

# Cleaning behaviour in *Diplodus* spp.: chance or choice? A hint for future investigations

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Ectoparasitic crustaceans (Copepoda: Caligidae) occurred at considerable frequency in stomach contents of young specimens of *Diplodus sargus* and *Diplodus puntazzo* (Pisces: Sparidae) from two central Mediterranean coastal lagoons. This finding suggests that the ectoparasites might give a non-negligible contribution to the diet of the studied fish species and reveal a certain adaptive advantage of cleaning behaviour in coastal environments.

Cleaning behaviour in fish basically implies the removal, by usually small-sized fish, of ectoparasites from the body of larger, cooperating individuals. This relationship has been long reported and thoroughly described in coral reef communities, where the highest levels of complexity in trophic interactions among fish are observed (Cote et al., 1998; Grutter, 1999).

Cleaning symbioses in temperate marine waters are scarcely reported; however, extensive cleaning behaviour has been recorded in some north European wrasse species (Family Labridae, genera *Centrolabrus* and *Ctenolabrus*). Such feeding activity has also been exploited in aquaculture to control sea lice (Copepoda: Caligidae) infestations of Atlantic salmon (Sayer, 1996; Tully et al., 1996).

In the Mediterranean, practically no investigations on either interspecific or intraspecific cleaning relationships among fish have been carried out so far.

During 1995 and 1996, an extensive survey of trophic ecology of sea breams (Family Sparidae) was carried out in two central Mediterranean coastal lagoons—Lake Fogliano and Lake Caprolace, about 80 km south-east of Rome, Italy—and trophic niches of seven sparid species were analysed (Massa et al., 1998). In food spectra of white sea bream (*Diplodus sargus* L.) as well as sharpnose sea bream (*Diplodus puntazzo* Cetti, 1777), a considerable occurrence of *Caligus* sp. (Copepoda: Caligidae) was recorded in stomach contents of 0+ aged total length (TL) between 30 and 70 mm specimens belonging to these species (Figure 1). Observed frequency of occurrence (*f*) values proved that such food items represented more than just occasional preys for each species (Table 1).

Cleaning behaviour in sea breams was previously reported only by Rosecchi (1987) in the French lagoons of Prévost and Thau, such habit involving juvenile stages of *Diplodus sargus* feeding on Caligidae. In the Mediterranean, these parasitic Copepoda (see Yamaguti, 1963) are usually found within gills and scales of species belonging to the families Mugilidae and Sparidae, and they may sometimes cause damage to cage-reared gilt-head sea breams (Mariniello et al., 1999).

In the present note, cleaning behaviour in *D. puntazzo* is reported for the first time, while the same habit is mentioned for the second time in *D. sargus*.

Fish scales found in stomach contents together with *Caligus* specimens were morphologically and dimensionally identical to those of the predator. Thus, although no direct observations were performed in the studied environments, it is likely that

young sea breams collect ectoparasites on the epidermis of conspecific, or at least congeneric individuals.

Cleaning behaviour among *Diplodus* spp. individuals is likely to be adaptively advantageous in coastal lagoons. In fact, in these environments, remarkable levels of productivity determine high fish population density; this may sometimes promote



**Figure 1.** Some *Caligus* sp. specimens from stomach contents of *Diplodus sargus*. Scale bar: 2 mm.

**Table 1.** Frequency of occurrence values in *Diplodus sargus* (from Lake Fogliano) and *D. puntazzo* (from Lake Caprolace).

	<i>Diplodus sargus</i> N=35 <i>f</i>	<i>Diplodus puntazzo</i> N=39 <i>f</i>
Hydrozoa	1.8	0
Anthozoa	0	15.4
Nematoda	7.1	0
Polychaeta	33.9	0
Amphipoda	60.7	53.8
Isopoda	35.7	0
Mysidacea	26.8	7.7
<i>Caligus</i> spp.	17.9	23.1
other copepods	19.7	15.4
Ostracoda	7.1	0
Crustacea-larvae	5.4	0
Bryozoa	0	23.1
Urochordata	17.9	61.5
Algae	10.7	15.4

sudden demographic blooms of ectoparasites (Mariniello et al., 1999), which might therefore provide a conspicuous food resource for young schooling fish.

However, no resolute nor definitive assumption can be made on these issues until new surveys are carried out with the specific aim to clarify the value of cleaning behaviour of fish in Mediterranean coastal waters. In fact, this question has never been addressed so far either in sparids, nor in other common coastal species of the Mediterranean. I hope that the present paper, besides pointing out an interesting finding, could provide possible hints towards future studies specifically targeted to this subject.

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