Sustainable Fisheries
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Reduction Fisheries:

SFP Fisheries Sustainability Overview 2015

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B_{MSY}; fisheries; FishSource; F_{MSY}; forage; improvement; low trophic level; ecosystem-based fisheries management; reduction; stock status; supply chain; sustainability; target

DISCLAIMER

This report was mainly prepared with information available from FishSource.com™, a program of Sustainable Fisheries Partnership (SFP). The findings summarized in the report are based on information that the authors accessed from FishSource in March 2015. SFP updates FishSource regularly but the report may not capture the most recent data for all the stocks. Always check FishSource.com for the most updated information SFP has for any given stock and fishery. Given the large number of existing fisheries for a given sector, this report evaluates the strategically most important stocks worldwide (based on criteria such as volume of catch or interest for SFP partners, for example). The *scoring* and *ranking categories* provided currently do not take into account the environmental impacts of the fisheries (i.e., are based solely on the quality of management/fishers' compliance and the status of the stock). However, the main environmental issues are considered at a high resolution, based on information already captured in the respective narrative "Environment and Biodiversity" sections of FishSource.com, and also in other sources of information.

EXECUTIVE SUMMARY

This briefing represents the sixth edition of the SFP global sustainability overview of main Pacific and Atlantic fish stocks used for reduction purposes. The 2015 analysis covers 24 stocks (compared to 28 last year) from 13 species and two main groups (fish and crustaceans), rated according to the sustainability assessment presented on FishSource (www.fishsource.com). The document covers the most recent assessment period for which comparable data is available as of March 2015.

Unlike previous years – in which our analysis encompassed all main small pelagic stocks, both for fishmeal and fish oil and for human consumption – this 2015 overview focuses solely on the stocks used for fishmeal and fish oil, regardless of the taxonomical group. For instance, in this edition we include Antarctic krill, which is a crustacean but growing in importance as a commodity for fishmeal or oil purposes. Conversely, the herring stocks from the northwest Atlantic (and more recently most of the northeast Atlantic mackerel and horse mackerel), which have been mostly used for human consumption in recent times, were excluded from this year's analysis. The proportion of any given species/stock being utilized for meal and fish oil is a function of market demand and can change with time.

The fisheries are ranked into four sustainability categories (A, B1, B2, and C) according to scores on FishSource, the SFP public database of fisheries information. The categorization is based on the quality of management (scores 1 to 3) and status of the target stock (scores 4 and 5). While information on environmental impacts of fishing activities is also captured in the narrative sections of the FishSource fishery profiles, it is not currently captured by the scoring system. The categories, defined within the context of FishSource's 10-point scoring scale, are:

Categories	Criteria
Category A: Very well managed fisheries	Score 8 and above across all FishSource scores
Category B1: Reasonably managed fisheries with stock in good condition	Score ≥ 6 across all FishSource scores, and score ≥ 8 in terms of biomass
Category B2: Reasonably managed fisheries	Score 6 or above across all FishSource scores
Category C: Poorly managed fisheries	At least one FishSource score is below 6

In summary, the briefing concludes that for the 24 stocks analyzed:

- **Most (63%)** of the catch supply for reduction purposes in this overview comes from South American fisheries (FAO area 87), followed by European (FAO area 27; **16% of total catch supply**) and northwest African (FAO area 34; **10% of total catch**) fisheries.

- **Catches from fisheries for reduction** purposes have a **considerable contribution** to the total finfish catches**.** The contribution of reduction fisheries to the total finfish catch for each of the FAO areas covered in this overview ranges from 12% (NW Africa; FAO 34) to 64%[1] (Atlantic, Antarctic; FAO 48) (Appendix A).

- **Anchoveta** remains by far the **most important species for reduction purposes**, accounting for **more than half (57%)** of the total catch in this overview**. European pilchard (10%)** from northwest Africa, and **blue whiting (7%)** are also important species.

- With the exception of some fisheries in Europe, all reduction fisheries in the Atlantic and Eastern Pacific target low trophic level (LTL) species. Management of such fisheries should be focused on an ecosystem-based (rather than single-species) perspective, given the key role of some of these species as a source of food to upper levels of the food chain.

- The top ten stocks in terms of catch supply for reduction purposes accounted for **96% of the total catch in this analysis (Table 5).** In this list are the Peruvian and Chilean anchoveta fisheries, the northwest African sardine fisheries, the Antarctic krill, the US Gulf menhaden fishery (Gulf of Mexico), as well as the largest European reduction fisheries: sand-eel (Dogger Bank area), blue whiting, and capelin (Barents Sea).

- Just **two percent** of the total catch volume of the reduction fisheries in this analysis comes from stocks in very good condition (**Category A**) (**Figure 1**). This corresponds to a single fishery: Antarctic krill - Atlantic Southern Ocean. This fishery is managed by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), and is MSC certified as sustainable since 2010.

- Cumulatively, **most (62.5%)** of the total catch volume in this analysis comes from stocks that are reasonably well managed (or better) (i.e., that score 6 or above on all five FishSource criteria). The stock with the largest contribution to this category was clearly the **anchoveta - Peruvian northern-central stock**, which represented 47.5% of the total catch in this analysis.

- Only **12%** of the catch comes from stocks that score 6 or above in all criteria AND the score for biomass is 8 or more, meaning biomass is at or above target levels (**Category B1**). These stocks are in very good shape in terms of biomass, but still need some improvements in management strategy. This level of performance is in line with the current Aquaculture Stewardship Council requirements for fisheries providing fishmeal and fish oil for feed to certified farms.

[1] For the Antarctic Atlantic, krill catches are compared to total catches in that FAO fishing area (finfish, crustaceans, etc.).

- **More than one third** (37.5%; 3.5 million tonnes) of the total catch for reduction purposes comes from the 12 poorly managed fisheries (Category C) in this overview (**Table 5**).
    - In several cases, the stock status of these **C-rated** fisheries is good but there is serious a management issue (e.g., overfishing, TAC above advised levels) that is causing the fishery to score badly. In such cases, if the specific management issue(s) is/are tackled (and the other conditions remain), the condition of the fisheries would improve.
    - Some fisheries are in very bad shape in terms of both the management strategy and stock status, where considerable improvements are needed. This is the case of the **anchoveta - Chilean regions V-X** fishery, for example **(**Appendix B**)**.
    - An analysis of why each of these fisheries are scoring badly (i.e., less than 6) in one or more the specific FishSource sustainability criteria is provided in **Appendix B**.Category C stocks in the 2015 evaluation and the reasons for scores below 6.
- For the 17 stocks covered in both the 2014 and 2015 evaluations, there was a **considerable decrease** in catch supply **from A and B1 category fisheries (- 46.6%)** compared to 2014. This was caused by the downgrade in category of the largest reduction fishery in the world: the North Peruvian anchoveta, as well as other relatively large fisheries such the northeast Atlantic blue whiting and the North Sea Norway pout. The number of stocks within each category remained relatively unchanged, however (**Table 4** and **Table 5**).
- Of the 24 fisheries analyzed, **changes in sustainability categories from 2014** were observed in **10 fisheries** (details on the specific changes for each of the fisheries can be found in **Table 6**):
    - **Four fisheries improved** their status: Atlantic menhaden - NW Atlantic; lesser sand-eel - Central Eastern North Sea; capelin – Icelandic; and lesser sand-eel - central western North Sea.
    - **Six fishery stocks decreased** in their sustainability category: anchoveta - Peruvian northern-central stock; boarfish - NE Atlantic; blue whiting - Northeast Atlantic; Norway pout - North Sea; lesser sand-eel - Dogger Bank area; and capelin - Barents Sea.

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1 INTRODUCTION

Sustainable Fisheries Partnership (SFP) applies a sectoral approach to its mission of making actionable information available to retailers and the supply chain in order to leverage market forces to achieve fishery improvements where needed. Seafood sectors may be defined in terms of the shared biological characteristics of harvested species and are designed to facilitate standardized approaches to data gathering and analysis. Seafood sectors are also intended to group fisheries that are of common interest to members of the supply chain.

SFP has created an online database, FishSource.com, in which individual stocks' and fisheries' performances within each sector are tracked against the FishSource sustainability criteria for management quality and stock status, environmental impacts, and improvement needs of individual fisheries. As of July 2015, FishSource covers around 1,760 individual fisheries from more than 500 stocks and 350 marine and freshwater wild-captured species (SFP 2015). Since 2008, analyses of FishSource data in the form of sector reports have been carried out for the most strategic seafood sectors. The sector reports assess the sustainability performance of individual stocks and aggregate data in order to reflect the status of the overall sector. This information can provide useful guidance to those parts of the fishing and seafood industries that need to incorporate sustainability criteria into procurement policies. This particular report focuses on the reduction fisheries sector.

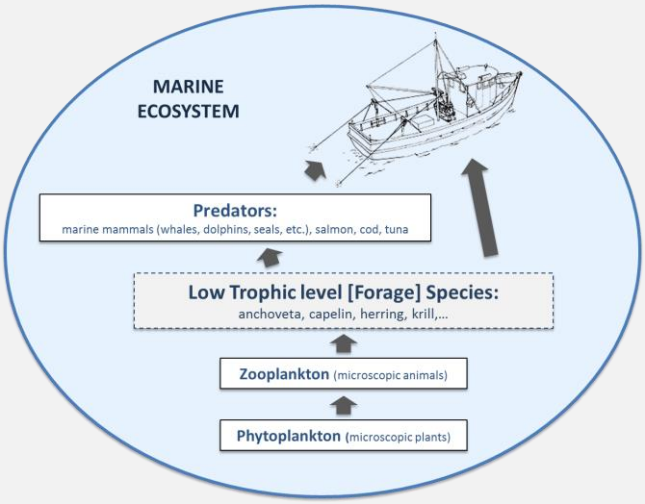
Reduction fisheries for the fishmeal and fish oil industry in the Atlantic and east Pacific oceans are largely dominated by low trophic level species. Also known as forage species, these are small, short-lived species that occupy a low trophic level (LTL) in the ecosystem (e.g., krill, anchovy, herring, pilchard, sprat, sardine, sand-eel, and menhaden) and can be found in large shoals in specific regions (e.g., southeast Pacific). Due to their specific population biology and dynamics (e.g., high fecundity, early maturity, and short life span), these species are frequently resilient to fishing pressure if catches are well managed, but overfishing is always a possibility without effective controls. These stocks are also extremely important to wider ocean ecology because they are a critical food source for many species of fish, marine mammals, and seabirds and act as the foundation for many food webs. It is of the utmost importance that these stocks are well managed with adequate safety margins and a healthy respect for the wider ecological implications of commercial exploitation (see box, below).

The 2015 SFP Fisheries Sustainability Overview analyzes 24 reduction fisheries (most targeting forage species) and assesses the sustainability of the current management regimes. It is important to note that only a subset of the global catch supply that is used for reduction is covered: fisheries which are used exclusively as fish trimmings are excluded from this analysis, as well as the "trash"[2] fisheries from Southeast Asia. The criteria for the inclusion of a given fishery in the report was thus based on a combination of its importance in terms of catch volume and the strategic interest for Sustainable Fisheries Partnership (SFP) partners.

[2] "Trash fish" is the term commonly used for fish that have generally very low or no direct commercial value; these are generally fish that are small in size or species with very low consumer preference. Trash fisheries are of great importance in the Asian region, representing more the one fourth of the total marine capture production in several Southeast Asian countries (FAO 2005). Trash fish are mostly used as fishmeal in aquaculture, but also for human consumption (as a cheap source of animal protein in coastal areas).

The importance of ecosystem-based fisheries management for low trophic level species

In many highly productive marine systems, a single key species (or only a few of them) may connect groups lower on the trophic chains with top predators. These species – known as low trophic level (LTL) species – act as predators on zooplankton while acting as prey for larger predators and as such occupy a crucial position in the marine food web. A substantial reduction in the population of a LTL species may have very significant impacts on the ecosystem and a wide range of prey and predator species. As the importance of these LTL species has become known (for instance, Cury et al. 2001) it has become clear that the fishing of such species would have to be regulated in such a way that enough biomass is left in the water to maintain regular functioning of energy flows across the food chain. This is especially critical in so-called "wasp-waist" systems (Rice 1995, Cury et al. 2000, Shannon et al. 2000) where a few highly abundant, key LTL species directly drive the abundance dynamics of both upper and lower trophic levels.



In fact, recent studies have shown that in several highly productive systems in the world, including areas where upwelling phenomena play a central role in ocean productivity (Humboldt current, California, Benguela, and Canary coast lines), fishing LTL species at F_{MSY} (B_{MSY}) is not precautionary enough and could negatively impact on the wider ecosystem. (Johnson et al. 2010, Brown and Mackinson 2011, Marzlof and Tam 2011, Shannon and Shin 2011, Smith et al. 2011, Kaplan et al. 2012).

Whereas in many real stock assessment situations a good proxy to B_{MSY} is taken from 40% of the unfished biomass (B_{40}), studies have shown that by managing key LTL stocks at a more precautionary B_{75} (75% of unfished biomass as target) the impact to other groups in the food chain can be mitigated, while not losing too much production in the long term (Smith et al. 2011, Pikitch et al. 2012).

Ecological considerations around key LTL species lie behind recent revisions of the Marine Stewardship Council standard regarding small pelagics. Any small pelagic species that is identified as key by the MSC methodology is subject to further criteria regarding biomass and exploitation that go beyond those required for non-key species. Consequently, in establishing the possibilities for any given fishery achieving MSC certification, it is essential that the stock first be defined as either key or non-key before further assessment can be performed.

A review of the management arrangements for fisheries assessed in this report demonstrates that, with the exception of those fisheries that are MSC certified or under MSC full assessment, none of the fisheries currently include wider ecosystem considerations in their management approach. Given the rapidly increasing scientific knowledge of the critical role played by LTL species in wider ecosystem functions, it is likely that fisheries will come under pressure in the future to consider such issues when devising management regimes.

2 SOURCES OF INFORMATION AND ASSESSMENT CRITERIA

Our overview is based on information from FishSource.com, SFP's online information resource about the status of fish stocks and fisheries. FishSource scores (Cannon 2006) consist of a suite of criteria to assess key aspects of management and stock status of fisheries and fish stocks. **Table 1**, below, provides a brief explanation of the five FishSource scoring criteria (full details of the FishSource scoring methodology can be found at: http://www.fishsource.com/faqs).

Table 1. Current rationale for each of the five FishSource scoring criteria

	Score/Criterion	Rationale	Rationale (description)
Management quality	**Score 1:** Is management precautionary?	$F_{at\ low\ biomass}$ / F_{target} OR $F_{current}$ / F_{target}	How does the adopted limit and/or target reference point for fishing mortality rate compare to the stock's fishing mortality rate at low biomass, as an index of whether the management strategy is precautionary? The higher the ratio, the lower the score.
	Score 2: Do fishery managers follow scientific advice?	Set TAC / Advised TAC	How does the adopted total allowable catch (TAC) level compare to the scientific advice on measures needed to meet stock management objectives, as an index of whether fishery managers follow scientific advice? The higher the ratio, the lower the score.
	Score 3: Do fishers comply?	Catches / Set TAC	How did the catch level in the most current year for which data are available compare to the adopted TAC level, as an index of whether harvest control rules were met? The higher the ratio, the lower the score.
Stock Status	**Score 4:** Is the stock biomass healthy?	$B_{current}$ / B_{target}	How does stock biomass in the most current year for which data are available compare to the biomass level that is predicted to support maximum sustainable yields, or similar biological reference point, as an index of whether the stock biomass is healthy? The higher the ratio, the higher the score.
	Score 5: Will the stock be healthy in the future?	$F_{current}$ / F_{target}	How does the fishing mortality rate in the most current year for which data are available compare to the rate that is predicted to support maximum sustainable yields, or similar biological reference point, as an index of whether the stock will be healthy in the future? The higher the ratio, the lower the score.

Source: Cannon 2006

For profiles assessed using the FishSource quantitative criteria, FishSource scores each criterion on a scale of 0 to 10, with 0 being the lowest and 10 the highest possible score. Preserving comparability with quantitative scores, qualitative scores are obtained by using the cut-off points as used in applications of the MSC fishery assessment method, where "< 6" indicates a high risk and a negative assessment finding, "≥ 6" indicates a medium risk and that improvements are required, and "≥ 8" indicates a low risk and that the fishery meets the criterion conditions.

The scores are based on the most recently available public data as of March 2015 and generally represent a snapshot of the position in 2014 with regard to management quality and stock status indicators and in 2013[3] for catch statistics. More recent data may be obtained from FishSource.com for some specific stocks, but not for all of the stocks analyzed.

FishSource scores are then used to place fisheries into one of four ranked sustainability categories (A, B1, B2, and C). The categorization is based on the quality of management (scores 1 to 3) and status of the target stock (scores 4 and 5). While information on environmental impacts of fishing activities is also captured in the narrative sections of the FishSource fishery profiles, it is not currently captured by the scoring system. **Table 2** below shows the criteria of the four sustainability categories used in the overview.

Table 2. Criteria for the four sustainability categories used in this 2015 Fisheries sustainability overview

Categories	Criteria
Category A: Very well managed fisheries	Score 8 and above across all FishSource scores
Category B1: Reasonably managed fisheries with stock in good condition	Score ≥ 6 across all FishSource scores, and score ≥ 8 in terms of biomass
Category B2: Reasonably managed fisheries	Score 6 or above across all FishSource scores
Category C: Poorly managed fisheries	At least one FishSource score is below 6

Given the important role of most of the species used for reduction as forage species (e.g., Peruvian anchoveta, Antarctic krill), particular emphasis is placed on biomass for the categorization above (i.e., the split into categories B1 and B2). This reflects the crucial role of this criterion in determining the quality of management of a fishery and is closely aligned with recent developments in the Marine Stewardship Council Fisheries Assessment Methodology with regard to low trophic level (LTL) fisheries. In our current sustainability overview, we also include a dedicated section on the importance of an ecosystem-based fisheries management approach for LTL species.

Unlike previous years – in which our analysis encompassed all main small pelagic stocks, both for fishmeal and fish oil and for human consumption – this 2015 overview focus solely in the stocks used for fishmeal and fish oil, regardless of the taxonomical group, due to redefinition of this seafood sector recently conducted by SFP to best align with its strategic mission. For instance, in this edition we include the Antarctic krill stock, which is a crustacean but growing in importance as a commodity

[3] Although catch data for 2014 is already available for some fisheries, most is only available up to 2013, thus we have used the 2013 catch across all fisheries. Four stocks had no catch data for 2013 and thus the latest catch available was used: Gulf menhaden - Gulf of Mexico (2012); anchoveta - Chilean regions XV-I-II/Southern Peruvian stock (2012); European pilchard - Northwest Africa central stock (2011); and European pilchard - Northwest Africa southern stock (2011).

for fishmeal or krill oil purposes. Conversely, the herring stocks from the northwest Atlantic (and more recently most of the northeast Atlantic mackerel and horse mackerel), where catches have been mostly for human consumption in recent times, were excluded from this year's analysis. The proportion of any given species/stock being utilized for meal and fish oil will be a function of market demand and can change with time.

3 RESULTS

Sustainable Fisheries Partnership has been releasing annual overviews of stock status and management quality for reduction fisheries since 2008, but has recently (in the past two years) been including stocks that are mainly for human consumption (e.g., the northeast Atlantic herring fisheries). The current report, however, relies on a seafood sector redefinition recently conducted by SFP to best align with its strategic mission; the current "reduction fisheries" sector only includes stocks where whole fish are used for reduction purposes (excluding trimmings) and also excludes trash fish fisheries. A comparison between the different approaches adopted in 2014 and 2015 is given in **Table 3**.

Table 3. Comparison of the stocks included in the current and last year's sustainability overview

	2015 (this report)	2014 report
Criteria for inclusion of stocks	Exclusive use for reduction, whole fish, non-"trash fish," non-exclusive use for human consumption, globally largest and/or important to key markets	Use for reduction OR for human consumption, preferably small pelagics, globally largest and/or important to key markets
Number of stocks analyzed	24	28
Total catch volume analyzed (kt)	9,304	10,878
Top five stocks in catch volume	1. Anchoveta - Peruvian northern-central stock 2. Anchoveta - Chilean regions XV-I-II/ Southern Peruvian stock 3. Blue whiting - Northeast Atlantic 4. Gulf menhaden - Gulf of Mexico 5. European pilchard - Northwest Africa central stock	1. Anchoveta - Peruvian northern-central stock 2. Anchoveta - Chilean regions XV-I-II/ Southern Peruvian stock 3. Araucanian herring - Chilean 4. Atlantic herring - Northeast Atlantic spring spawners 5. Gulf menhaden - Gulf of Mexico
Cumulative % for the top five, in catch volume	76%	61%
Taxonomic variability (in number)	Small pelagics (58.5%), other (33.5%), shrimp (4%), whitefish (4%)	Small pelagics (89%), other (11%)
Percentage of matching stocks (in number)	48.6 % (17 common, 35 unique combined)	

3.1 Overview of management quality and the current status of the stocks

Overall, the main results from the current assessment of the 24 small pelagic stocks, in terms of management quality and stock status are as follows:

- **Most (63%)** of the catch supply for reduction purposes in this overview comes from South American fisheries (FAO area 87), followed by European (FAO area 27; **16% of total catch supply**) and northwest African (FAO area 34; **10% of total catch**) fisheries.

- **Catches from fisheries for reduction** purposes have a **considerable contribution** to the total finfish catches**.** The contribution of reduction fisheries to the total finfish catch for each of the FAO areas covered in this overview ranges from 12% (NW Africa; FAO 34) to 64%[4] (Atlantic, Antarctic; FAO 48) (**Appendix A**).

- **Anchoveta** remains by far the **most important species for reduction purposes**, accounting for **more than half (57%)** of the total catch in this overview**. European pilchard (10%)** from northwest Africa, and **blue whiting (7%)** are also important species.

- With the exception of some fisheries in Europe, all reduction fisheries in the Atlantic and Eastern Pacific oceans target low trophic level (LTL) species. Management of such fisheries should be focused on an ecosystem-based (rather than single-species) perspective, given the key role of some of these species as a source of food to upper levels of the food chain.

- The top ten stocks in terms of catch supply for reduction purposes accounted for **96% of the total catch in this analysis (Table 5).** In this list are the Peruvian and Chilean anchoveta fisheries, the northwest African sardine fisheries, the Antarctic krill, the US Gulf menhaden fishery (Gulf of Mexico), as well as the largest European reduction fisheries (sand-eel (Dogger Bank area), blue whiting, and capelin (Barents Sea)).

- Just **two percent** of the total catch volume of the reduction fisheries in this analysis comes from stocks in very good condition (**Category A**) (**Figure 1**). This corresponds to a single fishery: Antarctic krill - Atlantic Southern Ocean. This fishery is managed by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), and is MSC certified as sustainable since 2010.

- Cumulatively, **most (62.5%)** of the total catch volume in this analysis comes from stocks that are reasonably well managed (or better) (i.e., that score 6 or above on all five FishSource criteria). The stock with the largest contribution to this category was clearly the **anchoveta - Peruvian northern-central stock**, which represented 47.5% of the total catch in this analysis.

- Only **12%** of the catch comes from stocks that score 6 or above in all criteria AND the score for biomass is 8 or more, meaning biomass is at or above target levels (**Category B1**). These stocks are in very good shape in terms of biomass, but still need some improvements in management

[4] For the Antarctic Atlantic, krill catches are compared to total catches in that FAO fishing area (finfish, crustaceans, etc.

strategy. This level of performance is in line with the current Aquaculture Stewardship Council requirements for fisheries providing fishmeal and fish oil for feed to certified farms.

- **More than one third** (37.5%; 3.5 million tonnes) of the total catch for reduction purposes comes from the 12 poorly managed fisheries (Category C) in this overview (**Table 5**).
    - In several cases, the stock status of these **C-rated** fisheries is good but there is serious a management issue (e.g., overfishing, TAC above advised levels) that is causing the fishery to score badly. In such cases, if the specific management issue(s) is/are tackled (and the other conditions remain), the condition of the fisheries would improve.
    - Some fisheries are in very bad shape in terms of both the management strategy and stock status, where considerable improvements are needed. This is the case of the **anchoveta - Chilean regions V-X** fishery, for example **(Appendix B)**.
    - An analysis of why each of these fisheries are scoring badly (i.e., less than 6) in one or more of the specific FishSource sustainability criteria is provided in Category C stocks in the 2015 evaluation and the reasons for scores below 6.
- For the 17 stocks covered in both the 2014 and 2015 evaluations, there was a **considerable decrease** in catch supply **from A and B1 category fisheries (- 46.6%)**, compared to 2014. This was caused by the downgrade in category of the largest reduction fishery in the world: the North Peruvian anchoveta, as well as other relatively large fisheries such the northeast Atlantic blue whiting and the North Sea Norway pout. The number of stocks within each category remained relatively unchanged, however (**Table 4** and **Table 5**).
- Of the 24 fisheries analyzed, **changes in sustainability categories from 2014** were observed in **10 fisheries** (details on the specific changes for each of the fisheries can be found in **Table 6**):
    - **Four fisheries improved** their status: Atlantic menhaden - northwest Atlantic; lesser sand-eel - central eastern North Sea; capelin – Icelandic; and lesser sand-eel - central western North Sea.
    - **Six fishery stocks decreased** in their sustainability category: anchoveta - Peruvian northern-central stock; Boarfish - northeast Atlantic; blue whiting - northeast Atlantic; Norway pout - North Sea; lesser sand-eel - Dogger Bank area; and capelin - Barents Sea.

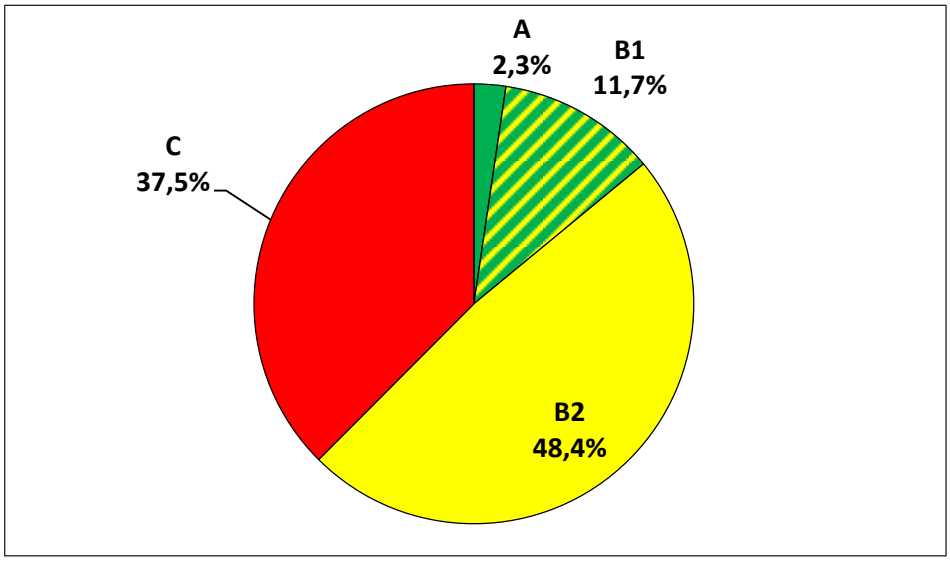


Figure 1. Proportion of total reported landings by SFP FishSource sustainability category for the 24 stocks in this overview

Table 4. Changes in catch volumes of fish from the four categories (A, B1, B2, C) for the 17 common stocks between the 2014 and 2015 reporting periods

Evaluation category	Evaluation category criteria	2015 report			2014 report			Change 2014 – 2015
		Stocks (n)	Catch ('000 t)	% of catch	Stocks (n)	Catch ('000 t)	% of catch	
A	All scores ≥ 8	0	0	0.0%	1	376	4.2%	- 4.2% (1 stock)
B1	All scores ≥ 6, and biomass score ≥ 8	5	1088	12.1%	5	4860	54.5%	- 42.4% (2 stocks)
B2	All scores ≥ 6, biomass score <8	2	4392	49.0%	2	341	3.8%	+ 45.2% (4 stocks
C	One or more scores < 6	10	3492	38.9%	9	3336	37.4%	+ 1.5% / 1 stock

Note: This analysis does not include Antarctic krill - Atlantic Southern Ocean, as this stock was not evaluated in the 2014 sustainability overview.

Table 5. Current FishSource scores, sustainability category, and latest catch data for the 24 stocks used for reduction purposes, assessed in this overview (as of March 2015)

Stock [1] [2]	Management			Stock Status		Evaluation category	Catch ('000 t)	% of total	Year of catch	Changes from last year	FIP Y/N (year)	Certification	
	Score 1	Score 2	Score 3	Score 4	Score 5							IFFO	MSC
Antarctic krill - Atlantic Southern Ocean (Country: NO; Gear: TM; MSC-Client: AKB; MSC-Status: MSC Recertified)	≥ 8	10	10	≥ 8	≥ 8	**A**	217.4	2.3%	2013	-	-	-	Cert
Atlantic menhaden - Northwest Atlantic	≥ 6	≥ 6	10	10	10	**B1**	169	1.8%	2013	C to B1	-	✓	-
European sprat - North Sea	≥ 6	≥ 6	10	10	9.3	**B1**	70.6	0.8%	2013	-	-	✓	FA
Gulf menhaden - Gulf of Mexico	≥ 6	≥ 8	≥ 6	8.8	10	**B1**	579	6.2%	2012	-	-	✓	-
Araucanian herring - Chilean	≥ 6	10	10	8.7	7.8	**B1**	230	2.5%	2013	-	2008	✓	-
Lesser sand-eel - Central Eastern North Sea	≥ 6	10	10	8.1	≥ 6	**B1**	39.2	0.4%	2013	C to B1	-	✓	FA
Anchoveta - Chilean regions III and IV	≥ 6	10	10	7.5	7.6	**B2**	34.7	0.4%	2013	-	-	✓	-
Anchoveta - Peruvian northern-central stock	≥ 6	10	≥ 6	≥ 6	≥ 6	**B2**	4250	45.7%	2013	B1 to B2	-	✓	-
Capelin - Icelandic	≥ 6	≥ 8	10	≥ 6	≥ 6	**B2**	142	1.5%	2013	C to B2	-	✓	-
Boarfish - Northeast Atlantic	≥ 6	10	10	≥ 6	≥ 8	**B2**	75.4	0.8%	2013	A to B2	-	✓	-
Lesser sand-eel - Central Western North Sea	≥ 6	10	10	≥ 6	≥ 6	**B2**	5.2	0.1%	2013	C to B2	-	✓	FA
Lesser sand-eel - Shetland	≥ 6	10	10	n/a	≥ 6	**B2**	0	0.0%	2013	-	-	✓	n/a [3]
Blue whiting - Northeast Atlantic	8.9	5.8	10	10	8.4	**C**	626	6.7%	2013	A to C	-	✓	FA
Norway pout - North Sea	≥ 6	0	10	10	≥ 8	**C**	82.1	0.9%	2013	B1 to C	-	✓	FA
European pilchard - Northwest Africa southern stock	≥ 6	≥ 6	< 6	8.0	9.2	**C**	419.1	4.5%	2011	-	2014	-	-
Lesser sand-eel - Southeast North Sea	≥ 6	10	0	7.4	≥ 6	**C**	23.5	0.3%	2013	-	-	✓	FA
Lesser sand-eel - Dogger Bank area	≥ 6	10	0	6.7	≥ 6	**C**	210.1	2.3%	2013	B2 to C	-	✓	FA
Anchoveta - Chilean regions XV-I-II/Southern Peruvian stock	≥ 6	≥ 6	≥ 6	6.6	5.5	**C**	1067.8	11.5%	2012	-	-	✓	-
European pilchard - Northwest Africa central stock	< 6	< 6	< 6	≥ 6	8.7	**C**	504.6	5.4%	2011	-	2014	-	-
Capelin - Barents Sea	≥ 8	0	9.8	≥ 6	≥ 6	**C**	177	1.9%	2013	B2 to C	-	✓	-
Chilean jack mackerel	≥ 6	10	10	4.9	9.4	**C**	341.7	3.7%	2013	-	2010	✓	-
Anchoveta - Chilean regions V-X	< 6	10	< 6	1.5	0	**C**	39.7	0.4%	2013	-	2008	✓	-
Lesser sand-eel - Kattegat	< 6	10	10	n/a	n/a	**C**	0.1	0.0%	2013	-	-	✓	FA
Lesser sand-eel - Viking and Bergen Banks	< 6	10	10	n/a	n/a	**C**	0	0,0%	2013	-	-	✓	n/a [3]

Notes: [1] Shading in stock name: white means no change from 2014; light green means rise in sustainability category; light orange means drop in sustainability category. [2] The 17 stocks in common for the 2014 and 2015 evaluations are bold highlighted. [3] The directed fishery is closed.

Table 6. Changes in sustainability categories across the stocks evaluated

Stock	Change in category[(1)]	Notes
Atlantic menhaden - Northwest Atlantic	**C to B1**	**A benchmark assessment was conducted in 2015** (SEDAR 2015). Results are much more optimistic than in the previous assessment: **stock is currently considered healthy (i.e., well above the target reference point), and fishing mortality levels are low.**
Lesser sand-eel - Central Eastern North Sea	**C to B1**	**Recent good recruitments have resulted in improvements in the stock condition.** Reproductive biomass increased considerably from very low levels in 2013 and is currently estimated at above the target reference point. Managers have followed scientific advice in setting the TACs; fishers' compliance is strong.
Capelin - Icelandic	**C to B2**	**Stock is a good condition.** According to ICES' latest assessment, the current spawning stock biomass was estimated to be well above the limit biomass reference point (B_{lim}) (ICES 2015). If 2015 catches follow the agreed TAC – which is based in the agreed escapement strategy in place – **the stock biomass is expected to remain above the escapement biomass threshold of 400,000 tonnes by the end of the fishing season**.
Lesser sand-eel - Central Western North Sea [(2)]	**C to B2**	**In 2014, the set TAC was again in line with scientific advice (at 5 thousand tonnes).** No assessment is conducted, but the latest survey data from Firth of Forth indicates 2014 year-class is the strongest since 2009, estimated well above the average for 2010–2013. ICES considers the stock is currently stable.
Anchoveta - Peruvian northern-central stock	**B1 to B2**	Although reported landings have been below the TACs, **non-reported discarding of juveniles (prohibited) is considered to have increased in recent years**, probably as a result of a recent regulation that also sets a maximum allowable percentage of juveniles in landings. Management authorities are making efforts to incentivize reporting of juvenile catches and avoid discards. **There is substantial uncertainty on the current status of this stock.** No regular stock assessments are publicly available; reports from biannual scientific acoustic surveys have been used instead to manage this stock in recent years. Available summaries for 2014 only show latest total biomass estimates but do not report modeled time-series. SSB values in the datasheet from 2009 onwards might not be comparable to the time-series shown up to 2008, obtained from a peer reviewed exploratory model using an age-based assessment (Diaz et al. 2010). In addition, it is uncertain if biomass estimates shown in the summaries are from stock assessment models or direct estimates from acoustic surveys. The available information suggests a considerable decrease in stock biomass in mid-2014; biomass estimates obtained from the winter surveys were the lowest of the last 20 years (for the same period of the year), and attributed to cumulative adverse warm environmental conditions since late 2013. Probably due to a progressive recovery of the coastal upwelling, the December (summer) hydroacoustic surveys indicated a significant increase in stock biomass (to 4.39 million tonnes). However, the stock was estimated to be mainly composed of juveniles (65% by weight), which represents a risk factor if protection measures are not effectively put in place to allow the recovery of the stock.

Stock	Change in category[1]	Notes
Boarfish - Northeast Atlantic [2]	**A to B2**	No analytical assessment was conducted in 2014 due to uncertainties around the model used in previous assessments, and ICES' advice for 2015 was based on a data-limited approach. Previously defined reference points are no longer considered adequate, and thus the current status of the stock against reference points is unknown. **Survey indices and an exploratory assessment suggest a sharp decline in the stock size from 2012**, but latest biomass estimate is still above a candidate B_{lim}. **No specific management plan is in place for this fishery.** A long-term management plan was proposed in 2012 by the Pelagic Regional Advisory Council, but it is still to be implemented and fully evaluated by ICES.
Blue whiting - Northeast Atlantic	**A to C**	Current exploitation levels are sustainable and stock is in good shape: spawning biomass has been increasing since 2010 and currently well above the target reference point. In recent years, managers have set TACs in line with ICES' recommendations (following the precautionary management plan in place). **However, in 2014 the set TAC (1.2 million tonnes) was 26% above ICES' advice.** As of early March there was still no agreement between the European Union and Norway on the 2015 TAC.
Norway pout - North Sea	**B1 to C**	Although managers have generally followed scientific advice on setting the TACs, **the final combined EU+Norway TAC in 2014 was well above (132%) ICES' updated advice. For 2015, only EU quota is known so far**.
Lesser sand-eel - Dogger Bank area	**B2 to C**	No formal management plan is still in place, but in recent years EU and Norway have used real-time monitoring for setting TACs within the fishing year, explicitly taking in consideration closing areas known to be commercially depleted. Managers have set TACs in line with scientific advice, **but reported sand-eel landings for this area in 2014 were 68% above the set TAC (57 thousand tonnes)**.
Capelin - Barents Sea	**B2 to C**	A long-term management plan has been in place since 2002, and managers have generally followed scientific advice. In 2015, however, **the TAC was set well above ICES' advice, which took into account both the precautionary management plan and uncertainties around the current stock status.**

Notes: [1] Light green means rise in sustainability category; light orange means drop in sustainability category. [2] Not in 2014 evaluations.

3.2 Assessing sustainability under uncertainty: the current main challenges on data quality

The lack of quantitative information from fisheries and stocks renders a precise assessment of status more difficult and uncertain. The high number of qualitative scores in Table 5 (e.g., "≥ 6") shows that a substantial proportion of the stocks suffer from data limitation issues. These have to do with the absence of target reference points for management, missing estimates of fishing mortality and biomass, outdated estimates, or a combination of all of these. In fact, when looking at the list of stocks, the uncertainty generated by missing data is high, with only a minority of stocks (11 of 24, 28% of the catch volume) achieving a good level of information quality, measured as public availability of target fishing mortality and biomass reference points, lower limit biomass reference point, and up-to-date estimates of fishing mortality and biomass (**Table 7**).

Table 7. Quality of available data for assessing status of stocks (catch is in thousand tonnes)

Stock	F_{trp}	F (up to date)	B_{trp}	B_{lim}	SSB (up to date)	Data quality	Catch (kt)
Anchoveta - Chilean regions III and IV	Yes	Yes	Yes	Yes	Yes	5	34.7
Anchoveta - Chilean regions V-X	Yes	Yes	Yes	Yes	Yes	5	39.7
Anchoveta - Chilean regions XV-I-II/Southern Peruvian stock	Yes	Yes	Yes	Yes	Yes	5	1067.8
Araucanian herring - Chilean	Yes	Yes	Yes	Yes	Yes	5	230.0
Atlantic menhaden - Northwest Atlantic	Yes	Yes	Yes	Yes	Yes	5	169.0
Blue whiting - Northeast Atlantic	Yes	Yes	Yes	Yes	Yes	5	626.0
European sprat - North Sea	Yes	Yes	Yes	Yes	Yes	5	70.6
Gulf menhaden - Gulf of Mexico	Yes	Yes	Yes	Yes	Yes	5	579.0
Lesser sand-eel - Central Eastern North Sea	Yes	Yes	Yes	Yes	Yes	5	39.2
Chilean jack mackerel	Yes	Yes	Yes	No	Yes	4	341.7
European pilchard - Northwest Africa central stock	Yes	Yes	Yes	No	Yes	4	504.6
European pilchard - Northwest Africa southern stock	Yes	Yes	Yes	No	Yes	4	419.1
Lesser sand-eel - Dogger Bank area	No	Yes	Yes	Yes	Yes	4	210.1
Lesser sand-eel - Southeast North Sea	No	Yes	Yes	Yes	Yes	4	23.5
Norway pout - North Sea	No	Yes	Yes	Yes	Yes	4	82.1
Anchoveta - Peruvian northern-central stock	No	No	Yes	Yes	No	2	4250.0
Boarfish - Northeast Atlantic	No	Yes	No	No	Yes	2	75.4
Capelin - Barents Sea	No	No	No	Yes	Yes	2	177.0
Capelin - Icelandic	No	No	No	Yes	Yes	2	142.0
Lesser sand-eel - Central Western North Sea	No	Yes	No	No	Yes	2	5.2
Antarctic krill - Atlantic Southern Ocean	No	No	No	No	No	0	217.4
Lesser sand-eel - Kattegat	No	No	No	No	No	0	0.1
Lesser sand-eel - Shetland	No	No	No	No	No	0	0.0
Lesser sand-eel - Viking and Bergen Banks	No	No	No	No	No	0	0.0

The “data quality” column in Table 7 is an index summing across how many data quality key building blocks (as defined above) are available to assess management and status of stocks. About half of the catch volume analyzed has only one or two of these five, which inevitably increases the level of uncertainty when assessing these fisheries. A good proportion of the volume in this category is due to Peruvian anchovy northern stock for which no recent fishing mortality or biomass estimates are available and no target fishing mortality has been set. This represents a huge challenge for scientists and evaluators in general when producing advice or using any sort of metrics or scores to summarize current status.

We have searched for additional information and complementary data to try to overcome these problems: among the "data-poor" stocks (those in data quality category 2 or below) we looked into how precautionary management has been recently compared to the amount of uncertainty in the data. More specifically, for those stocks with fishing mortality (F) historical series (up to date or otherwise) yet no target in place (Peruvian anchovy northern, boarfish, Norway pout, and three sand-eel stocks – SE North Sea, Dogger Bank, and central western North Sea) we estimated how high the most recent fishing mortality estimate is compared to the historical series (by means of its percentile) and we plotted this statistic against the most recent year for which the estimate is available (**Figure 2**).

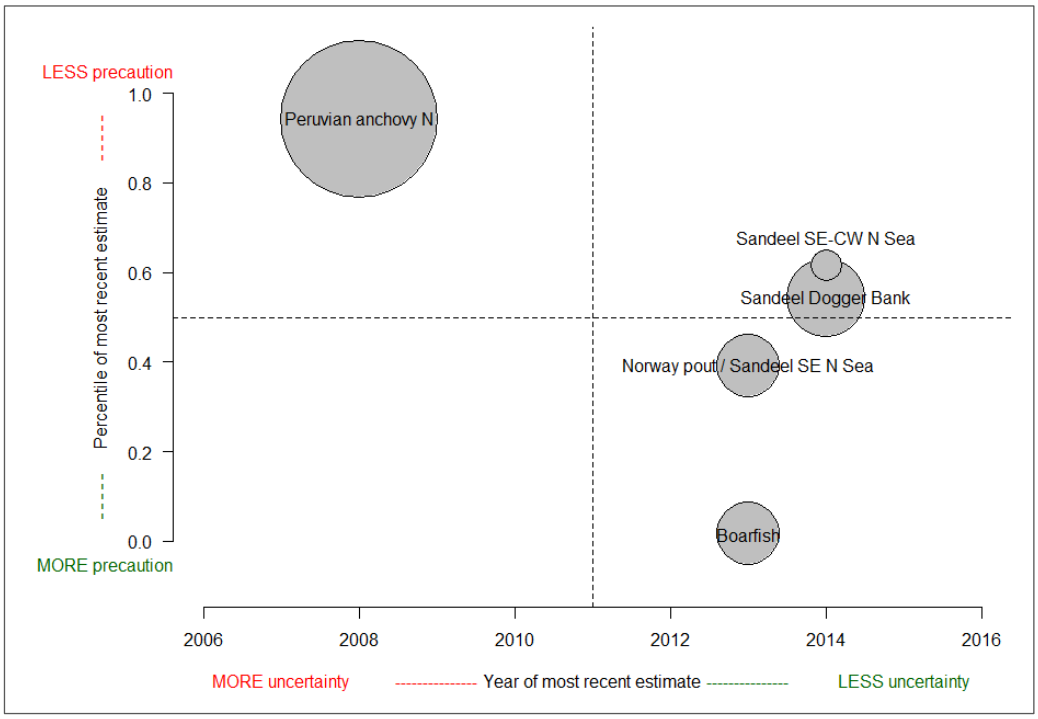


Figure 2. Precaution in management versus uncertainty in fishing mortality data (width of circles is proportional to catch)

As the most recent year for which fishing mortality is available extends back in time, the uncertainty in the estimate itself increases (x axis). On the other hand, having an historical series of fishing mortality, fluctuating across a given range, a specific F estimate with a high percentile, closer to 1 (in y axis), denotes that that specific F estimate is high compared to the whole historical series of Fs. Conversely, low percentiles mean that those F estimates are low compared to the whole series. Therefore, high percentiles (in y axis) for the most recent fishing mortality estimates means that, compared to historical series, fishing mortality is currently high (highest would render an exact 1 in y axis). The first quadrant (upper left) of these two plotted axes therefore accommodates for less precautionary management under more uncertainty (to avoid), while the third quadrant (lower right) denotes the opposite – more precaution in management under less uncertainty (the optimal, under the data limitations above-mentioned). Peruvian anchovy northern stock clearly stems from the group: this is by far the largest catch volume in the global market used for reduction, yet being managed with

limited access to data (**Table 7**), and with less precaution while affected by more uncertainty on current status of fishing mortality levels. On the contrary, while in absence of reference points, boarfish management appears to be precautionary, under less uncertainty on current status of fishing mortality levels. The remaining four stocks fall within a similar scenario: most recent estimate median of series, managed with the least uncertainty (e.g., fishing mortality estimates available for year 2014).

For data-rich stocks with target reference points in place (**Table 5**) we have confronted current F over target F against current biomass against target biomass and produced *kobe* plots for quick and easier inspection of sustainability status (described in the next section).

3.3 Managing small pelagics under different scenarios – MSY-based management vs precautionary management as "key" LTL species

The publicly available information for each of the stocks considered here varies substantially, as does the management systems in place for those stocks and their managerial and validation tools (SFP 2015). Using the most up-to-date information on biomass indices, fishing mortality and respective reference points we have assessed the current status of biomass against (a) mainstream best practices in fisheries management (MSY-based) and (b) a more precautionary suite of management targets which are more appropriate for "key" LTL species (from Smith et al. 2011), with B_{75} and $0.5*F_{MSY}$ set as targets. Outcomes from this analysis are in figures **Figure 3** and **Figure 4**. We have assumed equivalency between $B_{40\%}$ and B_{MSY} for plotting purposes.

There is not yet a comprehensive assessment of all small pelagic stocks to establish whether they are "key" or not and so no conclusions can currently be drawn about how many fisheries should be managed in line with the more precautionary approach. However, there is clearly an urgent need to establish the "key" status for LTL fish stocks and this will require further research in describing and quantifying their importance to food chains, understanding feeding profiles and building dietary matrices.

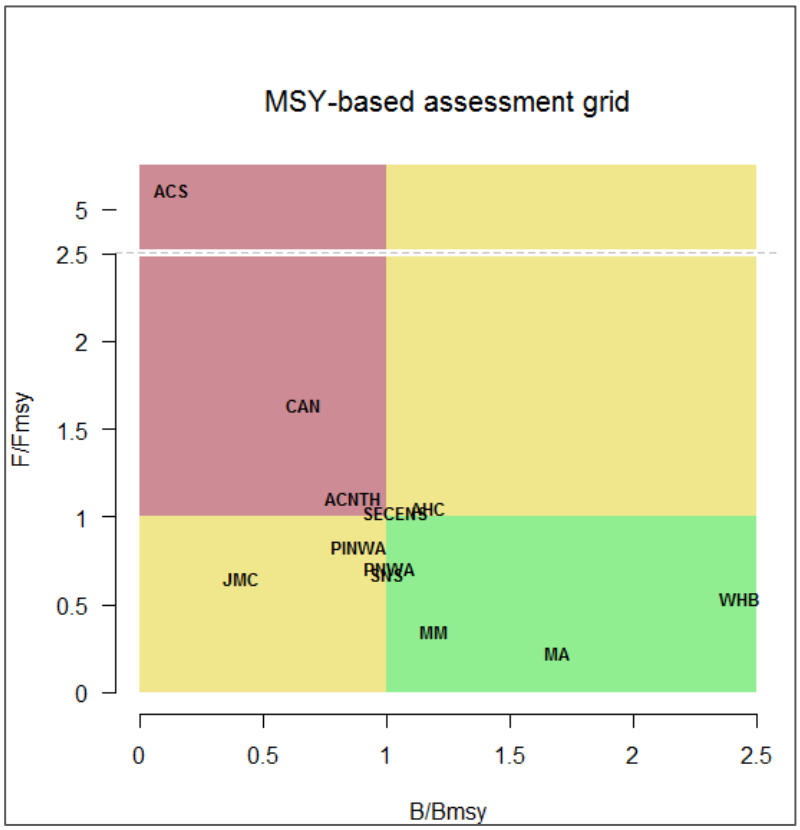


Figure 3. Kobe plot – MSY-based assessment grid: biomass and fishing mortality relative to MSY for stocks for which necessary information for plotting is publicly available. Acronyms denote stocks as follows: ACNTH: Anchoveta - Chilean regions III and IV | ACS: Anchoveta - Chilean regions V-X | AHC: Araucanian herring - Chilean | CAN: Anchoveta - Chilean regions XV-I-II/Southern Peruvian stock | JMC: Chilean jack mackerel | MA: Atlantic menhaden - Northwest Atlantic | MM: Gulf menhaden - Gulf of Mexico | PINWA: European pilchard - Northwest Africa central stock | PNWA: European pilchard - Northwest Africa southern stock | SECENS: Lesser sand-eel - Central Eastern North Sea | SNS: European sprat - North Sea | WHB: Blue whiting - Northeast Atlantic.

An assessment using the MSY-based grid shows that most stocks perform relatively well and lie either within or close to the third (green) quadrant where fishing pressure is below F_{MSY} and biomass is above B_{MSY} or equivalent. However, adopting a more conservative management approach that would be appropriate for "key" LTL species significantly reduces the number of fisheries that could be considered to be performing well. Consequently, it is of great importance to establish which species are "key" and which are not. Notably, blue whiting (WHB) being the best performer across all stocks, it is unlikely, given its known population dynamics, that it may play a "key" role in the northeast Atlantic ecosystems (yet, no studies are publicly known that address this point).

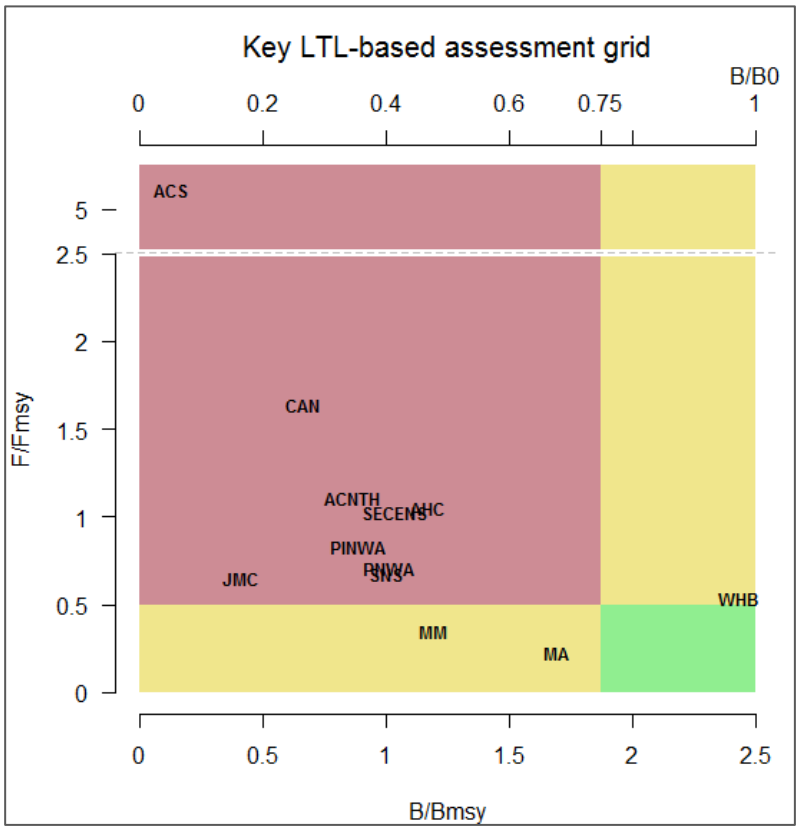


Figure 4. Kobe plot – key LTL-based assessment grid: biomass and fishing mortality relative to B_{75} and 0.5 F_{MSY} for stocks for which information is publicly available. Acronyms and notes as in caption of **Figure 3**.

There is as yet no comprehensive assessment of which LTL species are "key." Sand-eel stocks (SECENS, SEDB, SESENS), which have been tentatively described in the literature as key LTL species (Brown and Mackinson 2011), perform poorly against the more precautionary LTL-based grid, especially the central-eastern North Sea stock (SECENS). Anchoveta stocks from the Humboldt Current areas (Chile and Peru) have also been described as key (Marzloff and Tam 2011) and perform equally poorly against the key LTL assessment grid, especially the Chilean anchovy V-X stock (ACS), but also the Chilean XV-Southern Peruvian stock (CAN). The northern Peruvian anchovy stock lacks fishing mortality reference points and cannot be plotted on these Kobe diagrams, but biomass is most likely well below the more precautionary biomass reference point of 75% of B_0, which may be more appropriate for this stock according to recent literature (Marzloff and Tam 2011).

3.4 Certification and fisheries improvements information

Table 5 (page 9, above) includes information on the reduction fisheries involved in a fishery improvement project or certification program. With the exception of the two stocks of northwest African sardines, all fisheries in this overview are involved in some kind of certification program (IFFO and MSC). This means 90% of the catch supply from fisheries for reduction in this overview comes from either IFFO- or MSC-certified fisheries.

In terms of the MSC program specifically, 13.7% of the total catch in this 2015 overview comes from fisheries engaged in the MSC program (i.e., either certified or undergoing full assessment). This is a considerable increase compared to previous years (e.g., only 3% in 2014), owing to the recent entry of new European fisheries in the MSC program. Examples of fisheries recently entering the MSC program are blue whiting (MSC 2014) and North Sea fisheries for sand-eel, sprat, and Norway pout (MSC 2015).

Five of the reduction fisheries have fishery improvement projects ongoing. Information on progress for each FIP can be found in Appendix C.

4 CONCLUSIONS AND RECOMMENDATIONS

This report offers a comprehensive sustainability overview of the leading fisheries used for fishmeal and fish oil and includes data on management quality, stock status, certification, and data quality. The following conclusions can be drawn from the report:

- Very few reduction fisheries are operating at a level that SFP would consider "very good." Just **two percent** of the total catch volume of the reduction fisheries in this analysis comes from stocks in very good condition (**Category A**) (**Figure 1**). This corresponds to a single fishery: Antarctic krill - Atlantic Southern Ocean. The fishmeal and fish oil industry should use this observation to question whether they should undertake further efforts to achieve excellence in the future, or at least a commitment to continuous improvement over time.

- Only **12%** of the total catch comes from stocks that score 6 or above in all criteria AND the score for biomass is 8 or more, meaning biomass is at or above target levels (**Category B1**). These stocks are in very good shape in terms of biomass, but still need some improvements in management strategy. This level of performance is in line with the current Aquaculture Stewardship Council requirements for fisheries providing fishmeal and fish oil for feed to certified salmon farms. The fishmeal and oil industry should question why such a small proportion of global production is capable of meeting the requirements of a leading aquaculture certification and whether this should serve as a spur to future improvements.

- Cumulatively, **most (62.5%)** of the total catch volume in this analysis comes from stocks that are reasonably well managed (or better) (i.e., that score 6 or above on all five FishSource criteria). However, this should not be grounds for complacency and all of these fisheries should be engaged in attempts to improve performance.

- More than **one third (37.5%; 3.5 million tonnes)** of the total catch for reduction purposes comes from 12 poorly managed fisheries (Category C) identified in this overview (**Table 5**). Again, for an industry producing a strategically vital raw material such as fishmeal and oil, it hardly seems ideal that such a large proportion of material should come from resources that are not well managed.

- With the exception of MSC-certified fisheries or fisheries under MSC full assessment, none of the fisheries reviewed in this report consider wider ecosystem effects when creating management regimes. This oversight seems harder to sustain in the light of an increasing body of scientific knowledge showing that low trophic level species (which include the vast majority of Atlantic and Eastern Pacific reduction fisheries) can play a crucial role in the healthy functioning of marine ecosystems. Without creating management systems that address wider ecosystem impacts, it is unlikely that reduction fisheries will ever be able to claim that they are sustainable.

- Part of the report for this year looks at the vexing question of data availability for reduction fisheries. The lack of publicly available fisheries data has been a major problem for SFP in creating FishSource profiles and continues to reduce the accuracy of assessments. SFP has identified five key data "building blocks" that need to be made public to allow an accurate assessment of a fishery (in terms of management and stock), but only nine of the 24 fisheries studied by this report have all of them. Four fisheries have none at all. Clearly, in the current era where both corporate and government transparency are highly prized, it is essential that fisheries supply adequate data for the rest of the world to form judgments. Fisheries that are assessed as poorly managed should not blame their reviewers if the data required to make an accurate assessment is not in the public domain.

- **90% of the catch supply** from reduction fisheries in this overview comes from either IFFO- or MSC-certified fisheries. This is a very high level of certification and the fishmeal and oil industry should be commended for this achievement. However, the new trend that has emerged in this report (and was absent from previous reports) is that 13.7% of the total catch now comes from fisheries engaged in the MSC program (i.e., either certified or undergoing full assessment) whereas this figure was almost insignificant (3%) in past years. This increase in engagement with the MSC program is due to the recent entry of new European fisheries such as blue whiting and North Sea fisheries for sand-eel, sprat, and Norway pout. It may be significant that all of these fisheries are European, and other regions should assess whether these fisheries will enjoy a preferential place in the market when fully certified. It would be highly undesirable for a situation to emerge where European reduction fisheries are MSC certified, while South American fisheries appear incapable of achieving that level of performance.

- **Five of the reduction fisheries assessed** in this report have **fishery improvement projects in place**. These projects are to be welcomed and SFP is confident that further projects will emerge in the course of the next 12 months.

In conclusion, it is evident that while reduction fisheries are generally well managed there are several significant challenges. More than one third of the total catch from these fisheries is considered to be poorly managed, only a small percentage meets the requirements of a leading aquaculture certification, very few of the fisheries have incorporated wider ecosystem concerns into their management regimes, and there is limited evidence that the industry as a whole is committed to continuous improvement. On the other hand, there are reasons to be optimistic; several fisheries have now engaged with the MSC program and five fishery improvement projects are in place, with the prospect of more to follow. There are many potential opportunities in the next 12 months for the fishmeal and oil sector to substantially boost both performance and reputation and SFP looks forward to reporting progress in the next annual sustainability overview.

Recommendations

SFP recommends that all parts of the fishmeal and fish oil supply chain support specific recommendations for individual fisheries identified in **Appendix C**. SFP also recommends the following general approaches for reduction fisheries:

- Those fisheries that have no certification at all should conduct an assessment against the IFFO RS standard and identify the improvements required to meet the fishery component of that standard. These improvements should be implemented via a fishery improvement project (or an IFFO RS Improver Project).
- Those fisheries that have achieved a level of performance consistent with the fishery component of the IFFO RS standard should consider reaching the MSC standard. This could be achieved through an MSC pre-assessment and then the creation of a fishery improvement project to oversee the workplan for achieving certification.
- If a fishery decides not to aim for MSC certification, it should still take measures to include wider ecosystem considerations into the management regime.
- All fisheries, regardless of certification status, should publicly commit to continuous improvement and seek to validate progress through the publication of objective performance data.
- Fisheries should make efforts to ensure that data regarding fishery management is placed in the public domain so that interested stakeholders can establish the performance of the fishery and the effectiveness of management.

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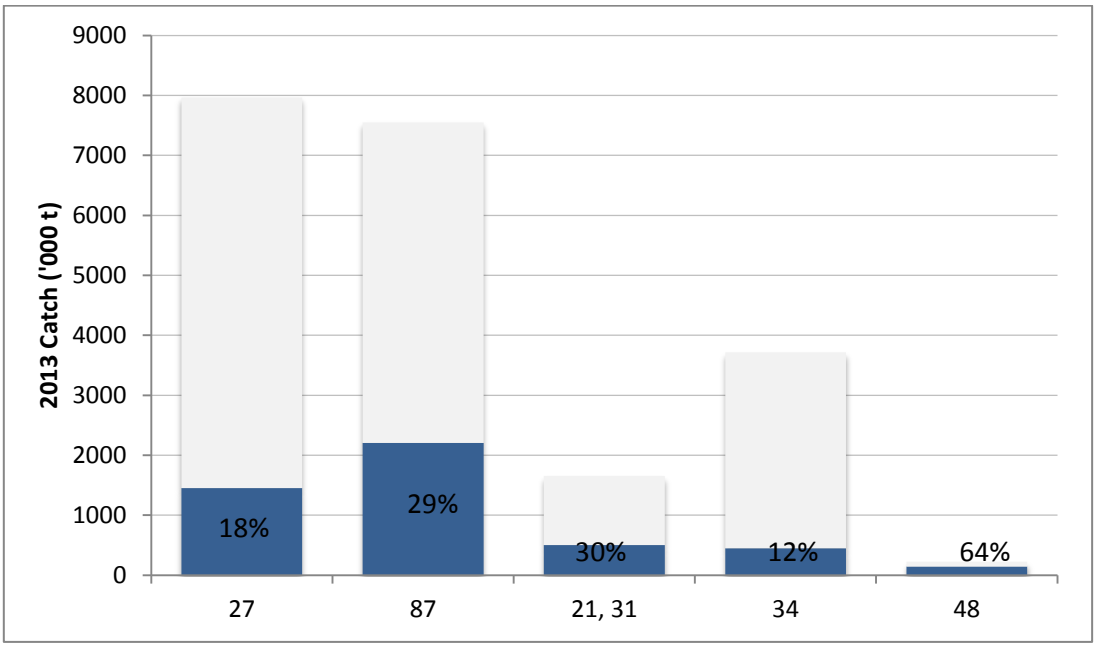
APPENDICES

Appendix A. Catch from reduction fisheries per main FAO fishing area, compared to total finfish catch.

Codes for Areas are as follows: 27 – Northeast Atlantic, 87 – Southeast Pacific, 21 – Northwest Atlantic, 31 – West-Central Atlantic, 34 – East-Central Atlantic, 48 – Antarctic. For Antarctic reduction fisheries catches (krill) are compared to total catch (crustaceans, fish, etc.).



Source: FAO FishStatJ (FAO 2011–2015)

Appendix B. Category C stocks in the 2015 evaluation and the reasons for scores below 6.

Stock	Score 1	Score 2	Score 3	Score 4	Score 5	Comments
Blue whiting - Northeast Atlantic	8.9	5.8	10	10	8.4	In recent years, managers have set TACs in line with ICES' recommendations (following the multi-annual precautionary management plan in place). However, in 2014 the set TAC (1.2 million tonnes) was 26% above ICES' advice. As of early March, there was still no agreement between the European Union and Norway on the 2015 TAC.
Norway pout - North Sea	≥ 6	0	10	10	≥ 8	Managers have generally followed scientific advice on setting the TACs; however the final combined EU+Norway TAC in 2014 was well above (132%) ICES' updated advice. For 2015, only the EU quota was known as of March 2015.
European pilchard - Northwest Africa southern stock	≥ 6	≥ 6	< 6	8.0	9.2	Official catches have been below the national catch limits, but the level of non-reporting of sardine catches in this fishery has historically been very high, with estimates from 38% (Kamili 2006) to 100% (Baddyr 2006 in Rojo-Diaz and Pitcher 2006) of total reported catches.
Lesser sand-eel - Southeast North Sea	≥ 6	10	0	7.4	≥ 6	Compliance with TACs in this fishery has been low in recent years. In 2014, the TAC (5,000 tonnes) was exceeded by 73%. Although a number of measures are in place, including TACs, closed seasons, and minimum mesh sizes, an ecosystem-based long-term management plan is still lacking.
Lesser sand-eel - Dogger Bank area	≥ 6	10	0	6.7	≥ 6	Although historically compliance has been strong in the North Sea sand-eel fisheries, reported sand-eel landings for this area were 68% above the set TAC (57 thousand tonnes) in 2014.
Anchoveta - Chilean regions XV-I-II/ Southern Peruvian stock	≥ 6	≥ 6	≥ 6	6.6	5.5	Latest fishing mortality (F) levels were very high: F in 2014 was estimated at almost twice the target reference point. TACs are still set unilaterally by Chile and Peru, with the combined TAC generally above advised levels. For 2015, Chilean managers adopted a TAC of 620,225 tonnes; the first season Peruvian fishery officially open in March, but the TAC is not known as yet.
European pilchard - Northwest Africa central stock	< 6	< 6	< 6	≥ 6	8.7	No catch limits are defined for the stock and a management strategy is also still lacking. Official catches in 2011 were 26% above the recommended levels. There are indications of non-reporting of catches, but no information is available on recent catch levels.

Stock	Score 1	Score 2	Score 3	Score 4	Score 5	Comments
Capelin - Barents Sea	≥ 8	0	9.8	≥ 6	≥ 6	A long-term management plan has been in place since 2002, and managers have generally followed scientific advice. In 2015, however, the TAC was set well above ICES' advice, which took into account both the precautionary management plan and uncertainties around the current stock status.
Chilean jack mackerel	≥ 6	10	10	4.9	9.4	Spawning biomass has been showing improvements since the historical low values in 2010, but is still well below the provisional B_{MSY} (i.e., the stock is still considered overfished). Considerable improvements have been made in terms of management strategy.
Anchoveta - Chilean regions V-X	< 6	10	< 6	1.5	0	Anchoveta is part of a mixed fishery that also targets Araucanian herring. The fishery's high exploitation rates are hindering the recovery and adequate protection of the anchoveta stock. Preliminary catches of anchoveta in 2014 (as of November 2014) were 32% above the TAC. The level of misreporting in the artisanal sector might also be considerable, but no estimates are available. Reference points have been recently revised and adopted, but still no specific recovery plan for this stock is known to be in place.
Lesser sand-eel - Kattegat	< 6	10	10	N/A	N/A	There are no specific management objectives for this stock and no reference points defined. No assessment has been conducted, thus stock status is unknown. TAC in 2014 was set in line with scientific advice (at 220 tonnes).
Lesser sand-eel - Viking and Bergen Banks	< 6	10	10	N/A	N/A	There are no specific management objectives for this stock and no reference points defined. No assessment has been conducted, thus stock status is unknown. Managers followed scientific advice and the directed fishery has been closed since 2011.

Appendix C. Current SFP sustainability category and SFP public improvement recommendations for the 24 stocks used for reduction purposes, assessed in this overview.

FIP progress rating categories: (A) exceptional progress; (B) good progress; (C) recent progress; (D) past progress; (E) negligible progress.

Stock Year FIP started | (FIP progress rating) | FIP leadership | link to FIP public report	Sust. Category	Current SFP Public Improvement recommendations	
		to catchers and regulators	to retailers and supply chain
Antarctic krill - Atlantic Southern Ocean (Country: NO; Gear: TM; MSC-Client: AKB; MSC-Status: MSC Recertified)	**A**	1. Monitor fishery and management system for any changes that could jeopardize MSC re-certification.	1. Support the sustainability achievements of this fishery by sourcing this product, and ensure that the producers are aware that sustainability certification played a role in your decision to source this product.
Atlantic menhaden - NW Atlantic	**B1**	1. Managers should develop Ecological Reference Points that account for menhaden's role as an important prey species in the food web. 2. Improve harvest reporting in the bait sector to reduce uncertainty regarding removals. 3. Continue research to improve understanding of the role of menhaden in the food web.	1. Encourage your supplier to lead a publicly reported FIP to address sustainability issues in this fishery. 2. Contact the Atlantic States Marine Fisheries Commission and request that they establish Ecological Reference Points that account for menhaden's role as an important prey species in the food web.
European sprat - North Sea	**B1**	1. Support the development of a long-term management plan that takes into account the role of sprat as a forage species.	1. Contact your national fisheries administration and request they provide updates on progress re the EU multi-annual management plan and having pelagic fisheries included and whether the supply chain can contribute to the development of an ecosystem-based management plan. 2. Retailers and their farmed fish suppliers to ask the European Sustainable Fishmeal Roundtable to encourage their vendors and/or primary producers to support the MSC assessment and certification process of the fishery.

Stock Year FIP started | (FIP progress rating) | FIP leadership | link to FIP public report	Sust. Category	Current SFP Public Improvement recommendations	
		to catchers and regulators	to retailers and supply chain
Gulf menhaden - Gulf of Mexico	**B1**	1. Publish summary information on bycatch composition and frequency from the 2011 observer coverage. 2. Implement a Gulf-wide annual quota to control harvest of this stock. 3. Implement reference points that account for the ecosystem services provided by menhaden as prey for many species.	1. Contact the NOAA Fisheries National Observer Program and request that a summary of the 2011 bycatch observer data is made publicly available on NOAA's website. 2. Contact the Gulf States Marine Fisheries Commission encourage them to update the Gulf Menhaden Regional Fishery Management Plan, and include a total allowable catch (TAC) and biomass and fishing mortality targets (F and F_{MSY}) that account for the ecosystem services provided by menhaden as prey for many species.
Araucanian herring – Chilean 2008 | (D) | CeDePesca | http://cedepesca.net/promes/small-pelagics/chilean-anchovy-and-sardine/	**B1**	1. Increase the fishery management transparency by publishing promptly the complete stock assessments. 2. Support development and implementation of a multispecies fishery management plan with clear recovery and research objectives considering the depleted condition of the anchoveta. 3. Improve the landings registry for better control on TACs, especially in the artisanal fishery.	1. Request the design and implementation of a multispecies fishery management plan with clear recovery and research objectives considering the depleted condition of the anchoveta. 2. Determine if product from that fishery is an ingredient used in aquaculture feed in any of your supply chain. If so, encourage your suppliers to participate in the South America Reduction Fisheries Supplier Roundtable (http://www.sustainablefish.org/fisheries-improvement/small-pelagics/south-american-small-pelagics-roundtable). 3. Request that fishmeal producers do not accept more than 10% of juveniles at processing plants.

Stock Year FIP started | (FIP progress rating) | FIP leadership | link to FIP public report	Sust. Category	Current SFP Public Improvement recommendations	
		to catchers and regulators	to retailers and supply chain
Lesser sand-eel - Central Eastern North Sea	**B1**	1. Catchers to continue reporting catch and effort by the seven management areas. 2. Support the development of an ecosystem-based long-term management plan.	1. Request that catchers continue to report catches and effort by management area. 2. Contact your national fisheries administration and request they provide updates on progress re the EU multi-annual management plan and having pelagic fisheries included and whether the supply chain can contribute to the development of an ecosystem-based management plan. 3. Retailers and their farmed fish suppliers to ask the European Sustainable Fishmeal Roundtable to encourage their vendors and/or primary producers to support the MSC assessment and certification process of the fishery.
Anchoveta - Chilean regions III and IV	**B2**	1. Make scientific reports and catch recommendations publicly available in a timely manner (before managers set catch limits) 2. Implement a monitoring program to better document fishery interactions with non-target species, particularly jack mackerel and protected, endangered, and threatened species of sea birds and marine mammals. 3. Conduct research on fishery interactions with bottom habitat in shallow regions where purse seines are more likely to make contact with the seafloor.	1. Request that scientific reports are made publicly available before managers set catch limits. 2. If you (or your aquaculture feed supplier) are sourcing from that fishery, join the South America Reduction Fisheries Roundtable and start a fishery improvement project (FIP) for this fishery.
Capelin - Icelandic	**B2**	1. Advocate for and support scientific institutions establishing reference points and assessing the environmental impact of the fishery. 2. Adopt ecosystem-based fisheries management, namely consider the importance of capelin as a forage species when setting fishing opportunities. 3. Request an evaluation if the management plan is precautionary.	1. Contact the Marine Research Institute (MRI) requesting that reference points for the stock are developed and that the environmental impact of the fishery is evaluated. 2. Ask your supply chain to request an evaluation of the management plan to the Icelandic Ministry of Fisheries and Agriculture.

Stock Year FIP started | (FIP progress rating) | FIP leadership | link to FIP public report	Sust. Category	Current SFP Public Improvement recommendations	
		to catchers and regulators	to retailers and supply chain
Boarfish - NE Atlantic	**B2**	1. Advocate for the TAC to continue being set according to the interim management plan. 2. Collect further biological data to allow for a robust age-based assessment.	1. Contact your national fisheries administration and request the adoption of the management plan, while the TAC should continue to be set according to the interim plan. 2. Contact your national fisheries research institute and request that they collect biological data on this stock to allow for a robust age-based assessment.
Lesser sand-eel - Central Western North Sea	**B2**	1. Catchers to continue reporting catch and effort by the seven management areas. 2. Support the development of an ecosystem-based long-term management plan.	1. Request that catchers continue to report catches and effort by management area. 2. Contact your national fisheries administration and request they provide updates on progress re the EU multi-annual management plan and having pelagic fisheries included and whether the supply chain can contribute to the development of an ecosystem-based management plan.
Lesser sand-eel - Shetland	**B2**	1. Catchers to continue reporting catch and effort by the seven management areas. 2. Support the development of an ecosystem-based long-term management plan.	1. Request that catchers continue to report catches and effort by management area. 2. Contact your national fisheries administration and request they provide updates on progress re the EU multi-annual management plan and having pelagic fisheries included and whether the supply chain can contribute to the development of an ecosystem-based management plan.

Stock Year FIP started | (FIP progress rating) | FIP leadership | link to FIP public report	Sust. Category	Current SFP Public Improvement recommendations	
		to catchers and regulators	to retailers and supply chain
Blue whiting - Northeast Atlantic	**C**	1. Catchers to continue reporting catch and effort by the seven management areas. 2. Support the development of an ecosystem-based long-term management plan.	1. Request that catchers continue to report catches and effort by management area. 2. Contact your national fisheries administration and request them to contribute to the European Commission public consultation on the multi-annual management plan asking for inclusion of pelagic fisheries as well as development of an ecosystem-based management plan.
Norway pout - North Sea	**C**	1. Catchers should pro-actively engage with ICES and fishery management authorities to ensure a long-term management plan is developed and adopted. 2. Regulators should, in the absence of an agreed F (fishing mortality) reference point, ensure TACs are set in alignment with ICES' advice.	1. Buyers/branded suppliers should write to the Pelagic RAC requesting advice of the status of EU pelagic fisheries of interest to them and expressing support for third-party certification re sustainability. 2. Retailers and their farmed fish suppliers to ask the European Sustainable Fishmeal Roundtable to encourage their vendors and/or primary producers to support the MSC assessment and certification process of the fishery.
European pilchard - Northwest Africa southern stock 2014 | (N/A) | Industry Steering Group | http://fisheryimprovementprojects.org/fip/moroccan-sardine-2/	**C**	1. Implement a harvest control rule and annual, stock-level TACs. 2. Improve catch reporting, potentially by requiring vessels to carry observers on board. 3. Conduct genetic studies to clarify the stock structure of northwest African sardine.	1. Contact the Morocco and Mauritania national fisheries administrations and advocate for a harvest control rule and annual, stock-level TAC, as well as genetic studies to clarify the stock structure of northwest African sardine. 2. Advise your supplier that you are concerned regarding the accuracy of landing data. Ask them to request vessels to carry observers on board (available from the already established programme for both trawl and purse seine). 3. Request your suppliers to support the Morocco Sardine FIP and refer them to the FIP website (http://fisheryimprovementprojects.org/fip/moroccan-sardine-2/).

Stock Year FIP started | (FIP progress rating) | FIP leadership | link to FIP public report	Sust. Category	Current SFP Public Improvement recommendations	
		to catchers and regulators	to retailers and supply chain
Lesser sand-eel - SE North Sea	**C**	1. Catchers to continue reporting catch and effort by the seven management areas. 2. Support the development of an ecosystem-based long-term management plan.	1. Request that catchers continue to report catches and effort by management area. 2. Contact your national fisheries administration and request they provide updates on progress re the EU multi-annual management plan and having pelagic fisheries included and whether the supply chain can contribute to the development of an ecosystem-based management plan. 3. Retailers and their farmed fish suppliers to ask the European Sustainable Fishmeal Roundtable to encourage their vendors and/or primary producers to support the MSC assessment and certification process of the fishery.
Lesser sand-eel - Dogger Bank area	**C**	1. Catchers to continue reporting catch and effort by the seven management areas. 2. Support the development of an ecosystem-based long-term management plan.	1. Request that catchers continue to report catches and effort by management area. 2. Contact your national fisheries administration and request they provide updates on progress re the EU multi-annual management plan and having pelagic fisheries included and whether the supply chain can contribute to the development of an ecosystem-based management plan.

Stock Year FIP started | (FIP progress rating) | FIP leadership | link to FIP public report	Sust. Category	Current SFP Public Improvement recommendations	
		to catchers and regulators	to retailers and supply chain
Anchoveta - Chilean regions XV-I-II/Southern Peruvian stock	**C**	1. Develop and implement a coordinated management and research plan between Peru and Chile. 2. Make stock assessment and scientific advice publicly available in a timely manner. Establish total allowable catch (including allocations by country and sector) in accordance with scientific advice and considering the species role in the food web. 3. Support IMARPE (Instituto del Mar del Peru) to improve control and surveillance of landings including of juveniles, discarding, and bycatch.	1. Encourage the Peru and Chile governments to establish a binational fishery management plan. 2. Encourage the Peru and Chile governments to make public all scientific advice and set catch limits in accordance with scientific advice and considering the species' role in the food web. 3. Determine if product from that fishery is an ingredient used in aquaculture feed in any of your supply chain. If so, encourage your suppliers to participate in the South America Reduction Fisheries Supplier Roundtable (http://www.sustainablefish.org/fisheries-improvement/small-pelagics/south-american-small-pelagics-roundtable).
Anchoveta - Peruvian northern-central stock	**B2**	1. Increase transparency on the fishery management by publishing in a timely manner the complete stock assessment reports. 2. Ensure that limit reference points consider the role of the species in the food web. 3. Evaluate direct and indirect impacts of the fishery on the ecosystem, especially as a food source for protected species. 4. Update the management measures by including adaptive management strategies to implement if the spawning biomass falls below the Limit Reference Point.	1. Request the Peruvian government to promptly disclose the complete stock assessment reports. 2. Request the Peruvian government to establish an official harvest control rule, which considers the species' role in the ecosystem. 3. Determine if Peruvian anchovy is an ingredient used in aquaculture feed in any of your supply chain. If so, encourage your suppliers to participate in the South America Reduction Fisheries Supplier Roundtable.

Stock Year FIP started | (FIP progress rating) | FIP leadership | link to FIP public report	Sust. Category	Current SFP Public Improvement recommendations	
		to catchers and regulators	to retailers and supply chain
European pilchard - Northwest Africa central stock 2014 | (N/A) | Industry Steering Group | http://fisheryimprovementprojects.org/fip/moroccan-sardine-2/	**C**	1. Implement a fishery management plan, including a harvest strategy and total allowable catch. 2. Improve catch reporting, potentially by requiring vessels to carry observers on board. 3. Conduct genetic studies to clarify the stock structure of northwest African sardine.	1. Contact the Morocco and Mauritania national fisheries administrations and advocate for a fishery management plan, including a harvest strategy and total allowable catch, as well as genetic studies to clarify the stock structure of northwest African sardine. 2. Advise your supplier that you are concerned regarding the accuracy of landing data. Ask them to request vessels to carry observers on board (available from the already established programme for both trawl and purse seine). 3. Request your suppliers to support the Morocco Sardine FIP and refer them to the FIP website (http://fisheryimprovementprojects.org/fip/moroccan-sardine-2/).
Capelin - Barents Sea	**C**	1. Advocate for the TAC to be set following scientific advice. 2. Advocate and support scientific institutions on developing a multispecies model and establishing a biomass target reference point. 3. Support the review of the harvest control rules to take into account herring predation on capelin.	1. Contact IMR (Norway) and PINRO (Russia) requesting that a multispecies model and biomass reference points are developed. 2. Contact the Norway and Russia Fisheries Ministries requesting that the TAC is set according to scientific advice, and a review of the harvest control rule to take into account herring predation on capelin.

Stock Year FIP started | (FIP progress rating) | FIP leadership | link to FIP public report	Sust. Category	Current SFP Public Improvement recommendations	
		to catchers and regulators	to retailers and supply chain
Chilean jack mackerel 2010 | (D) | CeDePesca | http://cedepesca.net/promes/small-pelagics/chilean-jack-mackerel/	**C**	1. Design and implement a research program aimed at improving the stock assessment inputs, especially those related to the stock structure. 2. Establish biomass and fishing mortality reference points considering the species' ecological role in the food web. 3. Make publicly available the bycatch information collected by the observers program and results from the ecological risk assessments.	1. Encourage the South Pacific Regional Fishery Management Organisation to set biomass and fishing mortality reference points that consider the species' ecological role in the food web. 2. Encourage your supply chain to work with the governments to collect and make public information on bycatch.
Anchoveta - Chilean regions V-X 2008 | (D) | CeDePesca | http://cedepesca.net/promes/small-pelagics/chilean-anchovy-and-sardine/	**C**	1. Increase the fishery management transparency by publishing promptly the complete stock assessments. 2. Support development and implementation of a multispecies fishery management plan with clear recovery and research objectives considering the depleted condition of the anchoveta. 3. Improve the landings registry for better control on TACs, especially in the artisanal fishery.	1. Request the design and implementation of a multispecies fishery management plan with clear recovery and research objectives considering the depleted condition of the anchoveta. 2. Determine if product from that fishery is an ingredient used in aquaculture feed in any of your supply chain. If so, encourage your suppliers to participate in the South America Reduction Fisheries Supplier Roundtable (http://www.sustainablefish.org/fisheries-improvement/small-pelagics/south-american-small-pelagics-roundtable). 3. Request that fishmeal producers do not accept more than 10% of juveniles at processing plants.
Lesser sand-eel - Kattegat	**C**	1. Catchers to continue reporting catch and effort by the seven management areas. 2. Support the development of an ecosystem-based long-term management plan.	1. Request that catchers continue to report catches and effort by management area. 2. Contact your national fisheries administration and request they provide updates on progress re the EU multi-annual management plan and having pelagic fisheries included and whether the supply chain can contribute to the development of an ecosystem-based management plan. 3. Retailers and their farmed fish suppliers to ask the

Stock Year FIP started | (FIP progress rating) | FIP leadership | link to FIP public report	**Sust. Category**	**Current SFP Public Improvement recommendations**	
		to catchers and regulators	**to retailers and supply chain**
			European Sustainable Fishmeal Roundtable to encourage their vendors and/or primary producers to support the MSC assessment and certification process of the fishery.
Lesser sand-eel - Viking and Bergen Banks	**C**	1. Catchers to continue reporting catch and effort by the seven management areas. 2. Support the development of an ecosystem-based long-term management plan.	1. Request that catchers continue to report catches and effort by management area. 2. Contact your national fisheries administration and request they provide updates on progress re the EU multi-annual management plan and having pelagic fisheries included and whether the supply chain can contribute to the development of an ecosystem-based management plan.