POST-HATCHING MOVEMENTS OF YOUNG ANCIENT MURRELETS

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Precocial development in truly marine birds is exhibited by only four species, all alcids. Other species in the family are semi-precocial or exhibit a developmental pattern intermediate between these two (Ricklefs 1973, Sealy 1973, Birkhead 1977). The movement of newly hatched murrelets away from the colonies permits them to use what appears to be a patchily distributed food supply at sea (Lack 1968, Sealy 1975a, 1975b, 1976). The young of most other marine birds that exploit patchily distributed food or distant food resources develop slowly in their nest sites because they are fed infrequently (Ashmole 1971).

COMPOSITION OF FAMILY GROUPS

Most Ancient Murrelet *(Synthliboramphus antiquus)* family groups consist of two adults with two young (Table 1). Adults of both Craveri's Murrelet *(Endomychura craveri)* and Xantus' Murrelet *(E. hypoleuca)* accompany their two chicks at sea (De Weese and Anderson 1976, George L. Hunt pers. comm.). Single young of Common Murres *(Uria aalge)*, which leave the nest site at 3 weeks of age, are accompanied usually by the adult male (Scott 1973).

MOVEMENTS OF FAMILY GROUPS

Little is known of the behavior and movements of precocial murrelets during their post-hatching development. Two-day-old Ancient Murrelets leave their concealed nest burrows at night, often in great numbers (Willett 1915, Guiguet 1953a, Sealy pers. obs.), and are gone by sun-up from the colonies and surrounding waters. This exodus occurs from late May to late June on Langara Island, Queen Charlotte Islands, British Columbia (Sealy 1976). During this period in 1970 and 1971, Sealy never saw Ancient Murrelet family groups within the 15-20 km radius off Langara Island that he regularly covered. Discussions with fishermen who had fished that area for many years revealed that only an occasional family group was seen, usually west of Langara Island and north of Frederick Island. Charles J. Guiguet (pers. comm.) believes, based on many years of at-sea observations in British Columbia, that these family groups move directly to offshore waters where the young grow. He saw adults and downy young only once nearshore, on 1 June 1959 (Table 1). Bartonek and Gibson (1972) saw families with downy young from 30 to over 40 miles from shore off the Alaska Peninsula. George L. Hunt (pers. comm.) radio-tracked a Xantus' Murrelet with brood from its nesting site on Santa Barbara Island, California, and lost contact 16 km offshore.

The dearth of sight records of Ancient Murrelet family groups is puzzling. Vermeer and Vermeer (1975) indicated that 190,000 pairs of Ancient Murrelets nest in British Columbia at 22 colonies (the number of known nesting colonies is now 30 with the completion of the British Columbia Provincial Museum west coast seabird colony survey). Sightings of family groups are very few despite the thousands that must be at sea in June and July each year. Therefore these groups probably disperse widely after leaving the colonies. As well as moving offshore, some family groups move southward (see observations off Vancouver Island, Table 1) to areas where Ancient Murrelets are not known to nest. The Vancouver Island sightings were made 2-6 weeks after young on Langara Island have started to leave the colony. Ancient Murrelets gradually build up in numbers in Barkley Sound, Vancouver Island, beginning in mid-July (Hatler et al. 1978). The southward movement continues in late fall and winter until they reach northern and central California (Grinnell and Miller 1944, Ainley 1976).

In mid-July many young Ancient Murrelets, now about adult size and in juvenal plumage, begin moving back to inshore waters. Sealy first saw such young near Langara Island on 10 July 1971, and their numbers increased after that time. Eight such young averaged 208 g in weight (extremes, 183.9 and 220.3 g) and were similar to breeding adults (Sealy 1976). Except for one observation on 18 July 1971 (Table 1), these young were not accompanied by adults. The adults possibly stay offshore in mid-July and molt.

Table 1. Location and composition of Ancient Murrelet family groups observed at sea.

AREA	DATE	FAMILY GROUP[1]	OBSERVERS
ALASKA			
Between Forester and Dall islands	21 July 1920	2A, 2Y	Willett (1920)
Bristol Bay	20-26 July 1969	8A, 8DY	Bartonek and Gibson (1972)
QUEEN CHARLOTTE ISLANDS			
S.W. Moresby I. (1.6 km offshore)	1 June 1959	1A, 2DY	Drent and Guiguet (1961)
Egeria Bay, Langara I.	18 July 1971	1A, 2Y	Sealy (1976)
Hecate Strait	16 June 1972	2A, 1Y	P. W. Martin
Hecate Strait	22 July 1973	2A, 1Y	P. W. Martin

Table 1 (Cont.)

AREA	DATE	FAMILY GROUP[1]	OBSERVERS
BRITISH COLUMBIA MAINLAND COAST			
28-32 km W. Goose I.	13 June 1945	2A, 2DY	Guiguet (1953b)
Goose I. Banks	8 June 1947	several	Martin and Myres (1969)
Goose I. Banks	6, 8 June 1972	2A, 1Y	P. W. Martin
Goose I. Banks	30 June 1972	2A, 1Y	P. W. Martin
Off Blackney I.	19 June 1976	2A, 1Y	R. W. Campbell, M. S. Rodway
Off Goose I.	21 June 1976	7A, 4DY	R. W. Campbell, M. S. Rodway
Off Simonds Group	21 June 1976	2A, 1DY	R. W. Campbell, M. S. Rodway
W. Limit I.	21 June 1976	1A, 1DY	H. R. Carter, K. Taylor
Moore Island	25 June 1976	4A, 2DY	R. W. Campbell, M. S. Rodway
VANCOUVER ISLAND[2]			
Triangle Island	24-30 June 1949	2A, 2Y	G. C. Carl, C. J. Guiguet
Quatsino Sound	16 July 1949	2Y	Martin and Myres (1969)
Quatsino Sound	31 July 1949	increasing no. of imms.	Martin and Myres (1969)
Triangle Island	29 June 1972	4A, 4DY	C. J. Guiguet[3]
Triangle Island	16 June 1974	3A, 1Y	K. R. Summers
Triangle Island	2 July 1974	2A, 1Y	Vermeer et al. (1976)
	TOTALS[4]	49A, 37(DY & Y)	

1 A: adult; DY: downy young; Y: young in juvenal plumage.

2 Observations off Vancouver Island, where Ancient Murrelets do not nest, indicate that the presence of family groups does not imply that nesting occurred nearby (but see Vermeer et al. 1976).

3 Two downy young collected (British Columbia Provincial Museum 11899, 11900).

4 Data include 49 adults, 37 young (young without adults not included), 21 adult-chick groups. Young per adult=1.3; young per group=1.8.

Evidence indicates that Ancient Murrelets prefer colder waters. Ainley (1976) found that they arrived in northern California in November coincident with the decrease in surface temperatures. Also, the species was present in greatest numbers off California during winters of low water temperature (9°C-10°C). Departure from California occurs suddenly in March (Ainley 1976), when adults begin returning to the vicinity of nesting colonies on the Queen Charlotte Islands (Sealy 1976). Water temperatures near Langara Island average 7°C in March and rise to 11°C in June (Dodimead et al. 1963), when family groups are moving away from the colonies.

DISCUSSION

Why are vulnerable, downy young Ancient Murrelets moved out to sea away from the protection of burrows in the nesting colonies? The answer appears to lie in the use by this species of available food resources. All other alcids, except murrelets of the genus *Endomychura*, rear their young in nest sites and bring them food from the sea, at least during their first few weeks. The Ancient Murrelet's breeding strategy differs from that of semi-precocial alcids in that its incubation shifts are 72 hours (long for an alcid) and young are not fed during their 2 days in the nest (Sealy 1972, 1976). Long incubation shifts and the eventual long intervals between chick feedings suggest that food is either far from the colonies, as happens with many procellariiforms (see Ashmole 1971), or is patchily distributed and requires much time to locate. Evidence indicates the latter situation exists with Xantus' Murrelet (Eppley and Schwartz 1976). Also, the precocial murrelets lack specialized morphological apparatus, seen in plankton-feeding auklets (Bédard 1969a, Speich and Manuwal 1974) and fish-feeders (Bédard 1969b), which would facilitate the transport of economically feasible amounts of food to the two young in the nest.

Scott (1973) postulated that the number of Common Murre parents that accompany their single chicks varies with the availability of food. Presence of the usual family group, with the male accompanying the young, reveals normal feeding conditions in which only one parent is needed to obtain enough food for the developing young. The adult female murre possibly spends more time protecting the chick on the open cliff ledge or feeding it during its 3-week period in the nest (see Birkhead 1977). It may be advantageous for adult males and their fledglings to move away from the colonies, thereby reducing competition with females for food. Two Ancient Murrelet parents, however, may be needed to locate and obtain enough food for both young.

The observations in Table 1 suggest that family groups are isolated from one another and are dispersed widely at sea. This isolation contrasts with the gregarious habits of Ancient Murrelets in winter and at

breeding colonies. In a precocial species such as the Ancient Murrelet, if the food supply is uniformly distributed, adults and their young should remain rather evenly spaced throughout their environment. Avoidance of other groups would have the advantage of not attracting predators. Capture rates should average higher if another group has not foraged recently over the same area. On the other hand, when food is highly clumped, distribution of adults and young should reflect the uneven distribution of the food supply (Lack 1968, Orians 1971).

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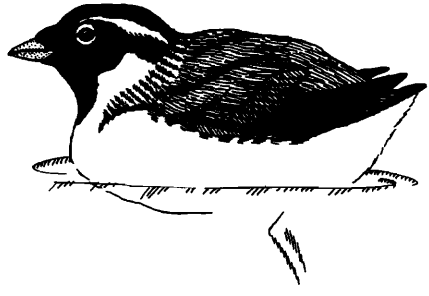

Ancient Murrelet

Sketch by Narca Moore