

graphic data afford a fairly comprehensive survey, for the summer months. As yet our winter data are confined to Massachusetts Bay, and the region just north of Cape Ann, but it is proposed to continue the work at other seasons in future years. The reports on the oceanography, with preliminary accounts of the plankton, are being prepared in the Museum of Comparative Zoology, those for the summer of 1912 being now in press. And the more important groups of pelagic organisms have been distributed to specialists who have undertaken the task of reporting on them.

It would be premature to discuss the scientific results of the cruises here. But passing notice may be called to our demonstration of the fact, long ago suspected by Verrill, that the low surface temperatures of the northeastern part of the Gulf of Maine do not indicate the direct influence of an Arctic current, as has so often been suggested, but are merely the evidence of the strong tidal currents, which cause a more or less complete vertical mixing of the water. Where the gulf is coldest on the surface, it is warmest at the bottom, depth for depth, and *vice versa*. This process reaches its extreme in the Grand Menan Channel, and on German Bank, where the physical characters of the water are practically uniform from surface to bottom. Mention has already been made in the daily press of our discovery of extensive beds of the sea scallop (*Pecten magellanicus*) off the coasts of New York, New Jersey and Maryland. And this promises a new fishery of such importance that the *Grampus* was dispatched southward once more, on August 20, 1913, in charge of Mr. W. W. Welsh, for a two weeks' survey of the beds.

HENRY B. BIGELOW

HARVARD UNIVERSITY

SPECIAL ARTICLES

ECTO-PARASITES OF THE MONKEYS, APES AND MAN

FOR several years I have been urging the thesis that the host distribution of the wingless, permanent ecto-parasites of birds and mammals is governed more by the genetic re-

lationships of the hosts than by their geographic range, or by any other ecologic conditions. In numerous papers, and particularly in a recent¹ one surveying all the known records of the occurrence of Mallophaga on birds, I have offered evidence to support this thesis.

Now, if this contention is sound, the converse of the statement is also true. That is, the kinds (genus, species, etc.) of permanent ecto-parasites found on birds and mammals will indicate in some measure the genetic relationships of the hosts. If, for example, ornithologists have before their eyes certain birds of doubtful relationships, as the hoatzins of South America, or the whole family of owls, they may well pay respectful attention to the kinds of ecto-parasites harbored by these hosts. I have, indeed, pointed out, in the paper just referred to, some suggestive specific cases of this sort.

The wingless, permanent ecto-parasites of birds and mammals are of two groups, namely, the biting lice, Mallophaga, feeding on the feathers and hair, and the sucking lice, Anoplura, feeding on blood. Certain mites (Acarina) may perhaps also be assigned to this category of permanent wingless parasites, but the fleas can not be, for they hop on and off their host, and all their immature life is non-parasitic and wholly apart from their future hosts. The Mallophaga, of which nearly 2,000 species are now known, occur chiefly on birds, while the Anoplura, of which less than 100 are known so far, are confined to mammals.

As my own study of these ecto-parasites has been almost exclusively restricted to the Mallophaga I have not been able to illustrate or bolster up my thesis with many examples derived from conditions among the mammals, but the recent careful work of Fahrenholz (Hanover) and Neumann (Toulouse) on the determination and distribution of certain genera and species of Anoplura makes it possible to point out an especially interesting case of host and parasitic relations which is

¹ "Distribution and Species-Forming of Ecto-Parasites," *Amer. Nat.*, Vol. 47, pp. 129-158, March, 1913.

highly pertinent to the thesis and its converse or corollary, as worded above. This case is that of the sucking lice (Pediculidæ) of man, the anthropoid apes and the tailed monkeys. As no biting lice (Mallophaga) have been found on man, nor on any anthropoid, and only two species, so far, on the lower monkeys, no evidence from their distribution can be derived to confirm or contradict the evidence from the occurrence of the Pediculines.

The situation is this. Sucking lice of species representing two genera, *Pediculus* and *Phthirus*, occur on man. Of the second genus but one species is known, and this is confined exclusively to *Homo*. Of the other, *Pediculus*, six species (perhaps five and a variety) are known of which two (or perhaps, as Neumann holds, one and a well-marked variety) occur on man and only on man, while one is found, and exclusively, on the chimpanzee, another on the gibbons (two species of gibbons), and two on monkeys of an American tailed genus, *Ateles*. On the other tailed monkeys are found several Pediculine species of two distinct genera, *Pedicinus* and *Phthirpedecinus*.

It is gratifying—to the upholder of my thesis—to find man and his cousins, the anthropoid apes, harboring and really characterized by parasites of such near relationships, while when the leap from the anthropoid to the lower monkeys is made—a leap notoriously greater, from a genetic point of view, than that from man to the anthropoids—the parasites are found to be of other genera. Only the *Pediculus* species on *Ateles* seems to be a disturbing exception. But it is precisely the monkey genus *Ateles* which offers a special taxonomic problem to students of the primates. Friedenthal (of serum precipitins fame) has affirmed that on a basis of blood and hair comparison *Ateles* shows unmistakable differences from other tailed monkeys, and resemblances with the anthropoids, and he suggests that in *Ateles* we should see monkeys that, in a certain sense, replace, in the new world, the anthropoids.

The above is the situation as Fahrenholz works it out. Neumann believes that the

typical, man-infesting parasite species, *Pediculus capitis*, should include not only the other man-infesting form, *P. corporis*, but also perhaps one of the *Ateles*-infesting forms (*P. consobrinus*). And he is inclined to credit *Pediculus capitis* with a tendency to pass from man to man-apes and monkeys in menageries, and to persist on these new hosts. If *capitis* can do this, then that in itself is a curiously strong indication of the genetic affinities of these various hosts, because both the Mallophaga and Anoplura are curiously sensitive to differences in host blood or host hair and feathers. I have often become, in the course of collection, the temporary host of various bird- and mammal-infesting Mallophaga, but these parasites all seemed as anxious to escape as I was to have them. And they did escape; or, if they did not, they died in a few hours. There is, indeed, an extraordinarily exact fitting of parasite to host in the case of Mallophaga and Anoplura. It is hard to understand of just what details this fitting consists, beyond such more obvious, and insufficient, ones, as number and shape of claws, number and character of clinging spine-hairs, etc. The essential fitting is far more subtle. It is a fitting to the host's physiology as well as to its epidermal structures.

Anyway, Neumann has not known all the cases of the taking of *Pediculus* specimens from the man-apes and from *Ateles*, and some of these cases are beyond the explanation of casual straggling in menageries. For some of the ape hosts were not in menageries.

There is no doubt that man is host to certain permanent, wingless ecto-parasites which find their closest relatives in parasites of the man-apes and of a problematic lower monkey. And this evidence from commonness of parasites adds itself to the already acquired great mass of other evidence from conditions of structure, blood serum reactions, crystallizable proteins (hemoglobins), and the rest, that bind us so unescapably in close genetic relationship with the anthropoids.

VERNON L. KELLOGG

STANFORD UNIVERSITY,
CALIFORNIA