AGE-RELATED DIFFERENCES IN FORAGING IN THE MASKED LAPWING *VANELLUS MILES* IN AUSTRALIA

The recognition that adult birds locate, capture and consume food with greater alacrity and agility than young has attracted attention because of its presumed association with delayed reproductive maturity. This association between maturity and age differences in foraging techniques and feeding success has been most convincingly demonstrated in a variety of seabirds, many species of which do not breed until their third year or later (Lack 1967). It remains interesting to document such age differences in species where delayed reproductive maturity is not known to occur, and to examine the process of maturation whereby young birds master foraging techniques. Age-related differences in feeding ability have been noted for gulls *Larus* (Verbeek 1977; Ingolfsson & Estrella 1978; Searcy 1978; Burger & Gochfeld 1981, 1983), terns *Sterna* (Dunn 1972; Buckley & Buckley 1974), pelicans *Pelecanus occidentalis* (Orians 1969), frigatebirds *Fregata magnificens* (Gochfeld & Burger 1981), and cormorants *Phalacrocorax olivaceus* (Morrison *et al.* 1978).

Other taxa that exhibit delayed breeding as well as age-related differences in foraging, include Little Blue Herons *Florida caerulea* (Recher & Recher 1969), and two species of shorebirds or waders. Groves (1978) found that the feeding rates and success rates of juvenile Ruddy Turnstones *Arenaria interpres* were lower than rates of adults. Similarly Burger (1980) found that young Black-necked Stilts *Himantopus mexicanus* obtained significantly fewer items per minute and took more steps per minute than did adult Stilts. Adult Stilts had lower interfood intervals, indicating that they spent less time searching for, obtaining and handling food items. Turnstones and Stilts do not generally breed until two years of age (Stout 1967; Glutz von Blotzheim *et al.* 1977).

For many shorebirds the age classes are difficult to distinguish in the field, but in some species young of the year are distinguishable from adults in post-breeding migratory or wintering flocks. In this paper we report on age-related differences in the Masked Lapwing *Vanellus miles*, which we observed near Gladstone (race *novaehollandiae*) and Cairns (race *miles*) in Queensland, Australia, in mid-summer, 1983–1984. These forms were considered conspecific by van Tets *et al.* (1967), the treatment followed in our recent species list (Gochfeld *et al.* 1984). Plumage differences between adults and young are mentioned by Johnsgard (1981). Young were distinguished by the mottled crown and indistinct facial pattern (evident in *novaehollandiae*), and by the much shorter or absent wattle (applicable in both races).

We encountered flocks of five to thirty Lapwings feeding on lawns, playing fields, and pastures. Near Cairns we found six famiily groups comprising two adults and one or two young. The birds were consuming primarily small insects which we could barely discern, and occasionally small earthworms or insect larvae. During each observation period we recorded the interfood interval alternately for adult and juvenile Lapwings. This is the interval between two successive food items obtained by an individual bird. We determined that a food item was obtained when a peck was followed by swallowing. We watched the Lapwings from a car parked within 50 m and had no difficulty determining age or when food had been swallowed. We recorded the interval for one feeding bird and then switched to another individual in the flock or family group. We attempted to obtain at least three and no more than 10 intervals per individual and used the mean of the individual values to compute a grand mean, standard deviation and median (shown in Table I) for each age class. In any given flock the extreme distance between birds was less than 80 m, hence the feeding conditions for a given flock (usually mowed lawns) were grossly uniform, although we realize that subtle but important differences might exist.

On no occasion did we see young being fed by adults, nor did the young follow the adults, hence we consider them to be independent, although we do not know their actual age nor how long they had been independent. We did not note any aggressive encounters between the adults and young, and concluded that exclusion or dominance by adults was not occurring. During all observation periods the interfood intervals for adults were less than those for young (Table I; tested statistically with Mann-Whitney U Test). Moreover, whereas adults pecked once and swallowed, young birds often pecked repeatedly at a single spot without swallowing or before picking up and consuming a food item.

We also noted that young were more likely to be distracted by passing traffic to which their putative parents were apparently habituated. Adults were more vigilant than young, looking up and around more often, but nonetheless they had much shorter interfood intervals. Adult vigilance involved short periods of 1–5 sec (mean 9.4 sec per min, $n = 8$), while young responding to passing vehicles often remained alert for 15 sec or more, (mean 17.3 sec per min, $n = 8$ Mann-Whitney $U = 5$, $p < .001$). When cars passed, young birds frequently ran 1–20 m before resuming feeding.

Although there is little information on age of first

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TABLE I

Interfood Intervals of Adult and Young Masked Lapwings in Queensland, Australia. Given are grand means ± one standard deviation with the median value in parentheses. All values are in seconds. P indicates probability from Mann-Whitney Test. N = number of birds.

Date	Subsb	Group	Adults N	Adults Mean + SD*	Young N	Young Mean + SD*	U	P<
29 Dec. 1983	S	Flock	23	12.5 6.2 (10)	12	28.2 9.4 (27)	13	.001
13 Jan. 1984	M	Flock	17	9.6 5.5 (8)	10	21.8 10.2 (18)	12	.001
17 Jan. 1984	M	Flock	12	4.3 1.9 (3)	12	12.4 8.0 (11)	18	.001
18 Jan. 1984	M	Families	11	4.9 2.1 (6)	6	15.3 6.9 (15)	1	.001

* Mean for each age class is a grand mean of the mean for individuals which was based on 3-10 samples per individual.

breeding in shorebirds in general, Tree (1981) trapped known age Crowned Lapwings *V. coronatus* breeding before 18 months of age, and Barlow *et al.* (1972) reported that Masked Lapwing females may breed at age one but males not until age two. Our results indicate that it would be valuable to study the time course of the age differences, and the time at which the feeding behaviour, efficiency, and success of young Lapwings approximate those of the adults. We should point out that it is not essential to invoke delayed breeding in relation to age differences in foraging, for differences in phenology, clutch size and breeding success, have also been described for many species when first-time breeders are compared with other "adults" (Ryder 1980).

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