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The parasitic isopod *Anilocra physodes*, as a novel food source for the lizardfish *Synodus saurus* (Synodontidae)

by

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Résumé. – Le parasite isopode, *Anilocra physodes*, nouvelle source de nourriture pour le poisson lézard *Synodus saurus* (Synodontidae).

Au cours de différents travaux menés sur le comportement et la reproduction du poisson lézard de l'Atlantique, *Synodus saurus*, aux Açores (Atlantique NE), des ectoparasites isopodes, *Anilocra physodes*, ont été découverts dans divers contenus stomacaux de ces prédateurs piscivores. Ce résultat intriguant nous a permis de conclure pour la première fois que des espèces de poissons peuvent ingérer leurs propres parasites, ce qui peut être doublement bénéfique pour eux, qui, tout en s'en libérant, disposent d'une nouvelle source de nourriture.

Key words. – Synodontidae - *Synodus saurus* - Cymothoidae - *Anilocra physodes* - Azores - Ectoparasites - Predation.

The isopod *Anilocra physodes* (Linnaeus, 1758) (Cymothoidae) is a blood-feeding ectoparasite, which only needs one host to complete its life cycle (holoxenic life cycle) (Ramdane *et al*., 2007) and is typically attached to a specific site on the body, or inside the branchial or buccal cavities (Trilles and Öktener, 2009). This type of parasitic infection can dramatically affect host behaviour and physiology (Binning *et al*. 2014), infecting diverse fish species, many of which are commercially valuable (Trilles and Öktener, 2009). However, the ecological significance of parasite ingestion has rarely been considered, particularly when consumption does not lead to transmission (Johnson *et al*., 2010). It was thus surprising to find, while undertaking a study on *Synodus saurus* (Linnaeus, 1758), a demersal epibenthic species, which is described as a mobile piscivorous predator (Soares *et al*., 2002; Esposito *et al*., 2009), that this species was ingesting *A. physodes*.

MATERIALS AND METHODS

Between March and December 2000, a sample of 310 specimens of *Synodus saurus* was collected in Terceira Island (Azores) (Fig. 1) and studied for feeding ecology (Soares *et al*., 2002, 2003) and reproduction (Sousa *et al*., 2003). The body surface, inside of the mouth and the stomach contents of the lizardfish were examined for the presence of *Anilocra physodes* and whenever found, these were counted, removed and measured to the nearest mm.

RESULTS

Synodus saurus sizes ranged from 185-345 mm (average size = 265.8 mm; SD = 45.9 mm). *Anilocra physodes* telson length ranged between 2-12 mm (average size = 1.8 mm; SD = 0.26 mm). *A. physodes* occurred in 237 fish (76.5%) under the eyes (81.0%) and inside the mouth (19.0%, Fig. 2). The average number of these ectoparasites per fish was 1.3 (SD = 0.06). In 17 of *S. saurus* stomachs, 27 specimens of *A. physodes* were found and represented the only food item in four of these stomachs (Fig. 3). From these, 85.2% were intact and 14.8% had distinct bite markings. All fish that had ectoparasites in their stomach contents presented mouth scars, indicating a previous parasitized condition and none of them had live parasites either in their mouths or on the remaining body.

DISCUSSION

In the Azores, *Anilocra physodes* parasites are commonly observed attached to a wide range of fishes although the impact

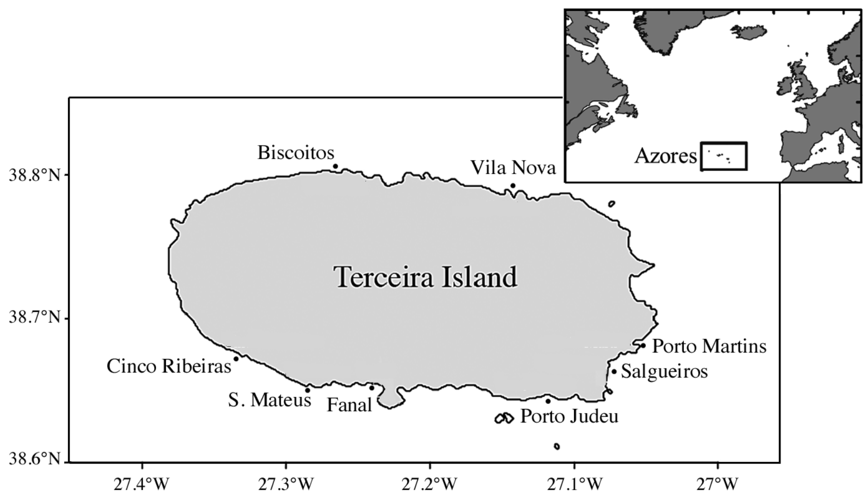

Figure 1. - Terceira Island, Azores Archipelago (NE Atlantic). (•): Sampling locations.

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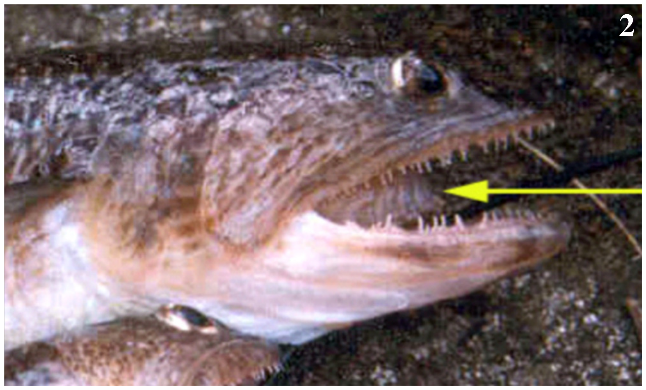

Figure 2. - *Synodus saurus* with an ectoparasite *Anilocra physodes* still attached to its mouth (arrow).

Figure 3. - Several *Anilocra physodes* found inside a single stomach content of *Synodus saurus*.

of this infection source is still unknown. One of the most classic mechanisms used to control ectoparasite infestation in marine environments is to interact with specialized cleaning organisms (fishes or shrimps). These cleaner organisms search for ectoparasites (most commonly gnathiid isopods and caligid copepods) on the body surface, gills and mouth of other fish (Côté, 2000). While some obligatory cleaner fish, such as *Labroides dimidiatus* (Valenciennes, 1839) have been observed removing ectoparasites from lizardfish species (MC Soares, pers. obs.), these mutualistic interactions are not often reported with lizardfish species. Moreover, facultative cleaners such as those reported in Azores (e.g. *Coris julis* Linnaeus, 1758), are even more unlikely to interact with piscivorous fishes due to an increase in predation risk (Francini-Filho and Sazima, 2008). Also, *A. physodes* may become difficult or impossible to ingest, especially when they grow to relatively larger sizes (Bunkley-Williams and Williams, 1998).

If *Synodus saurus* is not engaging cleaning interactions, why would most of the ectoparasites of these fishes be found attached under the eyes and only a minor percentage inside the mouth? One probable reason for parasites to be found less extensively inside the mouth of their hosts compared to the stomachs would be that they are being dislodged by the host fish. In the case of *S. saurus*, the ectoparasite *A. physodes* should be more easily dislodged than for other fish species because of the presence of teeth on its palatine and on its tongue (Russell, 2000). Parasites attached inside the mouth would be especially difficult to cope with and would probably seriously affect the ability of the host to feed properly. In some cases, parasites may become prey through a prey-to-predator transfer when the infected host is eaten by a predator (Johnson *et al.*, 2010). However, we found four stomach contents with *A. physodes* alone and without any traces of other prey. By ingesting these parasites (14.8% had distinct bite markings), the lizardfish *S. saurus* is able to decrease parasite infestation levels, which could contribute to control some parasite-derived diseases (Johnson *et al.*, 2010) while profiting from an additional energetic food source.

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