



REPORT TO THE MINISTER FOR THE MARINE

The Sea Trout Working Group 1994

February, March 1995

FISHERIES RESEARCH CENTRE, ABBOTSTOWN

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7. Conclusions

- 1 The scale of the sea trout collapse in the west of Ireland has not been reflected in the sea trout fishery catch data from any other region. In 1994 several key rivers in the West showed encouraging signs of recovery. None of these fisheries, however, has yet achieved the same levels of catch as reported prior to 1988.
- 2 The survival of Burrishoole smolt to return as finnock in the same year ranged historically from 11.4% to 32.4%. In 1992 the survival fell to 3.7%, increased in 1993 to 7.4% and there was a further increase to 9.9% in 1994.
- 3 The 1994 River Gowla upstream sea trout run represents a very significant increase towards the normal range of marine survival for a sea trout stock: over 15% compared with less than 1% each year since trapping began in 1991.
- 4 The geographic area of Connemara and south Mayo covers 2,189 km² and contains an estimated 7,278 hectares of lakes. Estimates of regional sea trout smolt production for the years 1988-1994 (excluding 1989 when only two census stations were in operation) indicate an average of 141,000 smolts per year.
- 5 Sea trout smolt enhancement work has produced positive results in the Crumlin, Casla and Burrishoole catchments. There is now a better understanding of juvenile trout stocking methodology and of the contribution that stocked juvenile trout are making to overall sea trout smolt production.
- 6 New data for the Waterville fishery, available for the first time this year, supports a revised opinion that the sea trout stock in Lough Currane was not in serious decline, as concluded in the 1993 Sea Trout Working Group Report.
- 7 Lice levels on fish farms were generally much lower in 1994 than in previous years. In addition, the practice of fallowing and maintaining single-generation sites was seen to reduce the lice burden on farmed salmon smolts going into their first winter.

- 8 The physiological experiments indicated that the parr-smolt transformation in sea trout is less well defined than in salmon. The experiments confirmed that sea trout post-smolts have a natural ability to move in and out of freshwater.
- 9 Laboratory and field research initiated in 1994 yielded valuable information on the biology and behaviour of sea lice:
- * Under experimental conditions, all three larval stages of the sea louse *Lepeophtheirus salmonis* are capable of settling and developing on salmon. These infestations would appear to arise from passive uptake via the gills, in addition to active attachment by the copepodite to the body surface. Such passive infection routes may also be possible in nature with wild stocks or in the fish farm situation.
 - * In an experiment with salmon and seawater-acclimatised brown trout, the mean infestation by sea lice was significantly higher in trout than in salmon. The lice on the trout had shorter bodies, shorter egg strings and larger eggs than the lice on the salmon.
 - * There is evidence that brackish water conditions can give rise to higher sea lice copepodite production than full marine conditions.
 - * Research in Killary Harbour and Kilkieran Bay has added considerably to the existing information concerning the behaviour of sea lice larvae. Evidence from this work, and from Norway, now indicates that sea lice larvae can undergo vertical migrations, apparently in response to the stimuli of tides and/or light. While encouraging advances have been achieved towards elucidating the distribution of sea lice larvae in coastal waters, the precise mechanism, and the distances involved, remain unclear. The nett transport can therefore vary from zero (i.e. retention in a given area) in situations where larvae do not disperse very far below the surface on ebbing tide, to a nett displacement of kilometres if larvae drop into bottom water or onto the sea bed on ebbing tide.
 - * The results of small cage experiments showed considerable spatial and temporal variation which was not fully analysed. In addition, infestations were very low in all cases compared to infestations on wild sea trout post-smolts, although not low compared to infestations on salmon smolts in farm cages over a similar time period. The Working Group found the results of these trials inconclusive, therefore, and had difficulty in deriving a satisfactory interpretation of them.
- 10 In 1994, cluster analysis of lice infestations on wild sea trout in 23 rivers identified four site groups (two low intensity groups and two high intensity groups). The more

northerly rivers clustered in the low infestation areas, while rivers in the west and south west were distributed throughout the four clusters.

- 11 In both 1992 and 1993 a statistically significant relationship was shown between lice infestation on sea-trout and distance to the nearest fish farm, taking into account all sea trout rivers from which valid samples had been obtained. Analyses indicated that variations in lice infestation levels on sea trout demonstrated their maximum range in the vicinity of salmon cages, whereas at distances remote from cages the overall infestation levels were always at the lower end of the observed range. In 1994, no significant relationships were observed. The relationship was seen to have become progressively weaker over the three years, coincidental with reduced lice levels on fish farms. The model was further developed by including extra parameters such as the natural death rate of sea-lice larvae. As data become available for these parameters, the nature of such a relationship may be further clarified.

A similar analysis was carried out using an arbitrary cut off value of 25km. This indicated no statistically significant relationship between lice abundance and distance to the nearest fish farm, at that distance.

A considerable number of other statistical examinations were carried out by the Working Group (both on the linear distance and on the zoned analysis), not all of which were statistically significant.

- 12 Despite the substantial advances achieved during recent years in our understanding of the biology of sea lice and wild salmonids, the results currently available do not yet constitute conclusive proof of a causal link between sea lice infestations of farmed salmon, and infestations on wild sea trout in nearby rivers.
- 13 Minimising or eliminating lice in salmon cages is now seen to be an achievable management objective, and appears to have important beneficial effects.
- 14 The scientific results in this Report of the Sea Trout Working Group support the recommendations made in the Report of the Sea Trout Task Force (1994).

Information footnote:

The databases for the analyses discussed in Section 6.5, and in Conclusion 11 above, have been deposited in the Marine Data Centre, 80 Harcourt St., Dublin 2.

8. Recommendations.

The Sea Trout Working Group recommends that:

- 1 All smolt traps currently in use should be operated from the 1st of March each year to ensure a complete smolt count from as many fisheries as possible and should continue to operate at least until the end of May.
- 2 Considering the value of the counter and trap data in 1994, additional trapping or counting facilities should be established on selected rivers in all fishery regions, and existing facilities upgraded, to provide information on smolt migrations and adult returns.
- 3 Wherever possible, a salinity profile should be collected at each sea trout sampling site.
- 4 A level of sampling intensity and statistical confidence comparable to that established for the salmon farm monitoring programme should, as far as possible, be provided for the sea trout/sea lice monitoring programme.
- 5 The sea trout smolt enhancement programme should be monitored with a view to developing juvenile trout stocking protocols (timing of stocking, size and age of juvenile trout to be stocked, density at which juvenile trout are stocked into freshwater). The ongoing enhancement programme should be maintained in order to restore, in a rational manner, stocks in badly affected sea trout rivers .
- 6 The salmon farm monitoring programme should report total numbers of ovigerous lice in each bay because:
 - * it avoids misinterpretation of anomalous levels of infestation caused by lateral transfer of lice during harvesting;
 - * it is relevant to single bay management and immediate management advice can be given.

- 7 Recognising signs of recovery in several key sea trout fisheries in the West of Ireland and the reduction in the numbers of early returning sea trout post-smolts with heavy lice burdens, co-incident with the reduction of lice levels on most fish farms in 1994, the Working Group recommends that:
- * levels of sea lice on fish farms must continue to be kept as near zero as possible;
 - * fish farm monitoring must be maintained, particularly during the critical period from February to May and in autumn (September to November) to ensure low lice levels on overwintering fish in cages;
 - * the beneficial effects of fallowing and single bay management strategies should be maintained and expanded;
 - * in the light of these beneficial effects, consideration should be given to reviewing some of the current restrictions on fish farming to ensure the availability of additional fallowing and single bay management sites.
- 8 In line with stock improvements, existing conservation bye-laws should be kept under review, on a catchment by catchment basis. In the case of the Waterville fishery the bye-law should be relaxed. It should be noted that in the most severely affected fisheries in the mid-West, it will be some years before stocks will have recovered sufficiently to permit the killing of even a limited number of sea trout. (In Burrishoole, for example, the total adult population of sea trout was only 106 fish in 1994.)
- 9 Future research priorities should address:
- * hydrographic conditions in selected bays, in relation to the dispersion of sea lice larvae from farm sites;
 - * further studies on lice behaviour and biology;
 - * effective alternative sea lice treatments;
 - * the continuation of detailed research into the triggers for smoltification, and the interactions of juvenile migratory and resident trout stocks;
 - * the intensification of research into sea trout biology and ecology, with a view to assessing the long term sustainability of sea trout stocks and their exploitation.

APPENDIX 5

SUPPLEMENT TO THE 1993 REPORT OF THE SEA TROUT
WORKING GROUP

Foreword

To Mr. David Andrews, T.D., Minister for the Marine

As Chairman of your Sea Trout Working Group, I present this document as a Supplement to our 1993 Report. As before, our terms of reference were:

To evaluate the results of the 1993 research programme and draw scientific conclusions.

To report the conclusions to the Minister, together with recommendations on actions which could be taken or intensified in order to (a) halt the decline of sea trout stocks and (b) rebuild them.

It has been brought to my attention that it would be helpful to clarify some of the statements in Section 5 (Recommendations). I would be glad to take the opportunity to do so here.

1. While the evidence available to date has not disclosed a causative relationship between lice on farmed salmon and the collapse of the sea trout, the Working Group has now been able to demonstrate, for the first time, that a highly significant statistical relationship exists. Given that (a) incontrovertibly, there has been a widespread collapse of sea trout stocks in the west of Ireland; (b) to date, all the alternative hypotheses concerning the cause of these collapses have, on investigation, been found to be false; (c) the strength of the correlation between sea lice levels on caged salmon and on sea trout returning to neighbouring rivers, we have advised (Recommendation 1) that, on a precautionary basis, all those responsible for management should act as if a causative relationship had in fact been established - even though concrete proof of that has not yet been demonstrated.
2. In Recommendation 2 we state that "the effective management of lice numbers on ... salmon farms is of critical importance to the survival of neighbouring sea trout stocks". Given the facts as summarised in the above paragraph in this Foreword, we stand over that statement as being in accordance with the evidence, even though it is not yet clear *how* critical it is, nor how the process works. That said, it is not to be taken to imply that a causative relationship has been established.
3. Recommendation 3 must be read in the context of the evidence available to date, and the present poor state of knowledge concerning the precise nature and mechanisms of the relationship between sea lice and sea trout. Until further advances are made in this direction, a precautionary approach dictates that it would be prudent to avoid siting new fish farms, or increased farmed salmon production (above existing licensed tonnages for the operation), within 20 km of a sea trout river mouth.

APPENDIX

4. On a separate but related issue, the Working Group remains supportive of fallowing. The Working Group shares the widely expressed acknowledgement that fallowing is a very useful tool in managing diseases and parasites, and therefore clearly stated its support for fallowing in the wording of Recommendation 4. The Working Group's findings, however, suggest that the actual methods may need to be amended or refined - single bay management with regard to fallowing will be absolutely essential, for example. We therefore advise, in Recommendation 4, that a review of overall fallowing strategy ("policy" is used synonymously with "strategy") would be a logical and prudent move.

5. As frequently happens with scientific investigations, the research programme to date, and the findings reported here, have raised as many questions as they have provided answers and working assumptions. Recommendation 7 identifies the priority areas for further work which, in the opinion of the Working Group, are the most likely to shed light on the natural processes which underlie the correlation which we have demonstrated. Until these physical and biological processes have been investigated and understood, we will be unable to advise on exactly *how* critical the lice levels on fish farms are, nor on the mechanisms by which lice may transfer from caged salmon to wild sea trout.

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