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TRICHODINA AS A CAUSE OF MORTALITIES IN CAGE REARED RAINBOW TROUT *(Salmo gairdneri)* AND SALMON *(Salmo salar)*

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Trichodinids are important parasites of both freshwater and marine fish. The freshwater forms generally occur on the skin and marine forms on the gills (Lom 1962) where they feed on bacteria, erythrocytes and epithelial cells (Davis 1947; Padnos and Nigrelli, 1942). In cultured fish mortalities can result from heavy infestations causing skin hyperplasia and destruction of the normal gill structure (Davis 1947; Sarig 1971; Padnos and Nigrelli, 1942). Although the parasite has caused mortalities in cultured plaice in the UK (Pearse 1972) there are no published reports of serious mortalities due to this parasite in salmon or trout reared in cages in the sea.

Varying losses attributable to this parasite occurred at sea cage sites in Ireland in 1982 and 1983. In one of the 1982 case studies losses of about 20% occurred mainly in 1 + rainbow trout and broodstock salmon. Younger salmon smolts in adjacent cages experienced no appreciable losses.

Losses occurred suddenly in July, being more marked in the rainbow trout than in the salmon. Surviving fish appeared restless, showed a markedly reduced appetite, a bluish film on the skin dorsally particularly around the head and also gaping of the opercula. Very weak fish fell to the bottom of the cage. Grossly the gills showed a distinct pale appearance at the extremities of the filaments and in some cases severe erosion occurred giving the gills a ragged appearance.

Microscopically gill scrapings showed massive numbers of typical trichodinid parasites. When whole preparations of gill filaments were examined the parasites could be seen in large numbers actively moving around the extremities of the primary lamellae. Histologically the major change was a severe hyperplasia of the distal extremity of the primary lamellae which extended back along the gill filament to involve the secondary lamellae also (Fig. 1). Parasites could often be seen between adjacent secondary lamellae and were usually associated with an oedematous reaction resulting in separation of the epithelium from the underlying capillary system (Figure 2). However in some areas the epithelium of the secondary lamellae was absent leaving the capillary exposed (Fig. 3). In areas of the gill where severe erosion had occurred, the normal architecture of the gill filament had broken down leaving only a stump of gill ray, the epithelial and circulatory elements having been destroyed (Fig. 4). Histology tended to underestimate quantitively the level of infestation compared to examination of wet preparations. This could be explained by the loss of parasites from the tips of the primary lamellae during tissue processing leaving only those parasites trapped between adjacent secondary lamellae.

Although *Trichodina* has been observed previously in small numbers on the gills of farmed fish in Ireland (J.

McArdle, unpublished data) heavy infestations associated with serious mortalities have not been previously seen. However, Ireland experienced an unusually warm summer in 1982 and again in 1983 and sea water temperatures as high as 23°C were recorded. Salinities at some cage sites were also higher than normal. It would appear that the unusually high temperature or possibly a combination of high temperature and high salinity led to an explosion in parasite numbers and resultant large scale mortalities. The importance of temperature and possibly salinity in determining levels of *Trichodina* infestation in fish has been previously recognised but the precise relationship between these factors is uncertain (Lom and Laird 1969).

It is interesting that in the 1982 case only 1+ rainbow trout and maturing salmon were severely affected while salmon smolts in adjacent cages experienced no significant mortalities. The age and state of maturity of the affected fish were probably important factors as it is generally accepted that the severity of most ectoparasitic infestation increases with the age of the host (Hanek and Fernando 1978 a,b) and severe ectoparasitic infestation has been reported to occur in sexually mature or maturing fish (Cope 1958; Becker and Katz 1965; Pickering and Christie 1980). The large salmon and a proportion of the 1+ rainbow trout, particularly males, would have commenced sexual maturation by this time.

In 1983 further cases of *Trichodina* infestation were observed. However most of these cases involved salmon smolts and there was usually a concurrent severe infestation with *Ichthyobodo* sp. (Costia) and in some cases secondary *Vibrio* and myxobacterial infection of the skin also developed. Because the fish involved had been treated for parasites prior to transfer to sea cages it was felt that the parasites involved were marine types and not freshwater types carried over into the sea. The parasites probably originated from wild fish which occur in and around sea cages in fairly large numbers and examination of some of these fish confirmed the presence of trichodinids on the gills.

Because of the severity of these infestations treatment was carried out in a number of cases. Formalin was used in one case at a concentration of 1 in 2000 and in others at 1 in 4000 for approximately half an hour. The method of treatment was similar to that used for sea lice infestation (Rae, 1979) and the effectiveness was assessed by examining fish immediately prior to and following treatment. In the first case oxygen levels were monitored and pumped seawater from outside the cage was available in the event of oxygen dropping to low levels. Whilst oxygen levels did fall somewhat, at no stage did the fish appear stressed and the use of the pumped seawater or oxygen was unnecessary. The treatment was very effective in eliminating the parasites at both concentrations and halting further losses but in one case although the parasites were eliminated losses persisted which were attributed to a secondary *Vibrio* infection.

Summary

Losses attributable to *Trichodina* and sometimes mixed *Trichodina* and *Icthyobodo* (Costia) infestations of cage reared salmon and trout occurred in 1982 and 1983 in Ireland. The heavy infestations caused significant pathological changes to the gills of affected fish. The severity of the infestations was associated with unusually high water temperatures. Treatment using 1 in 4,000 formalin bath for approximately half an hour was effective in removing the parasite.

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Fig. 1. Section of gill showing hyperplasia of secondary lamellae and cellular infiltration of primary lamella.
(H + E × 140)

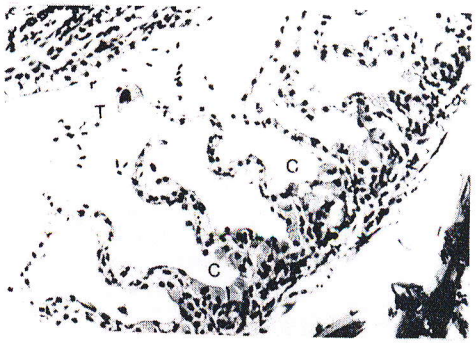

Fig. 3. Secondary lamellae which have lost their epithelial lining and showing presence of trichodinid parasite (T). Note the distortion in the shape of the secondary lamellae and also the prominence of chloride cells (C).
(H + E × 200)

Fig. 2. Trichodinid parasites (T) between adjacent secondary lamellae. Note the oedematous reaction and separation of gill epithelium from underlying capillary.
(H + E × 200)

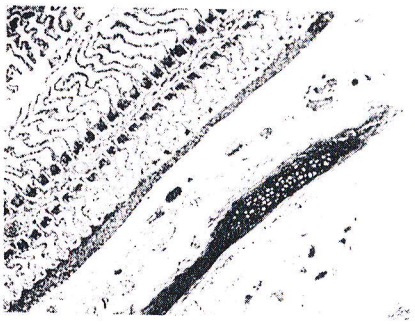

Fig. 4. Severely eroded gill filament with only stump of gill ray remaining. The epithelium of the gill and capillary system have been destroyed.
(H + E × 80)