Marine Sustainability and Certification Schemes

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Executive Summary

- CCAMLR set precautionary catch limits for krill based on the scientific analysis and model prediction. Member consensus is needed for new conservation matters.
- CCAMLR put the environment and fish stocks before economic profit.
- The precautionary Catch Limit is 5.61 million tonnes per year. The actual limit used is the Trigger Level, which is 0.62 million tonnes per year, which is distributed among four subareas to prevent concentrated fishing efforts.
- Evidence suggests that krill declined in the 1980s but there no evidence of a long-term decline in recent decades.
- Currently, the krill harvest is precautionary to krill dependant species.
- Reduced sea-ice could mean a decline in krill populations in the south-west Atlantic if fishing pressure and natural predation increase. However, trigger levels limit this possibility.
- Krill harvest is believed to be sustainable at present and the fishery is regarded as being managed with a precautionary approach.
- The certifying standards/guidelines are set by the UNFAO and certification schemes are constantly improving to adhere to or be better than these guidelines.
- The guidelines are meaningful toward protecting the environment and good health of fish stocks and should strive to always improve.
- MSC is regarded as the best certification scheme by many.
- MSC is regarded as having a ‘quasi-monopoly’ by some.
- FOS potentially has greater criteria to protect the marine environment and fish stocks.
- Small-scale fisheries are significantly disadvantaged because of certification schemes even though these fisheries may be more sustainable than certified large fisheries.

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1 Introduction

In the past two decades, public awareness and consciousness surrounding the benefits of sustainable fishing and the need to mitigate the environmental implications associated with fishing and aquaculture have soared. In 2008, the Food and Agriculture Organization (FAO) reported that three-quarters of fish stocks were being fully- or over-exploited (FAO, 2009), because of 'poorly implemented, government-run, command and control management schemes', which have often failed to keep in check fishing effort, prevent over fishing and avoid environmental degradation (Parkes et al., 2009). Furthermore, illegal, unregulated and unreported (IUU) fisheries have, and are, having significant detrimental implications on fish stocks globally. Market based eco-labelling approaches have shown promise in generating motivation for improved catching and culture practices. Many market-based schemes have entered the market and encompass information on: environmental impacts of fishing and aquaculture practices; fish stock condition; animal health and welfare; traceability (chain of custody); and social, labour and ethical aspects (Parkes et al., 2009).

Wakamatsu and Wakamastu (2017) describe eco-labelling as a market-driven mechanism that incentivises environmentally-friendly production processes. The authors state that direct regulation, the standard method for resource conservation, guides fishing or harvester behaviour to positively effect fisheries that suffering are from overfishing and depleted stocks. Seafood eco-labelling in turn changes consumer behaviour and consumer preference for eco-labelled seafood drives price premiums and/or increased market share. Fisheries that focus on profit maximisation become motivated to apply for eco-labels, which in turn requires the fisheries to become more sustainably managed. By design, eco-labels are a win-win cyclic 'solution' to both the health of the ecosystem, fisheries and civic concerns (Wakamatsu & Wakamatsu, 2017).

Certification schemes are, however, not without contention. Many are sceptical of whether these schemes create sustainable fisheries or are just creating a market for sustainable fish (Pointe, 2012). This report discusses the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) and the state of the current krill fishery in the Southern Ocean; certification scheme hierarchy and conformance with FAO guidelines; whether or not the schemes actually provide environmental benefits; and how small-scale fisheries are currently disadvantaged by certification schemes.

2 Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)

In 1997, the contracting parties to the Antarctic Treaty whom had enjoyed 'depoliticising governance' and promoting scientific collaboration began to the first steps toward negotiating an international commission. One of the primary purposes of the commission was and is to prevent the over exploitation of Antarctic Krill, which is widely regarded as the keystone species of the Southern Ocean food webs (Croxall & Nicol, 2004). The convention was signed in 1980 and has been in force since 1982. The convention applies to the entire Southern Ocean south of the Antarctic Polar Front, which is an approximate area of 32 million km^2. The convention is unique in that it was the first in the marine environment to try and combine the requirements of sustainable harvesting with adequate protection for non-target species, which may potentially be affected directly or indirectly by harvesting and practises (Mooney-Seus & Rosenburg, 2007). The fundamental principles of the convention call for the adoption of a precautionary approach and the need for ecosystem-based approaches for management of marine systems (Constable, 2011). The CCAMLR is widely recognised as a leading international organisation in developing best practice in ecosystem approach to managing fisheries (Constable, 2011). The objective of the convention is the conservation of Antarctic Marine Living Resources, the requirements of which are stipulated in Article 2 of the CCAMLR, which generally say:

1. to balance the needs of sustainable harvesting with those of conservation;
2. to provide protection for the dependant and related species, coupled with the restoration of depleted stocks and populations, and;
3. to avoid changes that are potentially irreversible within two to three decades.

Constable (2011) reports that CCAMLR has achieved the advances in best practice ecosystem management beyond national jurisdiction without precedent guided by the principles within Article 2 of its convention and should be used as an important case study to learn from. Between the years of 1987 and 1990 a working group on developing approaches to conservation started the mission to interpret the conventions objectives and provide a mechanism for making ecosystem orientated decisions. The work of the scientific committee primarily concentrated on fish stock assessment, ecosystem monitoring and management, incidental mortality arsing from fishing, and statistics assessments and modelling (Constable, 2011). Article 9 of the convention provides the framework by which the CCAMLR can manage fisheries. The framework ensures that all decisions must be based on the best scientific evidence available. This means, however, that the CCAMLR is not required to wait until all science is concluded before making decisions. Consensus among the scientific committee,

however, is usually required before the commission will agree to conservation measures that have a ‘scientific basis’ (Constable et al., 2000; Constable, 2011).

Generally speaking, fishery decisions made by the CCAMLR are based on comprehensive scientific-based reports and can be trusted with respect to putting fish stocks and prey dependant species before economic profit. Furthermore, CCAMLR has been at the forefront of international efforts to combat IUU fishing (Miller et al., 2005). However, Constable (2011) warns that ‘without adequate safeguards, voluntary participation by fishing states in the CCAMLR, and its consensus environment, CCAMLR does not provide strong foundations for achieving, in the long term, the ecosystem-based principles for managing fisheries when there is any degree of scientific uncertainty.

3 Krill Sustainability in the Southern Ocean

CCALMR (2018) reports that the sustainability of krill fishing is ensured by setting catch limits that leave healthy breeding populations and ensuring that there is enough for krill dependant species. Constable (2011) briefly describes the process by which krill catch limits are set by CCAMLR. The approach fits a time-series model which considers a simple set of parameters governing the dynamics of krill and the consequent dynamics of predators and then uses the resultant parameter estimates and their uncertainty to undertake Monte Carlo simulation projections. This is a spatially structured empirical model that applies a nominated spatial harvest strategy in the projection. Constable (2011) states that the spatial harvest strategy could be dictated by several factors including: spatially distributed predator demand; krill distribution; historical catch distributions; or according to the requirements of the fishing industry.

3.1 Precautionary and Trigger Level Catch Limits

Environmentally speaking, the CCALMR attempt to set their catch limits of krill to 'minimise the impact on the ecosystem rather than trying to maximise the size of the fishery'. The current total allowable catch (TAC) of krill for the south-west Atlantic is currently 5.61 million tonnes annually (CCAMLR, 2017). The fishery is currently only operating in the south-west Atlantic (Nicol et al., 2012). Krill fishing, however, is also permitted in the Indian Ocean sector (Divisions 58.4.1 and 58.4.2) (Hill et al., 2016), which has a TAC of 3.085 million tonnes (Refer to Appendix A for more detail). The governing conservation measure for the Antarctic Krill fishery in south-west Atlantic sector (subareas 48.1-48.4) is Conservation Measure (CM) 51-01 (refer to Appendix A), which identifies two catch limits. The higher limit of 5.61 million tonnes is known as the 'precautionary limit' and was established in 2010. The lower limit of 0.62 million tonnes is known as the 'trigger level' and was first stated as a limit for the krill fishery in CM 32/X in 1991. Hill et al. (2016) state that the precautionary catch limit specifies the catch that could be permitted when the "commission has defined an allocation of this total catch limit between smaller management units". Hill et al. (2016) explain that this means that "CCAMLR agrees that catches of 5.61 million tonnes per season spread out through subareas 48.1 to 48.4 will not reduce the ability of the krill stock to replace itself".

Hill et al. (2016), however, do note that CCAMLR agrees that excessive concentration of this catch in any part of the region might be harmful to either krill stock or the wider ecosystem. As CCAMLR has not yet produced localised catch limits necessary to prevent possible harm, trigger levels have been set, which limit the catch that can be taken in the interim. Furthermore, CM 51-07 (refer to Appendix A), which was initially established in 2009, sets individual catch

limits for the subareas for the total trigger level limit, which is 0.62 million tonnes: 48.1 (25%); 48.2 (45%); 48.3 (45%); and 48.4 (15%) (refer to Appendix A for further detail).

Hill et al. (2016) state that there are four main steps involved in calculating the precaution catch limit. The following steps are direct excerpts from Hill et al. (2016):

1. Identification of a set of conservation criteria for the krill stock intended to help CCAMLR to meet its objectives for the stock and the wider ecosystem. These criteria are that the median krill spawning stock biomass (i.e. the total weight of reproductively mature individuals) after 20 years of fishing should not be below 75% of a reference level (the median of SSB_0 estimates) and that the estimated probability of the spawning stock biomass falling to 20% of the reference level at any time should be no more than 10%. Constable et al. (2000) and Miller and Agnew (2000) provide full details of these criteria and their underlying logic. See also www.ccamlr.org/node/74616.
2. Estimation of reference levels for unexploited spawning stock biomass (SSB_0), and unexploited biomass (B_0, which includes immature individuals, and is greater than SSB_0). These estimates were originally based on data from the FIBEX survey conducted in 1981, which covered 0.55 million km^2 in Subareas 48.1 to 48.3 (Trathan et al., 1995). These estimates have been updated based on the CCAMLR 2000 Krill Synoptic Survey of Area 48 (CCAMLR-2000 Survey) (SC-CAMLR, 2010b; Fielding et al., 2011) which provided data on krill biomass in 2 million km^2 of Subareas 48.1 to 48.4 in January 2000.
3. Estimation of a precautionary exploitation rate. This is the maximum proportion of B_0 that model projections suggest can be taken each season while ensuring that the conservation criteria for the krill stock are met. Constable and de la Mare (2003) provide details of the modelling process.
4. Calculation of the precautionary catch limit, which is the precautionary exploitation rate multiplied by B_0.

Hill et al. (2016) state that the annual 'trigger level' was calculated based on the 'sum of maximum catch in each subarea' prior to 1991 (SC-CAMLR, 1991), which is now thought to be 0.68 million tonnes not the original 0.62 million tonnes per year, thus is conservative. This trigger level of 0.62 million tonnes per year represents only 1% of the total estimated krill biomass within the sector and only 0.3% of this total biomass (60.3 million tonnes) is currently harvested. There is consensus among the CCAMLR members and an agreement has been made that 'any expansion in the krill fishery should not happen unless the scientific data indicate that it will continue to be sustainable' (CCAMLR, 2018).

In 1991, the CCAMLR Scientific Committee reported that 'there is no evidence thus far to suggest that historical catch levels in Statistical Area 48 have significantly impacted either on krill stocks or on associated predators dependent on these stocks for food' (SC-CAMLR, 1991, cited in Hill et al., 2016). Hill et al. (2016) explain that the precautionary catch limit, set out in CM 51-01 (refer to Appendix A) of 5.61 million tonnes was an estimate based on the CCAMLR-2000 Survey estimate of Antarctic Krill biomass of 60.3 million tonnes, which equates to 9.3% (sampling CV, which measures how the density varies between transects = 12.8% (SC-CAMLR, 2010b; Fielding et al., 2011). The annual precautionary catch limit was intended to apply over a number of years pending new information or improved methods (Constable et al., 2000; Hewitt et al., 2002;2004; cited in Hill et al., 2016). Hill et al. (2016) report, however, that since the trigger level is currently the effective catch limit and not the precautionary catch limit, the biomass survey does not influence the total amount the fishery is allowed to harvest. Hill et al. (2016) report that there are no concrete plans at present for a new synoptic survey using either research or fishing vessels.

3.2 Are Krill Declining?

There is however, ever growing concern among certain members of the scientific community that the krill fishery is not as sustainable as we might think. Nicol et al. (2012) reports that the most ambitious attempt at examining current krill stock, which used all available data from scientific nets, concluded that there had been a contraction in the range of krill to the south and that had been associated with a 'significant' decline in 'krill density' (Atkinson et al., 2004; cited Nicol et al., 2012). It was reported that the decline in krill density that occurred the 1980's was between 38-80%, which is very contentious. That would mean that if the current density is only 20% of what is was in the 1980's, then approximately 500 million tonnes of a keystones species is missing, which would result in significant ecological ramifications (Nicol et al., 2012), of which have not been seen. A literature review carried out by Hill et al. (2016) on the past status of the krill stock found that there is some evidence for a decline in abundance of krill in the 1980s, but no evidence of a further decline in recent decades (refer to Hill et al., 2016 for examples).

The reducing sea-ice cover is of concern, as the reproductive output and recruitment success of krill in the Antarctic Peninsula region has been linked to the extent and duration of the winter sea-ice cover (Kawaguchi & Satake, 1994; Siegel & Loeb, 1995; as seen in Kawaguchi, 2009) i.e. more ice cover has been linked to greater reproductive output and recruitment success. This is important as the population size of krill seems to be largely driven by recruitment success, rather than predation pressure on post-larval krill (Atkinson et al., 2008). Siegel

(1988) regards the water to the north-west of Antarctic Peninsula as one the principle spawning and feeding grounds of Antarctic Krill and this area is also one of the prominent historic krill fishery grounds (Kock et al., 2007), as seen in Figure 3-1. The dominant view of population dynamics of krill in this region is that the South Shetland Islands are the source region of krill, which are then transported to the 'downstream' region (Hofmann & Murphy, 2004). Despite this view being simplistic (Nicol, 2006), if fishing pressure was to increase in a region that is regarded as the source region of krill for whole of the South Atlantic, there could be cause for concern and future endeavours should be contemplated with extra precautionary management (Kawaguchi et al., 2009). As discussed earlier, however, the 'trigger levels' set for each subarea prevent concentrated fishing efforts in such areas and once a 'trigger level' has been reached, fishing within that subarea is closed. Thus, the harm is minimised. The current 'trigger level' for the subarea 48.1, which includes the South Shetland Islands is 25% of 0.62 million tonnes per year, which equates to 0.155 million tonnes per year.

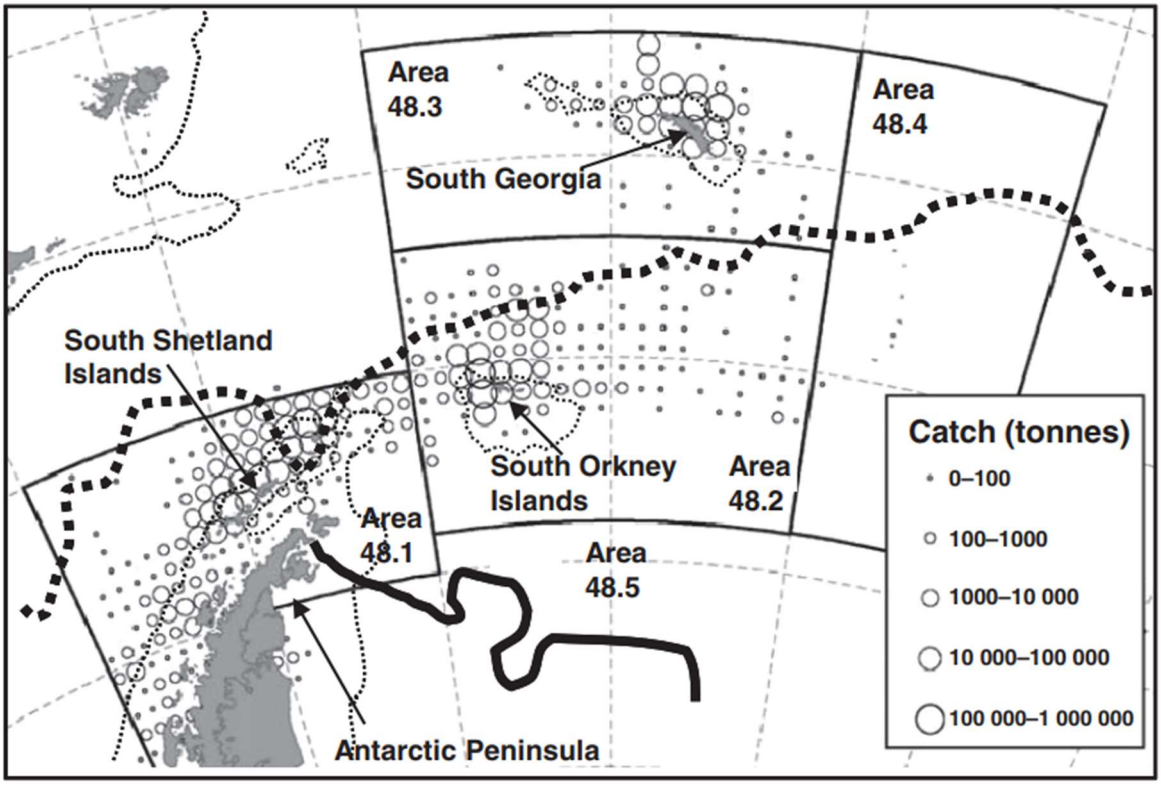

Figure 3-1. Illustrates krill fishing area around the South Shetland Islands (CCAMLR Area 48.1) (north-west of Antarctic Peninsula), South Orkney Islands (CCAMLR Area 48.2) and South Georgia Islands (CCAMLR Area 48.3) (Reproduced from Jones & Ramm, 2004; as seen in Kawaguchi et al., 2009).

3.3 Is the Current Management Precautionary to Krill Predators?

Hill et al. (2016) explain that current precautionary management system aims to maintain the average krill biomass above 75% of its unexploited level, thus reserving a portion of the stocks production for predators. This is consistent with recommendations for fisheries targeting lower trophic level species such as herring, anchovy and krill (Smith et al., 2011; cited in Hill et al., 2016). The current 'trigger level' prevents the exploitation of stocks above the 9.3% rate (5.61 m/t/y),in turn ensuring excessive exploitation of the krill stock at the regional scale does not occur, thus protecting vital food sources for predators. This is specifically covered in CM 51-07, which explains the need to distribute the krill catch in manner that predator populations, mainly land-based, would be inadvertently and disproportionately effected by fishing activity. The CM51-07 also notes that advances are urgently needed as the trigger level itself is not related to the status of the krill stock.

A study was carried out Watters et al. (2013), which modelled krill and 34 predator populations in smaller management units. The model distributed the fishing effort and catches according to the limits specified in CM 51-07. The study assessed the risk of fishing causing predator populations to fall by 25%. Out of the 34 predator populations, the probability of depletion was between 1% and 12% for only 6 populations, whereas the other 28 populations were regarded as negligible. At 65% of the trigger level, or 0.4 million tonnes per year, the risk to all predator populations was negligible. Note, the current annual catch is below 0.3 million tonnes.

4 Certification Schemes

Certification bodies, such as Marine Steward Council (MSC) and Friend of the Sea (FOS), comprise a set of fundamental principles, which align with FAO guidelines for the eco-labelling of fish and fishery products from marine capture and minimum substantive requirements (refer to Table C 1 and Table D 1) and FAO's code of conduct for responsible fisheries. These certification schemes contract third party certification bodies, which assess fisheries who voluntarily apply to be certified if they pay. If the fishery applicant is seen as meeting the selection criteria of the subject certification body, then the applicant is certified. With respect to MSC and FOS, the third-party certification bodies are accredited by independent accreditation bodies, which ideally minimises any conflict of interest. Typically, annual audits and surveillance are carried out by the third-party certification bodies. Successful applicants must recertify periodically: For example, MSC every 5 years and FOS every 3 to 5 years.

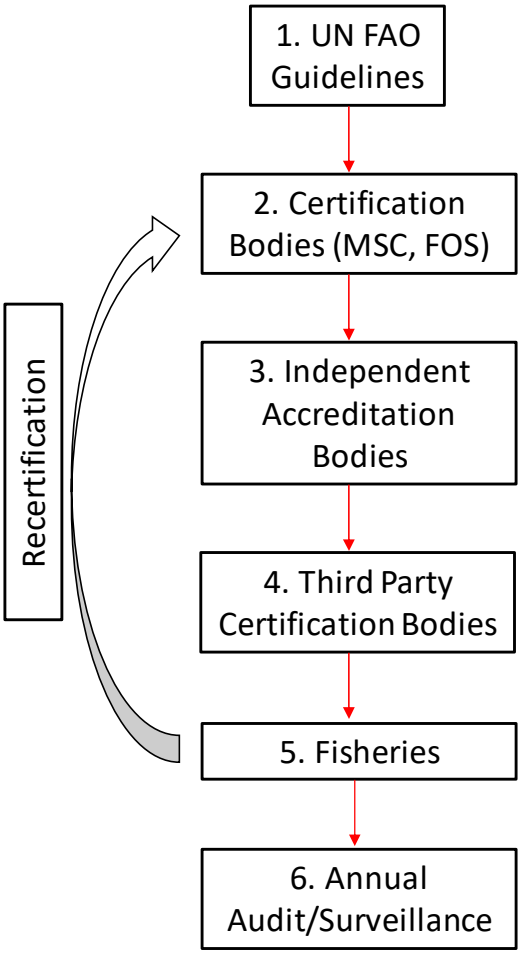

Figure 4-1. A basic schematic illustrating the general process of certification from guidelines to fisheries becoming certified.

4.1 Conformance with FAO Guidelines

The guidelines created by the certifying authorities that HealthPost utilise are largely derived from, and conform to, the core principles created by the Food and Agriculture Organisation of the United Nations (refer to FAO 2005; 2009) and somewhat from the experiences of the CCAMRL. The interpretation of the guidelines by certifying authorities such as the Marine Stewardship Council and Friend of the Sea and many others, do however, vary and this is considered by some as creating confusion in the market for consumers and as potentially creating a 'sustainable fish' market rather than 'sustainable fisheries' (refer to Ponte, 2012).

Parkes et al. (2009) observed that most of the schemes are improving with their conformance with the FAO guidelines. Parkes et al. (2009) recognises that all schemes are constantly

improving and adapting their methodologies to better align with FAO minimum substantive requirements and that reviews such as Parkes et al. (2009) only provide a snapshot of the 'current state of affairs' of the sector. This suggests that many review papers of sustainable fishery information schemes are likely outdated soon after their preparation. Furthermore, with recent rapid increases in the number and type of certification schemes there has been little opportunity for harmonisation of the methods and advice. Parkes et al. (2009) states that a lack of consistency of approach and contradictory recommendations of the various schemes have the potential to confuse consumers and potentially 'blur the differences between what is good and what is not', in turn potentially eroding and undermining the benefits of purchasing information and the credibility of future information about sustainability, respectively.

Parkes et al. (2009) provides an objective review of 29 certification schemes and recommendation lists for both wild capture and aquaculture fisheries, which is based on a review (Parkes & Walmsley et al., 2009) commissioned by the Fish Sustainability Information Group (FSIG). The FSIG is an international consortium representing a variety of national organisations concerned with seafood marketing, which is overseen by the UN FAO. The basis of the review was to develop a clear picture of what constitutes current best practice for communicating fish sustainability information. The review used the guidelines developed for the eco-labelling/certification of capture and aquaculture fisheries (FAO, 2005; 2009) for which to compare to the schemes. FAO also produced a review of their own on ecolabelling schemes for fish and fish products from capture fisheries (refer to Sainsbury, 2010). The FAO guidelines cover minimum substantive requirements relating to the content of the standard against which fisheries are assessed, as well as institutional and procedural aspects, including governance, certification and accreditation procedures, transparency and stakeholder involvement (Parkes et al., 2009).

There are three essential components of the FAO certification against which a fishery is assessed: the management system; the stock under consideration; and ecosystem considerations. Thus, a fish sustainability information scheme should cover all three aspects. Refer to FAO (2005 & 2009) for more information on the *guidelines for eco-labelling of fish and fishery products from marine capture fisheries* or refer to Appendix B.

Parkes et al. (2009) identified that all the certification schemes reviewed included the three main substantive requirements. The way in which these schemes assess performance, however, varies significantly: the extent to which the data used relate to the stock under consideration; how up to date the data are required to be; whether the stock status reference points are explicitly considered; and whether stock assessment data are peer-reviewed to verify their quality and applicability. As a result, over-exploited stocks have in some cases been certified. Parkes et al. (2009) argues that the Marine Steward Council (MSC) makes the

most comprehensive, robust and transparent assessment of performance whilst Friend of the Sea (FOS) and Naturland further include social aspects in their standards of fisheries, which goes beyond the minimum substantive requirements of the FAO guidelines (refer to Appendix C), which MSC does not. Table C 1 and Table D 1 illustrate Parkes et al. (2009) comprehensive summary of characteristics of certification schemes and the summary assessment of fishery certification standards against the minimum substantive requirements in FAO (2005), respectively.

Parkes et al. (2009) review identified seven key attributes, which align with FAO guidance, that all schemes must address to mitigate the inconsistent approaches and contradictory advice among the schemes: drivers; accuracy; independence; precision; transparency; standardisation; and cost-effectiveness. Excerpts of the seven key attributes from Parkes et al. (2009) review paper can be observed in Appendix H.

A more recent review of the certification schemes carried out by the World Wild Life Organisation (WWF) in 2012 found that MSC scored highest with respect to WWF criteria, followed by Alaska Seafood Marketing Institute, then Friend of the Sea, and then Icelandic Responsible Fisheries. Of note, however, is that FOS scored highest with respect to preventative measures for ecological and habitat impacts (refer to WWF, 2012 for more information).

With respect to ISEAL accreditation, MSC are the only wild seafood certification scheme to become a full member. Furthermore, in March 2017, the Global Sustainable Seafood Initiative (GSSI) steering board recognised the MSC for the scope of Fisheries Certification. This recognition identifies that the MSC, with Fisheries Certification Requirements and Guidance Version 2.0, effective of 1 October 2014, is in alignment with all 143 applicable essential components of the GSSI Global Bench Mark Tool (version 1.0, 8 October 2015). The Tool is grounded in FAO guidelines for the eco-labelling of fish and fishery products from marine capture fisheries and consists of performance areas related to scheme governance, operational management (including chain of custody) and applied wild capture fisheries audit standards.

4.2 Implications of Certifications Schemes: Are Fish Stocks and the Environment of Good Health?

The Marine Stewardship Council (MSC) is the most widely used certification scheme for eco-labelling of seafood followed by Friend of the Sea (FOS) the former of which has retained somewhat of a quasi-monopoly (Ponte, 2012; Wakamatsu & Wakamatsu, 2017) but has in

recent times been criticised for favouring large scale industrial fisheries and not certifying many southern and small-scale fisheries (Ponte, 2012; Wakamatsu & Wakamatsu, 2017).

Ponte's (2012) paper '*The MSC and the making of a market for sustainable fish'* highlights the many issues surrounding MSC from its governance through to the effectiveness of the scheme from an environmental stand point. Because of the civic concern, Ponte (2012) highlights that two major evaluations have been carried out in managing the environmental component: the *Wildhaven report*; and the *Bridgespan Group report.* Pointe (2012) argues that as a result of pressure from civic organisations, the MSC also commissioned a study (refer to Agnew et al., 2006), which examined 10 MSC certified fishers, all of which had been subject to at least one post certification audit. 62 certification conditions were studied to assess whether they could ultimately lead to environmental benefits. Eight instances were identified in the study of 'no gain' (note: no category for deterioration) and 89 environmental gains. The gains, however, vary significantly and are of very different nature. Institutional gains constituted 29 of the gains that 'could' lead to environmental benefits (hypothetical or conditional gains). There were 27 instances of 'research gains' and 17 'operational gains' comprising of activities in the fishery industry, such as new regulations that are expected to lead to environmental gain, but for which Pointe (2012) argues there is no environmental link. In terms of 'operational results', which is the most desirable of the gains, these totalled 16. Of these 16, only 8 were attributed to most probably be stimulated by the certification process (as seen in Pointe, 2012).

The authors of the 2006 study identified 'some lessons learnt', two of which Ponte (2012) found interesting; (1) the largest gains occurred where conditions were attached to certification (stricter certification process); (2) that fisheries that are regarded as difficult should be encouraged to apply for certification, as they are the fishers where certification is likely to have the greatest environmental gains.

In 2009, MSC published a study that provided anecdotal evidence of positive sustainability impacts (MSC, 2009, as seen in Pointe, 2012). Pointe (2012) argues that the study did not constitute proper assessment as it was based on interviews with industry operators who had gone through MSC certification. Furthermore, Pointe (2012) highlights a more recent independent study funded by the Packard Foundation, which assesses one of the first and most controversial MSC-certified fisheries, the New Zealand Hoki Fishery (refer to Norden et al., 2011, as seen in Pointe, 2012). It should be noted that the New Zealand Hoki Fishery is currently suffering a setback, as fish stocks are not what they should be (22% drop in Hoki quota) (Stuff, 2018), with some referring to this as a collapse of the Hoki fishery (Norman, 2018). The Norden et al. (2011) study found that: MSC certification had little to no impact on the by-catch rates of non-target species and of fur seals and seabirds; certification had no impact of catch rates (declining prior to certification (Pointe, 2012)); certification did not result

in more conservative catch limits; the same certifiers were contracted to carry out further audits creating a conflict of interest; and that corrective actions were addressed based on examining plans and not actions. One of the positive spin-offs was that the suppliers were receiving a price premium for the certified fish (Pointe, 2012), which suggests that there are positive outcomes in terms of economic incentives, marketing and industry cohesion, but poor management of environmental impacts of civic concern. It is evidence such as this, which leads to statements by Pointe (2012) such as “the MSC has so far failed to convincingly show that its certification scheme has positive environmental impacts” and “as a global solution to the fishery crisis, the MSC seems to be better tuned to the creation of a market for sustainable fish rather than sustainable fisheries”.

The issues highlighted are not singularly the fault of any one party. Third party certifiers also have a significant role to play the health of fish stocks and the marine environment. Note: all certification schemes will have likely encountered issues like these, MSC just happens to be one of the largest, longest running and most studied schemes.

4.3 Third Party Certification Bodies

Most certification schemes, including MSC, FOS and Naturland have third party certification bodies, which assess fishers on the requirements and criteria of the certification schemes. The idea is to remove all conflict of interest between fishers and certification schemes. Most of these third-party bodies are subject to their own accreditation by independent accreditation bodies. There are concerns by some (e.g. Jacquet et al., 2010), however, that conflicts of interest between fishers and third parties have arisen. Jacquet et al. (2010) argue that the certification system creates a potential for financial conflict of interest because certifiers that ‘leniently’ interpret existing criteria, created by certifying bodies, might expect to receive more work and profit from ongoing annual audits. Whilst Jacquet et al. (2010) recognise that some MSC-certified fisheries, such as the one for five species of Alaskan Salmon, do adhere and exceed the underlying MSC principles, the authors claim many others do not. Jacquet et al. (2010) argue that this a result of the ‘loose wording’ of the MSC criteria: “for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery”, thus allowing for generous interpretations. For example, the MSC certified the US-trawl fishery for pollock in the eastern Bering Sea in 2005, despite the reported declining stocks of 64% between the years 2004 to 2005 (for other examples refer to Jacquet et al., 2010).

4.4 Certification Implications to Small-Scale Fisheries

The cost of certification also raises discriminatory issues for lower socio-economic countries and their fisheries, which leads to an unfair competitive advantage or an exclusion if you will into global markets (Jacquet et al., 2010; Pointe 2012, Wakamatsu & Wakamatsu, 2017). Ponte (2012) suggests that one of the most important 'events of the decade' was Wal-Mart's 2006 announcement that they would only source MSC certified fresh and frozen products by 2011, as part of their fish sustainability policy. As Ponte (2012) puts it, this created a domino effect with large food service and distribution services making a similar announcement within a few months, but less far-reaching. Effectively, this gave a huge market share and competitive advantage to all companies with MSC certification and as a result, disadvantaged other smaller-scale fisheries that were managed sustainably but couldn't afford the certification.

Certification often entails large acquisition and maintenance investments prior to benefiting from price premiums (Wakamatsu & Wakamatsu, 2017). In turn, inadequate financing can hinder those small-scale fisheries that are sustainably managed and are keen on becoming certified. In some nations, particularly lower socio-economic nations, a lack of environmental awareness can undermine the market-driven mechanism and can result in low or no price premiums for certified fisheries, which can further discourage certification as the incentives of being certified do not exist (Wakamatsu & Wakamatsu, 2017). For example, small-scale fisheries and vessels represent 98% of the Japanese fleet, which is the highest among the OECD. Despite this, only two small-scaled fisheries are certified, as Japanese consumers are 'unwilling to pay extra for MSC products'.

It is noted that any fishery can voluntarily apply to be certified, however, the expense at which this comes can far out weight the benefits to small-scale fisheries. Wakamatsu and Wakamatsu (2017) report that the costs of certification, MSC in this case, can range from $2,000 to $20,000 for pre-assessment and $10,000 to $500,000 for a full assessment and certification depending on the type of fisheries i.e. the targeted species and the relevant ecosystem. Furthermore, it is a requirement that fisheries make a continuous commitment to annual surveillance and audits at their own expense. The costs differentiate between countries because of the travel costs associated with third party certifier visits where domestic certifiers do not exist and where data collection is required. The latter of which is not normally an issue for large-scale fishers, as they may already be doing research and data collection for biological stocks on their government's behalf and expense. Furthermore, costs associated with MSC logo application comprises two types: an annual charge ($2,000 to $55,000+); and a sales royalty (0.5%) on total sales (Wakamatsu & Wakamatsu, 2017).

There are, however, some options available to small fisheries to mitigate the financial burden. For example, cooperation among territorial fishing groups. Under Principle 1 of the MSC criteria, MSC requires the assessment of a species, regardless of the size of fishery or fishing group. Thus, neighbouring groups of fisheries can jointly seek certification for species migrating across their territories, as their boundaries often differ from the ecological boundaries (Wakamatsu & Wakamatsu, 2017). Furthermore, certification requirements for data deficient fisheries have been adopted by MSC. For example, Certification Requirements version 2.0 allows a risk-based framework (RBF), as for many small-scale fisheries there are limited numerical data and the cost associated with collecting these data can create a 'bottleneck' (Wakamatsu & Wakamatsu, 2017). The RBF is regarded as more stringent than the standard assessment. The framework, however, provides small-scale fisheries with the opportunity to apply for eco-labelling, in turn avoiding the financial burden of the standard assessment. Some governments and NGO's also provide financial assistance. Eco-labelling is beneficial to both consumers and fishers to 'promote' sustainable fisheries, however, the mechanism upon which this relies are the price premiums, which incentivise fisheries. As it stands the mechanism currently fails to achieve this in the markets faced by many small-scale fisheries.

5 Conclusions and Recommendations

Fully and over-exploited fisheries as well as illegal, unregulated and unreported fisheries have resulted in depleted stocks globally. Through market-based fishery consumer schemes, the certification of fishing industries by certification bodies are hoping to turn the tide on unsustainable fishing practices. Whether or not these schemes are in fact providing the beneficial environmental impacts they claim is still up for debate. However, these schemes provide the best possible mechanism for creating sustainable fisheries and preventing total collapse of global stocks.

The CCAMLR is a non-government organisation that has set strict guidelines surrounding the conservation and protection of Antarctic marine living resources. They have helped develop and set the standard from which other guidelines, such as the UN FAO, have learned from. Currently, 0.3% of the total estimated biomass of krill in the south-west Atlantic region is harvested. The CCAMLR has set a trigger level of 620,000 tonnes distributed across four regions, which represents ~1% of the reported total unexploited biomass (60 million tonnes) for the area. The precautionary limit is currently 5.61 million tonnes annually, which equates to 9.3% of the total population within the region. The precautionary limit is not used and will not be used until the Commission defines allocation of this total catch limit between smaller management units based on advice from the Scientific Committee. Reduced sea-ice around known krill spawning and feeding grounds has increased fishing pressure and natural predation in these areas. This could see a decline in krill populations in the future if the CCAMLR does not continue to take the best precautionary approach. From the data available, it is thought that the current krill fishery is sustainable, and the practice is precautionary toward krill and predators.

The MSC certification scheme is regarded by many as the leading and most trusted certification scheme despite the limited number of small-scale and southern fisheries they have certified. WWF scored MSC highest is the last (2012) review comparing certification schemes. MSC are the only wild seafood certification scheme to be ISEAL accredited as well as being recognised by the GSSI as adhering to all applicable essential components of the Global Bench Mark Tool. Friend of the Sea, however, appears to have more ecologically sustainable and environmentally friendly certification criteria (refer to Appendix E-G). FOS have also certified many more southern and small-scale fisheries than MSC and also certifies aquaculture schemes, which MSC does not. Both utilise chain-of-custody, which ensures the certified food is from where it says it is (DNA tracing) i.e. a sustainable source.

All certification schemes are improving at a rapid pace, which makes review articles quickly outdated, in turn making it hard to point out which ones are better than others. There is still

contention around whether certification schemes are just creating a market for sustainable fish rather than sustainable fisheries. Despite this, these schemes provide the best mechanism for holding fishing industries and governmental organisations accountable for best fishing practices. In general, the certification schemes are a great mechanism as eventually this will mean greater environmental benefits and more sustainable fishing practices globally, hopefully.

There is vast room for improvement in the certification schemes, however, which is pointed out by Parkes et al. (2009) whom identified seven key attributes, which align with FAO guidance, that all schemes must address to mitigate the inconsistent approaches and contradictory advice among the schemes: drivers; accuracy; independence; precision; transparency; standardisation; and cost-effectiveness. Currently, small-scale fishers are significantly disadvantaged because of industry cohesion and the cost of certification, audits and recertification. Financial conflicts of interest between third parties and fisheries also need to be eliminated to remove any lenient certification of fishers. The schemes have the best intentions of doing right by the environment and sustainable fishing, but more work is needed on the execution and criteria of these schemes to fiercely protect our oceans.

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Appendix A. EXTRACTS FROM THE SCHEDULE OF CONSERVATION MEASURES IN FORCE 2017/2018 – CCAMLR

CONSERVATION MEASURE 51-01 (2010)
Precautionary catch limitations on *Euphausia superba* in Statistical Subareas 48.1, 48.2, 48.3 and 48.4

Species	krill
Area	48.1, 48.2, 48.3, 48.4
Season	all
Gear	all

The Commission,

Noting that it has agreed (CCAMLR-XIX, paragraph 10.11) that the krill catches in Statistical Subareas 48.1, 48.2, 48.3 and 48.4 shall not exceed a set level, defined herein as a trigger level, until a procedure for division of the overall catch limit into smaller management units has been established, and that the Scientific Committee has been directed to provide advice on such a subdivision,

Recognising that the Scientific Committee agreed a trigger level of 620 000 tonnes,

adopts the following measure in accordance with Article IX of its Convention:

Access
1. The fishery for *Euphausia superba* in Statistical Subareas 48.1, 48.2, 48.3 and 48.4 shall be conducted by vessels using fishing methods listed in Conservation Measure 21-03, Annex A only.

Catch limit
2. The total combined catch of *Euphausia superba* in Statistical Subareas 48.1, 48.2, 48.3 and 48.4 shall be limited to 5.61 million tonnes in any fishing season.

Trigger level
3. Until the Commission has defined an allocation of this total catch limit between smaller management units[1], based on the advice from the Scientific Committee, the total combined catch in Statistical Subareas 48.1, 48.2, 48.3 and 48.4 shall be further limited to 620 000 tonnes in any fishing season.

4. This measure shall be kept under review by the Commission, taking into account the advice of the Scientific Committee.

Season
5. A fishing season begins on 1 December and finishes on 30 November of the following year.

Mitigation
6. The operation of this fishery shall be carried out in accordance with Conservation Measure 25-03 so as to minimise the incidental mortality of seabirds in the course of fishing.

7. The use of marine mammal exclusion devices on trawls is mandatory.

Data
8. For the purpose of implementing this conservation measure, the data requirements set out in Conservation Measure 23-06 shall apply.

Environmental protection
9. Conservation Measure 26-01 applies.

[1] Defined in CCAMLR-XXI, paragraph 4.5.

CONSERVATION MEASURE 51-02 (2008)
Precautionary catch limitation on *Euphausia superba* in Statistical Division 58.4.1

Species	krill
Area	58.4.1
Season	all
Gear	trawl

Access	1.	The fishery for *Euphausia superba* in Statistical Division 58.4.1 shall be conducted by vessels using fishing methods listed in Conservation Measure 21-03, Annex A only.
Catch limit	2.	The total catch of *Euphausia superba* in Statistical Division 58.4.1 shall be limited to 440 000 tonnes in any fishing season.
	3.	The total catch shall be further subdivided into two subdivisions within Statistical Division 58.4.1 as follows: west of 115°E, 277 000 tonnes; and east of 115°E, 163 000 tonnes.
	4.	This measure shall be kept under review by the Commission, taking into account the advice of the Scientific Committee.
Season	5.	A fishing season begins on 1 December and finishes on 30 November the following year.
Mitigation	6.	The operation of this fishery shall be carried out in accordance with Conservation Measure 25-03 so as to minimise the incidental mortality of seabirds in the course of fishing.
	7.	The use of marine mammal exclusion devices on trawls is mandatory.
Data	8.	For the purposes of implementing this conservation measure, the data requirements set out in Conservation Measure 23-06 shall apply.
Environ-mental protection	9.	Conservation Measure 26-01 applies.

CONSERVATION MEASURE 51-03 (2008)
Precautionary catch limitation on *Euphausia superba* in Statistical Division 58.4.2

Species	krill
Area	58.4.2
Season	all
Gear	trawl

Access

1. The fishery for *Euphausia superba* in Statistical Division 58.4.2 shall be conducted by vessels using fishing methods listed in Conservation Measure 21-03, Annex A only.

Catch limit

2. The total catch of *Euphausia superba* in Statistical Division 58.4.2 shall be limited to 2.645 million tonnes in any fishing season.

3. The total catch limit shall be further subdivided into two subdivisions within Statistical Division 58.4.2 as follows: west of 55°E, 1.448 million tonnes; and east of 55°E, 1.080 million tonnes.

Trigger level[1]

4. Until the Commission has defined an allocation of this total catch limit between smaller management units, as the Scientific Committee may advise, the total catch in Division 58.4.2 shall be limited to 260 000 tonnes west of 55°E and 192 000 tonnes east of 55°E in any fishing season.

5. This measure shall be kept under review by the Commission, taking into account the advice of the Scientific Committee.

Season

6. A fishing season begins on 1 December and finishes on 30 November of the following year.

Mitigation

7. The operation of this fishery shall be carried out in accordance with Conservation Measure 25-03 so as to minimise the incidental mortality of seabirds in the course of fishing.

8. The use of marine mammal exclusion devices on trawls is mandatory.

Observers

9. Each vessel participating in the fishery shall have at least one scientific observer in accordance with the CCAMLR Scheme of International Scientific Observation or a domestic scientific observer fulfilling the requests in the scheme, and where possible one additional scientific observer, on board throughout all fishing activities within the fishing period[2].

Data

10. For the purposes of implementing this conservation measure, the data requirements set out in Conservation Measure 23-06 shall apply.

Environ-mental protection

11. Conservation Measure 26-01 applies.

[1] A trigger level is a set level that the catch shall not exceed until a procedure for the division of the overall catch limit into smaller management units, upon which the Scientific Committee has been directed to provide advice, has been established.

[2] Bearing in mind the limited ecological information from research and fisheries observers in Statistical Division 58.4.2 compared to Statistical Area 48, the Commission recognised the need to collect scientific data from the fishery. This paragraph applies only to the krill fishery in Statistical Division 58.4.2 and shall be revised depending on the advice of the Scientific Committee on a systematic scheme for scientific observation in the krill fishery or reviewed within three years, whichever comes earlier.

CONSERVATION MEASURE 51-04 (2017)
General measure for exploratory fisheries for *Euphausia superba* in the Convention Area in the 2017/18 season

Species	krill
Area	various
Season	2017/18
Gear	various

The Commission hereby adopts the following conservation measure:

1. This conservation measure applies to exploratory fisheries for Antarctic krill (*Euphausia superba*), except for such fisheries where the Commission has given specific exemptions, and only to the extent of those exemptions.

2. Fishing in any statistical subarea or division shall cease when the reported catch reaches the specified catch limit[1] and that subarea or division shall be closed to fishing for the remainder of the season. No more than 75% of the catch limit shall be taken within 60 n miles of known breeding colonies of land-based krill-dependent predators.

3. In order to give effect to paragraph 2 above:

   (i) the precise geographic position of a trawl haul will be determined by the midpoint of the path between the start point and end point of the haul for the purposes of catch and effort reporting;

   (ii) for the purposes of this conservation measure, fishing is defined as any time that fishing gear, conventional trawls, pumped codends and continuous pumping gear are in the water;

   (iii) the Secretariat shall notify Contracting Parties participating in these fisheries when the total catch of *Euphausia superba* combined in any statistical subarea or division is likely to reach the specified catch limit, and of the closure of that subarea or division when that limit is reached[2]. No part of a trawl path may lie within a closed subarea or division.

4. The total green weight of krill caught and lost shall be reported.

5. Each vessel participating in the exploratory fisheries for krill during the 2017/18 season shall have one observer appointed in accordance with the CCAMLR Scheme of International Scientific Observation and, where possible, one additional scientific observer, on board throughout all fishing activities within the fishing season.

6. The Data Collection Plan (Annex 51-04/A) and Research Plan (Annex 51-04/B) shall be implemented. Data collected pursuant to the Data Collection and Research Plans for the period up to 1 May 2018 shall be reported to CCAMLR by 1 June 2018 so that the data will be available to the meeting of the Working Group on Ecosystem Monitoring and Management (WG-EMM) in 2018. Such data taken after 1 June 2018 shall be reported to CCAMLR not later than three months after the closure of the fishery, but, where possible, submitted in time for the consideration of the Scientific Committee.

7. Contracting Parties choosing not to participate in the fishery prior to the commencement of the fishery shall inform CCAMLR of changes in their plans no later than one month before the start of the fishery. If, for whatever reason, Contracting Parties are unable to

participate in the fishery, they shall inform CCAMLR no later than one week after finding that they cannot participate. The Secretariat will inform all Contracting Parties immediately after such notification is received.

[1] Unless otherwise specified, the catch limit for krill shall be 15 000 tonnes in any statistical subarea or division.

[2] The closure of fisheries is governed by Conservation Measure 31-02.

DATA COLLECTION PLANS FOR EXPLORATORY KRILL FISHERIES

1. During normal fishing operations, all vessels will comply with the Ten-day Catch and Effort Reporting System (Conservation Measure 23-02) and the Monthly Fine-scale Catch, Effort and Biological Data Reporting Systems (Conservation Measures 23-04 and 23-05), including requirements for the provision of haul-by-haul data.

2. During normal fishing operations, all data required by the CCAMLR *Scientific Observers Manual* for krill fisheries will be collected.

3. Detailed information on the configuration of every commercial trawl used during normal fishing operations and every research net used during required research operations will be reported to CCAMLR in accordance with Conservation Measure 21-03, Annex 21-03/A, no later than one month after the conclusion of each fishing trip.

4. Data collected from research net hauls shall include:

   (i) the start and end positions and times of the haul;

   (ii) the date on which the haul was conducted;

   (iii) characteristics of the haul such as tow speed, the maximum amount of wire payed out during a tow, the average wire angle during the tow, and calibrated flow-meter values that can be used to provide accurate measures of volume filtered;

   (iv) an estimate of the total catch (in numbers or weight) of krill; and

   (v) a random sample of up to 200 krill or the entire catch, whichever is less, to be taken from the haul by the observer – the length, sex and maturity stage should be measured and recorded for all krill according to protocols in the CCAMLR *Scientific Observers Manual*.

5. At a minimum, data collected from acoustic transects shall:

   (i) as far as possible, be recorded following protocols specified for the CCAMLR-2000 Survey;

   (ii) be linked to position data recorded from a GPS;

(iii) be continuously recorded and then electronically archived every five days or whenever the vessel moves between exploratory units, whichever occurs most frequently.

6. Data collected during research operations conducted by fishing vessels shall be reported to CCAMLR no later than one month after the conclusion of each fishing trip.

7. Data collected by Contracting Parties conducting fishery-independent research operations shall, as applicable, be submitted to CCAMLR following guidelines for the submission of CEMP data and data collected during the CCAMLR-2000 Survey. These data shall be submitted in sufficient time to be considered by the next meeting of the Working Group on Ecosystem Monitoring and Management (WG-EMM).

ANNEX 51-04/B

RESEARCH PLANS FOR EXPLORATORY KRILL FISHERIES

1. Activities under this Research Plan shall not be exempted from any conservation measure in force.

2. This plan applies to all subareas or divisions.

3. A schematic representation of the plans described herein is provided in Figure 1.

4. Contracting Parties intending to conduct exploratory krill fisheries shall choose one of the following four Research and Data Collection Plans and advise CCAMLR of their choice at least one month prior to initiating any fishing activities:

   (i) predator monitoring;
   (ii) a research survey conducted from a scientific vessel;
   (iii) acoustic transects by fishing vessels; or
   (iv) research trawls by fishing vessels.

5. Where a Contracting Party's vessel collaborates with a research institute to conduct the research plan, the Contracting Party shall identify the collaborating institute.

6. In cases where Contracting Parties select plan (i), predator monitoring, from the list in paragraph 4 above, those Parties shall, as far as possible, follow CEMP Standard Methods. Monitoring shall be conducted for a period of time sufficient both to cover the entire breeding period of land-based predators and to cover the duration of any exploratory fishing that occurs during their breeding season.

7. In cases where Contracting Parties select plan (ii), a research survey conducted from a scientific vessel, from the list in paragraph 4 above, Contracting Parties shall, as far as possible, follow all data collection and analysis protocols specified for the CCAMLR-2000 Survey.

8. In cases where Contracting Parties select plans (iii), acoustic transects by fishing vessels, or (iv), research trawls by fishing vessels, from the list in paragraph 4 above, vessels

participating in exploratory krill fisheries may carry out the research plan either before (preferred option) or after normal exploratory fishing operations. The research requirements must be completed within a fishing season.

9. For the purposes of this conservation measure, exploratory units are defined as areas of 1° latitude by 1° longitude size, and the vertices of these units shall occur at integer points of latitude and longitude within statistical subareas or divisions.

10. If the vessel undertakes plan (iii), acoustic transects by fishing vessels, or plan (iv), research trawls by fishing vessels, before normal exploratory fishing operations, then the research plan shall be conducted as follows:

    (i) undertake a research plan for the exploratory units based on the area where it intends to fish;

    (ii) during normal exploratory fishing operations, vessels can choose to fish in any exploratory unit;

    (iii) complete additional research operations so that the number of exploratory units in which research operations are conducted by the end of fishing is greater than, or equal to, the catch obtained during normal fishing operations divided by 2 000 tonnes;

    (iv) carry out its work so that exploratory units in which research operations are conducted surround and include the units where normal fishing operations are conducted.

11. If the vessel undertakes plan (iii), acoustic transects by fishing vessels, or plan (iv), research trawls by fishing vessels, after normal exploratory fishing operations, then the research plan shall be conducted as follows:

    (i) during normal exploratory fishing operations, vessels can choose to fish in any exploratory unit, however, one set of acoustic transects or one set of research hauls must be conducted in each exploratory unit visited during normal fishing operations;

    (ii) upon completion (either voluntarily or if the catch limit has been reached) of normal exploratory fishing operations, the vessel will transit to the nearest previously unvisited exploratory unit and begin research operations;

    (iii) the vessel will determine how many previously unvisited exploratory units must be surveyed during research operations by dividing the catch obtained during normal exploratory fishing operations by 2 000 tonnes and rounding that number to the nearest integer;

    (iv) the vessel will then select a number of exploratory units equal to the number of units determined by the calculation in item 11(ii) above and conduct one set of acoustic transects or one set of research hauls in each of these units;

    (v) exploratory units visited during research operations must not have been visited during normal exploratory fishing operations;

(vi) the survey will be conducted in a way that ensures the exploratory units visited during research operations will surround the units in which normal exploratory fishing operations previously occurred.

12. Research hauls shall be conducted with nekton trawls commonly used in scientific research (e.g. IKMT or RMT type nets) that have 4–5 mm mesh, including the codend. Every research haul shall be a randomly located oblique haul made to a depth of 200 m or 25 m above the bottom (whichever is less) with a duration of 0.5 h. A set of research hauls is defined as three research hauls separated by a minimum of 10 n miles.

13. Acoustic transects shall be conducted using a scientific-quality echosounder collecting information at a minimum frequency of 38 kHz with a minimum observing depth of 200 m. The echosounder should be calibrated prior to the vessel leaving port and, to the extent possible, on the actual fishing ground, and calibration data shall be reported with research transect data. If a vessel is unable to calibrate its echosounder on the fishing grounds:

    (i) acoustic transects comparable with transects visited in previous fishing seasons should be conducted on subsequent visits;

    (ii) vessels undertaking continuous trawling should attempt to match some acoustic observations with respective trawl catches since they may be able to trawl more or less immediately after acoustic data have been recorded.

    Every acoustic transect shall be a randomly located continuous path travelled at constant speed of 10 knots or less and in a constant direction. The minimum distance between the start and end points of a transect shall be 30 n miles, and a set of acoustic transects is defined as two transects separated by at least 10 n miles.

14. All acoustic transects, both during normal exploratory fishing operations and research operations, shall be accompanied by at least one net haul. These hauls can be conducted either with commercial trawls or with research trawls. Trawls that accompany acoustic transects can be conducted during the transect or immediately after the completion of the transect. In the latter case, the trawl shall be conducted along a previous segment of the transect line. Trawls that accompany acoustic transects shall be at least 0.5 h in duration, or of sufficient time to achieve a representative sample, and the data collected from these hauls shall be the same as those required for research hauls.

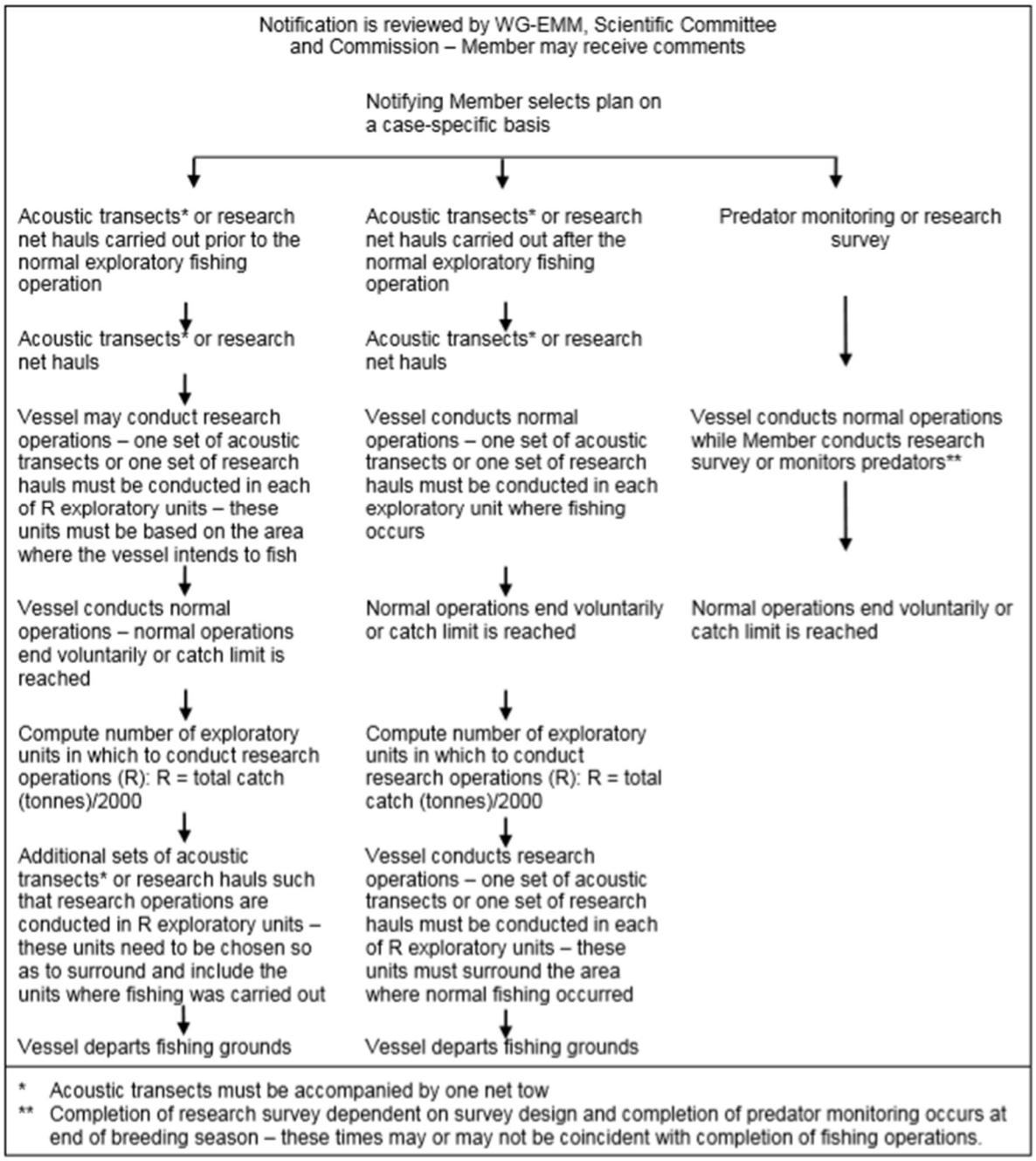

Figure 1: Schematic description of main operations to be conducted during the planning and prosecution of exploratory krill fisheries.

CONSERVATION MEASURE 51-06 (2016)
General measure for scientific observation in fisheries for *Euphausia superba*

Species	krill
Area	all
Season	all
Gear	all

The Commission,

Recognising the importance of krill within the Antarctic ecosystem,

Noting the increased demand for krill products and the expansion in krill fisheries,

Mindful of major data gaps in biological data reporting in most areas of this fishery,

Reaffirming the need for adequate monitoring and management of the krill fishery to ensure that it remains consistent with the objective of the Convention,

Bearing in mind the recommendation of the Scientific Committee that scientific observer coverage is required in the krill fishery, and that in order to determine an appropriate deployment scheme, which will deliver adequate data for its assessments of the impact of the krill fishery on the ecosystem, the Scientific Committee has recommended an initial comprehensive and systematic approach to observer coverage, such as a 100% observer coverage on krill vessels.

hereby adopts the following conservation measure in accordance with Article IX.2(i) of the Convention:

1. Each Contracting Party shall make best efforts to ensure that its fishing vessels engaging in the krill fishery carry on board at least one scientific observer appointed in accordance with the CCAMLR Scheme of International Scientific Observation or any other observer appointed by the Contracting Party[1] and, where possible, one additional scientific observer, throughout all fishing activities in all fishing seasons.

2. Unless specified in any other conservation measure, each Contracting Party shall ensure that its fishing vessels engaging in the krill fishery carry out a systematic scientific observer coverage scheme in accordance with the CCAMLR Scheme of International Scientific Observation, or by any other observer appointed by the Contracting Party[1], throughout all fishing activities in all fishing seasons.

3. The systematic observer coverage scheme referred to in paragraph 2 above shall entail:

   (i) a target coverage rate of no less than 50% of vessels during the 2016/17 and 2017/18 fishing seasons; no less than 75% of vessels during the 2018/19 and 2019/20 fishing seasons; and 100% coverage in subsequent fishing seasons;

   (ii) vessels shall ensure that the scientific observer has access to sufficient samples to fulfil the sampling and data collection as per the requirements outlined in the *Scientific Observers Manual*[2];

   (iii) all vessels being observed at least once every two fishing seasons until 100% coverage is in force.

4. For the purpose of implementing this conservation measure, the data requirements set out in Conservation Measure 23-06 apply.

5. Total green weight of krill caught and brought on board shall be reported. The method used to estimate green weight shall be reported in accordance with the requirements of Conservation Measure 21-03. An estimate of the total green weight of krill caught but not brought on board is encouraged to be reported as a separate category.

[1] The scientific data collection and sampling protocols followed by a Contracting Party appointed observer shall conform to the requirements of the CCAMLR Scheme of International Scientific Observation and the protocols found in the CCAMLR *Scientific Observers Manual*, including application of the priorities and work plan defined by the Scientific Committee. Data and observer reports shall be submitted to CCAMLR according to the requirements of the CCAMLR Scheme of International Scientific Observation for inclusion in the CCAMLR database and analysis by the Scientific Committee and its working groups.

[2] This includes three-day sampling intervals during the period November–February and five-day sampling intervals between March and October for krill length measurements, and sampling according to the instructions in the observer logbook for finfish by-catch.

CONSERVATION MEASURE 51-07 (2016)
Interim distribution of the trigger level in the fishery for *Euphausia superba* in Statistical Subareas 48.1, 48.2, 48.3 and 48.4

Species	krill
Area	48.1, 48.2, 48.3, 48.4
Season	2016/17 to 2020/21
Gear	all

The Commission,

Noting the need to distribute the krill catch in Statistical Area 48 in such a way that predator populations, particularly land-based predators, would not be inadvertently and disproportionately affected by fishing activity,

Recognising that large catches up to the trigger level from areas smaller than subareas should be avoided,

Recognising that the distribution of the trigger level needs to provide for flexibility in the location of fishing in order to (i) allow for interannual variation in the distribution of krill aggregations, and (ii) alleviate the potential for adverse impacts of the fishery in coastal areas on land-based predators,

Understanding that methods such as a quantitative risk assessment framework will provide an initial scientific basis for determining the interim allocation of krill catches and that progress towards feedback management is intended to provide a long-term mechanism to further improve future management of krill, and the spatial allocation of krill catches,

Recognising that further progress with management of krill will require coordinated fishery-dependent and fishery-independent research and monitoring, including for krill-dependent predators,

Recognising that advances are urgently needed as the trigger level itself is not related to the status of the krill stock,

Noting the need for the Scientific Committee to progress toward a functional management system, based on robust science, and that an interim measure is needed to ensure CCAMLR fulfils its obligations under Article II,

hereby adopts the following conservation measure:

1. Pending the review in paragraphs 2 and 3, an interim distribution of the trigger level in paragraph 3 of Conservation Measure 51-01 will be in accordance with the following proportions, where no more than the percentage indicated can be taken from the nominated area:

   Statistical Subarea 48.1 – 25%
   Statistical Subarea 48.2 – 45%
   Statistical Subarea 48.3 – 45%
   Statistical Subarea 48.4 – 15%.

2. Advice on the interim distribution of the trigger level in paragraph 1 shall be updated by the Scientific Committee as new scientific evidence becomes available.

3. The Scientific Committee shall provide advice to the Commission regarding progress towards the development of the risk assessment framework, feedback management and the spatial allocation of catch no later than the annual meeting in 2019.

4. If the Scientific Committee so advises, the proportions in paragraph 1 will be revised, with the intent of ensuring the implementation of Article II of the Convention. The Commission shall seek to update or replace this conservation measure, in progressing feedback management, no later than the end of the 2020/21 fishing season, at which time this conservation measure will expire if agreement has not been reached.

Appendix B. EXTRACT OF THE GUIDELINES FOR THE ECOLABELLING OF FISH AND FISHERY PRODUCTS FROM MARINE CAPTURE FISHERIES

GUIDELINES FOR THE ECOLABELLING OF FISH AND FISHERY PRODUCTS FROM MARINE CAPTURE FISHERIES

SCOPE

1. These guidelines are applicable to ecolabelling schemes that are designed to certify and promote labels for products from well-managed marine capture fisheries and focus on issues related to the sustainable use of fisheries resources.

PRINCIPLES

2. The following principles should apply to ecolabelling schemes for marine capture fisheries:

2.1 Be consistent with the 1982 United Nations Convention on the Law of the Sea and the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, the FAO Code of Conduct for Responsible Fisheries and the World Trade Organization (WTO) rules and other relevant international intruments.

2.2 Recognize the sovereign rights of States and comply with all relevant laws and regulations.

2.3 Be of a voluntary nature and market-driven.

2.4 Be transparent, including balanced and fair participation by all interested parties.

2.5 Be non-discriminatory, do not create unnecessary obstacles to trade[1] and allow for fair trade and competition.[2]

2.6 Provide the opportunity to enter international markets.[2]

2.7 Establish clear accountability for the owners of schemes and the certification bodies in conformity with international standards.

2.8 Incorporate reliable, independent auditing and verification procedures.

2.9 Be considered equivalent if consistent with these guidelines.

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[1] Consistent with the WTO Agreement on Technical Barriers to Trade.
[2] See Code of Conduct for Responsible Fisheries Article 11.2.

2.10 Be based on the best scientific evidence available, also taking into account traditional knowledge of the resources provided that its validity can be objectively verified.
2.11 Be practical, viable and verifiable.
2.12 Ensure that labels communicate truthful information.
2.13 Provide for clarity.
2.14 Be based, at a minimum, on the minimum substantive requirements, criteria and procedures outlined in these guidelines.

3. The principle of transparency should apply to all aspects of an ecolabelling scheme including its organizational structure and financial arrangements.

GENERAL CONSIDERATIONS

4. Ecolabelling schemes should take into account that principles, minimum substantive requirements, criteria and procedures set out in this document will apply equally for developed, transition and developing countries.

5. Bearing in mind that ecolabelling schemes relate to fisheries management, and rights and duties of States[3], it is recognized that the involvement of States in ecolabelling schemes is desirable and should be encouraged. It is also recognized that States and, as appropriate, Regional Fisheries Management Organizations (RFMOs) may develop ecolabelling schemes in a manner consistent with these guidelines. Ecolabelling schemes should give full consideration to the recommendations and advice by States, and, as appropriate, RFMOs.

6. In accordance with Article 5 of the Code of Conduct for Responsible Fisheries, and recognizing that all countries should have the same opportunities, and in view of the special conditions applying to developing countries and countries in transition and their important contribution to international fish trade, it is acknowledged that in order to benefit from applying ecolabelling schemes, States, relevant intergovernmental and non-governmental organizations and financial institutions should provide developing countries and countries in transition with financial and technical assistance to develop and maintain appropriate management arrangements that will allow them to participate in such

[3] In these Guidelines, the reference to States includes the European Community in matters within its competence.

schemes. Such assistance should also consider direct support towards the often high costs of accreditation and certification. Development agencies and donor institutions are encouraged to support FAO in facilitating financial and technical assistance to developing countries and countries in transition.

Appendix C. EXTRACT OF THE MINIMUM SUBSTANTIVE REQUIREMENTS AND CRITERIA FOR ECOLABELS FROM THE GUIDELINES FOR THE ECOLABELLING OF FISH AND FISHERY PRODUCTS FROM MARINE CAPTURE FISHERIES

Introduction

26. The following sets forth the minimum substantive requirements and criteria for assessing whether a fishery can be certified and an ecolabel awarded to a fishery. Ecolabelling schemes may apply additional or more stringent requirements and criteria related to sustainable use of the resources. The requirements and criteria presented below are to be based on and interpreted in accordance with the current suite of agreed international instruments addressing fisheries, in particular the 1982 UN Convention on the Law of the Sea, the 1995 UN Fish Stocks Agreement and the 1995 Code of Conduct for Responsible Fisheries, as well as related documentation including the 2001 Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem.

27. Requirements are specified for each of three areas: the management systems, the fishery and associated "stock under consideration" for which certification is being sought, and consideration of serious impacts of the fishery on the ecosystem. Criteria and related measurable performance indicators and a corresponding monitoring system should be established in order to assess the conformity of the fishery concerned with the requirements and the criteria of the ecolabelling scheme. In developing and applying the criteria and assessing the conformity of the fishery with the standard of certification, the views and opinions of States, RFMOs and FAO should be fully considered.

Management systems

28. Requirement: The fishery is conducted under a management system which is based upon good practice and that ensures the satisfaction of the requirements and criteria described in Paragraph 29. The management system and the fishery operate in compliance with the requirements of local, national and international law and regulations,

including the requirements of any regional fisheries management organization that manages the fisheries on the "stock under consideration".

28.1 For the "stock under consideration" there are documented management approaches with a well based expectation that management will be successful taking into account uncertainty and imprecision.

28.2 There are objectives, and as necessary, management measures to address pertinent aspects of the ecosystem effects of fishing as per paragraph 31.

29. The following criteria will apply to management systems for any fisheries, but it must be recognized that special consideration needs to be given to small-scale fisheries with respect to the availability of data and with respect to the fact that management systems can differ substantially for different types and scales of fisheries (e.g. small scale through to large scale commercial fisheries).

29.1 Adequate data and/or information are collected, maintained and assessed in accordance with applicable international standards and practices for evaluation of the current state and trends of the stocks[4] (see below: Methodological aspects). This can include relevant traditional, fisher or community knowledge, provided its validity can be objectively verified.

29.2 In determining suitable conservation and management measures, the best scientific evidence available is taken into account by the designated authority, as well as consideration of relevant traditional fisher or community knowledge, provided its validity can be objectively verified, in order to evaluate the current state of the "stock under consideration"[5] in relation to, where appropriate, stock specific target and limit reference points.[6]

29.2bis: Taking due account of paragraph 32, for the "stock under consideration" the determination of suitable conservation and management measures should include or take account of:

- Total fishing mortality from all sources is considered in assessing the state of the "stock under

[4] After Code of Conduct for Responsible Fisheries, Article 7.4.4.
[5] Code of Conduct for Responsible Fisheries, Articles 6.4 and 7.4.1.
[6] Code of Conduct for Responsible Fisheries, Article 7.5.3.

consideration", including discards, unobserved mortality, incidental mortality, unreported catches and catches in other fisheries.

- Management targets are consistent with achieving maximum sustainable yield (MSY) (or a suitable proxy) on average, or a lesser fishing mortality if that is optimal in the circumstances of the fishery (e.g. multispecies fisheries) or to avoid severe adverse impacts on dependent predators.
- The management system should specify limits or directions in key performance indicators (see 30.2), consistent with avoiding recruitment overfishing or other impacts that are likely to be irreversible or very slowly reversible, and specify the actions to be taken if the limits are approached or the desired directions are not achieved.

29.3 Similarly, data and information, including relevant traditional, fisher or community knowledge, provided its validity can be objectively verified, are used to identify adverse impacts of the fishery on the ecosystem, and timely scientific advice is provided on the likelihood and magnitude of identified impacts (see paragraph 31).

29.4 The designated authorities adopt and effectively implement appropriate measures for the conservation and sustainable use of the "stock under consideration" based on the data, information and scientific advice referred to in the preceding bullets.[7] Short-term considerations should not compromise the long-term conservation and sustainable use of fisheries resources.

29.5 An effective legal and administrative framework at the local, national or regional level, as appropriate, is established for the fishery[8] and compliance is ensured through effective mechanisms for monitoring, surveillance, control and enforcement (see paragraph 6).[9]

29.6 In accordance with the Code of Conduct Article 7.5, the precautionary approach is being implemented to protect the "stock under consideration" and to preserve the aquatic environment. *Inter alia* this will require that the absence of adequate scientific information should not be

[7] Based on Code of Conduct for Responsible Fisheries, Article 7.1.1.
[8] Code of Conduct for Responsible Fisheries, Article 7.7.1.
[9] Code of Conduct for Responsible Fisheries, Article 7.1.7.

used as a reason for postponing or failing to take conservation and management measures.[10] Further, relevant uncertainties are being taken into account through a suitable method of risk assessment. Appropriate reference points are determined and remedial actions to be taken if reference points are approached or exceeded are specified. [11]

"Stocks under consideration"

30. Requirement: The "stock under consideration" is not overfished, and is maintained at a level which promotes the objective of optimal utilization and maintains its availability for present and future generations[12], taking into account that longer term changes in productivity can occur due to natural variability and/or impacts other than fishing. In the event that biomass drops well below such target levels, management measures (Code of Conduct Article 7.6) should allow for restoration within reasonable time frames of the stocks to such levels (see also paragraph 29.2.bis). The following criteria are applicable:

30.1 The "stock under consideration" is not overfished if it is above the associated limit reference point (or its proxy).

30.2 If fishing mortality (or its proxy) is above the associated limit reference point, actions should be taken to decrease the fishing mortality (or its proxy) below that limit reference point.

30.3 The structure and composition of the "stock under consideration" which contribute to its resilience are taken into account.

30.4 In the absence of specific information on the "stock under consideration", generic evidence based on similar stocks can be used for fisheries with low risk to that "stock under consideration". However, the greater the risk the more specific evidence is necessary to ascertain the sustainability of intensive fisheries.

[10] Code of Conduct for Responsible Fisheries, Article 7.5.1.
[11] Code of Conduct for Responsible Fisheries, Article 7.5.2.
[12] Code of Conduct for Responsible Fisheries, Article 7.1.1.

Ecosystem considerations

31. Requirement: Adverse impacts of the fishery on the ecosystem should be appropriately assessed and effectively addressed.[13] Much greater scientific uncertainty is to be expected in assessing possible adverse ecosystem impacts of fisheries than in assessing the state of target stocks. This issue can be addressed by taking a "risk assessment/risk management approach". For the purpose of development of ecolabelling schemes, the most probable adverse impacts should be considered, taking into account available scientific information, and traditional, fisher or community knowledge provided that its validity can be objectively verified. Those impacts that are likely to have serious consequences should be addressed. This may take the form of an immediate management response or further analysis of the identified risk. In this context, full recognition should be given to the special circumstances and requirements in developing countries and countries in transition, including financial and technical assistance, technology transfer, and training and scientific cooperation. The following criteria are to be interpreted in the context of avoiding high risk of severe adverse impacts:

31.1 Non target catches, including discards, of stocks other than the "stock under consideration" are monitored and should not threaten these non-target stocks with serious risk of extinction; if serious risks of extinction arise, effective remedial action should be taken.

31.2 The role of the "stock under consideration" in the food-web is considered, and if it is a key prey species in the ecosystem, management measures are in place to avoid severe adverse impacts on dependent predators.

31.3 There is knowledge of the essential habitats for the "stock under consideration" and potential fishery impacts on them. Impacts on essential habitats and on habitats that are highly vulnerable to damage by the fishing gear involved are avoided, minimized or mitigated (Code of Conduct 7.2.2). In assessing fishery impacts, the full spatial range of the relevant habitat should be considered, not just that part of the spatial range that is potentially affected by fishing.

31.4 In the absence of specific information on the ecosystem impacts of fishing for the unit of certification, generic evidence based on similar fishery situations can be used

[13] Code of Conduct for Responsible Fisheries, Article 7.2.

for fisheries with low risk of severe adverse impact. However, the greater the risk the more specific evidence is necessary to ascertain the adequacy of mitigation measures.

Appendix D. SUMMARY OF CHARACTERISTICS OF CERTIFICATION SCHEMES

Table C 1. Summary of characteristics of certification schemes (Parkes et al.,2009).

	For fisheries												For aquaculture									
Scheme	3rd party certifier (3rd) or National Standard (NS)	Wild fisheries	Aquaculture	Dedicated to seafood	Seafood as part of broader product certification	Stock status	Ecosystem impacts	Management system	Animal health and welfare	Food safety and quality	Environmental integrity	Social responsibility	Source of information	Frequency of re-certification (for fisheries/aquaculture)	Independent accreditation body?	Independent certification bodies? (i.e., 3rd party)	Certification process allows stakeholder input/challenge	Traceability included	Small-scale and/or data deficient certified?	No of fisheries certified	No. of aquaculture operations certified	Indicative cost of certification/audit (€)
FOS	3rd	✓	✓	✓		✓	✓	✓	Ind	Ind	✓	✓	FAO, RFMO or NMRA	3–5 years	✓	✓	✓	✓	✓	~65[1]	~25	8,000
MSC	3rd	✓	✗	✓		✓	✓	✓					SA	5 years	✓	✓	✓	✓	Few	55		30,000
MEL-Japan	3rd	✓	✗	✓		✓	✓	✓					Japan national SA	5 years	✗	✓	✓	✓	✗	1		15,000
GlobalGAP	3rd	✗	✓		✓				✓	✓	✓	✓	Audit	Annual	✓	✓	✗	✓	✓			400
GAA	3rd	✗	✓	✓					✓	✓	✓	✓	Audit	Annual[2]	✗	✓	✓	✓	✓		72[3]	3,175[4]
Naturland	3rd	✓	✓		✓	✓	✓	✓	✓	Ind	✓	✓	Local SA	Annual	✗[5]	✓/✗[6]	F: ✓ A: ✗	✓	✓	1	?	750
TQS	NS	✗	✓	✓					✓	✓	✓	✓	Audit	Annual	✗	✗	✓/✗[7]	✓	✓		250	0
DEWHA	NS	✓	✗	✓		✓	✓	✓					Australia national SA	0–5 years	✗	✗	✓	✗	✓	121		0

Note: 3rd = Third-party certifier; NS = National Standard; SA = Stock assessment from the fishery; Ind = indirectly, i.e., issue is not specifically addressed and is considered to be beyond the scope and remit of the scheme, but some aspects are indirectly addressed through other measures.

[1]Counts individual species within a single audit as separate fisheries. Count by country and species was 30 for fisheries. In practice, some are mixed fisheries (e.g., line fisheries for swordfish, kingfish, kawahai, tarahiki, and trevally in NZ).

[2]Not specified, but none of the 'certified until' dates for certified farms, hatcheries, or processing plants were more than one year in the future.

[3]Refers to the number of hatcheries (15) and farms (57) certified. In addition, 91 processing and 7 repacking facilities have also been certified.

[4]Relates to cost of membership or registration and the cost of certification audit or annual inspection.

[5]Accreditation is not to Naturland's procedures, but to ISO65.

[6]Naturland certification committee takes the certification decision, not the certification body.

[7]Review indicated "there is the possibility for peer review and debate but not necessarily resulting in an improved outcome."

Appendix E. SUMMARY ASSESSMENT OF FISHERY CERTIFICATION STANDARDS AGAINST THE MINIMUM SUBSTANTIVE REQUIREMENTS IN FAO (2005)

Table D 1. Summary assessment of fishery certification standards against the minimum substantive requirements in FAO (2005) (Parkes et al., 209).

	Management system	State of the stock	Ecosystem impacts
FOS	Includes management system (e.g., fishery follows advice of scientific advisory bodies, has an adaptive management plan, makes data available for scientific monitoring and fishery management), but does not assess whether the data collected by the management system are sufficient for scientific monitoring. Includes precautionary principle.	Stock may not be overfished, depleted, recovering, or data deficient according to most recent stock assessment by FAO, regional fisheries management organization (RFMO), or national marine research agency (NMRA); however, will certify overfished stocks in certain circumstances; stock assessments are not independently reviewed as part of the certification process. 'Stock assessment' used does not always relate to the stock under consideration, especially where taken from FAO (2005b), and can also be out of date (up to 6 years). Other data sources (RFMO, NMRA) better, where available/used.	Assesses against specific criteria (e.g., impacts on seabed; sensitive habitats; biodiversity; ecosystem; endangered, threatened, and protected (ETP) species; predator-prey relationships; selectivity/bycatch; fuel efficiency; and carbon footprint). References cited do not always relate to the specific fishery being assessed.
MSC	Includes assessment of the management system, its effectiveness and implementation. Only scheme that specifically requires the data and information to be sufficient for achieving the other objectives (stock status and ecosystem impacts). Includes precautionary principle.	Uses stock assessment data specific to the stock under consideration. Reference points must be set above the level at which there is an appreciable risk of impairing future viability of the stock. Will not certify a stock that is below limit reference point ('overfished'). If stock is below target reference point and has not been consistently fluctuating around it, a recovery plan should be in place. Stock assessment data are peer-reviewed.	Considers potential direct impacts in the categories of retained species, bycatch species, ETP species, habitats, plus any additional indirect impacts on the ecosystem; requires management responses that address significant impacts.
MEL-Japan	Requires there to be an 'effective' management system but does not provide further details; instead, specific guidelines are developed by the certification body on a case-by-case basis. Does not include precautionary principle.	Target resource is maintained at the 'level of sustainable use', although this is not explicitly defined. Uses data used in Japan's national stock assessments, not independently reviewed as part of the certification process. Data relatively up-to-date (2 years). Would certify overfished stocks if managed under a recovery plan and showing progress towards stock recovery.	Requires that 'appropriate measures should be taken for the conservation of the ecosystem', against the 'most probable adverse impacts'.
Naturland	Includes management system; detailed requirements set for each fishery. Requires data to be collected but does not mention requirement for a full stock assessment or actions to maintain sustainability of the stock based on scientific data. Does not include precautionary principle.	Uses stock assessment results from local research agency. Not independently reviewed as part of the certification process.	Assesses against specific criteria (e.g., no use of poisons or explosives). Also develop specific criteria for individual assessments.
DEWHA	Includes assessment of the management system, its effectiveness and implementation. Includes precautionary principle.	Uses stock assessment data specific to the stock under consideration. Would certify an overfished stock if the management system was considered capable of ensuring recovery.	Considers most serious potential impacts and requires management responses that address those impacts.

Appendix F. FRIEND OF THE SEA SUSTAINABLE FISHERY CRITERIA

Fisheries are categorically excluded from certification if they:

1. Have target or bycatch species that are overfished, depleted or recovering (an exception is made for traditional fisheries if less than 10% of the catch is made up of such overfished stocks and the fishery otherwise provides an example of a well-managed fishery).

2. Have as target or bycatch species that are on the International Union for Conservation of Nature (IUCN) Red List.

3. Are data deficient in relation to determining the stock status of target and bycatch species.

4. Use gears that impact the sea bed unless the impact can be shown to be negligible.

5. Have a discard level higher than the average worldwide level reported by FAO (currently 8% of total catch).

6. Do not respect catch limits if they are set by the management authority.

7. Include any illegal, unreported or unregulated fishing, or Flag of Convenience vessels.

8. Involve certain labour conditions such as forced or child labour, wages below legal standards or do not respect national or international labour legislation.

9. In addition, the Friend of the Sea recommends that the fishery management system use a precautionary approach and incorporate monitoring and research. These latter two points are recommendations rather than requirements because

Appendix G. MARINE STEWARDSHIP COUNCIL SUSTAINABLE FISHERY CRITERIA

The MSC principles and criteria are generic and the key points in relation to minimum substantive requirements are:

1. Fishing levels maintain high and ongoing productivity of fish stocks (including reproductive capacity) within safety margins for error and uncertainty.

2. Depleted stocks are recovered within a specified time frame in order to provide and maintain high and ongoing productivity.

3. Fishing does not threaten biodiversity (including genetic and species biodiversity), habitats or associated, dependent and ecologically related species. Fishing maintains functional relationships and should not lead to regime changes in ecosystem state or food webs.

4. Fishing avoids or minimizes the capture of non-target species, adverse impacts on habitats, and mortality or injuries to threatened, endangered or protected species.

5. The management system has clear objectives consistent with the above requirements of fishing.

6. The management system is consultative to all interested parties, including fishing interests, and includes appropriate dispute resolution mechanisms.

7. The management system is appropriate to the context, scale and intensity of the fishery.

8. The management system includes a research and monitoring programme appropriate to the scale of the fishery, to provide the information necessary for management.

Appendix H. KEY ATTRIBUTES CERTIFICATION SCHEMES MUST ADRRESS

Drivers

"Certification schemes generally apply only to those fisheries or aquaculture facilities seeking to become certified. Most of the drive and initiative for improving sourcing policies has come from industry itself, including the fish catching sector, traders, processors, retailers (notably supermarkets), foodservice companies, and their customers. Most sectors of the fishing industry are increasingly aware of issues related to overfishing and ecological impacts, and for some time have been making efforts towards sustainability. From the fishers' point of view, adopting responsible fishing practices can raise their profile, so that processors and retailers looking for sustainably and ethically sourced products view them in a more favourable light. Other factors for the industry as a whole include individual and generic brand reputations, a need to assure clients along the supply chain of the legality and sustainability of supplies, their own sustainability policies towards environmental responsibility, and also the fact that a sustainable company requires a sustainable supply of fish. NGO campaigns for sustainable seafood have increased the pressure on industry to act and source responsibly."

Accuracy

"The information used to conduct assessments for certifications and recommendation lists should be comprehensive, up-to-date, and well-referenced, from published and peer reviewed sources wherever possible. There are two key issues involved: first, the most recent and relevant information available must be used in the assessment of sustainability; and second, there needs to be a clear procedure and timetable for updating the assessment as new information becomes available. Recommendation lists involve much less detailed analysis of information than certification schemes and may reach conclusions that are different to peer-reviewed outcomes from certification schemes. There is also significant variation in the way in which different certification schemes assess compliance with their standards, notably in the area of stock status. Certification schemes generally have a well-defined timetable for the certification, annual audits, overall duration of a certificate and the procedure for re certification."

Independence

"Independence of fish information schemes is an important element of their credibility that applies at all levels of their development, governance, and implementation. If they are to gain trust and credibility they should not be influenced by political or industrial interests, or wider campaign objectives. Providing certification is available to all fisheries that meet the standard, without discrimination; the decision of a fishery to seek certification is an active and voluntary decision. The producers of recommendation lists, by contrast, are free to assess any fishery

they choose and have the option of 'blacklisting' those that do not meet their sustainability criteria. In preparing recommendation lists, environmental NGOs may put campaign priorities (e.g., a global ban on bottom trawling) ahead of fishery-specific, peer-reviewed outcomes. Certification schemes consider the impacts of each fishery separately and have certified some fisheries that use bottom trawls. While the recommendation lists provide a simple message to consumers, the certification schemes' approach has greater scientific integrity, and produces a fairer and more independent result for the fishery."

Precision

"The issue of precision represents perhaps the clearest divide between certification schemes and recommendation lists. Certification is normally carried out on a clearly defined unit (fish stock, gear type, fleet, etc.) whereas recommendation lists in general do not assess on a stock-by-stock basis, instead assessing a fish species or group of species sourced from a region, and perhaps by an identified fishing or farming method. As a result they present more general and less detailed information at lower resolution than certification schemes. Commonly, this lacks precision and can mask variations among both well-managed and poorly-managed fisheries that all become tarred with the same brush; in turn, this may lead to advice that conflicts with certification scheme assessments. Such inconsistencies are unhelpful to information recipients and consumers and may have significant impacts on well-managed fisheries that should not be grouped together with other less-well-managed units. Thus, certification schemes have the advantage of being able to drill down to the practices of a particular fishery or aquaculture facility and, hence, assess the sustainability of a clearly defined and distinct unit.''

Transparency

"To maintain credibility, there must be a high level of transparency at all stages in the process of developing and implementing the schemes. For certification schemes this includes publication of preliminary information on fisheries and aquaculture units to be assessed, so that stakeholders may provide timely input into the process, as well as the publication of assessment reports prior to the certification decision being taken. In the case of recommendation lists, the full assessment (i.e. scoring against criteria) for fisheries should be made publicly available for comment. However, it is generally more difficult to trace exactly how a particular conclusion has been reached for recommendation lists than for certification schemes. The latter usually have more transparent procedures and/or peer review processes."

Standardization

"Different certification schemes certify different things, have different standards, and use different assessment methodologies. There has been little effort to date to seek equivalence between different, competing schemes, particularly in the capture fisheries sector. While it is not realistic to expect all certification schemes to address exactly the same issues, where possible, greater standardization and harmonization between schemes should be encouraged. This would enable increasing recognition of equivalence between standards and would be a measure that would facilitate business for industry. This is already happening in the organics sector where certification under one scheme can lead to that product's 'organic' status being recognized by other organic labels. Greater standardization and harmonization should be encouraged as a longer-term goal to work towards, and could lead to recognition of equivalence between schemes. This process should be greatly facilitated by the FAO guidelines. Likewise, for recommendation lists, the development and application of common methodologies for scoring and compiling the lists would helpminimize the consumer confusion that already exists surrounding sustainable seafood. Within a scheme, quality control of certifications is necessary to ensure consistent application of the standard and its consistent communication to consumers."

Cost-effectiveness

"For certification schemes, there is a balance to be found between the scheme being comprehensive and robust, and the cost involved in assessing against a wide range of detailed criteria. A very complex scheme that requires a large amount of detailed information for the assessment may become too expensive to be accessible for the industry. On the other hand, a scheme that is very simple and has an assessment procedure that is quick and easy to implement, and is therefore less costly, may not be sufficiently robust to inspire and maintain the confidence of industry, retailers, and consumers. Both will fail to achieve their objectives since they will not achieve the necessary uptake. The costs involved vary, but certification processes are often time consuming and costly. The decision to seek certification is both active and voluntary; a fishery or aquaculture facility will generally choose one certification scheme to promote its environmental credentials, based on an assessment of potential costs and benefits involved, together with market recognition and how they can take advantage of this. Certification is primarily industry-funded, although other funding mechanisms exist. Governments have provided financial support to help fisheries go through private certifications, but this is not common. The industry generally bears the cost of preparing documentation and meeting any imposed conditions. Certification costs need to be kept under control to avoid costs becoming too high, such that certain fisheries (e.g., small-scale fisheries

or those in developing countries) are priced out of the system and cannot benefit from certification. Certification of products coming from developing world fisheries and aquaculture operations is less frequent than from developed countries because of high costs and because the production systems are more likely to be small-scale and data-poor. Certification schemes may, therefore, result in products being sourced preferentially (but unintentionally) from developed countries. Uptake of certification schemes in developing countries varies, but all schemes are seeking to improve this. There are varying approaches to making certification costs accessible to small-scale producers and to producers in developing countries, such as group certification, keeping audit costs low, or accessing public sector or grant funding."