The Nursery Function of Mediterranean Sand Bottoms for Gobiid Fish

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The aim of this study was to demonstrate the importance of sand bottoms in the Mediterranean Sea as nurseries for typical benthic fish like gobies. Two of the chosen habitats were fine sand bottoms which lay in 12 m (C-2) and 15 m depth (C-3) at the Ile Grosse close to the Laboratoire Arago, Banyuls-sur-Mer (France). A coarse sand bottom in Peyrefite near Banyuls lying in a depth of 7 m was included in these studies.

The youngs of the gobies (Teleostei, Gobiidae) Gobius geniporus VAL. and Pomatoschistus bathi MILLER prevailed in these bottoms in summer 1987. Densities of the gobies were measured during SCUBA dives with means of a measuring rope by counting several areas of 0.25 m^2.

Densities of young gobies were changing in habitat C-3 and were c. 20 in regard to G. geniporus and c. 12 to P. bathi m^{-2} (Fig. 1). Even 27 G. geniporus and 31 P. bathi existed in habitat C-2 whereas in Peyrefite only 3 individuals of every species per square-meter were counted (Fig. 1). These results differ from former investigations (ZANDER & HAGEMANN 1990) in the C-2 and Peyrefite habitats and may depend on the respective seasons.

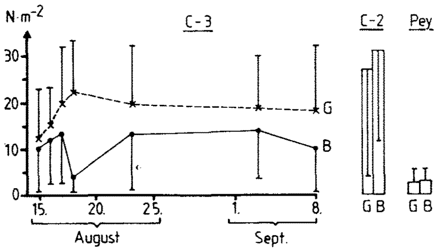

Fig. 1. Density counts (N m^{-2}) of two goby species in three habitats off Banyuls-sur-Mer/France. Vertical lines = standard deviation, B = Pomatoschistus bathi, G = Gobius geniporus.

Samples of fish were fixed in 4 % formalin and were treated for analyses of trophic relationships as was described by ZANDER (1982). The fullness index (the relation of ingested biomass of food to fish biomass) was compared in larger and smaller (less than 25 mm total length) G. geniporus as well as in P. bathi (Fig. 2). These values were similar at two dates in habitat C-3 with very high values of small G. geniporus, whereas the values of gobies from Peyrefite were lower (Fig. 2).

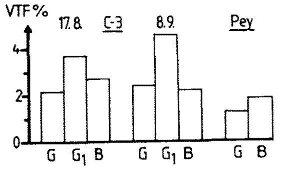

Fig. 2. Fullness index (VTF %) of three goby species or stages, respectively, from two habitats off Banyuls-sur-Mer/France. The C-3 habitat was studied in two dates. B = P. bathi, G = larger G. geniporus, G_1 = smaller G. geniporus (less than 25 mm total length).

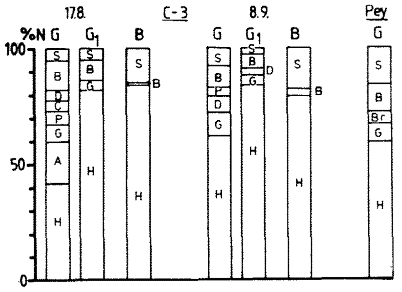

Fig. 3. Food spectra (% abundance) of three goby species or stages, respectively, from two habitats off Banyuls-sur-Mer/France. The C-3 habitat was studied in two dates. Symbols above columns mean B = P. bathi, G = larger G. geniporus, G1 = smaller G. geniporus (less than 25 mm total length). Symbols within columns: A = Anisopoda, B = other benthos, Br = Branchiostoma, C = Corophiidae, D = Decapoda, G = Gammaridae, H = Harpacticoidea, P = Polychaetes, S = Plankton/Suprabenthos.

The abundance of components was used for the analysis of food spectra (Fig. 3). Harpacticoids were the most important food of all gobies and prevailed in smaller G. geniporus and P. bathi. Larger G. geniporus completed their diets with several macrofauna organisms as diverse crustaceans, polychaetes or Branchiostoma (Fig. 3). These results are in accordance with former investigations (ZANDER 1982, ZANDER & BERG 1984, ZANDER & HAGEMANN 1990).

The supply of potentially available food organisms was richest in the C-2 habitat where also the fish biomass was highest (Table), obviously due to high densities (Fig. 1). In contrast, the Peyrefite habitat presented lowest fish biomass though the food supply was higher than in the C-3 habitat (Table). In other seasons and years the fish biomass was found to be lower in the C-2 and Peyrefite habitats (ZANDER & HAGEMANN 1990). Ingestion rates were highest in the September sample of the C-3 habitat, but lowest in Peyrefite (Table).

Table. Ecological data of three sand bottoms off Banyuls-sur-Mer/France.

Habitats		C-3 (Aug.)	C-3 (Sep.)	C-2	Peyrefite
Biomass supply (mg DW m^{-2}) excl. molluscs		565.9	1303.4	2265.3	2183.2
Mean weights (mg DW)	G. geniporus	28.2	36.1		193.8
	P. bathi	8.1	8.3		12.1
Fish biomass (mg DW m^{-2})	G. geniporus	550.6	656.7	761.4	581.4
	P. bathi	105.9	83.1	251.1	37.7
	total	666.5	739.8	1014.5	619.1
Ingestion (mg DW m^{-2}) = VTF x fish biomass					
	G. geniporus	13.6	19.6		7.0
	P. bathi	2.9	1.8		0.7
	total	16.5	21.4		7.7

Therefore, high productivities of sand bottoms provide high densities of young fish. When they are growing up the relation of supplied biomass to fish biomass increases, but predators reduce densities and lesser feeding effectivity cause decreases of fullness indices.

References

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