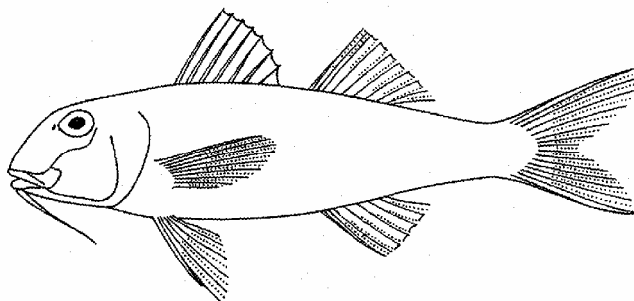


**Striped red mullet*****Mullus surmuletus***
Family MulliadaeMax size: 34 cm
Max age: 10 years

Introduction

Taxonomy: Striped red mullet *Mullus surmuletus* Linnaeus, 1758 (Order: Perciformes; Family: Mullidae) have, like all members of this family, two barbels on their lower jaw, hence their common name: goat fishes. Two species occur in the Northeast Atlantic: striped red mullet *M. surmuletus* and red mullet *M. barbatus*. Although old records of *M. barbatus* exist from the North Sea, and one specimen was reported from the Southern Bight in 2005, *M. surmuletus* is the more common one. Further south, e.g. in the Mediterranean, the two species co-occur.

| common names | | | |
|-----------------|--------------------|-------------------|----------------------|
| <i>Danish</i> | Mulle | <i>Icelandic</i> | Sæskeggur |
| <i>Dutch</i> | Mul | <i>Latvian</i> | Svītrainā jūrasbarbe |
| <i>English</i> | Striped red mullet | <i>Norwegian</i> | Mulle |
| <i>Estonian</i> | Kefaal | <i>Polish</i> | Barwena |
| <i>Faeroese</i> | - | <i>Portuguese</i> | Salmonete |
| <i>Finnish</i> | Keltajuovamullo | <i>Russian</i> | Барабуля |
| <i>French</i> | Rouget, barbet | <i>Spanish</i> | Salmonete |
| <i>German</i> | Meerbarbe | <i>Swedish</i> | Mullus |

General: The striped red mullet is a warm-temperate species reaching its northern distribution limit in the North Sea. They migrate through the Channel into the southern North Sea in spring, and possibly enter the northern North Sea from the northwest in autumn. Catches in recent years have increased, both in the southern and northern North Sea [1], as well as in the Skagerrak/Kattegat. Being a southern species, more is known about its biology in southern waters, especially the Mediterranean, than from the North Sea.

Minimum Landing Size: There is none.

Distribution

Biogeographical information: Striped red mullet occurs along the coast of Europe from the North Sea to Gibraltar, also along the northern part of West Africa to Dakar, in the Mediterranean and Black Seas [2]. Considered a Lusitanian species.



Striped red mullet

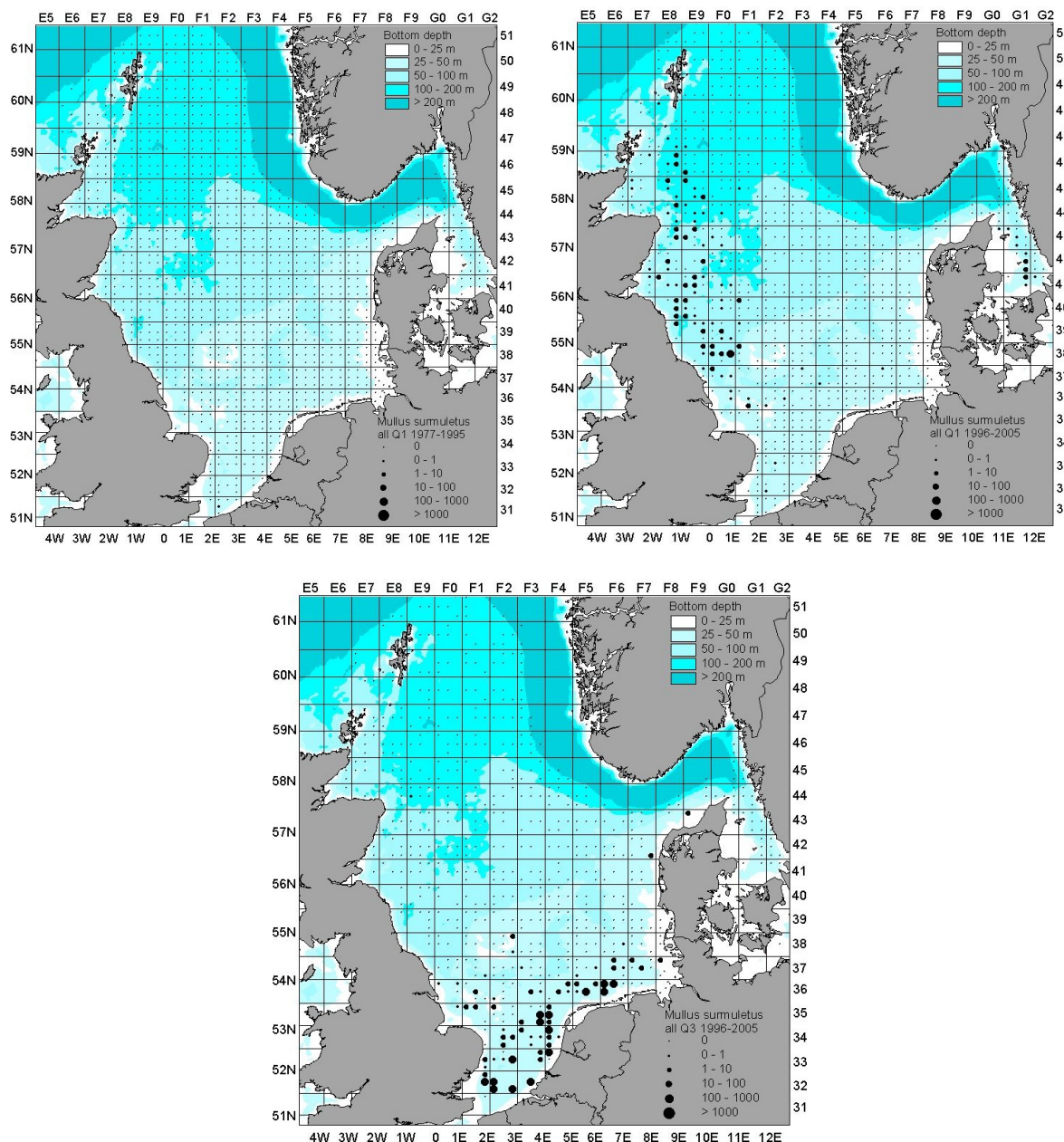
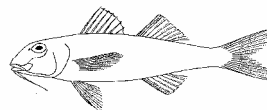
Mullus surmuletus
Family Mullidae

Figure 1. Average annual catch (number per fishing hour for all length classes combined) for *M. surmuletus* in the IBTS survey. Top left: quarter 1, 1977-1995. Top right: quarter 1, 1996-2005. Bottom: quarter 3, 1996-2005.

Spatial distribution in North Sea: There has been a large change in the presence of striped red mullet in the North Sea. Between 1977 and 1996, the species was virtually absent in winter surveys, and specimens were reported only occasionally (Fig. 1). Since the late 1990s, the species has been regularly reported from the western North Sea and in the Kattegat, with a few incidental catches in the Southern and German Bights during the winter (Fig. 1). Furthermore, there is a big difference between the summer and winter distribution. During summer very few fish have been recorded from the northwestern North Sea, whilst they are regularly observed in the southern North Sea (Fig. 1). Although IBTS data highlight the recent increase in the abundance and distribution, this species has also been a regular summer visitor in the southern North Sea in the earlier years.



Striped red mullet

Mullus surmuletus
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Habitat characteristics: In the western Mediterranean, striped red mullets occur mainly in relatively shallow waters, between 10 and 50 m, particularly on rough bottoms. The red mullet inhabits deeper waters (from 50 to 200 m), and is found on muddy bottoms [3]. In the Channel and North Sea, *M. surmuletus* is found in depths of 3 – 90 m on sandy or muddy bottoms but also at times on rocky ground [4].

In the eastern Mediterranean, size increases with depth, with smaller individuals occurring in shallower and warmer water [5,6].

Life history

Growth rates, length-weight relationship, longevity: In the North Sea, striped red mullet may grow to 40 cm in length and weigh up to 1 kg [4]. Females grow larger than males [4,7]. In the Mediterranean males grow to a length of 23 cm, whereas females reach a maximum length of 34 cm [7].

The relationship [7] between weight (W) and total length (L) is $W = 0.016 * L^{2.91}$

Available von Bertalanffy growth parameters are given in the text table below:

| area | | L_{∞} (cm) | W_{∞} (g) | K (yr ⁻¹) | t0 (yr) | reference |
|---------|----------------|-------------------|------------------|-----------------------|---------|-----------|
| Majorca | males | 23.3 | 137.3 | 0.288 | -3.325 | 7 |
| Majorca | females | 34.5 | 505.8 | 0.137 | -3.821 | 7 |
| Majorca | sexes combined | 29.8 | 310.8 | 0.238 | -2.065 | 7 |
| Majorca | sexes combined | 31.3 | | 0.211 | -2.348 | 8 |

In the Channel and North Sea striped red mullets may live to over ten years [9].

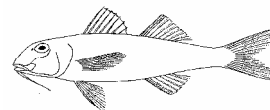
Reproduction: Off Majorca fifty percent maturity in males and females is reached at 15 and 16.8 cm, respectively [8], off the Canary Islands at 16 cm [10]. This is similar to the Channel and North Sea where they are reported to mature after one year [9]. Both eggs and larvae are pelagic [11], as are the early juveniles. These blue-backed and silvery-sided creatures live at the surface of the sea, feeding on larval crustaceans and copepods [9]. At about 5 cm they move towards the coast and take up adult coloration and a benthic existence.

Spawning occurs in May and June off the southern coast of Brittany [12], and from May to July off Plymouth [13]. During extensive egg-surveys in 1989 in the southern North Sea, no eggs of this species were reported [11], but this was before the sharp increase in population abundance. Inshore demersal surveys along the Dutch coast in October yield mullets in the range of 4–14 cm (with a peak around 7 cm), see also Fig. 3. The presence of these 0-groups suggests that in recent years spawning may take place in the southern North Sea.

Migrations: The species enters the southern North Sea in spring and migrates along the continental coast as far north as the Skagerrak and Kattegat. In autumn these fish return to the Channel. It is not completely clear from where the fish found in the northwestern North Sea originate. They might be an overspill of the southern North Sea [1] but they might also have come from the northwest. In 1997, juvenile striped red mullet were observed on the west coast of Scotland [14].



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Food habits: This species uses its long barbels to detect food in soft bottoms in quest of food. These barbels can be folded into a median groove on the throat and carry sensory organs. They may vigorously excavate a pit with their mouth to seize their prey, which consists almost entirely of benthic organisms such as shrimps, amphipods, polychaete worms, molluscs, and benthic fishes [4,9,15].

In the northern part of the Bay of Biscay the diet also consists of benthic invertebrates: crustaceans, annelids and molluscs [15]. In the north-eastern Mediterranean the diet is dominated by amphipods and decapod crustaceans [6,16].

Population structure

Length and age composition: In the North Sea quarter 1 surveys the reported length ranges from 8-34 cm (Fig. 2). The length classes from 8-18 cm, with a peak at 14 cm, dominate the catches. In the Skagerrak/Kattegat the length range is virtually restricted to fishes of 10-18 cm with a peak at 15 cm and larger specimens are rarely caught. The dominating length classes in both areas are likely to represent 1-year-old fish. This is confirmed by a comparison of the length frequency distributions of catches in different quarters with different gears along the Dutch coast (Fig. 3). Smaller O-group fish appear in the catches for the first time in quarter 3, with a peak in the length distribution at 6-7 cm. In quarter 3 the peak has shifted to 9-10 cm, and in quarter 1 to 13 cm.

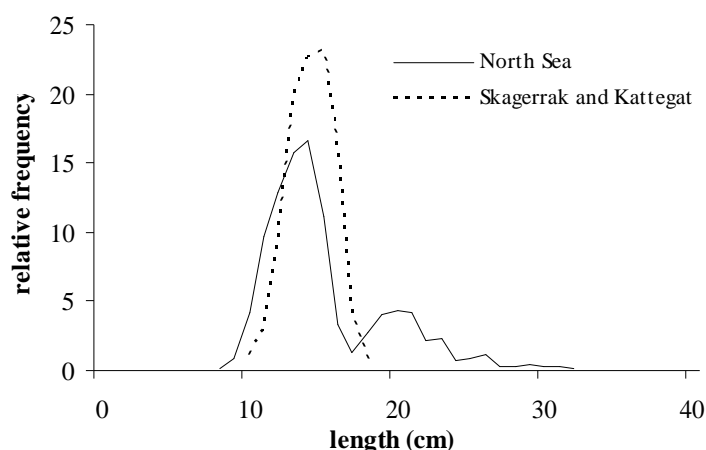


Figure 2: Length frequency distribution (in %) based on quarter 1 IBTS, 1985–2005.

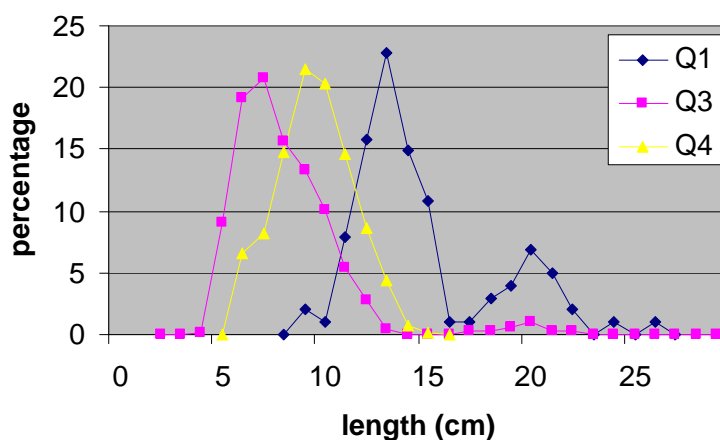
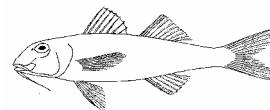


Figure 3. Length frequency distribution (in %) based on Dutch trawl surveys in the southeastern North Sea in different quarters: quarter 1 IBTS only, quarters 3 and 4 different surveys including fine-meshed beam-trawl surveys in more shallow waters.



Striped red mullet

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Off Majorca the length range of the catches (10-32 cm) was very similar to the North Sea and comprised of six age-groups [8]. No age compositions are available for the North Sea.

Sex ratio: Females seem to dominate the catches [7].

Changes in abundance: Since the late 1980s, winter catches in the North Sea have increased rapidly, whereas from the earlier surveys only occasional records are available.

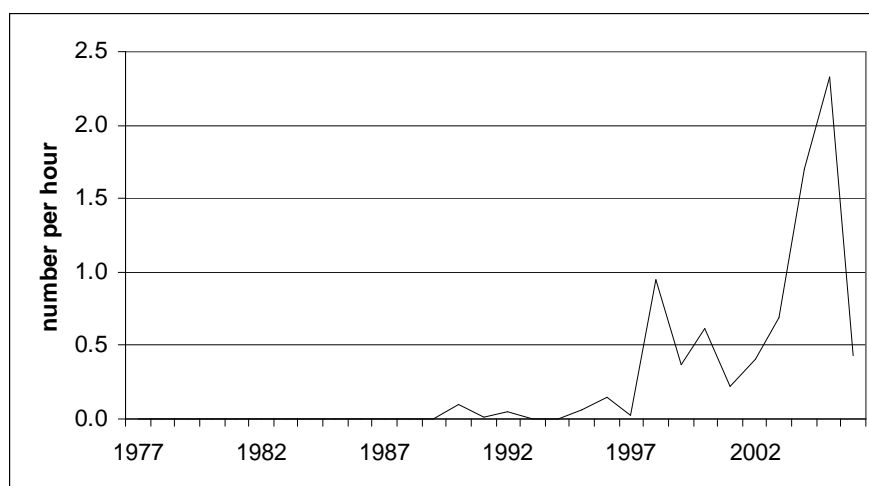


Figure 4. Catch in number per hour during the IBTS in quarter 1 in the North Sea proper (excluding Skagerrak and Kattegat).

Exploitation

Fisheries and landings: Striped red mullets are valuable commercial fishes in the southern Bay of Biscay, Iberian waters and Mediterranean, but until recently they were of minor importance in the North Sea. In the late 1990s a directed fishery developed in the southern North Sea, with landings by the Dutch fleet rapidly increasing from 1 t in 1996 to 352 t in 2004.

Stock status: Unit stocks have not been identified, but the North Sea population is undoubtedly strongly connected to the one in the Eastern Channel. The status is not known, but both survey and commercial catches are increasing, possibly in response to increasing sea temperatures. The species is currently not assessed and is not subject to any specific management measures.

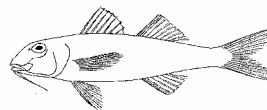
References

1. Beare, D.J., Burns, F., Greig, A., Jones, E.G., Peach, K., Kienzle, M., McKenzie, E., and Reid, D.G., 2004. Long-term increases in prevalence of North Sea fishes having southern biogeographic affinities. *Marine Ecology Progress Series*, 284: 269-278.
2. Hureau, J.-C. 1986. Mullidae. In *Fishes of the North-eastern Atlantic and the Mediterranean*. Vol. II, pp. 877-882. Ed. by P.J.P. Whitehead, M.-L. Bauchot, J.-C. Hureau, J. Nielsen, and E. Tortonese. UNESCO, Paris. pp. 517-1007.
3. Lombarte, A., Recasens, L., Gonzales, M., and de Sola, L.G. 2000. Spatial segregation of two species of Mullidae (*Mullus surmuletus* and *M. barbatus*) in relation to habitat. *Marine Ecology Progress Series*, 206: 239-249.
4. Wheeler, A. 1978. *Key to the fishes of northern Europe*. Frederick Warne, London. 380 pp.
5. Machias, A., Somarakis, S., and Tsimenides, N. 1998. Bathymetric distribution and movements of red mullet *Mullus surmuletus*. *Marine Ecology Progress Series*, 166(0): 247-257.
6. Vassilopoulou, V., Papaconstantinou, C., Christides, G. 2001. Food segregation of sympatric *Mullus barbatus* and *Mullus surmuletus* in the Aegean Sea. *Israel Journal of Zoology*, 47 (3): 201-211.
7. Morales-Nin, B. 1992. Biological parameters of red mullet *Mullus surmuletus* L. 1758 off Majorca (in Spanish). *Boletín Instituto Español de Oceanografía*, 7(2): 139-147.
8. Renones, O., Massuti, E. and Morales Nin, B. 1995. Life history of the red mullet *Mullus surmuletus* from the bottom-trawl fishery off the Island of Majorca (north-west Mediterranean). *Marine Biology*, 123 (3): 411-419.
9. Wheeler, A. 1969. *The fishes of the British Isles and north-west Europe*. Macmillan, London. 613 pp.



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10. Gonzales Pajuelo, J.M. and Lorenzo Nespereira, J.M. 1993. Spawning period and sexual maturity of red mullet, *Mullus surmuletus* (Linnaeus, 1758), off the Canary Islands (in Spanish). Boletín del Instituto Español de Oceanografía, 9 (2): 361-366.
11. Land, M. A. van der 1990. Distribution and mortality of pelagic eggs of by-catch species in the 1989 egg surveys in the southern North Sea. ICES CM 1990/H:19.
12. N Da, K. and Deniel, C. 1993. Sexual cycle and seasonal changes in the ovary of the red mullet, *Mullus surmuletus*, from the southern coast of Brittany. Journal of Fish Biology, 43 (2): 229-244.
13. Russell, F.S. 1976. The eggs and planktonic stages of British marine fishes. Academic Press, London. 524 pp.
14. Gibson, R.N. and Rob, L. 1997. Occurrence of juvenile red mullet (*Mullus surmuletus*) on the west coast of Scotland. Journal of the Marine Biological Association of the United Kingdom, 77 (3): 911-912.
15. N Da, K. 1992. Diet of the red mullet *Mullus surmuletus* (Mullidae) in the northern area of the Bay of Biscay (in French). Cybium, 16 (2): 159-167.
16. Labropoulou, M., Machias, A., Tsimenides, N., and Eleftheriou, A. 1997. Feeding habits and ontogenic diet shift of the striped red mullet, *Mullus surmuletus* Linnaeus, 1758. Fisheries Research, 31(3): 257-267.

