

GENERAL NOTES

The *pikai* Plumage of the Least Tern.—In a previous paper concerning plumage sequences of the Least Tern (*Sterna albifrons*) we mentioned the presence on southern California breeding grounds of birds which were intermediate in head pattern and bill coloration between first alternate (*portlandica*) plumage and definitive alternate (nuptial) plumage (Massey and Atwood 1978). At the time we had no conclusive banding data regarding the age of these birds, and suspected that such individuals, referred to as being in *pikai* plumage (Lawrence 1853, Cullen 1957, Grant et al. 1971), might be 2-year-olds that had failed to fully acquire definitive alternate plumage. However, we did not exclude the possibility that *pikai* individuals were "hormonally advanced" 1-year-olds in a first alternate plumage distinct from *portlandica*.

As a result of ongoing research on the endangered California population, we have now obtained a minimum of 11 recoveries of color-banded, known-aged Least Terns in *pikai* plumage, and all have been one year of age. Furthermore, of at least 40 known 2-year-olds which have now been recovered within the breeding range, all have acquired full definitive alternate (nuptial) plumage with no evident tendencies toward *pikai* characters.

Therefore, both *portlandica* and *pikai* plumages should be considered representative of the species' first-summer plumage. This plumage is best described by wing characteristics, which consist of dark gray cubital bar and dark gray inner, as well as outer, primaries. Head characteristics of the first alternate plumage appear quite variable, with *portlandica* (black bill and black eye stripe extending back on head to form nuchal collar) and *pikai* (yellowish bill with varying amounts of dusky or blackish and head pattern approaching that of nuptial plumage but with considerable white flecking in the black crown) merely being two extremes of a single continuum.

California Least Tern banding operations were conducted under authorization of state and federal banding permits and Endangered Species Banding Permit PRT-8-207-B-C issued to Charles T. Collins.

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Avian Predation on Winter Stoneflies.—Stonefly (Plecoptera) larvae comprise a significant part of the diet of trout and other freshwater fishes (Eddy and Underhill 1974), but little is known of terrestrial mortality in these insects. Many species emerge during late winter and early spring when ambient temperatures at northern latitudes are frequently near or below freezing and snow cover is present. As they emerge to mate, slow moving adults are conspicuous against the snow, making them vulnerable to avian predators.

From 19-25 March 1980, I observed four species of birds feeding on stoneflies (*Taeniopteryx nivalis*) emerging from the Chippewa River and one of its tributaries near Mt. Pleasant, Michigan. Ambient temperatures ranged from -4° to +6°C during observation periods, and water was free of ice. Patches of snow persisted on banks protected from direct sunlight, but 5 cm of snow fell on 25 March.

Few species of birds have been reported feeding on winter stoneflies. Hamilton (1932) noted Blue Jays (*Cyanocitta cristata*) feeding on plecopterans in late winter, and Pinkowski (1976) reported Eastern Bluebirds (*Sialia sialis*) and Cedar Waxwings (*Bombycilla cedrorum*) feeding on stoneflies in southeastern Michigan during mid-March. This note reports additional avian predators exploiting plecopteran prey in central Michigan.

Three White-breasted Nuthatches (*Sitta carolinensis*) gleaned stoneflies from ridges of bark on black willow (*Salix nigra*) and repeatedly foraged around the bases of the trees where stoneflies were densely aggregated. The birds continued to feed on insects crawling along the bank of the river. Although McAtee (1926) reported that arthropods comprised the diet of nuthatches, he did not mention aquatic insects.

Following snowfall on 25 March, approximately 15 American Robins (*Turdus migratorius*) took shelter in a heavily forested ravine and fed on stoneflies emerging from a stream. The birds were dispersed along the bank and selected naiads on exposed debris or adult insects crawling along exposed shoreline.

Rather than obtaining their prey by flycatching (Pinkowski 1976), flocks of Cedar Waxwings gleaned stoneflies directly from the low branches of dogwood shrubs (*Cornus* sp.) or from the ground. Although they are largely frugivorous, waxwings have been reported feeding on aquatic insects including stoneflies (McAtee 1926).

Common Grackles (*Quiscalus quiscula*) obtained stoneflies by wading in water. Four birds moved methodically in shallow water along the shoreline, where they searched for emerging naiads and adult insects. Several aquatic arthropods have been reported as part of this grackle's omnivorous diet (Bent 1958).

Large emergences and an inability to move quickly at cool ambient temperatures make stoneflies easy prey for foraging birds. Furthermore, the extent of wing development in adult stoneflies is variable, and some species cannot fly (Merritt and Cummins 1978). As they move conspicuously over snow, the insects frequently select dark or cryptically colored substrates that serve for copulation or perhaps to enhance thermoregulation (R. H. King, pers. comm.).

Pinkowski (1976) suggested that emerging stoneflies might enhance the survival of early avian migrants. This would be especially true when other sources of food were inaccessible after late winter or early spring storms. In addition, an insectivorous diet may provide supplementary resources facilitating egg production in species whose breeding cycles begin early. However, foraging on winter stoneflies probably reflects opportunistic behavior because the availability of insects varies with water conditions. When ice cover is extensive, stoneflies may emerge and mate in the space that forms between the ice and the water surface (Sailer 1950, Clifford 1969), thus preventing predation by birds.

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