Diomede (SBCM 9089). Both of these birds also have bills too small to be those of *A. a. polaris* (Table 1). *Alle alle alle* is the more widespread subspecies, whereas *A. a. polaris* is known to breed only at Franz Josef Land and possibly Severnaya Zemlya (Vaurie 1965); the identity of the subspecies that breeds at the latter location is not clear, however (Cramp 1985).

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LITERATURE CITED

American Ornithologists' Union. 1983. Checklist of North American birds. 6th ed. American Ornithologists' Union, Washington, DC.

Bailey, A. M. 1948. Birds of arctic Alaska. Colo. Mus. Nat. Hist., Pop. Ser., No. 8:1–317.

Cramp, S. [ed.]. 1985. Handbook of the birds of Europe, the Middle East, and North Africa, Vol. IV: Terns to woodpeckers. Oxford Univ. Press, New York.

Divoky, G. J. 1984. The pelagic and nearshore birds of the Alaskan Beaufort Sea: biomass and trophics, p. 417–437. *In* P. W. Barnes, D. M. Schell, and E. Reimnitz [eds.], The Alaskan Beaufort Sea: Ecosystems and environments. Academic Press, Orlando, FL.

Hersey, F. S. 1916. A list of birds observed in Alaska and northeastern Siberia during the summer of 1914. Smithson. Misc. Coll. 66:1–33.

Holmes, R. T. 1968. A Dovekie on the Pribilof Islands, Alaska. Condor 70:86.

Kessel, B., and D. D. Gibson. 1978. Status and distribution of Alaska birds. Stud. Avian Biol. 1:1–100.

Portenko, L. A. 1973. [Birds of the Chukotsk Peninsula and Wrangel Island, Part II]. Nauka, Leningrad, U.S.S.R.

Roby, D. D., K. L. Brink, and D. N. Nettleship. 1981. Measurements, chick meals, and breeding distribution of Dovekies (*Alle alle*) in northwest Greenland. Arctic 34:241–248.

Sealy, S. G., J. Bédard, M.D.F. Udvardy, and F. H. Fay. 1971. New records and zoogeographical notes on the birds of St. Lawrence Island, Bering Sea. Condor 73:322–336.

Smith, T. G. 1973. The birds of Holman region, western Victoria Island. Can. Field-Nat. 87:35–42.

Stenhouse, J. H. 1930. The Little Auk (*Alle alle polaris* Sub-Sp. Nov.) of Franz Josef Land. Scott. Nat. 182:47–49.

Vaurie, C. 1965. The birds of the Palearctic fauna: Non-Passeriformes. Witherby, London.

The Condor 90:714–715

THE "BUGS" CALL OF THE CLIFF SWALLOW: A RARE FOOD SIGNAL IN A COLONIALLY NESTING BIRD SPECIES[1]

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Key words: Food signals; information center; Cliff Swallow; coloniality.

I report here the description of a vocalization that appears to act as a food signal in a colonial passerine, the Cliff Swallow (*Hirundo pyrrhonota*). Food signals have great potential importance to the information center hypothesis (Ward and Zahavi 1973) which states that birds living in communal roosts may gain information concerning foraging success and location from successful returning foragers. While food signals appear ubiquitous within the Galliformes where they serve a courtship function and facilitate feeding chicks (e.g., Williams et al. 1968, Stokes 1971, Stokes and Williams 1972, Heinz 1973), among colonially nesting birds there have been no reports of vocalizations that serve the sole purpose of recruiting colony mates to newly discovered food patches.

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Colonially nesting swallows are ideal candidates for information center function because they feed on ephemeral insect swarms which reduces the cost of sharing information on foraging location and success, since the swarms will last only tens of minutes even if undisturbed. Brown (1986) has demonstrated that passive food information transfer occurs frequently at Cliff Swallow colonies.

While studying vocal recognition within family groups of Cliff Swallows in Washington, I observed the following sequence on seven occasions in 4 years: one adult swallow would fly directly towards the colony. At a distance of about 10 m, it would give a loud call *tseer* similar to the species' alarm call, but less nasal in quality, probably due to a lack of the alarm call's second voice. The caller would not land and feed its young but rather would turn and fly straight back in the direction from which it came, sometimes repeating the call two or three times. Every adult swallow in the colony would then leave its nest and fly in the same direction as the caller. Shortly the swallows would encounter an insect swarm and feed rapidly. In approximately 3 min, the swallows would return to the colony and feed their nestlings. Often both parents would arrive simultaneously at the nest and one would wait, clinging to the outside of the nest, while the other delivered its food. Because both parents could not simultaneously feed young, the next outward volley of foragers was less synchronous than the first and there never appeared to be a third foraging attempt at the initial site of the insect swarm. What I observed I can only interpret as an individual actively sharing information about a productive foraging site, thus I have termed the *tseer* vocalization the "bugs" call.

Close observation of the insect swarm (shoreflies Ephydridae and shore bugs Saldidae) during one foraging bout following a bugs call, revealed that the foraging swallows flew straight through the middle of the insect mass and disrupted the swarm within 5 min, during the second foraging volley, rather than consuming it all. Thus, there appeared to be a cost associated with recruiting the entire 45-pair colony out to the feeding site. This disruption is consistent with observations I have made of mixed-species groups of swallows feeding on midges (Chironomidae). There too, the swallows have flown through the middle of the swarms and the insects have dispersed within 3 to 5 min, only to reswarm in the same location after the swallows left to feed on a nearby swarm.

The colonies where I have heard the bugs call and witnessed the ensuing foraging sequence have been small, two colonies of 45 and 100 pairs in eastern Washington (*H. p. hypopolia*) and one colony of five pairs on the Olympic Peninsula (*H. p. pyrrhonota*) (subspecies names follow Behle 1976). The bugs call and its associated foraging recruitment behavior was an infrequent event among Cliff Swallows at these colonies. Given the rarity of the bugs call foraging sequence during my observations, I conclude that this active food information transfer behavior does not account for the major portion of the information center function of Cliff Swallow colonies as demonstrated by Brown (1986). I have only observed this call sequence when the foraging has been poor. For instance, all seven observations occurred in the late afternoon rather than the morning or evening when aquatic insects were at peak emergence. Two occurred on unseasonably cool days, and five occurred on very hot days. Two in the latter group occurred 10 min after a desert thunderstorm. Although the bugs call is rarely given it may serve an important function by helping colony members to feed their nestlings when foraging is poor.

On four occasions I have been able to point out the bugs call and accompanying behaviors to other biologists. One year, I obtained a recording of the *tseer* vocalization but wind distortion made it unsuitable for use as a playback stimulus or even for a reasonable sonogram. The following year, a colleague and I camped beside a colony for a month trying to record the *tseer* vocalization but we only heard it on two occasions, both immediately after thunderstorms when our tape recorders had been taken inside the tent.

To date, there has been no mention of any vocal signal matching the description of the bugs call in the work on Cliff Swallow vocalizations (Samuel 1971, Brown 1985 and pers. comm.). As I have discovered, direct pursuit of the bugs call problem reaps a low rate of return. Researchers working on small colonies of Cliff Swallows should keep sharp watch for the characteristic mass-foraging exodus following a loud clear call. Any recordings of the *tseer* vocalization would be especially valuable for both descriptive and experimental work. With enough observations in well-studied colonies, we may gradually amass sufficient information to understand how the bugs call relates to kin benefits, colony size, reciprocity, and other aspects of colonial breeding.

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LITERATURE CITED

BEHLE, W. H. 1976. Systematic review, intergradation, and clinal variation in Cliff Swallows. Auk 93:65–77.

BROWN, C. R. 1985. Vocalizations of Barn and Cliff swallows. Southwest Nat. 30:325–333.

BROWN, C. R. 1986. Cliff swallow colonies as information centers. Science 234:83–85.

HEINZ, G. H. 1973. Responses of ring-necked pheasant chicks (*Phasianus colchicus*) to conspecific calls. Behaviour 21:1–9.

SAMUEL, D. E. 1971. Vocal repertoires of sympatric Barn and Cliff swallows. Auk 88:839–855.

STOKES, A. W. 1971. Parental and courtship feeding in Red Jungle Fowl. Auk 88:21–29.

STOKES, A. W., AND H. W. WILLIAMS. 1972. Courtship feeding calls in gallinaceous birds. Auk 89: 177–180.

WARD, P., AND A. ZAHAVI. 1973. The importance of certain assemblages of birds as "information centres" for food finding. Ibis 115:517–534.

WILLIAMS, H. W., A. W. STOKES, AND J. C. WALLEN. 1968. The food call and display of the Bobwhite Quail (*Colinus virginianus*). Auk 85:464–476.