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'Thinking like a fish': adaptive strategies for coping with vulnerability and variability emerging from a relational engagement with kob

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Abstract

Based on ethnographic fieldwork amongst a group of commercial handline fishers in the town of Stilbaai in South Africa's southern Cape region, this paper presents a range of flexible, adaptive and evolving strategies through which fishers negotiate constantly shifting variability in weather patterns, fish stocks, fisheries policies, and economic conditions. These variabilities constitute a diverse set of vulnerabilities to which fishers must respond in order to sustain their livelihoods. In this context, the act of 'thinking like a fish' on the part of the fishers provides them with an effective means of adapting to variability and uncertainty. Findings of ethnographic research in 2010-11 suggest that a number of the fishers who participated in the research actively work towards achieving a balance between profit and sustainability. 'Thinking like a fish' is an embodied, interactive way of knowing that emerges from interactions between fishers and fish, offering an ethical and ecological outlook which is a valuable resource for fisheries and conservation management in the region. We suggest that the deeply embodied interactional component of 'thinking like a fish' results from a desire to understand the life world of fish and to think from their perspective in order to more effectively target them while sustaining the species and ecosystem.

Keywords: 'Thinking like a fish'; Adaptive strategies; Perspective; Variability; Umwelt; Mimesis

"The ceremonial worlds of the West...are diminished in the sense that they are not intended to be responsibly true worlds, ones that ring true for everybody's well-being. Nor are they worlds built on the basis of an ethical-epistemological orientation of attentiveness (respect). Moreover, these worlds tend to be built in accordance with epistemologies of domination and control; and it is within these worlds that we propose ethical theories and projects to *counter* domination and control".

Hester and Cheney (2001)

Introduction

In an article entitled 'The climate of history', historian Dipesh Chakrabarty (2009) presents the concept of the Anthropocene as a means of thinking through the current state of human history. Described by Crutzen and Stoermer (in Chakrabarty, 2009) as the "... major and still growing impacts of human activities on the earth and atmosphere, and

at all, including global, scales ... in geology and ecology” the concept of the Anthropocene recognizes human activity as having a planetary-wide impact that is on par with a geological epoch. Month by month, new research announces dire findings regarding climate change, pollution, threatened ecosystems and food securities to name but a few. Arguably the most visible signs of the Anthropocene are to be found in the oceans: islands of plastic in the North Pacific gyre; oceanic oil spills and pipeline leaks; the collapse of significant fish stocks such as Atlantic Cod in Canada. These are just some of the more visible examples of the variety of ways in which humanity’s rapid alteration of the planet and marine ecosystems manifest. Increasingly, there is recognition that the marine ecosystems, upon which much food security and global trade are reliant, are either threatened or already degraded. The growing evidence of stock collapses and associated failures of centralized, quantitatively managed fisheries in many parts of the world have led to a number of calls for alternative approaches to fisheries management which seek to address as one, the concerns of biophysical ecosystems and human wellbeing (Food and Agriculture Organization of the United Nations UN FAO 2003; Ommer and Team, 2007; Neis and Felt, 2000). A growing body of marine social-ecological research (Ommer and Team 2007; Murray et al 2008a,b; Neis et al 1999; Neis and Felt 2000; Stead et al 2006; Stanley and Rice 2003) suggests that working with the knowledges^a of fishers within the fisheries management context offers the possibility of augmenting scientific knowledges by contributing locally-grounded, experiential understandings and strategies for dealing with variability. In the South African context, fisheries legislation is increasingly being formulated in ways which both call for and (at least in theory) support the role of collaboration in both research and management (Republic of South Africa, 1998). However, inter- and transdisciplinary work, particularly that which actively involves fishers in the process, has been slow in coming (Sowman, 2011). The reasons for this are many, but stem at least in part from a set of pervasive stereotypes on the part of many (but certainly not all) marine researchers (both government and academic), fisheries managers, conservationists and compliance officers. These stereotypes have been observed by the authors in a range of situations including public meetings, one-on-one interviews and during participant observation fieldwork. They suggest that commercial fishers on the whole are: either incapable of or not interested in thinking ecologically; short-sighted in their outlook; driven solely by profit and thus bent on the maximum extraction of the resource at all costs; as a result, wholly unethical and opposed to sustainable ideals or ecosystem conservation considerations. The research question which frames this work challenges these stereotypes and asks: is there an alternate way of knowing and interacting with the marine world amongst the Stilbaai fishers? If so, what are some of the forms and strategies through which this alternative is expressed? In addressing these questions, we present ethnographic examples from fieldwork conducted by Duggan^b (2012) in 2010-11 to explore an emergent, adaptive way of thinking and being, known locally amongst the fishers as ‘thinking like a fish’. We suggest that ‘thinking like a fish’ is an effective means via which fishers work with changing circumstances, multiple vulnerabilities and uncertainty in the social-ecological system. Asking what it means to ‘think like a fish’ we explore how this outlook results from a desire to understand the life world of fish and to think from their perspective. We show that this outlook results in an attempt, where possible, to balance profitability and sustainability. Drawing on concepts of *umwelt* (von Uexküll, 1934) and mimesis (Willerslev, 2004), the article considers the thinking underpinning ‘thinking like a fish’

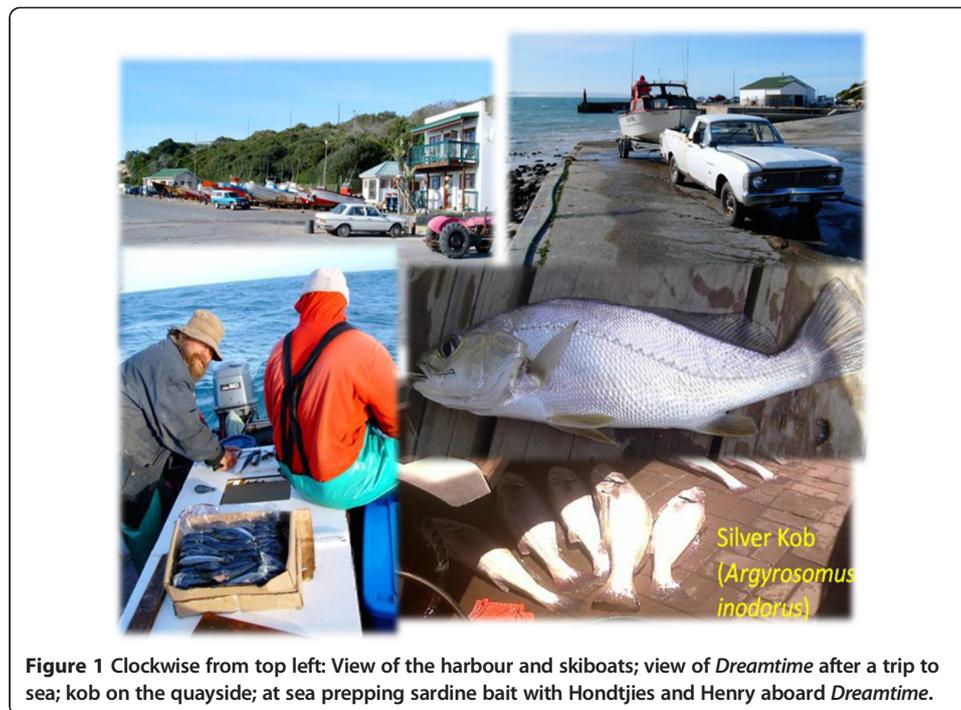
and suggest that it holds important implications for current ecosystem approaches to fisheries management (EAF) in the region. Such overlaps suggest potential for bringing what are often regarded as distinctly different groups and interests into productive communication and collaboration (Verran, 2013). As such, we suggest that 'thinking like a fish' holds the potential to move beyond traditional mathematical, biologically-focussed discussions in the Stilbaai fishery by allowing for a rethinking of the ways in which human-fish interactions are framed and carried out.

Fieldwork and the Stilbaai commercial handline fishery

Over a period of seven months between 2010 and 2011, Duggan conducted participant observation fieldwork amongst commercial handline fishers in the southern Cape coastal town of Stilbaai. During this time, the researcher lived in Stilbaai and immersed himself in the local context. The research explored different ways of knowing and interacting with fish as a means of fostering dialogue between 'experts' (be they fishers, government or academic scientists, conservationists or fisheries managers). The research revealed that a sense of interconnection and interaction beyond that of commercial extraction as well as an understanding of the broader ecosystem appeared to form part of the fisher-fish relationship. What began to emerge from the research was a somewhat messy (Law, 2004), evolving yet strong sense of ecological and ethical thinking amongst the fishers.

Located approximately 350 km east of Cape Town, Stilbaai has been operating as a commercial handline fishery for some 100 years (Steyn, 1996). Handline fishing refers to a method of catching fish using thick nylon filament wound around a simple spool of plastic or sometimes wood. Using one or two strong hooks attached via a swivel-trace with separate sinker, the fisher pays out and brings in the line in a hand-over-hand motion. The method has been popular in South Africa for the past 212 years (Isaacs, 2013), particularly in the commercial fishing sphere where the swiftness, adaptability (of bait and gear) and directness of the method ensures the fishers' ability to target specific species and size classes. In Stilbaai, handline fishing takes place between 3 km and 60 km off-shore in depths between 20 m and 60 m over reef structures surrounded by muddy sea bed. During the field research period (2010-2011), the town played host to between 35 and 40 permanent handlining boats predominantly of a mono-hull design. These craft, measuring between 5-9 m in length, constructed of wood and fibreglass and powered by twin outboard engines, are manned by a skipper and fishing crew of between 3 and 8 (see Figure 1).

The majority of the commercial catch effort in the Stilbaai fishery focuses on kob^c. Prized in restaurants for its tender white flesh, kob has long been the staple catch of the Stilbaai handline industry. There are both minimum and maximum size limits^d on kob of 50 cm and 110 cm respectively. The responsibility of monitoring these is carried out by the Fisheries Branch of the South African government's Department of Agriculture, Forestry and Fisheries (DAFF) via local fishery inspectors. Fish such as kob and Red Roman^e, staple catches in the area, fetch high prices at the quayside (between R32 to R35 per kg on average) when compared to commercially caught species on the South African west coast such as snoek^f (R15 to R55 for a 4-6 kg fish). As such, when the fishing is good, the skippers and crew, who also have considerably lower living expenses when compared to their compatriots in Cape Town, are able to derive a good income. When catches of kob peaked in 2010, for example, it was not uncommon for a skipper



to bring home 1.5 tonnes of fish up to three times a week. On average, 50-60% of the profits from the sale of the catch are split between the crew, with the skipper taking the remainder and also being responsible for upkeep of the boat as well as fuel and bait costs.

The southern Cape is considered a relatively politically and economically stable region of South Africa and, in particular, Stilbaai appears to be well buffered against external perturbations in the political and economic spheres. A number of factors contribute to this, including the town's role as a popular holiday and retirement destination with a building industry offering temporary jobs for at least some crew when fishing conditions are poor. As such, it is a suitable location in which to conduct fisheries research since that the social and economic problems which give rise to considerable tensions and violence on the west and east coasts of South Africa are not as prevalent nor pervasive there. Further to this, where such problems do exist, the violence associated with them in other regions tends not to be expressed in the southern Cape, possibly owing to the aforementioned stable political and economic context. This is not to say, however, that the fishers of Stilbaai do not face harsh economic challenges. Towards the end of the research period in early 2011, kob catches plummeted and have remained low until present. This event, combined with the impacts of the global recession, precipitated a difficult time for the fishers, many of whom developed and relied on a range of flexible adaptive strategies to cope with the shifting conditions (Duggan, 2012).

The fishers whose voices are heard in this article come from a range of social and economic backgrounds. Stilbaai itself is stratified into two distinct areas—the town of Stilbaai proper, sprawled on the west and east banks of the Goukou river—and the smaller town of Melkhoutfontein, which was the original settlement in the Stilbaai area, developing in the mid-1800's. Today, boats are owned, skippered and crewed by a mix of people from both Stilbaai and Melkhoutfontein. For the purposes of the research,

skippers from Stilbaai and Melkhoutfontein were selected. These skippers represent a diverse range of backgrounds and include multi-generational career fishers and more recent entries into both commercial fishing and the Stilbaai fishery. Being ethnographic in nature, the research involved spending time with the fishers on land and at sea, taking time to observe and interact with them as they went about their work. Interviews and conversations were semi-structured and conducted in the terrestrial and marine working environments. Skippers and crew tend to be between the ages of 40 and 70 years old with the majority in their 50's and this was true also of the research participants. Owing to the significant economic barriers to entry posed by the initial start-up costs of a commercial handline venture, the variable nature of the fishery and the sense amongst younger people that fishing represents hard, inconsistent work, the cohort of active commercial fishers in the region is both ageing and shrinking with very few young entrants. Moreover, many of the fishers who participated in the research were adamant that they desired a different career path for their children, actively encouraging them to stay out of the fishery and make their way to larger towns and more stable income streams.

On fish intelligence and ecosystem health

In order to foreground the ethical and ecological components and unpack the concept of 'thinking like a fish', we turn now to a conversation with two experienced Stilbaai fishers in early 2010.

Sitting in the comfortable front lounge of Oom^g Koos's house in Stilbaai West chatting with Oom Louis and Oom Koos, we were discussing the role of knowledge and experience in fishing. Oom Koos, head of the Stilbaai handline fishers' association, came to Stilbaai some ten years ago after retiring from his job as a corrections officer at Mossel Bay prison. Oom Louis came to Stilbaai at roughly the same time having left the diamond mining industry in Kimberley. Despite their previous professions, both fishers had held various connections to the Stilbaai area over the years through friends and family and had been avid recreational fishers since childhood. Oom Koos in particular, had, since arriving in the town and the commercial fishery, become deeply involved in the local handline fishers' association at an administrative level, using his knowledge of government departments and bureaucratic procedures to forge relationships with members of MCM^h on behalf of the fishers' association's members.

Discussing the idea of fishers' knowledge of fish behaviour and intelligence, the skippers noted:

Oom Louis: most people think fish is stupid—fish is not stupid—fish is exceptionally clever—exceptionally clever! You just take the colour of the gut (handline)—with one colour you'll get fish, and with another colour you'll get zilch!

Oom Koos: ja, no fish. Especially the green—your strop-line, where your hook is on —
Duggan: so you have to change your line to suit the water colour?

OK: ja, most times, when the fish is on the bottom, then if you catch with green line, strop line, then you will not catch fish. Put a white line on and you will catch it. Sometimes even the hook colour—the silver hook or the—that brown one—especially on hakeⁱ—

As the conversation unfolded, the two experienced fishers articulated a relationship to fish premised on more than that of fisher and fish, predator and prey, or dominant and dominated. Rather, through their engagements with fish, the two had come to know their quarry as intelligent, sensitive and highly adaptive. This relationship to fish and the ecosystem was expounded upon by Oom Tem, another seasoned fisher who traces a fishing ancestry back many generations to the first settlers of Melkhoutfontein. A man of the sea from a young age, Oom Tem has spent the past 35 years of his life plying his trade on the east, south and west coasts of South Africa. Starting out as a teenager fishing out of Stilbaai harbour and moving to the west coast as a snoek and hake fisherman, he has worked on both skiboats and long liners. Some ten years ago he “came home” as he puts it, buying a ski boat and fishing out of Stilbaai harbour once more. Oom Tem has spent much of his life in Melkhoutfontein. For years under the Apartheid regime he was limited to crewing for white skippers but in 2002 applied to MCM for an interim permit under the provisions of the Marine Living Resources Act (Republic of South Africa, 1998) and secured a government-backed loan to buy a trailer, boat and motors. Today he has a successful boat and crew and has begun to plan for his retirement. In the conversation below, Oom Tem discussed his understanding of the pressures which fishing and in particular, the use of anchors, had on the health of the reef environment and its suitability for fish.

Taking a break after a month of fishing with hardly any days off, Oom Tem was relaxed and excited to talk about the prolific kob catches of the past month. The researcher was interested to know how the Oom felt about the future of kob fishing in the bay after such a successful season: was this a last hurrah from the kob or an emergent state of plenty born of the now popular minimum size regulation changes implemented by MCM in 2004?

Oom Tem: ...once you have worked off all the food and plants from damage from anchors dragging, the fish will naturally move over to a new, more food-rich environment. That new spot, you see, there haven't been anchors over it which can damage the vegetation and hurt them [speaking in Afrikaans, Oom Tem used the phrase “maak seer die plantegroei” –literally to wound or hurt the vegetation and compromise their growth]. So you see, if a person has worked too much on the rocks a fish will see and know. He will move on. To better plants, better protection. We know, I will suggest to you, that these anchors we are using are bad for the reef and the plants, they hurt them all the time when they become stuck and then you must pull using the motors. Look, would you wish to live in a home where a man has just pulled the roof off and destroyed your vegetable garden with a loud machine? No! The kob, he is a sensitive creature and we must work with him, not against him. That is the only way to ensure future fishing in this area. I have asked the MCM people to come talk to us about anchors—I have made an anchor that doesn't need the sharp points to hook but nobody (at MCM) wants to hear about it.

...pulling with the motors, you hurt that reef badly. It will scar it I am sure. And then that bank for the past five, six, seven years (will stand) empty. Every so often we check it out to make sure... and then the last while it has had fish again—it has repaired and healed itself enough to support life again but now all the boats are over it once more and in a few months or a year or whatever that reef will be without kob

and smaller fish again because the anchors and the noise and the stresses from above will have cleaned it out.

Rather than thinking of the fish in isolation from their environment, Oom Tem took cognizance of the health of the reef and the plants which colonize it in determining its suitability and attractiveness to fish of different sizes and species. Oom Tem's reference to the conventional hooked anchors as "killing our reefs" expressed a concern for the health of the reef, which he sees as a living organism that fishers have a responsibility to care for. In his understanding, the kob form part of a complex interwoven ecosystem that includes reef, fish, humans and plants. Through his interactions with kob as an element of this broader ecosystem, Oom Tem brings a particular account of the world into being—a nature in which beings are interconnected and ecosystem is inseparable from society. In other words, the scale of Oom Tem's narrative and way of relating to the fish, by accounting for their world (the reef and marine ecosystem), are generative of a particular version of reality (Green, 2012). In this particular reality, kob is not merely an object "out there" but a sensitive, knowing subject which must be related to, understood and worked with. In Oom Tem's account, if the health of the reef ecosystem is considered and actively supported, and fishers understand the impacts which they have on the fish's habitat, the fish and ecosystem will respond accordingly and thrive. Conversely, a fisher who does not interact with the ecosystem in this way will drive fish away and be unsuccessful in his endeavours. Such ecosystem-scale thinking as the fisher engages in converges with that of an ecosystem science which works with the entire biophysical realm in order to account for complexity in understanding, modelling and managing a fishery (Shannon et al, 2010; Jarre et al, 2013). Both positions assume the interconnectedness of humans and non-humans whereby the behaviour of one actor exerts an influence over other actors in the system.

On numerous occasions while at sea with the fishers, we would arrive at a spot only for the skipper to cast a quick glance at the water and declare that we would catch nothing. This was not a snap decision, but rather one based on the fullness of the fisher's observations on the day and an understanding based on many years of accumulated knowledge and experience. Boetie had followed his father's footsteps into the Stilbaai fishery some twenty years previously. Boetie's father, Oom Attie, is hailed by local residents and fishers of Stilbaai as the best commercial fisher in the region. At the time of the research, Boetie, then in his early 40's, was also well known locally as having inherited his father's talents. His boat *Dreamtime* was the only catamaran-hulled boat in the fleet and he went to sea with only two crewmen, Henry and Hondtjies. The following is taken from Duggan's field notes in July 2010 on a trip with Boetie and the crew of *Dreamtime*:

We arrive at the first site some 6 km from the harbour (according to the GPS) around 7 am. As he throttles back the engines to dead slow, Boetie surveys the water and declares that we will catch nothing.

Boetie: Nah, there's (nothing) here. Doesn't look to me like we'll catch anything other than vaalhaai¹ today.

D: How can you tell? We haven't thrown a line or even set anchor. The temperature looks low but not too bad –

B: No, It's (bad) fishing today. The south east wind was too strong out here last night. Look at the water colour—its wrong. And the chop on the surface is too rough. If I was a kob I wouldn't want to eat here today. I'll tell you now they've moved on from here.

Perhaps in order to humour me, Boetie and crew members Hondtjies and Henry throw in lines baited with anchovy. Within a minute the first bite comes and the first fish is hooked.

Henry: Bloody vaalhaai...you can always tell. Here—feel my line.

Taking his thick nylon line in my fingers I try to feel the characteristics of the fish. The pulsing tug on the line is erratic but strong.

H: You see—vaalhaai.

I don't see, can't see. I've fished for most of my life but when a fish takes the bait I struggle to "see" with my fingers and nerve endings. Sure enough, Henry lands a 40 cm long vaalhaai a few seconds later and when Hondtjies' line is pulled taught shortly afterwards, Boetie moves to the front of the boat to begin pulling up the anchor he had just dropped and set.

Boetie: See, vaalhaai. They like this water—I could see they were under there when we arrived. They're here when the kob's not. It's a bad sign of change for us—the fish is moving away.

Reading over the day's notes and reviewing the recordings it was apparent that Boetie had clearly done more than looking at the water surface and simply making an educated guess. They were so sure of what was happening below the surface that it did not seem surprising when only vaalhaai were landed as predicted. The fishers had carefully read the environmental and weather conditions, determining that these were unfavourable.

Umwelt and mimesis

Having never dived down or seen the reefs some 20 to 60 m below the surface, how was Oom Tem, for example, able to manufacture an anchor which was less damaging to the reef plants, or Boetie able to predict what fish would be caught on the day? It was clear that the fishers had developed and worked with an intricately nuanced picture of the fish's breeding, feeding, resting habits and habitat. Rather than working with an understanding of the 'habitat' of the fish—what humans perceive as being the important components in an animal's world—the fishers actively tried to imagine what the *fish* saw as important in its world from its perspective.

Oom Tem: ...you see, I have learnt... that you cannot think of yourself alone: there is fish out there and if it is underneath me, I must understand how he wants to live...

When I pull up my anchor I see how I have pulled up plants and small animals. And I know that those are the (plants, worms and other sea life) that those small bait fishes eat because I have looked inside them too. Now those bait fish, they won't come to eat here again, you see? So the kob, he won't come there again either—because there is no food for him.

Duggan: So knowing what is important to the kob is important to you?

OT: Of course yes! I have opened up (the fish's) stomachs to see what they eat on the reefs...and I know what my anchor drags up. You get to know the reefs and this fish

like this—not just the big fish we catch but also all the small ones (the kob) catches... We fishermen, we know the *structure*, you see? How does (the kob's) life work? Where does he eat? Where does he sleep? How does his home look and work—I must know these things if I want to catch him and if I want him to come back again. We must see what he sees and then we will catch him and look after these (reefs) for him.

Boetie had a similar perspective to Oom Tem. At sea with the skipper one wintry day in 2010, the conversation turned to Boetie's understanding of the reef ecology:

Boetie: it is too important to know where the kob lives, how he lives. A man that doesn't respect the kob—he won't pay attention. He will think that he knows everything—I have seen it lots of times—but he doesn't actually know how the kob is thinking, where it is actually living and how it lives and he doesn't try to know. He doesn't have respect...Me and the other men who are good fishermen here, we have known from our father and their fathers that you must *see* the kob under the water, find out what it important to him, ask questions, investigate. That is why I read so much. People say "Ja Boetie, you know all about fish hey, why must you read about them too?" That is because I don't know enough. I want to know how they migrate. What is important to them is important to me.

The work of Estonian bio-philosopher Jakob von Uexküll is a useful theoretical tool here in understanding the ways in which the fishers think about the world of fish. In his 'A Foray Into the Worlds of Animals and Humans' von Uexküll (1934), proposed that there exist multiple animal life worlds and took on the task of imagining the perspective of the creatures who inhabit these. von Uexküll used the term '*umwelt*' to explain the perceptual life world of an animal—the world which the animal sees from its perspective. In other words, *umwelt* is an integral presupposition in coming to understand the social and physical environments which animals and individuals within species both inhabit and create. von Uexküll's (1934) work suggests that these environments are innumerable and form multiple realities within a broader shared nature. Considering *umwelt* then, effectively allows the viewer to transcend the binaries of subject-object, human-nonhuman by positing that all animals are in fact not passive objects but active subjects which form the centre of their own individual worlds, rather than the periphery of ours.

Through their years of interaction with fish, Boetie and Oom Tem have come to know and recognise the importance of considering the *umwelt* of kob rather than thinking of the fish in isolation from its environment. In thinking from the perspective of the kob, the fishers come to know the fish as "sensitive creatures" which are to be worked with rather than against. Their observations of overfished reefs have also taught them the sensitivity of reef ecosystems. Since the fishers understand fishing to hold the potential to damage the home world of kob and drive them away, they recognised the importance of sustainable fishing in maintaining a healthy ecosystem.

When at sea, Duggan often witnessed the way in which the fishers entered the *umwelt* of kob, performing a narrative based on embodied experiences of fishing over reefs, pulling up anchors with plant material trapped in them, seeking out, attracting and catching fish. Learning through these interactions, paying attention to and working with a mental

image of the *umwelt* of the kob, the fishers' desire to sustain catches and profits into the future was manifested in the form of an ecological outlook which sought to protect the kob life world through the development of appropriate fishing gear and practices.

Attendant to this way of thinking and seeing from an alternative perspective, the fishers were comfortable in moving fluidly, unconsciously and subtly between thinking from the perspective of both fisher and fish. Writing on the hunting practices of Yukaghir hunters in Siberia, Willerslev (2004) suggests that common conceptions of animals as responding automatically and instinctually to external stimuli are limited by their anthropocentric perspective. For the Yukaghir, hunting entails taking on a 'double perspective' (Willerslev, 2004). This 'double perspective, or mimesis, is a process whereby the hunter tries to take on and impersonate the perspective of the prey being hunted but remain a human hunter. Mimesis is a valuable means of understanding the act and ability of fishers to take on the perspective of fish whilst simultaneously thinking like humans. From the techno-centric perspective in which the use of Internet, cell phones, GPS and sonar are of paramount importance, they transition readily into taking on the perspective of fish, a perspective in which kob are the centre of their *umwelt*. The fishers take on the mimetic perspective in order to decide upon a location, bait, line colour, fishing depth and predict fish movements. Even line and hook colour play an important role in catching fish, suggesting that fish are aware of the presence of the line in the water and in effect will make a choice as to whether or not to take the bait dependent on these seemingly tiny details. The fishers must constantly adapt and think both from human and fish perspectives if they are to make a success of any trip to sea.

The ways of knowing which emerge from 'thinking like a fish' enable the fishers to more effectively understand and thus target fish. Imagining the life world of their prey and taking on their perspective offers an effective relational approach to fish and fishing. Knowing their quarry in this empathetic way, they see fish as clever, adaptive to different fishing pressures, and apt to change its behaviour, feeding patterns and movements according to various anthropogenic and environmental factors. This innately empathetic relationship with fish was expressed in the following conversation with Oom Jannie. With some 45 years experience as a skipper and fisher in the commercial handline, west coast rock lobster and inshore pelagic purse seine industries, Oom Jannie is a respected thinker and innovator amongst his fellow fishers. In mid-2010 the fisher had been handline fishing out of Stilbaai for a little under 20 years. During the conversation, the focus turned to questions of change and variability in fishing:

Oom Jannie: ...now also, I can't say why but I can swear it to you, the fish bite differently...in the past, maybe ten years back now, right, you would go out when they were on the bite and for maybe two weeks you would catch fish every day. Maybe a tonne on the first day, then three hundred kilos the next, then six hundred and fifty the next and so on, but you got fish every day for two weeks. Now they come—you catch seventy tonnes between fifteen boats in one and a half days... and then they're gone again for a month... Then they come back again for a short time but they go crazy—you catch them much more quicker today than we used to even ten years back. Also, you see, and this is something I'm really sure about, I will swear it to you and I am certain of this, I will put my reputation on this, the fish's

movements have changed... in Mossel Bay we were the first ones to get a commercial trawling license for the small pelagics—to catch pilchards...When we started we used to catch them right in the surf! And most of them that we caught were full of roe. They were breeding in the surf and in the harbour close in to shore ...we didn't have a factory in those days so we catch just for the local sales. But they were right there close to land. Now fifteen years later I go back there and the guys from then until now are catching them thirty kilometres off shore or more, maybe thirty miles. None of (the fish) are there anymore like they were. They learnt where we were catching them and they moved on, move away. And that's the same story with this sardine story on the west coast you know...agh man, these guys they are dumping so much from the trawlers... I can show you where we have been out and from one (ski) boat to the next we are three hundred meters (apart) and there is fish all the way in between us. Now if you dump a tonne of fish maybe ten percent floats, the rest is like a brick...it sinks fast to the ocean floor. No fish wants to live in a graveyard and this is why the west coast sardine have moved off.

Echoing Oom Tem's sentiments, Oom Jannie expressed the importance of understanding and supporting a healthy ecosystem which would in turn ensure productive grounds for fish and fishers alike. Skill in hunting, in such a context, derives from the ability to imagine what it would be like to be in another kind of body. Such an approach extends beyond skill, to providing a way of thinking from the point of view of the creature being tracked (Green and Green, 2013; Willerslev, 2004; Viveiros de Castro, 2004), in order to be able to imagine and predict what the creature might do next. In this speculative interaction, the fish come to be part of the society of actors in a fisher's world: they are not simply objects for consumption. As actors in the fishers' world, fish take on behavioural, cognitive and physical characteristics.

The complex adaptive relationship which emerges from this interaction is predicated on thinking how a fish will respond, and it comes to inform and affirm an account of nature in which fish are lively, adaptive, complex and knowing beings which recognise the interaction with fishers and change their behaviour accordingly. The fishers in turn recognise the fish through the relationship of interaction and are themselves changed through this. In this way the relationship is one of mutual recognition and bringing into being. Fishers perceive fish as adapting to environmental, ecosystem or anthropocentric influence. Just as the fish adapt to the presence of humans in their world, so too the humans adapt to the behaviour of the fish and ecosystem. The dance between fisher and fish, then, is a mutually adaptive complex relationship. This relationship is often expressed through a range of complex adaptive strategies both at sea and on land and being deployed to cope with variability of many forms and in turn embracing the potential which arises in varying circumstances

Strategies at sea and on land

Perhaps the most striking strategy to arise during Duggan's time in the Stilbaai fishery was the practice known as *riem hou*, an Afrikaans term meaning to "hold the oar". The practice emerged from the fishers' observations and understandings of reef health, fish behaviour and intelligence and the desire to maintain their profits in the face of

otherwise declining catches. *Riem hou* involves the skipper keeping the boat positioned directly above the swimming shoal while it feeds on the edge of the reef. Keeping the motors in forward gear at minimal revolutions, the skipper must account for the forces of wind, current, swell and tide in order to keep his crews' lines falling directly over the fish.

A number of Stilbaai fishers, sharing Oom Jannie's sentiments, agreed that the ways in which the fish moved, both between reefs and around reefs (spending less time in one position; shoaling in more dispersed patterns; moving quickly and covering vast distances every day), and took bait had shifted significantly in recent years. It was also believed that the sound of an anchor landing on the rocky reef was something the kob in particular had learnt to avoid. In conversation with fisher Boetie one day whilst at sea, Duggan asked why the *riem hou* practice had seemingly overnight become popular amongst some of the fishers:

Boetie: ... it's because the fish move so fast these days, understand? It's not like they used to be—on the rock for days. Now it's all fast and they *move*... They move fast and you must keep over them. Sometimes too, they like the sound of the engines above if (the engines are idling). This way you can stay over them as they move. Otherwise, I tell you—and you have seen it now—you will put an anchor down and as soon as it hits the bottom that fish has moved twenty, thirty, fifty metres away before you even throw in a (fishing) line. And when you do—there's nothing... So we must adapt and move with the fish. That's why I say, we are always experimenting and thinking like the fish.

Observing the GPS track log data from one *riem hou* voyage with Boetie, Duggan was stunned by the sheer complexity of the boat's movements. In effect, the practice of *riem hou* mimicked the movements of the swimming, shifting shoal, an expression of the act of mimetic component of 'thinking like a fish'. Physically following the shoal's every movement for up to 13 hours at a stretch sometimes covering over 100 km over a square area of just 5 km², was a tacit acknowledgment by the fishers that they operate at the periphery of the fish's world. They had to enter into that world and track the fish rather than simply throwing out anchor and line and waiting for something to take the bait.

Learning from fish is a vital component of 'thinking like a fish'. Without the desire to learn and improve, and the ability to think from a different perspective than ones' own, the process of 'thinking like a fish' would simply not exist. As a result of their observations and interactions, the fishers have learnt to identify and work flexibly with the potential inherent in most situations. For Oom's Louis and Koos, for example, the reactivity of fish to the colour of line and hook were of critical importance. In response, the fishers constantly took cognisance of behavioural and feeding shifts throughout any voyage and changed line colour and even hook colour accordingly. Similarly, observing higher than expected ocean temperatures in the winter period of 2010 (winter being a time when the fishers traditionally did not go to sea for two to three months), a group of fishers decided to try their luck and were rewarded with the highest kob catches in decades.

Just as the processes of trying to understand and think like fish was expressed in flexible ways of thinking and being at sea, it found similar expression on land. Towards the end of

2010, the kob catches began to decline significantly. This rapid decline, combined with a number of challenging environmental (no other commercially-viable fish species came into the bay to fill the place of the kob) and economic (the global recession began to be felt in the Stilbaai building industry, a traditional buffer for fishers who have sought temporary positions as painters or day labourers during the fishing off-season in the past) factors left the fishers with few promising options.

In response to this mounting variability and vulnerability, every fisher employed his own suite of adaptive strategies in dealing with the change. Oom Jannie, for example, concentrated his skills on fibre glassing and fixing trailer axles. Oom Koos focused on mechanical problems such as fixing impeller mechanisms^k and welding rusted trailers. Oom Louis turned to fixing cars. During this time, Boetie volunteered as a crew member on commercial handline boats operating out of Cape Town as a means of making ends meet, catching snoek off Cape Point and sending his earnings home. The fishers leant on these strategies for the better part of two years, however, when the general paucity of fish in the bay worsened further, they again adapted their strategies: Oom Jannie, for example, returned to the trawl industry as a skipper; Oom Louis turned to commercial beekeeping to bolster his income stream and Oom Tem downsized his operation by buying a considerably smaller boat and motors to save on money and focus on near-shore species.

Working with potential

In his (2004) work on Chinese classical philosophy, Francois Jullien suggests that relying on the propensity of things rather than constructing and working within or towards an ideal form is a means of enabling oneself to “detect the factors whose configuration is favourable to the task at hand; instead of setting up a goal for our actions... (or) imposing our plan on the world, we could rely on the potential inherent in the situation” (2004).

Trying out different anchor designs, fixing boats and trailers, changing line colours, cutting open fish to view their stomach contents, working with bees, *riem hou* and fishing in unconventional spots are just some of the ways in which fishers test theories and hunches and adapt flexibly to their circumstances. In seeking to learn from the fish, to think like them, one of the most important lessons the fishers have learnt is to react flexibly to variability, and to readily identify, adapt and, where possible, profit from the potential of a situation. Jullien (2004) suggests that the advantage of working with the potential which emerges from circumstance is that it does without “a world of ideal forms, archetypes, or pure essences that are separate from reality but inform it”.

Boetie summed up his thinking on short-term flexibility in early 2011 as we sat talking in his kitchen. The conversation turned to a previous trip during which we failed to find any fish.

Duggan: Ja Boetie, but I notice that when we go out [to sea] and I ask you where we are going you are always very vague...

Boetie: (laughing) haha, ja I saw that got to you this last time, hey? It's no good to have a plan—you will just get disappointed and frustrated. My only plan is to be open to the sea and the fish. You can have all the hi-tech equipment and weather science

stuff off the internet from Windguru¹ that you want but unless you're out there on the spot, looking for the kob...you're not going to find him unless you are prepared to look...

Similarly, Oom Louis suggested that adaptability was a key asset in the strategy of a successful commercial fisherman:

Oom Louis: look man, as I have told you before, we are always learning...and through learning I will tell you, we have seen that if you want to catch fish, you must adapt or die...This is the way or you will surely starve. Look there's guys who say they *know* where the fish is going to be. They go straight there, far away to some or other bank and they find (absolutely) nothing...You know why? Because this kind of guy is stupid—he doesn't stop to think “hang on, maybe I must *look* for the fish and think where they will be” because the fish is not a sheep that will follow you, it is not stupid. He thinks he can predict a fish! Hah. No...that will never happen. You can have all the science and stuff and GPS you want—that is why you see when we were out the other day and you asked me why I don't have a log of all the spots I've caught fish at (on the GPS)—It's because things change. I have marks for the better banks but even they come on and off and you can't say for how long or when (they will have fish over them).

... we don't know where the fish is but we must look. Maybe it's not there—it hasn't been now for two weeks... But this I can tell you: a fisherman who tells you he has a plan and that it works—that is a man who is lying to you. Yes, you must know how to catch fish when they are there but to find them you must observe and you must react and be open to all kinds of strange stuff, I tell you. It's not just a case of knowing the weather and the water, it's much more than that.

In the commercial handline sector, especially in Stilbaai where kob, the dynamic, sensitive, reactive and complex beings are the principle pursuance, relying on a rigorously structured plan is no guarantee of success. Working in the moment with whatever circumstances may arise, and focussing on their immediate interactions with fish, the fishers draw on their adaptive outlook as their principle strategy. The plan then is to not have a fixed plan, rather a set of cognitive and embodied skills and knowledges premised on acknowledgement of variability. Rather than imposing their own ideal model of universal reality on events, the fishers improvise their actions, allowing themselves to be influenced by and work with the events of the moment. Preparing for sea, for example, there is little hard planning conducted beyond being prepared for anything. Aside from checking the weather forecast it is only on the water that a skipper, having carefully observed the conditions on the day, decides upon a course of action. Even then, if this course does not realise good fishing it is seen as part and parcel of the enterprise and a new location or fishing tactic is adopted.

However, this is not to say that the fishers do not plan ahead. Rather, there is a sense amongst the fishers of balancing long-term thinking and preparedness with short-term flexibility. Whilst short-term flexibility and the ability to recognise and work with potential are important, these would not be possible without a solid foundation and long-term thinking. In other words, in order to be able to adapt flexibly and rapidly, fishers

must build the potential and put certain preconditions in place to facilitate this. As such, they rely on a range of long-term strategies such as conducting regular maintenance on their boats and equipment when the fishing is poor, fixing any mechanical or physical damage to the boats immediately after it happens irrespective of fishing conditions, or saving petrol money and bait so that when a good fishing day does arrive, they are ready to respond immediately.

An ethical evaluation of the price of life

While the fishers were comfortable shifting their catch effort from one species to another whenever the situation required, this mutability was tempered by a desire to conserve those stocks which they saw as being rare, endangered or as having more worth alive than dead. Duggan was often witness to these strategies at sea, watching as fishers threw back certain species, citing reasons of sexual maturity, size or conservation status^m. In conversation with Oom Louis and Oom Koos in early 2010, discussing the observations he had made in this regard amongst the fishers at sea, Duggan asked the fishers about their personal conservation strategies:

Oom Louis: [laughing] you'll get stressed if you ask questions (when we're out on the boat)—I'm...half crazy—I sometimes throw back fish—like the red steenbrasⁿ—I don't take red steenbras out—it's my part of conservation—there's lots of fish I don't take.

Oom Koos:—ja many times we throw it back when you're catching lots of kob you throw it back—and also the big sharks—we don't pull out big sharks anymore because you don't get money for it. Over 12 kilos then you can throw it—I knip my line—

OL:—like a hammerhead—a hammerhead you get R2.50 for!

OK: ja, R2.50 per kilo—why would you kill an animal for that!?

OL: no one on my vessel is allowed to take a hammerhead, I won't take it back.

Certainly, economic imperatives are of great importance in the fishers' lives. However, the ethical and ecological relationality via which they operate offers a counterpoint to fiscal motivations, substantiated by their understanding that without a healthy, functioning ecosystem, there will be no fish. The balance of economic and conservation or sustainability ideals is a difficult and ever-shifting one. During the research period, Stilbaai was experiencing the (unknown at that time) final stages of a relative abundance of kob. Catches were at a 30 year high with fishers regularly returning to the harbour with boats laden—catches of 1.5 tonnes of fish (a massive haul for these small boats) were landed by a number of boats during this period. At the prices of the time, R35/kg, the skippers and crew were living comfortably. However, towards the end of the research period in late 2010 and early 2011, catches began to decline rapidly. By mid-2011, a follow-up trip to the field revealed that there was so little kob in the bay as to make trips to sea futile. It was at this time that the fishers' strategies came under pressure. For the most part, they shouldered the weight of the difficulty, explaining that the cyclic nature of the fishing industry was something they were accustomed to and would be able to weather. However, in the months that followed the collapse, rumours of misconduct or misdemeanour on the part of the fishers spread through the community. Allegations of fishers heading to

sea to target endangered or protected species in Marine Protected Areas (MPA's) also began to surface, highlighting the fluid and fragile nature of the local ecological ethic. In light of these developments, we suggest that it is necessary that further work be done to identify and support strategies which might allow the fishers to keep on operating legally within the social-ecological system.

Discussion

An ethics which emerges from and focuses on relationality returns the locus of influence and responsibility squarely onto the shoulders of those who claim a particular knowledge: if one perceives all knowledge as contextually-generated and relationally-based, the implication is that claims to a particular knowledge or way of knowing are contingent upon interactions with others. Relationality suggests that ethics originates within interactions between actors operating within a shared and inseparable social-ecological whole which is both internal to a particular person's reality and constituted through interactions with other beings. As such it disputes the concept of ethics as purely cultural or based on an account of a universal shared nature/reality, returning the onus of ethics to the actors rather than ascribing it a universal origin. Moreover, if nature and culture are perceived in terms of an interwoven network, irreducible from the whole, then of essence an ethics which emerges from this takes cognizance of the rights and well-being of all living beings equally.

In the opening quote of this paper, Hester and Cheney (2001) suggest that the dominance of modernist thought which distinguishes so absolutely between what it sets up as separate realms of nature and culture has resulted in an ethically-impooverished epistemology. Operating from a position which sets out to dominate 'non-humans', modernity is in essence "a paradigm of war...a way of conceiving humanity, knowledge and social relations that privileges conflict or *polemos*" (Maldonado-Torres, 2008 emphasis in original). The stock assessment management paradigm which continues to dominate South Africa's fisheries emerged from within a belief in the separation of society from the natural realm. The approach favours a focus on individual species (Griffiths, 2000) rather than whole ecosystems and essentially implements a top-down approach which has been widely criticised as ignoring the role of both people and capital in the fisheries (Isaacs, 2006; Sowman, 2011; van Sittert, 2002; Isaacs and Mohamed, 2000; Isaacs et al, 2006). As van Sittert (2002; 2003) has shown, the influence of well-established networks and associations of capital in the country's fisheries has resulted in entrenched power and monetary dynamics which continue to sideline the concerns of many fishers, particularly small-scale groups. A moral economy of gain typifies this management style and the ethics which attends it is premised on the maximization of profits and shows little concern for economic or social inequalities amongst previously (and currently) disadvantaged people^o.

In addressing these issues, there is increasing pressure on South African social scientists who are involved in fisheries to draw on 'indigenous knowledge' approaches in order to improve the dialogue of fisheries managers with fishers. However, an indigenous knowledge analytic severely limits the possibilities for conversation, since it implicitly frames alternative knowledge claims in a politics of identity. Identity-based claims to knowledge render fishers' knowledge as 'cultural', reiterating the problem in which people are 'othered', and in which 'cultural knowledge' is seen as the implicit opposite of the

'knowledge of 'nature' in formal science. Yet as this research shows, fishers' actual practices may have many points in common with research in the sciences. An alternative, suggests Berkes (2011), writing on the concept of social-ecological knowledge, is that "to restore unity in managing marine social-ecological systems, there is a need to reconnect natural science, social science, and humanities perspectives, and reconcile the various disciplines with largely different scientific traditions". In response to this suite of challenges, Berkes (*ibid.*) posits a three-pronged approach including recognizing and working accordingly with what the author refers to as social and ecological sub-systems (within a broader social-ecological whole); formulating appropriate complex adaptive strategies to deal with complex variable, shifting and unpredictable social-ecological systems; working with participatory models throughout all stages of research and management.

In light of Berkes' (2011) suggestions, and the challenges facing South Africa's inshore fisheries and fishing communities, the characteristics of 'thinking like a fish': flexibility; adaptability; strategy development; ethics; ecological thinking and the ability to work with potential offer an opportunity to researchers, fisheries managers and policy makers alike. Certainly there are a number of convergences with the multiple dimensions considered in an EAF paradigm. The embodied, relational engagements which typify 'thinking like a fish' recognise and seek to work with motivations of economics, ethics and ecosystem health in real-world scenarios. This is by no means a complete answer to the problems facing South Africa's beleaguered fisheries. However, what 'thinking like a fish' does provide is a viable means of identifying and working with potential, formulating appropriate, timely strategies for thinking and working ethically with dynamic social and ecological systems.

Conclusion

Drawing on ethnographic examples from commercial handline fishers in South Africa's southern Cape region, this article has introduced a local outlook, 'thinking like a fish'. Through processes of interaction and mimesis, fishers come to know fish and the act of fishing as dynamic and fraught with variability. Trying to think like the fish, from their perspective is, in and of itself, a process of thinking more empathetically. Learning from these relational engagements, the fishers evolve adaptive strategies which vary with person and context, shifting roles where necessary. This flexible adaptive capacity and the ability to work productively with potential allows a degree of buffering where vulnerability and variability are concerned, imbuing fishers who work in this way with a capacity to weather changes. For the Stilbaai fishers, 'thinking like a fish' and the attendant ethics which emerge from a relational engagement are inseparable from and form the basis of their fishing and life strategies. In a fisheries management context, 'thinking like a fish' speaks to a number of issues: it provides a range of flexible adaptive strategies for responding in real-time to shifting variability and vulnerability by making use of the potential of a situation. It is a means of thinking beyond traditional approaches to management which seek long-term stability through top-down, single-species approaches. Moreover, to return to Hester and Cheney (2001), the outlook makes space available to speak and think in terms of worlds built upon "an ethical-epistemological orientation of attentiveness", wherein domination and control of resources do not form the basis for thought, knowledge or action and living beings are known and experienced bodily

through interaction as lively, intelligent subjects rather than objectified resources. Through their stories, interviews and conversations presented in this article, the fishers have shown that 'thinking like fish' is a means not only of locating, attracting and catching fish, but also a strategy for learning from fish in their *umwelt*, thinking through ways of conserving their populations and life worlds. Thinking and interacting mimetically and empathetically, these fishers have come to understand the importance of a personal ethics of conservation as a strategy for sustained livelihood.

Where fisheries management in South Africa, and in particular, the southern Cape is concerned, there is an important research question which must thus be attended to: given that 'thinking like a fish' is an effective means of reacting in the short-term to real-time variability and vulnerability, is it possible to marry this with the necessities of fisheries management for long-term sustainability? This paper has highlighted the potential of 'thinking like a fish' as an ethical, ecological and economically-viable strategy in the short to medium-term. In South Africa, projects such as the forthcoming community quota system, community co-management and an EAF are gaining traction. Such developments put in place a more adaptive framework and flexible approach to governance which open up space to consider alternative approaches to and ways of knowing the marine environment. Further to this, in an EAF, where increasing variability and long-term change to the natural and human sub-systems are explicitly considered, exploring the strategy of 'thinking like a fish' with a long-term perspective requires further collaborative and transdisciplinary research.

Endnotes

^aThe term 'knowledges' is used in the plural here to denote the existence of multiple, heterogeneous ways of knowing rather than a singular, consolidated notion of fishers' knowledge. For more information in this regard, see Duggan (2012) MSocSc thesis.

^bIn what follows, unless otherwise stated, all ethnographic work cited refers to field-work from Duggan's (2012) MSocSc thesis with ethnographic research conducted amongst a group of commercial handline fishers of Stilbaai. In the body text, the three authors speak in the collective; however, since the ethnographic research was conducted by Duggan, it is presented and discussed as such and the abbreviation (D) is used to denote the researcher.

^c'Kob' refers to the Silver kob or Kabeljou, *Argyrosomus inodorus* of the family *Sciaenidae*. There are a number of species of kob identified in South African waters but the local Stilbaai fishermen predominantly target the *Silver kob*, which is renowned as a good eating fish, readily growing in excess of 1 m in length at maturity.

^dThe minimum and maximum size limits were implemented in the early 2000's in order to protect breeding stock. The maximum size limit allows for one kob larger than 110 cm to be caught per person, per day.

^eRefers to *Chrysoblephus laticeps*, a member of the seabream family and endemic to South Africa. The Red Roman is endangered and prized by anglers for its delicious flesh. It is found over reef structures and is a highly resident species.

^fRefers to *Thyrsites atun*, the snoek is a popular fish amongst Capetonians and a traditional cheap seasonal protein staple amongst many lower income households.

^gThe Afrikaans word 'Oom' means uncle, and is a term of respect used when speaking with men a generation or more, older than oneself.

^hDuring the research period, South Africa's commercial handline industry was administered by Marine and Coastal Management (MCM). In 2012, MCM was disaggregated and commercial handlining is now administered by the fisheries Branch of the department of Agriculture, Forestry and Fisheries.

ⁱHake refers to *Merluccius capensis*, the shallow water species of hake found mostly on the shelf and slope of the Agulhas bank. Targeted predominantly by the inshore and offshore trawl industries, it is also caught by commercial handliners.

^jVaalhaai is the local name given to the small shark *Galeorhinus galeus*. It is considered a nuisance by fishers and is usually released or sometimes clubbed with a stick and thrown overboard. Such is the complexity of working with relationalities – the example of *vaalhaai* shows that whilst fishers are concerned with the health of the ecosystem they are not averse to labelling some fish as nuisances and disposing of them.

^kAn Impeller is a component in the cooling system of an outboard motor, sucking water into a cooling jacket surrounding the engine and forcing it back out. Due to the corrosive nature of salt water these often disintegrate or become clogged, potentially causing the engine to overheat and seize.

^lA weather forecasting website popular with many of the Stilbaai fishers.

^mCertainly this may also have been in part due to Duggan's position as an outside researcher but the networks through which the fishers monitored one another's fishing behaviour exerted a strong influence in constraining illegal or "grey" activities to the extent that not many fishers sold undersized or endangered species without the entire community knowing and speaking openly about it.

ⁿA highly endangered species, *Petrus rupestris*, listed by MCM as a no catch/no sale species.

^oDuring the apartheid regime, the distribution of fishing licences in the commercial sector was based on racial prejudices with active discrimination shown towards those who were not White. As a result, those non-White fishers who derived a livelihood from the sea were usually unable to rise above the role of crew or subsistence fishers and were invariably underpaid for their work. While the current post-Apartheid government has sought to redress the racial and financial inequalities of the past, historically-ingrained inequalities in income, networks of power and access to capital have meant many boats continue to be owned by whites and the majority of crew remain disenfranchised within the fisheries (van Sittert, 2003).

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

GLD carried out all ethnographic fieldwork, transcribed all interviews and lead the authoring of the document. LFG and AJ supervised the fieldwork and analysis, providing conceptual support for the thesis work. All authors read and approved the final manuscript.

Acknowledgements

We gratefully acknowledge a variety of funding sources for this project: The SA Research Chair Initiative, funded by the Department of Science and Technology (DST) and administered by the National Research Foundation (NRF), provided bursary funding and research expenses for Greg Duggan through the Research Chair in Marine Ecology and Fisheries (Prof. Astrid Jarre), as well as funding for participation in the Symposium "People and the Sea VII: Maritime Futures" in Amsterdam, June 2013. The NRF Sea-Change project, through grant No. 442316 (Lesley Green), provided a bursary top-up for Greg Duggan. The

Contested Ecologies project in the UCT's Sawyer Seminar series "Ways of knowing in the PostColonial University" funded by the Andrew W Mellon Foundation. UCT's Fishers' Knowledge project in the Programme for the Enhancement of Research Capacity (PERC), funded by the Carnegie Foundation, provided funding for workshops and a seminar programme on knowledge studies which contributed to the conceptualisation of the approach presented here.

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Received: 5 September 2013 Accepted: 31 December 2013

Published: 23 April 2014

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doi:10.1186/2212-9790-13-4

Cite this article as: Duggan *et al.*: 'Thinking like a fish': adaptive strategies for coping with vulnerability and variability emerging from a relational engagement with kob. *Maritime Studies* 2014 13:4.

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