Spawning Migration and Intragravel Movement of the Torrent Sculpin, *Cottus rhotheus*

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ABSTRACT

Torrent sculpins (*Cottus rhotheus*) migrated into the Abernathy Incubation Channel from late January to late April with most fish entering from mid-March through mid-April. Egg laying by captive females was restricted to April. A downstream migration of sculpins occurred in Abernathy Creek in May and June. The sculpins appeared to have entered the incubation channel by intragravel movement.

INTRODUCTION

The role of torrent sculpins in a salmon stream is little understood, and information on their life history is sparse. Incidental capture of numerous torrent sculpins in inclined screen traps used for evaluating salmon survival in the Abernathy Incubation Channel made possible observations of movements and spawning habits of the species. In addition, sculpins were captured in a similar inclined screen trap operated for two years to sample downstream fish movement in Abernathy

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Creek adjacent to the channel. A description of the channel and methods of operation are presented by Thomas and Shelton (1968).

SPAWNING MIGRATION

The incubation channel was normally operated from mid-September through early June and dewatered during the summer. Sculpins were captured in the channel only from 29 January through 25 April, with most of them being caught from mid-March through mid-April. Of 31 sculpins examined, 28 were adults and 3 were sub-adult males. Mature females were easily distinguished by their extended abdomens, and the egg patterns could be observed through the skin. During the first four seasons, sculpins were kept in troughs for investigation of spawning activity. Egg laying was restricted to April for all 4 years with egg clusters being found on 23 April 1964, from 12 to 15 April 1965, and from 11 to 18 April 1966. Eggs from two females were found on 29 April 1967. All eggs laid were infertile even though mature males were present each year. The spawning season of *C. rhotheus* in British Columbia was reported by Carl, Clemens, and Lindsey (1959) as April to June.

The appearance of mature sculpins in the channel just before and during the spawning season suggests that an upstream spawning migration occurs at this time. Simon and Brown (1943) suggested that *C. bairdi semiscaber* migrated upstream to spring areas to spawn. Sculpins appear to normally have a small home range. McCleave (1964) found the home range of *C. bairdi* to be less than 45.7 m (150 ft) with marked individuals moving a maximum distance of 179.8 m (590 ft) upstream and 153.0 m (502 ft) downstream. Bailey (1952) found maximum movements of 143.3 m (470 ft) by *C. bairdi punctulatus*.

A downstream migrant trap in Abernathy Creek adjacent to the channel was operated from mid-April through late August 1963 and 1964. Sculpins were captured in the trap from 24 May to 29 June 1963 and from 8 May to 9 June 1964. These captures may indicate a post-spawning downstream migration. Although McCleave (1964) could not demonstrate homing in sculpins, this migration may return the fish to the general area of their original home range. Green (1971) found homing to specific tide pools in *Oligocottus maculosus*. Meehan and Siniff (1962) also found a nocturnal downstream migration of sculpins (*Cottus* sp.) from mid-May to early June in Alaska.

INTRAGRAVEL MOVEMENT

The presence of sculpins in the incubation channel is a subject for speculation. The water supply for the channel is screened and thus would prevent passage of sculpins. The outlet from the channel has a series of waterfalls, the highest having a freefall drop of about 55 cm. While this drop may be no obstacle for trout, it would for sculpins measuring from 7 to 10 cm. Entering the channel from the outlet could not be ruled out until the 1966–67 season when the channel was divided into three experimental sections by additional traps. After installation of these traps, sculpins were captured in both upper and lower sections of the channel. Carl Bond (personal communication) has found that torrent sculpins can climb out of troughs by wedging in corners and using the pectoral fins. A double jump, the first having no attraction water and nearly complete blockage by a walk-way, and a 1.65-m climb up a 25% slope against a force of water would be required to pass each migrant trap. It is not likely that sculpins could swim or climb past the migrant traps and the only possibility remaining was intragravel movement.

The work of Phillips and Claire (1966), using aquaria and various gravel sizes, demonstrated the ability of the reticulate sculpin, *C. perplexus*, to move within gravel. Gravel in the channel is in the following proportions: 5 cm, 20%; 3.8–5 cm, 40%; and 2.5–3.8 cm, 40%. Water is known to travel through gravel under all three traps. At the end of one season of operation when the channel was being dewatered, a few salmon fry were observed to have traveled through the gravel from above one trap to a pool area downstream. While the evidence for sculpins entering the channel through the gravel is circumstantial, there appears to be no other explanation.

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