DOMICILIARY COCKROACHES AND THEIR OOTHECAL PARASITES IN INDIA (1)

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In a survey for oothecal parasites of cockroaches in India, 6 species of cockroaches were recorded. Of these Neostylopyga rhombifolia (STOLL) was restricted to thatched huts while Blattella germanica (L.), Periplaneta americana (L.), P. australasiae (F.), P. brunnea BURMEISTER and Supella longipalpa (F.) were common in other types of buildings. Eight species of parasites, of which 4 are new records, were reared: Anastatus tenuipes BOLIVAR, Comeria merceti COMPERE, Evania appendigaster (L.), Evania sp. near antennalis WESTW., Genus et sp. nov. near Anastatus, Tetrastichus asthenogmus (WATERSTON), T. hagenowii (RATZEBURG) and Tetrastichus sp. (miser group) which is hyperparasitic. The natural and experimental hosts of these parasites are discussed. The low levels of field parasitism suggest there is scope for introducing more promising parasite species into India for biological control of cockroaches.

Cockroaches are not only a nuisance in human dwellings, infesting kitchens, bathrooms, stores, etc. but are dangerous, potential disease vectors. Their medical importance and role in the dissemination of pathogens was reviewed by ROTH & WILLIS (1957).

Parasites belonging to at least 6 families of Hymenoptera have been recorded from the oothecae (ROTH & WILLIS, 1960). To explore the possibilities of using some of them in biological control, a survey for indigenous parasites in India was initiated in 1976. Parasites and hosts recorded during the survey are reported here.

MATERIAL AND METHODS

Residential buildings including hostel and hotel kitchens, and huts (2) in Bangalore were visited and samples of cockroach oothecae collected at random. Small consignments of oothecae were also received or collected from Ammasandra, Amruthur, Bhadravati, Gundlupet, Mysore and Tumkur (Karnataka); Calcutta; Delhi; Chittoor and Hydes...

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(2) This term is used in this paper for temporary, thatched dwellings as contrasted with more or less permanent buildings made of brick, stones, plaster and concrete.
The oothecae were classified specifically and segregated into 3 groups — apparently healthy, those with parasite emergence holes and those from which nymphs had emerged. The numbers in each were noted and the 1st group was retained for observation. These oothecae were held individually in $8 \times 1$ cm glass vials plugged with cotton wool and the emergence of parasites or nymphs was recorded. Those from which there were no emergences were dissected after two months to check the fate of the contents.

**PEST SPECIES**

Six species of cockroaches were abundant in human dwellings: *Blattella germanica* (L.), *Periplaneta americana* (L.), *P. australasiae* (F.), *P. brunnea* BURMEISTER, *Supella longipalpa* (F.) and *Neostylopyga rhombifolia* (STOLL). The 1st 5 are well-known domiciliary species while *N. rhombifolia* is believed to be similar to *P. americana* in habits and to be of Indo-Malayan origin. During the present survey, *N. rhombifolia* was found breeding in huts in and near Bangalore, in Amruthur district (Karnataka) and in Chittoor district (Andhra Pradesh) but it was only encountered twice in other types of buildings. In huts, *B. germanica* was found frequently, *Periplaneta* spp. were rare and *S. longipalpa* was seldom collected. Of the species which deposit oothecae, 75.5% of the 2976 oothecae collected from buildings belonged to *Periplaneta* spp. (*P. brunnea*, 33.5%; *P. americana*, 22%; and *P. australasiae*, 20%) and the remainder to *S. longipalpa*. *B. germanica*, a species which carries its ootheca until the nymphs emerge or are about to emerge, was breeding in large numbers wherever it was found.

According to CORNWELL (1968) *Blatta orientalis* L. is essentially a species of temperate regions. It was not detected during the present survey although USMAN (1949) reported it as common in Bangalore and reared *Tetrastichus hagenowii* (RATZEBURG) from it.

**OOTHECAL PARASITES**

Eight parasite species, of which 4 are new records, were reared during the present survey. In the following notes distribution records are from ROTH & WILLIS (1960) unless other references are given.

1. *Tetrastichus hagenowii* (RATZ.) (*Hym., Eulophidae*)

This species is probably world-wide in distribution. It has been recorded from oothecae of *P. americana* from different geographical areas; from *P. australasiae* in Australia, India, Saudi Arabia, Taiwan, Trinidad and the U.S.A. (VARGAS & FALLAS, 1974); *P. brunnea* in the U.S.A.; *P. picea* SHIRAKI in Japan (YOSHIKAWA & IKUSHIMA, 1956); and *P. fuliginosa* SERVILLE in the U.S.A. and in Japan (FLEET & FRANKIE, 1975; KANAYAMA et al., 1976). It has also been recorded from *Blatta* sp. and *Parcoblatta* sp., a woodroach in the U.S.A. There is a single record from *N. rhombifolia* in Hawaii, but, when ROTH & WILLIS (1960) exposed groups of 10 to 20 oothecae of *N. rhombifolia*, at 3 different times, none of them was parasitised by *T. hagenowii*. *B. germanica* has also been listed as a host of this parasite but, ROTH & WILLIS (1954) failed to obtain parasitisation of this host and questioned the record. *T. hagenowii* is recorded as a hyperparasite of *Evania appendigaster* (L.), another oothecal parasite, but ROTH & WILLIS (1960) suggested that this relationship was accidental. Experimental hosts include *B. orientalis* and