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MORTALITY OF CAPTIVE HERRING, *CLUPEA HARENGUS* L. (TELEOSTEI: CLUPEIDAE) DUE TO *PSEUDANTHOCOTYLOIDES HETEROCOTYLE* (VAN BENEDEN, 1871) (MONOGENEA: POLYOPISTHOCOTYLEA: MAZOCRAEIDAE).

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Abstract

Mortalities of herring, *Clupea harengus* L., held in a public aquarium in Scotland, are considered to have been caused by heavy infections on individual fish of more than 300 specimens of the blood-feeding gill monogenean *Pseudanthocotyloides heterocotyle*.

Introduction

A large number of protistan and metazoan parasites have been recorded from the Atlantic herring *Clupea harengus* L., including 17 species of Monogenea, of which thirteen are gyrodactylids and two are mazocraeids (MacKenzie, 1987). One of the mazocraeids, *Mazocraes harengi* van Beneden and Hesse, 1863, has been reported only twice since its original description. These reports were in check-lists of parasitic helminths collected in the Plymouth area of southwest England by Baylis and Jones (1933) and Marine Biological Association (1957). Llewellyn *et al* (1984), however, examined 100 herring from the same area and found no monogeneans. They consider that the "*Mazocraes harengi*" referred to in the Marine Biological Association's (1957) paper may in fact have been *Pseudanthocotyloides heterocotyle* (Van Beneden, 1871), a parasite of sprats, *Sprattus sprattus* L., due to misidentification of the host because juvenile herring and sprats are so similar.

Pseudanthocotyloides heterocotyle was redescribed by Euzet and Prost (1969) from the Mediterranean Sea and reported from the same host in the southern North Sea by Reimer (1978). *Pseudanthocotyloides* spp. are primarily parasites of small engraulids and clupeids (Williams, 1988). One species was implicated in the loss of 87,000 anchovies *Engraulis japonica* Temminck and Schlegel, 1846, in the Sea of Iyo, Japan (Yamamoto *et al.*, 1984). Common symptoms recorded by Yamamoto *et al* (1984) were "gauntness and anaemia". Of the 155 anchovies examined, 99% were infected by *Pseudanthocotyloides* sp.

Materials and methods

About 200 herring, caught in the nearby Loch Creran, are usually kept on public display at the Sea Life Centre, Barcaldine, near Oban on the west coast of Scotland. They were held in a single-species glass aquarium with reverse flow undergravel filtration with the option of a continuous water flow and were fed on a commercially available pellet diet.

During the period mid-August to early October 1994, an average of 10 fish per week were being lost. These herring had been held in captivity for two years. A complete parasitological survey was carried out on a sample of 30 dead herring.

Results

The average length and weight of the dead herring were 20cm and 50g respectively.

Internally the fish were extremely anaemic and each fish had more than 300 *Pseudanthocotyloides heterocotyle* attached to the gill lamellae associated with excessive mucus

production in the gills. The burden of worms was such that a large number of them had overflowed from the branchial chamber and were found along the flanks of the herring. Many of the herring died with their mouths locked open. No other parasites were found.

Discussion

Monogenea are recognised as a serious threat to fish held in captivity (Thoney and Hargis, 1991) because they have direct single-host life cycles and, given suitable conditions, can reproduce rapidly to reach epidemic proportions. During the period when mortalities of these herring occurred there was an increase in the ambient water temperature up to a maximum of 17°C, which appears to have favoured reproduction of *P.heterocotyle*. The polyopisthocotylean group, to which *P.heterocotyle* belongs, are blood feeders, which would account for the extreme anaemic condition of the heavily infected herring. There are no previous published reports of this parasite from herring, but it has been found on herring caught off the west coast of Sweden (H. Rahimian, Zoological Institute, University of Göteborg, Sweden, personal communication). The lack of published reports may be due to misidentifications of either the parasite (as *Mazocraes harengi*) or the host (as sprat).

This incident highlights the importance of disinfecting wild-caught fish using one of the methods described by Thoney and Hargis (1991) before transferring them to aquaria.

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