind.
<u>S. decipiens</u>	10.6	5	mature ind.
<u>S. bipunctata</u>	10.6	345	mature ind.
<u>S. bedoti</u>	10.1	41	mature ind.
<u>S. serratodentata</u>	9.3	199	mature ind.
	10.2		pacifica
	8.7		atlantica
<u>P. draco</u>	6.9	352	mature ind.
<u>S. neglecta</u>	6.4	3	mature ind.
<u>K. pacifica</u>	6.4	54	mature ind.
<u>S. minima</u>	5.7	179	mature ind.
<u>S. regularis</u>	5.0	30	mature ind.

Species not measured because of too few specimens:

S. pulchra

S. planctonis

E. hamata

S. maxima

Table A6-1. Variance ratios (observed/expected from MacArthur's Model, 1957) and other data concerning relative abundances of chaetognaths of the Agulhas current.

Locality	Species Numbers	Total Inds.	Observed Variance	Expected Variance	Ratio (Ob/Ex)
N70V-data					
All samples combined	16	21235	2352309	1389245	1.69
All neritic samples	16	6211	614016	118849	5.17
All oceanic samples	15	15024	1214433	781279	1.55
N70V-data Summer survey					
All samples	15	4102	199030	58240	3.42
All neritic samples	14	2210	139148	19131	7.27
All oceanic samples	15	1892	16738	12390	1.35
Durban neritic "	10	701	34576	3474	9.95
Durban oceanic "	11	233	967	325	2.97
Port Shep neritic "	12	77	48	30	1.58
Port St. Johns " "	12	445	7219	1019	7.08
P.St. Johns oceanic "	12	216	816	240	3.40
East London neritic "	6	213	6733	745	9.03
E. London oceanic "	14	519	1253	1055	1.19
Port Eliza neritic "	13	774	9601	2677	3.59
Port Eliza oceanic "	13	924	4489	3816	1.18
N70V-data Autumn survey					
All samples	15	9263	400621	296987	1.35
All neritic samples	15	2700	122261	25232	4.85
All oceanic samples	15	6563	205296	149086	1.38
Durban neritic "	10	273	2910	526	5.52
Durban oceanic "	13	1309	13989	7658	1.83
P.Shep. neritic "	10	117	269	96	2.78
P.Shep. oceanic "	14	1076	6514	4535	1.44
P.St.Johns neritic "	8	112	786	129	6.08
P.St.Johns oceanic "	14	1249	7254	6110	1.19
Bashee neritic sample	11	235	2552	331	7.71
Bashee oceanic "	14	631	1324	1559	0.85
E.London neritic "	11	116	543	80	6.74
E.London oceanic "	14	639	1776	1599	1.11
P.Alfred neritic "	6	84	349	115	3.01
P.Alfred oceanic "	14	570	2056	1272	1.62
P.Eliza. neritic "	13	1033	29478	4769	6.18
P.Eliza. oceanic "	14	1089	8516	4645	1.83
Cape Seal "	14	730	8839	2087	4.23
N70V-data Winter survey					
All samples	16	7870	341989	190819	1.79
All neritic samples	16	1301	16883	5858	2.88
All oceanic samples	15	6569	301699	149359	2.02
Durban neritic "	10	233	1371	383	3.57
Durban oceanic "	15	482	991	804	1.23
P.Shep. neritic "	6	20	22	6	3.45
P.Shep. oceanic "	12	940	4850	4529	1.07
P.St.Johns neritic "	5	52	353	58	6.02
P.St.Johns oceanic "	13	1597	28024	11399	2.46
Bashee neritic samples	3	15	28	9	2.88
Bashee oceanic "	14	691	4005	1870	2.14
E.London neritic "	5	17	10	6	1.64
E.London oceanic "	12	1099	13053	6218	2.10
P.Alfred neritic "	13	417	1630	784	2.08
P.Alfred oceanic "	9	107	100	93	1.07
P.Eliza. neritic "	9	215	1966	391	5.03
P.Eliza. oceanic "	13	1653	18444	12212	1.51
Cape Seal "	12	332	2556	567	4.50
All N100B samples	16	15113	1449115	703680	2.06
All N100H samples	17	12027	1714522	399247	4.29
Fager main group					
N70V-data	9	5719	359341	276866	1.30