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SEX-RATIO OF THE CHEWING-LICE, *PIAGETIELLA* SP. (PHTHIRAPTERA : INSECTA) OF GREY PELICAN

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INTRODUCTION

The authors while conducting the bio-ecological studies on grey pelican (*Pelecanus philippensis* Gmelin) in Andhra Pradesh collected some arthopod ectoparasites for the first time from this host. These include ticks and chewing-lice. The latter species which appear new to Science belong to two genera viz., *Piagetiella* and *Pectinopygus* (*Epipelacanas*). Fifty specimens of the former (Fig. 1) and three males of the latter were collected from single host at Nelapattu (A.P.).

Clay (1949, 1950) recognized two ecological niches for the bird infesting Chewing-lice viz., the head & neck niche, and the abdomen and wing niche. Eichler (1963) added a third one, i.e., the gular pouch of the pelican (Fig. 2), and Emerson (1973) a fourth one in the large quills of Procellariformes, Galliformes, Charadiiformes and Psittaciformes (see Lakshminarayana, 1986). In the present instance, the specimens of *Piagetiella* (both male and female mainly collected from the gular pouches, the parasites freely moving in and out of the pouch through the gap of the beaks, and hence some were found on the neck and feathers also. *Pectinopygus* specimens were however, collected on the feathers.

Normally, in the natural populations of the chewing-lice the females outnumber or atleast equal, to the males, and in some cases the males are practically unknown. It is assumed that in the last named cases, the females might be parthenogenic. However, there are few instances, where the males outnumbered the females as for example, *Piagetiella* in the present case.

The chewing-lice are obligatory ectoparasitic insects on birds (and mammals) and highly host-specific and seldom live outside their host body. They are passed on from one member to the other during mating, roosting, feeding, dust baths and occasionally by phoresy and to each succeeding generation by the parent birds (*vide* Lakshminarayana, 1986).

Although, the bird infesting Ischnocerophthiran lice like *Pectinopygus* are mainly feather feeders, the Amblycerophthiran lice like *Piagetiella* ingest in addition blood,

sebaceous or mucous secretions also. The damage caused to the feathers is considerable in case of heavy infestation. Further, the lacerations caused during the feeding are prone to secondary infections thereby affecting the health of the bird indirectly. They not only cause annoyance by their various activities, but also produce dermatitis in some cases. Eichler (1963) attributed various deformities in the beak and the infestation of lice was heavy (Fig. 3) also in such cases. Such birds perhaps cannot preen the lice unlike the healthier ones, and therefore have had heavy infestations. It is well known, that the higher parasitic load atleast in poultry birds reduces the rate of fecundity and lower the egg production. The same may be true in the wild also. Thus the parasite populations indirectly influence the fluctuations of the host population and so need to be paid considerable attention in the conservation programme.

REVIEW OF LITERATURE

Hopkins (1949) emphasized that he was not aware of any instance of considerable normal excess of males over females save that of Keler (1940) where the males and females of *Trichodectes melis* were in the ratio of 1.4:1. This author further stated that usually the females are in excess over males and in such extreme instances as in *Damalinia americana*, *D. longicornis*, and *Geomydoecus scleritus*, where the male remained unknown and *D. equi* (now *Werneckiella equi*) where the male was discovered long after the discovery of the female. Hopkins (*op. cit.*) provided sex-ratios of mammal infesting lice (both chewing & sucking). From this list of 36 species/sub-species only three instances were found where males marginally outnumbered the females, while in considerable instances the sexes are nearly equal following the 50 : 50 rule as in all other bisexually reproducing species.

Recently, Marshall (1981) studied the sex-ratios in 250 species of various ectoparasitic insect groups including the chewing-lice. Marshall (1981) reviewed the literature on the subject in various ecto-parasitiec insect orders. This author's results show that in general the males and females are in equal proportions with very few exceptions. The reduction in males amongst lice was attributed to the close inbreeding (**perhaps due to host specificity*) and quoted Hamilton (1967) in support of this contention in that amongst inbreeding communities the reduction in males is to be expected. Marshall (1983) further considers that the sex-ratio in natural populations may alter with numerous factors such as season, climate, host species, population density, nutritional status, position on the host body, and previous sampling of the host body and its home.

In general he concluded that the females predominate the populations. Males, however, according to him, predominated in the free living cimicids and pyralids, although the data were sparse; in the Streblids, however, the males predominated.

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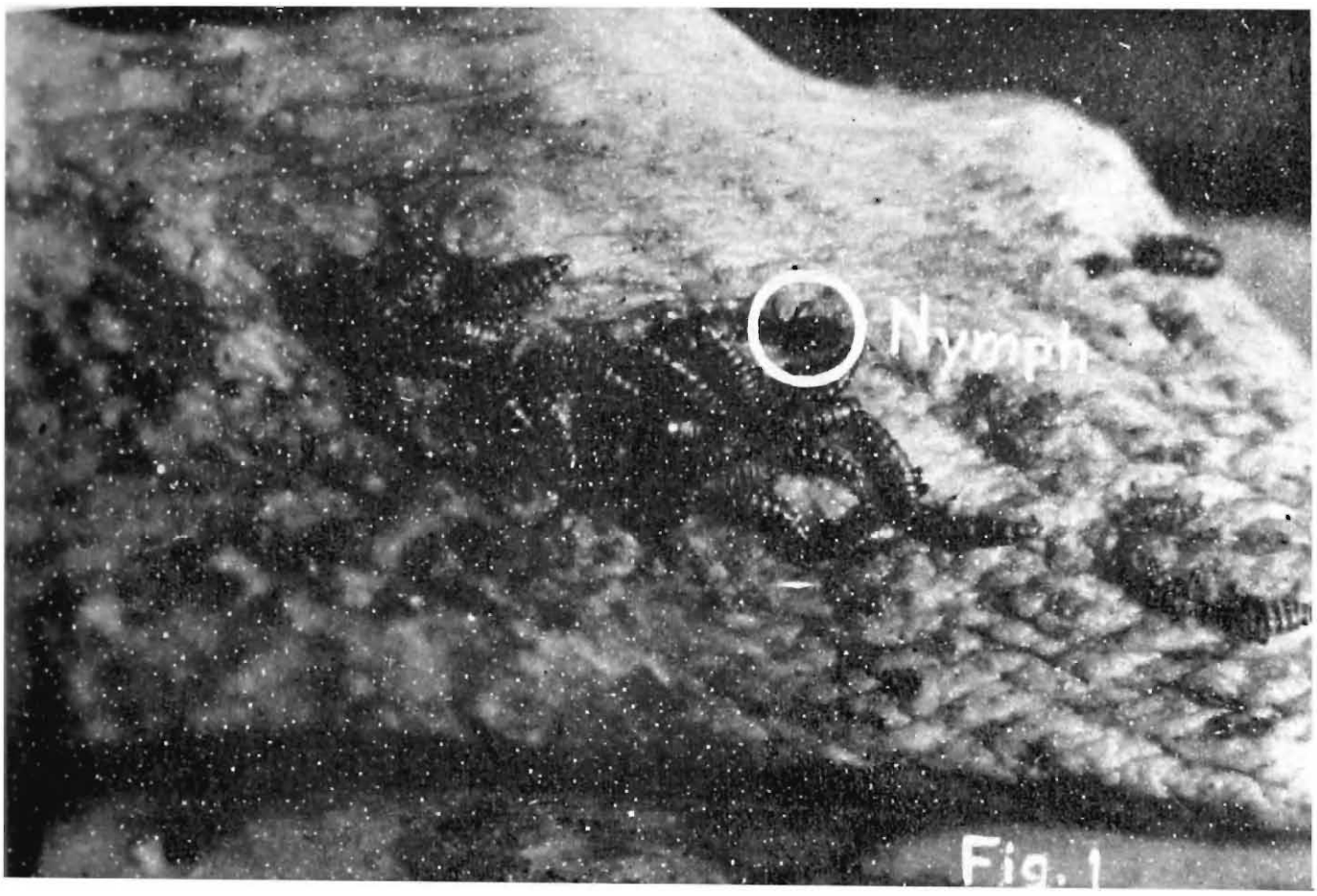
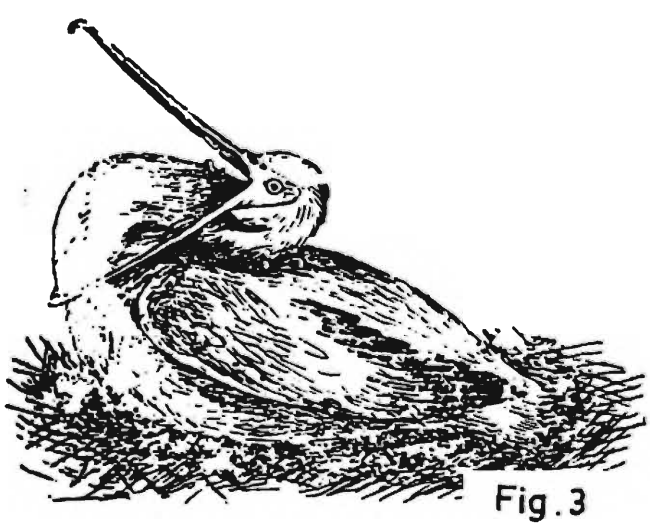
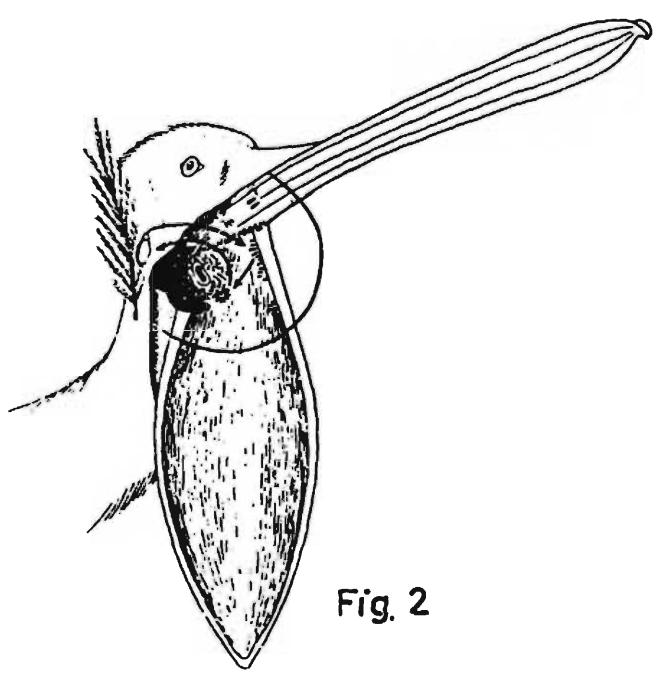
* italics ours.







Figs. 1-3. 1. Population of *Piagetiella* sp., *in situ* in the gular sac of *Pelecanus philippensis*; 2. The movement of *Piagetiella titan* on *Pelecanus onocrotalus* from feathers to gular sac and *vice versa* (after Dubinin, 1948, and Eichler, 1963); 3. The reaction of *Pelecanus onocrotalus* heavily infested with *Piagetiella titan* (after Dubinin, 1948, and Eichler, 1963.)

Marshall (1981) attributed the imbalance to the following causes : sampling number; sampling technique i.e., where the parasites are found both in the nest (or burrow) and the host body of which only one is examined; one sex escaping detection or capture; the short life of the male; the male being active and smaller than the female and liable to get separated from the population and lost due to predation by the host, or nutritional or climatic factors. In so far as the lice are concerned Marshall (*op.cit.*) following Hopkins (1949) opines that the males are short lived and hence the reason for the difference in sex ratio.

Fowler & Williams (1985) studied the population dynamics of the Chewing-lice (*Philopterus docophorulus, Brueelia blagoveshtchenskyi* Balat, *Ricinws fringillae* degreen I, and *Menacanthus* sp.) and Acari on winter roosting reed bunting (*Emberiza schoeniclus*). The authors encountered two genera each of Ischnocerophthiran and Amblycerophthiran groups of lice on 324 reed buntings. The authors concluded that no birds carried more than two species at a time and the sex-ratio of adult lice are in the ratio of 52% females to 48% males. In the second half of the roosting period the nymphs predominated over the adults. Fowler & Williams (*op. cit.*) quoting Ash (1960), Askew (1971), and Baum (1968), state that because of uniform ecological conditions the lice probably breed through out the year, but considerable evidence now available indicates that population growth rates are highest during spring prior to the breeding of the host, falling drastically after the fledgling stage and subsequent moults. Therefore, one should expect predominance of nymphs over the adults during the period of rapid growth of the host, although it is not a universal rule.

DISCUSSION

In the present instance, we encountered the proportions of males and females *versus* nymphs as follows : ♂ ♂ 41 : ♀♀ 4 : 1 ♂ n. : 4 ♀♀ n. This clearly shows an unusual assemblage of males over females contrary to the above cases, and therefore interesting to report.

Hopkins (1949) opines that in instances where purely male populations dominate in numbers, then it is probable that these infestations are new and doomed for annhilation unless reinforced by females, or those in which the nymphs have not given rise to the females. Buxton (1941) attributed it to the injury to the females by too frequent mating by the numerous males.

We consider the following probabilities for this unusual occurrence in the light of the above observations of various authorities.

1. The chewing-lice are highly host-specific and live with in the feather cover (or hair-cover in mammal infesting forms) the micro-climatic conditions like temperature, humidity, food etc., remain uniform and the external macroclimatic fluctuations do not have so much influence on the parasite as compared to its host. But when the external

ecological conditions are not conductive, the health of the colony of the host, or individual is effected. It is likely that the host population may dwindle. Under such circumstances, the lice may be forced to resort to the production of males and therefore males out number females.

2. Male producing eggs might have hatched earlier than the female ones.

3. The male nymphs might be developing at a faster rate than the female nymphs as suggested by Hopkins (*op. cit.*). In the present case, the male and female nymphs are in the ratio 1 : 4 respectively, the other male nymphs being already developed.

4. Unlike the other Chewing-lice, *Piagetiella* species occupy gular pouches. The oral or gular pouch temperature may have some influence in the differential growth rates of the male and female nymphs.

5. The cytotaxonomy of the chewing-lice is not even in its infancy. Therefore, we do not known anything about the sex determining mechanism viz., whether it is by sex chromosomes (homo-or hetero-gametic); or by a single gene alleles as in mosquitoes; or by producing haploid or diploid eggs where haploids develop in to males and diploids in to females; or the lice have capability of both parthenogenic and sexual reproduction depending on the condition of the host and thereby alter the composition ofthe populations.

6. The area where the pelicanry was found was affected by a severe cyclone just before the collections were made. It was reported that along with other birds, many of the pelicans were also lost or disturbed during the cyclone. Along with the *Piagetiella* specimens only three males of *Pectionpygus* were collected at the time. It is probable, the cyclonic after effects have affected the health and vitality of the pelicans considerably. If there is increased parasite load, it further impairs the health of the host. Therefore, the parasites might have been constrained to resort to population control by drastically increasing its male population in preference to females so that control of egg production and consequent reduction of numbers in the subsequent generation is achieved.

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* Original not seen