Opening dialogue and fostering collaboration: Different ways of knowing in fisheries research

AUTHORS:
Greg L. Duggan[1,2]
Jennifer J.M. Rogerson[1,2]
Lesley J.F. Green[3]
Astrid Jarre[1]

AFFILIATIONS:
[1]Marine Research Institute (Ma-Re), University of Cape Town, Cape Town, South Africa
[2]School of African and Gender Studies, Anthropology and Linguistics, Anthropology Section, University of Cape Town, Cape Town, South Africa
[3]Environmental Humanities Initiative, School of African and Gender Studies, Anthropology and Linguistics, University of Cape Town, Cape Town, South Africa

CORRESPONDENCE TO:
Greg Duggan

EMAIL:
greguct@gmail.com

POSTAL ADDRESS:
Marine Research Institute (Ma-Re), University of Cape Town, Private Bag X2, Rondebosch 7701, South Africa

DATES:
Received: 29 Apr. 2013
Revised: 18 Oct. 2013
Accepted: 17 Dec. 2013

KEYWORDS:
ethnographic research; facilitating dialogue; fishers' knowledge; artful deletions; relational approach

HOW TO CITE:
Duggan GL, Rogerson JJM, Green LJF, Jarre A. Opening dialogue and fostering collaboration: Different ways of knowing in fisheries research. S Afr J Sci. 2014;110(7/8), Art. #2013-0128, 9 pages. http://dx.doi.org/10.1590/sajs.2014/20130128

We set out to explore some of the impediments which hinder effective communication among fishers, fisheries researchers and managers using detailed ethnographic research amongst commercial handline fishers from two sites– one on the southern Cape coast and the other on the west coast of South Africa. Rather than assuming that the knowledge of fishers and scientists is inherently divergent and incompatible, we discuss an emerging relational approach to working with multiple ways of knowing and suggest that this approach might benefit future collaborative endeavours. Three major themes arising from the ethnographic fieldwork findings are explored: different classifications of species and things; bringing enumerative approaches into dialogue with relational approaches; and the challenge of articulating embodied ways of relating to fish and the sea. Although disconcertments arise when apparently incommensurable approaches are brought into dialogue, we suggest that working with multiple ways of knowing is both productive and indeed necessary in the current South African fisheries research and management contexts. The research findings and discussion on opening dialogue offered in this work suggest a need to rethink contemporary approaches to fisheries research in order to mobilise otherwise stagnant conversations, bringing different ways of knowing into productive conversation.

Introduction

In 2000, with a stock crisis in the country's commercial line fisheries looming, South Africa's government took steps to mitigate against widespread collapse by adopting a policy of reduced access rights for commercial fishers. What transpired was a dramatic curtailing of effort in the inshore fisheries, concomitant with the introduction of the *Marine Living Resources Act of 1998* (MLRA), which left many fishers without legal rights to carry out their trade on a commercial level. This disenfranchisement lead to widespread dissatisfaction and often contempt for the authorities and MLRA amongst many fishers and fishing communities, resulting in both political action and poaching in a number of instances.[1,2]

Today, South Africa's fisheries continue to face a number of severe and pressing challenges which must be addressed if progress is to be made in safeguarding marine ecosystems and the livelihoods of those who depend upon these in various ways. Instead of looking solely at how fishers know, which reiterates their apparent difference from science, the more productive approach is to try to understand where and how the dialogue runs into difficulty. We by no means make any claim to resolving all the difficulties that attend collaborative work among managers, fishers and researchers. Rather we explore some of the instances in which difficulties arise and present some possibilities with which to begin to move forward conversations which have in many cases become stagnant. As such, our intention in this paper is to introduce a theoretical foundation which poses significant practical applications, whilst highlighting its relevance through ethnographic examples. The conceptual framework and associated tools which we employ begin with the idea that the ways in which people engage the world are based on interactive relationships with humans and non-humans alike. The strength of this approach lies in being open to working with multiple ways of knowing without assuming that one represents complete truth while another is complete falsehood.

It is our contention that what is required is a shift in focus away from traditional 'top-down' management structures, in which local perspectives are generally not taken into account, towards an understanding of the extent to which social and ecological changes are mutually contingent.[3,4] In their 2007 work, the Canadian Coasts Under Stress (CUS) team recognised that 'the fundamental problem is an inadequate understanding of the highly complex links between social and environmental restructuring and how they interact with the health of people and places'[3]. Sutton Lutz and Neis[4] suggested that 'disciplinary boundaries (between social, natural, humanist and health researchers) have tended to mask interactions between these realms…' often with unfortunate and unforeseeable consequences. In answer to this dilemma, following Sutton Lutz and Neis, 'a key point of departure for CUS research…is the assumption that exploring these interactions requires cutting across traditional disciplinary boundaries'[4].

The social-ecological approach adopted by CUS suggests that it was necessary to create a third space in which different knowledge positions might be brought into conversation and worked with productively. In a bid to facilitate the creation of this third space, the CUS team perceived different ways of knowing and disciplines as bounded but simultaneously called for the recognition of heterogeneity and overlap as a means of bringing different ways of knowing into conversation.[4] The upshot of this outlook was the call for researchers to work across categories of knowledge. However, whilst such an approach began to open up the possibilities for collaborative research, it still implicitly relied upon and thus maintained categorical distinctions between knowledge groups such as scientists and fishers.[4-8] The contribution offered by our approach, by contrast, is an effort to move to recognise and work symmetrically with multiple ways of knowing the world, seeking the convergences and overlaps but also finding means of acknowledging and working with difference and divergence in productive ways.[9-12] As a point of departure, we begin with the assumption that knowledge boundaries are arbitrarily maintained and can be dissolved. We argue that different knowledges exist but these different ways of coming to know are not necessarily tied to, nor emerge from, specific disciplines or identities and rather are patterned on interactions between beings. Our

work, therefore, attempts to move beyond the restrictions of disciplinary and epistemological categories by working with individual knowledges rather than notions of bounded bodies of knowledge. Note that the term 'knowledges' is used to suggest that there is not a singular and universal way of producing knowledge about the world, but that there are ways of knowing the world which lie outside of the formal disciplines which people use and find effective. These may include practical and embodied knowledges, as well as different ways of thinking about the major ontological structures that frame modernist knowledge.[9,13] The focus of this kind of work is on the convergences and overlaps which exist. Where divergences do arise, these too may also be worked with productively, as discussed later in the text.

Building on the CUS approach, we take the view that productive dialogue with the knowledges of fishers is both possible and necessary.[3,4,14,15] There are several reasons for this view. The work of Van Zyl[1] and Schultz[2] on South Africa's east and west coasts, respectively, has illustrated that people excluded from conservation and management decisions resort to poaching, not only out of necessity but also as an act of demonstrating disagreement with management. Target-resource oriented management and traditional 'top-down' approaches to management have to date not been especially effective in ameliorating fisheries crises.[16-18] Additionally, with the mandated implementation of an ecosystems approach to fisheries (EAF) in South Africa in terms of international agreements, there is pressure on government to implement a more inclusive means of managing our fisheries and to allow for debate around knowledge.[19-21] There is also a need to rethink the state-science-public nexus in terms of which conservation policy in South Africa is increasingly implemented via control rather than cooperation.[1,2,11] The lack of effective dialogue between fishers and scientists – even though many scientists themselves are fishers and make the effort to communicate their work to fishers – is often framed as a problem of 'indigenous knowledge'. We believe that such an approach severely limits dialogue,[11,12] as making knowledge debates contingent upon socio-cultural identity renders them unavailable to critique or rethinking, with the consequence that they come to occupy seemingly intractable positions.[9] The work presented here is part of a larger project that reframes the possibilities for scholarly dialogue across different ways of knowing the sea and its creatures, and takes as its focus the ways in which people come to know the world. As such, we argue that the shift to research on dialogue creation between fishers and the sciences, is vital both in implementing an EAF in South Africa and in beginning to address the problems which face the country's fisheries.

Project background

We draw on initial findings and fieldwork from an extensive interdisciplinary research project which has been running for the past 4 years. A collaborative undertaking between the University of Cape Town's (UCT) Marine Research Institute (Ma-Re) and Anthropology, the project seeks to rethink the complexity and interface of multiple knowledges and ways of knowing in selected fisheries on the west and southern Cape coasts of South Africa as well as in Namibia's hake fisheries.

Over the past two decades, growing evidence of stock collapses and associated failures of centralised, quantitatively managed fisheries in many parts of the world have led to a number of calls for alternative approaches to fisheries management which address the concerns of biophysical ecosystems as well as human well-being.[3,22-25] Recently, a growing body of research has begun to suggest that working with the knowledge of fishers within the fisheries management context offers the possibility of augmenting scientific knowledge by contributing locally grounded, experiential understandings and strategies for dealing with the variability of fish and climate.[3,24-29] In 1992, the Convention on Biological Diversity (CBD) was formulated to address growing concerns surrounding the preservation and safeguarding of the earth's natural resources. Central to the CBD was a commitment that contracting states 'respect, preserve and maintain the knowledge, innovations and practices of indigenous and local communities'[30]. In terms of fisheries management, the guidelines outlined in the CBD laid the foundations for a significant shift away from established 'top-down' management paradigms, which ignored local people and their concerns, towards more inclusive approaches which worked with local people and ecologies.[20,30,31] One of the more prominent approaches to fisheries management which emerged from the guidelines of the CBD was the EAF.[21,32] A somewhat radical departure from established norms of fisheries management, an EAF adheres to a number of core premises which directly challenge conventional top-down management structures. One of its guiding principles is a focus on working with complex interlinked social-ecological systems. In 2002, at the Johannesburg World Summit for Sustainable Development, South Africa committed to the implementation of an EAF by 2010, which compels fisheries management to work in dialogue with fishers. However, this EAF has been slow in coming.[33]

In 2010, amid growing concerns surrounding climate change and variability; the 2002 Johannesburg World Summit mandate; perceived shortcomings in the MLRA; and the failure of top-down stock assessment-based management protocols to adequately work with people and marine resources, Ma-Re (UCT) initiated the 'Marine Research in the Benguela and Agulhas Systems for supporting Interdisciplinary Climate-Change Science'(BASICS) project. The project is interdisciplinary in nature and receives considerable support through the South African Research Chair in Marine Ecology and Fisheries. BASICS seeks to challenge the conventional management approach by explicitly investigating an EAF through social-ecological research and collaboration with fishers. The BASICS project incorporates perspectives from industry, government, fisheries management and academia as well as physical and ecological modelling across a range of scales and case studies working with fishers from within the Benguela ecosystem.[34] The objective of this multi-sited, multi-scalar, interdisciplinary project is to provide understanding of the impacts of climate variability as well as to predict future outcomes at various levels including marine ecosystems, individual species and human coastal communities.[34]

The Fishers' Knowledge Project (2010–2012) is a collaborative interdisciplinary and multi-sited research project conceptualised across a range of research partnerships, including the SeaChange programme of the South African National Research Foundation, UCT Sawyer Seminar's Contested Ecologies Project and UCT's Africa Knowledges Project as part of the larger Programme for the Enhancement of Research Capacity. Seeking to bring the objectives of Ma-Re BASICS, the Fishers' Knowledge Project and the Contested Ecologies Project together, Astrid Jarre (Ma-Re) and Lesley Green (Anthropology) co-supervised several Anthropology dissertations which focus on fishers' knowledge in a range of fisheries along the Benguela current ecosystem coastline of South Africa.

Methodology

Drawing on ethnographic participant observation methodology, the research presented here took place in two separate field sites over extended periods.[11,12,35] All research was conducted after receiving appropriate ethical clearance. Participant observation entailed researchers spending prolonged periods of time in the given field site and at sea with local fishers, with a focus on the collection of empirical data. Placing emphasis on extended fieldwork and engaging with local people while they went about their daily activities enabled the development of rapport and the building of relationships of trust, providing insight into the local context and people's ways of understanding and being in the world. The ethnographic examples presented in this paper refer to the work of Rogerson[11] and Duggan[12]. Duggan's[12] field research was conducted in the small commercial handline fishery in the southern Cape town of Stilbaai over a 7-month period; Duggan conducted participant observation, that is, spending time with fishers at work, both at sea and on land. The research revealed a complex set of interactions between fishers and fish in which fishers knew fish as intelligent, reactive beings and sought to balance a range of objectives including ecological, economic and ethical concerns via a suite of strategies aimed to cope with variability in the fishery at all levels. Over a 3-month period, also drawing on participant observation methodology, Rogerson's[11] work in Lamberts Bay focused on the embodied ways in which fishers come to know the sea. In her work, Rogerson suggested that the conservation

science which informs state-regulated fisheries policies such as the MLRA has served to exclude fishers from debates about the management of the marine environments they have fished for generations. Rogerson's study found that the fishers with whom she worked interacted with and related to fish and seals as knowing subjects rather than simple objects for capture.

In analysing the ethnographic data, our approach was grounded in that described by Lien and Law[36] as a relational ontology.[37] Whereas a cultural ontology rests upon the notion that different views of the world arise from social identity (such as ethnicity, race or region), a relational ontology concerns itself with the ways in which knowledge producers attend to specific objects and relationships in the world, and, in foregrounding them, bring them into being as matters worth attending to in scholarship and in political life.[36-38] The fishers with whom we worked were of varying ages and levels of experience. Stilbaai fishers *Oom* ('uncle', used as a form of respect) Louis and *Oom* Koos, for example, had between them nearly 65 years of experience on the sea in commercial fishing. Many of their peers had spent over 40 years as commercial fishermen working in a range of fisheries (commercial handline, commercial trawl and west coast rock lobster) in the Benguela and Agulhas ecosystems. A commonality shared by all of the people in the ethnographic conversations which follow is a self-identification as commercial fishers.

Research findings

The identification and classification of species and sub-species, the process of enumerating fish, and different ways of relating to fish and the sea are prominent themes which recur in both Rogerson's[11] and Duggan's[12] research. These themes represent nodes or moments around which convergence and divergence often take place in fisheries research and management and, as such, the interactions through which they come about warrant further exploration.

Species, classifications and 'artful deletions'

During any process of research, data are collected and recorded. The collection of data happens through equipment and different processes along the way. Streamlining, evaluating and interpreting data culminates in a written report. Through this process, certain elements of the original data set are emphasised whilst others are eliminated or underplayed in the final version. In what follows, we refer to these processes of streamlining as 'artful deletion' and suggest, following Law[38], that it is a practice which takes place in the formation and representation of all knowledge. 'Artful deletions' are achieved through the use of 'inscription devices' which include 'any item or apparatus or particular configuration of such items which can transform a material substance into a figure or a diagram which is directly useable'[38]. The value of inscription devices lies in their ability to direct focus onto the final, smoothed and simplified product, away from the complex interactions, material processes and practices which go into creating it. We begin by exploring this point via a discussion of the ways in which different worldviews result in different classifications of the same fish: kob (*Argyrosomus inodorus)* – known locally as the Silver kob or kabeljou, a highly prized commercially targeted species upon which the inshore handline fisheries of the southern Cape are deeply dependent.

In a weighty tome released in 2001 by the Department of Environmental Affairs and Tourism entitled the *Coastcare Factsheet Series*,[39] a group of government scientists and marine specialists set out to document, for public dissemination, elements of South Africa's marine ecosystems and coastline which were considered important. Included in the factsheet is an introduction to various common species, including a number of fish. In the third section, entitled 'Coastal and Marine Life – Animals: Vertebrates – Fishes', is a subsection dedicated over two pages to 'kob'. A single colour picture of a Snapper kob is shown at the bottom of the page. The description starts with an account of how many species of kob are found on the South African coastline ('about nine') and continues with a description of what kob *is*: under different headings such as 'Breeding Habits', 'Feeding Habits', 'Life Cycle' and 'Commercial Importance', the reader is presented with a neat, uniform version of kob – what can be expected of it, where to find it and how it operates in its environment. The account describes *all* kob as having 'a coppery sheen…fairly robust with an elongated body and a rounded tail fin' and that 'various kob species are superficially very similar, making it difficult for non-scientists to distinguish between them'.

We turn now to an ethnographic account concerning kob, taken from Duggan's[12] work amongst commercial handline fishers in Stilbaai:

> *Various boats, motors, trailers, tow-vehicles and a small freezer truck stood parked around the front and back of the house in various states of repair. The lounge served as an entrance to the home and I knocked on the door announcing my arrival.* Oom *Koos turned round in his seated position at his desk, and, beaming at me over his glasses extended a massive calloused hand to envelope mine in a firm, friendly handshake. As he gestured to a couch and told me to sit,* Oom *Koos informed me that he had invited his friend and fellow skipper* Oom *Louis to join our conversation. I was here to talk about the kob and both* Oom *Koos and* Oom *Louis were happy to do so. The discussion below picks up approximately twenty minutes into our conversation:*
>
> *Greg Duggan [GD]: How many types of kob are there?*
>
> *Oom Koos [OK]: There's about three, four…five!*
>
> *GD: That you catch here?*
>
> *OK:* Ja [yes]*, that you catch here, that is different from each other.*
>
> *Oom Louis [OL]: There's seven different species of kob. The only one that you don't get here definitely is the Snapper salmon that you get in Durban.*
>
> *OK: But we catch the square-tail also here!*
>
> *GD: The main ones I know of are the Dusky, the mini-kob, the Square tail and the Silver…*
>
> *OK:* Ja*, but the Silver kob, neh, the Silver kob – there's more subspecies of Silver kob – there's not only one. There's one with the long tail, the one with the funny fins – I showed the researchers the other day – what the difference is – there's a seven kilo fish, his tail is like that (broad), there's the other seven kilo fish and his tail is like that (thin, flat) – there's a hell of a difference between the fins – it's a different species... And then there's one of the fish where his head is small, and his body is fat –*
>
> *OL: – and then the other one with that rounded nose –*
>
> *OK: –* ja*, his top of his mouth is shorter than the bottom of his mouth.*
>
> *OL: Now they, if you look when the one's got a thick tail and the other a thinner tail, for the same size fish, they will, for the fun of it – not the fun, to get the knowledge – they will open both, see whether it's male, whether it's female – and you do get females with different bodies, males with different bodies. So it's definitely different species.*

GD: But are you catching them all together?

OK & OL: Together ja, *together!*

OK: But some times of the year, that short fish –

OL: – the thick one –

OK: – the thick one, yes, is at a certain time of the year, I think it's September, October, we catch plenty, plenty, plenty of it.

OL: You know where you get that is in Namibia as well.

OK: Really?

OL: It's different!

OK: Scientists don't class it differently but it's different.

OL: Ja *but to me it's still a kob and a kob is a kob* ou broer ['old brother'].

OK: [laughing] But we as fishermen see that as another species – we know it's another species and it's fighting more than the other species of kob when it's on the line. That shorter fish is much stronger, much, much stronger than the other kobs. Much, much, much, much stronger! And I show that to Lloyd the other day, I said 'look here, can you see the difference?' and he said yes, he can see the difference…but when you get to the harbour, neh, the inspector doesn't want to know it and the factory guy, he doesn't care either. You have a kob and for them it is a Silver kob and that is so.

OL: Ja, *he doesn't care because he gets his same price. Look if he turned around and said it was something else –*

OK: – or if we said it was something else –

OL: – ja, *if we said it was something else, we and him would get a different price. And probably not a better one, you understand? So we must look and speak about it to each other and leave it at that.*

OK: But that factory guy, he knows it's different, he sees it every day – a different shaped fish that's not a Dusky but that he sells as a Silver but clearly isn't a Silver.

What emerges from these two accounts are two knowledge claims about kob, which at times contradict one another. Two networks of actors[40] narrate their knowledge and research in the same environment featuring the same actor – kob. Yet their descriptions clearly reference two different versions of kob and ways of identifying and knowing the fish. In the knowledge claims of official state science, kob is a clearly defined, universalised fact which, whilst knowable to scientists, is 'difficult for non-scientists to distinguish'[39]. The narrative of the factsheet suggests that the version of kob presented therein is universally true for all kob, and is the only possible way of identifying and knowing kob. In *Oom* Koos' and *Oom* Louis' version of the fish, the definition is not as clear. While the two fishers identify officially recognised and classified species such as 'Silver kob', and 'Snapper salmon', they also talk about the existence of 'another species' or subspecies. Their descriptions, rather than being about a singular, authorised version of kob, speak of heterogeneity, complexity and multiplicity. Rather than being universalised and removed from context, their narrative speaks of identifying the fish through interaction when they are fighting the line. In other words, the fishers' way of knowing kob is mediated through interactions which change with context and time.

The process of enumeration

In the same way that fish are classified via the Linnaean system into a hierarchy of kingdoms, classes, orders, genera and species in descending order of specificity, a similar effect results from the process of enumeration in which relations and beings are represented as numbers for various purposes.[36-42] In the ethnography below, taken from Duggan's[12] fieldwork, an 'artful deletion' results:

> *Returning to the harbour with* Oom *Koos, we have made a good haul of kob, slightly over 800 kilograms by his estimate. Arriving at the quayside, we winch the boat up onto the trailer and tow her over to the Viking Fishing factory where the buyer, Willie, is waiting next to the scales. As the crew begin offloading the* bakke [large, hard plastic bins used to store the fish at sea and transport them on the quayside] *of fish, the process begins: at sea,* Oom *Koos had shown me some of the characteristics of different subspecies of Silver kob – the different fin, tail, head and body types. Opening some of them up, he showed me that these were both males and females and that there were indeed distinct differences between the subspecies, even though they swam together. Now, however, as Willie draws closer and the fish come to the scale, the different species of kob we had identified at sea quickly and seamlessly became one – Silver kob. It is a game, a performance for one another by fisher and buyer. As every fish is taken from the boat a length and weight measure are taken. Nothing else seems to matter. Individual characteristics are unimportant – in fact I get the sense that* Oom *Koos would rather not discuss these while Willie is around. The different individuals are thus transformed in a moment, becoming numbers. Then, once all of their number had been tallied, they became a single whole – the catch for the day, represented in kilograms and currency and later to be filled in on the log sheet which* Oom *Koos will submit to MCM/DAFF* [Marine and Coastal Management/ Department of Agriculture, Forestry and Fisheries] *at year end.*

Upon arriving at the quayside and pulling the boat out of the water, *Oom* Koos now related to kob differently, seeing them no longer as interesting individuals but as numbers. It was a relationship into which *Oom* Koos entered tacitly with Willie in which both agreed to a description of Silver kob in line with a Linnaean classification of what kob is. On the boat, *Oom* Koos had been quick to point out differences in subspecies of kob but outside the factory an altogether different account of nature again took place in *Oom* Koos's interaction with Willie. Now, *Oom* Koos's enactment and knowledge claim about the fish shifted: in order to sell the fish to the factory the multiple subspecies of kob were referred to by one name –Silver kob – thus becoming and becoming recognised as a unified entity. This shift was characterised by a seeming detachment from the fish, which were being thrown from the boat into waiting plastic *bakke*. The individual characteristics that had mattered at sea were no longer important in the relationship. Willie's compliance with this enactment of Silver kob was also important in securing a price for the catch and together the fisher and the buyer engaged in a process of transforming fish into figures. In so doing, the complexities observed at sea – the individual subjective characteristics such as nose, tail and body shape – were now of no importance, smoothed over and translated into object via number, an artful deletion of characteristics

which transformed the fish. Later that evening while writing up the day's experience Duggan[12] noted:

> *Perhaps it was just my perception of them or the sun and water reflecting off of their skin, but when we were at sea the kob, although dead, had still seemed lively. Now they appeared grey and waxen, bereft of their individual characteristics, flung unceremoniously as objects through the air. Suddenly they were lifeless numbers…one… two…thirty…forty five. I could almost see the fish being transformed from subjects as they were tossed off the boat and landed with a dull wet thud as an object in the* bakke.

In effect, the process of creating a number from fish represented a change in the relationship between fisher and fish and the latter's transition, entering into new relationships with other sets of actors. In this way, the end of the fish's interactions with fishers and their translation into numbers marks an entry into new networks in which they are further enacted. The numbers generated in the fishery enter into networks of resale, consumption, research and management, moving through processes which work with and shape them into accounts of reality. Lien and Law[36] argue that 'the inscription of a number in a notebook serves as a first point of making them real'. In other words, where management, research or the sale of fish are concerned, the creation of a number is a means of quantifying the existence of a thing. The day's total catch weight would be added to the month total for kob which in turn would be written down by *Oom* Koos on his catch log sheet and submitted to DAFF at the end of the year. At this point it would serve a range of purposes within DAFF research and management as well as informing future regulation of the country's commercial fisheries. The individuality and conditions of each fish and its capture are omitted at this stage. There is no space available to talk about different species or subspecies, water conditions, location, wind, currents, bait or fish behaviour. The log sheet simplifies and expedites data capture, severing ties between fishers and fish and the time–space in which they interacted. Only the month's total catch of the fish type is entered in each corresponding column and row. In this way, the messiness of the story of the catch is transformed, and the fish become universalised, represented by a series of digits. The complex, multiple, dynamic, unpredictable, sought after are, through this simple process of enumeration, rendered knowable, quantified, simple, predictable, singular, ready for entry into a stock assessment model or levy accounting sheet for next season's licensing purposes. It is in the moment of translation that the object of attention, although ostensibly the same being (a physical biological organism), can be very different and known as different 'things' dependent upon the perspective of the knower. Multiple versions of itself are simultaneously brought about, depending on who is interacting with it and the context in which these interactions take place.

Relational interactions among fishers, fish and sea

After a brief examination of the ways in which living beings are rendered as numbers through networks and processes of inscription and enumeration, we turn now to the ways in which particular relationships and ways of knowing fish and the sea make certain versions of reality possible. The question of embodied knowledge and relational engagements with the sea and sea creatures is an important one in the context of fisheries research and management, particularly where collaborative efforts are concerned. In the South African context, the objectives of conservation science are often perceived by fishers as not readily compatible with their own needs.[1] As such, many fishers reject conservation arguments and policies on grounds of knowing the sea and fish very differently from what is presented to them in official science and management.[1] To this end, the ethnography below, taken from Rogerson's[11] thesis, provides insight into some fishers' ways of understanding the sea and sea creatures, and highlights what we refer to as a relational way of knowing.

For many of the people working in Lamberts Bay, while they did not see the sea or the fish there as persons, they seemed to share a relationship with them that was more than one of fisher and catch. Willem, a local handline and west coast rock lobster fisher, spoke of how they needed to go out to sea with positive attitudes and with a smile on their faces or else fishing would not be successful because, according to Willem, the sea, fish and lobster could sense moods and act accordingly. In particular, the sea was understood by the fisher as a living being: a source of life and nurture as well as dread and harm. It became confusing at times because one person would be talking about how the sea gave him so much trouble and a minute later another would be talking of how much she loved the sea and how she felt free there. After some months, no longer a complete outsider, these apparent contradictions began to appear complementary to me. As Willem put it, 'sometimes the sea will give you so you can save, on other days nothing, so you can come back on those days that you have saved for'.

The sea in this example was a provider to Willem, generous on some days, miserly on others. The sea was bountiful but it did not allow fishers to have excess fish, meaning planning ahead and saving money were always necessary strategies. Often when we spoke, Willem's face became animated and excited when he spoke of the sea and how it works with him. Willem and Hennie spoke of their relationship with the sea:

> *Willem [W]: It's like the sea is in love with us because before he will take you he will warn you and then if you are reckless, careless then something will happen to you, but at least he has warned you.*
>
> *Jennifer Rogerson [JR]: The sea almost gives you a chance.*
>
> *W: Yeah.*
>
> *Hennie [H]: I'll share a personal experience of where the sea, he warned me. One day we were working close to Muisbosskerm, south of Lamberts Bay. There are lots of reefs and we work, putting a set of nets there. There is a wave coming but it's not breaking, it's coming and we could see. I told my* bakkie [a small wooden rowing boat typical of the West Coast traditional handline fisheries] *mate that we have to leave and we leave. At that time another* bakkie *came and that morning they smoked something, you could see. I went to them and I warned them, I said guys we've just been out there and we see the sea is standing up so I warned them and they ignored me, went in there and I warned my* bakkie *mate, I said 'you don't go after them, we wait outside'. They went a little bit deeper but we could still see them, they put their nets in the water. Then suddenly, the waves start to break and it turned them upside down. Capsized the whole boat, but from the head down, right over and we had to rush back to save them. The point is the sea warns you and you have to listen to that.*
>
> *W: I wouldn't say the sea is like a person but the sea it will tell you 'it's my area, I'm in control of it' and we have to listen to that. There are so many chances that the sea will show you.*
>
> *JR: It communicates with you in a way.*
>
> *W: Yes.*

Further to this, in the conversation below, one sees how Jacques and Ernest accord seals living in the bay with an intellect which goes beyond merely collecting food. The seals in this example actually learn the best

ways to get fish from fishermen. The seals directly affect fishers' catch efforts as well as the safety of their hands.

> *Jacques: The seals are really clever, the one seal, we don't know where he got his education but you can put your net in the water and then you put down your bait and without destroying your net he will take out the bait.*
>
> *Ernest: The seals aren't stupid, in the past I've caught mullets and you catch mullets with a net so when they come into the net their heads get stuck and they can't go back so you can't pull them, you have to push them through the nets. So the seals catch mullets from the nets, they pull them out and they are well educated. If you fight with a seal, hit him with rocks, disturb him, then he will cause trouble for you and destroy your net. But if you leave him he will just take your bait.*
>
> *Jacques: If the boats come in with catches of snoek then you can come and see what the seals are doing in the harbour. We have a way that we wash the fish, we take it and hit the water with it. Now the seals are clever, they won't come for the head or the middle part of the snoek, they will come for your hand so that you have to let go. And twice now, recently, there were seals who bit fishers.*

Rather than maintaining a conceptual separation of culture and nature, or human and non-human in the accounts above, Ernest and Jacques did not separate themselves from 'nature' around them. Rather they spoke of the sea and seals as knowing beings with which they interacted on an almost equal level. Through their interactions and accounts, the fishers produced particular versions of nature. In these versions, seals learned from people by observing them carefully. For Willem, the sea worked with him if he worked with it. Through their particular ways of knowing and the interactions which resulted from these, the fishers' ascribed attributes of social intelligence beyond themselves and into the natural world. In the context of an EAF and social-ecological research, such ways of engaging and thinking provide potentially powerful means of resolving theoretical and conceptual distinctions between the realms of humans and non-humans. By acknowledging that fishers, seals and the sea are engaged in relationships of mutual influence, a space is made available in which it is possible to view members of social-ecological systems as engaged in symmetrical relationships rather than hierarchies of power.

Discussion

In the ethnographic examples provided in this paper, the fishers provide conceptual interactive tools through which it is possible to rethink conventionally accepted approaches to research and management which rely on binary separations of humans from nature. Fishers hold valuable insights which are particularly pertinent in an EAF-type approach and can be valuable additions when brought into conversation with research and management. Social research on South African fisheries suggests that an approach that criminalises and disenfranchises those who fish for a living (particularly small-scale commercial handline fishers) is ineffective in the management of fisheries because communication is foreclosed, with a resultant increase in poaching and related criminal activity.[1,2,11,43,44]

We have argued that different ways of relating to others (be they human or non-human) inform multiple ways of knowing the world. In turn, these apparently different ways of knowing display moments of convergence as well as divergence. All knowledge positions undertake deletions and translations in order to tell their way of knowing the world. It is precisely because of the deletions and translations that people must make in order to be heard by their peers or other groups, that certain conversations are often rendered difficult and daunting, and become completely untenable. Within the existing fisheries paradigm, public consultations often become battlegrounds.[1] The reasons for this are many and vary with context, but at least part of the reason is that people come to them as stakeholders of particular positions and viewpoints that are pre-defined and as such feel compelled to carry their roles through in public for fear of losing what influence, authority, legitimacy or respect these might have.[1,44,45] In the experience of this project, representing a combined 13 months of field research, ethnographic methods offer a quieter conversational space. This space allows for a mediation of both views that differ from one another as well as those that go against mainstream research, established positions or management objectives. Such a space moves beyond treatments of knowledges as separate entities and acknowledges both convergences and divergences between different ways of knowing. In so doing, it is possible to pose questions and think about unexpected connections across 'the great divide', set up when one contrasts the knowledge of fishers with that of science. In the context of an impending EAF in South Africa, where opening up dialogue is essential to conduct effective research and management, how might fisheries researchers involved in the humanities and social sciences facilitate this? After all, fishers, fisheries managers and fisheries scientists (government and academic alike) undertake 'artful deletions' whenever they speak to one another. One possible avenue, we suggest, is evidenced in the earlier discussion on subspecies of kob. It is important to note here that we are not making a claim either way about the existence of a genetic kob subspecies population in Stilbaai. However, we seek to explore the possibility of collaboration further in line with Verran's[10] work in suggesting the use of alternative frameworks and exploring the situations in which these may be more effective than classical scientific categories in dealing with specific contextual issues. The question of kob genetics and morphology, as discussed previously by *Oom* Koos and *Oom* Louis, points to a possible research project in which fishers and scientists might work with different identification systems in relation to studies of population genetics.

Further to this, recent work has begun to tackle the thorny issue of actually facilitating dialogue between different ways of knowing and systems of classification.[10] Describing an interaction between an Australian Yolngu Aboriginal elder and an environmental scientist, in which the two discussed their alternative strategies for bush firing in the Australian outback, Verran[10] describes what she calls a moment of 'epistemic disconcertment', an interaction which results in discord and unease where the knowledge claims of experts come into contact in what both feel is their 'home turf', revealing divergent ways of perceiving, receiving and being in the world. In the example, collecting two sticks from what are classified in the Linnaean system as two different tree species, a senior Yolngu man suggests to the scientist that the two are in fact the same thing, being in a relationship of grandparent and grandchild rather than separate families. A moment of disconcertment arises as the scientist, drawing on his knowledge of Linnaean taxonomy and plant botany, tries to demonstrate that the two plants are in fact not related.

Eventually, the awkwardness of the situation is eased when the scientist provides an allegory to explain away the disconcertment. However, warns Verran[10], the use of allegory as a 'soothing balm' risks cutting off the possibility of what she refers to as 'generative tensions'– the ability of a situation of disconcertment to force invested parties to invent new ways of working with each other and their knowledge. In this instance, translation of one way of relating to and thinking about the ecology of an area into another weakened the original efficacy. Instead what was necessary was not translation but a means of working through these knowledge positions and moments of disconcertment rather than explaining each other away. The use of allegory explains away the position of others in familiar terms – enacting a translation on their worldview without actually resolving difference, thereby leaving imbalances in knowledge positions unchanged.[10] In Verran's[10] proposition, the tensions which arise from moments of disconcertment are positive because they challenge people to come to new understandings of one another's knowledge. Where allegory is used to explain away differences in perspective, it prevents the different perspectives from finding a possible common ground from

whence to open a productive dialogue. Verran's[10] suggestion is to foster unease with a series of epistemic questions which in turn could enable participants to confront their differences as well as to come to a greater understanding of their own positions. In the context of an EAF, in which a multitude of disciplines, objectives and knowledges are brought together in close working contact, Verran's suggestions are of great significance. If participants are to work meaningfully and respectfully with knowledge and the often divergent perspectives that attend these, it is important to work with difference generatively or else risk marginalising certain positions by claiming them to be merely allegorical.

In the ethnographic interview presented at the start of this paper, *Oom* Louis and *Oom* Koos speak of subspecies of Silver kob not recognised by DAFF scientists or the Linnaean system. In the conversation, these fishers initially speak in terms of common names recognised by the Linnaean system. However, the picture begins to change quickly as the conventional terminology and classifications reach their limits: speaking initially in terms which resonate with an official scientific version of kob, the fishers then speak from their own experiences in which they have come to recognise a range of 'different species' or subspecies not recognised by marine biologists. The means by which they recognise and categorise these subspecies are markedly different from the means scholarly taxonomists would employ within a Linnaean classification. The subspecies are identified by a range of characteristics including long tail and 'funny' fins; broad tail; thin, flat tail; small head and fat body; rounded nose and protruding lower jaw, with the fishers agreeing on the naturalness of these classifications to the extent that they are able to finish each other's descriptions.

Murray et al.[14], writing on the migration and stock structure of cod in the Northern Gulf of St. Lawrence (working with local fishers in conjunction with scientists), found that a more nuanced map of cod population structure and their movements was produced, yet neither group was found to have a complete understanding of these prior to the exercise. Conducting research with local fishers, Murray et al.[14] argue, presents the potential to augment scientific data with higher local resolution, suggesting the prospect of identifying local fish populations. In Gilbert Bay, Southern Labrador, Wroblewski[46] explains how scientists, working with data supplied by local fishers, were able to conduct a taxonomic study which revealed a genetically distinct population of cod which warranted separate management. In light of Murray et al.'s and Wroblewski's findings, the Stilbaai example points not only to a possible collaborative project but also to the existence of a potentially valuable additional system of classification. Even if subspecies in the Linnaean sense may not be identified (i.e. in contrast to the Gilbert Bay example), a further worthwhile collaboration might explore the circumstances in which it may be of advantage to use the fisher's relationality and classificatory system rather than the Linnaean one without carrying out translations (i.e. using allegory) between these two relational 'taxonomies'. This suggestion is in line with Verran's example in which the Yolngu classification of species and associated bush firing practices resulted in a higher plant species diversity than was achieved through conventional scientific firing practices.

Conclusion

In this paper, we have suggested that knowledge is always in a constant state of mediation and translation. All people engage in 'artful deletions' for a number of reasons. On the one hand, the complexity and messiness of knowledge is most often smoothed in the final description of a thing in order to render the subject knowable and more accessible, whether it be to fishers, researchers or managers. On the other hand, fishers, for example, feel compelled to undertake a series of artful deletions when dealing with researchers, managers and factory buyers in order to be heard. Likewise, those interacting with fishers might feel compelled to enact their own artful deletions in order to more effectively communicate their intended message. In the retelling of knowledge, the interactions and relationships (as seen in the kob multiple and 'sea as actor' examples) are, out of necessity, filtered. The shift we have proposed in our work is one which seeks to move beyond an identity politics of knowledge, towards an approach in which knowledge is an open and continual process of evaluating what is known.

One of the guiding principles of conflict mediation is to focus on underlying interests rather than established positions. Fishers and scientists have a shared interest in knowing and understanding the ecologies they work in. Taking this view, how people know something becomes as important as what is known. Understanding the former empowers researchers, managers and fishers alike to enter into dialogue and collaboration on a more equal footing. It is certainly a difficult and lengthy process and there are many biases, assumptions and hierarchies which must be challenged in order to take the work forward. Nevertheless, the relational approach outlined in this paper is an essential first step if researchers are to work realistically with social-ecological systems. The intention is that work such as this engage fishers, scientists and managers in collaborative dialogue. Before embarking on a new path it is necessary to slow down and carefully unpack new concepts, allowing them to take shape through feedback with all concerned and through careful testing. The aim of this paper has not been to present a 'new way forward', but rather to unpack an emerging approach to working with multiple ways of knowing which might benefit future collaborative endeavours. There is certainly a pressing need to address urgent concerns in South Africa's fisheries. However, it is our belief that taking the time to understand the context and the continually evolving knowledges will provide deeper understanding of positions and yield more appropriate and implementable strategies.

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 SA Linefish Symposium (Greg Duggan, Jennifer Rogerson, Astrid Jarre). The NRF Sea-Change project, through grant No. 442316 (Lesley Green), provided bursary funding and research costs for Jennifer Rogerson. Top-up bursaries were received from the Sea-Change grant (Greg Duggan) and the UCT-funded project Marine Research in the Benguela and Agulhas Systems for supporting Interdisciplinary Climate-Change Science (MA-RE BASICS) (Jennifer Rogerson). MA-RE BASICS, the Contested Ecologies project in UCT's Sawyer Seminar series, funded by the Andrew W Mellon Foundation, as well as UCT's Africa Knowledges 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. We thank the participants of the 2012 Linefish Symposium for discussions from which the emphasis in this paper arose. Four anonymous reviewers are thanked for their valuable comments on an earlier version of the manuscript.

Authors' contributions

All ethnography presented in the work emerges from the master's research by G.L.D. and J.J.M.R. A.J. and L.J.F.G. co-supervised both degrees and provided funding for the research from their respective grants.

References

1. Van Zyl M. Heritage and change: The implementation of fishing policy in Kassiesbaai, South Africa 2007 [MA thesis]. Cape Town: University of Cape Town; 2008.
2. EAF Schultz OJ. Belonging on the West Coast: An ethnography of St Helena Bay in the context of marine resource scarcity [MA thesis]. Cape Town: University of Cape Town; 2010.
3. Ommer RE, Coasts Under Stress research project team. Coasts under stress: Restructuring and social-ecological health. Quebec: McGill-Queen's University Press; 2007.

4. Sutton Lutz J, Neis B. Making and moving knowledge, interdisciplinary and community-based research in a world on the edge. Quebec: McGill-Queen's University Press; 2008.

5. Davis A, Wagner JR. Who knows? On the importance of identifying 'experts' when researching local ecological knowledge. Hum Ecol. 2003;31(3):463-489 http://dx.doi.org/10.1023/A:1025075923297

6. Holm P. Crossing the border: On the relationship between science and fishermen's knowledge in a resource management context. MAST. 2003;2(1):5–33.

7. Davis A, Ruddle K. Constructing confidence: Rational scepticism and systematic enquiry in local ecological knowledge research. Ecol Appl. 2010;20(3):880-894. http://dx.doi.org/10.1890/09-0422.1

8. Davis A, Ruddle K. Massaging the misery: Recent approaches to fisheries governance and the betrayal of small-scale fisheries. Hum Organ. 2012;71(3):244-254

9. Green LJF. Beyond South Africa's 'indigenous knowledge – science' wars. S Afr J Sci. 2012;108(7/8), Art. #631, 10 pages. http://dx.doi.org/10.4102/sajs.v108i7/8.631

10. Verran H. Engagements between disparate knowledge traditions: Toward doing difference generatively and in good faith. In: Green L, editor. Contested ecologies: Dialogues in the South on nature and knowledge. Cape Town: Human Sciences Research Council Press; 2013.

11. Rogerson JJM. Above the surface, beneath the waves: Contesting ecologies and generating knowledge contestations in Lamberts Bay [thesis]. Cape Town: University of Cape Town; 2011.

12. Duggan G. In the realm of the kob kings: Rethinking knowledges and dialogue in a small-scale fishery [thesis]. Cape Town: University of Cape Town; 2012.

13. Escobar A. Encountering development: The making and unmaking of the Third World. Princeton: Princeton University Press; 2011.

14. Murray G, Neis B, Schneider D, Ings D, Gosse K, Whalen J, et al. Opening the black box: Methods, procedures and challenges in the historical reconstruction of marine social-ecological systems. In: Sutton Lutz J, Neis B. Making and moving knowledge: Interdisciplinary and community-based research in a world on the edge. Quebec: McGill-Queen's University Press; 2008. p. 100–120.

15. Neis B. Moving forward. Social-ecological interactivity, global marine change and knowledge for the future. In: Ommer R, Perry I, Cochrane K, Cury P, editors. World fisheries: A social-ecological analysis. West Sussex: Wiley-Blackwell; 2011. p. 182–200. http://dx.doi.org/10.1002/9781444392241.ch11

16. Isaacs M, Mohammed N. Co-managing the commons in the 'new' South Africa: Room for manoeuvre? Paper presented at the 8th biennial conference of the International Association for the study of common property entitled, 'Constituting the common'; 2000 May 31–June 04; Bloomington, IN, USA. Mexico City: International Association for the Study of Common Property; 2000. p. 1–23.

17. Shannon L, Cochrane K, Moloney C, Freon P. Ecosystems approach to fisheries in the Southern Benguela: A workshop overview. Afr J Mar Sci. 2004;26(1):1–8. http://dx.doi.org/10.2989/18142320409504046

18. Isaacs M, Hara M, Raakjær Nielsen J. South African fisheries reform: Past, present, and future? Policy Brief No. 16. Cape Town: Programme for Land and Agrarian Studies, University of the Western Cape; 2005.

19. Dengbol P. Science and the user perspective: The gap co-management must address. In: Wilson DC, Nielsen JR, Dengbol P, editors. The fisheries co-management experience: Accomplishments, challenges and prospects. Fish and Fisheries Series 26.Dordrecht: Kluwer Academic Publishers; 2003. p. 31-49.

20. Wilson D, Raakjær Nielsen J, Dengbol P. Local ecological knowledge and practical fisheries management in the tropics: A policy brief. Mar Policy. 2006;30:794–801. http://dx.doi.org/10.1016/j.marpol.2006.02.004

21. Sowman M. New perspectives in small-scale fisheries management: Challenges and prospects for implementation in South Africa. Afr J Mar Sci. 2011;33(2):297–311. http://dx.doi.org/10.2989/1814232X.2011.602875

22. United Nations Food and Agriculture Organisation (UNFAO). Status of marine fisheries. Rome: UNFAO; 1998.

23. Maurstad M. Trapped in biology: An interdisciplinary attempt to integrate fish harvesters' knowledge into Norwegian fisheries management. In: Neis B, Felt L, editors. Finding our sea legs: Linking fishery people and their knowledge with science and management. St. John's, Newfoundland: ISER Books; 2000. p. 135–152.

24. Neis B, Felt L, editors. Finding our sea legs: Linking fishery people and their knowledge with science and management. St. John's, Newfoundland: ISER Books; 2000.

25. Zwaneburg K, King P, Fanning P. Fishermen and scientists research society: A model for incorporating fishers and their knowledge into stock assessment. In: Neis B, Felt L, editors. Finding our sea legs: Linking fishery people and their knowledge with science and management. St. John's, Newfoundland: ISER Books; 2000. p. 124–132.

26. Neis B, Schneider D, Felt L, Haedrich R, Fischer J, Hutchings J. Fisheries assessment: What can be learned from interviewing research users? Can J Fish Aquat Sci. 1999;56(10):1949–1963. http://dx.doi.org/10.1139/f99-115

27. Stanley R, Rice J. Fishers' knowledge? Why not add their scientific skills to the mix while you're at it? Putting fishers' knowledge to work. Vancouver: University of British Columbia Fisheries Centre; 2003. p. 1–23.

28. Murray G, Neis B, Johnson J. Lessons learned from reconstructing interactions between local ecological knowledge, fisheries science and fisheries management in the commercial fisheries of Newfoundland and Labrador, Canada. Hum Ecol. 2006;34(4):549–571. http://dx.doi.org/10.1007/s10745-006-9010-8

29. Stead S, Daw T, Grey T. Uses of fishers' knowledge in fisheries management. AiA. 2006;13(3):77–86.

30. Haggan N, Neis B, Baird I, editors. Fishers' knowledge in fisheries science and management. Paris: United Nations Educational, Scientific and Cultural Organization; 2007.

31. Erdelen W. Foreword. In: Haggan N, Neis B, Baird I, editors. Fishers' knowledge in fisheries science and management. Paris: United Nations Educational, Scientific and Cultural Organization; 2007. p. 21.

32. Shannon L, Jarre A, Petersen S. Developing a science base for implementation of the ecosystems approach to fisheries in South Africa. Prog Oceanogr. 2010;87:289–303. http://dx.doi.org/10.1016/j.pocean.2010.08.005

33. Augustyn J, Petersen S, Shannon LJ, Hamukuaya H. Implementation of EAF in the Benguela Current LME area. In: Garcia SM, Rice J, Charles AT, editors. Governance for fisheries and marine conservation: Interactions and co-evolution. Wiley-Blackwell. Forthcoming 2014.

34. Marine Research Institute. Internal policy document: Marine research in the Benguela and Agulhas systems for supporting interdisciplinary climate-change science (Ma-Re BASICS). Cape Town: Ma-Re; 2010. Available from: http://ma-re.uct.ac.za/ma-re-basics-programme/

35. Anderson TA, Draper K, Duggan GL, Green L, Jarre A, Ragaller S, et al. Conservation conversations: Things and their logics in fisheries management of southern Africa. In: Green L, editor. Contested ecologies: Dialogues in the South on nature and knowledge. Cape Town: Human Sciences Research Council Press; 2013. p. 187–201.

36. Lien M, Law J. Emergent aliens: On salmon, nature and their enactment. Ethnos. 2011;76(1):65–87. http://dx.doi.org/10.1080/00141844.2010.549946

37. Mol A. The body multiple: Ontology in medical practice. Durham & London: Duke University Press; 2002. http://dx.doi.org/10.1215/9780822384151

38. Law J. After method: Mess in social science research. New York: Routledge; 2004.

39. Department of Environmental Affairs and Tourism (DEAT). Coastcare Factsheet Series. Pretoria: South African Government Press; 2001.

40. Latour B. Pandora's Hope: Essays on the reality of science studies. London & Cambridge: Harvard University Press; 1999.

41. Roepstorff A. The double interface of environmental knowledge. In: Neis B, Felt L, editors. Finding our sea legs: Linking fishery people and their knowledge with science and management. St. John's, Newfoundland: ISER Books; 2000. p. 165–188.

42. Anderson T. Tracking the movement of fish: Skipper's logbooks and marine knowledges in fisheries management [thesis]. Cape Town: University of Cape Town; 2011.

43. Hauck M, Sowman M. Co-management of coastal and fisheries resources in South Africa: Policy and legislative framework. Waves of Change. Cape Town: UCT Press; 2003. http://dx.doi.org/10.1016/j.marpol.2007.11.004

44. Isaacs M, Hara M. Mainstreaming of HIV and Aids into South African fisheries policy. PLAAS Policy Brief. 2008;27.

45. Hauck M. Rethinking small-scale fisheries compliance. Mar Policy. 2008; 32:635–642.

46. Wroblewski J. The colour of cod: Fishers and scientists identify a local cod stock in Gilbert Bay, Southern Labrador. In: Neis B, Felt L, editors. Finding our sea legs: Linking fishery people and their knowledge with science and management. St. John's, Newfoundland: ISER Books; 2000. p. 72–81.