

*Drizzle Lake  
1980  
1981  
1982  
1983  
1984  
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1986  
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1988  
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EK 52 Research file

*To be submitted  
to Condon  
(short commercial collection  
& report)*

Drizzle Lake

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PARENTAL FEEDING IN THE RED-THROATED LOON  
(GAVIA STELLATA) ON THE QUEEN CHARLOTTE ISLANDS

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1980

## INTRODUCTION

Unlike other Gavidae, which forage for their young in or near the nesting territory, Red-throated Loons <sup>(*Gavia stellata*)</sup> fly to the ocean or larger lakes to obtain fish for the young. While there have been occasional notes on feeding activities of the young in this species (Johnson and Johnson 1935, Pearse 1946, Norberg and Norberg 1971, Sjolander 1980), observations of the feeding schedules and behaviour throughout the pre-fledging period have not been made. During recent studies of freshwater fish and avian piscivores on the Queen Charlotte Islands, British Columbia (Reimchen 1980, Reimchen and Douglas 1980), we examined parental feeding of a Red-throated Loon chick from hatching through to fledging.

## STUDY AREA AND METHODS

Observations were made at Drizzle Lake (53°56'N, 132°05'N) (112 ha), Queen Charlotte Islands in 1979. Description of the habitat and activities of non-breeding loons on the lake are provided in Reimchen and Douglas (1980); the lake contains resident populations of salmonids and three-spine stickleback. Although 2 chicks hatched (June 30), only 1 fledged; one was found dead on the morning of the second day. In the 51 days between hatching and fledging, we made 285 hours of observations, including 19 days with greater than 8.5 hours per day, from a blind placed 8 m from the nest. We recorded all feeding activities, general behaviour and interactions with

other species; only feeding data are presented here. Taxa and size of prey were assessed during feedings with spotting scopes (20 - 50 x), supplemented by 35 mm photographs (taken with a 1000 mm lens); length of prey was measured relative to length of the culmen of the adult birds. Additional observations (22.7 hours) were made on a 1 ha pond 1.5 km south of Drizzle Lake in 1981, where a single pair of Red-throated Loons was raising 2 chicks. The majority of feeding sequences at this nest were recorded on a Sony portable VTR. Terminology for vocalizations follows Sjolander (1981).

## RESULTS

While details varied with the age of the chick, a <sup>SOME</sup> ~~number of~~ factors were common to all observed feeding sequences (N = 152) <sup>(see TABLE 1).</sup> One of the parents took off from the nesting lake and flew to a marine inlet 2.5 km west of Drizzle Lake. After approximately 60 minutes the bird returned with a single marine fish held cross-wise in its bill, landing in or near the territory and offering the fish to the chick. The young always swallowed the fish whole and head-first. In cases where the chick dropped the fish during manipulation, one or both of the parents dove and retrieved the fish, offering it again. Within 15 seconds after the fish was swallowed, the parents dove repeatedly (<sup>X more meaningful?</sup> maximum 11 times) under the chick, similar to the response when the fish had been dropped. In all cases in which the chick failed to eat, one of the parents swallowed the fish.

During the first 10 days, feeding sequences took place near

the nest, where the chick spent the majority of its time. Prior to a feeding flight, the adult approached the nest and cooed; we could not recognize a distinctive response from the chick but after several minutes, the adult took flight to the ocean. On returning with a fish, the adult normally wailed, approaching within 2 m of the nest, repeatedly cooing and dipping the fish in the water until the chick left the nest. The parent lowered its head close to the water when offering the fish to the chick.

After Day 10, the chick and attending parent spent increasingly greater periods away from the nest, ranging progressively further into the lake each day. However, the feeding sequences continued as described above, except that all interactions occurred while rafting on water. Feeding flights were generally initiated by begging (pecking at adult's bill or breast) by the chick.

On Drizzle Lake, all of the observed fish brought to the chick were characterized by a high length : depth ratio. Approximately 20% of these were sandlances (Ammodytes hexapterus) and the remaining, which could not be positively identified, were probably herring (Clupeidae) and smelts (Osmeridae). Only 1 fish presented to the chick was captured from the nesting lake, a three-spine stickleback (Gasterosteus aculeatus) (Day 40). Mean standard length of fish, measured on 6 photographs (all taken before Day 10) was 91.6 mm (range 82.5 - 96.6 mm). On the pond, 15 of 19 fish brought to the young were sandlances ( $\bar{x}$  = 99.8 mm , range 82.5 - 121.0 mm, N = 7) and 4 were sea perch (Symatogaster aggregata,

$\bar{x}$  = 101.2 mm, range 80.5 - 120.8 mm, N = 4), which are a relatively deep-bodied form.

As the chick aged, it showed increasing proficiency at handling the fish. During the first 5 days, the chick took the fish directly from the adult's bill. <sup>In the time following</sup> ~~Beginning on Day 5~~, the adult dropped the fish several seconds before the chick reached it, yet not until Day 7 did the chick lower its head in the water and look for the dropped fish; Day 15 was the first time the chick retrieved the fish from the water. On Day 9, the chick began to handle the fish with its head beneath the surface and it was first observed eating with its head underwater on Day 19. By this time, the adult consistently dropped the fish before the chick reached it. The time spent manipulating the fish before swallowing decreased with the age of the chick from 4 minutes on Day 1 to a maximum 30 seconds on Day 25.

Both adults provided fish for the young. During the time that the birds were close to the nest, when we were able to distinguish <sup>how</sup> the sexes, the female made 54% of the flights. Each parent made 2 - 5 consecutive flights to the ocean before exchanging positions. From Day 0 - 12, one of the parents always remained with the chick. However, from Day 13 - 24, 8% of the feeding flights (~~→~~) involved both parents absent from the lake at the same time. During Day 24 - 27, 30% of the feeding flights (~~←→~~) involved simultaneous flights, leaving the chick unattended. The parents did not fly from the lake simultaneously; repeated begging by the chick

usually resulted in the parent leaving on a feeding flight before the second adult returned. The two parents normally returned within several minutes of each other, both with fish.

The young ate 83% of the fish brought from the ocean to Drizzle Lake. In 6 cases, all during the first 3 days, the chick grasped the sandlance offered by the parent, but was unable to properly manipulate and swallow it. The first feeding, 3 - 5 hours after hatching of the second egg, was unsuccessful. In another 12 instances, 8 during the first 3 days, the chick was probably satiated, as it did not leave the nest when the parent approached with a fish. The adult ~~offered~~<sup>held</sup> the fish to ~~the chick~~ for 2 - 10 minutes before swallowing ~~the fish itself~~<sup>it</sup>. In 4 cases, a Bald Eagle had just made a low flight over the adult and chick, initiating warning calls by the guardian parent when its partner returned from the ocean. In these cases, the adult immediately swallowed the fish without approaching the chick. On the lake, none of the fish offered appeared to be too large for the chick to swallow; on the pond, 1 fish, C. aggregata, could not be swallowed by either of the chicks after 20 minutes of manipulation.

The chick occasionally was observed diving in shallow water and surfacing with sedges (Juncus sp.) in its bill. It also dove in deeper water from Day 12 through to fledging, from 2 - 12% of observation time. As food items were not returned to the surface during these dives, we could not ascertain if fish had been captured.

While intervals between feedings were highly variable within

days (2 - 480 minutes), the mean interval (123. minutes) remained similar from hatching to fledging ( $r = 0.07$ ,  $P > 0.9$ ,  $N = 90$ ). Extrapolation from intervals, as well as direct observations of number of fish offered indicated that the chick consumed about 10 fish per day (Table 1). Mean durations of feeding flights was shorter in the first 4 days ( $\bar{x} = 37.3$ ) than from Day 27<sup>( $n = 46$ )</sup> ( $\bar{x} = 72.2$ ,  $t = 3.66$ ,  $P < 0.001$ ,  $DF = 46$ ).

There were regular diurnal changes in the number of fish offered to the chick, with fewer fish brought from the ocean near mid-day than in the morning and evening; this corresponds with an increase in the average duration of feeding trips to the ocean at mid-day (Figure 1). We have no evidence for flights during darkness, but on 3 occasions, one of the parents was observed leaving for the ocean at twilight.

#### DISCUSSION

Pedersen (19 ), working with Red-throated Loons in Greenland, observed that invertebrates were the main diet of the young during the 3 days following hatching. Our observations show that small fish were the only food item offered by the adults throughout the pre-fledging period. In eastern Canada, the adult loons brought sandlances (Ammodytidae), gunnels (Pholidae) and capelin (Osmeridae) to the young (Johnson and Johnson 1935) which, similar to those groups offered in the present study, have a high length to depth ratio. Cramp and Simmons (1977) and Rankin (19 ) have noted that

Why not put in  
how many?  
"numbers"  
means  
nothing -  
better to leave  
out

fish offered by the parents are frequently too large to swallow, implying that the adults are not choosing an appropriate size class of prey. While we observed ~~a number of~~ instances in which the chick was unsuccessful in orienting and manipulating the fish for swallowing, in only 1 of 171 feedings was the fish too large to be swallowed. This fish (Cymatogaster aggregata) was within the same body length range of other fish offered, yet had the greatest body depth (43.8 mm). Long, shallow bodied fish, which predominated in the diet, provide a large mass in proportion to depth. Even the longest sandlance had a body depth of only 13 mm.

Fish were regularly dropped by the chick during manipulation and were retrieved from the bottom by the parents, similar to the behaviour of Yellow-billed Loons (Gavia adamsii) (Sjolander and Agren 1976). As well, the parents dove repeatedly under the chick after the fish was swallowed throughout the pre-fledging period, even in cases where the tail of the fish protruded from the mouth of the chick. The adult birds did not seem to be capable of distinguishing between "dropping" and "swallowing" and appeared to respond principally to the visual disappearance of the fish. Such redundancy is probably functional in view of the high probability of the chick dropping the fish and the possibility of the chick regurgitating with its head underwater, which we observed in one instance. The energy investment in feeding flights is high (Norberg and Norberg 1976) and such diving behaviour would insure that the prey was utilized.



~~We observed the~~ Adults from both nest sites regularly foraging in Drizzle Lake, yet it is puzzling that lake fish were not fed to the young, except in one instance just prior to fledging. Although ~~Adult~~ three-spine stickleback may not be suitable prey for the chick because of their large stout spines, <sup>but</sup> char (Salvelinus malma), cutthroat trout (Salmo clarki) and juvenile coho salmon (Onchorhynchus kisutch) are all within an appropriate range of length (10 - 150 mm) and body depth. <sup>and are present in the lake</sup> Red-throated Loons normally nest on ponds (1-25 ha) too small to support fish and consequently must fly to larger fishing lakes or to the ocean to obtain prey for the young. In exceptional instances, in which the birds nest on larger lakes with fish, such as the present study, it may be satisfactory to argue that the birds lack sufficient behavioural plasticity to use resident fish for feeding the young. This species exhibits highly stereotyped behaviour during courtship and choice of nesting ponds in northern Europe (Sjolander 1980). However, <sup>since</sup> one would expect selection to favour behaviour which minimizes energy expenditure in feeding the young (i.e., fewer flights to the ocean), ~~there~~ there may be disadvantages, as yet unknown, to foraging and nesting in the same habitat. In Sweden, Red-throated Loons do not nest on fishing lakes, even in the absence of competing species and the presence of appropriate nesting habitat. (Sjolander 1980).

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Durations of feeding flights (min)

70  
60  
50  
40  
30

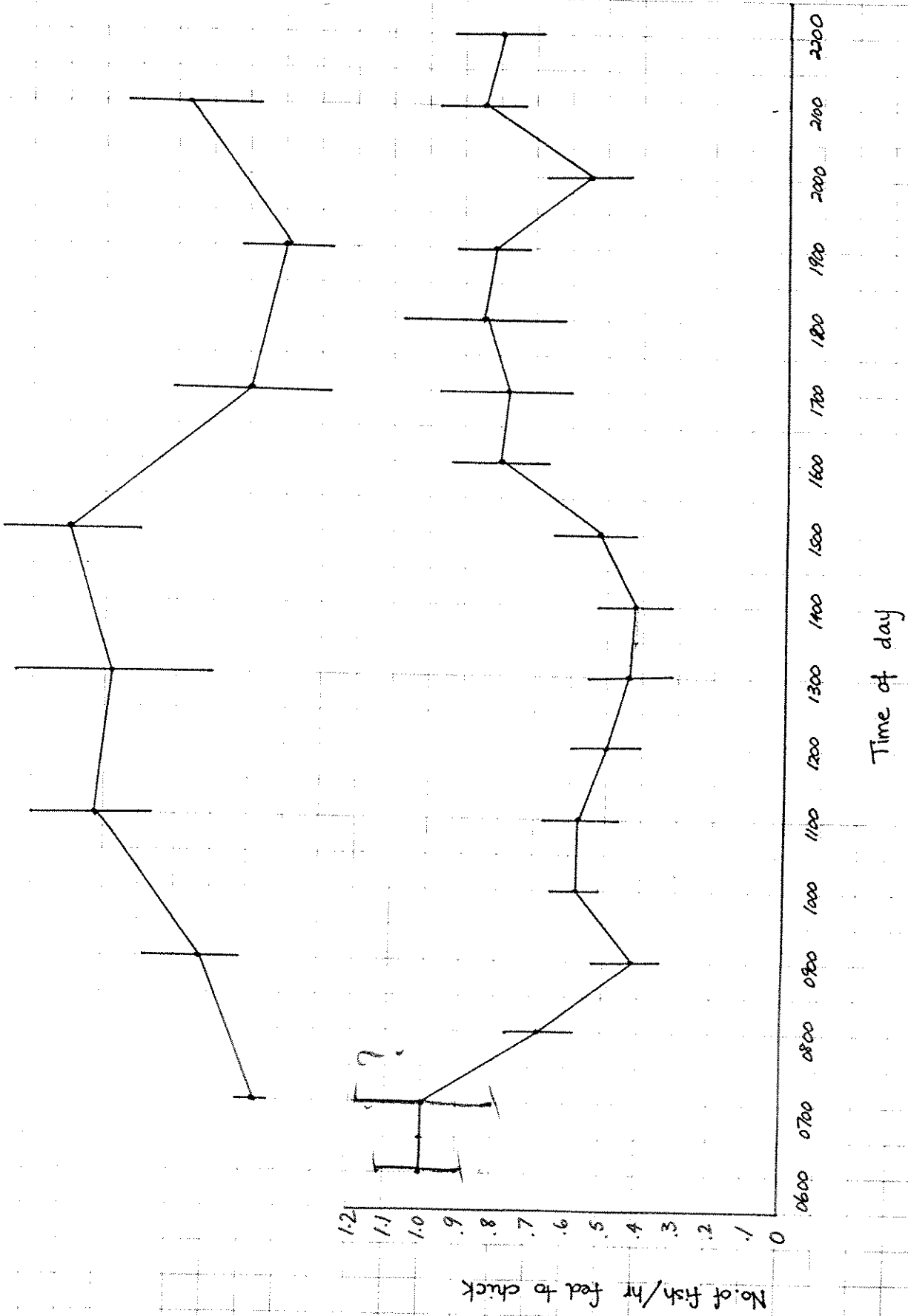


Figure 1. Mean number of fish fed to chick per hour and durations of feeding flights to ocean by adults. There was no significant heterogeneity over the pre-fledging periods; accordingly data is pooled. Vertical line =  $\pm 1$  S.E.

