Deep-Sea Research II 56 (2009) 2705–2712

Contents lists available at ScienceDirect

Deep-Sea Research II

journal homepage: www.elsevier.com/locate/dsr2

The benthopelagic fish fauna on the summit of Seine Seamount, NE Atlantic: Composition, population structure and diets

Bernd Christiansen *, Bettina Martin, Stefanie Hirch

Universität Hamburg, Institut für Hydrobiologie und Fischereiwissenschaft, Große Elbstraße 133, D-22767 Hamburg, Germany

ARTICLE INFO

Available online 8 January 2009

Keywords:
Seamounts
Benthopelagic fish
Diet
Population structure
NE Atlantic

ABSTRACT

Benthopelagic fishes were sampled during three cruises to Seine Seamount, NE Atlantic, using bottom trawls and an epibenthic sledge. A total of 16 fish species were caught on the summit plateau of the seamount at 160–180 m depth, belonging to 15 different families. Four species were common to all types of trawls, whereas the other species were found only in part of the catches. Most fish caught were small species and typical for shelf and seamount communities. The most abundant fish was the snipefish, *Macroramphosus* spp., which was important also in terms of biomass. The population structure (size classes and length/weight relationships) of the five most abundant species (*Macroramphosus* spp., *Capros aper*, *Anthias anthias*, *Callanthias ruber* and *Centracanthus cirrus*) shows that usually two or three size classes, probably representing age groups (year classes), were present, and that growth rates were high. A stomach content analysis of these fishes revealed a predominance of pelagic prey, mainly small copepods. No indications for a seamount effect in terms of enhanced biomass or topographic blockage were found.

© 2009 Elsevier Ltd. All rights reserved.

1. Introduction

Seamounts are often regarded as areas of enhanced biodiversity and productivity in the higher trophic levels, as compared to the surrounding ocean. This has, for a few decades, drawn the attention of fishermen who found high abundances of commercially valuable fish species at many seamounts (Koslow, 1997). The reasons for the fish aggregations at seamounts are still not clear. Hypotheses include that seamounts are a "meeting point" of usually dispersed fish stocks, for example to aggregate for spawning, or that an enhanced food supply caused by special current conditions is the basis for locally maintaining large fish stocks. The topographic blockage hypothesis suggests that benthopelagic fish benefit from vertically migrating zooplankton and mikronekton and thus link these compartments of the ecosystem with the higher trophic levels (Isaacs and Schwartzlose, 1965; Genin, 2004).

Although information on commercial fish stocks is available for many seamounts, knowledge about the smaller benthopelagic fish as their potential food basis is still poor. The most comprehensive study in the north Atlantic was made at Great Meteor Seamount, where fishes were sampled on the summit plateau during cruises in 1967 and 1970 and again in 1998 (Ehrich, 1977; H. Fock et al., 2002; H.O. Fock et al., 2002). The fish fauna of this seamount comprised mainly typical shelf species with faunal relationships to the NW African shelf, the European shelf and the Macaronesian islands (Ehrich, 1977).

In the framework of the OASIS project, fishes were collected at Seine Seamount using two approaches: On the one hand, longline sets were employed to collect fish of potentially commercial value (see Menezes et al., 2009). In this study, we used different types of bottom trawls to catch those fish which are not readily sampled by baited longlines.

2. Material and methods

Benthopelagic fishes were sampled on the summit of Seine Seamount, NE Atlantic. This seamount lies ca. 180 km northeast of Madeira. It has a near-circular shape and rises from more than 4000 m to a summit plateau at 160–180 m (Fig. 1). The almost planar summit plateau has an elliptical shape and is about 15 km long and 7 km wide; the area above the 200 m contour is ca. 50 km^2. Seafloor photographs show that it is covered in most places by coarse-grained sediment with only a few organisms and Lebensspuren visible. In some places, flat rocks protrude a few centimeters above the sediments.

Fishes were collected on three cruises to Seine Seamount using different types of trawls. The tow statistics for all trawl hauls are summarized in Table 1. During cruise Meteor 60/1, one haul with an epibenthic sledge was performed on the summit plateau of Seine Seamount at a water depth of 170–180 m. The epibenthic

* Corresponding author. Tel.: +49 42838 6670; fax: +49 42838 6678.
E-mail address: bchristiansen@uni-hamburg.de (B. Christiansen).

0967-0645/$ - see front matter © 2009 Elsevier Ltd. All rights reserved.
doi:10.1016/j.dsr2.2008.12.032

sledge was equipped with a 500 μm suprabenthic net and a 5-mm epibenthic net. Both nets opened only at bottom contact. Tow duration was ca. 30 min. The tow track is shown in Fig. 1. After recovery of the sledge, the lower part of the epibenthic net showed signs of abrasure indicating that the sledge was towed partly over rocky areas; however, the catch was not affected.

During cruise Poseidon 309, an otter trawl was successfully employed on the summit plateau of Seine Seamount. We used a Marinovitch otter trawl with a footrope length of ca. 15 m and an estimated net opening of 8.6 m (Merrett and Marshall, 1981). The mesh size was 44 mm in the front part and 37 mm in the intermediate part and in the codend, with a 13-mm inner liner in the codend. The trawl was towed for ca. 25 min (estimated bottom time) at a speed of 2.5 knots (tow track see Fig. 1). The mudrollers and the footrope were damaged during the haul, also showing that rocky areas are present on the summit plateau. However, since the net was largely undamaged, the effect on the catch appears unlikely.

Finally, on cruise Poseidon 322 we made two hauls each with an otter trawl and a beam trawl, both towed at 2.5–3 knots for ca. 20 min. The otter trawl had a footrope length of about 25 m and a mesh of 30 mm in the codend. The horizontal net opening was estimated as 14 m. The 2-m beam trawl was equipped with a 6-mm mesh net. The tow tracks are shown in Fig. 1.

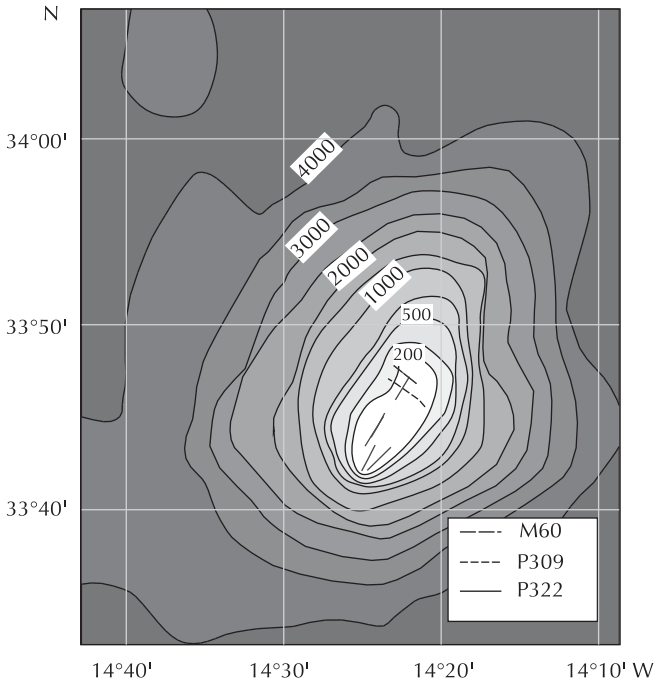

Fig. 1. Bathymetry of Seine Seamount with tracks of trawls.

Epibenthic megafauna and benthopelagic fauna from the epibenthic sledge were separately fixed in buffered formaldehyde. A subsample of specimens or tissue from various taxa was frozen at −80 °C for trophic analyses. In the laboratory, the preserved specimens were weighed, measured and sexed.

The catches from the otter trawls and beam trawls (P309 and P322) were sorted on board, and for each species the total weight was measured. Length measurements were made either on all specimens or, if numbers were too high, on a representative subsample. A few sample specimens were fixed in ethanol for genetic analyses. Tissue samples were frozen at −80 °C for isotopic and lipid analyses. The remainder was fixed in buffered formaldehyde. In the laboratory, the identification of fishes was verified, and the preserved fishes (Meteor 60/1 and Poseidon 309 only) were weighed, measured and sexed individually. Stomachs were taken for diet analyses. The stomach contents of a subsample of the three most abundant species (Poseidon 309 only, 12–24 specimens each) were identified to the lowest taxon possible.

3. Results

3.1. Catch composition and biomass

A total of about 3200 fishes were collected in all six hauls, representing 16 fish species belonging to 15 different families (Table 2). The number of fish caught differed greatly between the hauls, ranging from 16 to about 2200. The most abundant fish in all trawls was the snipefish, *Macroramphosus* sp(p)., making up 37–89% of all specimens. At several NE Atlantic seamounts, two morphological types of this fish were found, *Macroramphosus scolopax* and *Macroramphosus gracilis*, which may represent different species (Ehrich, 1974; Matthiessen, 2001, 2003; Lopes et al., 2006). The distinction of these two types in the Seine Seamount material is not quite clear; according to the position of the spike, most of the fishes belong to the *gracilis* type or an intermediary form. On the other hand, a histogram of the ratios spike length/standard length shows a bimodal shape that may indicate that two distinct types exist (Fig. 2). In the following, we will, for practical reasons, consider *M. scolopax/gracilis* one species, but acknowledging that it may in fact represent two species.

The number of species per haul ranged from 5 to 10; the highest species numbers were collected with the large otter trawl and the epibenthic sledge. Four fish species were common to all trawl types. Two species were found only in both types of otter trawls, one species in both the beam trawl and epibenthic sledge, and one species only in the otter trawl and beam trawl used on P322. The remaining species occurred in only one type of trawl (Table 2).

Table 1
Haul data.

Cruise	M60/1	P309	P322	P322	P322	P322
Gear/haul	EBS	OT45	OT80/1	BT2/1	BT2/2	OT80/2
Date	4.12.2003	31.3.2004	15.5.2005	17.5.2005	18.5.2005	18.5.2005
Start position	33°45.9′N	33°43.2′N	33°42.6′N	33°42.1′N	33°43.4′N	33°44.5′N
	014°21.7′W	014°25.1′W	014°24.7′W	014°24.7′W	014°24.8′W	014°24.0′W
End position	33°46.8′N	33°44.4′N	33°43.5′N	33°43.4′N	33°45.0′N	33°45.2′N
	014°23.2′W	014°24.8′W	014°24.2′W	014°23.2′W	014°23.7′W	014°23.6′W
Depth range	176–193 m	166–172 m	170–174 m	172–173 m	169–170 m	165–168 m
Tow distance (m^{-1})	2850	2270	1680	1940	1390	1420
Width swept (m^{-1})	2	8.6	14	2	2	14
Area swept (ha^{-1})	0.57	1.95	2.35	0.39	0.28	1.99

Download English Version:

https://daneshyari.com/en/article/4537791

Download Persian Version:

https://daneshyari.com/article/4537791

Daneshyari.com