**Lernanthropus kroyeri** van Beneden, 1851 (Crustacea: Copepoda) infections of cultured sea bass (*Dicentrarchus labrax* L.)

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**Abstract**

Forty sea bass *Dicentrarchus labrax* from a commercial sea-farm in Turkey were examined for the presence of parasites, in November 2005. Heavy infections by *Lernanthropus kroyeri* van Beneden, 1851, a pathogenic crustacean gill parasite, were detected in all fish. Thus, the prevalence was 100% and the mean intensity of infection was 50.30 (SD 10.68) with a range of 29-77 parasites per fish. The hosts showed pale, necrotic gills with a rich mucus production and prominent haemorrhages. Histologically infected gills showed erosion, desquamation, vacuolar degeneration of the secondary lamellae and fusion in the distal ends of the secondary lamellae.

**Introduction**

*Lernanthropus* is the most common genus of parasitic copepods. So far, more than 100 species isolated from gills of different marine teleosts have been described. Some species of *Lernanthropus* are strictly host specific, but many are parasitic on several species of fish within one or several genera (Kabata, 1979; Oliver & van Niekerk, 1995; Timi & Etchegoin, 1996; Ligue & Paraguas, 2003; Sharp et al., 2003). *Lernanthropus* attaches to the gill filaments with the third pair of legs and elicit severe pathological reactions (Kinne, 1984; Manera & Dezfuli, 2003; Korun & Tepecik, 2005). The present study reports the occurrence of *L. kroyeri* and its histopathological effects in a Turkish sea bass mariculture enterprise.

**Materials and methods**

This study was carried out in November 2005. Forty sea bass *D. labrax* were randomly sampled from a commercial aquaculture enterprise in Bodrum (western part of Turkey). The standard length of the fish and the total body weight were recorded before necropsy. Gills were dissected and fixed in 10% formalin and brought to the laboratory for further investigation.

Parasites were removed from the fish, fixed in 2.5% glutaraldehyde in 0.1 M phosphate buffer (pH 7.4) at 4°C (overnight) and then washed in buffer twice. The specimens were dehydrated through alcohol series and air-dried. They were then sputter-coated with gold (Topçu, 1977). SEM photographs were taken with a JEOL JSM-5200 (Tokyo, Japan) electron microscope.

Formalin fixed gill filaments were dehydrated, embedded in paraffin wax, sectioned (5 micrometer sections), stained with haematoxylin and eosin, and subsequently mounted on slides with entellan as embedding medium.

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The prevalence, parasite range and mean intensity were calculated according to Bush et al. (1997).

**Results**

Fish of mean body weight 291.75g (SD 14.42) in the farm were showing signs of respiratory distress, enhanced mucus secretion, congestion, haemorrhages, primary gill lamella erosions and lethargy, dark coloured skin and surface swimming.

Daily mortality of 3% was recorded. During the study, the seawater temperature was 17.5°C and salinity was 38 ppt. All sampled fish were found to be infected. A total of 2,012 parasites were recovered from 40 fish. Parasite intensities ranged from 29 to 77. Mean intensity of parasite numbers was 50.30 (SD 10.68).

The total length of female parasites was 4.34 (range 3.56-5.87) mm, with egg- sac length 8.44 (6.60-12.05) mm and length of male parasites was 1.79 (range 1.71-1.98) mm of male parasite.

The gill structure infested by *L. kroyeri* was highly disorganized. Furthermore, the affected fish had frayed and pale gills, increased gill mucus production and haemorrhages associated with the feeding activity of the parasite. Histologically, erosion, desquamation and vacuolar degeneration occurred near the site of attachment (Figure 1). Lamellar fusion in the distal ends of the filaments was observed (Figure 2). Compression of gill tissue by the head and second antennae of female parasite resulted in erosion of the branchial lamellar epithelium and lacerate tissue (Figure 3). Second

![Figure 1](image1.png)

**Figure 1.** Erosion, desquamation (black triangle), vacuolar degeneration (white triangle) in the primary lamellae. (scale = 100 μm) (H&E).

![Figure 2](image2.png)

**Figure 2.** In the distal part of primer lamellae show secondary lamellar fusion (black triangle). (scale = 100 μm) (H&E).

![Figure 3](image3.png)

**Figure 3.** Compression of by cephalic extremity (ce) and second antennae (sa) of female *Lernanthropus kroyeri* resulted in erosion of the branchial lamellar epithelium (star) and lacerate tissue (white triangle). (scale = 50 μm).
antennae and maxillipeds of parasite has caused partial occlusion and ruptures in capillary (Figure 4).

Discussion
Parasitic copepods have a worldwide distribution and are economically important parasites in marine aquaculture (Kabata, 1970; 1979). Disease outbreaks and subsequent mortalities caused by *L. kroyeri* are frequently observed in sea bass culture and economic losses occur as the result of reduced feed conversion, growth reduction, mortality, loss of product value and treatment costs (Manera & Dezfuli, 2003; Korun & Tepecik, 2005).

*Lernanthropus kroyeri* van Beneden, 1851 has been recorded from many localities along the coast of Europe, from the Adriatic Sea to the southern North Sea. The only host in all these waters appears to be *D. labrax* (Kabata, 1979).

The total length of female parasites was in the present study measured as 4.34 mm (average) and 1.79 mm of male. These measurements are slightly lower than found by other author’s (Kabata, 1979; Korun & Tepecik, 2005).

In this study, prevalence was 100% whereas Manera & Dezfuli (2003) and Özel et al. (2004) reported lower prevalences ranging between 35% and 75%, respectively.

Davey (1980) stated that the intensity of infection increases from February to July. This phenomenon was attributed to a recruitment of parasites to the host. If seasonality can explain these differences is still unknown. Furthermore, Davey (1980) stressed that female parasite prefer the internal face of the medial sector of the posterior hemibranch of the second gill. We also observed that the female parasite prefers the deep area between the hemibranchs of the second gill arch. Rarely, they were observed first and third gill.

But male parasites were observed on the posterior hemibranchs next to females. The reasons for this site selection need to be elucidated.

Parasitic copepods feed on host mucus, epithelial tissue and blood, and their attachment and feeding activities seem to be responsible for disease development. Generally, the relationship between the number of parasitic copepods and the severity of the disease is dependent on 1) the size and age of the fish, 2) the general state of health of the fish, and 3) the species of copepod and the developmental stages present (Pike & Wadsworth, 1999). In the present study, the fish examined had large gill areas due to their large size which increased the number of potential attachment sites.

Losses associated with disease are generally considered to be the result of direct mortality, mortality due to secondary infections, reduced growth, loss of carcass value, and
costs associated with treatment (Lin et al., 1994; Pike & Wadsworth, 1999; Ho, 2000).

Kabata (1970) listed 3 types of local gill effects that crustaceans can exert on the gills: 1) occlusion of the branchial circulation, 2) destruction due to the pressure feeding and 3) hypertrophy. In this study, destruction, occlusion of circulation, hyperplasia and lamellar fusion were observed with vacuolar degenerations. Likewise, Manera & Dezfuli (2003), Korun & Tepecik (2005) reported hyperplasia, lamellar fusion, erosion, desquamation and necrosis of the secondary lamellae.

Due to their feeding activities on host mucus, tissue, and blood, it has been suggested that parasitic copepods may serve as vectors of viral and bacterial diseases of fish (Nyland et al., 1991; 1993). Further studies should elucidate the specific cause of mortality associated with L. kroyeri infections.

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References


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