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This is a published version of a paper published in *Maritime Studies*.

Citation for the published paper:

Gallardo Fernández, G., Hauck, M. (2013)

"Crises in the South African abalone and Chilean loco fisheries: Shared challenges and prospects"

Maritime Studies, 12(3)

Access to the published version may require subscription.

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RESEARCH

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Crises in the South African abalone and Chilean loco fisheries: shared challenges and prospects

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Abstract

Worldwide there is an increasing realisation that there is an inextricable link between the natural and human systems, and there is a need to integrate these into the governance of small-scale fisheries. The critical importance of adopting such an approach is argued in this paper by exploring the challenge of resource over-exploitation in the abalone fishery in South Africa and the loco fishery in Chile, both of which faced unsuccessful fishery closures and the implementation of Territorial Use Rights in Fisheries (TURFs). By exploring similarities and differences in fisheries context and approaches, these case studies highlight that although management strategies have been progressive on paper, they are compromised, to different degrees, by a lack of understanding of the socio-economic and political factors that are influencing the fisheries system. We argue that unless a more integrated approach is adopted to understand the social-ecological system as a whole, few long-term benefits will be secured for both the resources and the livelihoods of fishers.

Keywords: Small-scale fisheries, South Africa, Chile, Loco, Abalone, Governance

Introduction

Worldwide, natural resource management has shifted from a centralised, top-down approach to a more holistic and people-centred approach that has involved resource users and communities in management and decision-making (Meinzen-Dick and Knox 2001). In the coastal and fisheries arena, similar trends are occurring in the area of small-scale, or artisanal, fisheries management (Berkes et al. 2001; Kooiman et al. 2005). In particular, there is an increasing realisation of the inextricable link between the natural and human systems, and the critical importance of integrating social, political, cultural and institutional factors into the governance of small-scale fisheries (Kooiman et al. 2005; McClanahan and Castilla 2007; Pomeroy and Andrew 2011). The notion of 'systems thinking' highlights these linkages and reinforces the need to incorporate the human and ecological dimensions into more holistic approaches to governance (Charles 2001; Garcia and Charles 2008). Fisheries co-management has also evolved over the past two decades to highlight the importance of establishing partnerships between fishers, government authorities and other stakeholders, to share responsibility and decision-making on resource use and management (Wilson et al. 2003). This process of sharing power between the stakeholders is considered key to ensuring that the needs and aspirations of the fishers are acknowledged and incorporated into

management arrangements (Jentoft 2007). A move to alternative and more innovative approaches to management have often been stimulated as a result of resource depletion, and in some cases, resource crises (Christy 1992; Ostrom 2009). Although this may catalyse increased collaboration, a 'crisis' may be perceived differently between stakeholders, depending on how the problem is defined, and by whom (Chuenpagdee and Jentoft 2007). The definition of the problem will invariably impact on the strategies that are developed to address it (Mahon et al. 2005).

This paper aims to explore and compare the challenge of resource over-exploitation in two small-scale fisheries in South Africa and Chile (see Figure 1), where new management approaches have been introduced to address resource collapse, and where the importance of adopting a systems approach is evident. One must acknowledge upfront, however, that there are important differences between the fisheries systems in each country, not the least of which is the fact that the rights allocation policies were implemented differently, with rights allocated to individuals in South Africa and to collectives in Chile. Nevertheless, by acknowledging these differences, and exploring the similarities, these case studies highlight that although management strategies have been progressive on paper, they are compromised, to different degrees, by a lack of understanding of the socio-economic and political factors that are influencing the fisheries system. Further, new governance approaches need to reflect the perceived crisis in relation to fishers' experiences and circumstances, and not only in relation to resource collapse. As Wärneryd and Hilding-Rydevik (1998) argue, environmental problems are social problems.

By first describing the abalone fishery in South Africa, and then the loco fishery in Chile, the paper concludes with six key observations that have emanated from research in both countries: (1) an outright fishery ban did not address the problem of resource over-exploitation; (2) fisheries governance is significantly affected by political transition at a national level; (3) fisheries decision-making remains too centralised; (4) illegal fishing is driven by a variety of factors and is a significant challenge to fisheries

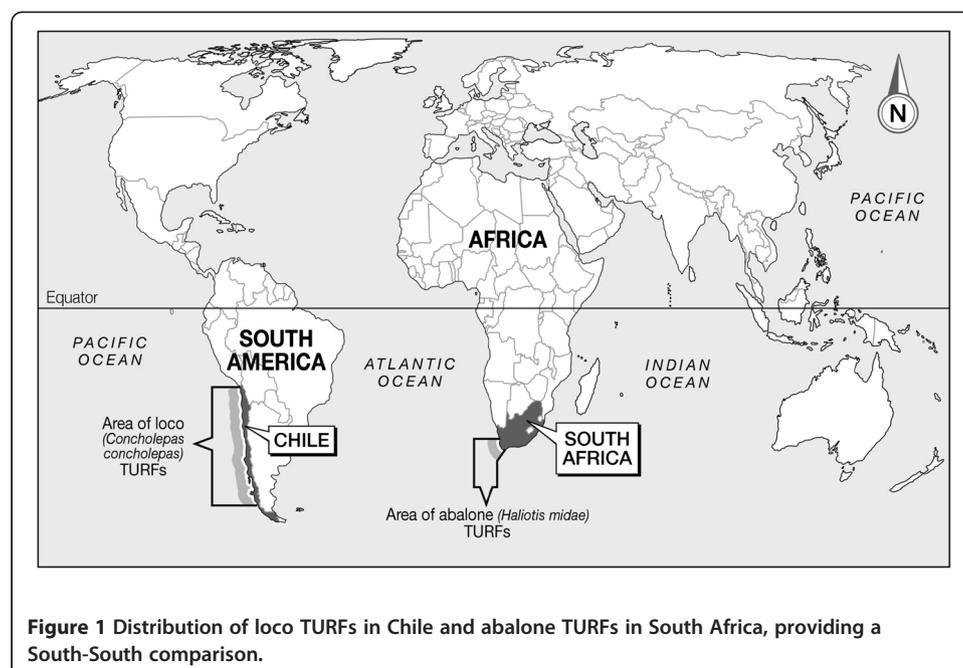


Figure 1 Distribution of loco TURFs in Chile and abalone TURFs in South Africa, providing a South-South comparison.

management; (5) strong fishers' institutions are pertinent to effective decision-making and (6) the principle of equity is a key consideration in fisheries governance. Each of these themes highlights the importance of understanding the social, economic, ecological and institutional dimensions of the fisheries system.

Southern perspectives: comparisons between South Africa and Chile

Research over the past decade is drawn on from both South Africa (Hauck 1999, 2009; Hauck and Sweijd 1999; Tarr 2000; Hauck and Kroese 2006; Raemaekers and Britz 2009; Raemaekers et al. 2011) and Chile (Stotz 1997; Meltzoff et al. 2002; Orensanz et al. 2005; Gelcich et al. 2005, 2006, 2010; Gonzalez et al. 2006; Castilla et al. 2007; Zuñiga et al. 2008; Gallardo 2008; San Martin et al. 2010; Gallardo et al. 2011; Gallardo and Friman 2011) to understand, through a comparative analysis, the dynamics and management approaches of the abalone (*Haliotis midae*) and loco (*Concholepas concholepas*) fisheries. Empirical research by the authors over the past 15 years in South Africa (for example, Hauck 1997, 1999, 2009; Hauck and Sweijd 1999), and the past ten years in Chile (Gallardo 2008; Gallardo and Friman 2010; Gallardo et al. 2011; Gallardo and Friman 2011), has included extensive fieldwork in coastal communities, which has largely relied on participatory research methodology, focus groups, key informant interviews, and in some cases quantitative surveys. This paper, therefore, is a review of secondary research on these fisheries, which includes reference to the previously published work of the authors. Although biologically different, the carnivorous loco is known as 'false abalone' due to the fact that it resembles the herbivorous abalone (Geaghan and Castilla 1988). These fisheries have a different historical timeline and they are influenced by unique national socio-political, economic and fishery dynamics (Table 1).

Although there are differences, the abalone and loco fisheries also incorporate a number of characteristics that lend themselves to comparison. First, both the abalone and loco species are destined for the Asian market as a delicacy enjoyed by the wealthy and growing middle class, which resulted in a 'harvesting fever' in both countries. Second, an illegal trade in abalone and loco have threatened, to various degrees, the sustainability of both fisheries. Third, both resources are located inshore and have historically been harvested by fishers as an important source of food and/or income. Finally, although due to different historical backgrounds, South Africa and Chile have both experienced a political transformation to democracy in the past two decades that has resulted in new fisheries legislation and policies. These new laws have embraced broader approaches to fisheries governance, such as Territorial Use Rights in Fisheries (TURFs) and co-management arrangements, although implementation strategies have differed between the countries. Both case studies will be described in more detail below, highlighting the management challenges as well as the different management approaches that have been adopted. The paper will conclude with a discussion of the key lessons that have emerged from both cases, and which we argue are important to consider for small-scale fisheries governance more broadly.

The fisheries crisis in South Africa

The abalone fishery in South Africa has been identified as one of the most difficult fisheries to manage (Branch and Clark 2006). This is a result of a combination of factors, but largely refers to the significant rise in the organized illegal trade of abalone since the mid-1990s

Table 1 Key characteristics of the abalone, loco and broader fisheries context in South Africa and Chile

<i>Fishery characteristics</i>	South Africa¹	Chile
Beginning of commercial fishery	1949	1940
Beginning of export	~1980s	1974-5
Extent of marketing	Worldwide	Worldwide
Main export destination	Asia (100%)	Asia (85.3%)
Maximum landings	2800t (1965)	25 000t (1980)
End of open access	1968	1981
Seasonal ban/closing	N/A	1981-1984
Introduction of quota system	1970	1985 -1989
Allocation of quotas	Individual (regional quotas)	Global regional quotas
Total closure of fishery	2008/2009	1989-1992/1992-2003/2003-2008-
Benthic Exploitation Regime (BER):		1993-97
Allocation of quota through tickets		12 Regional TAC
TURF regulation/decreed (Chile)/ TURF policy (South Africa)	2003	1995
Number of TURFs 2007 ²	15	664 (with decree) ³
Legal catch in 2007	125t	2939t
Estimated illegal catch in 2007	~927t	Half of the legal
Export price per kilogram in 2007 (whole mass)	US\$ 55.17	US\$ 15. 9 ⁴
Number of fishers under the TURFs in 2007	1096 ⁵	~30 000
Broader context		
Regimes previous to democracy	Apartheid (1948-1994)	Dictatorship (1973-1989)
Onset of democracy	1994	1989
Neo-liberal policy	1996	1974-75
Democratic fisheries legislation	1998	1991
Establishment of representative fisher organisations	2003	1965-1973 [1973-1989] ⁶ 1990-

¹ Much of this data is based on Sauer et al. 2003 and Raemaekers et al. 2011.

² The year 2007 is used for the following data in the table as it was the last year before South Africa's abalone fishery was closed (which corresponds to the official 2006-2007 fishing season). The fishery re-opened in 2010 but more recent data has not been obtained.

³ Gallardo (2008:99).

⁴ IFOP 1987 (Julio)-2008.

⁵ The estimated number of fishers is based on a 2006 calculation that included 264 individual rights holders, 40 diver entities (for example, companies) and 792 crew members (*pers comm.*, G. Maharaj, DEAT).

⁶ Labour organisations suppressed during Pinochet's government (1973-1989).

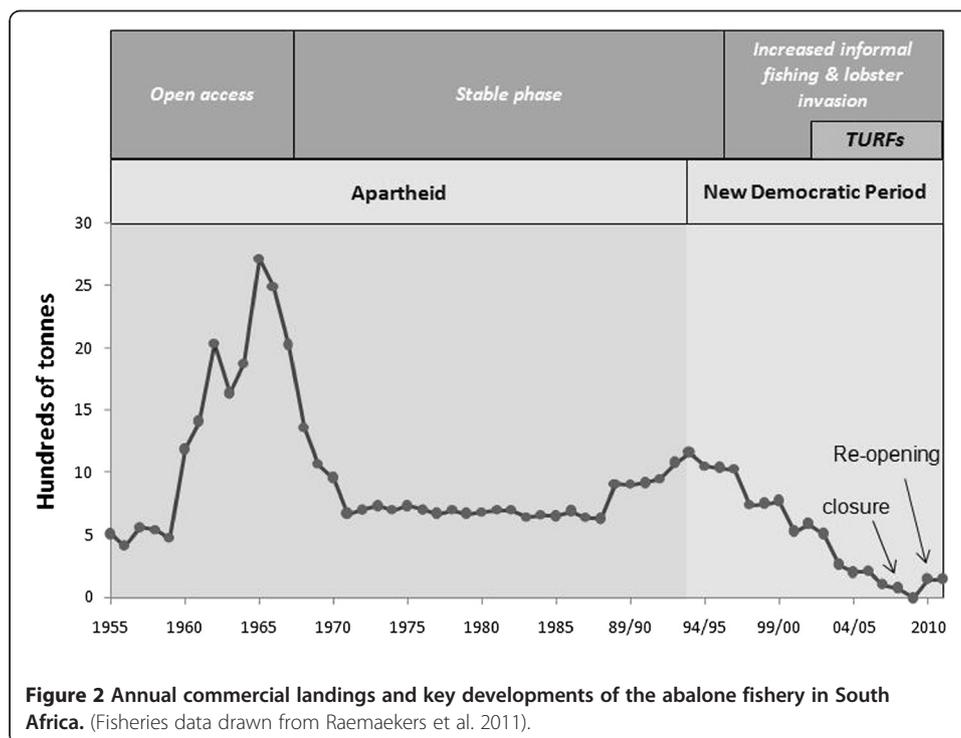
and the growing impact of ecological factors due to a mass migration of west coast rock lobster into key abalone areas (Tarr 2000). The combined impact of these phenomena have led to a 'resource crisis,' which saw an 88 percent decrease in the Total Allowable Catch (TAC) of the fishery from 615 tonnes in the 1995/6 season to 75 tonnes in the 2007/08 season, and complete closure of the fishery in 2008. The high profile of this fishery began in 1994 with what was known as the 'abalone war,' characterized as violent confrontations between the police and different fisher groups (Hauck 1999).

South Africa's commercial abalone fishery began in 1949 with an open access fishery (Sauer et al. 2003). Personal and subsistence use of the resource, however, has a much longer history and elderly coastal residents recall how they used to wade up to their ankles and harvest from the rocks (Hauck 1997). Commercial licenses were required from 1954, but there were no limits on harvesting, which was largely influenced by

demand. The commercial fishery was supplying a growing export market, particularly to Japan and South East Asia. The peak of the industry was in 1965, when 2,800 tonnes of abalone was harvested, with 14 processing plants and 112 divers operating in the fishery (Sauer et al. 2003). Due to a concern over the declining resource, the first catch regulations were put in place in 1968, with quota limits applied to the fishery from 1970. See Figure 2 for an overview of commercial landings since 1953.

Thus, the open access fishery evolved over a period of almost 50 years into four distinct sectors, defined through fisheries law as a means to regulate access: (1) commercial (industrial scale); (2) recreational (for sport); (3) subsistence (for personal consumption and limited sale); (4) limited commercial (largely for sale but on a small-scale). The latter two sectors (subsistence and limited commercial) emerged in South Africa's post-democratic fisheries law and policies as a means to cater for historically disadvantaged individuals that were previously excluded from harvesting marine resources due to apartheid policies (Isaacs 2006; Sowman 2006).

In addition to the formal fishery sectors outlined in law, the informal fishery^a emerged in the late 1960s when increased government regulations were put in place to limit harvesting (Hauck 2009). This fishery became significantly more organised and lucrative in the early-1990s, linked to high prices, the opening up of export markets, political drivers and ineffective regulatory measures. Thus, the black market fishery evolved from traditional fishers, many of whom were unsuccessful in receiving a formal (that is, legal) right to fish, to opportunists, who turned to this fishery for high economic gain. Thus, the profile of such fishers changed over time and varied between coastal regions (Hauck 2009; Raemaekers and Britz 2009), and had an increasingly negative impact on the fishery (Raemaekers et al. 2011).



Serious concerns over the status of the abalone resource and conflict between the stakeholders led to a number of regulatory measures, some of which will be discussed further below. However, the battle to save the abalone fishery had effectively been lost when the national Minister responsible for fisheries announced the closure of the abalone fishery effective from February 2008. Following the closure of the fishery, whereby 302 small-scale commercial fishers, their crew and their families had their livelihoods uprooted, organized illegal fishing continued to thrive. Animosity towards the state intensified in coastal communities and a groundswell of political pressure emerged so strongly that the newly appointed President of South Africa announced the re-opening of the fishery in 2010.

Socio-economic and political context of the abalone fishery

The crisis in the abalone fishery has not only been influenced by changes in the ecosystem, but also by social, economic, political and institutional drivers (Hauck 2008, 2009; Raemaekers et al. 2011). The socio-economic system related to small-scale fisheries in South Africa has been significantly influenced by the discriminatory laws of the past (Hersoug and Holm 2000; Hauck and Sowman 2005). The various policies and laws of the colonial era and apartheid regime effectively denied the majority of black ethnic groups^b access to and ownership of vast stretches of South Africa's coastline and resources. Furthermore, the country's historical legacy has contributed to coastal poverty through racial segregation, land dispossession and unequal distribution of natural resources (Glavovic and Boonzaier 2007).

South Africa's democratic elections in 1994, however, led to a radical transformation of policies and laws that sought to address the inequities that emanated from the apartheid era. The fisheries sector was no exception and South Africa's first democratic fisheries law was promulgated in 1998 as the Marine Living Resources Act (MLRA 1998). In addition to ensuring the long-term sustainable use of marine resources, the Act also seeks to promote equitable access to marine resources, transform the fishing industry and promote socio-economic benefits for coastal communities (Hauck and Sowman 2005). This law had significant implications for all of South Africa's fisheries, including abalone. The TAC for the abalone fishery was redistributed to many more entrants and the historical commercial and recreational sectors were extended to include small-scale fishers for the first time (defined as 'subsistence' and 'limited commercial' in law and policy). While there were only five abalone quota holders in 1992 ('white-based' companies), this increased to 271 (mostly individuals) in 2002. Of these 271, 84 percent were allocated to the 'limited commercial sector', which aimed to encompass small-scale traditional fishers (Raemaekers et al. 2011).

Although political transformation was necessary, various obstacles included cumbersome application processes, local elites gaining access at the expense of traditional fishers and economically unviable quota allocations (Isaacs 2006; Sowman 2006). Due to a limited resource, not all applicants were successful in their attempt to gain access to the fishery, often resulting in families, friends and neighbours in conflict, with some who 'got' and some who did not (Hauck 2009). Furthermore, the implementation of the MLRA has proven problematic in practice due to the conflicting objectives of sustainability, stability and equity, which were not adequately defined or prioritised in the Act (van Sittert et al. 2006; Witbooi 2006). Further, these objectives are influenced by broader national

policies, such as a macro-economic policy that favours neo-liberalism (van Sittert et al. 2006). This has promoted a market-driven approach through international trade rather than more direct interventions in terms of poverty alleviation (van Sittert et al. 2006; Isaacs et al. 2007). With high consumer demand for South Africa's abalone in the Far East, coupled with an opening up of international export routes following democracy, the abalone fishery became highly lucrative and attracted the interests of both traditional fishers and large-scale profit-seeking individuals and groups. With the entire commercial catch being exported to the Far East, the focus of management was on ensuring an economically viable fishery within the limits of the resource. Thus, despite new legislation to address the inequitable access to marine resources, there remained significant unrest in coastal communities where many fishers still felt excluded. This dissatisfaction with new policies and laws was particularly glaring in the abalone fishery where illegal fishing continued to thrive (Hauck 2009).

The illegal fishery has far outweighed the commercial fishery in terms of harvest in recent years, with a commercial TAC of 125 tonnes in the 2006/7 fishing season as opposed to an estimated illegal catch of over 900 tonnes during the same year (Raemaekers et al. 2011). The *modus operandi* of the illegal fishers changed from small-scale to large-scale operations, the use of technology became increasingly sophisticated and the abalone fishery infiltrated into existing criminal groups (Steinberg 2005). The proliferation of the illegal abalone trade coincided with a decreasing commercial TAC and a growing despondency of commercial fishers, resulting in enormous challenges to the fisheries authority and an attempt by the state to respond with new and varied management strategies.

Management approaches in the abalone fishery

Since 1995, both government and civil society organisations have put in place a number of management measures to improve compliance and sustain the abalone fishery. Although these interventions have been varied, and have involved a wide number of stakeholders, none have had long-term success. Management strategies were developed as a means of achieving the MLRA's objectives and in response to a concern for the growing illegal trade. In particular, and in line with the new fisheries law to address historical inequities, the redistribution of fishing rights led to the transformation of the commercial abalone fishery. This was significant at the time, and although there were challenges, it provided an opportunity to extend access to the fishery to many more people along the coast, including those who had traditionally harvested abalone.

In addition to the political impetus to redistribute access rights, a primary strategy of government has been to enhance law enforcement, effectively increasing its overall compliance budget by 300 percent (from 1995-2004) in order to create a greater presence along the coast and to target organized criminal syndicates (Hauck and Kroese 2006). The past decade has seen the focus on law enforcement intensify in response to the increasingly organised black market trade, with the fisheries authority enhancing its criminal investigation capacity, establishing partnerships with other law enforcement agencies (such as the national police, army and navy), devolving compliance authority to other organisations and levels of government and seconding specialised prosecutors to focus on serious marine offences (Hauck and Kroese 2006). The impact of these law enforcement efforts, however, has been challenged with the recognition that the illegal

fishery continues to grow. In addition to limited resources and capacity, coupled with allegations of state corruption, law enforcement strategies are not adequately supported by traditional fishing communities where illegal fishing takes place. The lack of legitimacy of existing rights and laws governing abalone fishing has eroded an obligation to comply, and has also hindered the initiation of social controls (Hauck 1999, 2009).

Although important attempts were made by the fisheries authority to initiate various management strategies (including those discussed above), the abalone policy of 2003 (DEAT 2003) will be highlighted here as the most ground-breaking. This policy, which established the parameters for the 'long-term' (ten year) rights allocation, proposed a new management plan for the abalone fishery that was considered a 'radical shift' forward (Department of Environmental Affairs -DEAT- 2003:3. It clearly stated that current management strategies had 'failed to effectively curb poaching' and that the abalone resource 'has been seriously overfished and it has collapsed' (DEAT 2003:3). Indeed, this policy was a progressive way forward as it introduced the concept of co-management, recognised ecosystem impacts (the importance of managing the migration of west coast rock lobster into key abalone areas), suspended the recreational fishery in the interests of sustaining commercial livelihoods, established ten year rights and initiated a TURF system.

Although this policy embraced a number of principles that ought to have enhanced the management of the abalone fishery, there were significant obstacles that minimised its effectiveness. One key obstacle was the ineffective implementation of the TURF system due to the sharing of some zones between fishers, instead of ensuring exclusive use by those living adjacent to the zone. In addition, the TAC was allocated to individuals (within zones) rather than allocated to a collective. A second key obstacle was the lack of consultation and engagement with the stakeholders in the abalone fishery in order to develop meaningful co-management arrangements, as well as inadequate budget and capacity within government to enact institutional change and decentralisation. Third was a lack of formal organisation among abalone fishers, and among small-scale fishers more broadly in South Africa. Disjointed groups and conflicting voices weakened the fishers' position to negotiate with government. Finally, there was an expectation from government that fishers would 'protect their areas' from illegal fishers and outsiders. However, fishers were unable to 'protect' their area from friends and relatives who were not given an individual right but who relied on abalone harvesting for their livelihood (Hauck 2009). Thus, an inadequate understanding of the socio-economic and political dynamics of the fishery, coupled with ongoing annual cuts in the TAC, exacerbated the challenges in the abalone fishery despite attempts at more integrative policies and laws.

The fisheries crisis in Chile

Historical evidence indicates that loco was part of the diet of coastal inhabitants in Northern Chile and Southern Peru as far back as 6,000 years ago (Reyes 1986). However, information on Chile's loco landings prior to the 1960s is scarce. Some data from 1926 indicates that 67 tonnes of loco were landed, but during the 1940s loco landings were between 1,000 and 2,000 tonnes per year (Reyes 1986).

Up until the mid-1970s, loco consumption was largely domestic and harvesting took place under an open access regime (Stotz 1997). Loco and other benthic species were also targeted by summer visitors and recreational fishers during low tides. There were

no regulatory controls except for two different minimum legal shell sizes for the north and the south, established in 1965 (Geaghan and Castilla 1988). Yearly landings before the export boom, which started in 1975, were about 4,000 tonnes (Castilla et al. 2007), but in a short period loco landings reached an unprecedented figure of 25,000 tonnes in 1980, marking its historical maximum that year. Due to the high price of loco, numerous people who did not have a historical link to artisanal fishing also became involved in loco harvesting. Thus, the resource crisis of the loco fishery emerged during the export boom in the late 1970s, when the yearly landings of loco grew significantly to meet international demand (Castilla 1995; Castilla et al. 2007; Meltzoff et al. 2002; Moreno et al. 2007). In an attempt to respond to the perceived over-exploitation of loco, a number of management measures were implemented. Between 1981 and 1992, three different regulations were sequentially introduced: (1) reproductive seasons or seasonal closing (1981-1984); (2) global national quota (1985-1989); and (3) total closure (1989 and extended by consecutive periods) (Castilla 1995). However, none of these regulations were implemented with much success. During the global quota period, official landings were set at a national limit of 4,000 tonnes per year. This quota was exceeded in 1985 and 1986. In 1987, 21,000 tonnes of loco were officially landed, while one million units of illegally caught loco were confiscated by the authorities (Reyes 1990; Meltzoff et al. 2002). In fact, it is argued that the new policy measures exacerbated the black market trade and the export of loco, and at the same time the global quota was being exceeded and filled too quickly (Meltzoff et al. 2002). Before the reproductive seasons were introduced, the high loco prices exacerbated competition and tension between local and migrant non-local fishers and this came to be known as loco 'fever' or loco 'war' (Meltzoff et al. 2002). With a growing concern over the sustainability of the resource, the authorities finally took the radical decision to completely close the fishery in 1989 (Castilla et al. 2007), just before the return of democracy to the country.

The first extraction ban of loco in Chile (1989-1992), which should have allowed for a moderate recuperation of the species, also led to a number of challenges such as increased prices and illegal fishing (Stotz 1997; Castilla 1995; Meltzoff et al. 2002). In addition, the ban resulted in a lack of scientific data to monitor the resource (as no stock evaluation could take place), enhanced political unrest (Orensanz and Parma 2010) and from the state's perspective, a loss in taxes from the banned fishery (Meltzoff et al. 2002; Castilla et al. 2007). Thus, the ban led to a variety of conflicts, with diverse role players unable to reconcile different economic, conservation and livelihood objectives. In 1990, under the new democratic period, fishers demanded that the ban be lifted (pers comm. S. Tapia, former president of the TURF Huentelauquén).

The series of failed measures eventually led to a new fishing law in 1991 and a decree (a rule of law issued by the head of state) in 1997 for the implementation of Management Areas (MAs), or Chilean TURFs, which was an attempt to approach fisheries management differently: from individual and competitive extraction to collective and organized extraction in fixed places, putting an end to fishers' traditional migrations.

The new Fishery Law (LGPA) guarantees artisanal fishers an exclusive area five miles from shore (LGPA 1991, Título IV, Art. 47; Subpesca 1991), with TURFs allocated from shore. The land spaces from where fishers organize the operation of their fishing activities (called *caletas*) are in rural and urban areas equivalent to fishing villages/towns, however some fishers have only small huts, fishing implements and their individually owned boats

at the *caleta*, living some distance away. In the former case, the *caletas* and their associated TURFs are more community based. In the latter case, the *caletas* form more transient communities brought together for the purpose of production or fish harvesting.

Socio-economic and political context of the loco fishery

The first evidence of loco resource depletion, as well as the first measures to try to address 'over-exploitation,' occurred during Pinochet's regime (1973-1989). Neo-liberal policies during this time resulted in a re-structuring and adaptation of the fishing sector in accordance with globalization requirements. Similar to other parts of the world, Chile's export policy re-channelled fisheries supply from local and regional markets to international markets (Gallardo 2008). A higher demand for loco in the international market was facilitated nationally through local credit programs and a favourable exchange rate that stimulated boat investment and processing plants (Castilla 1995; Meltzoff et al. 2002; Castilla et al. 2007; Moreno et al. 2007). Since the mid-1970s, both industrial and artisanal fishing increased considerably and during the 1980s, fisheries were the fastest growing economic sector in Chile (Castilla et al. 2007). Thus, although Chile is a relatively small nation, it holds its position as one of the top ten countries worldwide with the highest fisheries landings (Gallardo 2008).

Following democracy in 1989, a new fisheries law was promulgated in 1991 that continued to prioritise an economic policy that aimed to integrate the Chilean economy into the global market, thus legitimizing Pinochet's neo-liberalism, but it also aimed to be more inclusive and participatory, especially in relation to artisanal fisheries. This was a significant shift from the years of Pinochet's dictatorship, when participation was not on the political agenda.

Although fishing organisations have been established nationally in Chile since 1965, they ceased to operate in 1973 after the *coup d'état*. In 1985, a national commission for the support of artisanal fishers was gathered and this led to a new national fishers' organisation in 1990 under the new democracy. There are now two national confederations (CONAPACH and CONFEPACH), 35 regional federations, and at the ground level there are the unions, guilds associations and cooperatives, which are the three legal forms of fisher collectives. Through their collective power, artisanal fishers have become markedly stronger, securing five marine miles for their primary use, obtaining allocations of sea bottom through the TURFs for coastal fishers, and influencing changes to fishing law and related decrees.

Management approaches in the loco fishery

After several years of failed state measures and bans to halt resource depletion, the 1980s also saw fishers' groups in Chile imposing bans on themselves, in collaboration with scientists from national universities in some parts of the country. Experimentation with no-take zones, which became successful in terms of improving yields, led to alternative management strategies in the form of TURFs (decree No. 355/95; Subpesca 1995). TURFs were first implemented from 1997/98 (Meltzoff et al. 2002; San Martin et al. 2010), and promoted conservation, economic and social objectives (Subpesca 1995). Before this, from 1993-1997, another fishery measure was in operation called the Benthic Extraction Regime (BER), which consisted of quota allocations through 'tickets'. However, this management strategy was short lived

due to various challenges and became obsolete as the TURFs started to be implemented (Gallardo 2008).

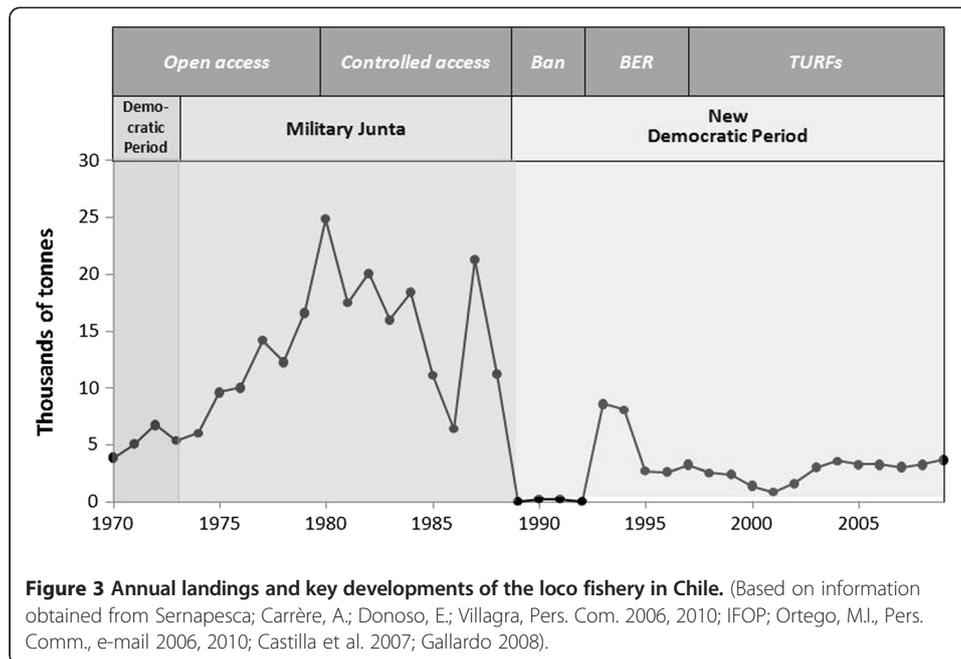
In this way, Chile initiated a TURF system that provided exclusive access to specific geographical areas, thus being space-based. TURFs are only allocated to organisations, requiring fishers to come together as collectives in order to be eligible to apply for, obtain and manage a TURF. The loco fishery continues to be banned outside of TURFs, thereby providing a direct incentive to apply. The initiation of the TURFs was strongly subsidized by the state, contributing up to 75 percent of the cost of baseline studies and follow-up assessments, including a four year moratorium on tax payments. Although loco are not the only resource exploited in the TURFs, they are, beside sea urchin, the most economically important and therefore the main motivation behind the implementation of the TURFs (San Martín et al. 2010). Since 1997, the number of TURFs has increased consistently. At present, approximately 40 percent of registered fishers belong to a TURF, and according to the authorities, almost all fishers that work with benthic resources are presently subsumed under the TURF system (pers comm. J. Rivera, Subpesca, Nov 2008).

The establishment of TURFs has led to changes of major significance regarding fishing practices and related activities. Not only have institutional arrangements changed radically, but there have also been significant impacts in terms of commercialization. The greatest achievements are considered to be those related to conservation objectives as well as social issues (Meltzoff et al. 2002; Orensanz et al. 2005; González et al. 2006; Castilla et al. 2007; Montoya 2007; Gelcich et al. 2008, 2010; Gallardo 2008; Zúñiga et al. 2008).

The conservation outcomes of the TURFs have been considered significant (Castilla et al. 2007; Gelcich et al. 2010). According to Gelcich et al. (2010:4), the success of TURFs is a result of an 'increase in abundance and individual size of targeted resources within the MEARBS [TURFs] in comparison with open access'. In addition, the TURFs have 'served as experimentation tools to refine stock assessment and management procedures' (Defeo and Castilla 2005:275). However, while landings have stabilized (see Figure 3), other studies have questioned the optimistic assessment of the conservation objectives, highlighting the existence of a dual system whereby fishers 'look after' their own TURFs but fish illegally outside their areas, despite the ecosystem linkages (Orensanz et al. 2005; Gallardo and Friman 2011).

Socio-politically, the fishers have become strengthened and powerful at various levels and in different areas. TURFs have led to an increased sense of fishers' 'ownership' over fishing areas, enhanced capacity of fishers and led to a series of incentives. TURFs have also contributed to a collective approach amongst the fishers. Fishers were required to become organised, which was significant in that Chile's political history had partially dismantled fishers' organisations. Thus, in the case of many TURFs, organisation strengthened collective action and contributed to joint decision-making. Further, this collective strength enhanced fishers' power to negotiate more broadly with other stakeholder groups, especially with middlemen and export firms (Montoya 2007; Gallardo 2008; Zúñiga et al. 2008; Gelcich et al. 2010; Gallardo and Friman 2011).

Presently fishers are harvesting in fixed fishing grounds, while previously they could fish freely throughout the country. The 1991 fishing law resulted in fishers being fixed geographically to only one region. Thus, instead of competing for the resources in groups of three or four, as they had done in the past, all the members of the TURFs



now harvest collectively. However, the fixed nature of harvesting in particular geographic zones has also been recognized as problematic by some authors as well as by fishers (Gallardo et al. 2011), with others also arguing that fishers are losing their traditional fishing practices and skills (Gelcich et al. 2005; Aburto et al. 2009). These, and other potential losses to fishers as a result of the TURFs, need to be explored further.

TURFs have also led to economic benefits, providing in some cases opportunities for fishers to diversify their livelihoods to other spheres such as gastronomy and tourism. The fact that fishers operate collectively in the TURFs, and plan their harvesting strategies carefully and at economically convenient times, has resulted in greater efficiency and left fishers with more time to pursue other occupations (Gallardo 2008; Gallardo and Friman 2011). The economic viability of the TURFs varies from case to case, but it is largely recognized that very few fishers are able to rely exclusively on revenue from the TURFs for their livelihoods (Gelcich et al. 2006; Montoya 2007; Zuñiga et al. 2008; Gallardo and Friman 2011). Thus, although TURFs have proven to have important economic benefits for fishers, concerns about the economic viability of TURFs have also been highlighted (Montoya 2007; Zuñiga et al. 2008; Gallardo et al. 2011; Gallardo and Friman 2011). For example, Zuñiga et al. (2008) studied 30 TURFs in Region IV, finding that only five did well economically, while the rest performed inadequately or badly. This raises concerns regarding fishers' livelihoods, and the potential impetus that this provides for fishers to justify illegal fishing. The economic benefits of the TURFs are therefore important, and some areas have proven more financially viable than others. Nonetheless, fishers have always had additional occupations, some related to fisheries and others not. TURFs that rely only on loco occupy the fishers only at specific times of the year (Gallardo 2008).

Issues of equity also need to be explored more thoroughly in relation to TURFs and the ways social groups relate (Gallardo and Friman 2010). Prior to the resource crisis and the bans, the loco fishery was open access. Thus, the TURF system introduced the notion of 'exclusion,' a key characteristic of TURFs (Christy 1992). TURFs were initiated

with fishing groups that, despite traditional migration, had a history of fishing in particular areas. To achieve fairness amongst fishing organizations, the law established a series of criteria for allocating TURFs. However, the boom of the loco attracted more people into the fishery (not necessarily fishers by profession). While in theory it is argued that when the number of TURFs increases, the number of those excluded should also diminish, there are challenges in relation to determining *who* gains access to the TURFs, and *how* a fisher is defined.

According to the First National Fishing Census (INE 2008-2009), approximately 17 percent of artisanal fishers in Chile are '*Pueblos Originarios*,' or indigenous people. In January 2008, a new law (nr. 20.249) was promulgated that aims to protect indigenous people's rights to their traditional spaces, partly addressing the rights of coastal people in response to historical dispossession of land and resources. This law gives preference to coastal spaces for the purpose of aquaculture, marine or management areas to indigenous groups, provided they can show that they have been exerting a consuetudinary use (fishing use, religious, recreational or medicinal, among others) over the space (Ministerio de Planificación Nacional y Política Económica –MIDEPLAN- 2008). It is interesting to note that when these use rights are given to the indigenous communities, they are given for an indefinite time, which is not the case with the TURFs given to non-indigenous people, which are for four years subject to renewal. Another equity issue is the difference between marine destinations given to artisanal fishers and those given to large companies, many of them being international. Fishers are asking authorities to change the TURF legal concept from destination to concession, more similar to the one the large-scale aquaculture farms enjoy. This change would give fishers more tenure security as concessions are for longer time periods.

There have been important positive benefits that have emerged as a direct result of Chile's TURF policy. In particular, conservation outcomes have been positively identified within the TURFs (not necessarily 'outside' them) (Oresanz et al. 2005) as well as the benefits associated with collective action, livelihoods and in some minor cases economic security. More recent research, however, has also cautioned that the socio-economic and political repercussions of the TURFs need to be considered more fully (Montoya 2007; Zuñiga et al. 2008; San Martin et al. 2010; Gallardo et al. 2011; Gallardo and Friman 2011), with potential losses to the fishers that may ultimately undermine the TURF approach. It seems apparent that while the TURFs have achieved a number of positive impacts, more effort is required to understand and incorporate the perspectives and needs of the fishers into the management approach. This is necessary in order to ensure that benefits are sustainable and secured more widely across regions, and that the broader ecological consequences of harvesting activities within and outside the TURFs are considered (Oresanz et al. 2005; Gallardo and Friman 2011).

Discussion

Despite different national political histories and socio-economic and fishery circumstances in South Africa and Chile, interesting lessons can be gleaned from each country's experience in managing the abalone and loco fisheries 'crisis'. Six themes have emerged as key lessons for understanding the challenges and prospects for fisheries governance in each country, and which may be relevant to small-scale fisheries more broadly.

First, experience in both countries has clearly indicated that the closure of the fishery as a management strategy to curtail over-exploitation has failed (Hauck 2009; Raemaekers et al. 2011; Meltzoff et al. 2002; Castilla et al. 2007; Gallardo 2008). The decision to close the fisheries in both South Africa and Chile was driven by a resource-focussed agenda in response to a perceived resource collapse. The assumption was that closure (that is, an outright ban of harvesting) would limit resource use and protect the ongoing decline of stocks. However, this decision did not adequately consider the human system and the socio-economic, political and institutional drivers that were influencing resource use. Thus, these decisions lacked legitimacy from the perspective of the fishers, resulting in the continuation of abalone and loco harvesting, albeit illegally. This was recognised by the South African government at the outset of their deliberations to close the abalone fishery: 'closure of the abalone fishery would not ensure the recovery of the abalone stock, because illegal exploitation will not stop' (DEAT 2004:2). Thus, although the challenges were recognised, scientists urged closure on the basis of a 'resource crisis'. Similarly, in Chile, the closure was implemented as a means to prevent over-fishing, but 'a main effect of the draconian closure was making the activity illegal, with disastrous consequences for fishing communities. Illegal fishing never stopped. . .' (Orensanz et al. 2005:533). Thus, the closures in both countries impacted the legitimacy of the management system, whereby access rights were questioned and 'fairness' was undermined (Jentoft and McCay 2003; Hernes et al. 2005).

Second, both countries have highlighted the significance of political change in influencing fisheries governance. Although at different time scales, both South Africa and Chile emerged from a politically disenfranchising era to one of democracy, which promoted fisheries reform. In Chile, the transition to democracy from Pinochet's recalcitrant anti-communism and largely suppressed democracy era opened 'a window of opportunity' in which political transformation coupled with resource collapse led to the opportunity to radically transform fisheries policy and law (Gelcich et al. 2010). Similarly, in South Africa, the transition from apartheid to democracy provided the opportunity to redress past injustices through a new fisheries law (van Sittert et al. 2006). By recognising that existing approaches to the abalone and loco fisheries were failing, new approaches were explored that garnered the support of new political leaders. In addition to fisheries management reform, the political environment was also instrumental in promoting neo-liberal policies that had a significant impact on the sector. While a macro-economic export policy fuelled international demand for abalone and loco, increased prices and led to a market-driven approach, it is argued that it in fact undermined efforts of socio-economic reform and poverty alleviation in coastal communities (Croeser et al. 2006; Isaacs et al. 2007) and led to broader inequalities (Kay 2012; López 2010). The political regime of a country, therefore, and its corresponding laws and policy, are instrumental in influencing fisheries management approaches.

A third key theme that has emerged from these case studies is that fisheries decision-making remains centralised, albeit at different scales. In South Africa, although there were attempts by the state to explore co-management and initiate a TURF system, these approaches were imposed by national government with inconsistent consultation with the fishers (Hauck 2009; Raemaekers et al. 2011). As a result, they became technical measures that were developed without adequately considering the social, economic, political and institutional realities in coastal communities, and therefore largely failed. In

Chile, there has been much more interaction and cooperation between the different stakeholder groups, including the fishers, scientists and fisheries authority. This has led to shared decision-making and responsibility for the management of benthic resources (Castilla et al. 2007; Gallardo 2008; Gelcich et al. 2010). However, there remain important aspects of the TURF system that are not adequately adapted to the fishers' needs. Power is perceived to remain in the hands of the authorities, particularly in relation to the period during which fishers can fish, the short-term tenure of TURFs, costly biological assessments when state subsidies are terminated, and taxes that exacerbate financial burdens that are seen as inequitable across TURF regions (due to uneven productivity). Fishers resent some of these top-down strategies (Orensanz et al. 2005), and some argue that it impacts on the sustainability of their areas, particularly in terms of economic and ecological impacts and challenges (Gallardo et al. 2011; Gallardo and Friman 2011). Thus, even though governance approaches may seem progressive by establishing fisher 'ownership' of geographical areas, enhancing equity and promoting co-operative decision making and management, if they continue to be implemented through a centralised approach, their success on the ground is jeopardised (Berkes et al. 2001; Hara and Raakjaer Nielsen 2003).

Fourth is the challenge of illegal fishing. Both countries have grappled with the onset of illegal fishing amidst enhanced regulatory controls and increased market demand. However, the perspective of 'illegal fishing' in both countries is different due to the history of fishing regulations. Chile, for example, had an open access system prior to the closure. The closure put an end to open access, and aimed to manage the resource 'crisis'. However, illegal fishing resulted and it became the only opportunity for many to regain access to the fishery. Even after TURFs were introduced, illegal fishing continued outside of the TURF areas, and even sometimes within. In South Africa, the new fisheries law provided opportunities to broaden access to an already limited entry abalone fishery. However, a lack of legitimacy of the rights allocation process, coupled with inadequate enforcement and lucrative prices, fuelled an illegal fishery. In both cases it was widely acknowledged that illegal fishing was exacerbated following the closures, and that the 'root causes' of over-exploitation were not adequately understood and addressed (Castilla 1995; Meltzoff et al. 2002; Orensanz et al. 2005; Castilla et al. 2007; Hauck 2009; San Martin et al. 2010; v2011). Thus, inadequate and inappropriate responses to non-compliance, which are reactive and tend to rely on law enforcement efforts, fail to engage with the underlying socio-economic and political drivers of fisher behaviour (Raakjaer-Nielsen 2003; Hauck 2011).

Fisher organisation has also been identified as a key issue influencing fisheries governance in Chile and South Africa. Democratisation had different effects in each country, with Chile re-instating strong representative national fisher organisations, while South Africa had only significantly mobilised its fishers during the political transition. Although fishers in South Africa became more represented during the policy development process for a new fisheries law in the late 1990s, there are no overarching local, regional or national fisheries bodies. The abalone fishery has a national fisher association but it is informal and is fraught with regional conflict. In Chile, on the other hand, national fisher groups have been credited with significantly influencing fisheries reform and actively engaging in decision-making to protect their interests (Gallardo 2008). These institutional structures, therefore, are perceived to hold significant power and are

considered key actors in fisheries management. It is argued, therefore, that strong fishers' institutions are instrumental for engaging with government authorities and developing fisheries management arrangements that are responsive to fishers' needs (Jentoft and McCay 2003). Further, the particular history of each country regarding organizational tradition at grass-roots level is also important in order to understand the different fishery dynamics. Though suppressed in Chile during Pinochet, the return to democracy saw fishers organising themselves again. Collective action among fishers constitutes a more fertile ground to allocate TURFs to collectives, while in South Africa these conditions were not in place, perhaps partially explaining the individual-based allocation of TURFs in this country.

A final lesson to highlight is the issue of equity in relation to marginalised and indigenous groups. South Africa identified equity as a fundamental principle in its new fisheries law, with the aim of redressing the historical imbalances of the apartheid era by prioritising access to marine resources to previously disadvantaged groups (that is, traditional fishers living in coastal communities) (Witbooi 2006). This fundamentally influenced the reshuffling of access rights and was instrumental in the implementation of fisheries policy. Thus, small-scale fisheries were largely limited to those fishers with traditional rights to the resource and who had been marginalised and dispossessed historically (Sowman 2006). In Chile, the allocation of TURFs was intended to be prioritised to those with traditional fishing grounds, independent of ethnic origins, but a new law has put a focus on indigenous rights. It remains to be seen whether this new law will create more opportunities regarding indigenous groups' rights to the coast. Even in the South African case, although national laws and policies are in place to promote equitable access and benefits to natural resources, implementation is often problematic. Equity issues remain at the forefront of small-scale fisheries debates, which are necessary for addressing the historical marginalisation of fishers and for creating legitimate governance arrangements that have the support of fisher groups (Chuenpagdee et al. 2005).

Conclusion

Research on the abalone fishery in South Africa and the loco fishery in Chile have highlighted important challenges that are facing many small-scale fisheries around the world, including resource over-exploitation, inequitable or insecure resource tenure and weak institutions. Underpinning these challenges is the realisation that fisheries governance rests on balancing the limits of the resource with the needs and perspectives of fishers who depend on it for their livelihood (Berkes et al. 2001). Thus, as system thinking argues, the natural and human systems need to be understood and addressed from the moment a problem is defined (such as a identifying a 'crisis') to the longer term process of designing and implementing a sustainable governance system (Garcia and Charles 2008). If a crisis is only perceived from an ecological perspective, then it is likely that management measures will be largely resource-focussed, further undermining the fishery system as a whole. This is explicitly highlighted by Chuenpagdee et al. (2005: 25), who state that fisheries challenges need to be tackled by acknowledging the 'interconnectivity of concerns for ecosystem health, social justice, livelihoods and food security and food safety'. This link, between social and ecological systems, is emphasized as being critical to understanding, and ultimately achieving, the sustainability of fishery systems (Berkes et al. 2001; Charles 2001; Berkes et al. 2003). It is argued that natural and social systems

are complex in themselves, and the interactions (and links) between them create even more complexity (Charles 2001; Berkes et al. 2003; Acheson 2006). Thus, multidisciplinary approaches are required to 'bridge disciplines and scales, and blend theory and practice, if we are to understand these linked complex systems and, on the basis of this knowledge, to design more effective systems of governance. . .' (Zaelke et al. 2005: 37).

While Chile and South Africa have both explored alternative and more integrated approaches to fisheries management, such as allocating use rights, including fishers in decision making and implementing TURFs, they have had varying degrees of success. A key obstacle has been the legitimacy of these approaches, which have not always reflected fishers' experiences and needs, but which is considered critical for implementation (Berkes et al. 2001; Kooiman et al. 2005; Oresanz et al. 2005; González et al. 2006; Jentoft 2007; San Martin et al. 2010). Top-down driven processes, no matter how progressive they may seem on paper, will continue to alienate fishers, jeopardise their livelihoods and threaten the long-term sustainability of the fishery system as a whole. A sustainable fisheries system, therefore, aims to achieve social, economic, ecological and institutional sustainability for the benefit of both the resource and the people who rely on it (Charles 2001; Garcia and Charles 2008; Pomeroy and Andrew 2011).

Endnotes

^a Informal fishers are considered those traditional, small-scale fishers who continue to harvest marine resources without a permit, even though it is illegal to do so, with many being driven by socio-economic and political factors (Hauck 2008). ^b Black ethnic groups, in the South African context, are those groups identified by apartheid policy as 'Indian', 'African' or 'Coloured'. ^c Conservation is defined as the 'rational, effective, efficient, present and future use of the natural resources and their environment' (LGPA, Titulo I, Art. 2, 14; Subpesca 1991).

Competing interests

Authors confirm that there are no competing interests.

Authors' contributions

All authors have read and approved the final manuscript.

Acknowledgements

The authors would like to gratefully acknowledge the financial support of the Swedish-South African research programme (Swedish Links) and the Southern African-Nordic Centre, which facilitated this research partnership. We would also like to acknowledge Jorge Ueyonahara for assistance with the figures. GLGF would like to warmly thank FORMAS (the Swedish Research Environment, Agricultural Sciences and Spatial Planning) for financing her research from 2007-2010. Further, both authors would like to thank the fishing authorities, consultants, leaders and fishers in South Africa and Chile for their assistance in the research, and in particular, we would like to thank our colleagues Wolfgang Stotz and Jaime Aburto in Chile and Merle Sowman and Serge Raemaekers in South Africa for their collaboration and feedback throughout the research process.

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Received: 21 November 2012 Accepted: 21 November 2012

Published: 25 March 2013

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doi:10.1186/2212-9790-12-3

Cite this article as: Hauck and Gallardo-Fernández: Crises in the South African abalone and Chilean loco fisheries: shared challenges and prospects. *Maritime Studies* 2013 12:3.

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