Occurrence of *Polyprion americanus* under floating objects in western Mediterranean oceanic waters, inference from stomach contents analysis

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Catches of 11 juvenile specimens of *Polyprion americanus* (Osteichthyes: Polyprionidae) are reported under fish aggregation devices (FADs) in waters off Mallorca (western Mediterranean). Sampling was carried out fortnightly by surrounding artificial FADs with a purse seine from April 1995 till February 1997. Juveniles were present from June–August. Specimens were mostly solitary during the period of association to the FADs, with a length interval of 25.8 and 34.2 cm total length. The trophic spectrum was analysed to explain a possible food link with the FAD. The diet of *Polyprion* was mainly based on juvenile fish *Trachurus* and the eunestonic isopod *Idotea metallica* that were associated with the objects providing evidence for a trophic relation to the artificial structures.

Polyprion americanus (Schneider) is a large (>1 m total length) demersal species distributed globally in temperate waters, including both sides of the North and South Atlantic Oceans, the Mediterranean, the western South Pacific, and the southern Indian Ocean. Juvenile wreckfish (<60 cm) are pelagic and tend to be attracted towards floating objects (Roberts, 1977; Sedberry et al., 1999) although only few studies have reported this behaviour in the Mediterranean (Relini et al., 1994; Deudero et al., 1999). The objectives of the study are to provide information on the feeding of pelagic juvenile *P. americanus* and to test the hypothesis of an increased food supply under logs as a possible explanation to the associative link of juvenile wreckfish *P. americanus* with floating structures.

A two-year study was performed on the ichthyofauna associated to fish aggregation devices (FADs). The capture of juvenile fish was conducted with an experimental purse seine net of 110 m length and 14 m in height with a cod-end mesh size of 2-mm (Massutí et al., 1999). Catches were obtained fortnightly under two groups of three FADs and open water control stations (39°21'N 03°24'E over the 200 m isobath and 39°19'N 03°18'E over the 800 m isobath) to test the aggregation behaviour.

In the laboratory, fishes were measured, weighed, and stomach contents removed. Each prey item was identified and weighed. Several indices were applied to describe the trophic spectrum of this teleost (Table 1).

Nine other teleost species were found in the vicinities of the artificial structures although this species represented the only polyprionid observed along the study period. The main species forming the fish fauna of the FADs were the carangids *Seriola dumerili*, *Trachurus picturatus*, *T. mediterraneus*, *T. trachurus* and *Naucratus ductor*, followed by shoals of *Coryphaena hippurus*, and other more solitary species as *Balistes carolinensis* and *Schedophilus ovalis*. Mean density of wreckfish under the coastal objects was 0.09 ± 0.26 ind/FAD and 0.17 ± 0.38 under the offshore structures. Colonization under FADS was observed during the summer period from the beginning of June till the end of August, peaking in July and August (Figure 1). From the first year of sampling, only two individuals were collected on 4 and 22 August 1996. Regarding the second year of study, one exemplar was landed on 11 June, four individuals were

caught on 28 June, two individuals on 30 July, and finally, three exemplars were recorded on 9 August 1996. Specimens were found in association with other fishes simultaneously under the same FAD (*T. picturatus*, *Seriola dumerili*, *N. ductor*, *Schedophilus ovalis*) but not with conspecifics except for one occasion. Total length of all the sampled individuals ranged between 25.8 and 34.2 cm.

The feeding spectrum from the stomach contents of *Polyprion americanus* included teleosts as *Trachurus*, isopods as *Idotea metallica*, cephalopods as *Argonauta argo*, amphipods, zoeas and various items comprising non-organic material as plastics or tar. This species was a predator ingesting mainly teleosts (Index of Relative Importance (IRI%)=64, N%=28, occurrence=7). Isopods were also frequent (IRI%=25, N%=38, occurrence=8) followed by mixed items (IRI%=9) and cephalopods (IRI%=3) (Table 1). Vacuity coefficient and feeding intensity were low (V=9 and Kim=7, respectively) while the trophic diversity was considerable (H=2.14) as well as the niche breadth (B=3.78) (Table 1).

The onset of attraction of juvenile *Polyprion americanus* towards floating objects can be triggered by the appearance and permanence of potential preys. In fact, there is an overlap in the residence time of the three congeneric species of *Trachurus* (*T. picturatus*, *T. mediterraneus* and *T. trachurus*) and *Polyprion*. Deudero et al. (1999) cited schools of *T. picturatus* comprising up to 500 ind/FAD especially during the summer period. The diet of the wreckfishes examined indicates a 64% of consumption of teleosts, essentially *Trachurus* sp., and isopods (*Idotea metallica*) in a 38% providing evidence for the 'increased food supply hypothesis' (Kojima, 1956).

Maximal abundance of *Polyprion* during the summer period (July–August) agrees with previous work from the Ligurian Sea by (Relini et al., 1994). The establishment of a thermic barrier, the thermocline, can be a factor influencing the vertical distribution of the ichthyofauna associated with the floating devices (Klimley & Holloway, 1996; Marsac et al., 1996).

These results indicate that in the Mediterranean *P. americanus* is a species that aggregates under floating structures during juvenile stages at least till it reaches a total length of 34 cm. Other authors have reported a more extended pelagic juvenile stage (Goujon et al., 1993; Roberts, 1977, 1989; Sedberry et al., 1999)

Table 1. Relative importance of the main food categories in the diet of *Polyprion americanus*.

	Stomachs TN 11	Empty stomach (ET) 1	Full stomachs 10	Vacuity coefficient (V) 9.09	Feeding intensity (Kim) 7.10	Feeding diversity (H) 2.14	Prey no. np 71	Mean no. of prey (Np) 7.10	Levins index (B) 3.78
Food categories	Occurrence	F%	No./prey	N%	No./stomach	Weight	W%	IRI	IRI%
AMPHIPODA	1	10	5	7.04	0.5	0.0400	0.060	71.02	0.54
CEPHALOPODA	3	30	6	8.45	0.6	2.5433	3.817	368.05	2.79
DECAPODA	1	10	1	1.41	0.1	0.0021	0.003	14.12	0.11
ISOPODA	8	80	27	38.03	2.7	2.1482	3.224	3300.23	24.98
TELEOSTEI	7	70	20	28.17	2.0	59.7064	89.624	8245.56	62.42
VARIOUS	6	60	12	16.90	1.2	2.1782	3.269	1210.27	9.16
			71					13209.25	

TN, total no. of analysed stomachs; TE, no. of empty stomachs; V, vacuity coefficient (ET/TN·100); Kim, feeding intensity; H, diversity; np, no. of prey in stomachs; Np, mean no. of prey/full stomach; Levins index (B); occurrence, no. times that the prey x appears; F%, occurrence percentage; No./prey, no. of individuals prey x; N%, numeric abundance percentage; No./stomach, no. individuals prey x/full stomachs; weight, weight of all the prey of the food category; P%, weight percentage; IRI, Index of Relative Importance = (N%+W%)F%, IRI%, IRI/∑IRI·100.

Figure 1. Monthly evolution of the percentage of appearance (bars) and length interval of *Polyprion americanus* sampled under floating objects.

with a switch to the demersal habitat at around 60 cm total length (Sedberry et al., 1996). The marked seasonality of permanence under FADs can be related to the life cycle of the species. It seems that this polyprionid takes advantage of the aggregation by predated on shoals of juvenile pelagic fishes and neustonic isopods that live under the objects during a limited period of time. It appears that after some months the individuals become demersal and change the habitat from the epipelagic to the benthic domain as evidenced from landings of the long-line bottom majorcan fisheries (personal observations).

We express our gratitude to our colleagues from the IEO and IMEDEA, Mallorca for assistance and for providing the research facilities. This work has been financed by the Directorate General for Fisheries (Project UE 94/031 and 95/73) and was supported by grants from IMEDEA to S.D.

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Submitted 3 April 2000. Accepted 18 May 2000.