1. Introduction

Sprat is a clupeid fish found widely in the North East Atlantic area. Sprat is a relatively short-lived species. The stock and the catches consist mostly of 1 and 2 year-olds. Sprat spawns in the upper water layers. Peak spawning takes place in May. Spawning and nursery areas, being near the coast, may be particularly sensitive and vulnerable to anthropogenic influences. The North Sea and the Baltic are the main fishery areas for this species. In the Baltic Sea, the fishery is mainly industrial, for fish meal. The most recent catch data (2009) show landings of c. 407,000 tonnes in the Baltic Sea. The bulk of the catch is taken by Poland (20% in 2009), Sweden (18%), Denmark (15%), Latvia (12%) and Estonia (12%). Smaller catches (6%) are also taken by Germany, Finland, Russia and Lithuania (5%).

2. Reliability of the stock assessment and data

Stock assessment

Stock assessment is carried out using an Extended Survivor Analysis (XSA). The procedures and precise method were determined at a benchmark assessment in 2005. In brief, this method involves a time based weighting on the tuning fleets, a catchability dependent on year class strength at age 1, and independent of age for ages 5 and older. The assessment uses landings and three age structured acoustic survey indices.

Retrospective analyses suggest that the assessment can be quite variable, and can tend to overestimate SSB, and underestimate F. Part of the variance may be due to changes in natural mortality associated with predation by cod (see below) and also to revisions of acoustic data used for tuning. Predictions of SSB for the next year are considered very sensitive to the assumed average year class
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strength. The assumed year classes can constitute up to 20 to 54% of predicted yield for 2010 and 2011 SSB, respectively.

Data

Commercial catch data are considered by WGBFAS (ICES 2010) to be somewhat uncertain due to mixed landings of herring and sprat. However, species misreporting is likely to be lower after 2005 when the prohibition to landed unsorted catch came into force. As the bulk of the catch goes for fish meal, discarding is considered minimal, although there is some evidence of discarding in the directed human consumption fishery.

Survey data are available from three acoustic surveys. The assessment WG has used two surveys in October for many years, these are the Russian/Latvian survey 1994-present (Areas 26-28) and an international survey (1983-present) in areas 24-29. The first survey is used for recruiting fish only. In 2007, the WG started using the May (2001-present) international survey (areas 24-28). The surveys appear to be well suited as indices and show internal consistency.

General conclusions

- Agreed and robust assessment. However vulnerable to variation in recruitment and in natural mortality due to cod predation. Predictions can be sensitive to highly variable recruitment.
- Three reliable and consistent surveys.
- Commercial data are considered reasonably reliable, although there are problems with mixed landings of sprat and herring.

3. State of the stock

The stock (SSB) is currently (2010) estimated at 825,000 tonnes, around the long term average (827,000 tonnes). During the 1990s the average SSB was around 1.2 million tonnes, and during the 1980s it was much lower at around 400,000 tonnes. The all time high SSB was 1.7 million tonnes recorded in 1996. All time low was 222,000 tonnes recorded in 1981. There is currently no agreed biomass reference point for this stock.

Fishing mortality is estimated at 0.54, the second highest value recorded for this stock. This is higher than the agreed candidate reference value of 0.4. This vale
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is taken as the precautionary F reference point Fpa. Fishing mortality has been over Fpa since 2002.

4.  Management and TAC setting

Management for this stock is based on scientific advice from ICES Baltic Fisheries Assessment Working Group (WGBFAS). TACs are agreed in the annual EU-Norway fishery negotiations.

Based on information from ICES TAC levels have been higher than total catches since 1987, except in 2009 where catches were slightly above the agreed TAC. In the 1980s, TACs exceeded catches by large margins, often by over 50%. The actual agreed TACs always considerably exceeded scientific advice until 2001. From then on there has been a good correspondence of TAC and advice, except in most recent years. TACs were actually smaller than advice in 2004, 2005 and 2007. However, in 2009 and 2010, TAC exceeded advice in 37% and 24%, respectively. In 2011 the TAC agreed was reduced by 30% (c. 288 800 tonnes) but was 20% higher than the precautionary TAC.

In 2010, the European Commission initiated a stakeholder consultation regarding a future multiannual management plan for pelagic stocks and its fisheries in the Baltic Sea (EC, 2010).

5.  Effects of the fishery on the marine ecosystem

In terms of fisheries, the Baltic represents a relatively simple ecosystem, with the main components being cod, herring and sprat (Harvey et al., 2003). Cod predate on both herring and sprat. Adult cod takes approximately 38% herring, 30% sprat, with mainly large benthos being the remainder. Juvenile cod take approximately 25% herring and 15% sprat, as well as others large benthos. So sprat is an important food source for cod after herring.

However, cod is one of the main predators on sprat and it has an important role in controlling natural mortality on this species. Recent increases in the cod stock are believed to have increased natural mortality by 20%. On the other hand, sprat feeds on cod eggs where in some areas and periods may be substantial and thus a high sprat stock size may have an impact on cod stocks. Nevertheless, with the recent increase in cod biomass, predation pressure on
sprat increased and coupled with rather high catches resulted in decline of sprat biomass. With likely future increases in cod biomass further decline in sprat stock is expected.

Other top predators in the Baltic are seals (ringed and grey seal). Harvey et al. (2003) estimated that sprat accounts for around 25% of the diet of seals, with cod and herring making up the bulk of the remainder. Similar values (20%) were provided for grey seal by Lundström & Hjerne (2006). Ringed seal are reported to eat mostly herring, with little or no sprat (Stenman & Pöyhönen, 2005). The ICES Marine Mammal Ecology Working Group (WGMME) reported that there were no known diet data for harbour porpoise in the Baltic (ICES, 2006). Given that the: sprat stocks are relatively strong at present, TAC levels are not generally exceeded, the seal populations are low and the secondary role of sprat in their diet compared to herring, it can be concluded that the fishery does not poses a major threat to seal populations.

There are no reports of high bycatch of marine mammals, either seals or porpoises, in the pelagic fisheries in the Baltic. Most bycatch reports for seals in the Baltic are for salmon nets or gillnets. Kuklik & Skóra (2003) reported 62 cases of harbour porpoise bycatches in Poland in the 1990s. Of these only one was in a trawl fishery targeting herring. The remainder were in drift and bottom set nets.

Regarding the interaction between seabirds and sprat in the Baltic, Österblom et al. (2006) found that high sprat biomass can actually lead to reduced fledgling body mass in the common guillemot Uria aalge. This is due to density dependent reductions in condition of sprat at high abundance. There is some information on the effects of the fishery on seabirds: there appears to be links between discarding and offal – not all from sprat fisheries – and gull abundance, especially herring gulls (Garthe & Scherp, 2003).

In summary, in the past the sprat fishery does not appeared to have a major detrimental impact on the wider marine ecosystem, either in terms of sprat as a forage fish or in terms of bycatch issues. Nevertheless, with likely increases in cod biomass a decline in sprat stock is expected which may change the impact of the fishery in the near future.

6. Potential fishery improvements
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- Catch reporting should continue to be improved, particularly the separation between herring and sprat catches.

- Encourage research in developing new reference points that take into account the increase in natural mortality due to a major shift in environmental factors and in food web composition.

- An in-depth analysis of the ecosystem impact of the fishery should be carried out and an application of Ecosystem Based Fisheries Management should be scheduled.

- Finally, a long term management plan for pelagic fisheries in the Baltic Sea should be developed following the EBFM.

7. References


Kuklik, I., and Skóra, K.E. 2003 NAMMCO Scientific Publications: Bycatch as a potential threat for harbour porpoise (Phocoena phocoena L ) in the Polish Baltic Waters NAMMCO Sci.Publ. 4: