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American Dipper, *Cinclus mexicanus,* foraging on Pacific salmon, *Oncorhynchus* sp., eggs

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We quantified the feeding rates of American Dippers (*Cinclus mexicanus)* foraging for salmon eggs and invertebrates along salmon rivers in southeastern Alaska. Dippers foraging in salmon-spawning stream reaches ate 1.8 eggs/minute versus 0.6 invertebrates/minute in non-spawning reaches. The success of dippers foraging for eggs, combined with high nutritional value of salmon eggs and their availability, may have consequences for dipper reproduction and populations.

Key Words: American Dipper, *Cinclus mexicanus*, Pacific Salmon, *Oncorhynchus*, predation, foraging, southeastern Alaska.

Pacific salmon (*Oncorhynchus* sp.) range along the Pacific coast of North America from California to Alaska, spawning inland to Idaho and the Yukon. During the spawning period, healthy salmon runs consist of thousands of fish and several species may choke streams from June to December. The range and intensity of salmon runs create the potential for strong ecological interactions through nutrient transfer from marine to freshwater and terrestrial systems (Willson et al. 1998), as well as direct consumption of spawning adult salmon, salmon carcasses, eggs, and rearing juveniles (Willson and Halupka 1995). Ecological interactions affect not only vertebrate predator/scavengers, such as Mink (*Mustela vison*; Ben-David et al. 1997), Brown Bear (*Ursus arctos*; Barnes 1989; Welch et al. 1997), and Bald Eagles (*Haliaeetus leucocephalus*; Stalmaster and Kaiser 1997), but also the aquatic biota (Wipfli et al. *in press*) and terrestrial vegetation (Bilby et al. 1996).

There have been few studies on the use of salmon eggs by wildlife (Willson and Halupka 1995). Fish eggs have been reported in dipper diets several times (Munro 1924; Ehinger 1930; Piorkowski 1995), but concentrated feeding on salmon eggs has been little reported. We observed American Dippers on several salmon streams along Lynn Canal in southeastern Alaska, documenting their utilization of salmon eggs.

Methods

We observed foraging dippers for approximately 15 hours at close range (< 50 m) along the Berners River using binoculars (Pentax 12x24) and recorded detailed notes on feeding behaviors. We measured with a hand-held stopwatch the time spent foraging and documented the type of prey (invertebrates or salmon eggs) consumed. Feeding rates were calculated as the number of prey items consumed per minute of foraging time. Dippers were observed from when they arrived at a stream reach until they left. We also observed dippers foraging on salmon eggs at Salmon Creek, Juneau, Alaska (58°30′N, 133°30′W), Berners River (40 miles northwest of Juneau; 58°55′N, 135°27′W), and Herman Creek, Haines, Alaska (59°30′N, 136°00′W).

Results and Discussion

On 10 July 1997, a family group consisting of one adult dipper with two fledglings was observed foraging on Salmon Creek. The group flew between gravel bars, where the adult entered Chum Salmon (*O. keta*) spawning redds, probing the substrate for shallowly buried eggs. The fledglings waited on shore for the adult to return with eggs, whereupon they begged for food. The adult collected seven eggs in four minutes. In July and August, 1998, we frequently observed dippers foraging on "drift eggs" (eggs not buried in redds) in several streams near Juneau.

On 17–23 October 1997, we observed multiple dippers (8–12 individuals) foraging for Coho Salmon (*O. kisutch*) eggs on the upper Berners River. Individuals were not marked, nor were they distinguishable except when viewed simultaneously. As

before, dippers probed for shallowly buried eggs in the spawning redds. The average feeding rate for all dippers feeding on salmon eggs was 1.8 eggs/minute (23 bouts, 74 min.). For dippers feeding on invertebrates in non-spawning reaches, the feeding rate was 0.6 invertebrates/minute (12 bouts, 62 min.).

From early November to late December dippers were observed on Herman Creek. Coho Salmon were spawning in the stream during this time and dippers (3–5 individuals) were observed on several occasions foraging for eggs.

Dippers exhibited several foraging modes (*sensu* Kingery 1996) when searching for salmon eggs. Depending on water depth and availability of rocks to perch on, dippers used dive-plunging (jumping from rocks and diving to stream bottom), wade-plunging (wading and dipping head or head and body into stream), and swim-plunging (swimming on surface, then diving to bottom).

These observations show that American Dippers target and exploit salmon eggs as a food source from at least July to December in southeastern Alaska. Eggs may be available to dippers in stream gravel even after salmon have stopped spawning, thus extending the resource temporally. Given the geographic distributions of dippers and salmon, it is likely that the observed interaction is widespread where salmon populations are healthy. Salmon eggs provide a readily available, highly nutritious food source for dippers: Chum Salmon eggs contain about 3600J of energy, and the smaller eggs of Pink Salmon (*O. gorbuscha*) contain about 1420J (K. E. Obermeyer, unpublished data). In contrast, invertebrates from streams in this area contain an average of about 250J per prey item (K. E. Obermeyer, unpublished data); these values are similar to those reported in the literature (e.g., Cummins and Wuycheck 1971; Higgs et al. 1995). Thus foraging on salmon eggs clearly provided much higher levels of energy yield per item captured than foraging on invertebrates, as well as higher foraging rates.

Although dippers ate salmon eggs rapidly during foraging bouts, this rate is not sustained throughout the day; rapid intake rates permitted much time to be spent in non-foraging activities (e.g., preening and singing). It is unlikely that egg-foraging by dippers has a detrimental effect on healthy salmon populations (Munro 1924), because they are unable to reach eggs that are buried at normal depths of several centimenters and therefore only forage on eggs that probably would not survive anyway.

The availability of salmon eggs may influence dipper fledgling survival in late summer and fall and the body condition of birds preparing to overwinter. In addition, salmon carcasses increase the number of stream invertebrates and probably the biomass of young salmonids also (Bilby et al. 1996; Wipfli et al. 1998). Dippers feed on young fish as well as invertebrate prey (Munro 1924; R. H. Armstrong, personal communication; our 1998 observations). There exists a strong relationship between dipper abundance and their food (Ormerod et al. 1985). Furthermore, dipper fledgling survival is positively correlated with invertebrate availability (Price and Bock 1983), and nesting success may also be influenced by the abundance of food or body condition of the adults.

Future research should examine the effects of salmon on dipper biology and ecology including survival, reproduction, and seasonal movements. Many other species of birds, mammals, fish, insects, and vegetation are influenced by healthy salmon runs. Research on these interactions is essential to understanding Pacific salmon ecosystems and possible consequences for wildlife, if salmon populations in the north Pacific were to decline as they have in the Pacific Northwest (Nehlsen et al. 1991).

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Additional Extralimital Records of the Harp Seal, *Phoca groenlandica*, from the Bay of Fundy, New Brunswick

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McAlpine, Donald F., and Robert J. Walker. 1999. Additional extralimital records of the Harp Seal, *Phoca groenlandica*, from the Bay of Fundy, New Brunswick. Canadian Field-Naturalist 113 (2): 290–292.

Three recent extralimital records of the Harp Seal, *Phoca groenlandica*, from the Bay of Fundy, New Brunswick, are documented. These observations coincide with a dramatic increase in extralimital occurrences for this seal along the Maine coast from 1994-1996. Winter ocean surface currents may limit the probability that Harp Seals straying outside their normal range enter the Bay of Fundy.

Key Words: Harp Seal, *Phoca groenlandica*, Bay of Fundy, New Brunswick, distribution.

McAlpine and Walker (1990) reviewed extralimital records for the Harp Seal, *Phoca groenlandicas*, in the western North Atlantic, noting that there was only a single, verifiable, report from the Bay of Fundy during the previous 148 years. Here we document three recent additional records of Harp Seals from the northern end of the Bay of Fundy. We show that these observations coincide with a dramatic increase in extralimital occurrences for both the Harp and Hooded seals that have been documented along the Maine coast since 1994 (Stevick and Fernald 1998; McAlpine et al. *in press*). However, we also suggest that winter ocean surface currents in the Bay of Fundy limit the probability that Harp Seals straying outside their normal range will enter the Bay. McAlpine et al.(*in press*) review possible hypotheses that may explain an apparent increase in numbers of ice-breeding seals in the northern Gulf of Maine region since about 1994.

On 14 March 1995, Walker and three others, while observing seabirds, sighted an adult Harp Seal on an ice cake about 1 km offshore of Waterside, Albert County, New Brunswick (45°38′ N, 64°50′ W). The characteristic pattern produced by the dark head and "harp" were visible on the animal during the hour and more it was observed from shore through two 40× Questar scopes. Observational details and sketches have been archived in the New Brunswick Museum marine mammal observational files. On 11 April 1997 a young seal was discovered and photographed (Figure 1) by local residents on Alma Beach, Fundy National Park, Albert County, New Brunswick (45°36′ N; 64°57′ W). This photo shows a one-year-old Harp Seal. Similarly, on 18 March 1995 a small, "light gray, seal with dark spots", probably also a young Harp Seal, was observed to crawl off an ice cake which stranded at high tide on Alma Beach. These March and April