

PARASITES OF WILD BIRDS AND MAMMALS, IN CONDITIONS OF ANTHROPOPRESSURE

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It would seem that the fauna of terrestrial arthropods, not directly connected with either human dwellings or man or domestic animals, is not, to any marked extent, subject to the influence of anthropopressure. Such a view of the matter, however, would be unfounded, since Poland actually has no areas untouched by human influence. The only place, perhaps, where this influence is practically unnoticeable, are the deep backwoods of the Białowieża Forest. Everywhere else, whether it be inhabited areas or uninhabited ones, man has for a long time been exerting influence on biocoenosis in one way or another. There is no doubt that anthropopressure is strongest in urban industrial agglomerations and in areas occupied by agricultural farms producing crops and livestock. Forestry farms can be placed in the same category, being in their character closer to planned plantations and controlled animal breeding farms than to natural communities of living organisms. There are still left mountain and lowland areas serving tourism and recreation, as well as nature reserves allocated either as refuge for already rarely found species of animals and plants or as grounds for the restitution of natural biotopes or their selected components. But even the areas allocated in this way are cut up by tourist routes which are often visited by crowds of people. Besides, various recreation centres tend to be more and more often created "on the bosom of the earth".

The consequences of anthropopressure can be very different depending on the local conditions:

1. In large urban industrial agglomerations, the primordial biocoenosis may be completely destroyed and in its place new synanthropic communities may be formed.

2. In agricultural farms (in the broad sense of this word) the primordial biocoenosis is subject to powerful selection pressure, which, on the one hand, may lead to reducing the number of component species and,

on the other hand, to the occupation of the free, newly created niches by organisms introduced by man or arriving in some other way. The wide use of insecticides also adds to changes in biocenosis and, unfortunately, the results are often incalculable.

3. In reserves and recreation grounds the selection of organisms is not so absolute, but apart from extinction of certain forms, it is possible for a number of new species to be brought along as a result of population migration.

Knowing that under the pressure of human activity different conditions are created for a great many organisms whose chances of survival are interrelated because of the often complex feeding chains, let us try to view from this side the section of biocenosis we are concerned with, and in particular arthropods infesting birds and mammals and synanthropic insects. In this aspect, the study of the quantitative and qualitative changes caused by anthropogenic factors in the world of parasites infesting wild animals is the domain of what is known as basic researches. However, achievements of this kind initiate a more synthetic approach to the phenomena which are of vital significance to the proper existence of man. And this is where a number of questions arise: Whether the devastation of nature caused by anthropogenic factors exerts an influence on the world of ectoparasites, and how is this done? What, in the light of this, are the chances for the growth of our wild birds and mammals? Will anthropopressure not lead to an excessive quantitative and qualitative growth of parasites, thus reducing the use value of game birds and mammals? Does any of the forms of man's intended or accidental activity not favour epidemics which may be caused in people and animals by microorganisms carried by parasitic and synanthropic arthropods? To tell the truth, we still lack sufficient knowledge to answer these questions.

During the debates of the scientific working session on "Entomology and Environment Protection" in Wisła-Uzdrowisko in 1974, a warning was given that entomofauna may be significantly reduced by human activity. Therefore, it may well be that some kinds of parasites are either directly destroyed or deprived of their chances of survival, if they are not allowed to develop. On the other hand, the increase in the density of population which causes expansion of town areas and migration of people (e.g. travelling by different means of transport, tourism at home and abroad, penetration of woodlands in search of forest undergrowth etc.) may create favourable conditions for an exchange of organisms as well as for the spreading and development of parasitic and synanthropic arthropods which are often vectors in various parasitoses in man and domestic animals.

The importance of the above mentioned problems refers to the latest trends in parasitology to prevent and fight the various causes of the progressing food crisis. This anxiety about the future of mankind is reflected in reports and other scientific papers sponsored by UNESCO, to which parasitologists from various countries, including Poland, contribute the results of their researches. At this point I should like to mention that the problems regarding correlations between parasites and the human environment were already touched upon during the debates of the Polish Parasitological Society Congress in Poznań, in 1974, where initial steps were taken in the field of the economics of parasitoses, and later in Warsaw, in 1975, at the International Symposium PARMAB. However, as was made clear by Professor Michajłow (*Wiad. Parazytol.*, 21, 3: 355-365, 1975), these researches are still well behind the present rapid progress in science and technology. Up till now, scientists have concentrated on the study of the economics of helminthoses. It would be equally important if entomologists and acarologists also joined in the common effort to solve the problems of parasitology in view of the ecological crisis which is a growing problem in this country, too.

In the research on the dynamics of population of parasites and synanthropic arthropods, a joint action of many scientists is essential and the obtained results ought to be comparable. But it is here where a number of difficulties of methodological nature arise. These are pointed out by Service in the report entitled "The Need for Perfection of Methods in Sampling Mosquito Populations". The author calls our attention to the fact that the present methods in estimating the population dynamics of those insects, so important because of their role in causing epidemics, do not guarantee that our perception of the really existing relationships in nature has been correct. Especially disputable are the research results aiming at estimating the so called population input. According to the author, the sampling applied for this purpose usually enables merely the determining of density at which a given microhabitat is being populated (e. g. by mosquito larvae). Equally ineffective are the methods in measuring dispersion in mosquitoes by catching adult individuals which are then marked and set free. From among those marked individuals, only few are later re-captured in nature and even those, after having been interfered with by man, in such a violent manner, as for instance treatment with powders, paints or radioactive substances, may show deviations from typical behaviour. The author of the report also expresses anxiety about the effects on insects of massive laboratory breeding, and wonders what, after setting them free, the indices of their lifespan, dispersion, sexual activity etc. are, as compared with forms living free.

Thus, it appears that human intervention in one form or another

creates obstacles difficult to overcome, in the research on problems of population in synanthropic insects. No doubt, similar difficulties will arise in analogical researches on the populations of various parasites. Therefore, the greatest caution should be taken when drawing conclusions regarding the present changeable conditions in biocoenosis.

Because of this continuous human interference, studies on the dynamics of population of ectoparasites as components of our biocoenosis still remain a question of the future. At the present stage it is still felt that the traditional researches on fauna ought to be expanded. According to the reports sent in for this symposium, the local fauna of the fleas (*Siphonaptera*) is now being examined. They are caught either outside their hosts or on them. A valuable contribution to our knowledge about the occurrence of fleas is the definition by Bartkowska of the range of occurrence of some of their species and subspecies in the region of the Western Beskidy mountains, situated north of the Tatras. It has turned out that, as regards their distribution, not only the particular species but also subspecies differ from each other. This is probably connected with the distribution and density of the populations of their hosts, whose manner of occurrence may be influenced, to some extent, even in the Beskidy mountains, by the increasing anthropopressure. Further studies on the geographical range of occurrence of fleas may, therefore, be of assistance when attempting to answer the questions concerning the directions of the changes in the distribution of parasites and their hosts in time and space.

The distribution and population density on fleas also depend, to a great extent, on the microclimate of the hosts direct environment, as reported by Kaczmarek, who examined the infestation by fleas of birds nests built in breeding houses. It has turned out that the percentage of flea-infested nests and the indices of infestation clearly depend on the structure and composition of the nests as well as their relative humidity. The conditions in dry nests as well as in very humid ones were equally unfavourable for the development of fleas. Excessive drying up of the bedding hampered their breeding, while on heavily moistened bedding numerous beetles were found, which, among others, prey upon fleas. According to the author, the most favourable conditions prevail in tits' nests, because of their rich bedding. Thus, by introducing breeding houses of a particular structure and features into various biotopes, man is able to exert an influence on the biocoenosis of birds' nests. Also, the way these houses are distributed and the number of successive hatches certainly determine the population dynamics of the parasites and the organisms which accompany them.

This dependence of seasonal parasites, which fleas basically are, on

the external environment of their hosts seems to be very strong. This is indicated by the figures quoted in the report by Skuratowicz, who managed to collect nearly 2,000 fleas from 105 carnivorous mammals belonging to 21 species. It turned out that the most numerous individuals as well as species had been recorded on mammals inhabiting deep holes. On 35 foxes (*Vulpes vulpes*), for instance, 468 fleas were found, belonging to as many as 10 species. These data have particular significance, considering that fox fleas can become vectors in various diseases which may be brought along even to country farms. It is also worth while to compare the results of the author's research on the flea-infestation of wild mammals with the results concerning domesticated mammals. For instance, on cats and dogs two species of fleas were recorded on each, the number of fleas per host being much greater than in wild animals. There is, no doubt, a close correlation between these facts and figures and the agelong, strong anthropopressure exerted by man on domestic animals and the way he breeds them nowadays.

The dynamics of population of parasitic and synanthropic arthropods is doubtless determined by many different factors not always connected with human activity. It is possible to pinpoint the effects of anthropopressure by the application of comparative studies in environments which have, to various degrees, been changed by human activity. Thus, Draber-Mońko has sent in the results of her research on the occurrence of synanthropic flies of a few families in ten biotopes of the Pieniny mountains, defined by the author as natural and seminatural. In all the examined biotopes synanthropic flies occurred; the fewest individuals and species were recorded on rock turf which is relatively difficult to reach. Their occurrence was most numerous in moist grounds in the Carpathian alder woods, but the largest number of species was found on the Pieniny meadow. Generally speaking, spots frequented by people and animals abound in these species, whose larvae are coprophagous. The author emphasizes that *Scatophaga stercoraria* is so closely connected with the presence of humans and animals that it can serve as an indicator of environment pollution.

Thus, we may fear that the expansion of tourism and of the raising of animals will favour the breeding and ever wider spreading of those burdensome and dangerous companions of man, which the various coprophagous arthropods are.

The influence of man on the dynamics of population of various insects is not always so direct as in the above mentioned cases. I have made some interesting observations while catching bird lice (*Mallophaga*) on rooks (*Corvus frugilegus*), black birds (*Turdus merula*) and sparrows (*Passer domesticus*), partly coming from urban environment and partly

from places far from any major human agglomerations. It has turned out that the urbanized environment, to which the above mentioned species of birds are perfectly adapted, exerts a definite influence on the fauna of biting lice. For instance, in birds living in Wrocław it is poorer, but the number of biting lice per host bird is greater than in the same species of hosts from outside Wrocław. But only in birds caught in town was I able to find massive infestations with several hundred biting lice on a bird.

So, it seems that biting lice are reliable indicators of the secondary environment which is modified by anthropopressure. Future researches will help to explain the mechanism of these changes.

Also, it still remains to be seen whether only populations of such permanent, obligatory and narrowly specific parasites, which biting lice are, undergo changes of this kind caused by human activity. It may well be that the fauna of stadial and less specific parasites, which ticks and parasitic flies are, changes its character when the hosts find themselves under a strong influence of human activity.

Another question is the influence exerted on the dynamics of parasite populations by the introduction of some animal species into an environment closest to their natural habitat, as for example in animal reserves. There is evidence that the fauna of ectoparasites in bisons reinstated in their natural habitat is shaped in a way similar to that observed in other hoofed animals. This is what ensues from the research made by Kadulski, who in different seasons of the year observed in bisons living in the Białowieża Forest reserve the occurrence of as many as four species of ectoparasites (*Ixodes ricinus*, *Dermacentor reticulatus*, *Bovicola sedecimdecembri* and *Lipoptena cervi*).

After having discussed the basic themes of the 7 reports qualified for the fauna section of this Symposium, it would be worth while to mention some reflections that come to mind regarding the present state of the arachno-entomological studies and some other problems requiring further research work. From among the reports sent in for this Symposium, 3 contained information on Fleas (*Siphonaptera*), 3 discussed various problems regarding synanthropic and parasitic flies (*Diptera*), two were concerned with biting lice (*Mallophaga*) and one with parasitic mites and ticks (*Arachnoidea*). Such a small number of reports dealing with problems of a relatively limited scope proves that research on the fauna of ectoparasites in the conditions of anthropopressure has so far not been sufficiently advanced in this country.

It is evident that the authors are mainly interested in the exploration of the fauna of parasites or synanthrops in those regions of Poland which for long years have been regarded by naturalists as attractive, like re-

serves and mountainous areas. Besides, a continuous trend is apparent to watch the fauna of parasites in hosts which are difficult to reach or are rarely examined from the parasitological point of view, for some other reasons. All things considered, this traditional approach to the problems existing on the borderline between entomology and parasitology seems to be justified at the present state of knowledge. Moreover, when we assume that researches of this kind will be continued in their physiographical, zoogeographical and parasitological aspects, even in the same regions of Poland, we can hope to find the answer to the question what the dynamics of population of parasitic arthropods and synanthrops in time and space are.

There certainly exists a correlation between the state of population of parasitic arthropods and the kind and degree of anthropopressure. It is desirable, therefore, that the fauna of parasites should be examined not only in areas where anthropogenic influence is weak and often hardly noticeable, but most of all in the centres of human activity such as urban and industrial agglomerations. In spite of the growing wave of publications at home and in the world, carrying scientific information, too little systematic researches is carried out to enable a synthetic approach to the problem of the effects of anthropopressure on parasitic land arthropods infesting and accompanying wild animals which, in their turn, are in many ways dominated by man and his husbandry. A great emphasis should be laid on comparative studies on the fauna of parasites and synanthrops in different micro- and macro-environments, with special regard to towns and industrial regions. It would certainly be interesting to examine not only towns of long standing tradition, but also new settlements and other currently created centres of human activity, where it would be possible to follow the development and succession of synanthropic organisms nearly from the beginning. Especially urgent is a continuous observation of the dynamics of population of parasites and other insects connected with such synanthrops as rats, mice, pigeons run wild etc. It would be truistic to mention at this point the role of the blood-sucking parasites as vectors in invasive and infectious diseases. We are not concerned, of course, with the kinds of potential diseases or the description of the so-called "cases", but we ought to be able to assess how imminent the outbreak of an epidemic is in a given environment. In this aspect, the observed tendency in some parasites, e. g. in biting lice and synanthropic flies, to increase in number or to swarm together in places inhabited by people or frequently visited by them, may be particularly helpful. It is possible that also populations of sucking lice (*Anoplura*) react to anthropopressure in a similar way. Unfortunately, this section has not received any reports on these parasites.

The forming of ever larger concentrations of people of a permanent character (towns) or seasonal ones (recreation centres) has not only a selective influence, but it may also favour the development of synanthropic birds and mammals together with their parasites. Thus, some new foci of infectious or invasive diseases in which parasites infesting animals accompanying man are the vectors may be the other side to the question of the rapidly advancing technological revolution. However, it would be difficult to forecast anything a priori, since strong infestations of ectoparasites in synanthropic animals may hamper the development of their populations. The research problems concerning the dynamics of population of ectoparasites in our wild birds and mammals are obviously very complex and ought to be regarded as an emergency of the hour.

As we all know how difficult it has always been to carry out collective work concluded with joint publications, it would be advisable to work out, first of all, such methods of study which would enable us to obtain comparable results and the most accurate conclusions. These methods will, of course, be different, depending on the type of the correlations between the parasites and their hosts as well as on their biology. Nevertheless, the urgent need for coordination of the researches is unquestionable and adequate means ought to be secured for this purpose.

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PASOŻYTY PTAKÓW I SSAKÓW DZIKO ŻYJĄCYCH, W WARUNKACH ANTROPOPRESJI

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Omówiono ogólnie skutki antropopresji w różnych biotopach. Stwierdzono, że nie ma w Polsce właściwie obszarów, gdzie by nie zaznaczały się wpływy człowieka. W związku z tym naświetlono obecną problematykę związaną z pasożytowaniem stawonogów na tle osiągnięć referowanych na parazytologicznych i entomologicznych sympozjach krajowych i skomentowano wyniki badań, zamieszczonych w siedmiu doniesieniach tymczasowych, dotyczących różnych aspektów pasożytnictwa wśród stawonogów. Sprecyzowano, zgodnie z najnowszymi trendami w biologii, cele badawcze prowadzące do właściwego poznania dynamiki populacji synantropijnych i pasożytniczych stawonogów. Badania takie uznano za szczególnie ważne i wyłoniono potrzebę ich koordynacji.