since nests were inaccessible. However, the stomachs of adult sparrows collected at the Poultry Unit were found to contain 80–97% poultry mash by weight (Nawawi and Jantan 1977). Chia et al. (1963) observed that insects constitute 91% of foods consumed by tree sparrow nestlings. Although the poultry mash's nutritive value may be comparable to or even surpass that of insects, its granular texture may prevent successful transport to the nestlings. If nestlings must be fed insects, then the discontinuity in breeding may occur when the abundance of insects suitable for feeding young is low. The molt and rainfall data presented in Table 1 suggest that the termination of reproductive activities may in part be controlled by the need to complete molt before the period of heavy rains. The curtailment of breeding and molt in the UPM tree sparrow population, in spite of the continuous and unlimited availability of high-quality food, indicates that the occurrence of these activities can be extended under favorable food conditions only up to a point. The ultimate extent of breeding may alternately be limited by the availability of suitable food to feed the young, and by the necessity to molt, which appears to be regulated by an endogenous schedule (Snow, Ibis 118:366–401, 1976) to avoid the period of heavy rains.

Acknowledgments.—S. Gopal, S. Mat, and Z. A. Manaf aided in the collection of sparrows. M. Mustaphar, Mokhtaruddin and A. Tahar of the Soil Science Department at UPM kindly provided the rainfall data they compiled. This paper was improved by comments from P. F. Becker, S. M. Goodman, Lord Medway (now the Earl of Cranbrook), D. A. Nelson, R. B. Payne, R. W. Storer, and D. W. Wells. Peace Corps Malaysia and the Faculty of Science and Environmental Studies of the Universiti Pertanian Malaysia provided living expenses and logistical support, respectively, during the study. Computer funds for statistical analyses and fellowship support were provided by the University of Michigan's Division of Biological Sciences during the paper's preparation.—MARINA WONG, *Dept. Biology, Universiti Pertanian Malaysia, Serdang, Selangor, West Malaysia.* (Present address: *Bird Division, Museum of Zoology, Univ. Michigan, Ann Arbor, Michigan 48109.*) *Accepted 30 July 1982.*

Wilson Bull., 95(2), 1983, pp. 294–296

Foraging dives by post-breeding Northern Pintails.—Dabbling ducks (Anatini), including Northern Pintails (*Anas acuta*), typically feed by "tipping-up" (Bellrose, Ducks, Geese, and Swans of North America, Stackpole Books, Harrisburg, Pennsylvania, 1976) in shallow water. Pintails are not as adapted for diving as members of the Aythyini or Oxyurini (Catlett and Johnston, Comp. Biochem. Physiol. 47A:925–931, 1974); however, incidents of foraging dives by small numbers of pintails have been reported (Chapman et al., Br. Birds 52:60, 1959; Bourget and Chapdelaine, Wildfowl 26:55–57, 1975). This paper reports on forage diving by a flock of several hundred pintails. Ecological explanations are suggested to account for the behavior and comparisons with tip-up feeding are presented.

Materials and methods.—Feeding pintails were observed with the use of a spotting scope (40X) between 11:00 and 14:00 on a 100-ha pond on Sacramento National Wildlife Refuge, Glenn Co., California, 22 September 1980. Data were collected in two ways with a stopwatch. Method 1: Dive and tip-up durations (period of head immersion) and "pauses" between dives and tip-ups of 133 individual (may include some repeat observations of the same birds) pintails were timed. Method 2: 20 other individuals were observed continuously for variable periods up to 2.5 min. The number of dives or tip-ups seen during the observation period was recorded for each bird.

Water depth was measured at dive and tip-up feeding locations. Five benthic samples (Swanson, J. Wildl. Manage. 42:426–428, 1978) were taken randomly within a 2-m-diameter

circle each at a location where pintails were diving for food and another location where birds were feeding by tipping-up. Each sample included about 800 ml of water at the diving sites and 400 ml at the shallow tip-up sites. Seeds and invertebrates were isolated from the samples, enumerated, dried, and weighed.

The number of pintails present on the study pond was visually estimated. Proportions of feeding birds diving and tipping-up were estimated by scanning through the flock three times using the spotting scope. The feeding behavior of each bird encountered along the sight line in the middle of the field of view was recorded. Collection of data by age and sex was not feasible because differentiation among definitive basic plumages of adults and juveniles and basic I plumages of immatures (Palmer, Handbook of North American Birds, Vol. 2 Waterfowl, Pt. 1, Yale Univ. Press, New Haven, Connecticut, 1976) was not reliable at the approximately 600-m distance from which observations were made.

Results.—Tip-up feeding behavior was first observed on 10 September 1980, shortly after initiation of pond flooding. Diving was first noticed on 20 September and had ceased by 25 September.

About 4000 pintails were present on the study pond. An estimated 1500 of these were actively feeding during the data collection period. Approximately half of the feeding birds were diving and half were tipping-up. Diving birds were located in central portions of the pond in water 60–150 cm deep, whereas pintails tipping-up were scattered around the edges in water 18–24 cm deep.

Pintails seemed to follow the same pattern for a typical dive as described for Mallards (*A. platyrhynchos*) (Mylne, Br. Birds 47:395, 1954). In addition, diving pintails often traveled several meters forward under water during dives and along the surface between dives. Tipping birds moved little during and between tip-ups.

Food available to pintails at both diving and tip-up locations was virtually the same. Swamp timothy (*Heleochloa schoenoides*) (Mason, A Flora of the Marshes of California, Univ. California Press, Berkeley, California, 1957) seeds made up nearly 95% by dry weight of the food items in benthic samples at both locations. Other seeds present at both sites included bulrush (*Scirpus acutus*), smartweeds (*Polygonum* spp.), and dock (*Rumex fueginus*). One dipteran pupa and one adult beetle were present in samples at the diving location.

Mean number and dry weight of timothy seeds in the benthic samples at diving locations (923 ± 215 seeds, 0.174 ± 0.45 g) did not differ significantly (Student's $t = 0.712$, 8 df, $P > 0.05$ for number; Student's $t = 0.735$, 8 df, $P > 0.05$ for weight) from those at tip-up locations (709 ± 209 seeds, 0.131 ± 0.038 g). Timothy seeds were the same size at both sites (about 0.185×10^{-3} g/seed).

Mean duration of dives (6.48 ± 0.20 sec) and tip-ups (6.50 ± 0.48 sec) was the same (Student's $t = 0.037$, 81 df, $P > 0.05$). Pause duration, however, was almost twice as long for diving birds (5.16 ± 0.36 sec) as for birds tipping-up (2.65 ± 0.49 sec) (Student's $t = 3.944$, 48 df, $P < 0.001$). Thus, the total mean time of a dive sequence (sum of dive and pause duration) was about 2.5 sec longer than the mean time of a tip-up sequence (tip-up plus pause duration). The number of dives per minute (4.93 ± 0.13) was significantly less (Student's $t = 6.304$, 18 df, $P < 0.001$) than the number of tip-ups per minute (7.04 ± 0.31) because of the longer pauses in the dive sequence.

Discussion.—Forage diving by pintails on a large scale as reported here is likely a rare event. However, it seems to be repeated under similar food and water conditions, as I again observed the phenomenon during September 1981. Large flocks of pintails using a foraging method thought to be unusual suggests that food being sought was highly preferred, and/or very abundant. Analysis of esophageal contents of pintails collected while tip-up feeding along the edge of the study pond indicated that swamp timothy was virtually the only food taken during September (Miller, unpubl.). Diving pintails were far from shore (300–400 m)

and could not be collected because of the absence of approach cover. But, based on the high degree of similarity of benthic-water column samples from diving and tip-up areas, extensive examination of the pond bottom before flooding, and known food selection of pintails in the area, I concluded that diving birds were also feeding on swamp timothy. Newly flooded swamp timothy marsh is always heavily used for feeding by pintails in the Sacramento (Miller, unpubl.) and San Joaquin valleys (Connelly and Chesemore, California Fish and Game 66: 233–237, 1980; Beam, unpubl.; Eulis, unpubl.).

Previous reports of forage dives by dabbling ducks suggest that the birds were forced to dive because shallow feeding areas were frozen over (Bourget and Chapdelaine 1975), food was in short supply in shallows (Cottam, Condor 47:39, 1945) or because birds were responding to availability of high energy grains such as wheat (*Triticum aestivum*) and corn (*Zea maize*) (Kutz, J. Wildl. Manage. 4:19–20, 1940, Cottam 1945; Chapman et al. 1959). Pintails observed during this study were not forced to feed on swamp timothy by diving. Timothy was available in the same pond and neighboring habitat in densities readily acquired by tipping-up. Also, other foods such as rice (*Oryza sativa*), millet (*Echinochloa crusgalli*), and smartweeds were available nearby and being used by large numbers of pintails.

Diving for food in deep water must be energetically more costly for pintails than tipping-up for the same food in shallow water. Animals would not likely use a higher energy consuming method of foraging unless it conferred some advantages, perhaps increased search efficiency (Norberg, J. Anim. Ecol. 46:511–529, 1977). Pintails may have obtained enough additional food to offset the high energy costs of diving, in which case diving behavior would have been related to efficient consumption of a highly preferred food. However, benthic sample size was not sufficient to reliably measure possible food quantity differences between the two feeding sites. Conclusions based on optimal foraging theory are not warranted without additional research.

Although this was a fortuitous observation, management implications are evident. Pintails are highly adaptable in their ability to obtain food under less than ideal conditions. However, swamp timothy could be made more accessible by managing water levels to allow tip-up feeding. Swamp timothy is obviously a preferred food, and habitat management could be used to improve stands at favorable sites.

Acknowledgments.—I thank B. Aldrich, D. Gilmer, R. MacLandress, K. Miller, and D. Raveling for helpful suggestions and critical review of the manuscript. C. LeFever processed benthic samples. I thank J. Beam and N. Eulis for access to unpublished food habits data.—
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Wilson Bull., 95(2), 1983, pp. 296–297

California Gull captures flying Barn Swallow with its bill.—Gulls are opportunistic in both their diet and feeding behavior (Bent, U.S. Natl. Mus. Bull. 113, 1921; Witherby et al., The Handbook of British Birds, Witherby Ltd., London, England, 1948; Bannerman, The Birds of the British Isles, Oliver and Boyd, London, England, 1962). Although there are many records of adult birds being captured and eaten (e.g., Drost, Bull. Int. Comm. Bird Preservation 7:108–111, 1958; Harris, Ibis 107:43–53, 1965; Jyrkkanen, Can. Field-Nat. 89: 77–78, 1965) and numerous records of gulls capturing winged insects with their bills while in flight (Bent 1921; Witherby 1948; Pettingill, Jack-pine Warbler, 36:154, 1958), there is no explicit mention of gulls catching birds in flight with their bills.

The incident reported here occurred at 10:00 on 21 October 1979 on the southwest corner of Tule Lake National Wildlife Refuge, Siskiyou Co., California. It was a clear day with no