SOME SABLEFISH KEPT FOR OBSERVATION DURING TAGGING IN 1972

by

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As noted in INPFC Document 1485, 1,003 sablefish, *Anoplopoma fimbria*, were tagged with FD-68B tags in August 1972. A sample of 50 of the tagged fish were kept for observation and 50 untagged fish captured at the same time and place were also kept as a control. Observations on both groups are here reported up to August 17, 1973.\(^1\) Some reference is made herein to our general experience with captive sablefish; it is based on rearing several lots of fish for as long as 3 years, totalling over 1,000 individuals, starting in 1967.

As far as possible both the tagged fish and the controls were treated identically. After measuring and tagging in one case or after measuring only in the other, they were left completely undisturbed aboard ship. During transfer from ship to final holding tanks at Nanaimo they were handled very carefully.

At the Pacific Biological Station in Nanaimo tagged fish were kept in one tank, untagged fish in another. Each tank was cylindrical, 244 cm in diameter, the water being about 75 cm deep. About 30 liters of seawater per minute, freshly pumped from a depth of about 20 meters in Departure Bay, were introduced near the edge of each tank as a tangentially-directed stream that caused the water in the tank to rotate counterclockwise. A drain in the centre of the tank maintained a constant water level. Air was supplied through airstones. The sablefish were fed entirely on fish that had been frozen whole then cut into pieces while frozen. They were fed approximately equal amounts of Pacific herring, *Clupea pallasi*; Pacific hake, *Merluccius productus*; whiting, *Theragra chalcogrammus*; and arrowtooth flounder, *Atheresthes stomias*. Experience indicates that sablefish thrive under the above conditions and on the diet indicated.

Tags are still firmly attached to all the tagged fish that still survive.

Some tagged fish have been adversely affected by the tag. In each such case the first symptom noted was a swelling on the right side of the fish, in about the same cross-section as the place where the tag was anchored and just above the lateral line. The swelling would gradually increase for about 10 days, then the fish would either die or gradually recover over a period of several weeks.

Autopsy showed remarkably similar conditions in all the tagged fish that died. In every case but one (see below for details on it) the toggle which is designed to anchor the tag in the fish was in the proper position, namely, oriented anteroposteriorly just to the right of, and in close proximity to, the small bones at the base of the first caudal fin. The area near the "toggle" was heavily infected with *Aeromonas salmonicida*, the furunculosis microorganism. Infection had spread along a narrow and easily followed route through the musculature, laterally, ventrally, and slightly anteriorly from the toggle to the skin on the right side about halfway between dorsal fin and lateral line. There was a hole, too small to be noticed in the swimming fish, through the skin at that point; the infected area obviously had drained through the hole. Infection had spread just under the skin near the hole, particularly ventral to it, and was

\(^1\)No significant changes as of August 24, 1973.
associated with the swelling that had been so noticeable in the living fish. Infection was heavy in the body cavity and notably heavy in the kidney and spleen.

Dr. Trevor Evelyn, a microbiologist at the Pacific Biological Station, who did the autopsies is of the opinion that all the tagged fish died from furunculosis that had been induced by tagging. I paraphrase his interpretation of events as follows: It is usual for the sablefish available to us to carry some _A. salmonicida_. In unstressed fish they remain latent but the stress that accompanies tagging allows the pathogens to become active in some cases. Damaged tissue in the area where the tag is anchored is an ideal medium for _A. salmonicida_ so active infection in an overstressed fish begins there, then spreads until eventually even kidney and spleen are involved and furunculosis is manifest.

Although the toggle of the tag usually remains in one place, in one fish (No. AA00600) it moved laterally and ventrally through the infected tissue and out through the hole in the skin associated with infection. This displacement of the toggle pulled the data-bearing enlarged part of the tag up tight against the skin on the left side where the tag had been inserted originally. When displacement of the tag was first noticed the fish was obviously in distress and it was killed and counted among those that died from infection.

A total of 5 of the 50 tagged sablefish died from furunculosis. Their numbers and dates of death (all in 1973) are as follows: AA00620 on March 2; AA00960 on March 27; AA00120 on April 16; AA00860 on May 5; AA00600 on August 1. Three other tagged fish (one in March, two in May) recovered after showing symptoms similar to those of the fish that died.

Except for one mortality within the first week, none of the 50 controls died within the first 9 months in captivity. Then three died on June 24, July 12 and July 16, respectively. The cause of death was not obvious for any control. Thus the mortality rates of tagged fish and of controls were much the same and both were consistent with our general experience that roughly 10% of captive sablefish die annually.

On the basis of weights at time of death and of lengths at time of tagging, growth rates were estimated as follows:

<table>
<thead>
<tr>
<th>Tag Number</th>
<th>Length August 1972 (cm)</th>
<th>Weight estimated from length (g)</th>
<th>Weight at death (g)</th>
<th>Weight gained in captivity (g)</th>
<th>Gain per month (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA00620</td>
<td>37</td>
<td>500</td>
<td>1,955</td>
<td>1,455</td>
<td>230</td>
</tr>
<tr>
<td>AA00960</td>
<td>36</td>
<td>460</td>
<td>1,640</td>
<td>1,180</td>
<td>168</td>
</tr>
<tr>
<td>AA00120</td>
<td>35</td>
<td>430</td>
<td>1,590</td>
<td>1,160</td>
<td>144</td>
</tr>
<tr>
<td>AA00860</td>
<td>37</td>
<td>500</td>
<td>2,100</td>
<td>1,600</td>
<td>191</td>
</tr>
<tr>
<td>AA00600</td>
<td>37</td>
<td>500</td>
<td>1,420</td>
<td>920</td>
<td>81</td>
</tr>
</tbody>
</table>
Thus, apart from fish No. AA00600 which was notably emaciated (perhaps associated with the toggle displacement described above) the tagged fish grew relatively fast in captivity. Captive sablefish usually gain about 150 g per month on the average although some individuals grow more than twice as fast, and some less than half as fast. In nature growth averages roughly 50 g per month.

The fish that died were originally all less than the average size, 38.3 cm, for controls.

Three of the tagged fish and one of the controls had become blind in the right eye. We have found it impossible to avoid occasional blindness - causing injury to the eyes of captive sablefish during handling (mainly while weighing them periodically) in spite of precautions. In the hope of preventing blindness, these tagged fish and controls have never been handled since they were unloaded in Nanaimo. Since the fish in both lots always swim clockwise¹, blindness in the right eye cannot be attributed to rubbing the side of the tank. It does seem to be associated with the fact that during measuring or tagging the right eye was nearest to the measuring board. Untagged fish would be on the measuring board for a shorter time than tagged fish.

Both tagged and untagged fish swim around the 244 cm diameter tank about four times per minute. Assuming that their average path is around a circle of about 180 cm in diameter, they swim at about 1.4 km per hour over long periods of time.

¹In every lot of sablefish that we have cultured in circular tanks most of the fish have soon established the habit of circling the tank in the same direction. In some lots the habit is to circle clockwise, in others it is to circle counterclockwise, but once the habit is established the fish in any given tank always swim the same way whether the water is made to rotate with them or against them.