

## **Annual Review of the status of the feed grade fish stocks used to produce fishmeal and fish oil for the UK market**

**March 2012**

**This review focuses on recent independent documentary assessments of these stocks. These are predominantly published by the United Nation's Food and Agriculture Organisation (FAO) and the International Council for the Exploration of the Sea (ICES). The review provides factual information on the status and management of fish stocks used to produce fishmeal for the UK market.**

**This publication is updated annually. This 2011/2012 edition is based on information available up to March 2012.**

**Compiled by Seafish**

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## FISHMEAL PRODUCTION

### What is fishmeal?

Fishmeal is the brown flour obtained after cooking, pressing, drying and milling whole fish and food fish trimmings. Use of whole fish is almost exclusively from small, bony species of pelagic fish (generally living in the surface waters or middle depths of the sea). UN FAO says that 90% of the fish used to make fishmeal and oil is “presently unmarketable in large quantities as human food”.

### A valuable outlet for food fish trimmings

Fishmeal production also provides a major outlet to recycle trimmings from the food fish processing sector, which might otherwise be dumped at extra cost to the environment and the consumer. In 2011, trade estimates are 35% of fishmeal consumed in the UK was produced from trimmings. (Trade estimates for 2008 were that 33% of fishmeal produced in the EU was manufactured from trimmings/offal from food fish processing but that worldwide, the proportion is lower, at 24%. These are the latest figures).

### Produced from short-lived, fast growing species

In general, the types of fish used to produce fishmeal are capable of very rapid reproduction and stock recovery. Stocks of Peruvian anchoveta, for example, are usually severely depleted by a warm current of water in the eastern Pacific Ocean (El Niño) every seven to ten years. However, natural stock replenishment usually takes just 12-18 months, supported by careful fisheries management and surveillance schemes.

Virtually all fishmeal supplies to the UK are sourced from Europe (UK, Denmark, Norway, Iceland and Ireland) and South America (Peru, Chile).

- **Europe (six species)**

Six key species are used to produce fishmeal and fish oil in Europe: sandeel, Norway pout, blue whiting, sprat, capelin and herring

- **Southeast Pacific (three species) and the Gulf of Mexico**

In Peru, anchovy is by far the most important species for fishmeal production. The Chilean fishmeal industry uses jack mackerel, anchovy and sardine. The menhaden fishery in the Gulf of Mexico is primarily a single-species reduction fishery for fishmeal and fish oil.

### A recent FAO report has categorised these fish as:

- Industrial grade forage fish - Gulf menhaden, sandeel, Atlantic menhaden, Norway pout. No market at all as food. Fishery would cease if no fishmeal plants.
- Food grade forage fish - Peruvian, Japanese, European and other anchovy. Capelin, blue whiting and European sprat. Demand often small, localised or niche. Fishmeal plants take what food fish markets cannot absorb.
- Food fish rejected by the market - Chilean Jack mackerel, chub mackerel and other species of sardine, mackerel and herring. Well established food markets. Landings not in demand for food go for fishmeal and fish oil.

## STATUS OF FEED GRADE FISH STOCKS USED TO PRODUCE FISHMEAL(FM) AND FISH OIL FOR THE UK MARKET

	% of FM used in UK		Whether used for human consumption/fishmeal	Commentary on status of fish stocks at June and Oct 2011 and March 2012	Source status info
	2007	2011			
<b>EUROPE</b>					
Sandeel <i>Ammodytidae</i>	Less than 3%	8%	Not used for human consumption.	Assessment now divided into six sub-areas. Large recruitment in 2009 but low recruitment in 2010/2011. Largest stock at full reproductive capacity.	ICES Mar 12 Pg 13
Sprat <i>Sprattus Sprattus</i>	3%	8%	Potential uses for human consumption but mainly used for fishmeal.	State unknown. No evidence recent catches have caused problems. The stock is lightly exploited. No advice on TAC.	ICES June 11 Pg 15
Capelin <i>Mallotus villosus</i>	Less than 1%	2%	Roe used for human consumption. Frozen capelin for specific limited markets. Mainly used for fishmeal.	<b>Icelandic:</b> Stock recovered. Commercial fishing to re-commence. Abundance now well above average. <b>Barents Sea:</b> Stock recovered and now above long-term average. Commercial fishing re-started in 2009.	ICES June & Oct 11 See page 17
Norway pout	Less than 1%	2%	Not used for human consumption	Stock size has increased since 2004 but fluctuates. Fishing mortality below natural mortality. No fishery recommended 2012.	ICES June 11 Pg 19
Blue Whiting <i>Micromesistius Poutassou</i>	21%	1%	Mainly used for fishmeal. Limited use for human consumption - there are processing difficulties.	Stock has full reproductive capacity and harvested sustainably, but overall perception stock is declining..	ICES Oct 11 Page 21
Herring <i>Clupea harengus</i>	3%	1%	Primarily used for human consumption, but non-food grade fish and trimmings may be used for fishmeal.	Main North East Atlantic stock: and the North Sea autumn spawning stock assessed at full reproductive capacity & harvested sustainably. Icelandic spring spawning infection risk.	ICES May & Sept 11 Page 23
Trimmings	38%	35%	Generally comprise small pelagic species (i.e. mackerel, capelin and herring) & trimmings from the white fish processing sector (e.g. cod).		
<b>SOUTH AMERICA/GULF</b>					
Anchovy <i>Engraulis ringens</i>	28%	38%	Very small amount used for human consumption. Majority used for fishmeal.	Uncertainty surrounding the status of the stock and fishing mortality levels are not disclosed, however compliance is high.	FAO/IMARPE Page 27
Jack mackerel <i>Trachurus murphyi</i>	1%	3%	50% of Chilean jack mackerel used for human consumption and 50% for fishmeal.	Currently in a vulnerable state. Slight increase in estimated total biomass 2011, but a continuing decrease in spawning biomass	FAO/IFOP Page 31
Sardine <i>Stangomer abentincki</i>	Less than 1%	1%	Used for human consumption and fishmeal	Up-to-date information on stock status not readily available. 2008 estimated in good condition.	FAO/IFOP Page 33
Menhaden	n/a	1%	Mostly used for fishmeal and fish oil	Up-to-date information on stock status is not readily available. In 2008 it was estimated to be in good condition.	NOAA Page 35

## OVERVIEW OF MANAGEMENT AND CONTROL MEASURES

### 1. Fish stock management and control measures include:

#### Official Government controls

All fisheries involved in the supply of fishmeal to the UK are subject to government controls to conserve stocks and prevent over-fishing.

#### Independent scientific monitoring and assessment

Controls on these fisheries are based on regular monitoring and assessment of the status of individual stocks, conducted by independent and government scientific organisations. Where more information is needed to make an adequate assessment about the structure of a fish stock in the North East Atlantic and North Sea ICES will advise time is needed to gather more information.

#### Annual catch limits

All stocks used to supply fishmeal to the UK are subject to total annual catch limits, set by Governments on a yearly basis. Total catch limits for the North East Atlantic and North Sea are agreed by the EU Council, Norway or Iceland (with advice from ICES). In South America the Institutes of Fisheries Research in Chile and Peru advise national governments on catch limits.

#### Overview of all controls observed by principal suppliers:

Species	TACs	Area catch limit	Closed area	Seasonal bans	By-catch limits	Type of gear Note 1	Any effect on seabed	Min mesh size	Min fish landing size	Vessel reg	Satellite tracking	ITQ system Note 2
<b>North East Atlantic and North Sea</b>												
Capelin	✓	✓	✓	✓		P	No	✓	✓	✓	✓	✓
Blue whiting	✓	✓				MT	No	✓		✓	✓	
Sandeel	✓	✓	✓	✓		T	Negligible	✓		✓	✓	
Sprat	✓	✓	✓	✓	✓	P	No	✓		✓	✓	
Herring	✓	✓	✓	✓	✓	P+T	No	✓	✓	✓	✓	✓
Norway pout	✓	✓	✓			P	No	✓		✓	✓	
<b>South America</b>												
Anchovy	✓	✓	✓	✓		P	No	✓	✓	✓	✓	
J Mackerel	✓	✓	✓	✓		P+MT	No	✓	✓	✓	✓	See P 31
Sardine	✓	✓	✓	✓		P	No	✓	✓	✓	✓	

1. P is Purse Seiner, T is Trawler and MT is Mid Water Trawler. 2. Individual Transferable Quota.

## **1. Independent stock assessment**

There are a number of key organisations involved in assessing/reporting on the status of feed fish stocks. These are:

- A. The UN Food and Agriculture Organisation (FAO)
- B. The International Council for the Exploration of the Seas (ICES)
- C. IMARPE in Peru
- D. IFOP in Chile
- E. MRI in Icelandic waters
- F. NOAA in West Atlantic

### **A. UN Food and Agriculture Organisation (FAO).**

The FAO's blueprint for sustainable responsible fisheries is defined by the 1995 Code of Conduct for Responsible Fisheries. The Code recognises the long-term sustainable use of fisheries resources is the overriding objective of conservation. <http://www.fao.org>

**The FAO Code of Conduct is further defined in a number of documents:**

- ◆ **UN Fish Stocks Agreement, 1995.** Relates to the conservation and management of straddling fish stocks and highly migratory fish stocks. [http://www.un.org/Depts/los/convention\\_agreements/texts/fish\\_stocks\\_agreement/CONF164\\_37.htm](http://www.un.org/Depts/los/convention_agreements/texts/fish_stocks_agreement/CONF164_37.htm)
- ◆ **European Code of Sustainable and Responsible Fishing Practices, 2003.** Directed at fishing operators and builds on the framework established by the FAO Code of Conduct. **See:** <http://govdocs.aquaculture.org/cgi/reprint/2004/1017/10170060.pdf>
- ◆ **FAO Strategy for Improving Information on Status and Trends of Capture Fisheries, 2003.** A voluntary instrument designed to provide a framework, strategy and plan for the improvement of knowledge and understanding of fishery status and trends. **See:** [www.fao.org/fishery/topic/3456/en](http://www.fao.org/fishery/topic/3456/en)
- ◆ **FAO Guidelines for the ecolabelling of fish and fisheries products from marine capture fisheries, 2005.** Outline general principles that should govern ecolabelling schemes. Ecolabelling provides the assurance that fishery products have been sourced from a stock that can reasonably be expected to maintain good status for the foreseeable future. **See:** [www.fao.org/docrep/008/a0116t/a0116t00.htm](http://www.fao.org/docrep/008/a0116t/a0116t00.htm)
- ◆ **FAO Technical Guidelines for Responsible Fisheries on the Ecosystem approach to aquaculture (EAA). 2010.** The main objective is to assist countries, institutions and policy-makers in the development and implementation of a strategy to ensure the sustainability of the aquaculture sector, integration of aquaculture with other sectors and its contribution to social and economic development. <http://www.fao.org/docrep/013/i1750e/i1750e.pdf>
- ◆ **Use of wild fish as feed in aquaculture. 2011.** FAO Technical Guidelines for Responsible Fisheries on aquaculture development focussing on the use of wild fish as feed in aquaculture. <http://www.fao.org/docrep/014/i1917e/i1917e00.pdf>

**FAO 'State of World Fisheries and Aquaculture' (SOFIA) Rpt 2010. Published March 2011.** FAO's global view of capture and aquaculture fisheries entitled 'State of World Fisheries and Aquaculture' is published every two years. Its purpose is to provide

policy-makers, civil society and those who derive their livelihood from the sector with a comprehensive, objective and global view of capture fisheries and aquaculture, including associated policy issues. This gives an overview of the status of all assessed fish species for consumption and feed.

<http://www.fao.org/docrep/013/i1820e/i1820e00.htm>

### **B. International Council for the Exploration of the Seas (ICES)**

ICES co-ordinates and promotes marine research in the North Atlantic, including adjacent seas such as the Baltic Sea and North Sea. Scientists working through ICES gather information about the marine ecosystem. As well as filling gaps in existing knowledge, this information is also developed into unbiased, non-political advice. The advice is then used by the 20 member countries, which fund and support ICES, to help them manage the North Atlantic Ocean and adjacent seas. <http://www.ices.dk>

Generally ICES publishes new advice on individual fish stocks twice a year, in June and October. Currently ICES advice on fish stocks is described in terms of MSY and the precautionary approach. MSY relates to optimising yield, the precautionary approach to avoiding stock depletion. MSY means fishing at levels that catch the maximum proportion of a fish stock, that can safely be removed on a continuous basis, while, at the same time, maintaining its capacity to produce sustainable returns, in the long-term. The ICES MSY approach is based on a long-term strategy whereby catch rates are fixed, enabling fish stocks to reproduce so that exploitation can occur in sustainable economic, environmental and social conditions. The EU has a plan for transition to MSY in four steps from 2011-15. ICES advice takes this into account. For short-lived species the ICES MSY approach is aimed at achieving a target escapement to ensure that there are adequate fish left to spawn, and in cases where the fish are considered to be important food fish for other species, sufficient fish to provide food for these species. The ICES approach assesses stock size at the start of the year, and then allows a harvest which means the biomass of the stock should not decrease below a set level. <http://www.ices.dk/committe/acom/comwork/report/2010/2010/Introduction%20for%20Advice.pdf>  
[http://www.seafish.org/media/Publications/SeafishGuidanceNote\\_MaximumSustainableYield\\_201103.pdf](http://www.seafish.org/media/Publications/SeafishGuidanceNote_MaximumSustainableYield_201103.pdf)

### **C. Institute of Fisheries Research (IMARPE) in Peru**

The role of IMARPE is to study the environment and marine biodiversity, evaluate the fish resource and provide information to enable decisions to be made about the fishing, aquaculture and protection of the marine environment. IMARPE provides the Ministry of Fisheries with an honest scientific and technical basis to enable the rational use of marine resources with the view of developing the socio-economic base of Peru. <http://www.imarpe.pe/imarpe/>

### **D. Fisheries Development Institute (Instituto de Fomento Pesquero - IFOP) in Chile/The National Fisheries Service (SERNAPESCA)**

The Fisheries Development Institute or IFOP is a non-profit technological institute controlled by the Agency for Economic Development (CORFO), which in turn is controlled by the Ministry of Economy. It is the main Chilean institution carrying out scientific and technological fishery research concerning the exploitation of fisheries resources and fish stock assessment in jurisdictional waters. IFOP advises Government



before annual quotas are set. SERNAPESCA is a public organisation which is responsible for executing national fisheries policy, for supervising its enforcement and for ensuring proper application of the legal rules and regulations on fishing.

<http://www.ifop.cl/>    <http://www.sernapesca.cl/>

### **E. Marine Research Institute (MRI) in Icelandic waters**

The Marine Research Institute (MRI) is a government institute under the auspices of the Ministry of Fisheries. MRI conducts various marine research and provides the Ministry with scientific advice based on its research on marine resources and the environment. The MRI conducts research on the marine environment around Iceland and its living resources; provides advice to the government on catch levels and conservation measures and informs the government, the fishery sector and the public about the sea and its living resources. [http://www.hafro.is/index\\_eng.php](http://www.hafro.is/index_eng.php)

### **F. National Oceanic and Atmospheric Association (NOAA) in West Atlantic**

NOAA's National Marine Fisheries Service is the federal agency responsible for the management, conservation and protection of living marine resources within the United States' Exclusive Economic Zone (water three to 200 mile offshore). It assesses and predicts the status of fish stocks, ensures compliance with fisheries regulations and works to reduce wasteful fishing practices. With the help of the six regional offices and eight councils, NOAA's National Marine Fisheries Service is able to work with communities on fishery management issues. <http://www.noaa.gov/>

## **2. The Sustainable Fisheries Partnership (SFP) league. May 2011.**

The SFP table consists of the 25 principal reduction fisheries around the Atlantic and South America rated according to the sustainability assessment presented on FishSource (<http://www.fishsource.org>).

- Score 1    Is management precautionary?
- Score 2    Do fishery managers follow scientific advice?
- Score 3    Do fishers comply?
- Score 4    Is the stock biomass healthy?
- Score 5    Will the stock biomass be healthy in the future?

The overview is that most of the reduction fisheries operate within limits that would be considered consistent with current good industry practice in the context of single species management regimes. However, a few fisheries are experiencing significant difficulties, many could benefit from improvements in single stock management and all would be enhanced by the incorporation of ecosystem principles into the overall management regime.

There are four evaluation categories –

Category A - All scores  $\geq 8$

Category B - All scores  $\geq 6$ , and biomass score  $\geq 8$

Category C - All scores  $\geq 6$ , biomass score  $< 8$

Category D - One or more scores  $< 6$



### FishSource scores for global reduction fisheries

Fishery	2009 Catch ('000 tonnes)	Score 1	Score 2	Score 3	Score 4	Score 5	Evaluation category
Atlantic herring – North Sea	168	8.0	8.5	10	8.1	9.0	A
Anchoveta – Peruvian northern central stock	5381	6	10	10	9.6	≥6	B
Atlantic herring (Norwegian spring spawner)	1687	8.4	10	9.6	10	7.1	B
Herring (Canada, NAFO 4TVn – autumn spawner)	48	≥6	≥6	10	10	9.3	B
Araucanian herring - Chilean sardine	829	≥6	10	7.2	10	≥6	B
Sprat (Baltic Sea)	407	≥6	6.9	9.7	≥8	6.6	B
Lesser sandeel (N Sea)	337	≥6	10	≥6	10	≥6	B
Horse mackerel (w stock, NE Atlantic)	177	≥6	9.7	9.3	8.5	8.5	B
Atlantic herring Baltic Sea Bothian Sea stock	69	≥6	10	10	≥8	9.6	B
Norway pout North Sea	55	≥6	10	10	10	≥6	B
Atlantic herring S Gulf of Lawrence fall spawners	47	≥6	≥6	10	10	10	B
Menhaden (US, Gulf of Mexico)	457	7.4	≥6	≥6	7.7	9.0	C
Capelin (Barents Sea)	306	≥8	10	10	≥6	≥6	C
Atlantic herring – Gulf of Maine and Georges Bank	104	≥6	10	10	7.9	9.9	C
European pilchard - Iberian	88	≥6	n/a	≥6	≥6	≥6	C
Atlantic herring – S Gulf of St Lawrence spr spawners	1.7	≥6	≥6	10	6.4	10	C
Anchoveta – Chilean regions xv-i-ii/Southern Peruvian stock	1032	≥6	0.4	≥6	6.6	7.0	D
Chilean jack mackerel	822	<6	10	10	3.3	n/a	D
Blue Whiting (NE Atlantic)	635	8.9	10	8.8	5.3	3.1	D
European pilchard – NW Africa central stock	369	≥6	≥6	<6	9.6	10	D
European pilchard – NW Africa southern stock	281	≥6	≥6	<6	10	10	D
Menhaden (US, Atlantic)	182	6.7	≥6	≥6	6.8	5.3	D
Capelin (Icelandic)	151	<6	0	9.9	<6	<6	D
Sprat (N Sea)	133	<6	≥6	10	≥6	n/a	D
Herring (Icelandic summer spawning)	46	6	0	10	7.5	≥6	D
Horse mackerel (S stock, NE Atlantic)	26	<6	7.1	10	≥6	n/a	D

<http://sfpcms.sustainablefish.org.s3.amazonaws.com/2011/05/03/SFP%20Briefing%20-%20Reduction%20Fisheries%20League%20Table%202011-1-ddd47116.pdf>

### 3. Certification and ecolabelling schemes – latest developments

#### Overarching guidelines:

- ◆ **FAO Technical Guidelines for Responsible Fisheries on the Ecosystem approach to aquaculture (EAA).** 21 November 2010. The main objective is to assist countries, institutions and policy-makers in the development and implementation of a strategy to ensure the sustainability of the aquaculture sector, integration of aquaculture with other sectors and its contribution to social and economic development. <http://www.fao.org/docrep/013/i1750e/i1750e.pdf>
- ◆ **FAO Global Guidelines.** January 2011. The first global guidelines for aquaculture certification were approved by the UNFAO Committee on Fisheries. The guidelines, which are non-binding, cover animal health, food safety, the environment and socio-economic issues relating to aquaculture workers. [ftp://ftp.fao.org/FI/DOCUMENT/aquaculture/TGAC/guidelines/Aquaculture%20Certification%20GuidelinesAfterCOFI4-03-11\\_E.pdf](ftp://ftp.fao.org/FI/DOCUMENT/aquaculture/TGAC/guidelines/Aquaculture%20Certification%20GuidelinesAfterCOFI4-03-11_E.pdf)
- ◆ **FAO private standards and certification in fisheries and aquaculture.** 8 February 2011. Looks at current practice and emerging issues, analyses the two main types of private standards - ecolabels and food safety and quality standards - their impact on fish trade and their implications for a range of stakeholders. <http://www.fao.org/docrep/013/i1948e/i1948e00.htm>
- ◆ **Use of wild fish as feed in aquaculture.** 26 June 2011. FAO Technical Guidelines for Responsible Fisheries on aquaculture development focussing on the use of wild fish as feed in aquaculture. <http://www.fao.org/docrep/014/i1917e/i1917e00.pdf>

#### The development of aquaculture standards is underway through separate organisations:

- ◆ **IFFO Global Standard and Certification Programme for the Responsible Supply of Fishmeal and Fish Oil (IFFO-RS)** enables fishmeal and fish oil producers to show that they offer traceable, high quality marine products, manufactured safely, using fish from responsibly managed fisheries. 30% of the worlds' fishmeal production is currently certified to this standard. An Improvers' Programme extension (RS-IP) is now included to assist fishmeal/fish oil factories which fall short of the existing Standard. <http://www.iffonet/default.asp?contentID=636>
- ◆ **Global Aquaculture Alliance (GAA)** Best Aquaculture Practices (BAP) programme. Has standards in place for shrimp, tilapia, pangasius and salmon. First pangasius two star facility certified in March 2011 and salmon standards finalised in June 2011. <http://www.gaalliance.org/>
- ◆ **GLOBALGAP** is a private sector B2B initiative that sets voluntary standards for the certification of agricultural products around the world. Standards are in place for bivalves, shrimp, tilapia, pangasius and salmon. <http://www.globalgap.org/>
- ◆ **Aquaculture Stewardship Council (ASC)** The ASC became operational in mid 2011. First four sets of standards developed by the Aquaculture Dialogues were handed over to ASC in May 2011 covering abalone, bivalves, pangasius and tilapia. Further standards on cobia, salmon, shrimp and trout are due to follow in 2012. <http://www.ascworldwide.org/>

# NORTH SEA & NORTH EAST ATLANTIC FEED GRADE FISH STOCKS

## Management and TACs

### 1. Consultation on fishing opportunities for 2012. 25 May 2011/Proposal on fishing opportunities for 2012 in the Atlantic and North Sea. 27 September 2011.

The European Commission published a consultation in May launching discussions on fishing opportunities in EU waters in 2012 (to reach MSY fishing by 2015).

This showed fish stocks in European waters are improving. The proportion of overfished stocks in the Atlantic and nearby fell from 32 out of 34 stocks in 2004 to 22 out of 35 stocks in 2010 (from 94% to 63%). MSY TACs have been set for Atlanto-Scandian herring, blue whiting and North Sea herring (all considered well-managed).

[http://ec.europa.eu/fisheries/partners/consultations/fishing\\_opportunities/consultation\\_document\\_en.pdf](http://ec.europa.eu/fisheries/partners/consultations/fishing_opportunities/consultation_document_en.pdf)  
<http://europa.eu/rapid/pressReleasesAction.do?reference=IP/11/638&format=HTML&aged=0&language=EN&guiLanguage=en>

<http://europa.eu/rapid/pressReleasesAction.do?reference=IP/11/1081&format=HTML&aged=0&language=EN&guiLanguage=en>

[http://ec.europa.eu/fisheries/cfp/fishing\\_rules/tacs/info/com\\_2011\\_717\\_en.pdf](http://ec.europa.eu/fisheries/cfp/fishing_rules/tacs/info/com_2011_717_en.pdf)

### 2. In season review and fishery closures

The Commission has previously proposed greater flexibility in changing TACs from year to year, to enable more effective recovery measures for overexploited stocks. A number of feed fisheries, are or have been, subject to in season review or fishery closure to help manage stocks and help stocks recover.

- Sandeel stocks are subject to an in season review.
- No fishing of Icelandic capelin was recommended for 2011 but an in season review set a quota of 390,000 t. The starting quota for 2011/2012 is 366,000 t.
- A closure of the Barents Sea commercial capelin fishery has allowed the stock to recover. The fishery re-opened in 2009, a quota of 360,000 t was recommended for 2010, this increased to 380,000 t in 2011, with 320,000 t recommended for 2012.
- The targeted fishery for Norway pout was closed in 2005, the first half of 2006 and all of 2007. The stock has also been protected with small mesh trawler bans, closed and seasonal areas, and mesh limitations. The fishery re-opened in 2008, 2009 and 2010. The stock is now considered to be above maximum sustainable yield escapement but the fishery closed again in 2011 and no fishery is recommended in 2012.
- A high *Ichthyophonus* infection was observed in the Icelandic summer spawning herring stock in the winter 2008/2009 and again in 2009/2010 and 2011/2012 causing additional natural mortality. Estimated prevalence of the *Ichthyophonus* infection was 32% in the winter 2008/09, 43% in 2009/10, and 34% in 2010/11. No TAC was set for 2010/2011 (later revised to 40,000 t. No TAC has been set for 2011/2012 until new information on the *Ichthyophonus* infection and the stock size is made available from survey monitoring early autumn 2011.

**Overview of annual quotas for the North East Atlantic and North Sea 2006 – 2012**

<i>Tonnes</i>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	
<b>N Sea sandeel</b>	300,000	170,000	ISR	177,500	200,000	364,000*	180,000	EU
<b>Sprat</b>	203,940	195,128	195,000	176,081	170,000	160,000	117,500	EU
<b>Capelin</b>								
Barents Sea	NIL	NIL	NIL	390,000	360,000	380,000	320,000	Russia/Norway
Icelandic	210,000	180,000	150,000	NIL	NIL	NIL Prelim 390,000 2010/2011	Prelim 366,000 2011/2012	Iceland
<b>Blue whiting</b>								
EU	438,557	364,500	350,906	165,628	151,592			EU/ Faroes/ Iceland/ Norway (NEAFC)
Faroes	522,500	444,125	300,572	141,870	129,847			
Norway	514,900	437,665	296,200	139,806	127,958			
Iceland ♦	353,000	300,050	202,836	95,739	87,625			
<b>Total</b>	2.0M	1.7M	1.26M	543,043	540,000	40,100	391,000	
<b>Herring</b>								
NE Atlantic	967,000	1,280,000	1,518,000	1,643,000	1,483,000	988,000	833,000	NEAFC
N Sea	322,874	341,000	201,227	171,000	164,300	200,000	243,000	EU/Nway
By-catch: N Sea	42,500	31,875	18,806	15,985	10,390	16,539	17,900	EU
By-catch S&K	20,528	15,396	11,470	8,373	5,442	6,659	6,659	EU
S&K				37,722	20,924	25,999	38,998	EU
Four Baltic	163,342	170,260/ 133,000	320,294	288,346	288,804	264,073	235,893	EU
Icelandic ♦	110,000	130,000	130,000	150,000	40,000*	40,000	ISR	Iceland
<b>Norway pout</b>								
North Sea/S&K	95,000*	NIL	115,000*	116,000*	162,000*	NIL*	NIL*	EU

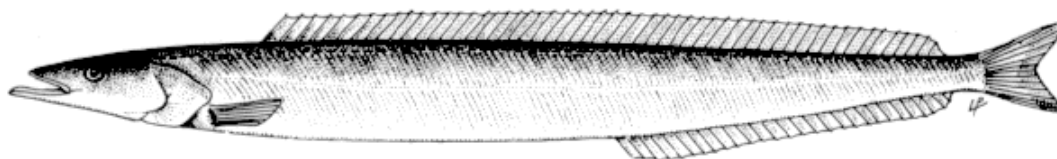
\* Subject to in-year management assessment

♦ Fishing year September to August

ISR = in season review. NA = Not available. S&K = Skagerrak and Kattegat.

**See page 41 for 2012 implementing legislation.**

## 1. SANDEEL



**Scientific Name** *Ammodytes tobianus*

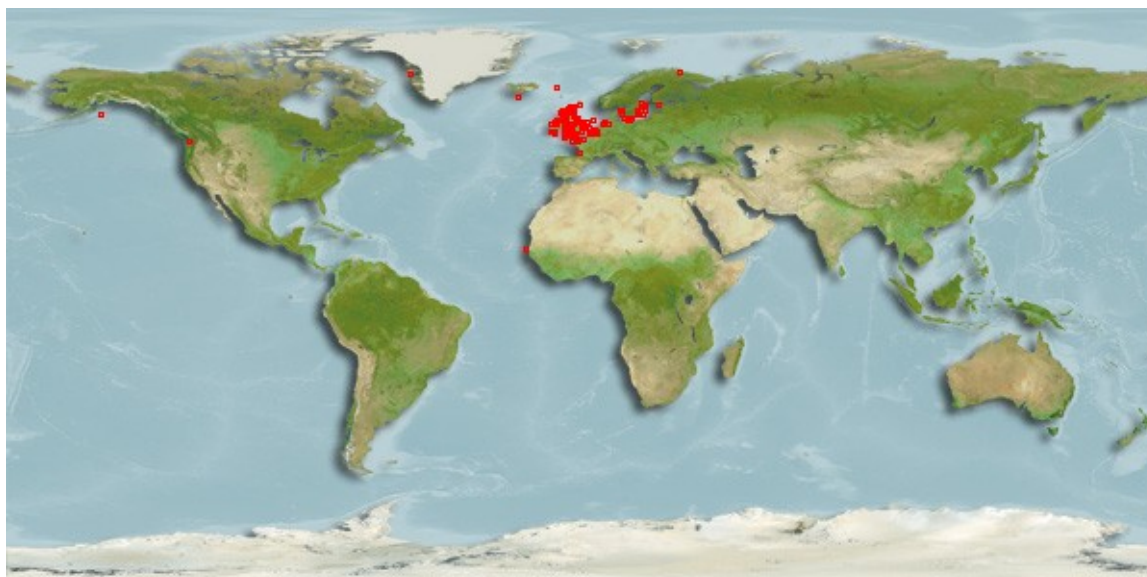
**Description** Sandeels are small eel-like fish which swim in large shoals and live in sandy substrates. They are an abundant and crucial component of food webs in the North Atlantic and are an important prey species for many marine predators such as seabirds and fish. In the North Sea fishing mortality is lower than natural mortality.

**Fishery** Demersal. An inedible feed-grade fish used mostly for fishmeal and fish oil. No demand for human consumption. Sandeel are caught by industrial fishery fleets. Seasonal fishery - mostly spring/summer.

**Resilience** High. Sandeels are comparatively short-lived. Life span of less than 10 years. Minimum population doubling time is less than 15 months. Maximum size is 20cm.

**% use in UK** It is estimated that sandeels accounted for 8% of the fishmeal used in the UK in 2011.

**Distribution** North Sea, North East Atlantic (Sub-area IV) and Shetland.



Map: [www.fishbase.org](http://www.fishbase.org)

### Current status of the sandeel stock

- ◆ The sandeel fishery built up from modest catch levels in the 1950s to around 800,000 tonnes pa in the 1980s/1990s but then collapsed quite abruptly to 350,000 tonnes in 2003 and 2004, and 172,000 in 2005. Since the collapse there has been a series of ICES recommendations: restricted fishing seasons, local measures to protect bird stocks, opening and closing fisheries to protect and rebuild the stocks.
- ◆ From 2011 ICES has divided the sandeel stock in the North Sea (IV) and Skagerrak-Kattegat (IIIa) into six sub areas - SA 1, 2, 3, 4, 5 and 6. ICES advice in March 2012 shows the 2011 dredge survey confirms the estimates drawn in 2010 of a large 2009 year classes in SA 1 (Dogger Bank – 71% of catches), SA 2 (South Eastern North Sea – 8% of catches) and SA 4 (Central Western North Sea – 1% of catches), but this has been followed by low recruitment in 2010 and 2011. The largest stock in the Dogger Bank is expected to be at full reproductive capacity at the start of 2012. For area 1 ICES advises that a catch of 23,000 tonnes can be taken in 2012. In SA 2, 3 and 4 ICES advises that a fishery should only be allowed in 2012 if analysis of real-time monitoring is available and indicates that the stock can be rebuilt to above precautionary levels by 2013. Catches for monitoring purposes should not exceed 5,000 tonnes in each of these areas. To protect the stock on a local scale, management should be implemented at area level. The quality of the current assessment is considered much improved compared to the combined assessment for the whole North Sea as conducted before 2010.  
<http://www.ices.dk/committe/acom/comwork/report/2012/2012/san-34.pdf>
- ◆ In February 2012 ICES was not able to offer advice on Viking and Bergen Bank in the North Sea (SA 5), Skagerrak – Kattegat (SA 6), or the Shetland area (SA 7) due to inadequate information. Catch statistics and survey trawl data are available for this stock but this is inadequate to make a stock assessment.

### Sandeel management and control measures

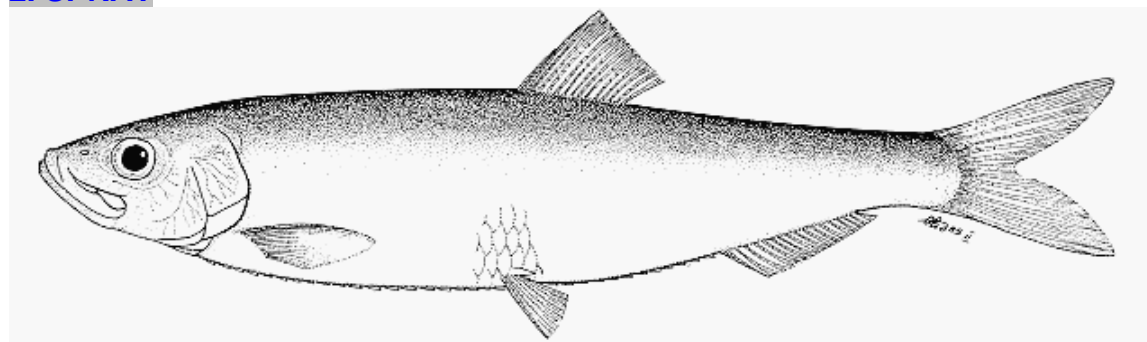
- ◆ EU Regulations 43 and 44/2012 set an initial TAC of 180,000 tonnes for 2012. This was subject to in season advice. New ICES advice in March 2012 calls for a large reduction, with catches of only 38,000 tonnes in SA 1, 2 3, and 4. No increase in effort is recommended in SA 5, 6 and 7 unless there is evidence that this is sustainable. (The February 2011 in season advice dramatically increased the TAC).
- ◆ There are precautionary initiatives to help manage sandeel stocks. In the North Sea a sandeel fishery is prohibited (April to August) in a 20,000 km<sup>2</sup> band of the North Sea off the Firth of Forth and Grampian Coast to safeguard seabird colonies. In Shetland a yearly quota of 1,000 tonnes has been agreed for the sandeel fishery off the coast of Shetland. Fishing would normally continue uninterrupted from April onwards. It was agreed to stop fishing in June and July to protect food supplies for the breeding seabird population.

### **TAC history 2004 - 2012**

<b>North East Atlantic and North Sea – quotas</b>										
<i>Tonnes</i>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>ICES 03/2012</b>
<b>Sandeel</b>	836,200	655,960	300,000	170,000	ISR	400,000	400,000	364,000	180,000	23,000



## 2. SPRAT



**Scientific Name** *Sprattus sprattus*

**Description** Sprat favour mostly inshore shoals moving to the surface at night. Filter feeders that predate on a variety of planktonic organisms. Spawning usually occurs in coastal waters in spring and summer, with planktonic eggs and larvae.

**Fishery** Pelagic. Potential use for human consumption (juvenile are marketed as whitebait) but mainly used for fishmeal because of limited outlets for human consumption. Sprat are caught by trawl, pair trawl and seine net.

**Resilience** High. Life span maximum 6 years. Minimum population doubling time is less than 15 months. Maximum size is 16cm.

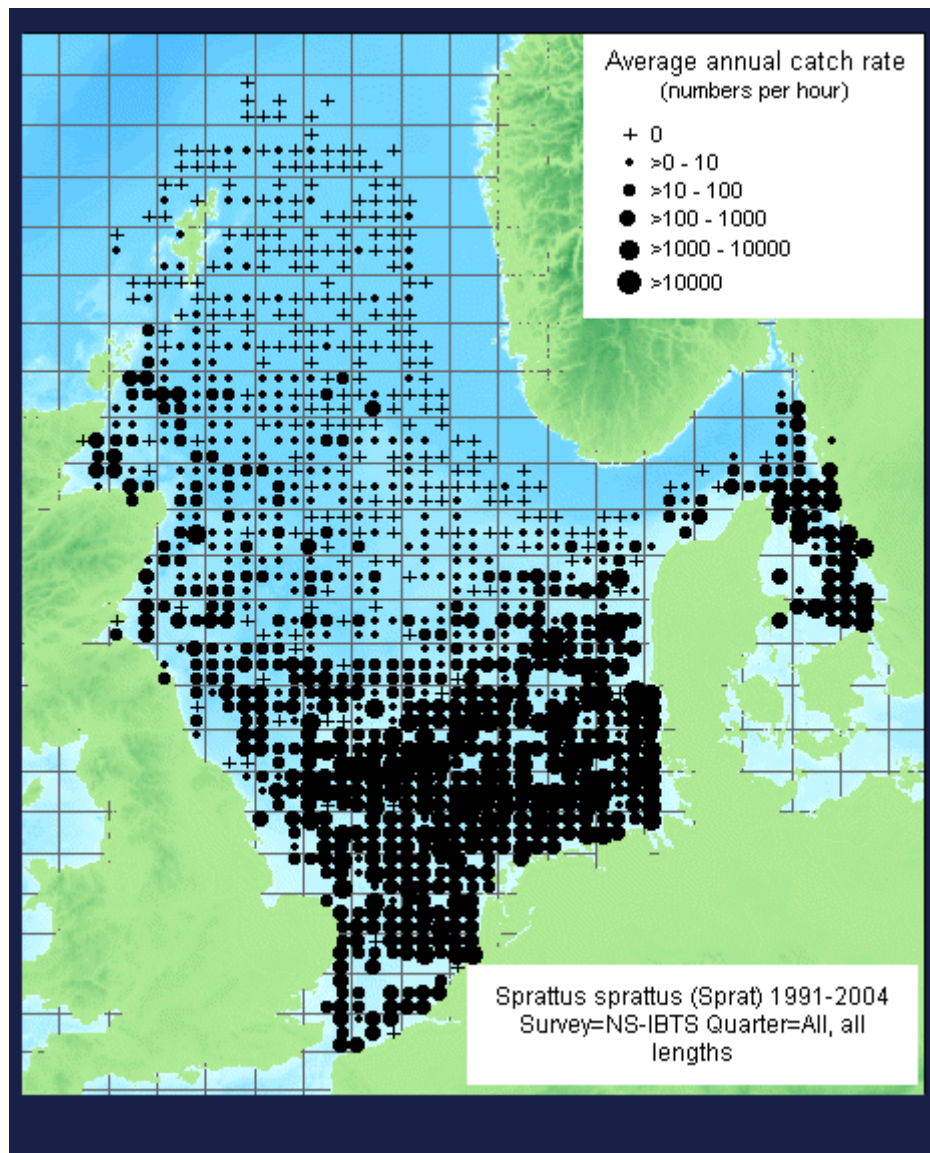
**% use in UK** It is estimated that sprat accounted for 8% of the fishmeal used in the UK in 2011.

**Distribution** North East Atlantic, North Sea, Baltic south to Morocco, also Mediterranean, Adriatic and Black Seas.

### Current status of the sprat stock

- ◆ In June 2011 the state of the North Sea and Norwegian Sea stocks was unknown. The available information is inadequate to evaluate stock status, therefore state of the stock is unknown. No in-year information for 2011 is available. The sprat fishery is considered opportunistic (and thus influenced by external factors such as abundance and price of other species), and therefore landings probably do not reflect the stock status. This makes quality assured (in-year) ICES advice impossible at present. <http://www.ices.dk/committe/acom/comwork/report/2011/2011/spr-nsea.pdf>
- ◆ In June 2011 for sprat in the Baltic Sea spawning stock biomass has declined from a historic high in the late 1990s. 2010 is estimated around long term average. Fishing mortality declined in 2010. The 2008 year class is estimated to be strong, but the 2009 and 2010 year classes slightly below average. <http://www.ices.dk/committe/acom/comwork/report/2011/2011/spr-2232.pdf>





Map: ICES

[Sprat management and control measures](#)

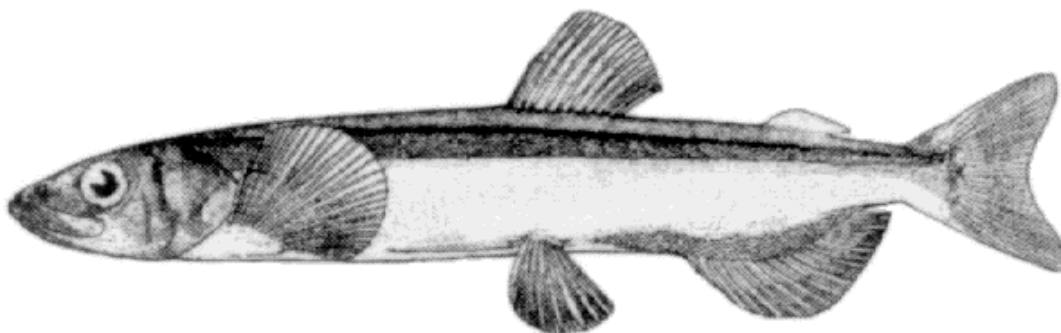
**TACs – Sprat fishing quotas for 2012**

The preliminary TAC for EC waters of IV (North Sea) and Zone IIa, the Norwegian Sea, was 160,000 tonnes for 2011, this has been reduced to 117,500 tonnes for 2012. There is also a TAC of 48,100 tonnes for 2012 for Skagerrak and Kattegat (IIIa).

**TAC history 2004 - 2012**

Norwegian Sea and North Sea – quotas										
Tonnes	2004	2005	2006	2007	2008	2009	2010	2011	2012	ICES advice
<b>Sprat</b>	284,250	296,250	203,940	195,128	195,000	176,081	170,000	160,000	117,500	<170,000

### 3. CAPELIN



**Scientific Name**

*Mallotus villosus*

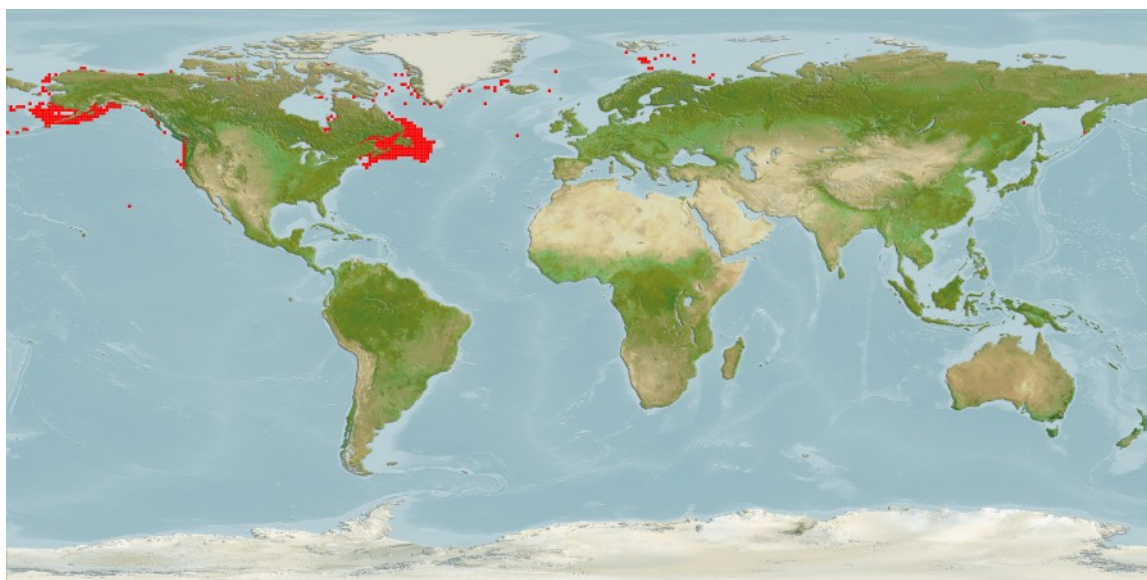
**Description** Capelin is a small pelagic shoaling fish which feed on animal plankton and small fishes. They are an important prey species for cod, saithe and other fish species. Spawning late winter.

**Fishery** Pelagic. Potential use for human consumption but mainly used for fishmeal because of limited outlets for human consumption. Capelin are caught by purse seine. Seasonal – mainly January to April, and late summer. Two capelin stocks – Barents Sea and Icelandic.

**Resilience** Medium. Life span maximum 6 years. Minimum population doubling time 1.4 to 4.4 years. Maximum size is 25.2cm.

**% use in UK** It is estimated that capelin accounted for 2% of the fishmeal used in the UK in 2011.

**Distribution** Northern hemisphere - North Atlantic, Barents/Norwegian Seas.



Map: [www.fishbase.org](http://www.fishbase.org)

## Current status of the capelin stock used to supply fishmeal to the UK

- ◆ The fishable Icelandic capelin stock has been at a low level in recent years but abundance is now well above average. The autumn assessment survey of juvenile capelin in 2010 gave a large estimate for the 2009 year class. In June 2011 ICES (following the advice of the Icelandic Marine Fisheries Institute) recommends a TAC that is 50% of the predicted catch (it has been 2/3 in the past) for 2011/2012 and for the fishery to start in October. This results in a starting quota of 366,000 t. The final TAC will be set after the planned autumn/winter surveys 2011/2012. The stock is managed in season to maintain a spawning biomass of 400,000 t. Icelandic capelin is managed by Iceland in co-operation with Norway and Greenland.  
<http://www.ices.dk/committe/acom/comwork/report/2011/2011/cap-icel.pdf>
- ◆ The status of Barents Sea capelin has remained the same. In October 2011 the stock was classified as above precautionary reference points. The maturing component in autumn 2011 was estimated to be 2.1 million tonnes. The spawning stock in 2012 will consist of fish from the 2008 and 2009 year classes. The survey estimate of the 2010 year class show it is above the long-term average and 0-group observations during an ecosystem survey in August–September 2011 also indicated the 2011 year class is also above the long-term average. Barents Sea capelin is managed by Norway and Russia through a management strategy. ICES recommended a nil quota for 2008, 390,000 t for 2009 and 360,000 t for 2010. On the basis of the management plan agreed by the Joint Norwegian–Russian Fisheries Commission (JNRFC) catches in 2012 should be no more than 320,000 tonnes.  
<http://www.ices.dk/committe/acom/comwork/report/2011/2011/cap-bars.pdf>
- ◆ Capelin has a key role in the food chain between animal plankton and other fish. Most fish, but especially groundfish, feed on capelin at some stage in their life and it is estimated that capelin may be 40% of the total food of cod. The estimated annual consumption of capelin by cod has varied between 0.2 and 3.0 million tonnes over the period 1984-2003. Young herring consume capelin larvae, and this predation pressure is thought to be one of the causes for the poor year classes since 2002.

## Capelin management and control measures

### **TACs – Capelin fishing quotas for 2012**

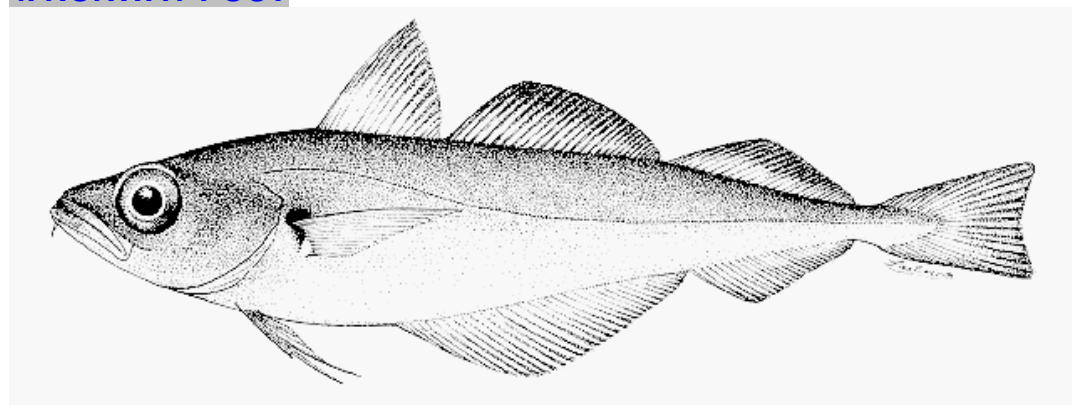
- ◆ Icelandic – An initial quota of 366,000 t is advised for the fishing year 2011/2012.
- ◆ Barents Sea – With no commercial fishing for four years (2005 – 2009) the stock has recovered and is now classified as at full reproductive capacity. A quota of 320,000 t has been agreed for 2012.

### **TAC history 2004 - 2012**

Tonnes	Capelin quotas									
	2004	2005	2006	2007	2008	2009	2010	2011	2012	ICES advice
<b>Icelandic*</b>	935,000	235,000	385,000	207,000	NIL	150,000	390,000	366,000		366,000
<b>Barents Sea</b>	Info not avail	NIL	NIL	NIL	NIL	390,000	360,000	390,000	320,000	320,000

\*Fishing year September to August

#### 4. NORWAY POUT



**Scientific name** *Trisopterus esmarkii*

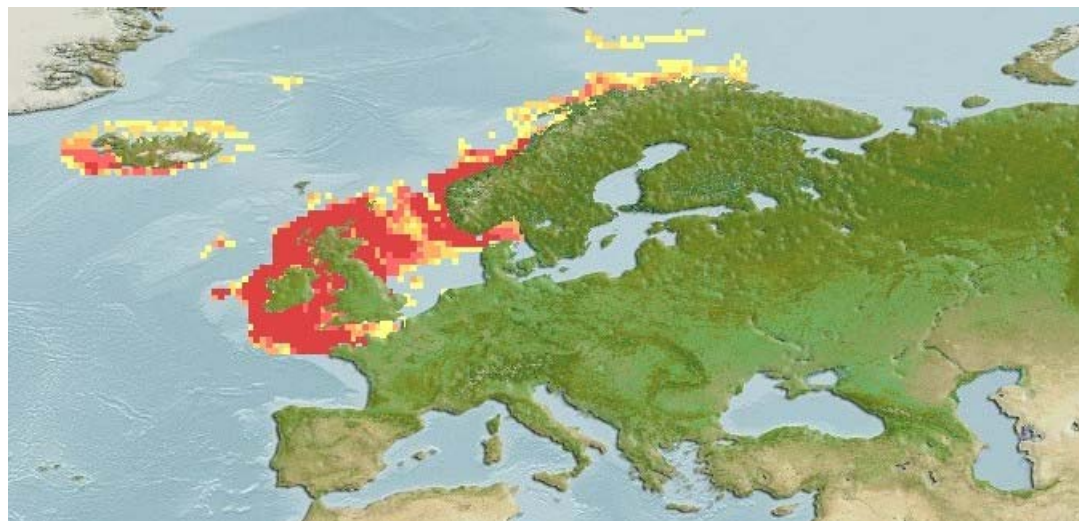
**Description** A small short-lived gadoid which rarely gets older than five years.

**Resilience:** Medium, minimum population doubling time 1.4 - 4.4 years.

**Fishery** The main area is The North Sea and Skaggerak-Kattegat where landings were 200,000 tonnes per annum up to 1995, then declined through to 2007. The species is also taken as by-catch in the Blue Whiting Fishery. Mainly fished by Danish and Norwegian vessels using small mesh trawls. A second fishery is operated by Danish vessels in the West of Scotland.

**% use in UK** It is estimated Norway pout accounted for 2% of the fishmeal used in the UK in 2011.

**Distribution** Northeast Atlantic: southwest Barents Sea, sometimes at Bear Island, south to the English Channel, around Iceland, and at the Faeroe Islands. Spawning takes place in the North Sea between Shetland and Norway.



Map: [www.fishbase.org](http://www.fishbase.org)



### Current status of the North Sea/Skagerrak-Kattegat Norway pout stock

- ◆ The North Sea fishery developed in the 1960s, peaked at 740,000 tonnes in 1974, in the 1980s and early 1990s fluctuated around 200,000, and then fell sharply. The targeted fishery for Norway pout was closed in 2005, the first half of 2006, all of 2007, as well as in the first half of 2011. Fishing effort and catches were low in 2008 and 2009, but increased in 2010. Historically, the fisheries have resulted in bycatches of other species, particularly whiting, haddock, saithe, and herring. Bycatches of these species have been low in the recent decade. The TAC has not been taken in 2008, 2009, and 2010 because of high fishing (fuel) costs in these years, as well as bycatch regulations in 2009 and 2010 (mainly in relation to whiting bycatch).
- ◆ In October 2011 it is estimated the stock size has increased since 2004 and is considered to be above maximum sustainable yield (MSY). Recruitment was well above average in 2009, but very low in 2010 and 2011 and this is expected to bring the spawning stock below  $MSY_{Bescapement}$  in 2012. Fishing mortality has been lower than the natural mortality for this stock and has decreased in recent years to well below the long-term average. The status of the stock is mainly determined by natural processes and recruitment.
- ◆ This stock is assessed twice a year. The spring assessment provides stock status up to 1st of April of the current year. The autumn assessment provides stock status for the current year and a forecast of fishing possibilities in the next year. This approach follows the escapement management strategy. A benchmark assessment is planned for 2012. ICES advises on the basis of the MSY approach that there should be no catches of Norway pout in 2012.  
<http://www.ices.dk/committe/acom/comwork/report/2011/2011/nop-34%20oct.pdf>

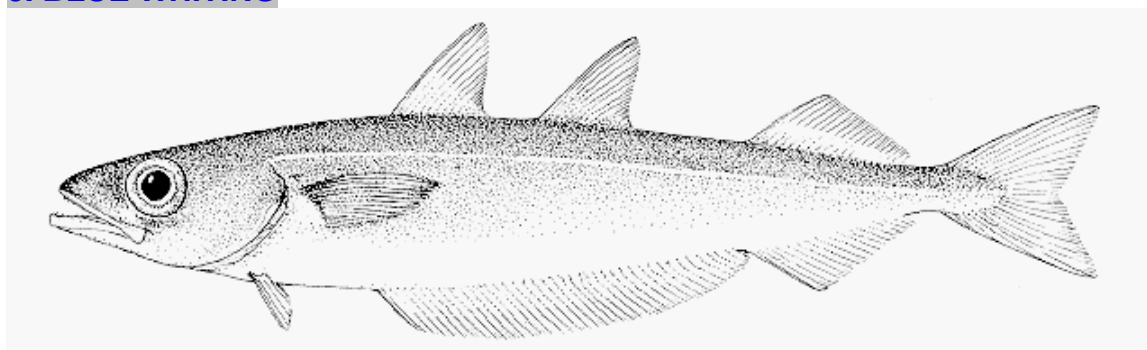
### Norway pout management and control measures

The Norway pout fishery is regulated through a single species TAC and by technical measures such as minimum mesh size in the trawls, fishing area closures and bycatch regulations.

<i>Tonnes</i>	2004	2005	2006	2007	2008	2009	2010	2011	2012	ICES advice
N Sea S&K	198,000 IYM	NIL	95,000	NIL	<115,000 IYM	<116,000 IYM	<162,000 IYM	<6,000 IYM	NIL	NIL

IYM = in year management

## 5. BLUE WHITING



**Scientific Name**

*Micromesistius poutassou*

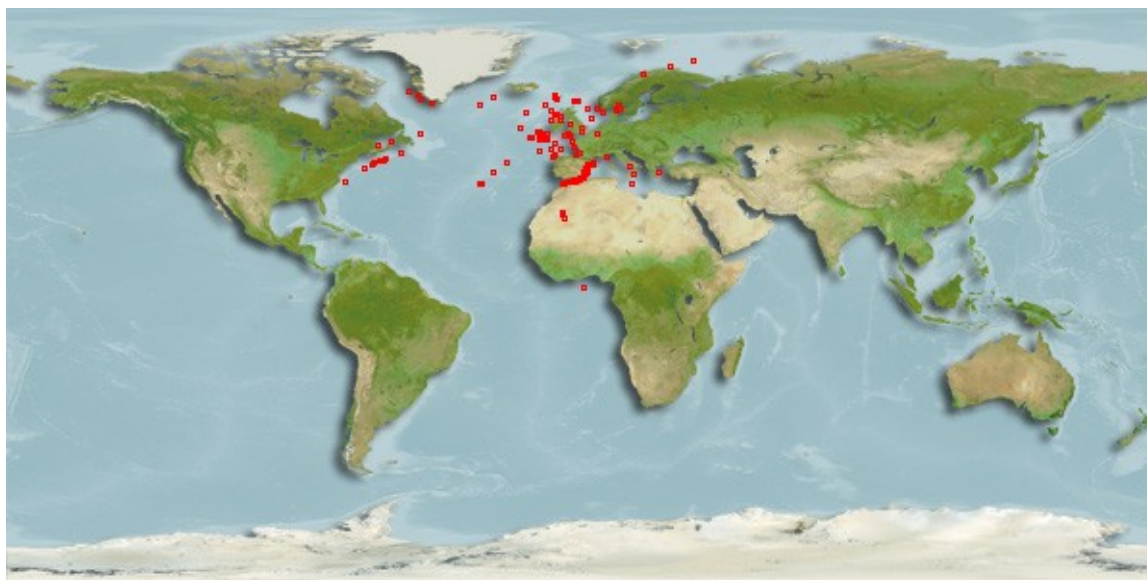
**Description** Blue whiting are found in open seas, most often near the surface or in mid water, but can be found down to depths of 1000m. Feeds primarily on krill and small crustaceans. Spawns in the spring.

**Fishery** Pelagic. Potential use for human consumption but mainly used for fishmeal because of limited outlets for human consumption. Blue whiting are caught by pelagic trawler. Seasonal – starts in March, mainly May to July.

**Resilience** Medium. Life span maximum 20 years. Minimum population doubling time 1.4 to 4.4 years. Maximum size is 50cm.

**% use in UK** It is estimated that blue whiting accounted for 1% of the fishmeal used in the UK in 2011.

**Distribution** Very large fishery. Distribution extends from Straits of Gibraltar to the Barents Sea including NE Atlantic, North and Norwegian Seas.



Map: [www.fishbase.org](http://www.fishbase.org)

### Current status of the blue whiting stock

- ◆ In October 2011 the blue whiting stock is considered to have full reproductive capacity and harvested sustainably. Because of poor recruitment the spawning stock biomass (SSB) is forecast to decline in the future and will likely fall below precautionary levels in 2013. All year classes from 2005 onward are estimated to be poor. SSB declined from a peak of 7 million tonnes in 2003 to 2.4 million tonnes at the beginning of 2011.
- ◆ ICES catch advice for 2009 to 2012 has varied principally because of the large changes in SSB and fishing mortality estimates. The exclusion of the 2010 IBWSSS data in this year's assessment results in a large change in the advice compared to 2010 (when the TAC dropped to 40,100 t). Compared to last year, the SSB for 2010 is estimated to be more than twice the estimate of the 2010 assessment and fishing mortality in 2009 to be almost half. The resulting large reduction in last year's advised catch for 2011 was a combination of this low SSB estimate and the low fishing mortality stipulated in the management plan when the SSB is below precautionary limits. Although the estimates of SSB have varied greatly in recent years, the perception that the stock is declining has remained unchanged for the last several assessments.  
<http://www.ices.dk/committe/acom/comwork/report/2011/2011/whb-comb.pdf>

### Management agreement

- ◆ Blue whiting is fished by the EU, Denmark (on behalf of the Faeroe Islands and Greenland), Iceland, the Russian Federation and Norway, which together form the North East Atlantic Fisheries Commission (NEAFC).
- ◆ In December 2005 these coastal states agreed on a sharing arrangement for the blue whiting stock. The management targets were to maintain SSB at levels above 1.5 Mt and fishing mortality rates at levels of no more than 0.32 (Fpa) for appropriate age groups. The Parties agreed to reduce the TAC by at least 100,000 t annually until fishing mortality (fish taken from the stock by fishing) reaches 0.32 (Fpa).
- ◆ In addition on 13 December 2005 the EU Commission announced agreement had been reached between Norway and the EU on blue whiting fisheries in the North East Atlantic. The Commission, on behalf of the EU, and Norway agreed that 61% of each party's TAC, to be set under a future coastal agreement, can be caught in the waters of the other party.
- ◆ A new management plan was agreed in November 2008. As a priority, the long term plan ensures with high probability that the size of the stock is maintained above 1.5 million tonnes. The parties agreed to establish the TAC consistent with reductions in fishing mortality of 35% each year until a defined fishing mortality is reached.

### Blue whiting management and control measures

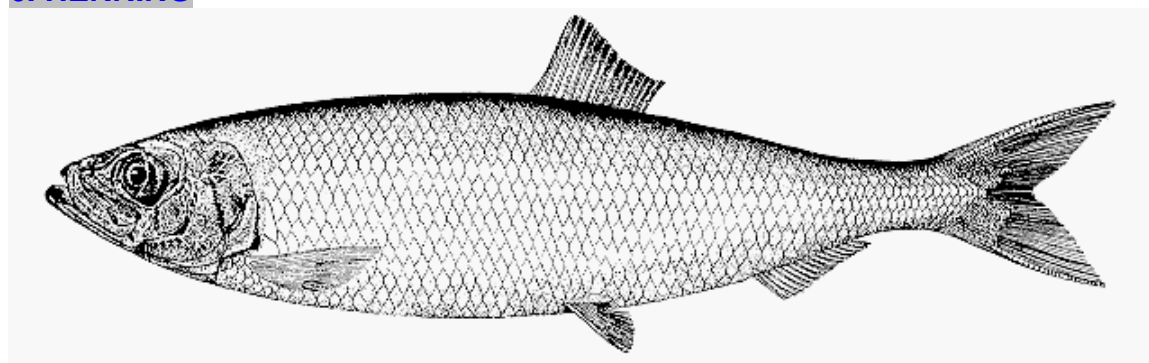
#### **TACs – Blue whiting fishing quotas for 2012**

#### **TAC history 2004 – 2012**

<i>Tonnes</i>	2004	2005	2006	2007	2008	2009	2010	2011	2012	ICES advice
<b>Total</b>	No quota	No quota	2.0M	1.7M	1.26M*	543,043	540,000	40,100	391,000	391,000



## 6. HERRING



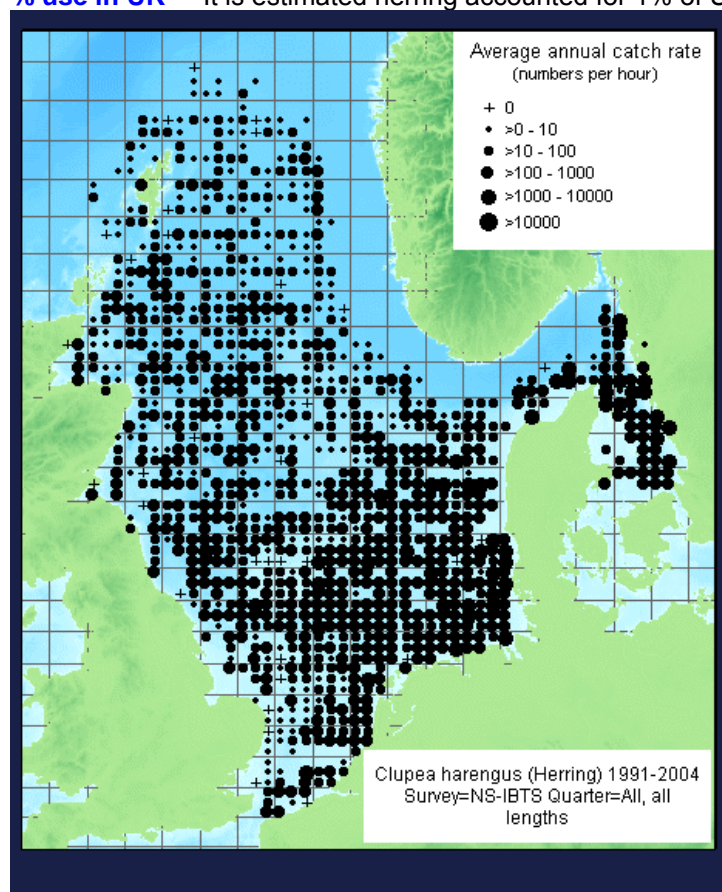
**Scientific Nm** *Clupea harengus*

**Description** Herring school in coastal waters and have complex feeding and spawning migrations. Spends the day in deeper waters rising to the surface at night. Feeds on small planktonic copepods in the first year, then mainly on copepods. Has major impact as prey and predator to most other fish stocks and prey for sea mammals.

**Fishery** Abundant pelagic species. In the EU primary use is human consumption but any surplus within the TAC may be used for fishmeal. Baltic herring may be used as feed grade. In Norway and Iceland may be directed as feed or food grade. Can be caught as a by-catch in the feed grade sprat fishery and small mesh fisheries. Highly commercial – caught by purse seiner and trawl fisheries.

**Resilience** Medium. Minimum population doubling time is 1.4 – 4.4 years. Maximum age is 11 years. Maximum size is 45cm.

**% use in UK** It is estimated herring accounted for 1% of UK fishmeal in 2011.



Map: ICES

### Current status of the herring stocks

Herring is spread across a number of fishing divisions including the North Sea, Skagerrak, Kattegat, North East Atlantic, Baltic and Norwegian/Icelandic waters.

- ◆ In September 2011 ICES advised that the biggest stock, North East Atlantic, or **Norwegian spring spawning herring** has full reproductive capacity and was being harvested sustainably. The fishery is shared between the EU, Faroe Islands, Iceland, Norway and the Russian Federation. Stock productivity is presently high (2009 - highest level for 20 years). In the last 13 years, five large year classes have been produced (1998, 1999, 2002, 2003 and 2004). Stock has shown a large dependency on the irregular occurrence of very strong year classes. In the absence of strong year classes since 2005, stock declined in 2010 and 2011 and is expected to decline further in the near future. Short-term prognoses indicates a decline in spawning stock from 7.9 MT in 2011 to 6.9 in 2012 and 5.9 MT in 2013, even if exploited in 2011 and 2012 according to the management plan.  
<http://www.ices.dk/committe/acom/comwork/report/2011/2011/her-noss.pdf>
- ◆ In May 2011 ICES advised herring in the **North Sea** has recently produced seven poor year classes in a row (2002 - 2007), but the year classes 2008 and 2009 are estimated to be above the long-term mean, however ICES still classifies the stock as being at full reproductive capacity and as being harvested sustainably and below management plan and maximum sustainable yield targets. The survival of the larvae has been poor. Productivity appears to be linked to climatic changes in the North Sea and ICES considers the stock is still in a low productivity phase. A management plan was agreed in November 2008. This was reviewed in November 2011 and was considered to be compatible with the precautionary approach.  
<http://www.ices.dk/committe/acom/comwork/report/2011/2011/her-47d3.pdf>
- ◆ In June 2011 ICES advises that **Icelandic summer spawning herring** spawning stock biomass has been declining for 3-4 years and is now close to precautionary levels. Fishing mortality is currently below maximum sustainable yield. A high *Ichthyophonus* infection was observed in the stock in the winter 2008/2009 (prevalence 32%), 2009/2010 (43%) and 2010/2011 (34%), causing additional natural mortality. In early autumn 2011 new information on the *Ichthyophonus* infection/stock size will be available. No TAC to be set until this information is available. <http://www.ices.dk/committe/acom/comwork/report/2011/2011/her-vasu.pdf>

### Herring management and control measures

TAC - Tonnes	2004	2005	2006	2007	2008	2009	2010	2011	2012	ICES advice
NEAtlantic	825,000	890,000	732,000	1.280 M	1,518 M	1.643 M	1.483 M	988,000	833,000	833,000
N Sea	326,000	379,850	322,874	341,000	201,227	171,000	164,300	200,000	243,000	248,000
Icelandic	110,000	110,000	110,000	117,000	130,000	ISR	40,000	40,000	ISR	ISR
Baltic (4)			163,342	170,260	320,294	288,346	288,804	264,073	235,893	N/A
S&K						37,722	20,924	25,999	38,998	N/A
By-catch N Sea	43,200	50,000	42,500	31,875	18,806	15,985	10,390	16,539	17,900	N/A
ByC S&K	21,000	24,150	20,528	15,396	11,470	8,373	5,442	6,659	6,659	N/A

## OVERVIEW - SOUTH EAST PACIFIC AND GULF FEED GRADE FISH STOCKS

### Southeast Pacific

The status of south east Pacific feed fish stocks are detailed in the latest published version of the biennial FAO *State of World Fisheries and Aquaculture 2010* (published March 2011) and in national Government statistics.

Three species in the Southeast Pacific account for around 80% of total catches:

- Anchovy - the Northern-Central Peruvian stock, managed by Peru; the Southern Peru/Chilean Regions XV-I-II stock, managed separately by both Peru and Chile; the Chilean Regions III-IV stock, managed by Chile; and the Chilean Regions V-X stock, also managed by Chile.
- Jack mackerel
- South American pilchard (sardine)

The governments of Peru and Chile have adopted a precautionary approach to fisheries management to safeguard the viability and prevent depletion of stocks, by means of national quotas for individual species and a closed season programme. They have taken steps to ensure commercial fishing in Peru and Chile is strictly monitored and controlled. These controls are based on independent scientific advice. Lower fishmeal production since 2006 reflects a responsible and precautionary approach to catch limits on the part of the relevant governments, especially in Peru and Chile.

### El Niño and La Niña

The whole of the Southeast Pacific is under the influence of two phases of the El Niño Southern Oscillation (El Niño and La Niña), generally on a ten-year cycle. As a consequence large catch fluctuations are common in the area. The NOAA climate prediction centre monitors this phenomenon. From August 2009 there was an El Niño present across the equatorial Pacific Ocean during winter 2009 - 2010. This weakened during April 2010, with a transition to neutral conditions by June 2010, but this substantially reduced catches.

### Fishmeal production in Peru and Chile

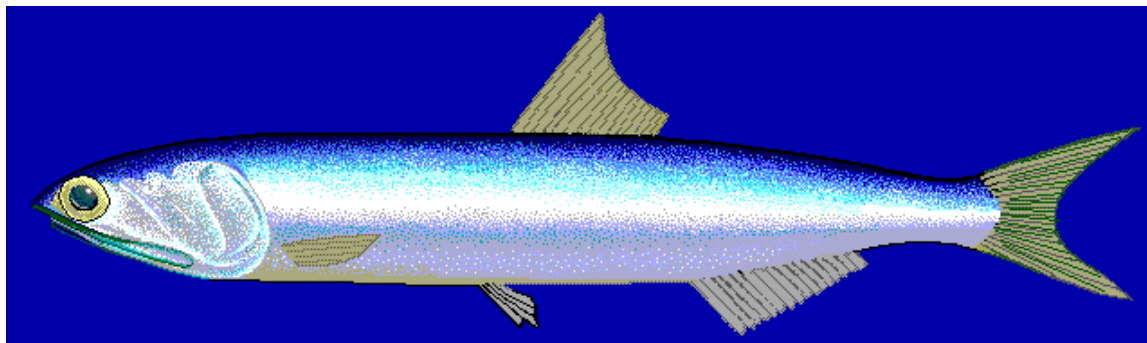
Fishmeal production tonnes*									
Tonnes	2003	2004	2005	2006	2007	2008	2009	2010	2011**
Peru	1.2M	1.9M	2.0M	1.4M	1.4M	1.4M	2.04M	1.48M	1.4M
Chile	664,000	933,000	789,000	758,000	713,000	668,000			750,000

Source: \*Globefish

\*\* <http://www.indexmundi.com/agriculture/?commodity=fish-meal&graph=production>

The status of Gulf menhaden stocks are assessed and monitored by the USA National Oceanic and Atmospheric Administration (NOAA). The menhaden fishery in the Gulf of Mexico is primarily a single-species reduction fishery for fishmeal and fish oil. Landings comprise around 11% of all US landings, making this the second largest commercial fishery in the US.

## 1. ANCHOVY (anchoveta – Peru and Chile)



**Scientific name**

*Engraulis ringens* Jenyns, 1842

**Description**

Anchovy form huge schools chiefly in surface waters ranging from 3 to 80 metres. Mostly restricted to cool, nutrient-rich upwelling zones. A filter-feeder entirely dependent on the rich plankton of the Humboldt current. Spawn in batches all year round, with two peaks.

**Fishery**

Pelagic species. Very small amount is now used for human consumption. Majority used for fishmeal. Highly commercial – caught by purse seiner.

**Resilience**

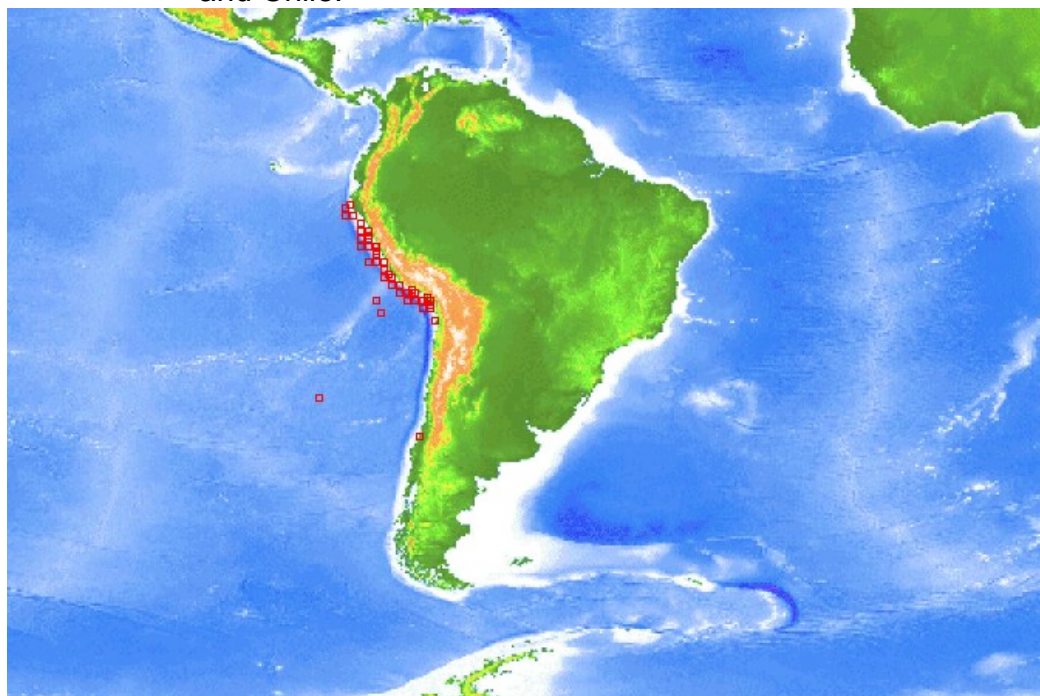
High. Minimum population doubling time is less than 15 months. Short-lived species. Maximum age 3 years. Maximum size 18.5cm.

**% use in UK**

It is estimated that anchovy accounted for 38% of the fishmeal used in the UK in 2011.

**Distribution**

South-eastern Pacific Ocean, mainly within 80 km of the coasts of Peru and Chile.



Map: [www.fishbase.org](http://www.fishbase.org)



### Current status of the Peruvian anchovy stocks

- ◆ **Northern-Central Peruvian stock, managed by Peru:** In 2011 IMARPE recommended 3.67 million tonnes for the first fishing season from April to July 2011, and 2.5 million tonnes for the second fishing season from November to January 2012. (This corresponds to 3.5 and 2 million tonnes for the two fishing seasons in 2009/10, and 2.5 and 2 million tonnes for 2010/11). Catches have been fairly stable between 2000 to 2009 (with an average catch of 7.1 million tonnes) but the effects of the EL Nino in 2010 resulted in a drop to 3.4 million tonnes. There is uncertainty surrounding the status of the stock and fishing mortality levels are not disclosed, however compliance was high - during the period 2006-2009, only in 2008 did landings surpass the TAC both in the first and the second fishing seasons, by 6% (284,000 t over 5 million tonnes).
- ◆ Stock assessment reports are not made available publicly so there is uncertainty surrounding the status of the stock (latest reports September 2009), and fishing mortality levels are not disclosed. Though compliance is good overall doubts have been expressed over the reliability of landing controls. Following observations over many years, a limit reference point of 4 million tonnes and a precautionary limit of 5 million tonnes of spawning biomass have been defined for the stock. This condition is not well documented, but it has been explained by IMARPE officials in public presentations and is referred to in some executive reports. Maximum sustainable yield (MSY) was estimated to be 7.5 million tonnes in 1965, increased to 9.5 million tonnes in 1970 and more recently has been estimated as 8 million tonnes (2009). <http://www.fishsource.com/fishery/identification?fishery=Anchoveta+-+Peruvian+northern-central+stock>
- ◆ The Association of Peruvian Anchovy Producers (APAP) announced in July 2009 it was pursuing Marine Stewardship Council sustainability certification for the Peruvian anchovy fishery.

### Total landings for Peruvian anchovy stocks

<b>Total landings - capture production for fishmeal reduction</b>											
<i>Tonnes mt</i>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>
Anchoveta	7.2	8	5.3	8.6	9.4	6.0	6.1	6.2	5.8	2.8	4.8

Source: IFFO, Ministerio de la Producción del Perú, Globefish and [http://pucp.academia.edu/SigbjornTveteras/Papers/709856/Individual\\_Fishing\\_Quotas\\_in\\_Peru\\_Stopping\\_the\\_Race\\_for\\_Anchovies](http://pucp.academia.edu/SigbjornTveteras/Papers/709856/Individual_Fishing_Quotas_in_Peru_Stopping_the_Race_for_Anchovies)

### Anchovy management and control measures by the Peruvian Government

- ◆ Government control of fisheries in Peru is managed by the Vice-Ministry of Fisheries, a part of the Ministry of Production.
- ◆ The government-funded marine research institute in Peru, IMARPE, advises government and conducts hydro-acoustic evaluation of pelagic resources along the entire Peruvian coastline two to three times every year to assess environmental status of fish stocks.

- ◆ IMARPE advises on fisheries control based on ecosystem effects. The approach is a multi-step procedure, which includes identification of ecosystems, relevant ecosystem components and linking human activities to impacts on the ecosystems.
- ◆ Fishing stops during Feb and March to protect growth of anchovy and sardine juveniles. Fishing closure from August to October to protect spawning stock.
- ◆ All fishing boats operating outside the 5 mile limit fitted with a satellite tracking system to allow government to monitor position of all boats at any given time.
- ◆ The Peruvian government imposes closed fishing seasons, closed entry of new fishing boats, and vessel licences to fish within the 200 mile limit.
- ◆ Limits on the minimum size of fish that can be landed with local short-term fishing closures if the level of small fish exceeds the number allowed.
- ◆ The Swiss-based international surveillance company SGS records all fishing landings on the coast of Peru for government management purposes. Only authorised vessels with the correct licence are permitted to unload fish in the 115 unloading points. This system is effective 24 hours per day.
- ◆ Fishmeal plants all have to have a working licence from the Ministry of Production and health certification from the Ministry of Health. Plants are also formalising HACCP systems and working towards implementing quality control systems such as the Feed Materials Assurance Scheme (FEMAS).
- ◆ A Fishing Behaviour Code has been established which covers the owners of plants and vessels, technicians of plants, skippers and crew members.
- ◆ **Maximum Catch Limits per Vessel (MCLV)** - were introduced in April 2009. There is a fixed percentage of the global quota assigned to each vessel: for steel fleets depending on the catch history and the hold capacity of each vessel - 60% or 40%; and for wooden vessels - based on their best annual catch - 100%. Before the introduction of MCLV there was an 'Olympic race' at the start of each fishing season when too many boats rush out and caught the entire quota in less than 50 days with consequent congestion at ports and fishmeal plants. The main objectives of the MCLV and other decrees introduced at the same time are to achieve more efficient use of the present oversized fleet and to better distribute fishing effort throughout the fisheries seasons, so reducing stress on the stock. Further objectives are to improve protection of artisanal fishing, safety of crew, impact on the environment and quality of fishmeal. The new regulations are also designed to promote investment, competitiveness and increased supply for human consumption. They include parachute payments and pensions for those retiring from fishing.
- ◆ **Voluntary codes** – Peruvian fishery companies representing over 70% of the trawlers have organised themselves into the Sociedad Nacional de Pesquería (SNP) and developed an Ethical Code of Conduct that has responsible fishing as a central theme, including strict compliance with regulations. A Fishing Behaviour Code has been established which covers the owners of plant and vessels, technicians of plants, skippers and crew members.

- ◆ **Anchovy for human consumption is a state policy** – there is a commitment against child malnutrition. By law, a minimum of 8% of all food purchases by the Peruvian state destined for social programs have to be anchovy and/or squid. In addition there is new investment in human consumption applications, including canning of anchovies.

#### EXAMPLE OF FISHERY CLOSURES TO PROTECT PERUVIAN ANCHOVY STOCK

2007 Peruvian Open Season - 3 million tonnes is taken in three steps	
Fishing stops in Jan, Feb and Mar.	<b>Subject to:</b> <ul style="list-style-type: none"> <li>• All vessels must have a valid fishing permit and use nets of minimum 13 mm;</li> <li>• Minimum fish size: 12 cm with 10% tolerance in the number of animals;</li> <li>• If the presence of juveniles exceeds 10% in the daily landings of a port, fishing will be stopped in this port for a minimum of three days;</li> <li>• Fishing within five miles of the coast line is prohibited, the vessels travelling through this zone are prohibited to stop and must keep a minimum speed of 2 knots;</li> <li>• Each vessel is authorised only one sailing per day;</li> <li>• All vessels must have on board an operating satellite positioning system.</li> </ul>
<b>Three-phase fishing authorised as follows:</b>	
1. April 10 at 00:00 hours until April 14: <b>500,000 tonnes</b>	
2. May 2 at 00:00 hours until May 11: <b>1 million tonnes</b>	
3. June 1 at 00:00 hours onwards [no final date specifically mentioned]: <b>1.5 million tonnes</b>	
Fishing closure Jul/Aug – Oct.	

For more about anchovy see: [www.iffonet.net/intranet/content/archivos/67.pdf](http://www.iffonet.net/intranet/content/archivos/67.pdf)

#### Current status of the Chilean anchovy stocks

- ◆ **Chilean Regions III-IV stock, managed by Chile:** Spawning biomass is well above the precautionary limit and fishing mortality well below target levels. Protective measures for spawning zones have been introduced. However managers regularly set TACs well above advised TAC levels, although these are rarely fully harvested. IFOP produces scientific reports with assessment results and recommendations. Scientific advice concerning the TAC is handed out once a year. For 2009, IFOP advised a TAC of 88,000 tonnes but a TAC of 106,000 tonnes was established. A quota of 106,000 tonnes was also established for 2010 (this has been set since 2006 and is referred to as the 'status quo' level'). In 2008, 47% of the quota was unfished and in 2009, 63%. No further information is available.  
<http://www.fishsource.com/fishery/summary?fishery=Anchoveta+-+Chilean+regions+III+and+IV>
- ◆ **Chilean Regions V-X stock, managed by Chile:** Depleted spawning biomass and very weak recent recruitment (in 2009 estimated spawning biomass fell below its absolute lower limit). No recovery plan is in place. Re-estimated fishing mortality from the 2009 assessment indicates rates considerably higher than advised targets. The industrial pelagic fishery lands a high ratio of jack mackerel, which is currently depleted in the region. A recovery plan is required for the stock. Greater compliance of quotas by the artisanal sector must be encouraged. For 2009 the Undersecretariat of Fisheries recommended a final TAC of 435,000 tonnes, and for 2010, 283,000



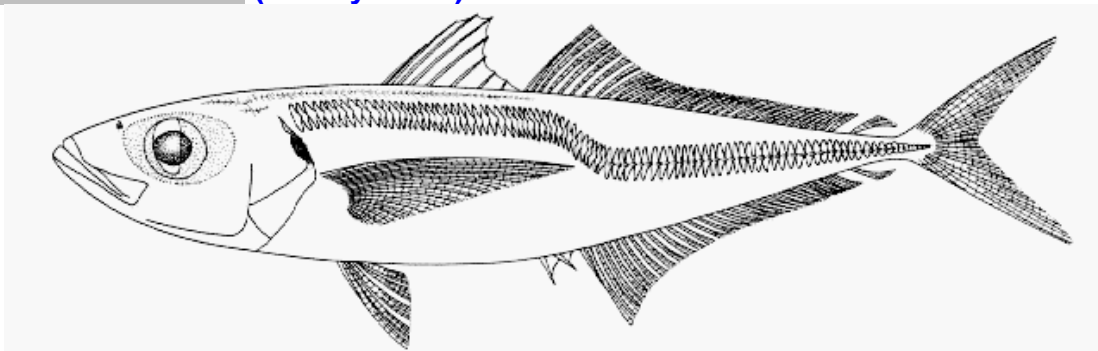
tonnes. SUBPESCA recommended a TAC of 80,000 tons for anchovy in 2011. This represents a significant decrease from the 2010 TAC, and the lowest by far in the last ten years, suggesting that scientific advice has been taken onboard. The TAC has been set at 80,000 tonnes as advised.

<http://www.fishsource.org/fishery/summary?fishery=Anchoveta+-+Chilean+regions+V-X>

- ◆ In January 2012 it was announced that the Fisheries Research Fund in Chile had begun research on the common anchovy and sardine resources between Regions V and X, aboard the research vessel *Abate Molina*. The main objective of the study is to evaluate and characterise the stocks of both species through the hydroacoustic method, during the period of maximum recruitment and the immediate autumn.

<http://fis.com/fis/worldnews/worldnews.asp?monthyear=&day=16&id=49124&l=e&special=&ndb=1%20target=>

## 2. JACK MACKEREL (mostly Chile)



**Scientific**

**Name** *Trachurus murphyi*

**Description** Jack mackerel form schools and are found in shore and open oceanic waters at a depth of 10 – 300 metres. Feed mainly on fish larvae and small crustaceans.

**Fishery** Pelagic species. Used for human consumption (canned) and used for fishmeal. Highly commercial – caught by purse seiner.

**Resilience** Low. Minimum population doubling time is 4.5 – 14 years. The maximum age is 16 years. Maximum size is 70cm.

**% use in UK** It is estimated that jack mackerel accounted for 3% of the fishmeal used in the UK in 2011.

**Distribution** South-eastern Pacific Ocean, off Peru and Chile.



Map: [www.fishbase.org](http://www.fishbase.org)

### Current status of the jack mackerel stocks

- ◆ There is evidence for the existence of two jack mackerel populations off the coasts of South America: one off the Peruvian coast and the other in Chilean waters, however the Chilean stock assessment model used by IFOP assumes a single stock of jack mackerel inside and outside the EEZ off Chile.

- ◆ **The South Pacific Regional Fisheries Management Organisation (SPRFMO) Scientific Working Group** issued advice on jack mackerel in Peru and Chile at the end of 2011. Over the period 2000 – 2010, annual recruitment was only 58% (10.4 billion fish) of the long-term average. As a result of weak year classes from 2004 onwards, average recruitment over the period 2006 – 2010 (4.4 billion fish) has only been 24% of the long term average. Weak year classes from 2004 onwards, combined with escalating fishing mortality, resulted in a decline in estimated total biomass to about 2.5 million t in 2010, the lowest level over the history of this fishery. The updated assessment indicates a slight increase in estimated total biomass to 2.8 million t in 2011, but a continuing decrease in spawning biomass from 760,000 t in 2010 to 723,000 t in 2011.

Reported jack mackerel catches increased steadily from 1970 onwards, reaching a peak of 4.74 million t in 1995. Catches then declined rapidly to 1.37 million t in 1999. Over the period 2000 - 2006 there was a slow increase in total catches to 2 million t. Despite increasing participation and fishing effort in the fishery since then, catches declined steadily from 2007 onwards to 753,761 t in 2010, which was at that time the lowest catch on record since 1976. Catches continued to decline in 2011, with reported or estimated total catches (as at September 2011) of 522,440 t, which is now the lowest catch on record since 1976.

<http://www.southpacificrfmo.org/assets/10th-SWG-and-9th-DIWG-meetings-Vanuatu/SWG-10/Annex-SWG-03-Jack-Mackerel-SubGroup-Report-SWG10.pdf>

- ◆ Annual National Report to SPRFMO Scientific Working Group 2011 for Chile. The 2011 global quota of jack mackerel catches was 284,000 tonnes, total catch to August was 218,000 tonnes, which represents a 15% decrease with regard to the same period in 2010. <http://www.southpacificrfmo.org/assets/10th-SWG-and-9th-DIWG-meetings-Vanuatu/SWG-10/SWG-10-07-Chile-NATIONAL-REPORT-2011.pdf>
- ◆ Annual National Report SPRFMO Scientific Working Group 2010 - 2011 for Peru states that in the last eight years, annual jack mackerel catch volume in Peru has fluctuated between 26,000 and 280,000 tonnes, showing a gradual decrease from 2006 to 2010, when the catch was only 300 tonnes - the lowest historic record. This was due to a weak El Niño (warm) in winter 2010 and in early summer 2011, the impact of La Niña (cold). From January to May 2011 jack mackerel landings have recovered to 118,000 tonnes. Since 2006 catch quotas have been applied in certain monthly periods. <http://www.southpacificrfmo.org/assets/10th-SWG-and-9th-DIWG-meetings-Vanuatu/SWG-10/SWG-10-11-PeruNationalReportforVanuatu.pdf>
- ◆ **TACs** - For 2009, the TAC was set at 1,400,000 tonnes, against a Sernapesca recommended quota of 1,250,000 tonnes and an IFOP recommendation of 750,000 tonnes. For 2010, the TAC was set at 1,300,000 tonnes. The TAC oscillated around 1,500,000 t during the period 2001-2008. There has been a decline in the TAC in recent years but it continually exceeds scientific advice: in 2008 by 28%, and in 2009 by 87%. Landings have shown a sharp decline and since 2007 the TAC has not been reached. In 2007, 19% was not fished, in 2008, 44% and in 2009, 41%. <http://www.fishsource.com/fishery/summary?fishery=Chilean+jack+mackerel>

- ◆ The earthquake in Chile at the beginning of 2010 has had a significant effect on the fishmeal industry in Chile. As most of the industry is based around Concepción, the epicentre of the earthquake, damage to the industry was substantial.

Annual jack mackerel catches in Chile Mt										
Tonnes	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
	1.5	2.5	1.7	1.7	1.8	1.7	1.9	1.9	1.4	1.2

<http://www.fao.org/fishery/species/2309/en>

Annual catches in Chile for fishmeal production Mt								
Tonnes	2000	2001	2002	2003	2004	2005	2006	2007
Anchoveta		0.85	1.5	0.75	1.7	1.5	0.9	1.4
J mackerel		1.65	1.44	1.38	1.36	0.9	0.7	0.7
Tot Pelagic	3.7	3.2	3.7	2.9	3.9	3.5	3.4	3.1

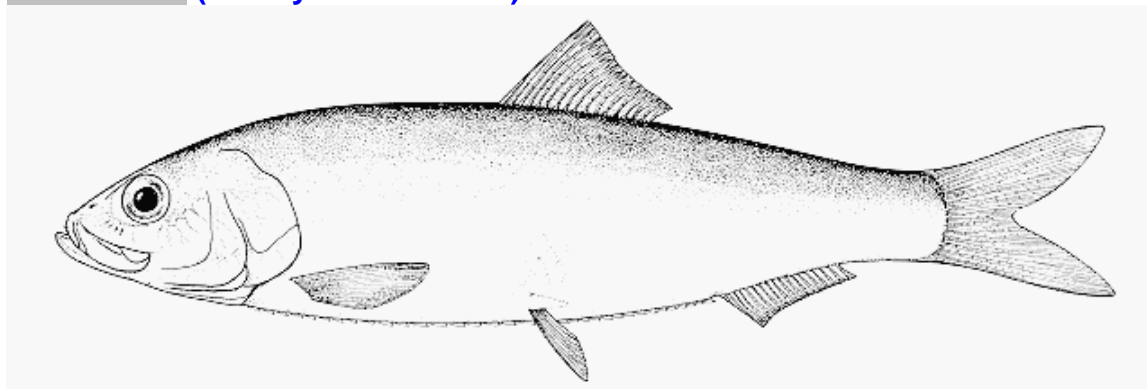
### Jack mackerel management and control measures by Chilean Government

To preserve stocks the Under Secretary of Fisheries with the approval of the National Fisheries Council in Chile has introduced a number of monitored control measures based on acoustic assessments of fish stocks and research cruises. Sernapesca is the Governmental body that watches over the whole system.

- ◆ All three Chilean jack mackerel fishery units have been declared under a full exploitation regime, so new access is prohibited.
- ◆ Jack mackerel in Chile has been controlled by the government's national annual quotas since 1999/2000 by species, and with individual quotas by company/ship-owner (ITQ or Maximum Capture Limits per vessel owner (LMCA)). A stringent unloading certification system is carried out by independent companies.
- ◆ A compulsory satellite positioning system is in place for the industrial fleet. All fishing boats are fitted with a Satellite Tracking System to ensure boats operate outside prohibited areas (such as designated areas of recovery) or the zone reserved for small artisan fisheries (first 5 miles offshore).
- ◆ Regular monitoring surveys to establish the state of the fishery resources. The results are used to set control measures required to protect the stocks.
- ◆ Legislation introduced to establish a maximum annual total catch limit for each species declared fully exploited and to provide quotas for each licensed fishing company according to its annual catch. For jack mackerel several fishing bans can be imposed during the year to protect small-sized fish including reproduction, spawning and recruitment fishing bans, and protected fishing zones.
- ◆ Minimum landing sizes (MLS) are also applied. MLS for jack mackerel, *Trachurus murphyi*, in the EU (the Northeast Bay of Biscay, the Cadiz Gulf, and Canary Islands) is 15 cm. Mediterranean Sea: 12 cm. Chilean jack mackerel: 26 cm.



### 3. SARDINE (mostly central Chile)



**Scientific**

**Name** *Clupea (Strangomera) bentincki*, Norman 1936 (Araucanian herring)

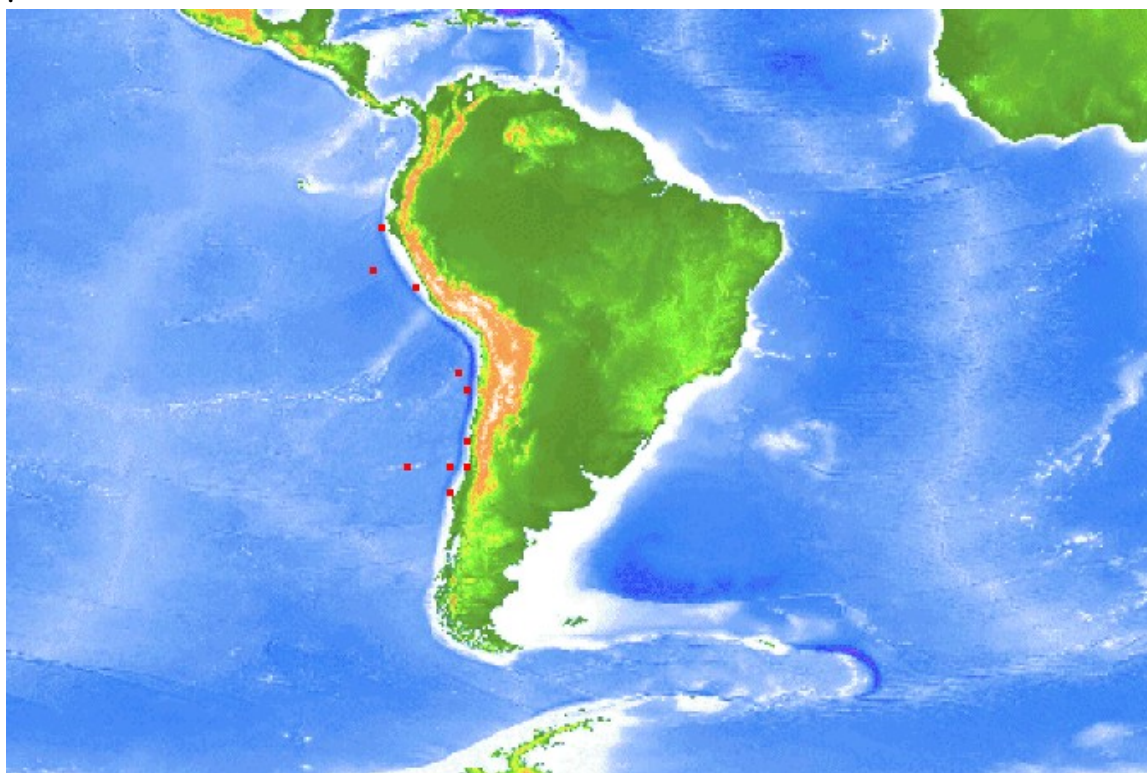
**Description** A coastal species that form large schools in central and southern Chile. Feeds mostly on zooplankton.

**Fishery** Pelagic species. Primarily used for fishmeal and partly for human consumption. Highly commercial.

**Resilience** Medium. Minimum population doubling time is 1.4 – 2.4 years. Maximum age is 4 years. Maximum size is 14cm.

**% use in UK** It is estimated that sardine accounted for 1% of the fishmeal used in the UK in 2011.

**Distribution** Southeast Pacific, Chile.



Map: [www.fishbase.org](http://www.fishbase.org)

### Current status of the sardine stocks

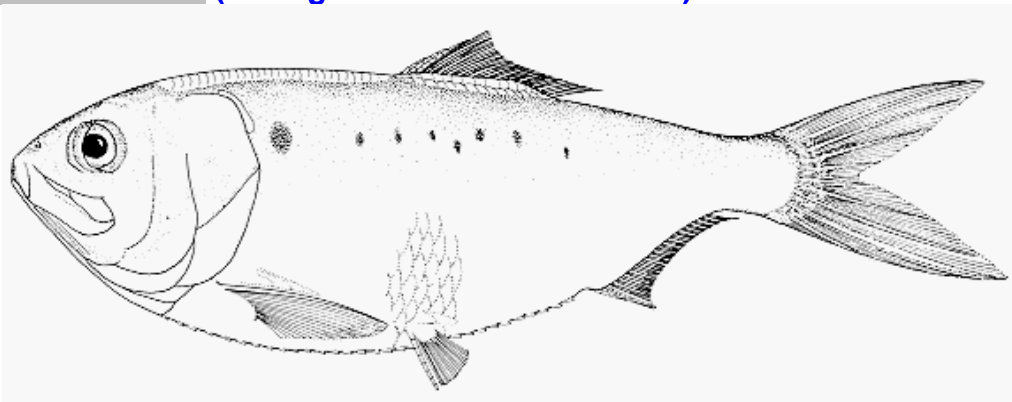
- ◆ The Chilean Pacific common sardine stock assessment uses data from direct methods (surveys) and from indirect assessment models. The direct hydroacoustic surveys have been conducted annually since 1999 by means of two cruises, one during the peak recruitment period (January) and the other in the autumn (April and May).
- ◆ In general, scientific advice for the TAC is given in three stages: first, a recommendation for an initial TAC is provided before the year starts; then, a second recommendation arises from the incorporation of updated landings data and new survey data from January (summer); finally, a third TAC recommendation is issued after a second cruise survey is carried out in May.
- ◆ Up-to-date information on stock status is not readily available. In 2008 it was estimated to be in good condition, its spawning biomass currently standing well above its precautionary limit of 585,000 tonnes. For 2007, spawning biomass was estimated at 889,000 tonnes, and for 2008 it was estimated at 2,355,000 tonnes.
- ◆ Generally, after 3% of the TAC is set aside for research, the artisanal sector receives approximately 70% of the remainder, and the industrial sector around 30%. The artisanal sector has exceeded its assigned quota in 2001, 2002, 2006 and 2008, while the industrial sector has fished within its assigned levels throughout the period. <http://www.fishsource.com/fishery/summary?fishery=Araucanian+herring+-+Chilean>

Annual catches in Chile for fishmeal production								
Tonnes	2000	2001	2002	2003	2004	2005	2006	2007
Sardine	723,000	325,000	310,00	274,000	329,000	277,000	374,000	229,000

### Sardine management and control measures by Chilean Government

- ◆ Since 2002 sardines have been subject to a national quota.
- ◆ Closed seasons for sardine and anchovy are set on an annual basis to protect the spawning stocks appropriate to the spawning cycle usually between August and September of each year in the northern part of the country. Closed seasons are also imposed during December to mid January to protect the recruitment process of anchovy.
- ◆ In the central-southern part of the country closed seasons are set for sardine and anchovy to protect the spawning period (usually July and August) and also from mid-December to mid-February.
- ◆ **Allocation of Exclusive Fishing Rights:** The industrial fishing quota is subject to a Maximum Catch Limit per Vessel Owner (ITQ) throughout the fishery unit.

#### 4. GULF MENHADEN (throughout the Gulf of Mexico)



**Scientific Name**

*Brevoortia patronus*

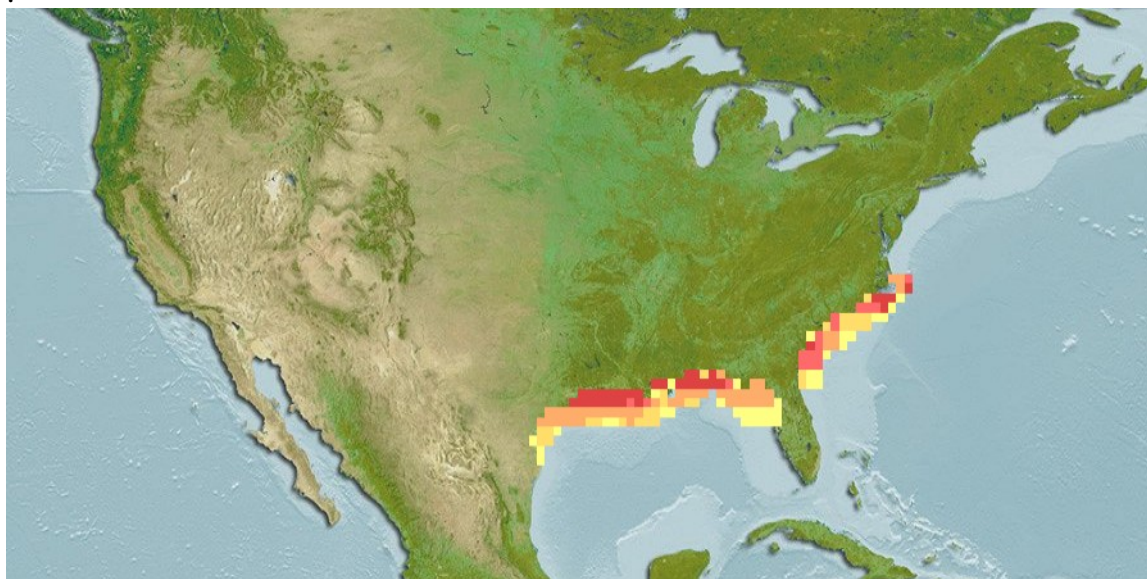
**Description** Occur inshore in summer with at least some moving into deeper waters from October. Feeds in dense schools, filtering phytoplankton. Breed in winter, with a peak in January.

**Fishery** Pelagic species. Primarily used for fish oil and fishmeal production. Highly commercial.

**Resilience** High. Minimum population doubling time is 15 months. Maximum length is 35 cm.

**% use in UK** It is estimated that menhaden accounted for 1% of the fishmeal used in the UK in 2011.

**Distribution** Throughout the Gulf of Mexico from the Yucatan Peninsula to Tampa Bay, Florida.



Map shows both Gulf and Atlantic menhaden. Map: [www.fishbase.org](http://www.fishbase.org)



### **Current status of the Gulf menhaden stock**

- ◆ Final purse-seine landings of gulf menhaden for reduction in 2010 amounted to 379,727 metric tons (1,250 million standard fish). This is down 17% from total landings in 2009 (457,457 t), and down 15% from the previous 5-year mean (446,982 t). For 2011 Gulf menhaden landings of 437,000 t are forecast.

[http://www.st.nmfs.noaa.gov/st1/market\\_news/menhaden\\_forecast\\_2011.pdf](http://www.st.nmfs.noaa.gov/st1/market_news/menhaden_forecast_2011.pdf)

Final purse-seine landings of Gulf menhaden for reduction in 2009 amounted to 457,457 metric tons (1,505 million standard fish). This is up 8% from total landings in 2008 (425,442 t), and up 2% from the previous 5-year mean (449,237 t). For 2010 Gulf menhaden landings of 463,000 t were forecast. Data shows low representation for age-1 Gulf menhaden, following the same trend as 2007 and 2008. Reasons for the decline of age-1 fish is not well understood. Thus, the strength of the 2008 year class of Gulf menhaden, and its relative abundance as age-2 fish in 2010, remains uncertain. If the 2008 year class of Gulf menhaden is a weak one (representing only 13% of the catch-at-age matrix in 2009), then the harvest of age-2 fish in 2010 may be down from recent years and landings may suffer. However there are also indications the 2009 year class may be above the long-term average.

[http://www.st.nmfs.noaa.gov/st1/market\\_news/menhaden%20forecast%202010.pdf](http://www.st.nmfs.noaa.gov/st1/market_news/menhaden%20forecast%202010.pdf)

- ◆ A 2007 stock assessment indicates that the gulf menhaden stock was slightly below target level (as indicated by its estimated fecundity), and fishing mortality was slightly above target level. The stock appears to be in good condition. However, if recent trends of decreased population and increased fishing mortality continue the stock would approach its limit reference points.

[http://www.fishsource.com/fishery/sustainability\\_analysis/Management%20Quality?fishery=Gulf+menhaden+-+Gulf+of+Mexico](http://www.fishsource.com/fishery/sustainability_analysis/Management%20Quality?fishery=Gulf+menhaden+-+Gulf+of+Mexico)

### **Gulf menhaden management and control measures**

- ◆ Statutory seasons/closures – the fishing season for gulf menhaden is from the third Monday in April until 1st November each year, approximately 140 days per year.
- ◆ Summary list of statutory management controls for gulf menhaden – closed areas; seasonal bans; by-catch limits; vessel registration.
- ◆ Mesh size regulations are in place (7/8" bar, 1.75" stretch mesh, knitted and knotted twine), which are designed to minimise the harvest of juvenile age-0 menhaden.
- ◆ Regulatory oversight – the gulf menhaden fishery is closely monitored and controlled at both the Federal and State level. The NMFS and its predecessor have monitored the gulf menhaden fishery since 1964, collecting information on: daily landings, nominal fishing effort, size and age compositions of the catch and tagging (mark and recapture) is also used to monitor stock health.
- ◆ A Government sampling programme is in place at all landing sites as input to its assessment modelling. Additionally, the NMFS conducts an annual review of the stock and fishery status to ensure a consistent approach to the evaluation of existing menhaden management measures.

- ◆ At the State level all fisheries agencies take regular trawl samples to assist with population assessments of menhaden. The menhaden industry itself has kept records of every set made since 1979, and provides this data directly to the NMFS.
- ◆ Stock rebuilding programs – in the event that the gulf menhaden stocks become overfished or depleted, the State/Federal Fisheries Gulf Menhaden Advisory Committee of the Gulf States Marine Fisheries Commission will recommend measures to rebuild the stock in a time frame not to exceed 10 years.
- ◆ Voluntary codes – fishing takes place only during daylight hours from Monday to Friday throughout the statutory fishing season.

**For more about Gulf menhaden see:**

<http://www.iffonet/intranet/content/archivos/63.pdf>

## FISHMEAL FACTS AND FIGURES

### Fishmeal production

<b>UK fishmeal summary 2009 (tonnes)</b>		<b>Fishmeal imports into the UK 2010 (tonnes)</b>		<b>World fishmeal production 2009 (tonnes)</b>	
UK consumption	130,400	Peru	33,600	Peru	1,347,100
Imports from EU	46,500	Denmark	29,700	Chile	641,000
Imports from non-EU	63,200	Germany (Peru)	14,900	Thailand	381,000
UK production	37,000	Ireland	10,900	USA	249,000
		Norway	3,600	Japan	192,000
		Iceland	2,800	Denmark	181,000
		Morocco	1,600	China	160,000
		Chile	300	Norway	129,000
		Others	3,400	Mexico	116,000
				Iceland	103,000
				Morocco	100,000

### UK fishmeal summary 2010 (tonnes)

UK consumption	135,400
Imports from EU	55,500
Imports non-EU	41,900
UK production	38,000

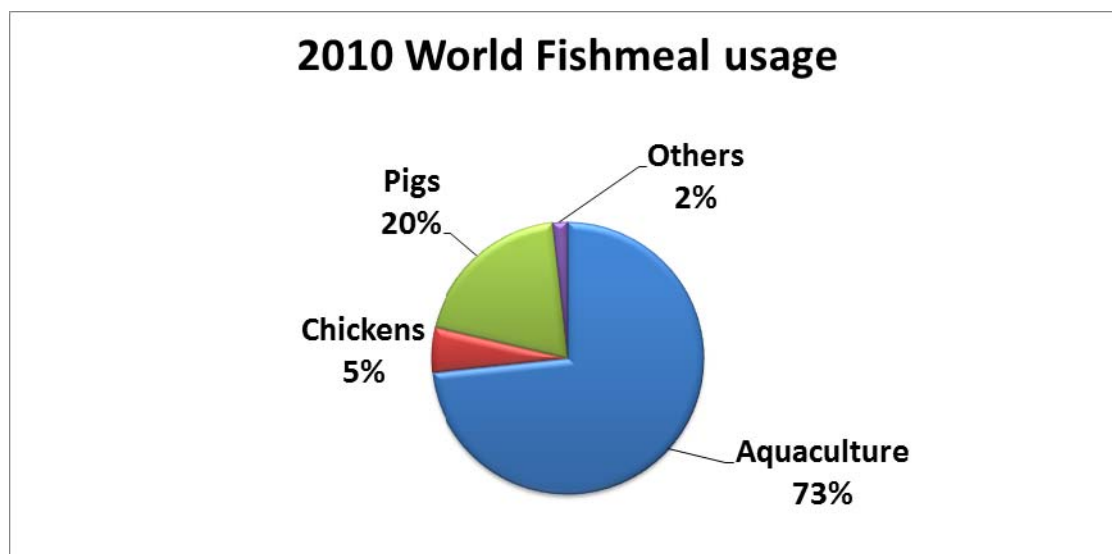
### Fishmeal in the UK

- ◆ UK fishmeal consumption in 2010 was 135,400 tonnes – above the 2007, 2008 and 2009s figure, although significantly down on the period 2002 – 2006. Of the 2010 consumption 97,400 tonnes were imported and 38,000 tonnes produced in the UK, the latter mainly from food fish trimmings.
- ◆ 38% of the fishmeal consumed in the UK is manufactured from trimmings (supplier figures - 2008).
- ◆ The main suppliers to the UK in 2010 were Peru, Denmark, Germany, Ireland, Norway and Iceland (in order).
- ◆ There is no recent estimate of usage by sector in the UK – fish, pigs, poultry etc, but see estimate for the world below.

### Fishmeal in the EU

- ◆ EU fishmeal production in 2009 was about 276,000 tonnes.
- ◆ In the EU about 33% of fishmeal is produced from trimmings from the food fish processing sector (2008 trade estimate).
- ◆ There is no known recent estimate of use by sector – fish, pigs, poultry etc, but see below for global figure.

## Fishmeal world-wide



- ◆ World annual fishmeal production has been about 5 to 6 million tonnes for many years. It has just dropped below 5 million tonnes in 2008 and 2009.
- ◆ In order of output the main fishmeal producing countries in 2009 were Peru, Chile, Thailand, USA, Japan, Denmark, China, Norway and Mexico.

### Fishmeal production by top 16 countries 1998 to 2009

(ranked according to 2009 figures)

'000 tonnes	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Peru	815	1904	2309	1844	1941	1251	1983	2,019	1,378	1,407	1,396	1,347
Chile	642	957	842	699	839	664	933	794	759	770	673	641
Thailand	410	398	387	381	387	397	403	410	461	428	468	381
USA	294	355	335	342	337	318	353	268	232	251	212	249
Japan	379	409	387	227	225	230	295	230	219	200	202	192
Denmark	324	311	318	299	311	246	259	213	209	166	161	181
China	693	707	806	723	460	420	400	305	297	204	141	160
Norway	301	241	264	216	241	212	215	154	169	172	135	129
Mexico	45	48	65	61	65	65	55	55	80	73	105	116
Iceland	220	234	272	286	304	279	204	188	144	152	140	103
Morocco	55	59	53	55	61	64	63	66	28	60	78	100
Ecuador								87	91	88	100	98
Russian Fed	163	155	126	98	95	68	70	60	65	66	71	77
S Africa	94	84	109	111	93	113	114	108	73	88	83	71
Pakistan						46	47	48	51	56	56	62
UK (23)	52	53	50	47	48	52	51	53	44	44	42	37

Source – IFFO Fishmeal and Fish Oil Statistical Yearbook 2010. Figures rounded up or down.  
Only new 2009 figures added – no revisions have been made to previous years' figures.

**See: Annual fishmeal and fish oil facts and figures October 2011**

[http://www.seafish.org/media/publications/SeafishFishmealandFishOilFactsandFigures\\_201110.pdf](http://www.seafish.org/media/publications/SeafishFishmealandFishOilFactsandFigures_201110.pdf)

## TACS FOR 2012 - IMPLEMENTING LEGISLATION

- 17/01/12 Council Regulation (EU) No 43/2012 of 17 January 2012 fixing for 2012 the fishing opportunities available to EU vessels for certain fish stocks and groups of fish stocks which are not subject to international negotiations or agreements.** <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:025:0001:0054:EN:PDF>
- 17/01/12 Council Regulation (EU) No 44/2012 of 17 January 2012 fixing for 2012 the fishing opportunities available in EU waters and, to EU vessels, in certain non- EU waters for certain fish stocks and groups of fish stocks which are subject to international negotiations or agreements.** <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:025:0055:0147:EN:PDF>
- 30/11/10 COUNCIL REGULATION (EU) No 1256/2011 of 30 November 2011 fixing for 2012 the fishing opportunities for certain fish stocks and groups of fish stocks applicable in the Baltic Sea and amending Regulation (EU) No 1124/2010.** <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:320:0003:0011:EN:PDF>
- Nov 2011 NEAFC agreement on blue whiting and herring.**  
Norwegian spring spawning (Atlanto-Scandian) herring - Overall TAC reduced from 988,000 tonnes to 833,000 t in accordance with the agreed management plan (30% reduction). Blue whiting overall TAC increased from 37,000 tonnes in accordance with the agreed management plan (reported as 40,100 tonnes elsewhere) to 359,881 (reported as 391,000 tonnes).  
<http://worldfishingtoday.com/news/default.asp?nyId=7421>  
[http://www.neafc.org/system/files/Rec\\_1\\_blue\\_whiting\\_recommendation\\_for\\_2012.pdf](http://www.neafc.org/system/files/Rec_1_blue_whiting_recommendation_for_2012.pdf)  
[http://www.neafc.org/system/files/Rec\\_3\\_recommendation\\_herring.pdf](http://www.neafc.org/system/files/Rec_3_recommendation_herring.pdf)  
[http://www.neafc.org/system/files/neafc\\_annual\\_meeting\\_press\\_release.pdf](http://www.neafc.org/system/files/neafc_annual_meeting_press_release.pdf)
- 18/10/11 Agreement in the Joint Norwegian–Russian Fisheries Commission on quotas for 2012.**  
<http://www.regjeringen.no/mobil/en/dep/fkd/Press-Centre/Press-releases/2011/2012-norwegian-russian-fishery-pact-agre.html?id=660700>
- Oct 2011 English summary of the State of Marine Stocks in Icelandic waters 2010/2011 – Prospects for the Quota Year 2011/2012.**  
<http://www.hafro.is/Astand/2011/35-engl-sum.PDF>  
<http://en.fiskistofa.is/heildastodur.php>



## RECENTLY PUBLISHED REPORTS

**1. UN FAO State of World Fisheries and Aquaculture 2010 (SOFIA). Issued every two years. 218 pages. Published January 2011.**

**Key themes (taken verbatim from SOFIA report – with equivalent figures from 2008 report in red):**

### **Aquaculture and the demand for fishmeal**

FAO conclusion: Aquaculture continues to be the fastest-growing animal food producing sector and to outpace population growth, with per capita supply from aquaculture increasing from 0.7 kg in 1970 to 7.8 kg in 2008, an average annual growth rate of 6.6%....It is set to overtake capture fisheries as a source of food fish....Growth rates for aquaculture production are slowing... With capture fisheries production stagnating, major increases in fish food production are forecast to come from aquaculture. Taking into account the population forecast, an additional 27 million tonnes of production will be needed to maintain the present level of per capita consumption in 2030.

- Capture fisheries and aquaculture supplied the world with about **142 (143.6)** million tonnes of fish in 2008. (**89.5 (92)** mt capture fisheries, **52.5 (51.7)** mt aquaculture).
- Of this **115 mt** was used as human food, providing an estimated apparent per capita supply of about 17 kg, which is an all time high. In 2009, as a consequence of uncertain economic conditions, demand remained rather sluggish and per capita consumption is expected to have remained stable.
- Aquaculture accounted for 46% of total food fish supply, a slightly lower proportion that reported in 2008 owing to a major downward revision of aquaculture and capture fishery production statistics by China.
- Globally fish provides more than **1.5 (1.5)** billion people with almost **20% (20%)** of their average per capita intake of animal protein. Overall fish provided more than **3.0 (2.9)** billion people with at least **15% (15%)** of their per capita animal protein intake.
- In 2008, **115 mt or 81% (110 mt or 77%)** of world fish production was used for direct human consumption, while the rest **27 mt (33 mt or 23%)** was used for non-food products, such as fishmeal and fish oil (**20.8 mt**), culture, bait, and pharmaceutical uses, as well as for direct feeding in aquaculture and for fur animals (**6.4mt**).
- World total (marine and inland) capture production for the period 2006-2008 was very steady at about **89.8 mt (92 mt)**.

### **Status of marine fisheries**

FAO conclusion: The apparently increasing trend in the percentage of overexploited, depleted and recovering stocks and the decreasing trend in underexploited and moderately exploited stocks give cause for concern..... strengthens the likelihood that the production of wild capture fisheries will not be able to increase unless effective management plans are put in place to rebuild overfished stocks.

### Messages/facts

- The proportion of marine fish stocks estimated to be underexploited or moderately exploited stocks declined from 40% in the mid-1970s to **15% (20%)** in 2008, whereas the proportion of overexploited, depleted or recovering stocks appears increased from **10%** in 1974 to **32%** in 2008. The proportion of fully exploited stocks has remained relatively stable at about **50%** since the 1970's.
- In 2008 about **15% (20%)** of the stocks monitored were underexploited (**3%** **(2%)**) or moderately exploited (**12%** **(18%)**) and able to produce more than their current catches. This is the lowest percentage recorded since the mid-1970's.
- In 2008 slightly more than half the stocks (**53%** **(52%)**) were estimated to be fully exploited and, therefore their current catches are at or close to their maximum sustainable productions, with no room for further expansion. The remaining **32%** (**28%**) were estimated to be either overexploited (**28%** **(19%)**), depleted (**3%** **(8%)**) or recovering from depletion (**1%** **(1%)**) and, thus, yielding less than their maximum potential production owing to excess fishing pressure, with a need for rebuilding plans. This combined percentage is the highest in the time series. While the degree of uncertainty about these estimates may be great, the apparently increasing trend in the percentage of overexploited, depleted and recovering stocks and the decreasing trend in underexploited and moderately stocks give cause for concern.
- Most of the stocks of the top ten species, which account in total for about 30% of the world marine capture fisheries production in terms of quantity, are fully exploited. The two main stocks of anchoveta (*Engraulis ringens*) in the Southeast Pacific and those of Alaska pollock (*Theragra chalcogramma*) in the North Pacific and blue whiting (*Micromesistius poutassou*) in the Atlantic are fully exploited. Several Atlantic herring (*Clupea harengus*) stocks are fully exploited, but some are depleted. Japanese anchovy (*Engraulis japonicus*) in the Northwest Pacific and Chilean jack mackerel (*Trachurus murphyi*) in the Southeast Pacific are considered to be fully exploited. Some limited possibilities for expansion may exist for a few stocks of chub mackerel (*Scomber japonicus*), which are moderately exploited in the Eastern Pacific, while the stock in the Northwest Pacific was estimated to be recovering.
- It should be noted that the declining global catch in the last few years, together with the increased percentage of overexploited, depleted or recovering stocks and the decreased proportion of underexploited and moderately exploited species around the world, strengthens the likelihood that the production of wild capture fisheries will not be able to increase unless effective management plans are put in place to rebuild overfished stocks. The situation seems more critical for some highly migratory, straddling and other fishery resources that are exploited solely or partially in the high seas.
- In the Northeast Atlantic, the blue whiting stock has recovered since the 1990s with current catches of about 1 mt per year, although a managed decline in the short term is probable owing to recent low recruitment. ....The largest stocks of sandeel and capelin remain overexploited..... Harvest control rules based on a more consistent maximum sustainable yield policy have been, or are being, developed for many stocks, including blue whiting and the larger herring

stocks.... Some sandeel and capelin stocks have become depleted, while fishing for shrimp seems to have ceased in some areas.

### **Fishmeal**

Small pelagics, in particular anchoveta, are the main groups of species used for reduction, and the production of fishmeal and fish oil is strictly linked to the catches of these species. The El Niño phenomenon has considerable effects on catches of anchoveta, which has experienced a series of peaks and drastic drops in the last few decades. Fishmeal production peaked in 1994 at 30.2 million tonnes (live weight equivalent) and has followed a fluctuating trend since then. In the last three years, it has experienced minimum variations (20.8 million tonnes in 2008) as catches of anchoveta have been rather stable.

<http://www.fao.org/docrep/013/i1820e/i1820e00.htm>

### **FAO Report: Use of wild fish as feed in aquaculture. June 2011.**

The FAO Fisheries and Aquaculture Department has just published new Technical Guidelines for Responsible Fisheries on aquaculture development. The document focuses on the use of wild fish as feed in aquaculture with an aim to contributing towards the development of aquaculture and the sustainable utilization of feed-fish stocks. The guidelines cover a number of issues relevant to the use of wild fish in feeds in aquaculture, including ecosystem and environmental impacts, ethical considerations on the responsible use of fish as feed, aquaculture technology and development, and statistics and information needs for managing the development of aquaculture. Specific matters relating to the management of fishery resources that may be used as feeds are also briefly considered. <http://www.fao.org/docrep/014/i1917e/i1917e00.pdf>

### **Blue Frontiers report - Managing The Environmental Costs Of Aquaculture. Sustainably-farmed seafood holds key to future global food security. 14 June 2011.**

A new and comprehensive analysis released by WorldFish Center and Conservation International has investigated the environmental impact of the world's major aquaculture production systems and species, and today offers a first-ever global assessment of trends and impacts of cultivated seafood. It states the environmental impact of aquaculture varies dramatically by country, region, production system and species and that aquaculture production is more efficient and better for the environment than other forms of animal protein production such as livestock.

[http://www.conservation.org/publications/Pages/blue\\_frontiers\\_aquaculture.aspx](http://www.conservation.org/publications/Pages/blue_frontiers_aquaculture.aspx)

### **Report: Is the Aquaculture Industry Caught In a Fishmeal Trap? Norwegian School of Economics and Business Administration. August 2011.**

The growth of the aquaculture sector will in the short-term be influenced by the availability of fishmeal, but it is not likely that the industry will be locked in a fishmeal trap in the long-run.

It is likely that there will be a downward trend in the fishmeal inclusion level over time, but as aquaculture production grows at a rapid rate the demand for fishmeal is not expected to decrease. The statistical analysis points out that soybean meal is not a perfect substitute for fishmeal, and this implies that it will continue to be a strained fishmeal supply/demand balance in the short term. Long-term it does however seem that research initiatives will come up with solutions that enables production with minimal inclusions of fishmeal, thus allowing increased aquaculture production of carnivorous fish. However, if commercially viable solutions from research programs are delayed, then aquaculture production of carnivorous fish could be restrained for some time. One way to increase aquaculture production irrespective of research progress could be to cultivate more non-carnivorous fish species. Carnivorous fish production in 2007 made up about 31% of total aquaculture production and the remaining 69% was non-carnivorous fish, where carp and molluscs (e.g. squid) are the most important non-carnivorous species. Aquaculture production could therefore be increased by focusing the growth on non-carnivorous species. However, market forces and governmental policies in many countries favour rapid expansion of carnivorous species such as salmon and shrimp (Naylor et al. 2000).

[http://www.globefish.org/upl/Publications/Nordahl%20-%20Is%20the%20Aquaculture%20Industry%20Caught%20In%20a%20Fishmeal%20Trap%20\(internet\)\[1\].pdf](http://www.globefish.org/upl/Publications/Nordahl%20-%20Is%20the%20Aquaculture%20Industry%20Caught%20In%20a%20Fishmeal%20Trap%20(internet)[1].pdf)

#### **FAO Report: World Aquaculture 2010. 9 September 2011.**

Aquaculture is the world's fastest-growing source of animal protein and currently provides nearly half of all fish consumed globally, according to a new FAO report (previously review was 2006). The report found that global production of fish from aquaculture grew more than 60 percent between 2000 and 2008, from 32.4 million tonnes to 52.5 million tonnes. It also forecasts that by 2012 more than 50 percent of the world's food fish consumption will come from aquaculture.

#### **Feed**

It was estimated that in 2008 about 31.5 million tonnes or 46.1% of global aquaculture production (including aquatic plants) was dependent on the direct use of feed, either as farm-made or home-made formulated aquafeed or industrially manufactured compound aquafeed. In terms of quantity, the major consumers of aquafeed are herbivorous and omnivorous fish. In 2008, an estimated 28.8 million tonnes of compound aquafeed were produced, of which about 31% was consumed by carps. On the other hand, while carnivorous fish and shrimps consume relatively less feed, they cannot thrive without fish or other marine proteins as a major component of their diet.

There are four feed-related issues that the aquaculture industry needs to address. They are:

- Reducing dependence on fishmeal and fish oil;
- Ensuring national quality standards for raw materials, feed additives and feeds;

- Facilitating safe and appropriate use of aquafeeds produced by small-scale manufacturers;
- Building the capacity of small-scale farmers to make more effective farm-made feeds.

## **Fishmeal and fish oil: trends in use and prices**

### **Key issues**

- Fishmeal and fish oil are preferred components in the feed of many land-farm animals, including swine, poultry and dairy cattle. In 2002, aquaculture used 45% of the total global annual fishmeal production, and by 2006 its share increased to 57%.
- This growth was the result of a reduction in the share of fishmeal used for land-farm animals, rather than an increase in the pelagic fish catch that is used for fishmeal. In particular, poultry's share registered a sharp decline from 22% to 14% over the four-year period. In the case of fish oil, aquaculture's share was about 87% of the total global annual production in 2006, with the remaining 13% used for a variety of purposes, including direct human consumption and land-farm animal feed.
- It has been estimated that, by 2012, 60% of world fishmeal production and 88% of world fish oil production will be used by aquaculture. Moreover, for the last few years, the amount of fishmeal and fish oil has remained static, while output from aquaculture has continued to increase.
- Among the ongoing research activities, Researching Alternatives to Fish Oils in Aquaculture, coordinated by the University of Stirling, the United Kingdom, and Perspectives of Plant Protein Use in Aquaculture, coordinated by the Institut National de la Recherche Agronomique, France, focus on targeted reduction of dependence on fishmeal and fish oil. As an example, salmon's current inclusion of fishmeal of between 35 and 47% is expected to be reduced to 12–16%. Moreover, as a positive impact of research, the FCRs of salmon and trout are about 1.3 and are likely to remain at this level over the next few years, while FCRs of other fish and crustaceans are expected to be reduced over the next ten years. Among others, FCRs for selected species are: carps: 1.8–1.6, catfish: 1.5–1.3, milkfish: 2.0–1.6, and shrimps: 1.6–1.4.
- The use of trash/low-value fish in aquaculture is another important issue that is being considered by policy-makers. It is estimated that some 5–6 million tonnes of trash/low value fish are used as direct feed in aquaculture worldwide particularly for marine carnivorous fish species (e.g. in China, Indonesia, Thailand and Viet Nam), marine crustaceans (lobsters and crabs) and certain freshwater fish species. To address the issue, successful farm trials in four countries (China, Indonesia, Thailand and Viet Nam) under an ongoing FAO-supported Technical Cooperation Programme have demonstrated the technical and economic feasibility of using pellet feeds to displace direct use of trash/low-value fish in marine finfish culture. <http://www.fao.org/news/story/en/item/94232/icode/>



**FAO Report: Regional Reviews of Aquaculture Development, Status and Trends.** These cover: North America, Latin America and the Caribbean, Sub-Saharan Africa, North East and North Africa, Asia Pacific and **Europe. 9 September 2011.**

- European shellfish culture is reliant on natural productivity and pond-based finfish aquaculture, mainly in Central and Eastern Europe, and is based on stimulating natural food production through the addition of inorganic and organic fertilisers. However, the species mix of almonds, sea bass, sea bream and other mainly piscivorous fish in European production has given rise to questions on the sustainability of using fishmeal and fish oil in aquafeeds.
- If the capture of non-food fish does not increase in coming years, then the availability of fishmeal and oils would not allow the projected increase of the world aquaculture production and certainly not in European production with the current species mix. To add to this, certain voices are questioning the use of this resource, arguing that a large part of this resource should be better used for direct human consumption, to maintain the per capita ratio of wild fish in the diet.
- European research focus and industry initiatives over the last decade have resulted in a decrease of 50% or more in the share of fishmeal in fish feeds. While the focus has been on plant protein sources, their market prices have not always provided justification and the EU ban on processed animal proteins in feeds has not facilitated the issue. Similar efforts are under way to reduce the use of the total fish oil use through replacement, but also through phase-feeding practices, using appropriate mixtures of plant oils for certain parts of the growing cycle, then switching to finishing feeds rich in fish oil to raise the levels of long-chain omega-3 polyunsaturated fatty acids to ensure the nutritional value of the fish to consumers. <http://www.fao.org/docrep/014/i2211b/i2211b.pdf>

**For sources of information on issues affecting the fishmeal and fish oil supply chain see:**

- Seafish fishmeal and fish oil information  
<http://www.seafish.org/aquaculture/fishmeal-and-fish-oil>
- Fishmeal and fish oil facts and figures  
[http://www.seafish.org/media/publications/SeafishFishmealandFishOilFactsandFigures\\_201110.pdf](http://www.seafish.org/media/publications/SeafishFishmealandFishOilFactsandFigures_201110.pdf)
- IFFO paper – Fish In – Fish Out (FIFO) Ratios explained  
<http://www.iffo.net/intranet/content/archivos/100.pdf>
- Legislation governing contaminants  
<http://www.seafish.org/processors/legislation/food-safety/contaminants---legislation>

## GLOSSARY

### ORGANISATIONS

**ACFM** – Advisory Committee on Fishery Management, an ICES committee with representatives from each country which decides on official ICES advice.

**CEFAS** - The UK Government's Centre for Environment, Fisheries and Aquaculture Science, based in Lowestoft, provides scientific research and advice in fisheries management and environmental protection.

**EU Fishmeal** – Union of Fishmeal and Fish Oil Manufacturers in the European Community

**FAO** - United Nations' Food and Agriculture Organisation, based in Rome, monitors fishery resources worldwide and provides independent scientific assessments of the status of individual stocks.

**GAFTA** - Grain and Feed Trade Association. The international Association promoting trade in grain, animal feedingstuffs, pulses and rice world-wide.

**ICES** - International Council for the Exploration of the Sea, an independent scientific organisation advising North Sea and North East Atlantic Governments on the status and management of commercial fish stocks. The information collected by ICES is developed into unbiased, non-political advice about the marine ecosystem.

**IFFO** - International Fishmeal and Fish Oil Organisation.

**IFOP** – Institute of Fisheries Research (Chile).

**IMARPE** – Institute of Fisheries Research (Peru).

**MCS** - Marine Conservation Society. A registered charity

**MSC** - Marine Stewardship Council. An independent body set up to establish basic principles for sustainable fishing and provide standards for individual fisheries.

**NEAFC** – North East Atlantic Fisheries Commission.

**RAC** – Regional Advisory Council.

**STECF** - The Scientific, Technical and Economic Committee for Fisheries (STECF) of the EU which advises on marine biology, marine ecology, fisheries science, fishing gear technology and fisheries economics.

## TERMS OF REFERENCE

Adult fish	Fish that have reached sexual maturity
Age group	A group of fish of the same age in years
Benthic	Bottom-living fish
$B_{lim}$	Precautionary biomass
By-catch	Species in the catch that are not the main target of the fishery.
Cpue	catch per unit effort
Catch	The total quantity of the fish taken by the fishery
Demersal	Fish living on or close to the seabed
Discards	Organisms that are returned to the sea after capture
$F_{lim}$	Limit fishing mortality rate
$F_{pa}$	Precautionary fishing mortality rate
Gadoid	Bony round fish with a body form like cod and hake
IBTS	International Bottom Trawl Survey
ISR	In Season Review (usually before setting TAC)
	A fishery that catches fish in bulk for reduction to fishmeal and fish oil – usually targeted at small, short-lived species
In year	ICES prefers to advise on the quota for a particular year until the year begins and checks can be made on the up-to-date status of the stocks.
Juvenile fish	(Immature) fish that have not reached sexual maturity
Landings	Fish that are brought ashore
Larva	Stage of life between hatching from the egg and metamorphosis
Mortality rate	A measure of the rates at which fish in a given stock die during a given time period. Natural mortality defines deaths due to natural causes – fishing mortality deaths caused by fishing
Pelagic	Fish living mostly in mid-water or near the surface and grouped in shoals
Precautionary approach	Implemented in ICES advice on fisheries management in 1998, includes a framework of biological reference points, related to upper exploitation boundaries. Management decisions for sustainable fisheries should restrict the risk that spawning biomass falls below a minimum limit, or that fishing mortality rate becomes too high. A minimum level of spawning stock biomass, or limit biomass ( $B_{lim}$ is defined). Below $B_{lim}$ there is a higher risk that the stock reaches a level where it suffers from severely reduced productivity. A limit to fishing mortality has also been defined. Management should prevent the spawning stock decreasing below $B_{lim}$ and avoid fishing mortality above $F_{lim}$ . Management advice is generally aimed at avoiding the risk that the spawning stock falls below the $B_{pa}$ (precautionary biomass) and fishing mortality increases above $F_{pa}$
Stock	A part of a fish population. Total stock refers to both juveniles and adults, whether in numbers or by weight. Spawning stock biomass refers to the numbers (weights) of individuals which are old enough to reproduce
TAC	Total Allowable Catch - the annual or seasonal quota limit applied to commercial landings of individual fish stocks.

## USEFUL WEB SITES FOR INFORMATION ON FEED FISH STOCKS

<a href="http://www.ices.dk">www.ices.dk</a>	<b>ICES</b> - International Council for the Exploration of the Sea
<a href="http://www.fao.org">www.fao.org</a>	<b>FAO</b> - United Nations' Food and Agriculture Organisation, based in Rome.
<a href="http://www.fishbase.org">www.fishbase.org</a>	A global information system on fishes. Set up initially in collaboration with FAO with support from the EC. Since 2001 supported by consortium of seven research institutions.
<a href="http://www.fishsource.org">www.fishsource.org</a>	FishSource provides information on the status of fish stocks/environmental performance of fisheries.
<a href="http://www.greenfacts.org/fisheries/index.htm">www.greenfacts.org/fisheries/index.htm</a>	<b>Greenfacts</b> has reproduced the 2008 UN FAO publication 'The State of World Fisheries and Aquaculture' in fact sheet format.
<a href="http://www.fisheries.is">www.fisheries.is</a>	Information Centre of the Icelandic Ministry of Fisheries
<a href="http://www.hafro.is">www.hafro.is</a>	Marine Research Institute, Iceland.
<a href="http://www.neafc.org">www.neafc.org</a>	North East Atlantic Fisheries Commission
<a href="http://ec.europa.eu/fisheries">http://ec.europa.eu/fisheries</a>	EU official information site.
<a href="http://www.fin.org.uk">www.fin.org.uk</a>	<b>FIN</b> – Fishmeal Information Network
<a href="http://www.iffco.net">www.iffco.net</a>	<b>IFFO</b> - International Fishmeal and Oil Organisation



Seafish was founded in 1981 by an Act of Parliament and aims to support all sectors of the seafood industry for a sustainable, profitable future. It is the only pan-industry body offering services to all parts of the industry, from the start of the supply chain at catching and aquaculture; through processing, importers, exporters and distributors of seafood right through to restaurants and retailers.

**Contact Seafish at:** [www.seafish.org](http://www.seafish.org)