SOME ECTOPARASITES OF BATS FROM SERAM ISLAND, INDONESIA[1]

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ABSTRACT: New host and distribution records are provided for some ectoparasites of the families Streblidae, Nycteribiidae, Ischnopsyllidae (Insecta), Ixodidae, Argasidae, Laelapidae, Spinturnicidae and Macronyssidae (Acari) removed from 9 species of bats collected in Manusela National Park, on the island of Seram, Indonesia.

The Indonesian island of Seram (Ceram) is situated in the Moluccan Archipelago between Sulawesi and Irian Jaya. Zoogeographically, it is part of the Wallacean subregion (the faunal transition zone between Asia and Australasia) and while part of the terrestrial fauna is endemic, much of it extends to the east and west in varying degrees. No endemic species of bats are known from Seram and this fauna shows Asian, Australasian, Malesian (Melesia: the biogeographical region stretching from Sumatra and the Malay Peninsula east to the Bismarck Archipelago (Whitmore, 1981, 1987)) or Moluccan distributions. Bat ectoparasite records from Seram are few and therefore valuable not only for inventory purposes but also for elucidation of host-parasite associations.

MATERIALS AND METHODS

Ectoparasites were collected by visual searches from 36 bats of 9 species mist-netted in Manusela National Park, Seram (3° 15'S, 129°38'E), during July and August, 1987. Ectoparasite material was stored in 70% ethanol until it could be processed for identification.

RESULTS AND DISCUSSION

The 9 bat species collected and the numbers of each examined for ectoparasites were as follows (bat nomenclature follows Honacki *et al.*, 1982): *Dobsonia viridis* (Huede) (1♂, 16♀♀), *D. moluccensis* (Quoy and Gaimard) (1♂, 1♀), *Rousettus amplexicaudatus* (E. Geoffroy) (2♂♂, 5♀♀),

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Syconycteris australis (Peters) (1♂, 1♀), *Pteropus temmincki* Peters (1♂, 1♀) (family Pteropodidae), *Miniopterus australis* Tomes (2♂♂) (family Vespertilionidae), *Rhinolophus euryotis* Temminck (1♂) (family Rhinolophidae), *Chaerephon jobensis* (Miller) (1♀), and *Mormopterus beccarii* Peters (2♀♀) (family Molossidae).

Table I lists the ectoparasites collected during this survey. The bat flies and the single flea are deposited in the U.S. National Museum of Natural History, Washington, D.C., and the ticks are in the U.S. National Tick Collection, Smithsonian Institution, Washington, D.C. (accessioned under RML 119,061-119,075).

The ectoparasites recorded here from Seram bats are fairly typical for this group of hosts. The following species represent new records for Seram: *Brachytarsina* (*Brachytarsina*) *amboinensis* Rondani, *Megastrebla* (*Magastrebla*) *gigantea* (Speiser), *M.* (*M.*) *parvior* (Maa), *Raymondia pseudopagodarum* Jobling (Streblidae); *Archinycteribia actena* Speiser, *Nycteribia parilis* Walker (Nycteribiidae); *Thaumapsylla breviceps* Rothschild (Ischnopsyllidae), and all of the ticks and mites.

Most of the bats and ectoparasites retrieved during this survey are known to have wide but contrasting geographical distributions. With respect to the streblid bat flies, *Brachytarsina* (*B.*) *amboinensis* was only taken from *Miniopterus australis* which ranges from India to China (Hainan) and northeastern Australia. The known range of *Brachytarsina* (*B.*) *amboinensis* is similar extending from India and Sri Lanka east to Australia, Vanuatu and New Caledonia (Jobling, 1951; Hiregaudar and Bal, 1956; Maa, 1962, 1971a, 1977; Maa and Marshall, 1981). This bat fly is represented by several subspecies in various parts of its range, and specimens from Seram appear to belong to the nominate subspecies. *Brachytarsina* (*B.*) *amboinensis* is principally parasitic on various species of *Miniopterus* Bonaparte.

The streblid, *Megastrebla* (*M.*) *gigantea* was collected from both species of *Dobsonia* Palmer. *Dobsonia viridis* is distributed throughout the Moluccan and Banda Islands and the Philippine island of Negros while *D. moluccensis* extends from the Moluccas eastward to Aru, New Guinea, and northern Queensland. *Megastrebla* (*M.*) *gigantea* has been recorded from India east to New Britain (Jobling, 1951; Hiregaudar and Bal, 1956; Maa, 1962). However, Maa (1971b) later stated that this species with its 3 subspecies (*gigantea gigantea*, *g. kalawawae* Maa, *g. solomonis* Maa) ranges only from Sumba east to the Solomon Islands, and that all other records must be held suspect. This is the largest known species in the genus and is probably restricted to bats of the genus *Dobsonia*. The specimens from Seram are of the nominate subspecies.

Megastrebla (*M.*) *parvior* was collected from *Rousettus amplex-*

icaudatus. This bat ranges throughout Malesia whereas *Megastrebla parvior* has a known distribution extending from India and Burma east to the Philippines, south to Sumatra, Sumba and New Guinea (Maa, 1962, 1971b, 1977). The specimens from Seram are of the nominate subspecies. Maa (1962) recorded the Sumba series of specimens from *Rousettus amplexicaudatus*, and the remaining type series from *Eonycteris spelaea* (Dobson). *Rousettus* Gray is the primary host of the nominate subspecies (Maa, 1971b), but it has also been recorded from a number of other hosts. A second subspecies, *Megastrebla parvior papuae* Maa, was described from New Guinea from *Rousettus amplexicaudatus* and *Dobsonia moluccensis*.

Raymondia pseudopagodarum was removed from a male *Rhinolophus euryotis*. This bat ranges from Sulawesi east to the Moluccas, Timor, New Guinea, the Bismarck Archipelago and adjacent small islands whereas its tiny parasite ranges from Burma, Thailand, China, east to the Philippines, and south to Timor and Seram (Jobling, 1951; Maa, 1962, 1977). Primary hosts for *Raymondia pseudopagodarum* seem to be species of *Rhinolophus* Lacepede and *Hipposideros* Gray, although a few other suspect hosts have been listed for the species.

With respect to the nycteribiid bat flies, *Archinycteribia actena* was collected only from *Dobsonia viridis*. This fly has previously been recorded from Ambon, New Guinea, the Solomon Islands and Australia (Maa, 1962, 1971a; Theodor, 1967). In 4 of the collections, *A. actena* was taken in association with *Leptocyclopodia* (*Oncoposthia*) sp. A, once with *Megastrebla* (*M.*) *gigantea*, and twice by itself.

The single specimen of *Cyclopodia* sp. collected from *Syconycteris australis* is in poor condition, but from the characters that can be seen it could be *Cyclopodia sycophanta* Maa that parasitizes the same host, or it might represent a new species in the *C. sycophanta* group. Additional specimens will be needed before the identity of this species can be determined with certainty.

Leptocyclopodia (*Oncoposthia*) *macrura* Speiser was collected only from *Dobsonia moluccensis*; this bat fly was previously reported from *D. moluccensis* on the islands of Biak and Owi off the northern coast of New Guinea (Hadi *et al.*, 1980). *Leptocyclopodia* (*O.*) *macrura* is a distinctive species and has also been recorded from Sumbawa, Ambon, Seram, New Guinea, and New Britain (Maa, 1962, 1966, 1968, 1975; Treodor, 1959, 1967) which approximates the distribution of *Dobsonia moluccensis*.

Leptocyclopodia (*Oncoposthia*) sp. A was collected mainly from *Dobsonia viridis* although 2 specimens were taken from *Syconycteris australis*. This latter bat species ranges from the Moluccas eastward to New Guinea, the Bismarck Archipelago and adjacent small islands and south to Australia. These bat fly specimens probably represent a new

species since neither sex runs successfully in Maa's key (1975) nor do they fully match the descriptions or illustrations of the other species of this subgenus. The true status of this fly can be determined only when comparative material of other closely related species is available.

Nycteribia parilis was found only on a male *Miniopterus australis*. The same host individual yielded 8 specimens of the streblid *Brachytarsina* (*B.*) *amboinensis*. *Nycteribia parilis* is known from Ambon, Batchian, Timor, and other Moluccan islands, New Guinea and Australia principally from various species of *Miniopterus* (Maa, 1962, 1971a; Theodor, 1967). There are 2 subspecies of this bat fly: the nonimate subspecies over most of its range, and *p. vicaria* Maa from Australia.

Thaumapsylla breviceps, the only flea collected, has a very broad geographical range that includes much of the Ethiopian and Oriental Regions. However, 2 subspecies are known: the nominate subspecies in Africa, and *b. orientalis* in Southeast Asia (Hopkins and Rothschild, 1956). Although it is most likely that the latter taxon was collected in this survey, the 2 subspecies can only be separated by male characters and the Seram specimen is a female. This flea typically parasitizes *Rousettus* bats, which agrees with the *R. amplexicaudatus* record documented here for Seram. *Thaumapsylla breviceps* has hyper-developed pronotal combs that may facilitate attachment to its volant hosts and partly explain why this species has such a large geographical distribution (Traub, pers. comm.).

The tick, *Ixodes* (*Eschatocephalus*) *simplex* Neumann, occupies a vast geographical area within the Palaearctic, Ethopian, Oriental and Australasian Regions (Arthur, 1956; Wilson, 1970; Clifford *et al.*, 1973). It was taken only from *Miniopterus australis* in this survey, an anticipated association since *Miniopterus* is the usual host (Wilson, 1970).

Ixodes (*Lepixodes*) *kopsteini* Oudemans is known to parasitize bats in the Ethiopian, Oriental and Australasian Regions including the Moluccas (Kadarsan, 1971; Clifford *et al.*, 1973). During this study it was collected from 3 host species belonging to 2 families. The molossids, *Chaerephon jobensis* which ranges from India and Sri Lanka, east to southern China and Vietnam, and southeast to the Philippines, Borneo, Bali and the Moluccas, and *Mormopterus beccarii* which ranges from the Moluccas east to New Guinea, northern and central Australia and adjacent small islands, appeared to be the main hosts but a single specimen was collected from the pteropodid, *Rousettus amplexicaudatus*. *Ixodes* (*L.*) *kopsteini* possesses certain morphological and reproductive features unknown in other ticks (Kadarsan, 1971). These morphological traits led Anastos (1950) to exclude this unusual tick from his monograph on Indonesian Ixodidae because he considered it to be, "probably a special type of mite."

Table 1. Ectoparasites of Bats from Seram Island, Indonesia, 1987.

	Dobsonia viridis (n = 17)	*Dobsonia moluccensis* (n = 2)	*Rousettus amplexicaudatus* (n = 7)	*Syconycteris australis* (n = 2)	*Pteropus temmincki* (n = 2)	*Miniopterus australis* (n = 2)	*Rhinolophus euryotis* (n = 1)	*Chaerephon jobensis* (n = 1)	*Mormopterus beccarii* (n = 2)
Nycteribiidae:									
Archinycteribia actena	11♂,7♀								
Leptocyclopodia macrura		8♂,3♀							
Leptocyclopodia sp. A	20♂,21♀			1♂,1♀					
Cyclopodia sp.				1♂					
Nycteribia parilis						1♂			
Streblidae:									
Megastrebla gigantea	2♂,1♀	1♂,4♀							
Megastrebla parvior			1♂						
Brachytarsina amboinensis						6♂,2♀			
Raymondia pseudopaoodarum							1♂		

Ischnopsyllidae:						
Thaumapsylla breviceps		1♀				
Ixodidae:						
Ixodes kopsteini		1L*			3N*	1N,6L
Ixodes simplex				1♀		
Argasidae:						
Ornithodoros sp.	70L	2L				
Laelapidae:						
Neolaelaps spinosa			1♂			
Macronyssidae:						
Macronyssus sp.				1N		
Trichonyssus sp.						3N
Spinturnicidae:						
Ancystropus taprobanius		1♂,1♀				
Ancystropus zeleborii		3♀				
Meristaspis calcarata			1♀			
Meristaspis jordani	1♂,7♀					
Meristaspis lateralis	1♂	5♂,4♀,3N				
Paraperiglischrus rhinolophinus					2♀	
Spinturnix psi				1♂,2♀		

*L = larvae, N = nymphs.

Ornithodoros sp. larvae could not be identified further so little can be stated regarding host associations or geographical distribution. Nevertheless, this tick genus occurred almost exclusively on *Dobsonia viridis* (70 specimens) although 2 specimens were taken from a female *Rousettus amplexicaudatus*.

The laelapid mite, *Neolaelaps spinosa* (Berlese) is parasitic on a variety of fruit bats in the genus *Pteropus* Erxleben. It ranges from Sri Lanka to Australia so the present record from *P. temmincki* on Seram is expected. This mite occasionally has been found attached phoretically to nycteribiid bat flies (Maa, 1971a) but this phenomenon was not observed in the Seram material.

All 4 macronyssid mites were damaged protonymphs and could not be identified beyond genus. Two genera were collected: *Macronyssus*, which is most often retrieved from vespertilionid bats, agreeing with the *Miniopterus australis* record documented here, and *Trichonyssus* which occurs principally on vespertilionids but also on some other bat families including Molossidae from which the Seram collections were made. While the genus *Macronyssus* is virtually cosmopolitan in distribution, there does not appear to be any previous records for *Trichonyssus* outside of Australia and Tasmania (Radovsky, 1979; Micherdzinski and Domrow, 1985; Domrow, 1987).

Seven species of spinturnicid mites were collected. *Ancystropus taprobanius* (Turk) and *A. zeleborii* Kolenati were both taken from *Rousettus amplexicaudatus* which concurs with previously documented host records especially those from southern Asian species of *Rousettus* (Prasad, 1969; Domrow, 1972; Hadi *et al.*, 1980). Three species of *Meristaspis* were identified from different bat hosts. *Meristaspis lateralis* (Kolenati), which ranges from the Near East (Palestine and Yemen) southeast to New Guinea, is principally parasitic on *Rousettus* species (Delfinado and Baker, 1963; Prasad, 1969). The present records of *Meristaspis lateralis* from *Rousettus amplexicaudatus* therefore conform to this trend although the single specimen of *Meristaspis lateralis* from *Dobsonia viridis* is an exception. *Meristaspis jordani* (Radford) was collected only from *Dobsonia viridis*. Previous records show this mite to be parasitic mainly on bats of the genus *Dobsonia*, and to range from Sulawesi and the Philippines to New Guinea and the Bismarck and Solomon Islands (Prasad, 1969; Domrow, 1972). *Meristaspis calcarata* (Hirst) typically parasitizes numerous species of *Pteropus* bats and ranges from Madagascar to Australia and a number of Pacific islands (Delfinado and Baker, 1963; Prasad, 1969). The present record from *P. temmincki* fits this distribution. *Paraperiglischrus rhinolophinus* (Koch) is associated with numerous species of *Rhinolophus* bats, and ranges from the British Isles southeast to Africa, southern Asia and Australia. In this survey it was collected

from *R. euryotis*. *Spinturnix psi* (Kolenati) is another ectoparasite with a wide geographical distribution. There are records of this mite from France, southern Europe, Madagascar, southern Asia and Australia. In this survey, *Spinturnix psi* was collected only from *Miniopterus australis* which concurs with its known host preference for species of *Miniopterus* (Baker and Delfinado, 1964; Prasad, 1969; Domrow, 1972).

The above records extend the known geographical distributions of most of the ectoparasites collected during this survey. Geographical distributions of the bat species and their associated ectoparasites are not congruent in the majority of cases. Different bat species are parasitized by these ectoparasites in other parts of their range. Conversely, a few of the ectoparasites were more host specific and may be expected to overlap more closely with the distributions of their hosts. The dispersive abilities of their volant hosts and the facility of some bat ectoparasites to utilize a spectrum of host species probably explains, at least in part, the large geographical distributions of many bat-associated arthropods.

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