ZOO-GEOGRAPHICAL AND SYSTEMATIC NOTES ON THE NYCTERIBIIDAE (DIPTERA PUPIPARA) OF INDIA, CEYLON AND BURMA.

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More than ten years ago I wrote a paper " On some Oriental Nycteribiidae,"[1] dealing almost entirely with material from Ceylon and India and, nearly three years later, I published a few additional Indian records.[2] Since that time Nycteribiidae have been submitted to me from various sources, and many notes and records have accumulated. In particular, during 1922 and 1923, four lots of material collected by Captain W. W. A. Phillips, F.Z.S., were received from Ceylon, partly through the kindness of Mr. R. Senior-White and partly direct from the collector. Moreover, early in 1924 and shortly before his regretted death, Dr. N. Annandale was good enough to submit to me almost the whole of the material of this group in the Indian Museum, and Dr. B. N. Chopra has subsequently sent certain further consignments; so that, excepting a few duplicates, I have now seen all the Nycteribiidae in that museum up to date. It seems, therefore, advisable, having determined so much material, to try and give a fuller account of the Nycteribiidae of India, Ceylon and Burma. There remain in my possession, however, some further unpublished records and material, not yet critically studied, from other parts of the East—the Malay Archipelago—as well as from quite other regions of the world.

Of the 18 forms dealt with in this paper, all are known to occur in the countries under review except one, namely *Nycteribia* (*Acrocholidia*) *phthisica* Speiser, the single example of which was obtained in Amboina: it is included here, in spite of not being Indian, because the unique type is preserved in the Indian Museum. I am much indebted to the authorities of that institution for allowing the loan of this type, and also of the unique types of *Basilia bathybothyra* Speiser, and *Cyclopodia amiculata* Speiser (all of which I had long wanted to see), and further for their permission to submit these three very desiccated and shrunken specimens to a prolonged soaking in water and afterwards to transfer them to spirit. Preliminary descriptions of these three species were published in 1907 (*Rec. Ind. Mus.* I, p. 295) and Dr. Speiser then stated that detailed descriptions were to follow. It is to be regretted that the detailed descriptions have not appeared, for I, being unable to recognise the species with certainty from the short preliminary descriptions (unaccompanied by figures), have since described and figured the two latter species under other names. These names now fall as synonyms, as explained in the following pages. It may also be remarked here that neither of these forms can be left in the genera to which they were, respectively, originally referred. In the present paper I have myself described three new species, all of them from one sex only—the female, which in Nycteribiidae usually

[1] *Ann. Mag. Nat. Hist.* (8) XIV, pp. 209-235, pl. x-xii (1914).
[2] *Parasitology* IX, pp. 593-610, pl. xxiv (1917).

presents far better external differentiating characters than the male—and in two cases from single specimens: but it may be hoped that no serious confusion will result, as the descriptions are drawn up from spirit material, are full, and are accompanied by figures.

The figures have all been made with the help of a camera lucida. Excepting those of *N.* (*A.*) *phthisica*, which are by myself, they were drawn by Mr. H. C. Gillings, to whom my best thanks are due for the care which he has given to their execution.

The names of the Nycteribiidae collected by Captain Phillips in Ceylon, together with remarks on their hosts, their relative abundance, etc., have been published by him in an article entitled "Ecto-Parasites of Ceylon Bats" [*Spolia Zeylanica*, (=*Ceylon Journal of Science*, Section B) XIII, pp. 65-70, September 1924], which is often cited in the present paper.

RELATIONSHIP OF PARASITE TO HOST, AND GEOGRAPHICAL DISTRIBUTION.—In my earlier paper on Ceylon Nycteribiidae I gave a table showing the distribution of each Nycteribiid, and the number of bat-species on which it had been found. In the present paper, following the example of Dr. Falcoz,[1] more than one table is given; in TABLE 1 the Nycteribiidae are listed, while their distribution is shown in the second, and the known hosts of each appear in the third, column; in TABLE 2 the bats are listed, while their distribution (at least within the countries under review) is summarised in the second, and the Nycteribiidae known to infest each bat appear in the third, column. Dr. Falcoz (*l.c.*) gives a third table, in which the localities are listed in the first column, and the Nycteribiids and bats associated together in each locality are shown in the second and third columns respectively; but nothing corresponding to this is attempted in the present article.

As to the identifications of the bats; the names of those on which the Indian Museum material was found were sent to me from that museum, and Captain Phillips is responsible for determining those from which specimens were collected by him in Ceylon. In the case of some other records published here for the first time, the names of the bats were sent to me when the Nycteribiid material was submitted for identification. The older records summarised here are taken from my own earlier papers and from Speiser's general work "Über die Nycteribiiden."[2] Mr. Oldfield Thomas, F.R.S., has very kindly checked all the names and indicated to me the up-to-date nomenclature and synonymy. But in cases where a species of bat is no longer referred to the same genus under which it has been cited in earlier works on Nycteribiidae, or to which it is referred in manuscript labels and records accompanying Nycteribiid material, it has seemed best in most cases to insert the older generic name in square brackets after the name of the genus in which the bat is at present placed: thus, *Leuconoe* [*Myotis*] *capaccinii* was referred to as *Myotis capaccinii* in earlier writings on Nycteribiidae, and *Myotis* [*Vespertilio*] *muricola* was called *Vespertilio muricola* on the manuscript label accompanying the parasites from this bat.

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[1] L. Falcoz, "Biospeologica, No. 49, Pupipara"; *Arch. Zool. Exper.* LXI, pp. 521-552 (1923).

[2] *Arch. Naturg.* LXVII (1), pp. 11-78, pl. iii (1901).

TABLE 1.—*Showing all the Nycteribiidae known to occur in India, Ceylon and Burma, together with the geographical distribution and all the known hosts of each species: the names of the bats on which the Nycteribiidae have, severally, been found in the countries under review are printed in heavy black type.*

NYCTERIBIIDÆ.	GEOGRAPHICAL DISTRIBUTION.	HOSTS.
Penicillidia dufouri (Westw.)	Europe, North Africa, Formosa, East and West Himalayas, Kashmir.	**Leuconoe longipes** Dobs. *Leuconoe* [*Myotis*] *capaccinii* Bon. (?) *Leuconoe* [*Myotis*] *taiwanensis* Lind. *Myotis myotis* Bork. *Myotis oxygnathus* Mont. *Miniopterus schreibersi* (sens. lat.). (?) *Pipistrellus abramus.* *Rhinolophus euryale* Bl. *Rhinolophus blasii* Pet. *Rhinolophus hipposideros* Bechst. *Rhinolophus ferrum-equinum* Schreb. *Rhinolophus clivosus* Rüpp.
Penicillidia jenynsi (Westw.) var. *indica*, nov.	India (Satara District, Bombay), Ceylon. [Typical form of this species known from China, Formosa, and Sumatra.]	**Miniopterus fuliginosus** Hodgs. [*Host of typical* form is *Miniopterus schreibersi*, sens. lat.].
Penicillidia fletcheri Scott	India (Coimbatore and Mysore)	**Scotozous [Pipistrellus] dormeri** Dobs.
Penicillidia bathybothyra (Speiser), (*fletcheri* var. *pumila* Scott).	India (Calcutta; Khandala, Bombay; Madras), Ceylon, West Africa.	**Myotis [Vespertilio] muricola** Hodgs. **Pipistrellus mimus mimus** Wrought. **Pipistrellus** sp. ? **coromandra** Gray.[1]

[1] This *Pipistrellus* was in both cases determined as *P. abramus*, and was referred to under that name as the host of *Penicillidia fletcheri* var. *pumila* by me in *Ann. Mag. Nat. Hist.* (8) XIV, pp. 212, 218, 1914. Mr. Oldfield Thomas, however, tells me that the true *P. abramus* is a Far Eastern form, and that the bats under consideration here were probably *P. coromandra*. On the other hand, the species included in the table as a possible host of *Penicillidia dufouri* may quite possibly have been the true *P. abramus*, as the record on which its inclusion is based is from Formosa.

Nycteribiidæ.	Geographical Distribution.	Hosts.
Penicillidia peali, sp. n.	Assam (Sibsagar).	Unrecorded.
Nycteribia (*Acrocholidia*) *vexata* Westw. . .	Europe, North Africa, Egypt, Sikkim Himalayas	[Himalayan host unidentified.] *Miniopterus schreibersi* Kuhl. *Myotis myotis* Bork. *Myotis oxygnathus* Mont. *Rhinolophus euryale* Bl. *Rhinolophus ferrum-equinum* Schreb. *Rhinolophus hipposideros* Bechst. *Rhinolophus* sp. [Egypt].
Nycteribia (*Acrocholidia*) *euxesta* (Speiser)	Burma, Ceylon, India (Orissa, Assam)	**Hipposideros armiger** Hodgs. **Hipposideros lankadiva** Kel. **Cynopterus sphinx gangeticus** K. And. **Rhinolophus subbadius** Blyth. **Rousettus leschenaulti** Desm.
Nycteribia (*Acrocholidia*) *phillipsi*, sp. n. .	Ceylon	**Rhinolophus rouxi rouxi** Temm.
Nycteribia (*Listropodia*) *pedicularia* Latr. . .	Europe, North Africa, India (Kashmir ; Darjeeling), China, Formosa, South Africa.	**Leuconoe longipes** Dobs. *Leuconoe* [*Myotis*] *dasycneme* Boie. *Leuconoe* [*Myotis*] *daubentoni* Leisl. *Myotis myotis* Bork. *Myotis oxygnathus* Mont. *Miniopterus schreibersi* Kuhl. *Rhinolophus hipposideros* Bechst. *Eptesicus* [*Vespertilio*] *serotinus* Schreb. *Nyctalus* [*Vespertilio*] *noctula* Schreb.
Nycteribia (*Listropodia*) *allotopa* Speiser, (*insolita*, Scott).	Sumatra, India (Satara District, Bombay), Ceylon, China, Formosa.	**Miniopterus fuliginosus** Hodgs. *Miniopterus schreibersi*, sens. lat.

Nycteribia (*Listropodia*) *parvula* Speiser, (*sauteri* Scott).	Sumatra, Formosa, Ceylon, India (Satara District, Bombay).	**Miniopterus fuliginosus** Hodgs. *Miniopterus scheibersi*, sens. lat.
Nycteribia (*Stylidia*) *annandalei*, sp. n. . . .	India (Singhbhum District, Bengal) . .	**Rhinolophus lepidus** Blyth.
Cyclopodia sykesi (Westw.) . . .	India (Assam ; Orissa ; Bihar ; Madras ; Travancore), Burma (Rangoon), Ceylon, Maldive Is., Judaea.	**Pteropus giganteus** Brünn. **Pteropus giganteus giganteus** Brünn. **Pteropus giganteus leucocephalus** Hodgs. **Pteropus intermedius** K. And. (?) **Pteropus medius** Temm. (?) **Pteropus vampyrus** L. [**celaeno**]. **Scotophilus kuhli** Leach.
Cyclopodia ferrarii (Rondani) . . .	Java, Sumatra, Burma, Ceylon, India (Calcutta).	**Cynopterus sphinx** Vahl. **Cynopterus brachyotis ceylonensis** Gray.
Cyclopodia (*Paracyclopodia*) *roylei* (Westw.) . .	India (Bengal ; Orissa ; Bihar ; W. Ghats ; United Provinces ; Madras ; Coromandel), Ceylon, Malay Peninsula.	**Hesperoptenus (Vesperugo) tickelli** Blyth. **Scotophilus heathi** Horsfield. **Scotophilus kuhli** Leach. **Scotophilus temmincki** Leach. **Scotophilus wroughtoni** Thomas. **Megaderma lyra** Geoffr. **Myotis formosus** Hodgs. **Pipistrellus** sp. (? **coromandra** Gray).[1] **Tylonycteris pachypus** Temm.
Tripselia amiculata (Speiser), (*fryeri* Scott) . .	India (Calcutta), Ceylon, Labuan, Assumption I., Tropical Africa (Belgian Congo ; Dahomey).	**Taphozous longimanus** Hardw. *Taphozous mauritianus* Geoffr. **Saccolaimus saccolaimus** Temm. *Saccolaimus peli* Temm.
Eucampsipoda hyrtli (Kolenati)	Africa (Egypt ; Senegal ; East and South Africa), Comoro Islands, Madagascar, Sumatra, Burma, Ceylon, India (Assam ; Orissa).	**Cynopterus sphinx gangeticus** K. And. **Rousettus leschenaulti** Desm. **Rousettus seminudus** Kel. *Rousettus leachi*, A. Smith [*collaris* auctt.]. *Rousettus aegyptiacus* Geoffr. *Tylonycteris pachypus* Temm.

[1] See footnote on page 353.

TABLE 2.—*Showing the species of bats on which Nycteribiidae have been found in India, Ceylon and Burma, together with the distribution of, and the species of Nycteribiidae found on, each host-species within the countries under review. The English names of the bats are those used by Capt. W. W A. Phillips in his work (1924) cited above. The distribution of the bats is mainly compiled from R. C. Wroughton's "Summary of the Results from the Indian Mammal Survey," section on Chiroptera,* Journ. Bombay Nat. Hist. Soc. XXV, no. 4, pp. 564-598 (1918) and XXVI, no. 1, pp. 19-27 (1918). *When the localities recorded in this paper and in other literature on Nycteribiidae are included within the areas summarised by the Mammal Survey, they are not separately mentioned, but when not so included, they are added briefly to the summaries of distribution given in the second column; in such cases the areas summarised from the Mammal Survey are distinguished by the letters (M. S. I.) following them, and those taken from the Indian Museum material by (I. M.), while records for which Capt. Phillips is responsible are indicated by (W W A. P.), and two taken from my own earlier paper (Sept. 1914) by (H.S.).*

CHIROPTERA.	GEOGRAPHICAL DISTRIBUTION WITHIN THE COUNTRIES UNDER REVIEW.	NYCTERIBIID PARASITES.
PTEROPODIDAE.		
Cynopterus sphinx Vahl.	Widely distributed in India, extending as far North as Sikkim and as far East as the Shan States; also Ceylon.	*Cyclopodia ferrarii* (Rond.).
Cynopterus sphinx gangeticus K. And. . . .	United Provinces, Central Provinces, Palanpur (Bombay) (M. S. I.); Garo Hills, Assam (I. M.).	*Nycteribia (Acrocholidia) euxesta* (Speiser). *Eucampsipodia hyrtli* (Kol.)
Cynopterus brachyotis ceylonensis Gray (Ceylon Short-nosed Fruit Bat).	Ceylon . . .	*Cyclopodia ferrarii* (Rond.).
Pteropus giganteus giganteus Brünn. (Common Flying Fox).	Widely distributed in India, North and South, also Ceylon and Burma.	*Cyclopodia sykesi* (Westw.).
Pteropus giganteus leucocephalus Hodgs. . . .	Nepal, Assam, Manipur	*Cyclopodia sykesi* (Westw.).

Pteropus intermedius K. And.	Amherst District, Burma (M. S. I.); Chilka Lake, Madras (I. M.).	*Cyclopodia sykesi* (Westw.).
Pteropus medius Temm.	Records under this name from Orissa and Travancore (I. M.); probably it should be regarded as synonymous with *P. giganteus* in these cases.	*Cyclopodia sykesi* (Westw.).
Rousettus leschenaulti Desm.	Widely distributed in India, as far South as Coorg and Pondicherry, and as far North as Kumaon and Bhutan; also Burma and Tenasserim.	*Nycteribia* (*Acrocholidia*) *euxesta* (Speiser). *Eucampsipodia hyrtli* (Kol.)
Rousettus seminudus Kel. (Ceylon Fruit-eating Bat)	Ceylon	*Eucampsipodia hyrtli* (Kol.).
RHINOLOPHIDAE.		
Rhinolophus rouxi rouxi Temm. (Rufous Horse-shoe Bat).	Nepal, Sikkim, Bengal, Bombay (Kanara and Dharwar), Nilgiris, Pondicherry, Ceylon.	*Nycteribia* (*Acrocholidia*) *phillipsi*, sp. n.
Rhinolophus subbadius Blyth	Nepal; Garo Hills, Assam; Mussoorie, U. P.	*Nycteribia* (*Acrocholidia*) *euxesta* (Speiser).
Rhinolophus lepidus Blyth	Kumaon, Bengal, Ganges Valley, Central Provinces, Kanara, South India (Wynaad), Burma (Mt Popa).	*Nycteribia* (*Stylidia*) *annandalei*, sp. n.
Hipposideros armiger Hodgs.	Kumaon, Nepal, Sikkim, Khasi Hills, Burma (as far East as Shan States).	*Nycteribia* (*Acrocholidia*) *euxesta* (Speiser).
Hipposideros lankadiva Kel (Large Indian Leaf-nosed Bat).	Ceylon, Mysore, Bellary, Kanara, Central Provinces (M. S. I.); Garo Hills, Assam (I. M.).	*Nycteribia* (*Acrocholidia*) *euxesta* (Speiser).
MEGADERMATIDAE.		
Megaderma lyra Geoffr. (Indian Vampyre)	Widely distributed in India, as far North as Sikkim and Bhutan Duars; also Ceylon and Burma.	*Cyclopodia* (*Paracyclopodia*) *roylei* (Westw.).

Chiroptera.	Geographical Distribution within the countries under review.	Nycteribiid Parasites.
Vespertilionidae ; Vespertilioninae.		
Leuconoe longipes Dobs.	Kashmir (M. S. I., I. M.) . .	*Penicillidia dufouri* (Westw.).
		Nycteribia (*Listropodia*) *pedicularia* Latr.
Myotis muricola Hodgs.	Nepal, Bhutan Duars, Tenasserim (M. S. I.); Calcutta (I. M.).	*Penicillidia bathybothyra* (Speiser), (*fletcheri* var. *pumila* Scott).
Myotis formosus Hodgs.	Nepal, Dharmsala (Punjab), Mussoorie (M.S.I.); Bihar (I. M.).	*Cyclopodia* (*Paracyclopodia*) *roylei* (Westw.).
Pipistrellus sp. (? *coromandra* Gray)[1] (Coromandel Pipistrel).	Widely distributed in India as far N. as Sikkim, also Ceylon.	*Penicillidia bathybothyra* (Speiser).
Pipistrellus mimus mimus Wrought. (Southern Dwarf Pipistrel).	Widely distributed in India, North and South ; also Ceylon and Burma.	*Penicillidia bathybothyra* (Speiser).
Scotozous dormeri Dobs.	Widely distributed in India, N. and S. . .	*Pencillidia fletcheri* Scott.
Tylonycteris pachypus Temm.	Widely distributed over all the East side of India, North and South, and Burma ; representative form on West coast considered distinct (M.S.I.) ; recorded (*sensu lato*) from Ceylon (H.S.).	*Cyclopodia* (*Paracyclopodia*) *roylei* (Westw.).
Hesperoptenus tickelli Blyth (Tickell's Bat) . .	Widely distributed in India, North and South ; also Ceylon.	*Cyclopodia* (*Paracyclopodia*) *roylei* (Westw.).

Scotophilus heathi Horsf.	Madras, Rajputana (M.S.I.); Bihar (H.S.) .	*Cyclopodia* (*Paracyclopodia*) *roylei* (Westw.).
Scotophilus kuhli Leach (Common Yellow Bat) . .	Widely distributed in India, North and South; also Ceylon and Burma.	*Cyclopodia* (*Paracyclopodia*) *roylei* (Westw.). *Cyclopodia sykesi* (Westw.): ? accidental, see below, p. 380.
Scotophilus temmincki Leach . . .	This name is not used in the M. S. I., but there is a record from United Provinces under it among the Ind. Mus. material: possibly the bat really belonged to another species of *Scotophilus*.	*Cyclopodia* (*Paracyclopodia*) *roylei* (Westw.).
Scotophilus wroughtoni Thos. (Wroughton's Bat)	Widely distributed in India, North and South; also Ceylon and Burma.	*Cyclopodia* (*Paracyclopodia*) *roylei* (Westw.).
MINIOPTERINAE.		
Miniopterus fuliginosus Hodgs. (Long-winged Bat) .	Kumaon, Nepal, Burma (Mt. Popa), W. Ghats, Satara District (Bombay), Ceylon.	*Penicillidia jenynsi* var. *indica*, n. *Nycteribia* (*Listropodia*) *allotopa* Speiser. *Nycteribia* (*Listropodia*) *parvula* Speiser.
EMBALLONURIDAE.		
Taphozous longimanus Hardw. (Long-armed Bat)	Widely distributed in India to as far North as Surat and Bengal, also Burma and Tenasserim (M.S.I.); Ceylon (W.W.A.P.).	*Tripselia amiculata* (Speiser), (*fryeri* Scott).
Saccolaimus saccolaimus Temm. (Pouch-bearing Sheath-tailed Bat).	Bengal; Kanara; Ceylon	*Tripselia amiculata* (Speiser).

[1] See footnote on page 353.

From a *geographical standpoint* these Indian Nycteribiidae may be roughly grouped as follows :—(i) A mainly PALAEARCTIC GROUP, consisting of *Penicillidia dufouri*, *Nycteribia* (*A.*) *vexata*, and *N.* (*L.*) *pedicularia*. It is true that the last of these is also recorded from South Africa, but it may be doubted whether this record is not based on some very closely allied form, perhaps not yet described. In any case, apart from this, these three species are almost exclusively Palaearctic, the first and the last ranging right across that vast region from Europe to Formosa ; in fact Formosa is the only part of their known range usually regarded as in the Oriental, rather than the Palaearctic, Region, and it is not very far beyond the generally accepted border-line between the two.[1] Though now recorded for the first time from India, these species are only known from Kashmir and the Eastern and Western Himalayas, which, above a certain altitude, are part of the Palaearctic Region. It is significant that the only recorded host of these species in India, *Leuconoe longipes*, on which *P. dufouri* and *N.* (*L.*) *pedicularia* were found (the Indian host of *N.* (*A.*) *vexata* is not recorded), also appears to be confined to these parts of India. In view of these facts it is rather surprising that these insects were sometimes taken at relatively low elevations. All three species were found on an unidentified bat at an altitude of only 3,500 feet in the Darjeeling District ; but *P. dufouri* has also been taken from a bat at 8,000 ft. in Garhwal. The elevation of the place in Kashmir where *P. dufouri* and *N.* (*L.*) *pedicularia* were taken from *Leuconoe longipes* I have been unable to discover. In connexion with the wideness of range, both vertical and horizontal, of Nycteribiidae, the great mobility of their hosts must be borne in mind.

(ii) The second, or characteristically ORIENTAL GROUP, may for the sake of convenience be subdivided into (ii A) SPECIES WIDE-SPREAD IN THE EAST, i.e., *Nycteribia* (*L.*) *allotopa*, *N.* (*L.*) *parvula*, and *Cyclopodia ferrarii*, which are known from Java, Sumatra, Formosa, Ceylon, and India. In the last-named country the two former are so far recorded only from the Satara District of Bombay. These two species are only known to occur on certain closely-allied forms of *Miniopterus*, on which they are usually associated with *Penicillidia jenynsi*, the distribution of which is the same as theirs ; but this last is represented in Ceylon and India by a distinct subspecific form, which may be placed in the following subdivision : (ii B) SPECIES KNOWN ALMOST EXCLUSIVELY FROM INDIA, CEYLON, AND BURMA are *Penicillidia fletcheri*, *P. jenynsi* var. *indica*, *Nycteribia* (*A.*) *euxesta*, *Cyclopodia* (*P.*) *roylei*, and *C. sykesi*. It is significant that none of these (nor those of the preceding subdivision) has been found in the Himalayas, though they are widely distributed in other parts of the countries under review, and their hosts are for the most part widely ranging Indian forms. *Cyclopodia* (*P.*) *roylei*, which extends into the Malay Peninsula, appears to be one of the

[1] It is not intended here to enter into any discussion of the peculiar relationships of the fauna of Formosa. The Vertebrates of that island have been discussed from this point of view in Wallace's " Island Life " and probably elsewhere. A considerable amount has been written about the insects, especially in the series of papers entitled " H. Sauter's Formosa—Ausbeute," of which my report on the Nycteribiidae (Feb. 1914) formed a small part ; but I am not aware that any general review of the insect fauna has yet appeared.

most abundant of Eastern Nycteribiids; it is known from nine different species of hosts (all but one belonging to the Vespertilionidae) and seems especially partial to the genus *Scotophilus*. *Cyclopodia sykesi* is also extremely abundant; it has been regarded as exclusively associated with the large flying-foxes (*Pteropus*), and as exclusively Oriental; but this paper includes a single record of it from *Scotophilus*, an occurrence which may be accidental; while previous opinions as to its distribution are upset by the recent record of this species from Judaea, published by Falcoz. The Judaean specimens undoubtedly are *C. sykesi* but the data as to their capture are not detailed and the host from which they were taken is apparently not named; no *Pteropus* occurs, but the allied genus *Rousettus* is represented, in that region. Further to the South-East, in the Malay Peninsula and Indo-Malay Islands, *C. sykesi* gives way to *C. horsfieldi*, which extends as far as the Philippines; while other large forms of *Cyclopodia* (*sensu stricto*) occur still further South and East, in the Moluccas, the Papuan region, New Caledonia, etc., and *C. greeffi* represents the subgenus in Tropical Africa. In some of the Eastern forms the males are extremely closely alike, while the females differ by constant characters in the bristling of the abdomen. As stated below, I am unable to see any external difference between the males of *C. sykesi* and those of *C. horsfieldi*, while the females are easily distinguishable: it would be interesting to examine the males of these forms more closely, and see whether the genitalia or other structures not normally visible present differentiating characters.

(iii) Species occurring in both Africa and the Orient are *Penicillidia bathybothyra*, *Eucampsipodia hyrtli*, and *Tripselia amiculata*. The first has quite recently been recorded (under the name *P. fletcheri* var. *pumila*) from West Africa, though its host in that region is not stated. *E. hyrtli* is extremely wide-spread and is associated mainly with fruit-eating bats of the genus *Rousettus*, which occur in Africa and in Southern Asia from Palestine to South China. *T. amiculata* is known from Dahomey and the Congo on the West to Labuan on the East; it appears to be restricted to bats of the family Emballonuridae, from which, conversely, no other Nycteribiids are recorded in the countries now under consideration.

(iv) It is difficult to speak of the new species under this head. *Penicillidia peali* is known from a single specimen from Assam, and its host is unrecorded. If one may venture to foretell, it should, from its affinities, prove to be characteristically Eastern. Consideration of *Nycteribia* (*A.*) *phillipsi* is best left till its affinities are more sure. *N.* (*Stylidia*) *annandalei* belongs to a subgenus hitherto only recorded from Palaearctic countries; the unique example was taken in the Singhbhum District of Bengal, at an elevation of 2,500 feet, and the host on which it occurred is widely spread in India and Burma.

As to the restriction of particular groups of Nycteribiidae to particular groups of bats, several instances of this have been mentioned in treating of the distribution of the parasites. Table 2 shows that Indian Pteropodidae (Fruit Bats) are specially (though not exclusively) infested by the genera *Cyclopodia* (*s. str.*) and *Eucampsipodia*; these bats are heavily parasitised by the Nycteribiidae associated with them. Indian Rhino-

lophidae (Horse-shoe and Leaf-nosed Bats) are seen to be victimised by at least three species of Nycteribiidae, though the numbers of individual parasites are not very great; Phillips has remarked on the frequent freedom of these bats from all parasites, and attributes it to their habit of hanging, when at rest, not crowded together, but some distance away from one another. Among Megadermatidae (Vampyres) there is only a single record of infestation by a Nycteribiid (and that a very common species) in India. In the Vespertilionidae twelve species of Indian Vespertilioninae are seen to be parasitised by these insects, in some cases by more than one species; Phillips has noted the complete absence of insect-parasites on bats of the subfamily Kerivoulinae in Ceylon, and I have no records under this group; among Miniopterinae, *Miniopterus* in these countries, as elsewhere, is usually abundantly parasitised by Nycteribiidae of several kinds. Emballonuridae (Short-tailed Bats), as Phillips states, are usually free from parasites, but the genus *Tripselia* is apparently restricted to bats of this family; this may be due to the habit of some, at least, of these bats of living in small isolated groups in the crowns of tall palms.

SUBSPECIFIC FORMS AND INDIVIDUAL VARIATION. These subjects are discussed and some previous references to them recalled under *Penicillidia jenynsi*, *Nycteribia* (*Acrocholidia*) *vexata*, *N* (*A.*) *euxesta*, *N.* (*Listropodia*) *parvula*, *Cyclopodia* (*P.*) *roylei*, and *C. sykesi*. In some cases these phenomena are merely minute variations in chaetotaxy presented by individuals from the same locality, as in *C. sykesi*; or in other cases such minute chaetotaxic variations have occurred in whole series of examples from particular localities, while series from other places do not show them, as in *C.* (*P.*) *roylei*. But apart from this, a tendency to form geographical races or subspecies does seem to be exhibited by some species, which is not surprising in view of the greatness of their geographical range. It is desirable, however, to avoid burdening the nomenclature with special names for such forms whenever possible. In some cases they have been named; *e.g.*, *Penicillidia jenynsi* var. *indica*, which may, however, come to be regarded as a separate species, as has happened in the case of the form originally described as *Penicillidia fletcheri* var. *pumila* (=*P. bathybothyra*). It would be interesting to know if subspecies or very closely allied species of Nycteribiidae are associated with particular subspecies of their mammalian hosts, but on this point there is hardly as yet any definite evidence.

LABOULBENIACEOUS FUNGI. The occurrence of Laboulbeniaceae on the bodies of certain of the specimens is noted under *Penicillidia jenynsi* var. *indica*, *Nycteribia* (*Acrocholidia*) *vexata* (this case being cited from the writings of Falcoz) and *N.* (*Listropodia*) *parvula*. I have previously recorded these organisms on a ♂ *Nycteribia* (*Listropodia*) *parilis* Walker, from Amboina (*Ann. Mag. Nat. Hist.* (8) xiv, p. 234, 1914), on one of the specimens of *P. jenynsi* var. *indica*, obtained by Fryer in Ceylon (*op. cit.*, p. 214) and on examples of the typical form of *P. jenynsi*, from Formosa (*Arch. Naturg.* lxxix, A. 8, p. 96, 1914): in the place last cited, the identity of the fungus was discussed and a list was given of the species of Nycteribiidae on which these fungi had previously been recorded.

While the hitherto unpublished localities and other data are given in detail, and also a summary of the known distribution of each species, the records from Ceylon and India contained in my earlier papers are not usually repeated in full.

Genus **Penicillidia** Kolenati.

Penicillidia dufouri (Westwood).

Nycteribia dufouri, Westwood, 1835.
Penicillidia dufouri, Kolenati, 1863; Speiser, 1901; Scott, 1914 (Feb.), *Arch. Naturg.* LXXIX, A. 8, p. 95; P. A. Buxton, 1914 (March), *Ent. Record*, XXVI, p. 68; Falcoz, 1923, *Arch. Zool. Exper.* LXI, p. 537; *id.* 1924, *Bull. Mus. Paris*, XXX, p. 309.

The material from the Indian Museum is as follows: 3 ♂, 1 ♀ from unidentified bat, Painsur, above Lohba, 8,000 ft., Garhwal, W. Himalayas, iv. 1914 (*Tytler*); 1 ♂ from unidentified bat, Pashok, 3,500 ft., Darjeeling District, E. Himalayas, vi. 1916 (*L. C. Hartless*), in same tube with 1 ♂ and 1 ♀ *N.* (*Acrocholidia*) *vexata* and 1 ♂ *N.* (*Listropodia*) *pedicularia*; 2 ♂ from *Leuconoe longipes* Dobs., Bumbroo Caves, Matan, Pahlgam Road, Kashmir.

This species has long been known from many localities in Europe and North Africa; and when recording it in 1914 from Formosa, I predicted that it would probably be found in other places between these two extremes, which has now come to pass. The nature of the localities in which it has been taken in India supports the idea that its range is essentially Palaearctic, and it is doubtful whether the species will be found in the plains or southern parts of India. Falcoz (1923) has given a number of detailed records from Algeria, Spain, and France, with notes on the ethology. He lists (1924) as hosts *Rhinolophus euryale* Bl., *R. blasii* Pet., *R. hipposideros* Bechst., *R. ferrum-equinum* Schreb., *R. clivosus* Rüpp., *Leuconoe* [*Myotis*] *capaccinii* Bon., *Myotis myotis* Bork., *M. oxygnathus* Mont. The Formosan examples recorded by me were from a crowd of bats, nearly all of which were *Miniopterus schreibersi* (sens. lat.), but among which were a few *Leuconoe* [*Myotis*] *taiwanensis* Lind., and *Pipistrellus* sp. (determined as *P. abramus*), so that it is difficult to say exactly which species harboured the specimens of *Penicillidia dufouri*.

Penicillidia jenynsi (Westwood).

Nycteribia jenynsi, Westwood, 1835.
Penicillidia jenynsi, Speiser, 1901; Scott, 1908, *Trans. Ent. Soc. London*, p. 360, pl. 18, figs. 1-8 (♂♀); *id.* 1914, *Arch. Naturg.* LXXIX, A. 8, p. 95; *id.* 1914, *Ann. Mag. Nat. Hist.* (8) XIV, p. 213; Phillips, 1924, *Spolia Zeylanica* XIII, pp. 69, 70.

Var. **indica**, nov.

The ♂ of this species was redescribed by Speiser in 1901, and the ♀ was described for the first time by me in 1908 from Formosan specimens, when I also figured both sexes. I made further remarks on a long series of Formosan examples in 1914 (*Arch. Naturg.*) and, when recording two ♀ from Ceylon later in the same year, mentioned that the Ceylonese examples differed in certain small points from the majority of the

Formosan specimens. I have now had before me additional specimens from Ceylon, including a ♂, and a long series of both sexes from India, and find that both sexes differ from the Formosan examples in certain points which are constant enough to warrant the creatures being regarded at least as a distinct variety. For this the name *indica* is proposed, but it must be added that this form may not be confined to India, as in the ♀ sex some of its distinctive features were also observed to some extent in certain of the examples from Formosa.

The principal characteristic of var. *indica* lies in the form of the 4th sternite of the ♂ abdomen, the hind margin of which is produced to an apex in the middle, so that the sternite is obtusely angulate instead of broadly arcuate behind; instead of the surface of the sternite being almost entirely bare, it is covered with short bristles extending forward from the hind margin to more than half its length, and some long bristles arise among them, while the short "thorn-bristles" on the hind margin are perhaps a little less stout than in the typical form. The other distinguishing features consist in the surface of certain parts being covered

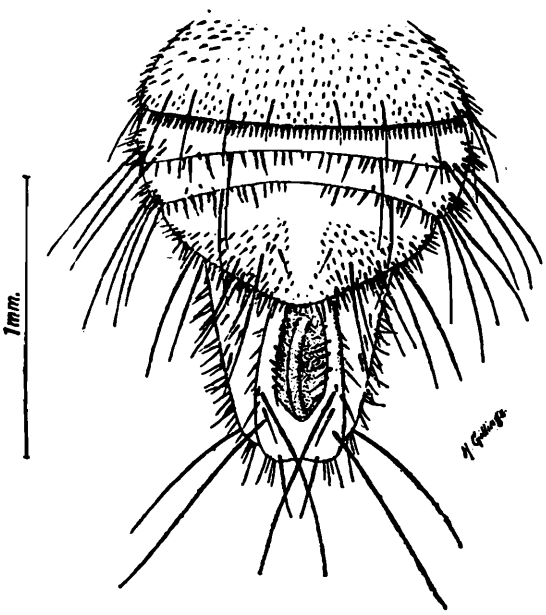

FIG. 1.—*Penicillidia jenynsi*, Westwood var. *indica*, nov. ♂; ventral view of abdomen.

with short bristles instead of being bare; in the ♂ the basal tergite is so covered; in the ♀ the 2nd tergite has a roughly triangular bristly median area, the paired ventral chitinous pieces have more of their surface bristly than is shown in my figure of the typical form (Scott, 1908, fig. 4 *b*), and the same applies to the transverse chitinous piece (fig. 4 *c*).

The Indian Museum possesses 19♂, 33♀, from *Miniopterus schreibersi* (sens. lat., probably *fuliginosus* Hodgs.), at Mahabaleshwar, Satara District, Bombay, c. 4,200 ft., 13-16. iv. 1912 (*F H. Gravely*), in same tube with 2♀ *N.* (*Listropodia*) *parvula* Speiser.

In CEYLON Capt. Phillips obtained 2 ♂ and 1♀ from *Miniopterus fuliginosus* at Dammeria, Passara, Uva, 3,000 ft., 15. v. 1922.

Types of var. *indica* in the Indian Museum; paratypes in my collection.

P. jenynsi was originally described from CHINA, and has been recorded from SUMATRA and FORMOSA, while var. *indica* represents it in CEYLON and INDIA.

1♂ and 1♀ in the series from Mahabaleshwar bear fungi which I take to be Laboulbeniaceae. Possibly this Nycteribiid is specially prone to infection with these organisms, the presence of which on an example from Ceylon and on three specimens from Formosa has been previously noted in my two 1914 papers.

Penicillidia fletcheri Scott.

Penicillidia fletcheri, Scott, 1914, *Ann. Mag. Nat. Hist.* (8) XIV, p. 214; pl. x, figs. 1-4; *id.* 1917, *Parasitology* IX, p. 605.

The types of this species were taken from *Scotozous* [*Pipistrellus*] *dormeri* Dobs., at Coimbatore, and in 1917 it was recorded from an unnamed host at Bangalore, Mysore. I have seen no further examples either in the Indian Museum collection or elsewhere. A larger form has been described by F. W. Edwards (*Journ. Fed. Malay States Museums* iii, p. 58, 1919) as *P. fletcheri* var. *majuscula*, from *Vespertilio* sp., Sungei Penoh, 2600 ft., Korinchi, West Sumatra, 12. iii. 1914 (*Robinson and Kloss*).

Penicillidia bathybothyra (Speiser).

Basilia bathybothyra, Speiser, 1907, *Rec. Ind. Mus.* I, p. 296.
Penicillidia fletcheri, Scott, var. *pumila*, Scott, 1914, *Ann. Mag. Nat. Hist.* (8) XIV, p. 217, pl. x, fig. 5; *id.* 1917, *Parasitology* IX, p. 606; Falcoz, 1924, *Bull. Mus. Paris* XXX, p. 228.
Penicillidia pumila, Phillips, 1924, *Spolia Zeylanica* XIII, pp. 68, 70.

For reasons given below, this form, originally described as a variety of *P. fletcheri*, must be regarded as a distinct species, and further the name *pumila* must give way to *bathybothyra* Speiser. A short preliminary description was given by Speiser in 1907 from a single male, and the species was referred to *Basilia*, a genus erected by Miranda de Ribeiro (*Arch. Mus. Rio de Janeiro* xii, 1903, p. 177) to contain a South American Nycteribiid, and characterised by the eyes being composed of more than one facet, while the tibiae are not ringed. Having now examined the type of *bathybothyra* under the highest power which can be used without detaching the head and mounting it in balsam, I cannot recognise the presence of more than one facet in the eye, and therefore must refer the insect not to *Basilia* but to *Penicillidia*. The type was dried and exceedingly shrunken and fragile, with the segments of the abdomen much telescoped one into the other and the sides of the thoracic ventral plate bent up, so that this plate appeared deceptively narrow; it was probably not mature when captured; but after prolonged soaking and careful examination of the specimen (now transferred to spirit), I can see no characters distinguishing it from the material subsequently described by me as the male of *pumila*.

As to the advisability of treating this species as distinct from *P. fletcheri*: in 1914, when *P. fletcheri* and var. *pumila* were described, the former was only known from India (Coimbatore), the latter only from Ceylon: the form *pumila* (=*bathybothyra*) is now known from both Ceylon and India, and since there is thus no geographical separation between it and *fletcheri*, while the differences between them seem to be constant, they are best treated as distinct species. This was first

suggested in a letter to me by Dr. Bequaert, as stated in my remarks on the matter published in 1917.

India. The *type* ♂ of *P. bathybothyra* (Indian Museum) was taken from *Myotis* [*Vespertilio*] *muricola* Hodgs., at Calcutta; 1 ♂, scarcely mature, from Madras (also in the Indian Museum), may also possibly belong to this species; and in 1917 I recorded it from Khandala, Bombay Presidency (host not named).

Ceylon: the material originally described as *fletcheri* var. *pumila* was taken from *Pipistrellus*(?) *coromandra*[1] at Peradeniya. Capt. Phillips has recently collected the following, all at Anasigalla, Matugama, and all from *Pipistrellus mimus mimus* Wrought.; 2 ♂, 2 ♀ (two examples on each of two bats in the same colony), 23. x. 1921; 2 ♂, 3 ♀ from two bats (four parasites on one bat, one on the other) in the roof of a bungalow, 20. iv. 1922; 4 ♂, 5 ♀ off 6 bats living together (one or two parasites on each), 30. vi. 1922. Further records are: 1 ♀ from *Pipistrellus mimus mimus*, 2. x. 1924, locality not stated, probably near Matale (*R. Senior-White*); 1 ♂, 2 ♀ from undetermined bat, Trincomalee, 3. ix. 1910 (Indian Museum).

West Africa (*teste* Falcoz, *l.c.*).

Captain Phillips remarks (*op. cit.*) that *P. mimus mimus* usually has one or two Nycteribiids on it, sometimes as many as four or five, and that they are often close in under the wings. He records no other species of Nycteribiid from this bat.

Penicillidia peali, sp. nov.

♀. This insect resembles *P. fletcheri* in many respects. *Length* (front of ventral thoracic plate to end of abdomen, which is rather shrunken) about 2·6 mm. *Head* laterally compressed; vertex, bearing a group of about 7 or 8 bristles of moderate length; ocelli darkly pigmented round the edge, otherwise light-coloured; sides of head-capsule with a few very short bristles near the lower border, and rather longer bristles along the lower border towards the front. *Thorax* ventrally conspicuously broad, the length being equal to about $\frac{7}{10}$ of the breadth; the median longitudinal furrow is deeply impressed at the hind end. *Legs* relatively longer than in *P. fletcheri*, tibiae rather long and slender; bristles on the legs (and on the body generally) rufous-brown, lighter in contrast with the pale yellowish-brown chitin than in the type-specimens of *fletcheri*.

Abdomen: small *basal tergite* with short erect bristles at the sides, and a close group of long dark bristles on the hind margin at either hind angle, these latter bristles being longer, and the groups much further apart, than in *fletcheri*; the big *2nd tergite* is of much the same form as in that species, it has about 4 short marginal bristles in the middle of each side margin, scanty, very short bristles on the surface, these latter more numerous towards the base and basal angles, a group of very long bristles on each hind angle, and in front of these a close group of short ones, not a transverse series as in *fletcheri*; *connexivum* behind tergite 2 and at the sides posteriorly bare, in strong contrast to that of *fletcheri*; *anal segment* also bare on its surface, but with a few outwardly directed bristles on its

[1] See footnote on p. 353.

side margins and a rather dense group of longer and shorter bristles on either hind angle; ventrally, *sternite* 1 has an impressed mid-longitudinal line and its surface is scantily bristled; this sternite is broad and the ctenidum is composed of more than 60 close-set teeth; the rather shrunken posterior part of the abdomen shows 4 transverse series of bristles of moderate length, longer in the 4th series, those in each series not very close together; at the sides there are outwardly directed bristles, including two groups of very long ones level with the 2nd and 4th trans-

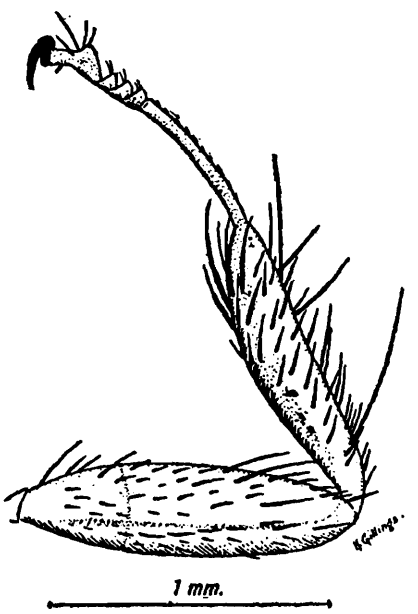

Fig. 2.—*Penicillidia peali*, sp. nov. ♀; inner surface of femur, tibia and tarsus of front leg.

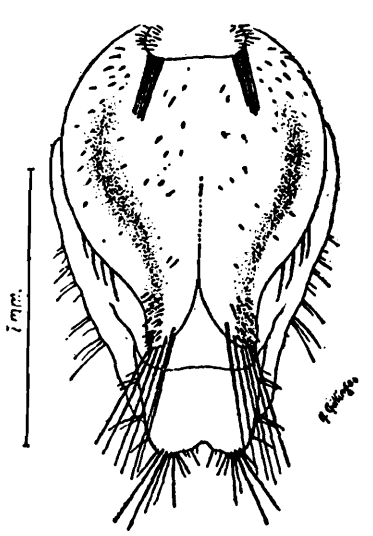

Fig. 3.—*Penicillidia peali*, sp. nov. ♀; dorsal view of abdomen.

verse series respectively; the area between the 3rd and 4th transverse series appears a little more chitinised than the rest and also has a few short bristles on its surface; behind the 4th transverse series is a plate nearly as long as wide, slightly narrowed behind and rounded off at the hind angles; its hind margin bears moderately long bristles (interrupted in the middle of the margin) and there is a group of short ones on the surface towards each hind angle; the surface of this plate is otherwise bare, it appears a little more pigmented towards the hind angles, and has

no bristles on its side margins, those which appear in fig. 4 being really on the sides of the anal segment; the shorter and longer bristles on the hind angles of the latter are of course visible in ventral, as in dorsal, view.

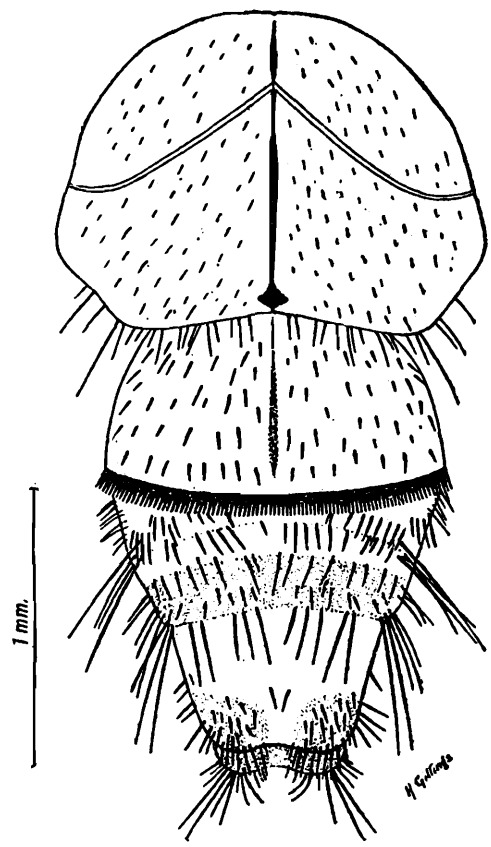

FIG. 4.—*Penicillidia peali*, sp. nov. ♀; ventral view of thorax and abdomen.

INDIA: Sibsagar, Assam, 1 ♀ (*S. E. Peal*); name of host and date not stated. The specimen (*type*) is in the Indian Museum.

This form is so clearly distinct from *P. fletcheri* by its larger size, relatively longer legs, and the other differences enumerated in the above description, that it seems best to describe it as a distinct species, though it is known only from a unique ♀ example. The species is dedicated to its discoverer, the late Mr. S. E. Peal.

Genus **Nycteribia** Latreille.

Subgenus **Acrocholidia** Kolenati.

Nycteribia (Acrocholidia) vexata Westwood.

Nycteribia vexata, Westwood, 1835.
Nycteribia montagui, Kolenati, 1856.
Acrocholidia montagui, Kolenati, 1863.
Nycteribia (*Acrocholidia*) *vexata*, Speiser, 1901; P. A. Buxton, 1914, *Ent. Record* XXVI, p. 68; Falcoz, 1923, *Arch. Zool. Exper.* LXI, p. 539; *id.* 1924, *Bull. Mus. Paris* XXX, p. 310.

1 ♂, 1 ♀, from unidentified bat, Pashok, Darjeeling District, 3,500 ft. vi. 1916 (*L. C. Hartless*); these specimens were in the same tube with 1 ♂ *Penicillidia dufouri*, 1 ♂ *N.* (*Listropodia*) *pedicularia* and some mites, doubtless from the same host.

The pair from the Indian Museum has been compared with specimens of both sexes taken from *Myotis oxygnathus* Mont., at the subterranean

lake, Hammam Meskoutine, E. Algeria, in 1913. These latter were collected and recorded by P. A. Buxton, and determined by me by comparison with descriptions and figures. Compared with the Algerian examples, the Himalayan specimens have the thorax ventrally even broader in proportion to its length, and the ♂ has short bristles on the surfaces of sternites 2, 3 and 4, which in the Algerian example have their surfaces bare.

The general distribution of this species is: Europe, North Africa and the Himalayas. It has been recently recorded from Spain by Falcoz, one ♀ out of three bearing a fungus (Laboulbeniaceae). *N.* (*A.*) *vexata* occurs in various parts of Europe, Algeria, Tunis and the Sahara, and like the two species of Nycteribiids with which it was associated at Pashok, its distribution appears to be essentially Palæarctic. I have recently seen 2 ♂, 1 ♀, taken by Professor E. Hindle from *Rhinolophus* sp. at the Gizeh pyramids, Egypt, 12. iii. 1921. Falcoz (1924) lists as hosts *Rhinolophus euryale, R. hipposideros, R. ferrum-equinum, Myotis myotis*, and *Miniopterus schreibersi*. As stated above, Buxton (*l.c.*) recorded the insect from *Myotis oxygnathus*.

Nycteribia (Acrocholidia) euxesta (Speiser).

Penicillidia euxesta, Speiser, 1901, *Arch. Naturg.* LXVII, 1, p. 29.
Nycteribia (Acrocholidia) euxesta, Scott, 1914, *Ann. Mag. Nat. Hist.* (8) XIV, p. 218, pl. x, xi, figs. 6-9; Patton, 1924, *Rec. Ind. Mus.* XXVI, p. 112.

3 ♂, 1 ♀, from *Rousettus leschenaulti* Desm., Khandagiri, Puri District, Orissa, 7-8. xi. 1912 (*F. H. Gravely*); these specimens were in the same tube with the 5 ♂, 4 ♀, of *Eucampsipodia hyrtli* listed below, and are doubtless from the same host-individual (No. $\frac{6151}{19}$ Ind. Mus.). Major Patton has recorded *N.* (*A.*) *cuxesta* from the Siju Cave, Garo Hills, Assam, where specimens were found on all the bats obtained in the cave; on *Rhinolophus subbadius* Blyth, at the entrance, on *Cynopterus sphinx gangeticus* K. And., at 400 to 500 feet from the entrance, and on *Hipposideros lankadiva* Kel., which ranges from 800 to 3,600 feet from the entrance: he has kindly submitted a specimen (♀) to me for examination, and I find in it certain deviations from the typical form, which are described below.

The general distribution of this species is: Burma, Ceylon, India. The Burmese examples, on which Speiser described the species, were collected by Fea, one pair from *Hipposideros armiger* Hodgs., at Kachin Cauri, 1886, and one ♂ from the Karen Hills, near Toungoo, ii. 1888.

Var. The single ♀ from the Siju Cave which I have seen is a rather large specimen, with the dorsal side of the abdomen differently bristled from that of the typical form: the connexivum has moderately long bristles evenly distributed all over the dorsal surface, with 4 or 5 longer and stouter ones in the middle behind; whereas in the typical form (*cf.* my 1914 paper, fig. 6) the longer bristles are confined to the middle part, in sharp contrast to the very short bristles on the dorso-lateral portions, while the conspicuously long and stout bristles on the hind part of the median area are more numerous.

Nycteribia (Acrocholidia) phillipsi, sp. nov.

? Nycteribia (Acrocholidia) blainvillei (Leach), Phillips, 1924, *Spolia Zeylanica* XIII, pp. 66, 70.

♀. *Length* of a gravid example (front of ventral plate of thorax to end of abdomen) 2·5 mm. *Head* with two pairs of rather short bristles on the front of the vertex, one pair slightly behind, and slightly nearer together than, the other, and with about two short bristles on each side on the lateral margin. *Halteres* with slender pedicel and rounded knob. *Thorax* beneath shown by careful measurement to be about as long as its greatest breadth, but as it is considerably narrowed in front it sometimes gives the impression of being decidedly longer than broad ; median longitudinal groove rather deeply impressed behind. *Legs* much as in *N. (A.) vexata ;* when the tibia is closed on the femur its apex reaches about to the pale ring in the basal part of the latter ; tarsus longer than tibia ; spines on the ventral side of the hind trochanters rather strong and close.

ABDOMEN DORSAL : *basal tergite* small, slightly darkened along either side, its surface bare except for a few very microscopic bristles towards the base, its hind margin with about five rather short bristles on either side

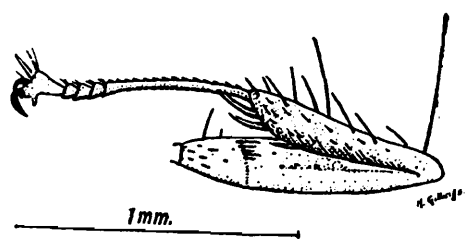

FIG. 5.—*Nycteribia (Acrocholidia) phillipsi,* sp. nov. ♀ outer surface of femur, tibia and tarsus of front leg.

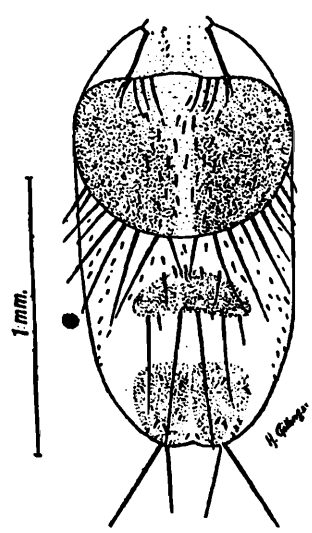

FIG. 6.—*Nycteribia (Acrocholidia) phillipsi,* sp. nov. ♀ ; dorsal view of abdomen.

and with about the median third bare ; *tergite 2* large and long, yellowish-brown, paler along the median longitudinal line, surface with scanty, very short bristles along its middle part but otherwise bare, hind margin forming a very flattened curve but more rounded off at the sides, and set with long bristles of varying lengths ; a little distance behind is a small *3rd tergite* only about ½ the width of the distended abdomen, widely arcuate in front its hind margin nearly straight and bearing about four

long and one or two shorter bristles, its surface bare; some distance behind this is a *posterior tergite*, not very sharply delimited in front in

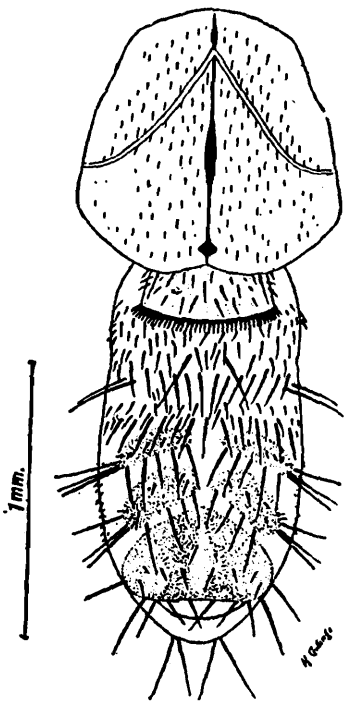

Fig. 7.—*Nycteribia* (*Acrocholidia*) *phillipsi*, sp. nov. ♀; ventral view of thorax and abdomen.

the specimen before me, broader at its base than long, narrowing towards the hind end, which is slightly and bluntly produced on either side and sinuate in the middle; this tergite has an indication of a paler median longitudinal line of weakness, each of its hind angles bears two long bristles, and the surface bears a few very minute bristles on either side towards the hind angle; there is no projecting, bilobed *anal segment* such as exists in *N.* (*A.*) *euxesta* and *N.* (*A.*) *phthisica*, but the anus lies in a vertical plane level with the hind end of the posterior tergite; the whitish *connexivum* bears very sparse short bristles between the 2nd and 3rd tergites and a pair of longer ones at the base of the latter, and extremely short, sparse bristles laterally, but between the 3rd and posterior tergites, and on either side of the latter, it is quite bare.

Abdomen ventral: the *basal sternite* appears rather small and narrow, with the hindmost bristles on its surface rather longer than usual and the teeth of the ctenidium close set; behind this is whitish *connexivum* traversed by two transverse series of strong and rather long bristles, the one or two outermost of which on either side are more or less erect; the surface before the anterior series is rather closely covered with shorter bristles and has a pair of longer erect bristles in the middle; surface between the anterior and posterior series also bearing shorter bristles; lateral parts of this connexivum closely covered with short bristles; behind the posterior of the two transverse series are two pairs of *chitinous plates*, the posterior of which lie obliquely sloping backwards towards the sides of the body; each plate has a few erect short bristles on its surface, and a series of longer bristles on its hind margin, the inner four or five of the marginal series lying flat while the outer two or three are erect and directed outwards; *subgenital plate* subtriangular, with angles

rounded off, and base of the triangle forming the hind margin; its pale yellowish-brown chitin is divided by a whitish median lonitudinal area reaching almost or quite to the front end, its hind marging bears about ten erect bristles, of which the two outer on either side (at the angle) are longer than the median six, and its surface bears an irregular transverse series of about six rather short bristles behind the middle of its length; the *anal segment* ventrally appears quite bare.

CEYLON: 3 ♀ taken off one or two individuals (part of a bat colony in a cave) of *Rhinolophus rouxi rouxi* Temm., at Anasigalla, Matugama, about 100 feet, xii. 1921 (*W. W. A. Phillips*). *Type* in my collection, where the paratypes also remain for the present.

Compared with the ♀ of *N.* (*A.*) *vexata*, this species is at once distinguishable by the thorax ventrally being as long as (and appearing longer than) broad, by the much longer and larger 2nd tergite (which recalls somewhat that of *N.* (*Stylidia*) *biarticulata*) and the more scanty bristling of the surface of this tergite, by the anal segment being only slightly sinuate at the hind end above the anus, instead of bilobed, and having much fewer bristles, by the longer bristling of the ventral connexivum in front of the two transverse series of bristles respectively, and the oblique position of the posterior ventral chitinous plates.

Although I have before me only the female sex of this species, it has seemed best to describe it, as the insect is quite distinct from any that I have seen, and does not agree entirely with the descriptions of any which I have not seen. Among the latter, the nearest approach to agreement is found in Speiser's redescription (*Arch. Naturg.* LXVII, I, p. 44, 1901) of *N.* (*A.*) *blainvillei* Leach, a species very briefly described by Leach from Mauritius in 1817, and to which Speiser referred the examples from Egypt described by him in 1901. Speiser had evidently not seen Leach's type, and I have been unable to find where it is, no specimens bearing the name *blainvillei* being traceable either in the British Museum or the Hope Museum, Oxford. Leach states that his material was communicated to him by his friend Blainville; I have inquired whether the type is in the Paris Museum, but it cannot at present (i. 1925) be found in that institution. In my manuscript notes and correspondence I at first called the Ceylonese specimens "probably *blainvillei* Leach," which led Capt. Phillips to refer to them under that name in his paper cited above. But on further consideration I cannot be certain if they are identical with the examples referred by Speiser to *blainvillei*, and this, coupled with the failure to find and compare Leach's type, has induced me to give the Ceylon insect a name and describe it as a new species, which I have pleasure in dedicating to Capt. Phillips. Leach described the legs of *blainvillei* as long and slender, and Speiser referred the Egyptian examples which he studied to that species mainly on the same character, describing their legs as very long and thin, as long as the body: this applies also to *phillipsi*, in which the middle and hind legs are even longer than the body. Speiser described the ventral surface of the thorax as strikingly longer than broad in *blainvillei*, but, as mentioned above, appearances may be rather deceptive in this respect. His account of the segmentation and bristling of the ♀ abdomen is not detailed enough for close comparison with that of *phillipsi*.

Nycteribia (Acrocholidia) phthisica Speiser.

Nycteribia (Acrocholidia) phthisica, Speiser, 1907, *Rec. Ind. Mus.* I, p. 295.

A short preliminary description of this species by Speiser was published in 1907. I now have the unique type (♀) before me, and after subjecting it to a prolonged soaking in water have been able to remove it from its pin and place it in spirit. Though the specimen was much shrunken through desiccation, it has regained its proper shape to some extent, and it is possible to give the following particulars and figures. The figures must not be taken as completely accurate in every small detail, as, owing to the shrinkage of the abdomen, it has been impossible to discern exactly the arrangement of all the bristles ; some, which are broken off but the points of origin of which are clearly visible, are represented by broken lines. Fig. 8*a* shows the dorsal aspect of the abdomen tilted over to the right, so much so that some of the ventral bristles are visible on the left-hand side of the figure : owing to the extremely fragile condition of the specimen no pressure could be applied to make it lie more nearly level.

The *length*, from the front of the ventral thoracic plate to the end of the abdomen, is (after soaking) about 2·3 mm. The insect closely resembles the ♀ of *N.* (*A.*) *euxesta* (Speiser), but is distinguished by its considerably smaller size, longer and narrower thorax, the sparser and feebler bristling of the abdomen, and the presence of a chitinous tergite immediately in front of the anal segment. Speiser described the ventral side of the *thorax* as almost twice as long as broad. Actually, though distinctly longer than broad, it is not as long as stated by him ; the appearance of extreme narrowness was partly due to desiccation, the side parts being bent upwards strongly in the dried specimen, so that the thorax appeared very narrow. After soaking it has assumed the form shown in fig. 9. The form of the *legs* is shown in fig. 8*b* ; it is not possible to say to which pair of legs the example drawn belongs, as it

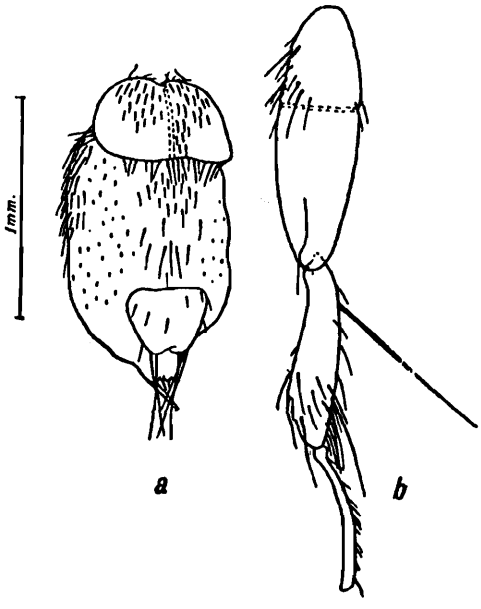

Fig. 8.—*Nycteribia (Acrocholidia) phthisica*, Speiser, ♀ ; *a*, dorsal view of abdomen (tilted to right) ; *b*, femur, tibia and metatarsus of one of the legs.

and several others have unfortunately become detached.

Abdomen : the dorsal aspect rather closely resembles that of *N.* (*A.*)

euxesta (compare my fig. 6 of that species, *Ann. Mag. Nat. Hist.* (8) XIV, 1914, pl. x); the small basal tergite has very short bristles on its hind

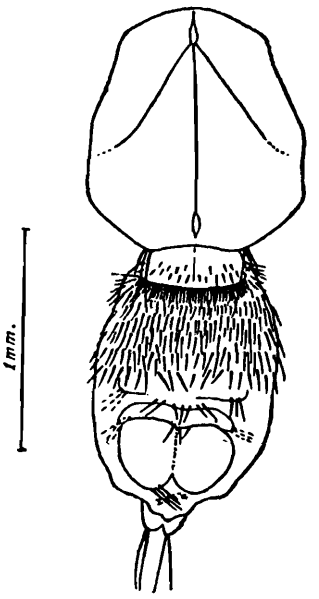

FIG. 9.—*Nycteribia* (*Acrocholidia*) *phthisica*, Speiser, ♀; ventral view of thorax and abdomen.

angles; the large second tergite is of the same form as in *euxesta*, with a line of weakness down the middle, some short bristles on its surface (these are few and situated mostly near the base, but probably a number of others have been broken off), while the hind marginal bristles are fewer and weaker than in *euxesta*, and absent towards the outer angles, though here again some may have been broken away. The connexivum dorsally is almost bare at the sides, and has longer bristles in the middle, but these are much fewer than, and not so long or strong as, those in *euxesta*. There is a rather large posterior dorsal chitinous tergite, narrowing behind, emarginate in the middle of the hind margin, with two long bristles at each hind angle, and a few short erect bristles on the surface at about the middle of its length and near its base; this tergite appears to be about as long as its breadth at the base, though it has not been possible to measure it exactly. The anal segment is small and bilobed, with two long bristles at either hind angle. Ventrally, the basal sternite is much smaller and narrower than in *euxesta* (*cf.* Scott, *op. cit.*, pl. xi, fig. 7), and its ctenidium has fewer teeth; these latter number a little over 40, while in the specimen of *euxesta* used for comparison there are over 50; the connexivum bears 5 or 6 quite irregular series of rather long and strong bristles, but they appear a little less close and strong than in *euxesta*. Behind the connexivum are two pairs of short, transverse, partly chitinised areas, each with a group of 3 outwardly-directed bristles at its outer angle and a few bristles at the base in the median part. The *subgenital plate* is large and bilobed, with a line of weakness along the middle, and the hind end of each lobe rounded and bearing a group of 3 long bristles; there are also a few shorter bristles in the middle at the base.

AMBOINA: 1 ♀ from *Rhinolophus euryotis* Temm. The specimen (*type*) is in the Indian Museum.

The points of difference between this species and *N.* (*A.*) *euxesta* have been mentioned above. *N.* (*A.*) *phillipsi*, however, has a chitinous tergite in the middle of the connexivum between the large second tergite and the posterior tergite, and this is quite absent in both *phthisica* and *euxesta*. *N.* (*A.*) *phillipsi* has a large posterior tergite with a line of weakness along the middle, but no projecting, bilobed anal segment; *euxesta* has a projecting, bilobed anal segment but no posterior tergite in front of it; *phthisica* possesses both these structures.

Subgenus **Listropodia** Kolenati.

Nycteribia (Listropodia) pedicularia Latreille.

Nycteribia pedicularia, Latreille, 1805.
Nycteribia latreillei, auctt.
Listropodia latreillei, Kolenati, 1863.
Nycteribia (*Listropodia*) *pedicularia*, Speiser, 1901; Scott, 1914, *Arch. Naturg.* LXXIX A, Heft. 8, p. 100; P. A. Buxton, 1914, *Ent. Record* XXVI, p. 68; Falcoz, 1923, *Arch. Zool. Exper.* LXI, p. 541; *id.* 1924, *Bull. Mus. Paris* XXX, p. 311.

The material in the Indian Museum is as follows: 1 ♂ from unidentified bat, Pashok, Darjeeling District, 3,500 ft., vi. 1916 (*L. C. Hartless*); this example was in the same tube with 1 ♂ *Penicillidia dufouri*, 1 ♂ and 1 ♀ *N.* (*Acrocholidia*) *vexata*, and mites, doubtless from the same host; 4 ♂, 4 ♀, "on bats," *Leuconoe longipes* Dobs., Bumbroo Caves, Matan, Pahlgam Road, Kashmir (in same tube with 2 ♂ *Penicillidia dufouri*).

This species is known from the whole of EUROPE, from ALGERIA (Buxton, *op. cit.*), TUNI and FORMOSA (Scott, *op. cit.*), while from CHINA I recently saw 1 ♂ taken from an unidentified bat at Foochow, 7. iv. 1922, and 1 ♂, 1 ♀ from an unidentified bat in the same place, date not given (*C. R. Kellogg:* these examples were submitted to me by Mr. F. J. Cox on behalf of the late Hon. N. C. Rothschild). Its range therefore seems to embrace the whole Palæarctic Region, and in addition it is recorded from SOUTH AFRICA (Speiser, 1901, pp. 53, 54). Falcoz has recently given several detailed records from France and Spain. The two other species of Nycteribiidae found on the same hosts with it at Pashok and in Kashmir are, so far as known, essentially Palæarctic. In 1914 (*op. cit.*) I gave reasons for regarding *Listropodia blasii* Kol. as a form of *N.* (*L.*) *pedicularia*. The hosts of this species, as listed by Falcoz (1924), are *Rhinolophus hipposideros* Bechst., *Eptesicus* [*Vespertilio*] *serotinus* Schreb., *Nyctalus* [*Vespertilio*] *noctula* Schreb., *Leuconoe* [*Myotis*] *dasycneme* Boie, *L.* [*M.*] *daubentoni* Leisl., *Myotis myotis* Bork., *M. oxygnathus* Mont., and *Miniopterus schreibersi*.

Nycteribia (Listropodia) allotopa Speiser.

Nycteribia (*Listropodia*) *allotopa*, Speiser, 1901, p. 37; Scott, 1914 (Feb.), *Arch. Naturg.* LXXIX A, Heft 8, p. 97; *id.* 1914 (Sept.), *Ann. Mag. Nat. Hist.* (8) XIV, p. 221; Phillips, 1924, *Spolia Zeylanica* XIII, pp. 69, 70.
Nycteribia (*Listropodia*) *insolita*, Scott, 1908, *Trans. Ent. Soc. London*, p. 364, pl. xviii, figs. 9-13, ♂ ♀.

The Indian Museum possesses the following material: About 39 ♂ and 67 ♀ from *Miniopterus schreibersi* (sens. lat.; probably *M. fuliginosus*

Hodgs.), Mahabaleshwar, Satara District, Bombay, about 4,200 ft., 13-16. iv. 1912 (*F H. Gravely*); these were in the same tube with a long series of *N.* (*Listropodia*) *parvula* from the same host. There is in the British Museum 1 ♂ (given by Hon. N. C. Rothschild) from *Miniopterus* sp., at Helwak, near Satara, 30. v. 1900.

In CEYLON Phillips took 6 ♂, 4 ♀ from *Miniopterus fuliginosus* at Dammeria, Passara, Uva, 3,000 ft., 15. v. 1922.

This species was incompletely described by Speiser from SUMATRA and redescribed and figured by me from FORMOSA under the name of *insolita*. I subsequently (1914, Feb.) gave additional records from Formosa and recorded the species from Amoy in CHINA, and still later (1914, Sept.) from CEYLON, pointing out certain features in which the Ceylonese examples differed from the Formosan specimens. The insect is here recorded for the first time from INDIA.

Though the host-bat has been identified on several occasions it has always proved to be a species of *Miniopterus* (*M. schreibersi*, sens. lat., or *M. fuliginosus*), on which *N.* (*L.*) *allotopa* seems often to be extremely abundant—witness the long series above, and the Formosan material, which amounted to 375 specimens (183 ♂, 192 ♀), 318 of which (155 ♂, 163 ♀) were taken on 3 days in the same week at the same place, apparently all in an old temple where the bats congregate (see Scott, 1914 (Feb.), pp. 94, 98). Moreover, *N.* (*L.*) *allotopa* is frequently associated on the same hosts with the following species, *N.* (*L.*) *parvula*.

Nycteribia (Listropodia) parvula Speiser.

Nycteribia (*Listropodia*) *parvula*, Speiser, 1901, p. 38, ♀; Scott, 1914 (Feb.), *Arch. Naturg.* LXXIX A, Heft 8, p. 98; *id.* 1914 (Sept.), *Ann. Mag. Nat. Hist.* (8) XIV, p. 222; Phillips, 1924, *Spolia Zeylanica* XIII, pp. 69, 70.
Nycteribia (*Listropodia*) *sauteri*, Scott, 1908, *Trans. Ent. Soc. London*, p. 366, pl. xviii, figs. 14-18, ♂ ♀.

From the Indian Museum : 2 ♀ from *Miniopterus schreibersi* (sens. lat.; probably *M. fuliginosus* Hodgs.), Mahabaleshwar, Satara District, about 4,200 ft., 13-16. iv. 1912 (*F H. Gravely*), in the same tube with the long series of *Penicillidia jenynsi* var. *indica* recorded above; 36 ♂, 35 ♀, same host, date and place as the preceding, in same tube with the long series of *N.* (*L.*) *allotopa* recorded above.

In CEYLON Phillips took 2 ♂ from *Miniopterus fuliginosus* at Dammeria, Passara, Uva, 3,000 ft., 15. v. 1922.

The general distribution of this species includes SUMATRA, FORMOSA, CEYLON and INDIA. No other hosts besides those mentioned above are recorded.

This species, like the preceding, was originally described from Sumatra, redescribed and figured by me from Formosa under the name *sauteri*, and later recorded from Ceylon. It is here recorded for the first time from India. In the Indian material the anal segment of the ♀ frequently has a regular transverse series of about six or seven short bristles before the middle of its length, and indications of a posterior series, interrupted in the middle, just before the hind margin; the Formosan ♀ figured in 1908 (*op. cit.*, pl. xviii, fig. 17) had only two or three short bristles on the dorsal surface of this segment.

Two of the ♂ from Mahabaleshwar bear Laboulbeniaceae, as do some of the examples of *Penicillidia jenynsi* var. *indica* taken at the same time and place.

Like *N.* (*L.*) *allotopa*, the species under discussion has never been recorded from any hosts but *Miniopterus schreibersi*, or *M. fuliginosus*, on which it sometimes occurs in great numbers, as shown by the long series from Mahabaleshwar and that from Formosa; in the latter country 166 examples (89 ♂, 77 ♀) were obtained on 3 days in the same week in an old temple at Tainan. The association of *N.* (*L.*) *parvula* with the two other species of Nycteribiids found with it at Mahabaleshwar has also been placed on record before, since it was found with both *N.* (*L.*) *allotopa* and with the typical form of *P. jenynsi* in Formosa, and with *N.* (*L.*) *allotopa* and *P. jenynsi* var. *indica* in Ceylon (see Scott, *op. cit.*, 1914, Feb. and Sept.).

Subgenus **Stylidia** Westwood.

Nycteribia (Stylidia) annandalei, sp. nov.

♀. *Length* of a gravid example (front of ventral plate of thorax to end of abdomen, not including the styles) about 2·1 mm. Distinctly smaller than *N.* (*S.*) *biarticulata* Herm. *Tibiae* shorter in proportion to the length of the femora; this is especially noticeable in the front legs, in which the tibiae are nearly as long as the femora in the examples of *biarticulata* used for comparison, but are only about ⅔ the length of the femora in *annandalei*; the tibiae are also distinctly shorter than the tarsi. Ventrally, the *thorax* appears distinctly long in proportion to its breadth.

Abdomen: the small basal tergite has short bristles along the whole of its hind margin, not merely a group at either angle; second tergite much shorter than in *biarticulata*, wider than long, very much rounded off at the sides behind, with scarcely any apparent median longitudinal line of weakness (only a slight darkening of the pigmentation on either side of the middle line), and the hind margin bearing only 4 long bristles, widely spaced, in the middle, and 3 shorter ones on either side; connexi-

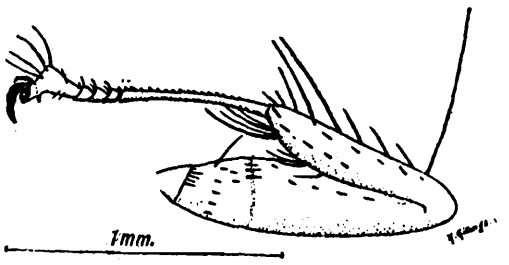

Fig. 10.—*Nycteribia* (*Stylidia*) *annandalei*, sp. nov. ♀; outer surface of femur, tibia and tarsus of front leg.

vum behind the second tergite bare in the mid-dorsal region; posteriorly there is a very small median chitinous area, with surface bare and 3 long bristles and 1 short bristle on its curved hind margin; behind this the extremity of the abdomen is chitinised on either side of the middle line and bears a group of about 5 short bristles at the base of either style. Basal sternite small and narrow; behind this the connexivum bears

about 5 transverse rows of bristles, neither very short nor very close; among these there are three pairs of longer, more outstanding bristles near the base, the anterior near the middle line, the next pair much wider, and the third pair still wider apart; behind the transverse rows of bristles are two pairs of very short, transverse, chitinised patches, each patch bearing 2 or 3 very short bristles on its surface, 2 or 3 long bristles on its hind margin, and a group of 3 laterally directed bristles at its outer angle; behind the second of these pairs the surface is chitinised on either side of the middle line, forming two not very well-defined ovoid areas, each with about two long and two shorter bristles at its hind end.

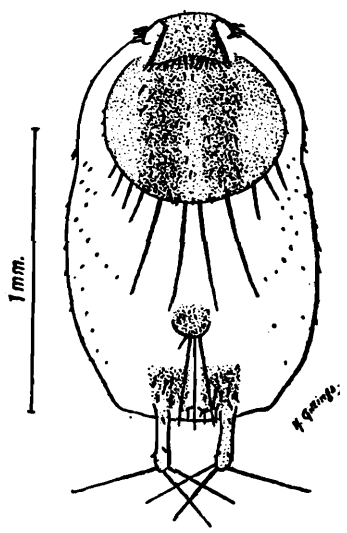

FIG. 11.—*Nycteribia* (*Stylidia*) *annandalei*, sp. nov. ♀; dorsal view of abdomen.

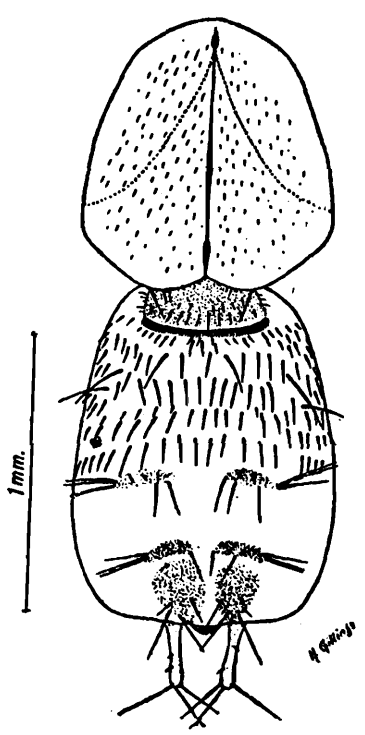

FIG. 12.—*Nycteribia* (*Stylidia*) *annandalei*, sp. nov. ♀; ventral view of thorax and abdomen.

INDIA: 1 ♀, taken from *Rhinolophus lepidus* Blyth, at hæmatite mine, Manharpur, Singhbhum District, Bengal, 2,500 ft. The specimen (*type*) is in the Indian Museum.

This interesting subgenus has not, to my knowledge, previously been recorded from any Oriental locality. I have seen examples of *N.* (*S.*) *biarticulata* from various parts of its range (England, Algeria, Palestine, etc.), but *annandalei* differs so markedly from *biarticulata* by its smaller size, narrower thoracic ventral plate, shorter tibiae, and differently shaped abdominal segments, that it must be described as a distinct species, even though only from one sex and from a single specimen. The chitinous parts of the example are very pale yellowish, but in other respects it seems mature, and the abdomen is swollen and gravid.

Besides *biarticulata*, the only other described species of the subgenus is *Nycteribia ercolanii* Rondani 1879, from Emilia (Italy). This species was referred to the subgenus *Stylidia* by Speiser and is distinguished from *biarticulata* in his key (*Arch. Naturg.* LXVII, 1, 1901, p. 69) by the relative shortness of its tibiae. I am much indebted to Professor Angelo Senna of Florence for having kindly lent me, in June 1924, a ♀ *Nycteribia ercolanii* from Rondani's collection; Professor Senna wrote that he was unable to say which of the examples in that collection is to be regarded as the actual type of the species. The specimen sent was pinned, and is much shrunken; at first I thought it to be a much desiccated *Listropodia*, but after examination I concluded that it is almost certainly a genuine *Stylidia*. In any case it is quite distinct from *N.* (*A.*) *annandalei*; the chitinous piece on the dorsal side of the abdomen before the anal segment is short, broad and truncate behind, and has both very long and quite short bristles along its hind margin; the second tergite is much shorter than in *biarticulata* and the thoracic ventral plate is relatively broader; the tibiae are (as remarked by Speiser) shorter, and are also broader and more flattened, than in *biarticulata*.

N. (*S.*) *annandalei* is named in memory of the late Dr. N. Annandale.

Genus **Cyclopodia** Kolenati.

Subgenus **Cyclopodia**, s. str., Scott, 1917, *Parasitology* IX, p. 607.

Cyclopodia sykesi (Westwood).

Nycteribia sykesi, Westwood, 1835, ♀.
Nycteribia hopei, Westwood, 1835, ♂.
Cyclopodia sykesi, Kolenati, 1863; Speiser, 1901; Scott, 1908 (Feb.), *Trans. Ent. Soc. London* 1907, pp. 421-428, figs. 1, 2; *id.* 1914, *Ann. Mag. Nat. Hist.* (8) XIV, p. 228; Phillips, 1924, *Spolia Zeylanica* XIII, p. 70; Falcoz, 1924, *Bull. Mus. Paris* XXX, p. 389.
Cyclopodia hopei, Enderlein, 1901, *Arch. Naturg.* LXVII, I, Heft 2, pp. 175-178, figs. 1, 2.

The material submitted to me from the Indian Museum is as follows: 2 ♂, 3 ♀ from *Pteropus giganteus leucocephalus* Hodgs., at Sadiya, N. E. Assam, 24. xi. 1911 (*S. W Kemp*, Abor Exped.[1]); 10 ♂, 8 ♀ from *Pteropus* sp., Balugaon, Puri District, Orissa, 21-31. vii. 1913 (*Annandale*); 3 ♂, 1 ♀ (dried) from *Pteropus medius* Temm., Satpara, Puri District, Orissa, 8-12. xii. 1908 (*J. Caunter*; other examples in the Indian Museum. not seen by me); 2 ♂, 1 ♀, preserved dry, from *Pteropus medius*, at Bhogaon

[1] One example of this series, a ♀, preserved dry, was labelled *Cyclopodia horsfieldi*, Meij.

Factory, Purneah, Bihar, 18. x. 1907 (*C. A. Paiva*[1]); 1 ♂, 2 ♀ "on body of flying-fox," Barkuda Island, Chilka Lake, Ganjam District, Madras, 10. vi. 1923 (*B. J. F.*); 7 ♂, 2 ♀ "on *Pteropus intermedius*," same locality as preceding, 23. i. 1923; 2 ♂, 2 ♀ "from *Scotophilus kuhli*," same locality as preceding, 25. ix. 1919 (*Annandale*); 8 ♂, 3 ♀ "from greater flying-fox" (*Pteropus* sp.), Peradeniya, Ceylon, 22. vi. 1910. I am informed that there is also in the Indian Museum other material of this species taken from *Pteropus medius* at Trivandrum, Travancore.

In Ceylon Phillips took 4 ♂, 1 ♀ from *Pteropus giganteus giganteus* Brünn., at Anasigalla, 100 ft., 24. vi. 1922; 4 ♂ from the same species of bat at the same place, 2. i. 1922; 16 ♂, 24 ♀ from four lots of bats (numbering 24 individuals in all) of the same species at St. George, Matugama, 100 ft., 27. ii. 1923. Capt. Phillips remarks (*l.c.*) that nearly every specimen of the Common Flying Fox examined had on it one or more examples of *C. sykesi*, and some had as many as eleven; they were usually among the hair of the nape of the neck, or under the wings. It may be recalled that one hundred examples of this Nycteribiid were found on eleven specimens of *Pteropus* at Barberyn Island, Ceylon, by Mr. T. B. Fletcher in 1907 (see Scott, 1908, *op. cit.*). Mr. Senior-White's collection contains 2 ♂ from the neck-fur of the same species of bat, Suduganga, 4. ii. 1920.

From Burma I have recently seen the following: 3 ♂, 2 ♀ from *Pteropus giganteus*, Rangoon, 18. i. 1917; and 3 ♂, 3 ♀ from unidentified bats collected by Mr. Ripley at Rangoon, viii. 1916; these were all sent to Professor Nuttall by Dr. H. H. Marshall.

The record given above of specimens from *Scotophilus kuhli* is most unusual. I have never before seen examples recorded from any bat outside the genus *Pteropus*. One is tempted to imagine that the insects may have wandered on to the *Scotophilus* accidentally, if it happened to alight in a place where *Pteropi* either were, or had been, resting.

The general distribution includes India, Burma, Ceylon, the Maldives, and Judæa. The last-named country has been recently added by Falcoz (*l.c.*), and is based on specimens in the Paris Museum, two of which Dr. Falcoz kindly allowed me to examine; they were dried and on long pins, and were labelled "Muséum Paris, Judée, Roux"; they appeared to be undoubtedly a ♂ and a ♀ *Cyclopodia sykesi*. The locality is surprising as previous records have been exclusively Oriental. According to the British Museum Catalogue of Chiroptera, no *Pteropus* occurs in Judæa, but there are species of the allied genus *Rousettus* in Cyprus and Palestine.

After carefully examining specimens of the two species side by side, I can see no superficial characters satisfactorily distinguishing *C. sykesi* and *C. horsfieldi* in the male sex, though the females are sufficiently distinct.

Individual variation. The ♂ of *C. sykesi* varies very little, but the ♀ displays some variation in the number of the large dorsal tubercles situated in the middle of the abdominal connexivum. Normally there are four arranged in a square; but in 1908 (*Tr. Ent. Soc.* 1907, pp. 423-4) I described and diagrammatically figured abnormal individuals with

[1] These specimens were placed as *C. horsfieldi*.

five, six, and even seven big tubercles, and Enderlein in 1901 (*op. cit.*) figured a single individual in which they are five in number. Further examples of this abnormality occur in the Indian Museum collection; both the ♀ obtained at Barkuda Island, 23. i. 1923, have five big tubercles, arranged in one example in a circle, in the other case in an irregular rectangular figure, three on one side, two on the other; and one of the ♀ from Balugaon also has five big tubercles irregularly arranged, three on one side, two on the other; the ♀ from Purneah, Bihar, has these big tubercles four in number but irregularly placed, the left-hand tubercle of the hind pair being behind, instead of level with, the right-hand member of the same pair.

Cyclopodia ferrarii (Rondani).

Nycteribia ferrarii, Rondani, 1878.
Cyclopodia ferrarii, Speiser, 1901, *Arch. Naturg.* LXVII, I. p. 55; Scott, 1914, *Ann. Mag. Nat. Hist.* (8) XIV, p. 222, pl. xi, figs. 10-15; *id.* 1917, *Parasitology* IX, p. 607 (remarks under discussion of characters of the genus); Phillips, 1924, *Spolia Zeylanica* XIII, p. 70.

India: 4 ♂, 6 ♀, from an undetermined bat, taken in the Museum building, Calcutta, 26. xi. 1914, were submitted to me. I am told that the Indian Museum contains other examples taken from *Cynopterus marginatus* (=*sphinx* Vahl) in the same place, namely the Museum compound, Calcutta.

In Ceylon Phillips took 2 ♂ from *Cynopterus brachyotis ceylonensis*, at St. George, Matugama, 150 ft., 9. i. 1923.

In Burma 1 ♂ and 7 ♀ were obtained by Fea at Bhamó xi. 1886 (*teste* Speiser, *l.c.*).

The general distribution includes Java, Sumatra, Burma, India and Ceylon.

Subgenus **Paracyclopodia** Scott, 1917, *Parasitology* IX, p. 608.

Cyclopodia (Paracyclopodia) roylei Westwood.

Nycteribia roylei, ♂, Westwood, 1835; Kolenati, 1863.
Cyclopodia roylei, ♂, Scott, 1908, *Trans. Ent. Soc. London*, p. 368, pl. xviii, fig. 19.
Nycteribia (*Acrocholidia*) *chlamydophora*, ♂♀, Speiser, 1903, *Fascic. Malay. Zool.* I, p. 123.
Cyclopodia roylei, ♂♀, Scott, 1914, *Ann. Mag. Nat. Hist.* (8) XIV, p. 224, pl. xii, figs. 16, 17.
Cyclopodia (*Paracyclopodia*) *roylei*, Scott, 1917, *Parasitology* IX, p. 608; Phillips, 1924, *Spolia Zeylanica* XIII, pp. 68, 70.

In 1917 I gave reasons for treating this species as the type of a distinct subgenus, *Paracyclopodia*. It is in some respects (*e.g.*, the structure of the ♀ abdomen) one of the most remarkable Nycteribiids, and it also seems to be one of the most abundant. From the Indian Museum there have been submitted to me thirteen separate lots of specimens: 6 ♂, 4 ♀, from unidentified bat, probably from Calcutta, 10. i. 1911 (*I. H. Burkill*); 5 ♂ from *Scotophilus kuhli*, taken in the Museum building, Calcutta, 14. i. 1922 (*S. W. Kemp*); 2 ♂, 11 ♀ from *Scotophilus wroughtoni*, Barkul, Puri District, Orissa, 9-13. xi. 1912 (*F. H. Gravely*); 9 ♂, 15 ♀ from *Hesperoptenus* [*Vesperugo*] *tickelli* at Balighai, near Puri, Orissa, 16-20.

viii. 1911 (*Annandale and Gravely*) ; 3 ♂ , 3 ♀ on *Pipistrellus* sp. (*? coromandra*[1]) taken "at light ; flew into the bungalow," Balugaon, Puri District, 21-31. vii. 1918 (*Annandale*) ; 7 ♂, 5 ♀ on *Myotis formosus*, Siripur, Saran, Bihar, 1. xi. 1912 ; 2 ♀ from *Scotophilus temmincki* at Hardwar, United Provinces ; 1 ♂, 1 ♀ from *S. wroughtoni*, Barkuda Island, Chilka Lake, Ganjam District, Madras, 12. x. 1920 ; 1 ♂ from *S. wroughtoni*, Barkuda I., Sta. 26 ; 3 ♂ from *S. kuhli*, Barkuda I., 15-22. vii. 1916 (*F. H. Gravely*) ; 1 ♂ and 7 ♂, 4 ♀, same data as preceding, but probably from different bat-individuals ; 1 ♂ from *S. kuhli*, Coromandel, S. India, *ca.* 2,500 ft., 23. x. 1910 (*Museum Collector*). I am told that the Indian Museum also contains specimens, not seen by me, taken from a bat at Madhupur, Bengal (*C. Paiva*). In my 1914 paper I recorded this species from *Scotophilus heathi* at Pusa, Bihar ; from *S. kuhli* at Saidapet, Madras ; and from *Megaderma lyra* in Madras. In 1917 I recorded it from *S. wroughtoni* taken near Satara, Western Ghats.

In CEYLON Phillips took 2 ♂, 2 ♀ from *S. kuhli* at Bentota Rest House, at sea-level on the west coast of the Southern Province, 2. x. 1921. Details of the earlier records from Ceylon will be found in my 1914 paper : they include a species of host not listed above, namely *Tylonycteris pachypus*.

General distribution : MALAY PENINSULA, CEYLON, INDIA.

A curious little variation is noticeable in the number and arrangement of the bristles on the longitudinally divided 5th sternite of the ♀. This was figured (Scott, 1914, pl. xii, fig. 17) as having an anterior pair of short bristles, a median pair, and a posterior transverse series of five or six ; this was the condition in the Ceylonese material examined. Among the Indian material listed above, only the anterior and median pairs are present, and the posterior transverse series is absent, in all the 15 ♀ examples from Balighai, Orissa, in the 3 ♀ from Balugaon, Orissa, in the 11 ♀ from Barkul, Orissa, and in the 4 ♀ labelled " ? Calcutta, 10. i. 1911 " ; while the posterior transverse series is present, in addition to the anterior and median pairs, in the 2 ♀ from Hardwar, in the 5 ♀ from Siripur, Saran, and in two lots of respectively 1 ♀ and 4 ♀ from Barkuda Island, Chilka Lake. This is not the only kind of variation known to exist in the chætotaxy of the 5th sternite, since in my 1914 paper (p. 227) I noted that 1 ♀ from Pusa, Bihar, had an extra four bristles midway between the anterior (basal) and median pairs ; while in the 2 ♀ recently collected in Ceylon by Captain Phillips there is an extra pair of bristles between the anterior and median pairs.

Genus **Tripselia** Scott, 1917, *Parasitology* IX, p. 608.

Tripselia amiculata Speiser.

Cyclopodia amiculata, Speiser, 1907, *Rec. Ind. Mus.* I, p. 296.
Nycteribia (Acrocholidia) fryeri, Scott, 1914, *Trans. Linn. Soc. London*, ser. 2, Zool. XVII, p. 163, figs. 1-4.
Tripselia fryeri, Scott, 1917, *l.c.* ; Phillips, 1924, *Spolia Zeylanica* XIII, p. 70 ; Falcoz, 1924, *Bull. Mus. Paris* XXX, p. 311.

In 1917 (*l.c.*) I expressed the opinion that *T. fryeri* might prove to be identical with *T amiculata* (Speiser), and having now had the unique

[1] See footnote on p 353.

type (♀) of *amiculata* before me I am confirmed in this view. The type of *amiculata*, preserved dry, was very much shrunken, and the ventral plate of the thorax had bent up greatly on each side ; but now that the specimen has undergone prolonged soaking in water and been transferred to spirit, gentle pressure with a fine needle causes the ventral plate to become more flattened and to assume a width just as great in proportion to its length as in *fryeri*. The specimens described as *fryeri* have only three bristles, rather long and wide apart, on each lateral margin of the big second tergite of the ♀, while in the type of *amiculata* these bristles are four in number on each side and a little shorter.

Distribution :—India, Ceylon, Labuan, Assumption I., Tropical Africa.

The type of *T amiculata* was taken from *Taphozous longimanus* Hardw., at Calcutta. In Ceylon Capt. Phillips took 1 ♀ off a bat, *Taphozous longimanus*, and a single ♀ off another bat, *Saccolaimus saccolaimus* Temm., in both cases at Anasigalla, Matugama, Kalutara, at an elevation of about 50 feet, 18. x. 1921. The type and paratypes of *T fryeri* were taken from *Taphozous mauritianus* Geoffr., in Assumption Island ; I have also recorded the species under that name from *Saccolaimus saccolaimus* at Labuan, and from *S. peli* Temm., in the Belgian Congo. Falcoz (*l.c.*) records it from an unidentified small grey " Roussette " in Dahomey.

Type of *T amiculata* in the Indian Museum, Calcutta ; types (♂ ♀) of *T. fryeri* in the British Museum.

Phillips remarks (*op. cit.*) that in his experience this very wide-ranging Nycteribiid is usually quite solitary. This does not, however, apply to the material from Assumption Island, where 18 examples (3♂, 15♀) were taken from the only two bats captured out of a small colony. In Assumption Island the bats (*Taphozous mauritianus*) were clinging to the stem of a coconut-palm just below the leaves ; and Phillips states that in Ceylon the allied *Taphozous longimanus* is " a somewhat uncommon bat living solitary or in twos and threes in the crown of coconut palms."

As I stated in 1917(*op. cit.*, p. 609) there appears to be a second species of this genus, of which I possess examples from Sumatra, but which I have as yet been unable to study in detail. Falcoz (*op. cit.*, p. 312) has described a new subgenus and species from West Africa ; this subgenus, *Neotripselia*, is characterised by the presence of a single pigmented ocellus on either side of the head, but has the tibiae three-ringed as in *Tripselia*, s. str.

Genus **Eucampsipodia** Kolenati.

Eucampsipodia hyrtli (Kolenati).

Nycteribia hyrtli, Kolenati, 1856.

Eucampsipodia hyrtli, Kolenati, 1863, *Horae Soc. Ent. Rossicae* II, p. 78, pl. xii, figs. 26 *d. e* (♀), pl. xiv, figs. 26 *a-c* (♂) ; Speiser, 1901, p. 48 ; *id.* 1908, in Voeltzkow, *Reise in Ost-Afrika*, II, 1908, p. 202 ; Scott, 1914, *Ann. Mag. Nat. Hist.* (8) XIV, p. 228, pl. xii, figs. 18, 19 (♀) ; *id.* 1917, *Parasitology* IX, p. 610 ; Falcoz, 1923, *Arch. Zool. Exper.* LXI, p. 549 ; *id.* 1924, *Bull. Mus. Paris* XXX, p. 315 ; Patton, 1924, *Rec. Ind. Mus.* XXVI, p. 112.

From the Indian Museum : 5♂, 4♀, from *Rousettus leschenaulti* Desm., Khandagiri, Puri District, Orissa, 7-8. xi. 1912 (*F. H. Gravely*),

in the same tube with 3 ♂ and 1 ♀ *N.* (*Acrocholidia*) *euxesta* (No. $\frac{6151}{19}$ Ind. Mus.). Major Patton has recorded *E. hyrtli* from the Siju Cave, Garo Hills, Assam, where many specimens were taken on *Cynopterus sphinx gangeticus* K. And., at 400-500 feet from the entrance; he kindly submitted 1 ♂ to me before publishing this record.

In CEYLON Phillips obtained 2 ♂, 3 ♀ from *Rousettus seminudus* Kel., at Mousakande Estate, Gammaduwa, East Matale, 3,000 ft., 27. viii. 1923; and Mr. Senior-White's collection (at present, i. 1925, at the British Museum) contains, 1 ♂, preserved dry, from the breast-fur of the same host-species, taken at Suduganga, Matale, 6. i. 1920. Fryer's specimens, recorded in 1914, were taken at Peradeniya from *Rousettus seminudus* and *Tylonycteris pachypus*.

This species is known from various parts of AFRICA (Egypt, Senegal, East and South Africa); COMORO ISLANDS; MADAGASCAR; SUMATRA; BURMA (Farm Caves, near Moulmein, *teste* Speiser 1901, *op. cit.*, p. 58); CEYLON; INDIA. A recent record is that of Falcoz (1923), from *Rousettus leachi* A. Smith, at Shimoni, Seyidié District, British East Africa. Some of the older records are from *Rousettus aegyptiacus* Geoffr. "South Africa" is included in the distribution on the strength of several ♂ and ♀ taken from *Rousettus collaris* (=*leachi*) at Salem, Cape Province, ix. 1904; these belong to the Albany Museum, Grahamstown, and were submitted to me in January 1915 through Dr. J. Waterston; I have not published the record before and am not aware that it has appeared elsewhere.

Since this paper was set up in type, I have received from Mr. A. Musgrave a copy of an interesting article on Australian Nycteribiidæ (*Rec. Australian Museum*, XIV, pp. 289-300, pl. xliv, xlv, 1925), in which he proposes changes in the names of two of the subgenera of *Nycteribia*. According to Musgrave, *Acrocholidia* Kol. should be known as subgenus *Nycteribia* [s. str.] Latr., and *Stylidia* West. should fall as a synonym of *Celeripes* Montagu. I have not yet had time to go into the matter and follow out Musgrave's reasons for these changes, so "*Acrocholidia*" and "*Stylidia*" remain in use in this present paper at all events. As might be expected, none of the five Australian species discussed by Musgrave is identical with any known Indian form.—H. S.