# Halibut Hatchery Trials - 1985

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## Abstract

This report covers the first halibut rearing trials, conducted at the SFIA Hatchery at Ardtoe in 1985. Details of the facilities used and of proposed modifications for future trials are included.

## Introduction

Workers in Norway have been attempting to rear larval halibut since 1979 and trials in Denmark and Great Britain started in 1983. In spite of a considerable amount of effort, no larvae have survived to feed in controlled tanks and only a handful of metamorphosed fish have been produced in semi-controlled floating bags.

The SFIA have held stocks of halibut since 1973 but work on larval rearing did not commence until 1984 when a variety of facilities were used unsuccessfully.

After visiting other units and discussing technology with experts in Norway, Denmark and Britain a facility for larval rearing was designed and put into operation in March 1985.

## Summary

Two batches of halibut larvae were handled at Ardtoe in 1985, both being obtained from the Aquaculture Station, Austevoll, Norway. The first batch, which had not yet completed hatching, suffered heavy mortality in transport after fog disrupted airline schedules. The surviving larvae were in poor condition and all died within 21 days of transport. The second batch arrived in good condition and the last fish was seen alive on the 61st day of the trial (461 degree-days). None of the larvae were seen to feed but the results showed that the rearing system was satisfactory for long-term survival of young halibut.

The results of the first trial were presented in a Progress Report in May 1984 and are only summarised in this report, the rest of it covering the second trial.

## Halibut Trial I - 1985

Summary

1. The duration of transport was extended to fourteen hours and the eggs had not completed hatching before despatch. These two factors combined to produce a high transport mortality and a great stress on the surviving larvae which probably resulted in their death after 140 degree-days ($^{o}$-d).

2. The rearing system appeared to work well except for problems of slight leakages. Float switches were installed to minimise the effects of such leakages and it is possible that the stabilising weights on these switches contained copper. They were changed before the second trial and EDTA was used to condition the water in the second trial.

3. The addition of 50 p.p.m. of chlortetracycline did not appear to improve the condition of the larvae.

4. A reaction to light was noted at 120 $^{o}$-d but larvae showed no attempt to capture a microencapsulated diet after this point.

## Halibut Trial II 1985

1. The tank system was set up as shown in Fig.1. About 10g of finely ground activated charcoal was placed in the filter body and 10 ppm EDTA (disodium salt) was added 5 hrs. before the fish were installed. The halibut rearing tank systems were held in an insulated cooled room which could maintain within 1.0$^{o}$C any set temperature between 5$^{o}$C and 15$^{o}$C.

2. The larvae arrived at 17-30 on 15.4.85, less than twelve

hours after they were packed for transport at Austevoll. Salinity on arrival was 34 p.p.t. and the transport water temperature was 5.1°C, some ice still being unmelted in the packing bags. After 25 minutes equilibration the larvae were released into the rearing tank which was then at 32 p.p.t. salinity and 6.5 °C. In order to compare the observations made in this trial with other trials at different temperatures, the age of the larvae has been given in degree-days (°-d) specified as the age of the larvae in days multiplied by the tank temperature on each day. It is assumed that the temperature on the two days after hatching, and before transport from Norway, was 7°C.

3. The fish were examined the following day and appeared to be very healthy, all being in mid-water. Inspection was then carried out twice daily using a rechargeable hand torch with a bulb rated at 0.3A, 2.5V. This torch was used throughout and did not appear to distress the fish unless the beam was on them for several seconds.

4. It was not possible to accurately count the fish and it was thought unwise to handle them so the number at the start of the trial could only be roughly estimated as 2000.

5. The design of the tank was such that most of the debris collected in a central cup which could easily be cleaned by siphon. Of the 486 mortalities removed, 391 were collected from the cup, 43 from the tank bottom, 44 from the mesh on the filter and 8 from the water surface. The body of the last fish was not located.

6. In the absence of a salinity meter, the salinity

determinations were made on the basis of readings from an electronic thermometer and a small hydrometer. The latter was difficult to read and the salinity calculations were made only to the nearest part per thousand. At the beginning of the trial the salinity stayed steady at 32 p.p.t. but rose at d15 and reached 34 on d20 (152$^{o}$-d). There was a persistent leak in the recirculation system which necessitated a frequent top-up from tanks of filtered sea water held at room temperature, a total of 230 lit. of water being added during the trial. On d39 it was feared that the high salinity (34‰) could be adversely affecting the fish, which were gathering at the water surface. For the next eleven days all topping-up was done with de-ionised fresh water and the salinity was reduced to 31‰ on d52 when sea water topping up was resumed.

7. The tank was kept covered and in total darkness (except for inspection) until d18 when the lid was removed and the tank room was constantly illuminated by a single 15 watt red bulb about 1m from the water surface. On d21 (159$^{o}$-d), fish were seen to be swimming towards the inspection light. From day 31 (233$^{o}$-d), the tank was illuminated by low intensity white light for 4-5 hours per day (a 40 watt white bulb appx. 0.5m above the water surface and 1m from the tank side). From day 46 (340$^{o}$-d) this light was on continuously and the red light was turned off.

8. The tank was supplied with continuously recirculating water at a rate of approximately 20 changes per day, the overflow being screened by a double-sided 'banjo' filter 25cm in diameter (see Fig.1) and faced with 300$\mu$ mesh. Between d10 and d20 (75-150$^{o}$-d), this filter became clogged and was frequently changed. All the

mortalities trapped on the filter were found between d10 and d15 (75-114°-d). The banjo filter remained clean later in the trial and was not changed after d29 (218°-d). The recirculation filter cartridge (5μ) was changed on d47 (347°-d) and all recirculated water was passed through a u/v unit from d52 (390°-d) to the end of the trial.

9. Copepods, tentatively identified as Tigriopus sp. were presented daily from d10 (74°-d) except for the last few days of the trial when they were still present in large numbers and there were very few larvae left in the tank. A total of 630,000 copepods was added plus 30.5 million rotifers (Brachionus plicatilis), the latter being added between d40 and d46 (298-340°-d). Both copepods and rotifers had been reared on a mixture of unicellular algae and baker's yeast.

10. During the course of the trial a test kit was used to check nitrite and ammonia levels in the tank. Results were as follows:-

| d | °-d | Nitrite (mg/lit. Nitrite - N) | Ammonia (mg/lit. NH4 - N) |
|---|---|---|---|
| 21 | 159 | < 0.05 | 0.3 |
| 27 | 203 | < 0.05 | 0.2 |
| 34 | 255 | < 0.05 | 0.2 |
| 46 | 340 | 0.05 | 0.2 |
| 61 | 471 | 0.05 | 0.3 |

11. Some tests were also carried out on bacterial and fungal concentrations using 'Orion Easicult' slides dipped in the tank.

Results were as follows:-

| d | °-d | Aerobic bacteria p ml | Fungi | Yeast | Aer. Sulphide bact. |
|---|---|---|---|---|---|
| 27 | 203 | $10^3$ | light | Nil | Nil |
| 47 | 347 | $10^4$ | moderate | $10^3$p.ml | Nil |
| 61 | 471 | $10^6$ | heavy | Nil | N/C |

These results could have been affected by a surface film which tended to form from d20 (152°-d) onwards. Skimming of the tank surface was necessary on eight occasions, five of these being d50 - 54 (375-404°-d). In future trials bacterial samples will be taken from water in the settlement tank (see Fig.1).

12. As far as possible, temperatures were kept fairly constant between 6.8°C and 8.0°C during the trial. On d50 (3.6.85) it was learned that similar batches in Norway were surviving fairly well at 9.5°C and it was decided to raise the temperature in an effort to obtain a better feeding response from the few fish remaining. Accordingly, the temperature was raised until it reached 9°C on d60 (454°-d). At this point the cooler was accidentally switched off overnight so that the single surviving fish was at 12.8°C on the following day. In spite of the temperature change, the fish looked very healthy and was possibly feeding. The next day, when the temperature had been reduced to 10.6°C the fish was lying on the tank bottom but was alive when removed and swam away when released. It was never seen again and it is assumed that it died and was eaten by the copepods which had become established on the tank walls.

13. Fig. 2 shows the recorded pattern of mortality as a count

of the dead fish removed. Most of the recorded mortalities took place within ten days of transport. 'Siphoning' was not carried out every day and it is probable that some dead larvae could have decayed and possibly been broken up by copepods.

## Conclusions and Recommendations

1. The tank system supported larvae up to 460°-d, at which point they should have commenced feeding. The tanks without a refrigeration system were not workable. More tank systems, incorporating temperature control, will be needed in order to conduct controlled trials in 1986.

2. The tank circulation system worked very well - very few fish were trapped on the filter mesh and most of the recovered mortalities were removed from the bowl designed to collect them. The design will be used again in 1986.

3. The addition of rotifers and copepods from an early age (74°-d) possibly harmed the fish later in the trial when bacterial counts increased, probably as a result of uneaten food. In future trials, food will not be added until much later e.g. 350°-d.

4. The system was able to maintain steady temperatures throughout. However, the only halibut to have been reared have been in floating bags which have been at ambient sea water temperature i.e. a slowly rising temperature during larval development within the range 5°C to 10°C. Future trials will incorporate such a temperature rise to reach 9-12°C at 450°-d.

5. It is proposed that the present regular monitoring of

temperature, salinity, ammonia nitrite and bacterial checks will be continued for all larvae batches. The checking of pH will also be undertaken.

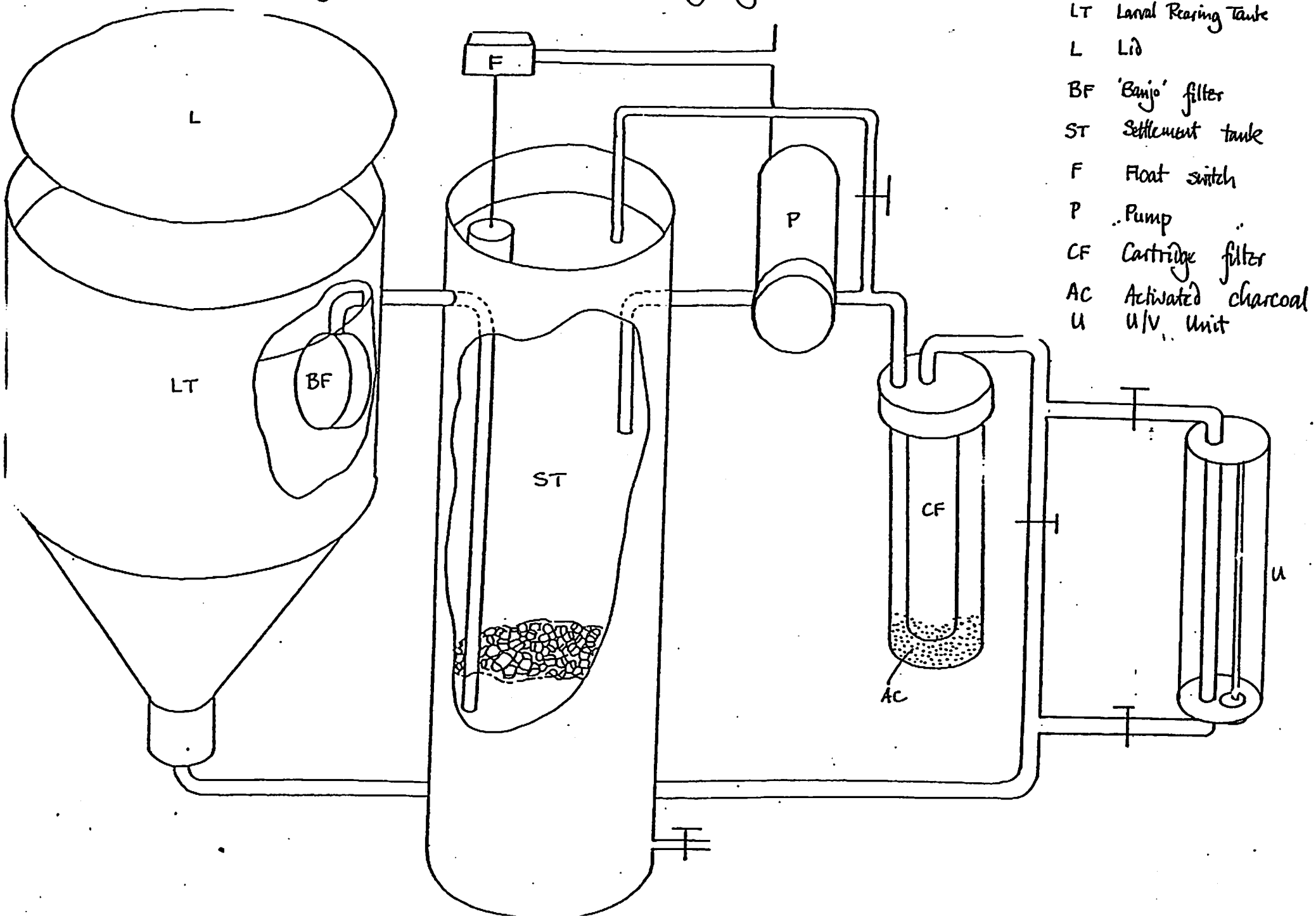
6. In spite of low salinities the larvae were able to maintain a mid water position. It is not thought that salinities need to be greatly increased in future trials.

7. The use of background lighting, red from d16 to d46 and white from d31, did not appear to adversely affect the larvae. The fact that the only larvae reared have been in bags open to normal daylight indicates a tolerance to illumination throughout larvae development. The same lighting regime will be used in future.

8. The few larval rearing trials so far attempted have utilised all available larvae. The only larvae reared to metamorphosis have been held at a very low density in large containers (50 - 350 in 2 cu. m).

9. It is hoped that the increase in spawning stock at Ardtoe during 1985 will produce many egg batches in 1986. Facilities for larval rearing at Ardtoe could not cope with such a demand and the opportunity should be used to supply other units. This implies the purchase of insulated shipping containers and budgeting for freight charges.

Figure 1 Halibut Larval Rearing System 1985




LT Larval Rearing Tank
L Lid
BF 'Banjo' filter
ST Settlement tank
F Float switch
P Pump
CF Cartridge filter
AC Activated charcoal
U U/V Unit

Fig 2 Counted mortalities of halibut larvae – Trial II 1985

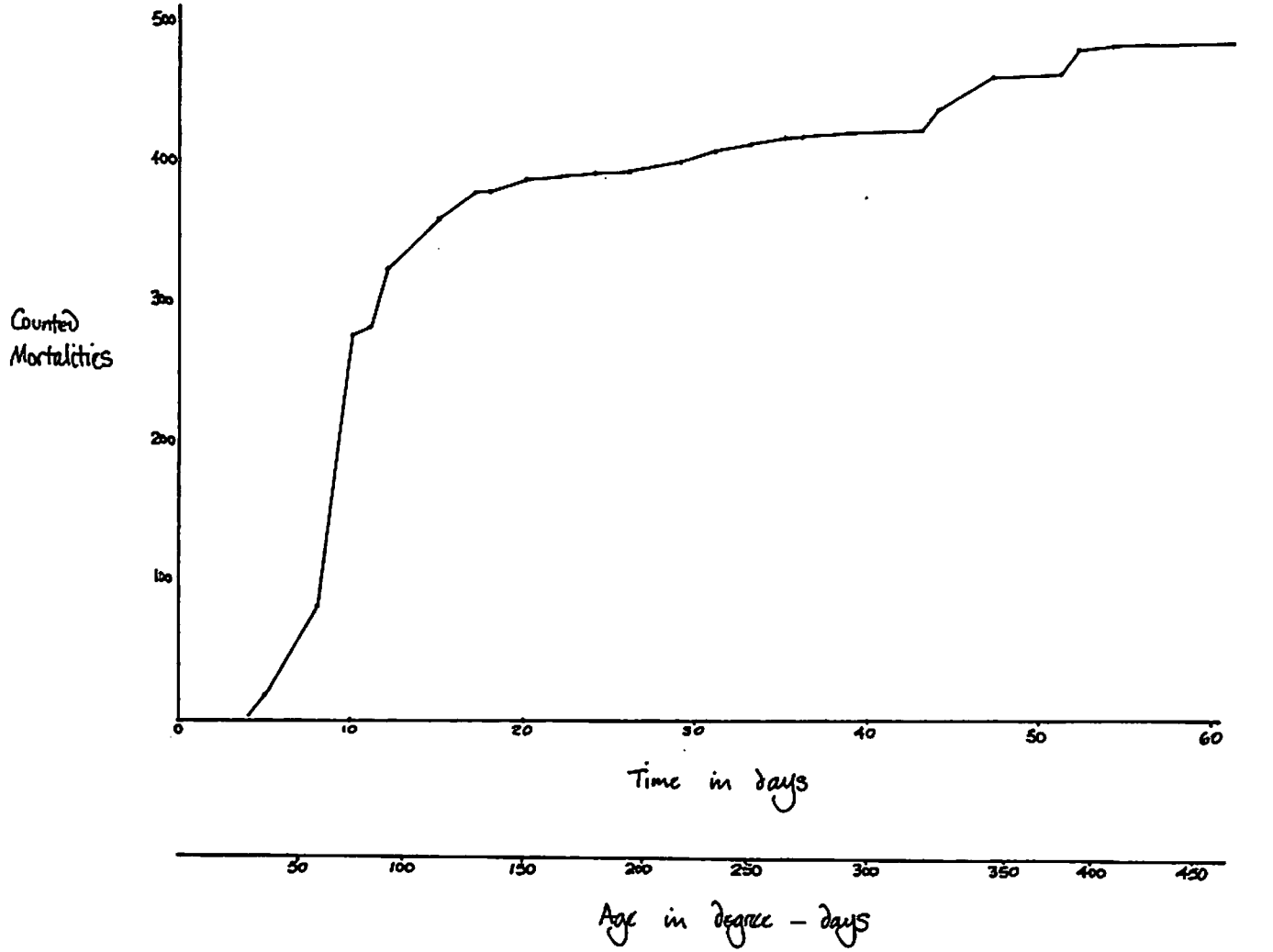


Fig 3 Tank conditions - Trial II 1985