



Limitations of the data

Catchability

The *ICES-FishMap* distribution maps are all based on mean numbers caught per hour fishing with the survey trawls and represent patterns of relative abundance, not of absolute abundance. Because the efficiency of the trawl varies between species and even within species, small species and juveniles of the larger species are often sampled inefficiently.

For example, although sandeels (Ammodytidae) are known to be extremely abundant in the North Sea and in recent years have been by far the largest single component of the commercial landings from the North Sea, they are poorly represented in the survey catches. This is because sandeels have very slender bodies and can easily pass through even a small-meshed net.

Another abundant species group that is almost absent from the catches comprises the gobies (Gobiidae). Not only are gobies very small fish, usually less than 10 cm, but they are also usually found in shallow inshore waters, beyond the reach of the vessels used (see below).

Some flatfish species are poorly sampled by the GOV used during the International Bottom Trawl Survey (IBTS), particularly species like sole that usually lie buried in the sediment. For these species it is preferable to base distributions on the data from the Beam Trawl Survey (BTS), albeit that not the entire area is covered in this survey.

The truly pelagic species, such as mackerel *Scomber scombrus* and garfish *Belone belone*, will hardly be caught by beam trawls, and even be inefficiently sampled in a bottom-trawl like the GOV-trawl. Such species usually occur too far from the seabed to be caught by a bottom trawl and they swim so fast that they usually avoid capture. Species associated with hard substrate such as outcrops and wrecks will also be missed.

Fishing positions

Reference should be made as well to the fishing positions. Not all parts of the North Sea are adequately sampled during the IBTS and BTS surveys. The design of both surveys permits stations to be chosen at random within a rectangle.

In practice, however, rough or muddy grounds are usually avoided to minimize damage to the fishing gear. When most of a rectangle consists of rough ground, a heavier gear, equipped with bobbins, may have been used in the IBTS (see also the text on “Research vessel surveys”).

Avoiding particular substrata and/or modifying the rigging of the net, especially the groundrope in the IBTS, undoubtedly influences the catches. It should also be borne in mind that, in addition to the general avoidance of 'difficult' fishing grounds, no hauls are made in the very shallow coastal areas.

In consequence inshore species are sampled incompletely, or not at all. Also, no hauls are made in the deeper parts of the Skagerrak and the Norwegian Deep. For information on the fish fauna of the Norwegian Deep, the reader is referred to [1].



Limitations of the data

Day/night effects

Another factor that may influence the catches is the fact that the majority of the hauls is made during the hours of daylight. Although it is well known that the time of day may affect the catch rates of a number of species [2,3,4], no attempt was made to apply correction factors.

Species identification

During the IBTS and BTS surveys we try to identify all fish species. Certain fish, however, are difficult to identify to the species level, and the original data will certainly include a number of incomplete or incorrect identifications [5]. This will most likely not have influenced the identification of most of the 15 species we currently present in *ICES-FishMap*. But there may have been incorrect identifications of the rays. Some of the thornback rays (*Raja clavata*) reported in our surveys, may in reality have been starry rays (*Amblyraja radiata*).

With due recognition of these limitations, we believe that the data presented in *ICES-FishMap* will lead to a better understanding of those species that are associated with 'trawlable' grounds in the North Sea. In the case of the 15 species dealt with in this first phase of *ICES-FishMap*, we think that our survey data provide a reasonably accurate representation of the distribution during the time period covered by the surveys.

References

1. Bergstad, O.A. 1990. Ecology of the fishes of the Norwegian Deep: Distribution and species assemblages. *Netherlands Journal of Sea Research* 25(1/2): 237–266.
2. Gulland, J.A. (ed) 1964. Contributions to symposium 1963: On the measurement of abundance of fish stocks. *Rapports et Procès-Verbaux des Réunions du Conseil International pour l'Exploration de la Mer* 155. 223 pp.
3. Ehrich, S., and Groeger, J. 1989. Diurnal variation in catchability of several fish species in the North Sea. *ICES CM 1989/B:35*. 10 pp.
4. Engås, A., and Soldal, A.V. 1992. Diurnal variations in bottom trawl catch rates of cod and haddock and their influence on abundance indices. *ICES Journal of Marine Science* 49: 89–95.
5. Daan, N. 2001. The IBTS database: a plea for quality control. *ICES CM 2001/T:03*.