BABBLER ChICKS

The contact call of the babbler chicks 'keenki keenki' helped the adults to find them and the intensity of the call increased when babbler with food were sighted. While begging the chicks kept their necks erect, bills open and the begging call was accompanied by wing shaking which continued for some seconds even after the food was swallowed. This enabled us to count the number of times it was fed. Like the cuckoo chick and the babbler chicks remained silent when the adults were away.

One 3 February, second day after they fledged, one of the babbler chicks was followed from the time of its post roosting arousal until it roosted and it was fed at least 118 times by the adults. Since the adults had split into two groups, each taking care of one chick, it was possible to follow a particular chick in the shrubbery with the aid of its begging calls. The distance between the two groups varied from 10 to 80 m and adults frequently moved from one group to another. Around roosting time both groups merged and the number of times the chicks were fed thereafter was divided by two to calculate the times the chick was fed. It was mentioned earlier that the cuckoo chick on the third day after leaving the nest was fed 78 times. Babblers feeding their own chick more frequently may be correlated with the scarcity of succulent prey in February. Caterpillars, for instance, become more common in December, after the northeast monsoon. This may have resulted in them feeding many smaller prey to the babbler chick. Although the babbler chicks were seen going to roost nine times, dense foliage meant that only once was a chick seen between two adults while others roosted on a different branch. Even six weeks after leaving the nest, babbler chicks were occasionally fed by the adults.

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MALLOPHAGA ON THE EGGS OF WADING BIRDS

GRAHAM D. RANKIN

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Mallophaga have been recorded frequently on the eggs of wading birds (e.g., Thompson 1936, 1938, Eichler 1953, Ash 1960). Mester (1971) proposed that the ectoparasites actively assembled on the eggs so that transference from one adult wader to its mate could be accomplished via the incubated eggs. He suggested that this would be a more successful method of inter-host transfer for Mallophaga than during intermittent contact between copulating hosts. This paper examines the...
incidence of Mallophaga on the eggs of Lapwing Vanellus vanellus and Redshank Tringa totanus throughout the incubation period and assesses the significance of these movements from the host to the egg of the host.

METHODS

During a study of the breeding biology of wading birds (Rankin 1979), the eggs of Lapwing, Oystercatcher Haematopus ostralegus, Redshank, Dunlin Calidris alpina and Ringed Plover Charadrius hiaticula were examined for the presence of Mallophaga.

Using nests whose complete history was known, the number of Mallophaga on each egg in each clutch was counted once during each quarter of the incubation period. Mallophaga were collected from those clutches which were not being studied intensively and were identified by C. H. C. Lyal of the British Museum (Natural History). All the specimens were collected in 1977 and 1978 from clutches on Rockcliffe Marsh, Cumbria, England.

Spot observations were made of the presence or absence of adult Lapwings at their nests during daylight hours in each quarter of the incubation period. These spot observations were used to calculate the proportion of time spent incubating by Lapwings during each quarter of the incubation period. The mean (± s.e.) incubation period was 23.9 ± 0.3 days (n = 48).

RESULTS

Mallophaga were recorded from the eggs of Lapwing and Redshank. None were obtained from the clutches of Dunlin (13 clutches examined), Ringed Plover (22 clutches) and Oystercatcher (89 clutches).

In May and June 1977 and 1978, the following Mallophaga species were identified from the eggs of Lapwing: Amblycera: Actornithophilia gracilis (Piaget 1880), Austromenopon spp. aequalitidis group; Ischnocera: Quadraceps junceus (Scopoli 1763).

A. gracilis was the most abundant feather louse recorded from Lapwing eggs: four adults and two nymphs were identified. Two adult Austromenopon spp. and one Q. junceus were identified. The Amblycera, Actornithophilia totani (Schrøn 1803), was the only species recorded from Redshank eggs. Two adults and one nymph were identified.

Significantly more Mallophaga occurred on Lapwing eggs during the latter stages of the incubation period than in the early stages ($X^2 = 81.4$, $P < 0.001$), and a higher proportion of Lapwing clutches was infested later than early in the incubation period ($X^2 = 30.2$, $P < 0.001$) (Table 1). The proportion of Redshank eggs and clutches infested by Mallophaga also increased significantly during the incubation period ($X^2 = 46.4$, $P < 0.001$ and $X^2 = 13.8$, $P < 0.01$, respectively) (Table 1).

The infestations of Redshank eggs and clutches were consistently lower during each quarter of the incubation period than those of the Lapwing. Mallophaga were first observed on Lapwing eggs on the eighth day of incubation, but they did not occur on Redshank eggs until Day 15. Mester (1971) referred to only a few infestations of Redshank eggs but it would appear that the pattern of the incidence of Mallophaga is similar to that on Lapwing eggs, albeit at a lower density.

Spot observations of the proportion of daylight hours spent by Lapwings incubating during each quarter of the incubation in 1977 (Table 2) were compared with the percentage infestation of Lapwing clutches and eggs (expressed as the square root of the arcsine of the percentage linearly to transform the data) in that year. The percentage infestation of clutches and eggs increased exponentially as the proportion of time the nest was incubated was increased. This relationship was
The numbers of Mallophaga on the eggs of Lapwings and Redshanks during each quarter of the incubation period in 1977.

<table>
<thead>
<tr>
<th>Stage of incubation period (days)</th>
<th>Lapwing</th>
<th>Redshank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-6</td>
<td>7-12</td>
</tr>
<tr>
<td>Clutches examined (n)</td>
<td>60</td>
<td>43</td>
</tr>
<tr>
<td>Eggs examined (n)</td>
<td>202</td>
<td>150</td>
</tr>
<tr>
<td>Clutches infested (n)</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Eggs infested (n)</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Mallophaga (n)</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

The relative frequency of incubation by Lapwings during each quarter of the incubation period in 1977, based on spot observations during daylight hours.

<table>
<thead>
<tr>
<th>Days after incubation commenced</th>
<th>0-6</th>
<th>7-12</th>
<th>13-18</th>
<th>19-24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency incubated</td>
<td>31</td>
<td>62</td>
<td>61</td>
<td>78</td>
</tr>
<tr>
<td>Frequency not incubated</td>
<td>47</td>
<td>45</td>
<td>32</td>
<td>15</td>
</tr>
<tr>
<td>Percentage observations of nests incubated</td>
<td>39.7</td>
<td>57.9</td>
<td>86.3</td>
<td>43.9</td>
</tr>
</tbody>
</table>

**DISCUSSION**

Various Austromonopon and Actornithophilus species have been recorded from the eggs of Lapwing and Redshank, including those Amblycera observed during this study (Eichler 1953, Spencer 1953, Thompson 1957, Ash 1960, Mester 1971). All the Mallophaga hitherto recorded from wader eggs have belonged to the sub-order Amblycera, which are more mobile than the Ichnocera (Thompson 1957). The occurrence of Quadaceps juncus, a species typically infesting Lapwings (e.g., Hopkins & Clay 1952, Zlotorzycka 1961), is apparently the first record of an ichnoceran on the egg of a wading bird.

No Mallophaga were recorded on the eggs of Dunlin, Ringed Plover and Oystercatcher. However, Eichler (1953) recorded Actornithophilus ochraceus (Nitzsch) on the eggs of Ringed Plover. Differences in the apparent susceptibility of the eggs of different wader species to infestation by Mallophaga may be related to differences in the behaviour of the lice species and to the varying levels of infestation of the hosts.

Mester (1971) documented an increase in the number of Mallophaga infesting Lapwing eggs which reached a maximum at the time of hatching. W. G. Hale, quoted by Thompson (1957), noted that Mallophaga were at their most numerous on Redshank eggs just prior to hatching. A similar trend was apparent during the present study for both Lapwing and Redshank egg infestations.

Mester (1971) may have overemphasized the importance of the purportedly...
adaptive behaviour of the Mallophaga in congregating on the eggs to facilitate inter-host transfer during the incubation period. As the incubation period progresses there is more opportunity for Mallophaga to transfer from their host to the eggs because host-clutch contact becomes more prolonged. Many bird species are known to become increasingly attentive at the nest as the incubation period progresses (e.g., Drent 1975). The temperature of incubated eggs approximates to the body temperature of the host and the Mallophaga may not distinguish between micro-climatically similar bodies. Host-clutch transfer is perhaps more likely to occur in the highly mobile Amblyceara, and members of this sub-order predominated on the eggs.

The exponential relationship between the percentage infestation of Lapwing eggs and the intensity of incubation may have been partially due to a seasonal increase in the feather lice populations. Some mallophagan populations of the northern hemisphere increase in May and have a peak of numbers in June, which may be adapted to the nesting activities of their hosts (e.g., Woodman & Dicke 1954, Evelleigh & Threlfall 1976). For example, the Mallophaga of the Orange-crowned Warbler V. c. australis have a maximum population size immediately before the hatching of the host's eggs (Foster 1969), thereby providing a surplus of individuals to disperse to recently hatched hosts. The presence of nymphs on both Redshank and Lapwing eggs suggested a seasonal increase in at least some of the Mallophaga populations.

The presence of Mallophaga on the eggs of wading birds does not necessarily imply, as Mester (1971) suggested, an adaptive response to facilitate dispersal. The relationship between percentage infestation and percentage incubation indicated that the presence of the lice on the eggs may be merely fortuitous. More information is required on the dynamics of Mallophaga populations and observations of inter-host transfer via the eggs to assess the importance, or otherwise, of the presence of Mallophaga on wader eggs as a dispersal stratagem.

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