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First Record of the Genus *Leptocyclopodia* (Theodor) (Diptera: Nycteribiidae: Cyclopodiinae) in Romblon Island Group, with a List of Arthropods Ectoparasitic on Bats in Romblon Province, Philippines

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ABSTRACT

Philippine Cyclopodiinae is represented by the genera *Cyclopodia* Kolenati, 1863; *Eucampsipoda* Kolenati, 1857; and *Leptocyclopodia* Theodor, 1959. Of these, *Leptocyclopodia* is the most diverse and has the highest number of endemic species which are commonly associated with forest- dwelling pteropodids. Herein, we report the first documentation of the genus *Leptocyclopodia* in the Romblon Island Group along with an initial list of ectoparasitic arthropods on bats occurring in Romblon Province, Philippines.

Keywords: Bat ectoparasites, Cyclopodiinae, *Leptocyclopodia*, Romblon, Tablas.

INTRODUCTION

Romblon is an archipelagic province comprised primarily of ophiolite complexes and metamorphic suites. The province is a geopolitical territory of Region IV-B MIMAROPA (Mindoro, Marinduque, Romblon, and Palawan) and composed of three major islands (Tablas, Romblon, and Sibuyan) and a few small oceanic islands (Dimalanta *et al.*, 2009). Biogeographically, the Romblon Island Group belongs to the Visayan Pleistocene Aggregate Island Complexes (Brown and Diesmos, 2002; Siler *et al.*, 2012). Among its geologic features, Mt. Guiting-Guiting is the most prominent as well as having the highest peak with an elevation of 2,058 m asl. In terms of biodiversity, Romblon province is home to a wide taxonomic array of endemic flora and fauna, such as: *Dicrurus menagei* (Tablas drongo) (BirdLife International, 2017), *Pseudogekko isapa* (Siler *et al.*, 2016), *Gekko coi* (Brown *et al.*, 2011), *Coraebosoma sibuyanicum* (Bellamy, 1990), and *Nepenthes sibuyanensis* (Nerz *et al.*, 1998).

Of the 79 species of bats known in the Philippines (Tanalgo and Hughes, 2019), 26 are recorded in the major islands of Romblon province (Tablas Is., Sibuyan Is., and Romblon Is.) (Heaney *et al.*, 2010). Of these, eight are known to be endemic in the Philippines: *Harpyionycteris whiteheadi* Thomas, 1896; *Haplonycteris fischeri* Lawrence, 1939; *Nyctimene rabori* Heaney and Peterson, 1984; *Ptenochirus jagori* (Peters, 1861); *Pteropus pumilus* Miller, 1910; *Hipposideros obscurus* Peters, 1861; *Rhinolophus virgo* Andersen, 1905; and *Myotis rufopictus* (Waterhouse, 1845) (Heaney *et al.*, 2010).

Forest-dwelling fruit bats are known to harbor various ectoparasitic groups, such as bat flies, bat fleas, and bat mites (Cuy, 1980a, b; Fain, 2002; Alvarez *et al.*, 2016). Among these, bat flies are the most common parasitic group, especially those belonging to the genus *Leptocyclopodia*. Prior to its elevation to genus status by Maa (1965), *Leptocyclopodia* was first designated as subgenus under *Cyclopodia*, with *Cyclopodia ferrarii* (Rondani) designated as the type (Theodor 1959). In the Philippines, *Leptocyclopodia* had been documented in main biogeographic regions and commonly associated with non-cavernicolous bat species (Cuy, 1980b; Cuy, 1981). Despite vast parasite diversity, there are relatively few studies concerning ectoparasitic arthropods on bats in the Philippines, particularly in the Romblon Island Group. Cuy (1980b) listed four species of nycteribiid bat flies found in the province, all of which were recorded in Tablas Island. Of the streblid batflies, only *Brachytarsina amboinensis* Rondani is represented, as documented by Jobling (1951). Corpuz- Raros and Lit (2015) listed six species of sarcoptid mites belonging to the genera *Chirobia* Fain, 1959; *Nycteridocoptes*

Oudemans, 1898; *Rousettocoptes* Klompen, 1992; and *Teinocoptes* Rodhain, 1923. Herein, we document the first report of the genus *Leptocyclopodia* (Theodor) in the Romblon Island Group along with an initial list of ectoparasitic arthropods on bats in the province.

MATERIALS AND METHODS

The host and ectoparasite specimens were collected in an agroforest area in Odiongan, Tablas Island (Figure 1) on 8-9 January 2017. Bats were collected using 6 × 12 meter mist nets and were established across possible flyways in the agroforest area. Specimens were immediately released after the morphometric data and species identity were obtained. Collected bats were identified to species level using Ingle and Heaney (1992). Ectoparasite specimens were collected using fine- tipped forceps and were preserved in 95% ethanol and kept under -4 °C prior to identification. Specimens were examined under Motic SMZ-171 stereozoom microscope and were identified down to the species level following the published keys including works of Theodor (1963) and Cuy (1980b). Specimens will be deposited at the Insect Taxonomy Laboratory- University of the Philippines Los Baños.

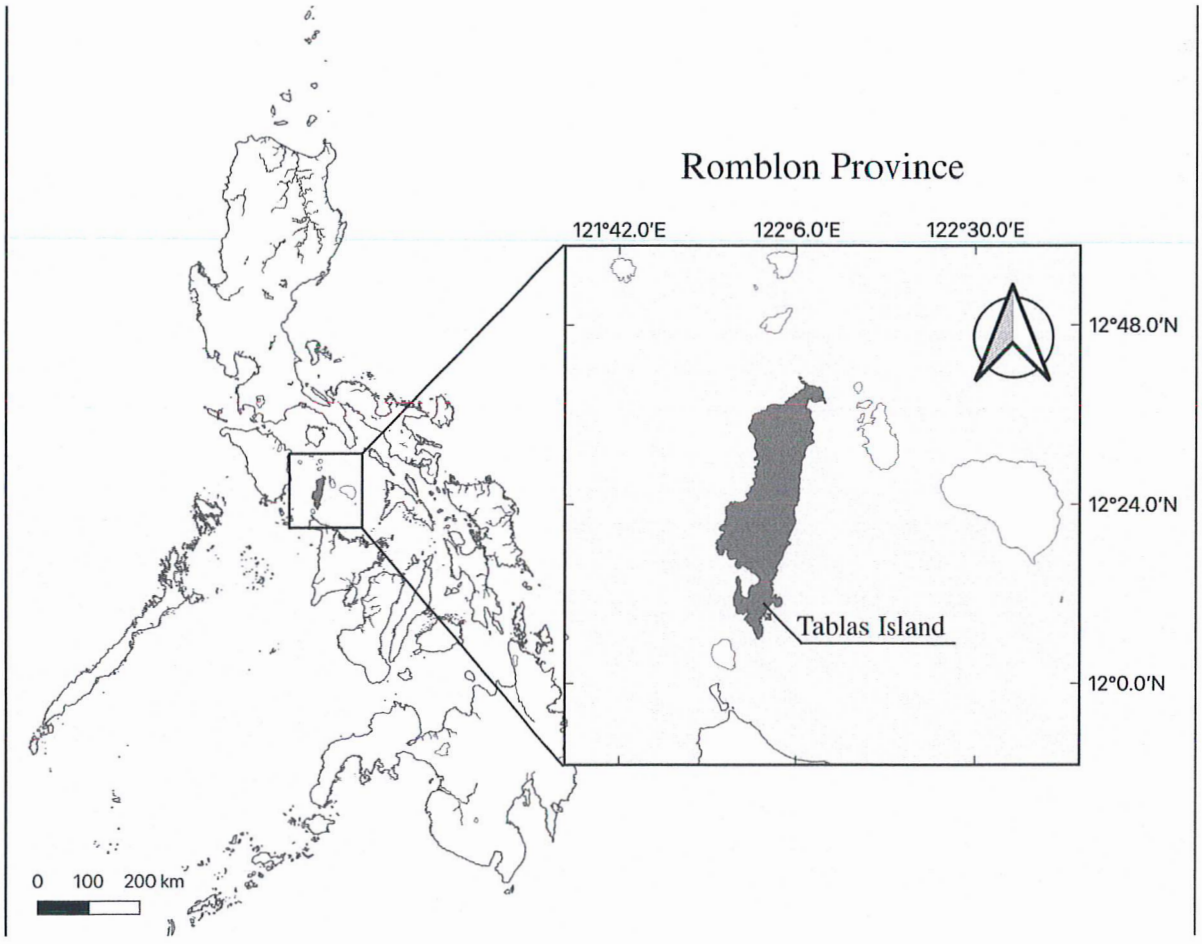


Figure 1. Location of Tablas Island in Romblon Province, Philippines.

RESULTS AND DISCUSSION

***Leptocyclopodia simulans* (Theodor, 1959)**
(Figure 2A)

Cyclopodia (*Leptocyclopodia*) *simulans* Theodor, 1959. Parasitology 49: 291.

Leptocyclopodia simulans Maa, 1965. Journal of Medical Entomology 1: 378.

Material examined: Philippines: Tablas Island: 5♂, 4♀, agroforest area, Romblon State University, Odiongan, 08–09.I.2017, ex. 2♂, 2♀ *Ptenochirus jagori* (Peters), R.N. Fornesa leg.

Diagnosis: *Leptocyclopodia simulans* is closely similar to its congener *L. analis* Maa. However, the former differs from the latter by having a more setose mesosternum, metasternum as wide as mesosternum, and longer phallobase (Cuy, 1980b).

Philippine records: Bohol, Camiguin, Cebu, Leyte, Luzon, Mindanao, Mindoro, Negros, (Theodor 1959; Maa 1968; Cuy 1980b; Alvarez *et al.* 2015, 2016), and Tablas Island (new record).

Host records: Commonly associated with Ptenochirus jagori but also documented in *Cynopterus brachyotis*, *Rousettus amplexicaudatus*, *Eonycteris robusta*, and *Macroglossus lagochilus* (now *M. minimus*) (Cuy, 1980b).

***Leptocyclopodia brevicula* Maa, 1966**
(Figure 2B)

Leptocyclopodia brevicula Maa 1966.
Pacific Insects 8: 677.

Material examined: Philippines: Tablas Island: 1♂ from agroforest area, Romblon State University, Odiongan, 08–09.I.2017, ex. 1♀ *Ptenochirus jagori* (Peters), R.N. Fornesa leg.

Diagnosis: *Leptocyclopodia brevicula* is closely similar to its congener *L. ferrarii* and *L. haplotes*. However, it can be distinguished from the latter two species by having a short and broad clasper; lateral plates on sternite VII of female curved and evenly elevated; sub-basal constriction on male terminalia absent (Cuy, 1980).

Philippine records: mainland Luzon, mainland Mindanao (Maa 1968; Cuy 1980b), Tablas Island (new record).

Host record: *Ptenochirus jagori* (Maa, 1966; Cuy, 1980b) (Figure 3A-B).

In his revisionary work, Theodor (1959) established the subgenus *Leptocyclopodia*, designating *Cyclopodia ferrarii* (Rondani) as the type. This subgenus was created to accommodate *C. ferrarii* (Rondani, 1878), *C. obliqua* (Theodor, 1959), *C. simulans* (Theodor, 1959), *C. brachythrinax* (Theodor, 1959), *C. macrura* (Speiser, 1900), and *C. orthotricha* (Theodor, 1959). Furthermore,

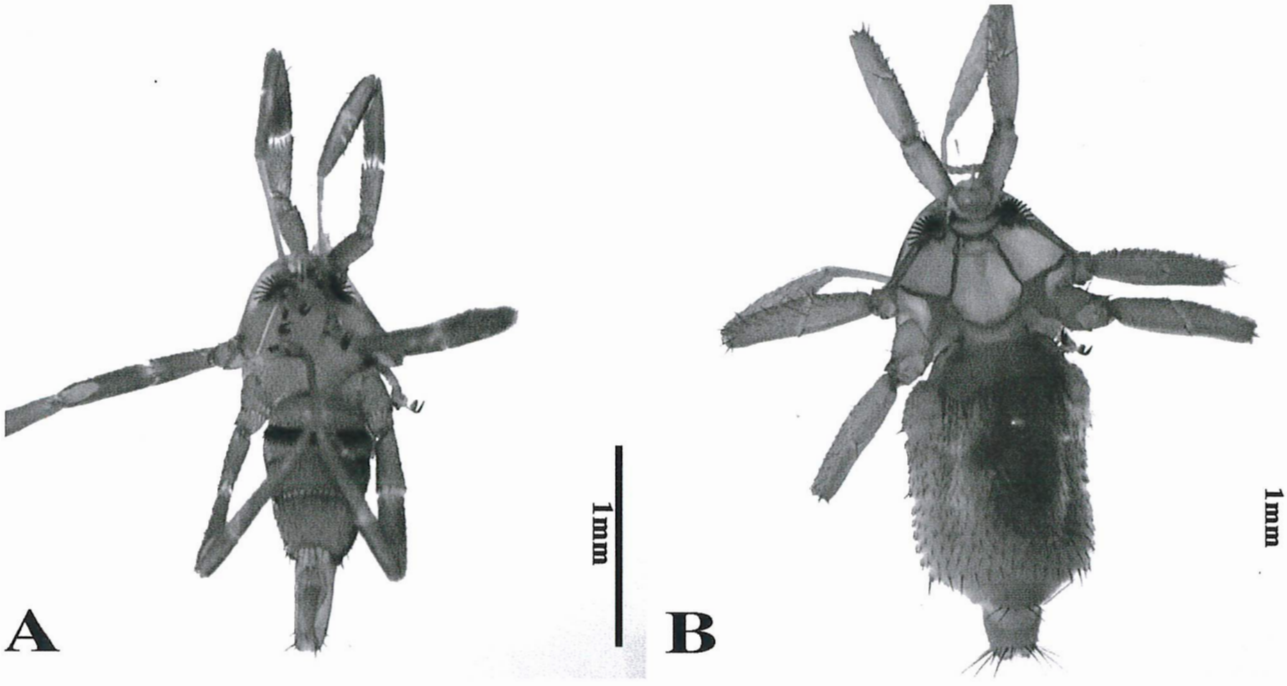


Figure 2. *Leptocyclopodia brevicula*, male (A); *Leptocyclopodia simulans*, female (B).

he described a new subspecies, *Cyclopodia ferrarii palawanensis* (Theodor, 1959), by virtue of the male genitalia architecture and chaetotaxy of female dorsum, as well as a new species, *Cyclopodia simulans*, which is closely related to *C. ferrarii*. In 1965, Maa elevated the subgenus status of *Leptocyclopodia* into a genus and erected the subfamily Cyclopodiinae to accommodate the genera *Archinycteribia* Speiser, *Cyclopodia* Kolenati, *Leptocyclopodia* Theodor, *Dipseliopodia* Theodor, and *Eucampsipoda* Kolenati. However, Maa (1975) erected the subfamily Archinycteribiinae, transferring the genus *Archinycteribia*, and assigning it as the type genus.

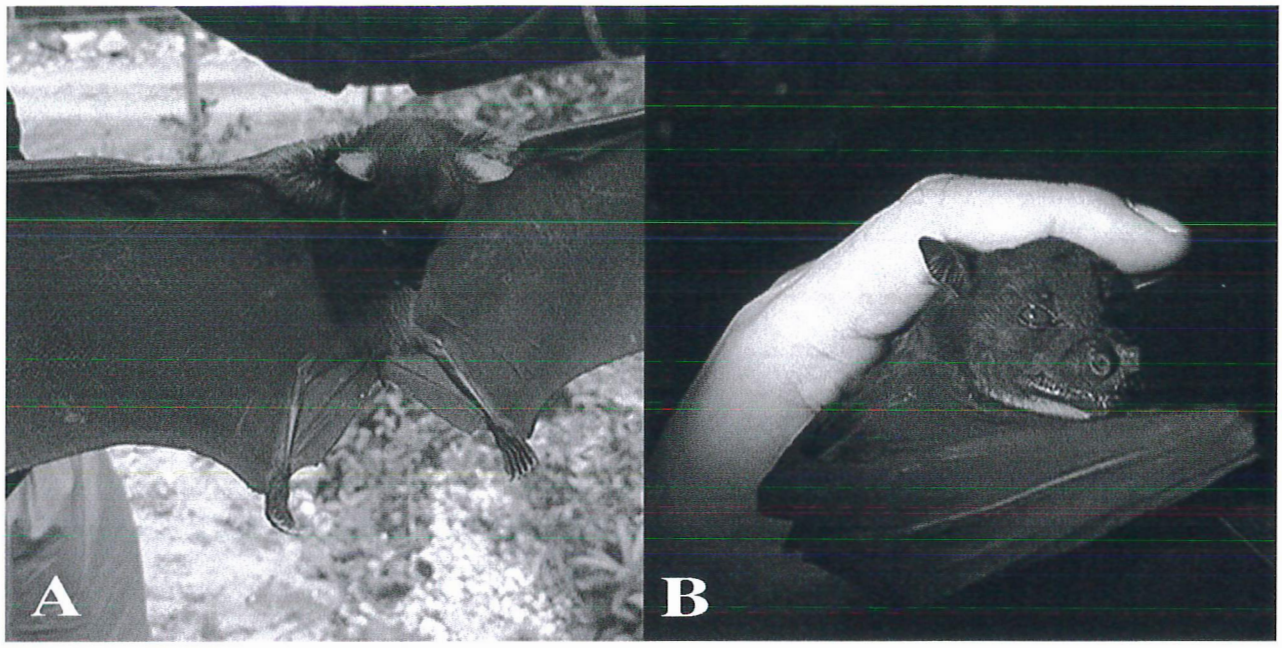


Figure 3. *Ptenochirus jagori* (Peters) (A-B), a widespread Philippine endemic species but absent in Greater Palawan Faunal Region.

Graciolli and Dick (2018) listed 2 subgenera (*Leptocyclopodia* and *Oncoposthia*), 22 species and 7 subspecies under the genus *Leptocyclopodia*. Members of this genus are distributed throughout Asia and the Pacific (Graciolli and Dick, 2018) and are known to be true ectoparasites of Pteropodidae (Theodor, 1959; Maa, 1965, 1975). In the Philippines, there are six species and one subspecies (*L. ferrarii mabuhai* Maa) known (Cuy, 1980b; Dick and Graciolli, 2018). Among these species, only *L. ferrarii* is not endemic; however, *L. ferrarii mabuhai* is only found in the Philippines, and it is known to occur in Camiguin, Guimaras, Leyte, mainland Luzon, mainland Mindanao, Negros, and Panay (Cuy, 1980b). Furthermore, Philippine *Leptocyclopodia* species are usually associated with members of subfamilies Cynopterinae, Harpyionycterinae, and Macroglossinae, all of which are forest- dwelling groups. Moreover, some Leptocyclopodia species have been reported to occur in cave-dwelling genera such as *Eonycteris*, *Hipposideros*, and *Rousettus* (Maa, 1966, 1968; Cuy, 1980b).

Aside from *Leptocyclopodia*, other batfly genera are also reported to be present in Romblon Province such as *Penicillidia*, *Nycteribia*, and *Brachytarsina.* Representative species from these genera reported in Romblon Province are usually associated insectivorous bats. Also, six species of sarcoptid mites have been reported to occur in the said province (Table 1). These species inhabit the wing membrane and often co-occurred with other mite groups parasitic on bats (Klompen and O'Connor, 1987).

Despite several biodiversity research studies conducted in several areas of the Romblon Island Group, knowledge of the faunistics of bat ectoparasites on the archipelago is still scarce as evidenced by relatively few published records (Table 1). Thus, it merits further and in-depth faunistic surveys concerning bat ectoparasites. Also, investigation on parasite dynamics and vector ecology should be done since these parasites are haematophagous, thus blood-feeding behavior plays an important role on intra- and inter-host pathogen transfer.

Table 1. List of ectoparasitic arthropods on bats reported in Romblon Island Group.

Species	Philippine Host Records	Philippine Locality Records	References
Nycteribiidae (wingless batflies)			
Penicillidia acuminata Theodor	*Chaerephon plicatus, Emballonura alecto, Miniopterus australis, M. schreibersii, Rhinolophus arcuatus, Rousettus amplexicaudatus*	mainland Luzon; Lubang Is.; Polillo Is., Marinduque Is., Tablas Is., mainland Mindanao	Cuy 1980b; Alvarez *et al.*, 2015; Amarga *et al.*, 2017
Penicillidia oligacantha Theodor	*Eonycteris spelaea, Miniopterus australis, M. schreibersii, Rousettus amplexicaudatus,*	mainland Luzon; Polillo Is; Marinduque Is.; Tablas Is.; mainland Mindanao	Cuy 1980b; Alvarez *et al.*, 2015; Amarga *et al.*, 2017
Nycteribia allotopa Speiser	*Chaerephon plicatus, Megaderma spasma, Miniopterus australis, M. schreibersii, Rhinolophus arcuatus, R. philippinensis, R. virgo*	mainland Luzon; Polillo Is.; Marinduque Is.; Tablas Is.; mainland Mindanao	Cuy 1980b; Alvarez *et al.*, 2015; Amarga *et al.*, 2017
Nycteribia parvula Speiser	*Chaerephon plicatus, Miniopterus australis, M. schreibersii, Rhinolophus arcuatus,*	mainland Luzon; Polillo Is.; Marinduque Is.; Tablas Is.; mainland Mindanao	Cuy 1980b; Alvarez *et al.*, 2015; Amarga *et al.*, 2017
Leptocyclopodia brevicula Maa	*Ptenochirus jagori,*	mainland Luzon; Tablas Is.; mainland Mindanao	Maa 1968; Cuy 1980b; Alvarez *et al.*, 2015; **this study**
Leptocyclopodia simulans Theodor	*Cynopterus brachyotis, Eonycteris robusta, Macroglossus minimus, Ptenochirus jagori, Rousettus amplexicaudatus,*	mainland Luzon; Mindoro; Tablas Is.; Cebu; Negros; mainland Mindanao; Leyte; Bohol; Camiguin	Theodor, 1959; Maa, 1968; Cuy, 1980b; Alvarez *et al.*, 2015, 2016; **this study**
Streblidae (winged batflies)			
Brachytarsina amboinensis Rondani	*Eonycteris spelaea, Hipposideros coronatus, Hipposideros diadema, Miniopterus australis, M. schreibersii, M. tristis, Rhinolophus sp., Rhinolophus arcuatus, Rousettus amplexicadatus*	mainland Luzon; Polillo Is.; Mindoro; Marinduque Is.; Tablas Is.; mainland Mindanao	Jobling, 1951; Cuy, 1980a; Alvarez *et al.*, 2016; Amarga *et al.*, 2017
Sarcoptidae (sarcoptid mites)			
Chirobia jagori Klompen	*Ptenochirus jagori*	mainland Luzon; Sibuyan Is.; Negros; Biliran Is.; Maripipi Is.; Leyte	Klompen, 1992; Corpuz-Raros and Lit, 2015
Chirobia rousettus Klompen	*Rousettus amplexicaudatus*	Sibuyan Is.; Negros; Leyte; Bohol; mainland Mindanao	Klompen, 1992; Corpuz-Raros and Lit, 2015
Nycteridocoptes asiaticus Fain	*Eonycteris robusta, E. spelaea, Rousettus amplexicaudatus*	Sibuyan Is.; Negros; Leyte; Bohol	Klompen, 1992; Corpuz-Raros and Lit, 2015
Rousettocoptes mammophilus Klompen	*Eonycteris spelaea, Rousettus amplexicaudatus*	Sibuyan Is.; Negros; Leyte; Bohol	Klompen, 1992; Corpuz-Raros and Lit, 2015
Teinocoptes pahangensis Fain	*Eonycteris spelaea, Rousettus amplexicaudatus*	Sibuyan Is.; Negros; Leyte	Klompen, 1992; Fain, 2002; Corpuz-Raros & Lit 2015
Teinocoptes vandeuseni Mitchell and Fain	*Rousettus amplexicaudatus*	Sibuyan Is.; Negros	Klompen 1992; Fain 2002; Corpuz-Raros and Lit, 2015

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