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Chewing Lice (*Insecta, Phthiraptera*) of the White Stork (*Ciconia ciconia* L.) in Poland

Wszoły (*Insecta, Phthiraptera*) bociana białego (*Ciconia ciconia* L.) w Polsce

SUMMARY

Typical parasitofauna of the White Stork includes four species that have already been reported in Poland but were known from a few records in central and southern part of the country. In this study an individual of the White Stork (*Ciconia ciconia* L.) that was found in Pomerania in 2005 was examined for ectoparasites. 253 specimens of lice of two species: *Colpocephalum zebra* (237) and *Neophilopterus incompletus* (16) were recorded; sex-ratio in the lice infracommunity was approximately 1:1, while the ratio of imagines to juvenile stages was ca. 5:1. Parasites showed clear host site preference – most specimens (91%) of *C. zebra* were found on the wings; while *N. incompletus* and the rest of *C. zebra* were observed on other parts of the body (neck, breast, flanks, back). This study is a first record of such high number of lice observed on the White Stork in Poland.

STRESZCZENIE

Typową parazytofaunę bociana białego stanowią cztery gatunki, znane wcześniej w Polsce z nielicznych stwierdzeń z centralnej i południowej części kraju. Obecnie zbadano na obecność ektopasożytów bociana białego (*Ciconia ciconia* L.) znalezionego w 2005 roku na Pomorzu. Zebrano 253 wszoły należące do dwóch gatunków: *Colpocephalum zebra* (237 os.) i *Neophilopterus incompletus* (16 os.); proporcja płci w infrazgrupowaniu wszołów wynosiła w przybliżeniu 1:1, a proporcja imagines do stadiów juwenilnych ok. 5:1. Pasożyty wykazywały wyraźne preferencje topiczne – większość (91 %) okazów *C. zebra* pochodziło ze skrzydeł; z kolei *N. incompletus* i pozostałe *C. zebra* stwierdzono w innych okolicach ciała (szyja, pierś, boki, grzbiet). Obecne

stwierdzenie jest pierwszym przypadkiem tak licznej obecności wszołów u bociana białego w Polsce.

K e y w o r d s: Chewing Lice, White Stork, *Colpocephalum zebra*, *Neophilopterus incompletus*

INTRODUCTION

Chewing Lice (*Insecta*, *Phthiraptera*, *Mallophaga*) are highly specialized, obligatory and stationary ectoparasites of birds and mammals, living on the feathers, hair and skin of the hosts, which are their living environment providing them with food. As a rule they show high host specificity, however, quite often even several specific species of *Ablycera* and *Ischnocera* are observed on a single bird, while in mammals this is usually one specific species of *Ischnocera*. Moreover, mallophagans could also show host site specificity – different species prefer certain parts of the body of a host.

There are ca. 3,000 species of Chewing Lice recorded all over the world, while over 350 have been observed in Poland up till now, and this includes nearly 120 species of *Amblycera* and over 230 of *Ischnocera* (8). Typical parasitofauna of the White Stork includes four species that have been known from a few records from the Mazurskie Lake District as well as central and southern part of the country (11, 12, 14).

MATERIAL AND METHODS

An individual of the White Stork (*Ciconia ciconia* L.), which was found near Tricity in September 2005 was sampled for ectoparasites. To determine the presence of *Mallophaga* the whole plumage of the bird was examined starting from its head, then neck, breast, belly and finally back, wings and legs (4). All collected lice were preserved in 70%-ethanol, while some of them were used to prepare permanent slides using polyvinyl lactophenol mountant according to a standard procedure applied in the studies on parasitic Arthropods (9).

RESULTS AND DISCUSSION

An infracommunity of ectoparasites of the White Stork includes four species of lice: *Ardeicola ciconiae* (Linnaeus, 1758), *Neophilopterus incompletus* (Denny, 1842) (*Ischnocera*), *Colpocephalum zebra* (Burmeister, 1838) and *Ciconiphilus quadripustulatus* (Burmeister, 1838) (*Amblycera*). All these species have already been noted in Poland, however, only a few records have been reported so far (16); moreover, there was lack of data on their presence on the white storks in Pomerania.

In this study, 253 lice of two species: *Colpocephalum zebra* (Burmeister, 1838), (*Amblycera*, *Colpocephalidae*) and *Neophilopterus incompletus* (Denny, 1842) (*Ischnocera*, *Esthiopteridae*) were noted on an individual of the White Stork which was found in 2005 and examined for the presence of ectoparasites. Up till now the former species has been recorded only in the Mazurskie Lake

District and the Wielkopolsko-Kujawska Lowland (11, 13), while the latter in the Mazurskie Lake District, the Białowieża Forest, the Wielkopolsko-Kujawska Lowland, the Lublin Upland and Śląska Lowland (14).

Most collected specimens were of *C. zebra* (93.7%, 237 specimens); imagines were dominant (85.7%) – 109 males, 94 females and 34 nymphs were found. Similarly in a population of *N. incompletus* (total: 16 specimens) adult stages were dominant (5 males, 5 females, 6 nymphs). Therefore sex-ratio of the lice infracommunity was approximately 1:1, and the ratio of imagines to juvenile stages was ca. 5:1. Although the females were still laying eggs, relatively low number of nymph stages, as well as a high number of remaining parts of eggs suggested that the period of the study was after the most intensive breeding time. Different species of lice show diverse population dynamics, usually highly correlated with biology of a host, however, summer is the time of the most intensive breeding in several species (6, 15).

Parasites showed clear host site preference. Most of *C. zebra* specimens (216) were collected on the wings. They could be found on both sides of the wings, however, more often on the underparts. The lice were numerous on the remiges – females hid mainly among barbs, where they could be hardly seen. Apart from imagines and nymphs, eggs and empty egg-shells were also found on the remiges – usually in the central part of a feather and close to the rachis. While only one specimen of *N. incompletus* was noted on the wing. *Mallophaga* were also observed on other parts of the body (neck, breast, flanks, back), but only a few specimens of both species were collected there. Evolution of topographic specificity results from adaptation to diverse microhabitats observed in the development of several morphological adaptations enabling clinging to the skin and feathers of the hosts, feeding on different food sources (7). For example, *Amblycera* usually occur directly on the skin or close to the base of the feather, and such strategy is observed in slender and mobile *C. zebra.* While sluggish *Ischnocera*, stocky and squat, prefer the head area of birds, but also neck, back and even wings like in *N. incompletus* recorded on the White Stork. Distribution of parasites can depend on, e.g. plumage structure, food availability, parasite competition or self-cleaning of a host, and less often on the second-order environmental factors, i.e. insolation, heavy rain (7, 15).

Important adaptations enabling lice to live in the plumage and on the skin of a host are the size and shape of their body, especially appendages organs have to be correlated with particular parts of the body of the host that lice use to cling to. The lice of two species collected during our study showed different adaptation strategies that could be observed, e.g. in different body proportion – *C. zebra* is elongated and slender (ratio of the body length to width is 3.2:1), while *N. incompletus* is shorter and stocky (2.5:1; Table1).

Table 1. Range of length [mm] of mallophagans of the White Stork

References	This study	Złotorzycka 1976, 1980	Dik and Uslu 2006
Colpocephalum zebra			
Female	2.02–2.52	2.20–2.50	2.60–2.65
Male	1.74–2.14	1.80–2.00	1.94–2.18
Length/width	3.2:1		
Neophilopterus incompletus			
Female	2.57–2.85		
Male	1.94–2.07	2.60–2.70	2.48–3.29
Length/width	2.5:1	1.90–2.00	2.16–2.41

Adaptations of lice to parasitism are not only represented by the size and shape of their body and anatomy of their appendages organs, but also by pigmentation correlated with the colour of the background and acting as cryptic coloration (3). According to Złotorzycka (11, 15), *N. incompletus* on the White Stork is less pigmented than *N. tricolo*r recorded on the Black Stork (*Ciconia nigra*). Similarly *C. zebra*, which was a dominant species in our study, is yellowish-brown. This characteristic, as well as its elongated shape, enable this parasite to hide perfectly among the barbs of the remiges and along the rachis.

Very interesting was a high total number of lice recorded on a single host. While most probably it is not a rare phenomenon, such numerous population of lice recorded on the White Stork has never been reported in Poland before. Moreover, a dominant species was *C. zebra,* while up till now *N. incompletus* had been recorded more often and was more numerous. According to Złotorzycka (11), *N. incompletus* was the most common species observed on the storks. For example, Złotorzycka (14) examined 7 birds and found 77 specimens of *N. incompletus* (34 males, 39 females, 4 nymphs), while only 31 specimens of *C. zebra* (12 males and 19 females). Similarly in the study conducted on four birds in Romania, *N. incompletus* was recorded on all birds and infestation ranged from 4 to 136, while *C. zebra* was found only on two individuals (16 and 85 respectively) (1). Our results support data given by Dik and Uslu (2) on 15 storks examined in Turkey. In that study 1316 lice of four specific species were recorded and the dominant ones were *C. zebra* (654) and *N. incompletus* (340). Even though mean infestation intensity was considerably lower, it could not be compared with the results of our study due to lack of data on the range of infestation intensity in an individual bird. To conclude, the White Stork was a rarely studied species in parasitology, moreover, most data were on a few birds and detailed information on topography of ectoparasites or parasitological parameters characterizing dynamics and course of infestation were sometimes lacking. According to these few studies (often based on the material from the zoological gardens (e.g. 13) it is difficult

to determine which species of Chewing Lice recorded on the storks shows the highest prevalence and intensity of infestation in natural populations of these birds. Observations of different authors on distribution and highly varied number of certain species on the studied hosts could result from different period of the studies as seasonal population dynamics of these lice is still unknown. Moreover, the result of the observations could be influenced by the preservation state of the storks as usually the examined individuals were found dead. It is well-known that mallophagans of *Amblycera* are mobile even after the death of a host, when they leave it, move outside and migrate faster and farther than stocky and sluggish *Ischnocera* (7). Therefore in the *post mortem* studies, when the bird was dead and stayed for a longer period not properly secured for the purpose of the study, the part of the "mobile" parasitofauna could have been lost.

Even though the species composition of lice typical of *C. ciconia* is well--documented in several papers, information on infestation progress, seasonal dynamics, ksenocommunities of these parasites and finally on their influence on the condition of the host is still lacking. The studies on Chewing Lice of other bird species showed that feeding lice damaged the skin surface and feathers causing their breakage, which could impair thermoregulation and consequently influence the host condition, moreover, undoubtedly it is a stress factor (10); a damage of the remiges could possibly impair the flight of a bird as well.

The White Stork is a protected species according to the Act on Protection of Nature, the Bonn Convention, the Berne Convention and the Ramsar Convention. Moreover, it is one of the species included in the EU Birds Directive and the world's largest population of this stork breeds in Poland (in 2004 ca 50,000 breeding pairs of the White Stork were recorded in Poland (5). Therefore the studies on infestation dynamics, mechanisms causing changes in the level and progress of parasitic infestation are essential in monitoring population of this species.

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