Mass mortality in wild greater amberjack (Seriola dumerili) infected by Zeuxapta seriolae (Monogenea: Heteraxinidae) in the Jonian Sea

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Abstract
An outbreak of monogenean infection in wild amberjack Seriola dumerili along the coasts of the Jonian Sea (Southern Italy) is described. Gross and histological examination of gills revealed the presence of numerous Zeuxapta seriolae worms per fish (mean number 476.28 ± 85.96). The results of this investigation suggest that massive infections of Z. seriolae may affect the health performance of amberjacks and cause mortality in offshore and inshore breeding systems.

Zeuxapta seriolae (Monogenea: Heteraxinidae) is a common parasite of gills of Seriola spp. with a worldwide distribution (Montero et al., 2004). Outbreaks of disease due to Z. seriolae have been reported in Japan (Ogawa & Fukudome, 1994), Spain (Grau et al., 2003; Montero et al., 2004), New Zealand (Sharp et al., 2003) and Australia (Tubbs et al., 2005). In the Mediterranean Sea a monogenean infection due to Z. seriolae of Seriola dumerili (Risso, 1810) (Perciformes, Carangidae) has been frequently reported in farmed amberjacks (Crespo et al., 1990; 1992; 1994; Giannetto et al., 1998; De Liberato et al., 2000; Grau et al., 2003; Montero et al., 2004). Parasites are transmitted directly between hosts and their high rate of reproduction can lead to rapid increase in numbers (Montero, 2001). Furthermore, the production of eggs by the parasite enhances their infectivity.

Monogenean infection may limit growth of the fish industry in this area and it thus constitutes an emerging economic problem in aquaculture (De Liberato et al., 2000; Grau et al., 2003; Montero et al., 2004). Heavy infections by Z. seriolae lead to anaemia, mucus hypersecretion, damage of respiratory epithelium, gill tissue destruction and, occasionally, lamellar fusion resulting in hypoxia, hyperventilation and loss of equilibrium (Montero, 2001; 2004; Grau et al., 2003). In these conditions metabolism and swimming performance are significantly impaired resulting in the death of infected fish (Grau et al., 2003).

This note reports an outbreak of monogenean infection with high mortality in the Ionian Sea involving wild amberjacks that were naturally infected by Z. seriolae. The related macroscopic and histopathological lesions are also described.

In August 2005, a total of 50 wild S. dumerili were retrieved dead along the coasts of Gallipoli (Gulf of Taranto, Ionian Sea, Italy, latitude 40° 3’ N, longitude 17° 59’ E) and

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collected for necropsy. The amberjacks were apparently healthy at direct physical inspection (i.e. normal colour and weight). Fish length ranged from 25 to 50 cm and weight from 350 to 500 g. Macroscopically, no lesion were present on the skin while the internal organs and muscles were pale. Specifically, the gills were whitish, with mucus hypersecretion and numerous flat worms (Figures 1a, 1b).

At necropsy gill arches were removed and analysed. Samples of gills, spleen and liver were collected from each amberjack and histologically processed. Briefly, samples were dehydrated in ascending grades of ethanol (from 50 to 100%), cleared in xylene and embedded in paraffin using an automatic tissue processor. Five-micrometer sections were cut with a 2030 Biocut microtome (Reichert-Jung, Germany). The sections were

Figure 1. (a) Macroscopy of gill arches and (b) detail of one fluke attached to gills. (c) Light micrography of mature fluke of *Zeuxapta seriolae* and (d) detail of clamps. (e) Eggs with a polar filament. (f) Histological detail of gill tissue damage and lamellar fusion (H & E 40x).
then stained with standard haematoxylin and eosin stain and examined under a light microscope (Leica, DM LB2, Germany).

Additionally, parasites were collected in 0.9% saline solution, fixed and stored in 70% ethanol. Subsequently, some of them were mounted and cleared with Amman’s lactophenol to observe the most relevant morphological features. Parasites were found in all the fish examined [mean abundance ± S.D. = 476.28 ± 85.96 per fish; range: 320-640]. They were attached to the fish gills by their haptor clamps with each clamp grasping one or two lamellae. The length of the flukes ranged from 8.4 to 11.2 mm and their width from 0.5 to 1.4 mm. The parasites were elongated and flat (Figure 1c), the tegument was smooth and transparent so the internal organs could be observed. The anterior edge was truncate with a subapically positioned oral sucker; the posterior edge presented an asymmetrical armed haptor with two rows of clamps, i.e. a longer one with 34-40 clamps and a shorter one with 24-30 (Figure 1d). The unarm ed genital pore was open on the middorsal surface and the inner zone contained eggs with a polar filament. In some flukes the eggs emerged from the genital atrium. Each egg had one polar monofilament (Figure 1e) reaching 1.2 -1.5 mm in length.

The flukes were morphologically identified as Z. seriolae (Rohde, 1984; Giannetto et al., 1998; Montero et al., 2003a; 2003b). No other parasites were found in the gills.

Histological examination showed no evidence of pathological alterations of the spleen or liver. Light microscopy of the gills revealed more than 400 fluke specimens per gill arch (mean abundance = 476.28 ± 85.96) attached to the gill filaments. The parasite clamps caused hyperplasia and hypertrophy of the gill epithelium and led to the destruction of the gill tissue and lamellar fusion (Figure 1f).

The massive presence of Z. seriolae on gills may account for the destruction of gill tissues and the lamellar fusion which caused severe respiratory illnesses and fish death. The results of this investigation suggest that massive infections by Z. seriolae may threaten the health performance of amberjacks. Infections by Zeuxapta spp. are considered to be a major, emerging, economic issue in aquaculture since this parasite cycles in a single host and is transmitted directly between hosts (Montero, 2001). In particular, Z. seriolae infection represents a problem for Seriola spp. breeding in inshore systems because infections may be introduced via wild fish (Montero et al., 2004). Hence, disinfection of fishnets, tank surfaces and pipes in aquaculture facilities is strongly recommended.

However, knowledge of the presence and geographical distribution of Z. seriolae in inshore and offshore breeding systems is instrumental in the control of this infection since many chemicals used to treat infected animals are highly toxic to fish and not approved for use in many countries (Schmahl & Taraschewski, 1987; Thoney & Hargis, 1991; Noga, 1996; de la Gandara et al., 2002; Montero et al., 2004; Sharp et al., 2004).

Further investigations regarding the presence and pathogenicity of Z. seriolae in wild amberjacks are warranted to prevent introduction of the infection into fish breeding systems.

References


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