

The Hydrometridae (Insecta: Heteroptera) of the Philippine Islands

V.P. Gapud*, H. Zettel** & C.M. Yang***

Abstract

In the Philippine Islands the family Hydrometridae is represented by four species of the genus *Hydrometra* LATREILLE, 1796: *H. julieni* HUNGERFORD & EVANS, 1934, *H. lineata* ESCHSCHOLTZ, 1822, *H. mindoroensis* POLHEMUS, 1976, and *H. orientalis* LUNDBLAD, 1933. Distribution data and habitat notes from literature and collections are compiled. The following first island records are presented: *Hydrometra lineata* for Polillo, Marinduque, Catanduanes, Masbate, Romblon, Sibuyan, Panay, Siquijor, Pacijan, Hiktop, Dinagat, and Olutanga; *H. mindoroensis* for Polillo, Marinduque, Catanduanes, Ticao, Masbate, Negros, Siquijor, Cebu, Bohol, Samar, Biliran, Camiguin, Bayagnan, and Busuanga; *H. orientalis* for Mindoro, Busuanga, and Palawan. A key to the species is provided and illustrated with SEM-photos of the anteclypeus and the terminalia of males and females.

Key words: Heteroptera, Hydrometridae, *Hydrometra*, distribution, first record, key, habitat, Philippines.

Zusammenfassung

Auf den Philippinen ist die Familie Hydrometridae mit vier Arten der Gattung *Hydrometra* LATREILLE, 1796 vertreten: *H. julieni* HUNGERFORD & EVANS, 1934, *H. lineata* ESCHSCHOLTZ, 1822, *H. mindoroensis* POLHEMUS, 1976 und *H. orientalis* LUNDBLAD, 1933. Verbreitungs- und Lebensraumangaben aus der Literatur und aus Sammlungen werden zusammengefaßt. Die folgenden ersten Inselnachweise werden erbracht: *Hydrometra lineata* für Polillo, Marinduque, Catanduanes, Masbate, Romblon, Sibuyan, Panay, Siquijor, Pacijan, Hiktop, Dinagat und Olutanga; *H. mindoroensis* für Polillo, Marinduque, Catanduanes, Ticao, Masbate, Negros, Siquijor, Cebu, Bohol, Samar, Biliran, Camiguin, Bayagnan und Busuanga; *H. orientalis* für Mindoro, Busuanga und Palawan. Ein Bestimmungsschlüssel wird vorgestellt, der mit REM-Aufnahmen des Anteclypeus und der Terminalia von Männchen und Weibchen illustriert ist.

Introduction

The marsh traders or water measurers, family Hydrometridae, are peculiar insects, which can be easily recognized by an elongate body, especially a long head (Fig. 1). *Hydrometra* LATREILLE, 1796 is the only genus encountered in the Philippines. Species of *Hydrometra* inhabit the transition zone between land and freshwater. They are agile runners on land and on the water surface. They are predators and scavengers. Most species are known for a pterygo-dimorphism. An excellent overview on the family Hydrometridae can be found in the work by ANDERSEN (1982).

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Species of *Hydrometra*, which inhabit Indochina and the western Malay Archipelago, have been taxonomically revised by POLHEMUS & POLHEMUS (1995). In the Philippines, only four species are recorded, none of which is endemic. Here, a summary of the present knowledge on Philippine Hydrometridae is compiled and numerous new records are presented.

Acronyms:

Repositories:

CSSAC	Camarines Sur State Agricultural College, Pili, Camarines Sur, Philippines
CSW	Coll. Franz Seyfert, Vienna, Austria
CUL	Coll. W. Ullrich, Lübeck, Germany
CZW	Coll. H. & S.V. Zettel, Vienna, Austria
NHMW	Naturhistorisches Museum in Wien, Vienna, Austria
SHUK	Snow Hall, Entomological Museum, University of Kansas, Lawrence, Kansas, U.S.A.
UPLB	Museum of Natural History, University of the Philippines, Los Baños, Laguna, Philippines
ViSCA	Visayas State College of Agriculture, Baybay, Leyte, Philippines
VPG	Coll. V.P. Gapud, University of the Philippines, Los Baños, Laguna, Philippines
ZRCS	Raffles Museum of Biodiversity Research (Zoological Reference Collection), National University of Singapore

Others:

br	brachypterous (forewing reaching tergite 2)
ma	macropterous (forewing reaching at least tergite 5)
m.e.	material examined
mi	micropterous (forewing reduced to very small pads hardly surpassing pronotal lobe)

Key to the species of *Hydrometra* in the Philippine Islands

- 1 Anteclypeus transverse, wider than long, with concave anterior margin (Fig. 2); 12.0 - 13.0 mm; micropterous or macropterous. ***H. julieni***
- Anteclypeus not transverse, longer than wide, with acute or blunt apex (Figs. 3 - 5). **2**
- 2 Laterotergites 3 - 7 with weakly delimited whitish or yellowish patches close to anterior margin; anteclypeus small (Fig. 4); sternite 7 of male close to anterior margin with pair of processes bearing spine-like cluster of black setae (Fig. 8, 12); tergite 8 of female widest at posterior margin (Fig. 20); 9.9 - 12.5 mm; usually micropterous, rarely macropterous. ***H. mindoroensis***
- Laterotergites without such patches; anteclypeus of normal size (Figs. 3, 5); sternite 7 of male without pair of processes (Figs. 7, 9, 11, 13); tergite 8 of female widest at anterior margin (Figs. 19, 21); brachypterous or macropterous. **3**
- 3 Anteclypeus with convex sides, with blunt apex (Fig. 3); male: in ventral view sides of segment 8 posteriad diverging, terminating in strongly produced hind corners (Fig. 11); female: connexiva 7 posteriorly strongly convergent, at apex bearing cluster of short, but distinct black setae; visible posterior margin of tergite 7 approximately half as long as anterior margin (Fig. 19); 11.6 - 15.0 mm. ***H. lineata***

- Anteclypeus with straight or weakly convex sides, with acute apex (Fig. 5); male: in ventral view sides of segment 8 parallel, terminating in blunt hind corners (Fig. 13); female: connexiva posteriorly weakly convergent, at apex bearing some indistinct short brown setae; posterior margin of tergite 7 slightly shorter than anterior margin (Fig. 21); 10.6 - 13.6 mm. *H. orientalis*

***Hydrometra julieni* HUNGERFORD & EVANS, 1934** (Figs. 2, 6, 10, 14, 18, 22)

Hydrometra julieni HUNGERFORD & EVANS, 1934: 55 (description, figures). - POLHEMUS & POLHEMUS 1995: 25 (redescription, key, figures, distribution, habitat).

Material examined: none from Philippines; figures from specimens from Kalimantan.

Distribution in the Philippines (Fig. 22): Oriental Mindoro (POLHEMUS & POLHEMUS 1995).

***Hydrometra lineata* ESCHSCHOLTZ, 1822** (Figs. 3, 7, 11, 15, 19, 23)

Hydrometra lineata ESCHSCHOLTZ, 1822: 110 (description). - HUNGERFORD & EVANS 1934: 72 (key, redescription, synonymy, records, figure). - POLHEMUS & REISEN 1976: 284 (key, figure, records). - ANDERSEN 1995: 84 (catalogue, distribution). - POLHEMUS & POLHEMUS 1995: 29 (key, redescription, figures, distribution, habitat). - POLHEMUS & LANSBURY 1997: 20 (key, redescription, figures, distribution, habitat).

Hydrometra lineatus BERGROTH 1915: 118 (description, synonymy, comparative notes). - LUNDBLAD, 1933: 429 (listed).

Hydrometra vittata STÅL, 1871: 705 (description) (syn. BERGROTH 1915).

Notes on synonymy: In the interpretation of the species *H. lineata* and its synonymy with *H. vittata*, we follow POLHEMUS & POLHEMUS (1995) and ANDERSEN (1995), but should remark that a verification based on type material appears necessary. Both cited papers attribute the synonymy of the two taxa to LUNDBLAD (1933). However, LUNDBLAD (1933: 429) only states "Die Type der STÅL'schen *H. vittatus*, eine Art, die mit *H. lineatus* identisch sein soll, scheint auch verloren gegangen zu sein." [The type of STÅL's *H. vittatus*, a species, which is supposed to be identical with *H. lineatus*, seems to be lost, too.] It seems evident, that LUNDBLAD (1933) refers to the note by BERGROTH (1915: 118) (also because he follows the latter author in using the ending *-us*): "There can be no doubt that *H. vittatus* Stål is identical with *lineatus*, a species apparently overlooked by Stål. ... Eschscholtz's and Stål's specimens were from the Philippine Islands (Luzon) from where I also have examples and where the species is common." Therefore, the synonymy must be attributed to BERGROTH (1915).

Material examined: Luzon: 1 ♀ (br), 5 ♂♂, 3 ♀♀ (ma), Ilocos Norte, Vintar, Vintar Dam, 22.10.1976, leg. A.A. Barroso (VPG); 1 ♂, 7 ♀♀ (ma), same locality and date, leg. D.C. Caballes (VPG); 1 ♂, 3 ♀♀ (ma), same locality and date, leg. H.O. San Valentin (VPG); 1 ♂ (ma), Ilocos Norte, Piddig, Tangaonan C. Nursery, Paraiso Reforestation Project, 21.10.1976, leg. A.A. Barroso (VPG); 1 ♂, 4 ♀♀ (ma), Ilocos Sur, Bantay, Caniaw BFD Station, pond, 20.10.1976, leg. A.A. Barroso (VPG); 1 ♂ (br), 3 ♂♂, 12 ♀♀ (ma), same locality and date, leg. D.C. Caballes (VPG); 2 ♂♂, 1 ♀ (br), 10 ♂♂, 8 ♀♀ (ma), same locality and date, leg. H.O. San Valentin (VPG); 1 ♂ (br), 2 ♂♂, 1 ♀♀ (ma), Ilocos Sur, Santa, near beach, 20.10.1976, leg. A.A. Barroso (VPG); 1 ♂ (br), same locality and date, leg. H.O. San Valentin (VPG); 1 ♀ (br), 3 ♂♂, 5 ♀♀ (ma), La Union, Agoon, Agoon-Damortis National Park, marsh, 18.10.1976, leg. A.A. Barroso (VPG); 1 ♀ (ma), same locality and date, leg. D.C. Caballes (VPG); 1 ♂ (br), 3 ♀♀ (ma), same locality and date, leg. H.O. San Valentin (VPG); 5 ♂♂, 8 ♀♀ (ma), La Union, Bacnotan, DMMSU, stream, 19.10.1976, leg. A.A. Barroso (VPG); 4 ♂♂, 4 ♀♀ (ma), same locality and date, leg. H.O. San Valentin (VPG); 4 ♂♂, 5 ♀♀ (ma), La Union, Tubao, Alipang River, 18.10.1976, leg. A.A. Barroso (VPG); 4 ♂♂, 4 ♀♀ (ma), same locality and date, leg. D.C. Caballes (VPG); 1 ♀ (br), 1 ♂, 2 ♀♀ (ma), La Union, Lloren, Tubao, rice paddy, 18.10.1976, leg. A.A. Barroso (VPG); 2 ♂♂, 6 ♀♀ (ma), Abra, Bangued, Abra River, 23.10.1976, leg. A.A. Barroso (VPG); 3 ♂♂ (ma), same

locality and date, leg. D.C. Caballes (VPG); 2 ♂♂ (ma), same locality and date, leg. H.O. San Valentin (VPG); 1 ♀ (ma), Mountain Province, 5 km S Bontoc, Balitian River, 900 m, 27.2.1999, leg. H. Zettel (190) (NHMW); 1 ♀ (ma), Mountain Province, NW Sagada, Lake Danum, 1600 m, 24.2.1999, leg. H. Zettel (187) (NHMW); 1 ♂ (br), Mountain Province, Chico River, Gonogon, 1100 m, 21.2.1999, leg. H. Zettel (184) (CZW); 1 ♂, 1 ♀ (ma), Benguet, Trinidad, stream, 30.10.1976, leg. V.P. Gapud (VPG); 1 ♂ (ma), Benguet, Tuba, Bridal Veil Falls, 10.12.1976, leg. V.P. Gapud (VPG); 3 ♂♂, 4 ♀♀ (br), 1 ♂, 2 ♀♀ (ma), Pangasinan, Gayaman Binmalay, 19.11.1955, leg. P. Catungal (SHUK, NHMW); 5 ♂♂, 2 ♀♀ (ma), Zambales, Olongapo, Subic Bay, small puddle at Riding Stable, 5.12.1993, leg. H. Zettel (37c) (NHMW); 1 ♀ (br), 1 ♂ (ma), same locality, pond at Gate, 5.12.1993, leg. H. Zettel (37d) (NHMW); 3 ♂♂, 3 ♀♀ (ma), Zambales, Sta. Cruz, Upper Lawis River, 16.5.1977, leg. A.A. Barroso (VPG); 1 ♂, 5 ♀♀ (ma), Bataan, Bagac, Umagol Creek, 24.4.1979, leg. V.P. Gapud (VPG); 2 ♂♂, 1 ♀ (br), 6 ♂♂, 4 ♀♀ (ma), same locality and date, leg. F.A. Mulimbayan (VPG); 1 ♂, 1 ♀ (ma), Bataan, 10 km E Olongapo, Roosevelt Park, 1.12.1993, leg. H. Zettel (38) (NHMW); 1 ♂ (ma), Tarlac, Tarlac, farm near river, at light, 30.4.1988, leg. V.P. Gapud (VPG); 1 ♂, 1 ♀ (ma), Nueva Vizcaya, Imugan, Maliko River, near waterfalls, 6.4.1999, leg. V.P. Gapud (VPG); 8 ♂♂, 6 ♀♀ (ma), Nueva Ecija, Carranglan, Maringalo BFD Station, rice paddies, 7.11.1976, leg. A.A. Barroso (VPG); 3 ♂ (ma), same locality and date, leg. D.C. Caballes (VPG); 2 ♂♂, 1 ♀ (ma), same locality and date, leg. H.O. San Valentin (VPG); 11 ♂♂ (ma), Nueva Ecija, creek going to Pantabangan Dam, 7.11.1976, leg. A.A. Barroso (VPG); 3 ♂♂, 2 ♀♀ (ma), Nueva Ecija, banks of Pantabangan Dam, 7.11.1976, leg. A.A. Barroso (VPG); 1 ♂, 5 ♀♀ (ma), Nueva Ecija, San Jose, Sibut, Talavera River, 7.11.1976, leg. A.A. Barroso (VPG); 1 ♀ (br), 3 ♂♂, 5 ♀♀ (ma), same locality and date, leg. D.C. Caballes (VPG); 4 ♂♂, 3 ♀♀ (ma), San Jose, same locality and date, leg. C.S. Sanchez (VPG); 1 ♀ (br), Bulacan, Baliwag, irrigation canal, 5.11.1976, leg. A.A. Barroso (VPG); 1 ♂, 1 ♀ (br), Laguna, Los Baños, Laguna de Bay, bank with dense vegetation, 13.11.1992, leg. H. Zettel (4) (NHMW); 1 ♂ (br), Laguna, Los Baños, temporary rain pool, 6.10.1976, leg. A.A. Barroso (VPG); 1 ♂, 1 ♀ (ma), Laguna, Los Baños, UPLB, Central Experimental Station, irrigation canal, 14.11.1976, leg. F.A. Mulimbayan (VPG); 1 ♀ (ma), Laguna, Los Baños, artificial pond, 2.8.1978, leg. C.R. Realon (VPG); 1 ♀ (ma), Laguna, Los Baños, Dampalit Creek, 15.11.1975, leg. V.P. Gapud (VPG); 3 ♂♂, 1 ♀ (ma), Laguna, Nagcarlan, stream, 18.6.1977, leg. A.A. Barroso (VPG); 1 ♂ (br), 2 ♂♂, 2 ♀♀ (ma), Laguna, Nagcarlan, fishpond, 2.9.1978, leg. V.P. Gapud (VPG); 1 ♂ (ma), Batangas, Batangas port area, on rock, 19.2.1977, leg. A.A. Barroso (VPG); 1 ♀ (ma), Cavite, Alfonso, Pajo, Humayao Creek, 17.3.1977, leg. A.A. Barroso (VPG); 1 ♂, 1 ♀ (ma), same locality and date, leg. V.P. Gapud (VPG); 3 ♂♂, 5 ♀♀ (ma), Quezon, Mt. Banahaw, Masalukot, Mamala Creek, 3.5.1979, leg. A.A. Barroso (VPG); 1 ♂, 2 ♀♀ (ma), Quezon, Mt. Banahaw, Lagnas River, 3.5.1979, C.S. Sanchez (VPG); 2 ♂♂, 11 ♀♀ (ma), Quezon, Real, National Botanic Garden, Lalawinan River, 31.3.1977, leg. A.A. Barroso (VPG); 1 ♂, 7 ♀♀ (ma), same locality and date, leg. D.C. Caballes (VPG); 2 ♀♀ (ma), same locality, 1.4.1977, leg. A.A. Barroso (VPG); 3 ♂♂, 2 ♀♀ (ma), same locality and date, leg. H.O. San Valentin (VPG); 2 ♂♂, 3 ♀♀ (ma), same locality, 1.-2.4.1977, leg. V.P. Gapud (VPG); 1 ♂, 3 ♀♀ (ma), Quezon, Real, National Botanic Garden, rain pool, 1.4.1977, leg. H.O. San Valentin (VPG); 2 ♂♂, 2 ♀♀ (ma), Quezon, Real, National Botanic Garden, stream, 10.12.1982, leg. V.P. Gapud (VPG); 1 ♂ (br), Camarines Sur, Pili, Pili National Agricultural College, irrigation canal, 5.12.1976, leg. A.A. Barroso (VPG); 2 ♂♂, 2 ♀♀ (ma), Camarines Sur, Lagonoy, Buenavista, Parogcan, 10.2.2001, leg. H. Zettel (267a) (CZW, UPLB); 1 ♂, 1 ♀ (br), 1 ♂, 1 ♀ (ma), Albay, 15 km SW Manito, S Cawayan, river, 24.2.1998, leg. H. Zettel (144) (NHMW, UPLB); **Polillo** (Quezon Province): 3 ♂♂, Polillo, 3.4.1977, leg. A.A. Barroso (VPG); 2 ♂♂, 1 ♀ (ma), Polillo, rice paddy, 3.4.1977, leg. D.C. Caballes (VPG); **Mindoro**: 2 ♂♂, 5 ♀♀ (ma), Oriental Mindoro, Puerto Galera, small Tabinay River, 27.2.1977, leg. A.A. Barroso (VPG); 2 ♂♂, 2 ♀♀ (br), 1 ♂ (ma), Oriental Mindoro, Puerto Galera, canal near rice paddy, 27.2.1977, leg. A.A. Barroso (VPG); 4 ♂♂, 1 ♀ (ma), Oriental Mindoro, Puerto Galera, river, 26.2.1977, leg. H.O. San Valentin (VPG); 2 ♂♂, 1 ♀♀ (br) 4 ♂♂, 2 ♀♀ (ma), Oriental Mindoro, Puerto Galera, irrigation canal, 26.2.1977, H.O. San Valentin (VPG); 1 ♀ (ma), Oriental Mindoro, SE Puerto Galera, 14.11.1992, 100 m, leg. M.A. Jäch (3) (NHMW); 4 ♂♂, 10 ♀♀ (ma), Oriental Mindoro, Puerto Galera, Sabang, Small La Laguna, shallow pond, 22.11.1992, leg. H. Zettel (9) (NHMW); 1 ♂ (ma), Oriental Mindoro, Puerto Galera, Sabang, Vienna Hill-top Lodge, at light, 9.1992, leg. H. Zettel (10) (NHMW); 3 ♂♂, 13 ♀♀ (ma), Oriental Mindoro, 10 km W Puerto Galera, Mindoro Beach, small stream and banks, 24.11.1992, leg. H. Zettel (17) (NHMW); 2 ♂♂, 1 ♀ (ma), Oriental Mindoro, Puerto Galera, S Big La Laguna, 22.11.1993, leg. H. Zettel (29) (NHMW); 1 ♂ (br), 1 ♂ (ma), same locality, 25.11.1993, leg. H. Zettel (33) (NHMW); 3 ♀♀ (ma), Oriental Mindoro, 4 km SE Puerto Galera, Big Tabinay River, 27.11.1993, leg. H. Zettel (36) (NHMW); 2 ♂♂, 3 ♀♀ (ma), same

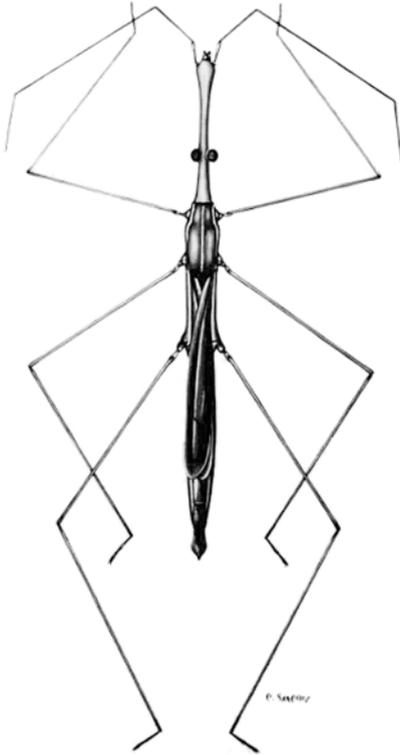
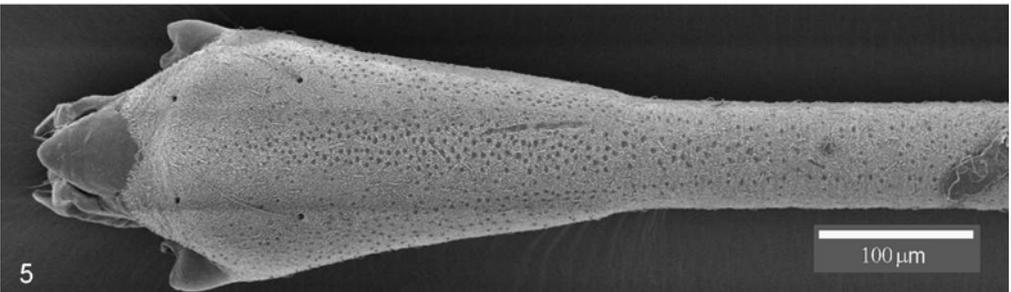
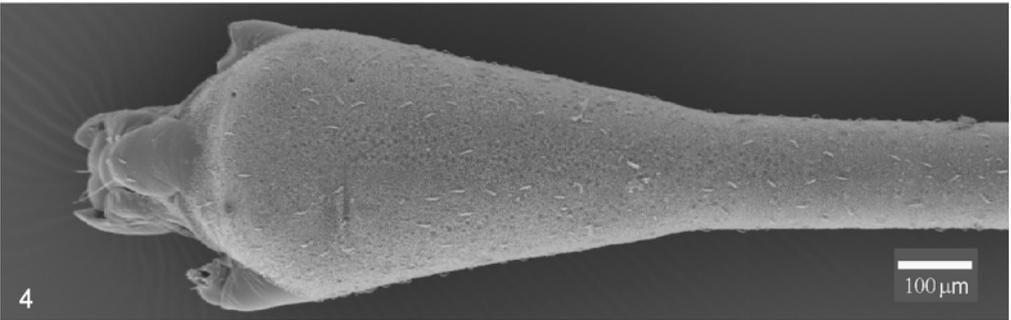
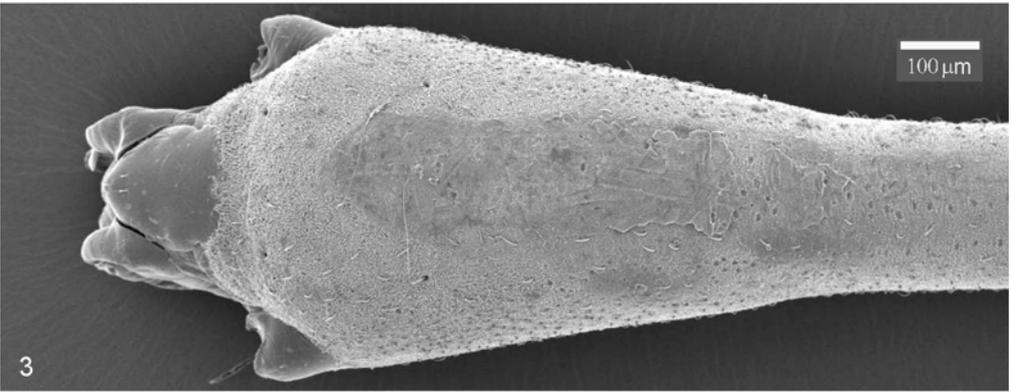
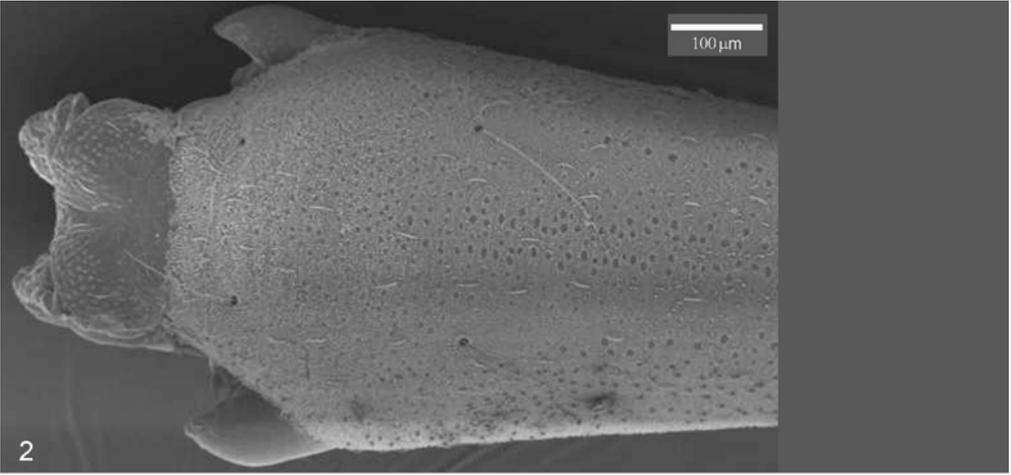
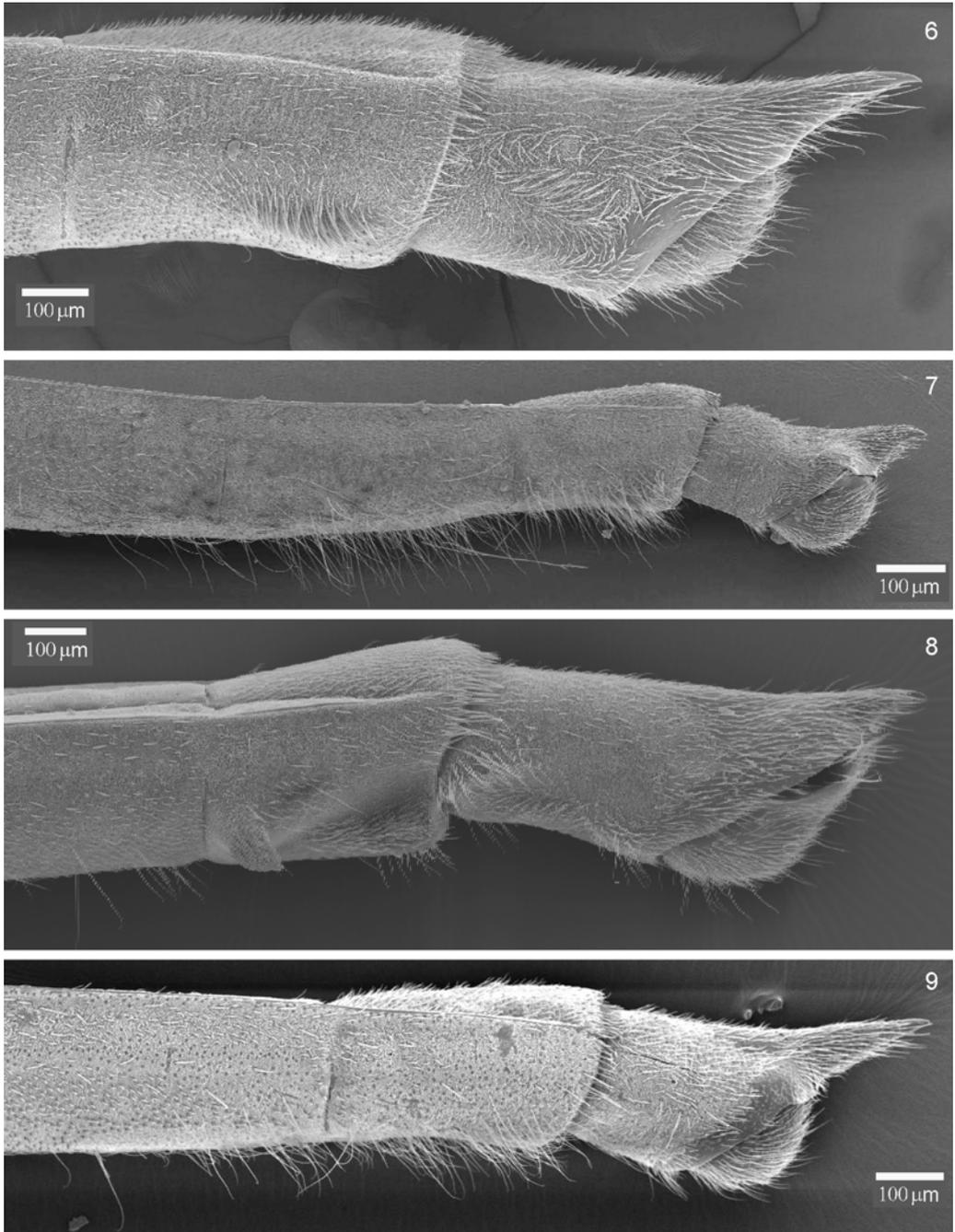


Fig. 1: Habitus of *Hydrometra mindoroensis*, macropterous male (artist: Carlito Sanchez).

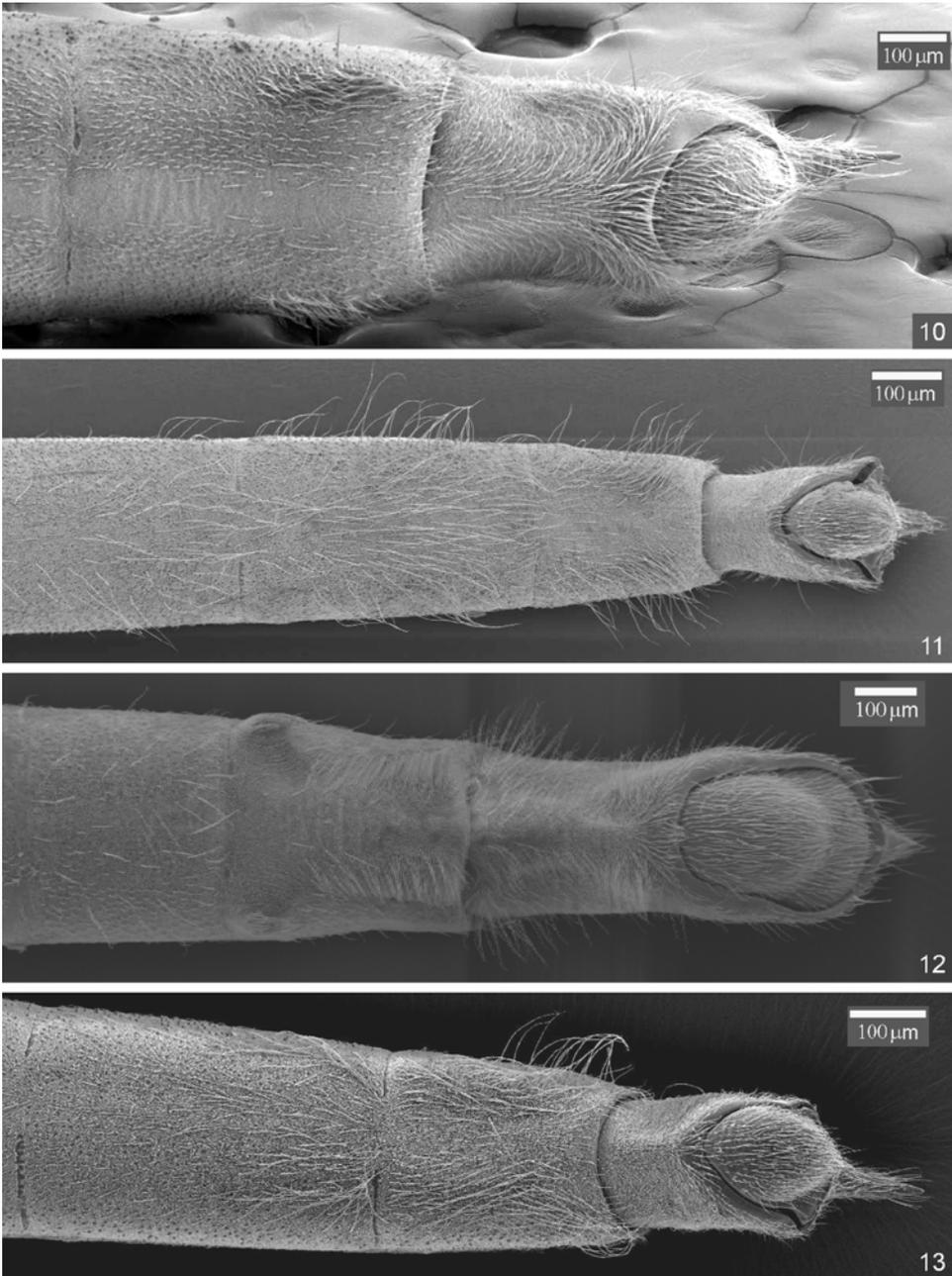
locality, 12.11.1994, leg. H. Zettel (62) (CZW); 1 ♂ (br), Oriental Mindoro, Baco, SW Calapan, pond, 20.11.1992, leg. H. Zettel (15) (NHMW); 1 ♂ (ma), same locality and date, leg. M.A. Jäch (6) (NHMW); **Marinduque**: 6 ♂♂, 2 ♀♀ (ma), 8 km on road SW Boac, S Laylay, 13.2.1998, leg. H. Zettel (135) (NHMW, UPLB); 7 ♂♂, 3 ♀♀ (br), 1 ♂, 3 ♀♀ (ma), 10 km W Boac, Mainit, Mainit Hot Spring, 14.2.1998, leg. H. Zettel (137) (NHMW, UPLB); 2 ♀♀ (ma), NE Boac, 7 km SE Mogpog, Bocboc, Paadyan Falls, 17.2.1998, leg. H. Zettel (140) (NHMW); **Catanduanes**: 1 ♂, 1 ♀ (ma), W Virac, Santo Domingo, Pajo River area, 10.3.1999, leg. Zettel (199) (NHMW, UPLB); 1 ♀ (ma), N Bato, S San Miguel, Balongbong Falls, 7.3.1999, leg. F. Seyfert (21) (CSW); **Masbate**: 2 ♂♂ (br), 2 ♂♂ (ma), 3.5 km SE Masbate, Tugbo, Tugbo River, 2.3.1998, leg. H. Zettel (152) (NHMW, UPLB); 1 ♂ (br), 8 km SE Masbate, S Mobo, Ubo Falls, 3.3.1998, leg. H. Zettel (153) (NHMW); **Romblon**: 2 ♀♀ (br), Limon Sur Looc, open stream, 30.12.1977, leg. N.G. Fabellar (VPG); **Sibuyan** (Romblon Province): 1 ♂, 2 ♀♀ (br), S Magdiwang, Jao-asan, Fato-o River, 18.11.1994, leg. H. Zettel (66c) (CZW); **Panay**: 2 ♂♂ (ma), Antique (N), Libertad, 21.-22.1.1994, leg. F. Seyfert & M. Graindl (NHMW); 1 ♂ (ma), Antique (S), 50 km NE San Jose de Buenavista, San Remigio, Sibalorn River, 20.3.1994, leg. H. Zettel (44) (NHMW); 2 ♂♂ (ma), Ilo-Ilo, 10 km NE Igarbas, Nadsadan Falls, 500 m, 22.3.1994, leg. H. Zettel (47) (NHMW); **Negros**: 1 ♂ (ma), Negros Occidental, Mambucal, Mt. Canlaon, 12.2.1994, leg. F. Seyfert & M. Graindl (NHMW); 5 ♂♂, 9 ♀♀ (br), 12 ♂♂, 6 ♀♀ (ma), Negros Occidental, SE Bacolod, Mambucal, stream at Health Resort, 900 m, 15.3.1994, leg. H. Zettel (39b) (NHMW); 1 ♀ (ma), Negros Occidental, Lizares, E Bacolod, Bago River, ca. 500 m, leg. S. Schödl (4) (NHMW); 1 ♂, 1 ♀ (ma), same locality and date, leg. H. Zettel (40) (NHMW); 1 ♀ (br), Negros Oriental, San Jose, Lake Balinasayao, 5000 ft, 2.4.1981, C.S. Sanchez (VPG); **Siquijor**: 6 ♂♂, 5 ♀♀ (ma), Lazi, Poo River, 1.3.1997, leg. H. Zettel (121) (CZW); 6 ♂♂, 6 ♀♀ (ma), San Juan, "Swimming Pool", 2.3.1997, leg. H. Zettel (122) (CZW); **Bohol**: 1 ♂ (br), 1 ♂ (ma), 9 km NE Tagbilaran, Corella, 26.11.1996, leg. H. Zettel (110a) (NHMW); **Pacijan** (Camotes): 3 ♂♂, 2 ♀♀ (br), 6 ♂♂, 3 ♀♀ (ma), San Francisco, Northern Poblacion, Lake Danao, 27.2.2001, leg. Zettel (281) (NHMW, UPLB, ZRCS); **Biliran**: 1 ♀ (ma), 7 km N Almeria, Masagongsong, 13.3.1998, leg. H. Zettel (160) (CZW); **Leyte**: 1 ♂, 2 ♀♀ (br), Leyte Prov., N Baybay, Bacan River, 10 km N ViSCA, 16.2.2000, leg. H. Zettel (240) (NHMW, ViSCA); **Hiktop** (Surigao del Norte): southwest coast, 5.2.2000, leg. H. Zettel (227) (NHMW); **Dinagat** (Surigao del Norte): ca. 6 km NE Dinagat, Bagumbayan, 3.2.2000, leg. H. Zettel (225) (NHMW, UPLB); **Mindanao**: 3 ♀♀ (ma), Zamboanga del Sur, Sta. Cruz, canal, 25.12.1980, leg. M.B. Endiape (VPG); 1 ♀ (br), 1 ♂, 2 ♀♀ (ma), Misamis Occidental, W Ozamiz, Tanguib, Lumban, 6.3.1997, leg. H. Zettel (124) (CZW); 2 ♂♂, 2 ♀♀ (ma), Surigao del Norte, 40 km S Surigao, Songkoy Spring, 8.2.2000, leg. H. Zettel (231) (NHMW, UPLB); 1 ♂, 1 ♀ (br), Sarangani, Lake Sebu area, barangay Bakdolong, bank pool, stream, 3.12.1993, leg. N. Nieser (N9365) (ZRCS); **Olutanga** (Zamboanga del Sur Prov.): 2 ♂♂ (ma), Suba Nipa, 1.1.1981, leg. M.B. Endiape (VPG); 1 ♂, 1 ♀ (ma), Solar, 29.12.1980, leg. M.B. Endiape (VPG); **Busuanga** (Palawan Pr.): 1 ♂ (ma), 2 km W Coron, 23.2.1996, leg. H. Zettel (80b) (CZW); **Palawan**: 1 ♂ (ma), 17 km WSW Puerto Princesa, Tagbuna River, 26.3.1994, leg. H. Zettel (51) (NHMW); 3 ♀♀ (ma), 10 km S Brooke's Point, Caingaren River, 1.4.1994, leg. H. Zettel (56) (NHMW); 14 ♂♂, 10 ♀♀ (ma), Narra, Tigman, 15.VII.1995, unknown collector (CUL, NHMW); 1 ♂ (ma), Central Palawan, Sabang, 50 - 100 m, degraded forest on slope, 30.XI.1995, leg. J. Kodada & B. Rigová (NHMW).





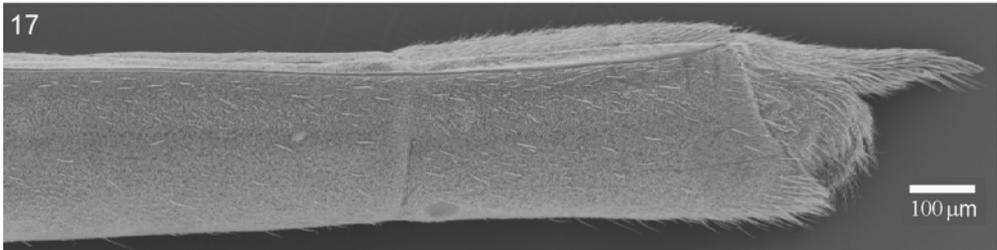
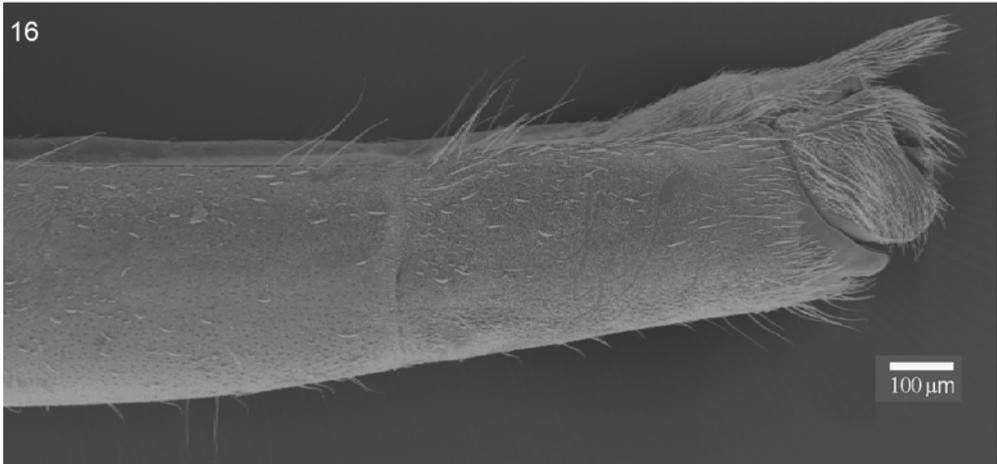
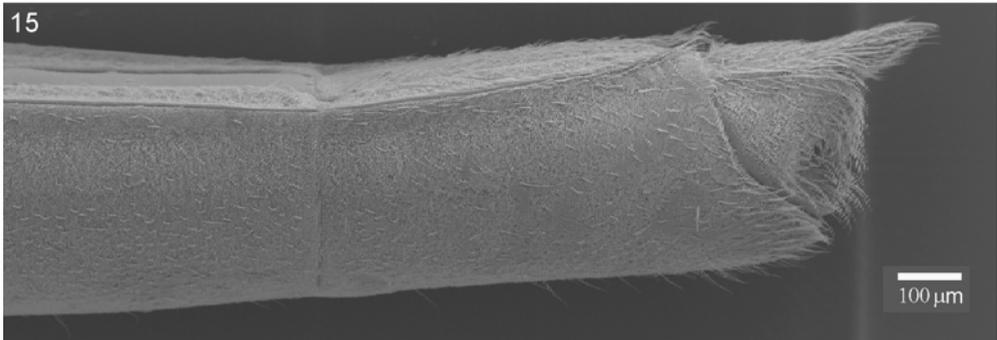
Figs. 6 - 9: Terminalia of males, lateral view, of (6) *Hydrometra julieni*, (7) *H. lineata*, (8) *H. mindoroensis*, and (9) *H. orientalis*.

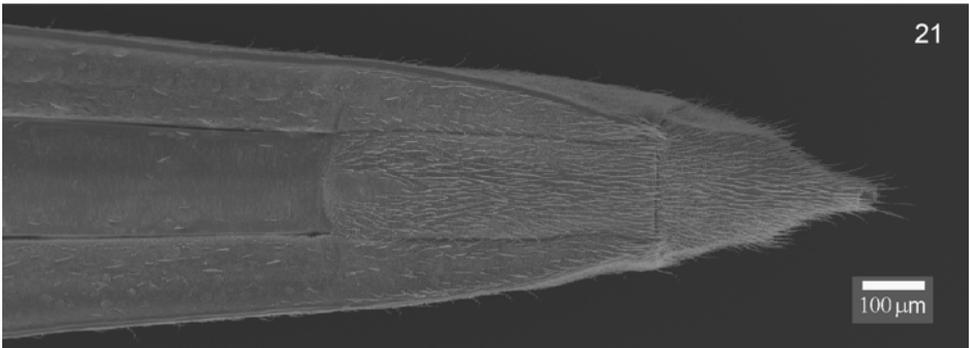
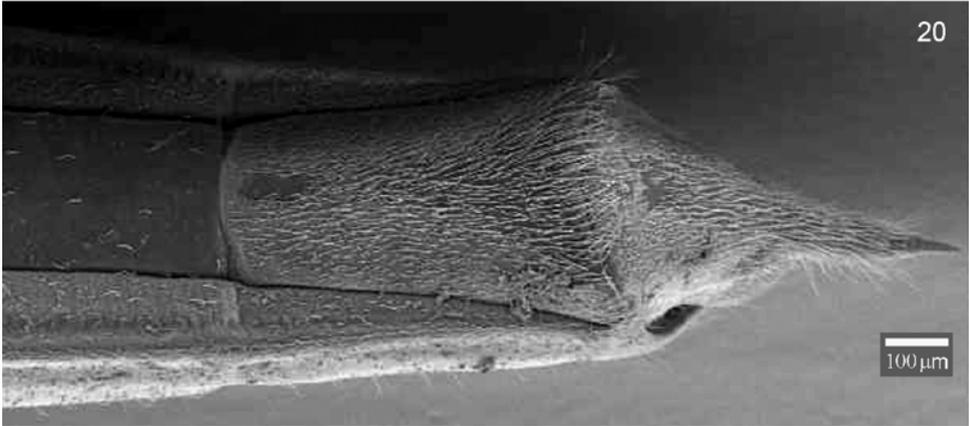
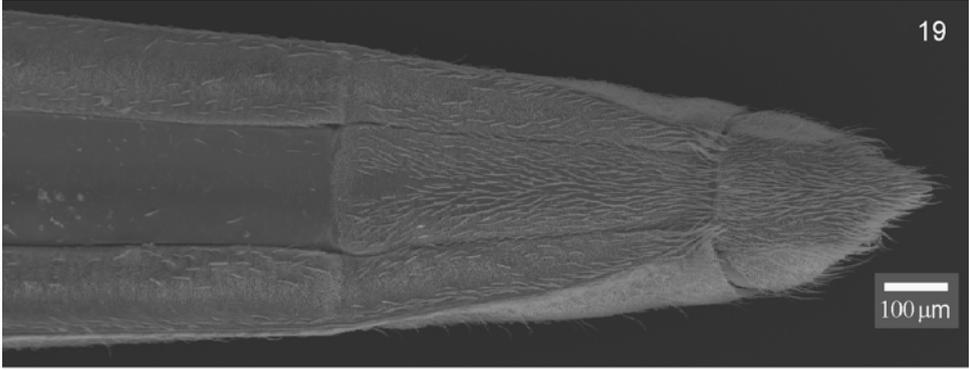
◀ Figs. 2 - 5: Apex of head with diagnostic anteclypeus of (2) *Hydrometra julieni*, (3) *H. lineata*, (4) *H. mindoroensis*, and (5) *H. orientalis*.



Figs. 10 - 13: Terminalia of males, ventral view, of (10) *Hydrometra julieni*, (11) *H. lineata*, (12) *H. mindoroensis*, and (13) *H. orientalis*.

Figs. 14 - 17: Terminalia of females, lateral view, of (14) *Hydrometra julieni*, (15) *H. lineata*, (16) *H. mindoroensis*, and (17) *H. orientalis*.





Distribution in the Philippines (Fig. 23): Luzon: Ilocos Norte (m.e.), Ilocos Sur (m.e.), La Union (m.e.), Abra (m.e.), Mountain Province (m.e.); Ifugao (YANO & al. 1981), Benguet (m.e.), Pangasinan (POLHEMUS & POLHEMUS 1995, m.e.), Pampanga (POLHEMUS & REISEN 1976), Zambales (POLHEMUS & REISEN 1976, m.e.), Bataan (HUNGERFORD & EVANS 1934, m.e.), Tarlac (m.e.), Nueva Vizcaya (m.e.), Nueva Ecija (m.e.), Bulacan (m.e.), Rizal (HUNGERFORD & EVANS 1934), Laguna (HUNGERFORD & EVANS 1934, POLHEMUS & REISEN 1976, m.e.), Batangas (m.e.), Cavite (m.e.), Quezon (m.e.), Camarines Sur (m.e.), Albay (m.e.); Polillo (m.e.); Lubang (POLHEMUS & REISEN 1976); Mindoro: Oriental Mindoro (m.e.); Marinduque (m.e.); Catanduanes (m.e.); Masbate (m.e.); Romblon (m.e.); Sibuyan (m.e.); Panay: Antique (m.e.), Ilo-Ilo (m.e.); Negros: Negros Occidental (m.e.), Negros Oriental (POLHEMUS & POLHEMUS 1995, m.e.); Siquijor (m.e.); Bohol (POLHEMUS & POLHEMUS 1995; m.e.); Pacijan (m.e.); Biliran (m.e.); Leyte: Leyte (POLHEMUS & POLHEMUS 1995, m.e.); Hiktóp (m.e.); Dinagat (m.e.); Mindanao: Zamboanga del Norte (POLHEMUS & POLHEMUS 1995), Zamboanga del Sur (POLHEMUS & POLHEMUS 1995, m.e.), Misamis Occidental (POLHEMUS & POLHEMUS 1995, m.e.), Surigao del Norte (m.e.), South Cotabato (POLHEMUS & POLHEMUS 1995), Sarangani (m.e.); Olu-tanga (m.e.); Busuanga (POLHEMUS & POLHEMUS 1995, m.e.); Palawan (POLHEMUS & POLHEMUS 1995, m.e.).

***Hydrometra mindoroensis* POLHEMUS, 1976** (Figs. 1, 4, 8, 12, 16, 20, 24)

Hydrometra mindoroensis POLHEMUS, 1976 (in POLHEMUS & REISEN): 283 (key, description, illustration). - POLHEMUS & POLHEMUS 1995: 36 (key, redescription, illustrations, distribution). - POLHEMUS & LANSBURY 1997: 21 (key, redescription, illustrations, distribution).

Material examined: Luzon: 1 ♂ (mi), Ilocos Sur, Bantay, Caniaw BFD Station, stream, 21.10.1976, leg. A.A. Barroso (VPG); 6 ♂♂, 8 ♀♀ (mi), Mountain Province, 5 km S Bontoc, Balitian River, 900 m, 27.2.1999, leg. H. Zettel (190) (NHMW, UPLB); 1 ♀ (mi), Mountain Province, Sagada, Bokong Waterfalls, 1400 m, 19.2.1999, leg. H. Zettel (182) (CZW); 1 ♂ (mi), Mountain Province, Sagada, Echo Valley, Underground River, 23.-24.2.1999, 1500 m, leg. H. Zettel (186) (NHMW); 1 ♂ (mi), Mountain Province, Chico River, Gonogon, 1100 m, 21.2.1999, leg. H. Zettel (184) (CZW); 1 ♀ (mi), Benguet, Baguio, 2 km below Camp John Hay, 18.2.1999, leg. H. Zettel (181) (CZW); 2 ♂♂, 3 ♀♀ (mi), Zambales, Subic Forest Reserve, Triboa River, 9.11.1998, leg. V.P. Gapud (VPG); 1 ♀ (mi), Nueva Vizcaya, Imugan, Maliko River, near waterfalls, 6.4.1999, leg. V.P. Gapud (VPG); 2 ♂♂, 1 ♀♀ (mi), 2 ♀♀ (ma), Nueva Ecija, Carranglan, Maringalo BFD Station, creek, 5.11.1976, leg. A.A. Barroso (VPG); 3 ♂♂, 1 ♀ (mi), 1 ♂, 7 ♀♀ (ma), Cavite, Alfonso, Pajo, Humayao Creek, 17.5.1977, leg. A.A. Barroso (VPG); 2 ♂♂, 2 ♀♀ (mi), same locality and date, leg. V.P. Gapud (VPG); 1 ♂, 3 ♀♀ (mi), Laguna, Mt. Makiling, Molawin Creek, 2.12.1976, leg. A.A. Barroso (VPG); 3 ♀♀ (mi), same locality, 2.4.1978, leg. V.P. Gapud (VPG); 3 ♂♂, 5 ♀♀ (mi), same locality, 28.8.1978, leg. V.P. Gapud (VPG); 1 ♂, 1 ♀ (mi), same locality, 27.8.1978, leg. F.A. Mulimbayan (VPG); 2 ♂♂, 1 ♀ (mi), Laguna, Los Baños, Mt. Makiling, Flat Stones, 10.2.1998, leg. H. Zettel (132) (NHMW); 2 ♀♀ (mi), 1 ♂ (ma), Laguna, Mt. Makiling, Mudspring area, stream, 6.10.1976, leg. A.A. Barroso (VPG); 11 ♂♂, 5 ♀♀ (mi), 1 ♂ (ma), same locality, 7.3.1977, leg. A.A. Barroso (VPG); 2 ♂♂, 4 ♀♀ (mi), 1 ♂ (ma), same locality, lower creek, 6.10.1976, leg. V.P. Gapud (VPG); 1 ♂ (mi), same locality, 11.2.1998, leg. H. Zettel (134) (NHMW); 1 ♂ (mi), same locality, 23.-24.1.1999, leg. H. Zettel (167) (CZW); 1 ♂, 1 ♀ (mi), Laguna, Los Baños, Botanical Garden, 21.4.1983, unknown collector (ZRCS); 2 ♂♂, 4 ♀♀ (mi), 1 ♂, 1 ♀ (ma), Laguna, Mt. Makiling, Dampalit Creek, near waterfalls, 21.5.1977, leg. A.A. Barroso (VPG); 3 ♂♂, 1 ♀ (mi), 1 ♂ (ma), same locality and date, leg. H.O. San Valentin (VPG); 1 ♀ (mi), same locality, 26.9.1978, leg. A.A. Barroso (VPG); 1 ♂ (mi), Laguna, Mt. Makiling, Pook ni Maria Makiling, stream, 3.1.1979, leg. C.S. Sanchez (VPG); 3 ♀♀ (mi), Laguna,

Figs. 18 - 21: Terminalia of females, dorsal view, of (18) *Hydrometra juliени*, (19) *H. lineata*, (20) *H. mindoroensis*, and (21) *H. orientalis*.

Mt. Makiling, Calamba side, Putting Lupa, stream, 13.10.1976, leg. A.A. Barroso (VPG); 3 ♀♀ (mi), same locality, 18.10.1976, leg. V.P. Gapud (VPG); 2 ♂♂, 2 ♀♀ (mi), 2 ♀♀ (ma), same locality and date, leg. F.A. Mulimbayan (VPG); 1 ♂ (mi), same locality and date, leg. A.A. Barroso (VPG); 2 ♀♀ (mi), 1 ♀ (ma), Nagcarlan, stream, 14.6.1978, leg. V.P. Gapud (VPG); 1 ♀ (mi), Laguna, Alaminos, Hidden Valley, Awique Creek, 7.3.1979, leg. C.S. Sanchez (VPG); 1 ♂, 1 ♀ (mi), same locality and date, leg. F.A. Mulimbayan (VPG); 1 ♂ (ma), Quezon, Mt. Banahaw, Mamala Creek, 3.5.1979, leg. A.A. Barroso (VPG); 1 ♂ (mi), same locality and date, leg. D.C. Caballes (VPG); 1 ♂ (mi), same locality and date, leg. F.A. Mulimbayan (VPG); 1 ♂ (mi), Quezon, Real, National Botanic Garden, Lalawinan River, 31.3.1977, leg. A.A. Barroso (VPG); 1 ♂ (mi), 1 ♀ (mi), same locality, 1.4.1977, leg. H.O. San Valentin (VPG); 4 ♂♂, 2 ♀♀ (mi), Quezon, Mt. Banahaw, Concepcion, Sariaya, mountain stream, 19.2.1977, leg. A.A. Barroso (VPG); 1 ♂, 3 ♀♀ (mi), 1 ♀ (ma), same locality, 20.2.1977, leg. H.O. San Valentin (VPG); 1 ♀ (mi), Quezon, W Atimonan, Quezon NP, Old Zigzag Road, 13.2.1996, leg. H. Zettel (79c) (CZW); 1 ♂ (mi), same locality, 24.-30.3.1998, leg. H. Zettel (165) (CZW); 3 ♂♂ (mi), Camarines Sur, Pili, Buncao, Himaao Creek, 1.2.2002, leg. H. Zettel (302) (CZW, CSSAC); 1 ♂, 2 ♀♀ (mi), Albay, 15 km SW Manito, S Cawayan, river, 24.2.1998, leg. H. Zettel (144) (NHMW, UPLB); **Polillo**: 2 ♂♂ (mi), Polillo, rice paddy, 3.4.1977, leg. A.A. Barroso (VPG); **Mindoro**: 1 ♂ (mi), Oriental Mindoro, Puerto Galera, small Tabinay River, 27.2.1977, leg. A.A. Barroso (VPG); 1 ♀ (mi), Oriental Mindoro, Puerto Galera, canal near rice paddy, 27.2.1977, leg. A.A. Barroso (VPG); 2 ♂♂, 1 ♀ (mi), 1 ♂, 1 ♀ (ma), Oriental Mindoro, 10 km W Puerto Galera, Mindoro Beach, small stream and banks, 24.11.1992, leg. H. Zettel (17) (NHMW); 1 ♀ (ma), W Puerto Galera, Aninuan Waterfalls, 27.1.1999, leg. H. Zettel (168) (CZW); **Marinduque**: 3 ♂♂, 2 ♀♀ (mi), 1 ♀ (ma), 1 km N Sihi, Malinao Spring, 16.2.1998, leg. H. Zettel (139) (NHMW, UPLB); 9 ♂♂, 4 ♀♀ (mi), 1 ♀ (ma), NE Boac, 7 km SE Mogpog, Boboc, Paadyan Falls, 17.2.1998, leg. H. Zettel (140) (NHMW, UPLB); **Catanduanes**: 1 ♀ (mi), 1 ♂ (ma), W Bato, Maribini Falls, 6.3.1999, leg. H. Zettel (194) (NHMW); 2 ♂♂, 5 ♀♀ (mi), S of Summit, N Narsari, 9.3.1999, small creek, leg. H. Zettel (198) (NHMW, UPLB); 1 ♂, 1 ♀ (mi), W Virac, Santo Domingo, Pajo River area, 10.3.1999, leg. Zettel (199) (NHMW, UPLB); 4 ♂♂ (mi), 1 ♀ (ma) E San Andres, 11.-12.3.1999, leg. H. Zettel (200) (NHMW, UPLB); 2 ♂♂, 1 ♀ (mi), same locality and date, leg. F. Seyfert (26) (CSW, UPLB); **Ticao**: 1 ♂ (mi), Monreal, Real, Matang, Tubig Spring, 28.2.1998, leg. H. Zettel (151) (NHMW); **Masbate**: 3 ♂♂, 4 ♀♀ (mi), 3.5 km SE Masbate, Tugbo, Tugbo River, 2.3.1998, leg. H. Zettel (152) (NHMW, UPLB); 2 ♂♂, 1 ♀ (mi), 8 km SE Masbate, S Mobo, Ubo Falls, 3.3.1998, leg. H. Zettel (153) (NHMW); 1 ♀ (mi), 2 km S Baleno, stream, 4.3.1998, leg. H. Zettel (154) (NHMW); **Negros**: 1 ♂, (mi), Negros Occidental, SE Bacolod, Mambucal, 1000 m, 16.3.1994, leg. H. Zettel (39d) (NHMW); 1 ♀ (mi) same locality, Seven Falls, 900 m, 15.-16.3.1994, leg. H. Zettel (39a) (NHMW); 1 ♀ (mi), same locality, 16.3.1994, leg. S. Schödl (2) (NHMW); 1 ♀ (mi), Negros Oriental, San Jose, Lake Balinsasayao, 5000 ft, 2.4.1981, leg. C.S. Sanchez (VPG); 1 ♀ (mi) Negros Oriental, W Dumaguete, Valencia, Banica Valley Resort, 25.2.1997, leg. H. Zettel (117) (CZW); **Siquijor**: 1 ♂, 1 ♀ (mi), Lazi, Poo River, 1.3.1997, leg. H. Zettel (121) (CZW); 1 ♀ (mi), Lazi, tributary to Poo River, 1.3.1997, leg. H. Zettel (121a) (CZW); **Cebu**: 1 ♀ (mi), Cebu City (NW), Tabunan Natural Park, mountain stream, 13.7.2000, leg. V.P. Gapud (VPG); 1 ♂ (mi), Cebu City (SW), Sudlon II, DENR Station, stream, 22.7.2000, leg. V.P. Gapud (VPG); 2 ♂♂, 1 ♀ (mi), S Badian, Matutinao, Kawasan Falls, 2 - 50 m, 29.-30.11.1996, leg. H. Zettel (112) (NHMW); **Bohol**: 1 ♂ (mi), NE Tagbilaran, S Sikatuna, near Dangay, 26.-27.11.1996, leg. H. Zettel (111) (NHMW); **Samar**: 2 ♂♂ (mi), Western Samar, Mt. Sohoton, Rawis Creek, 17.8.1980, leg. A.A. Barroso (VPG); **Biliran**: 1 ♂ (mi), SE Almeria, Balagombong Falls, 14.3.1998, leg. H. Zettel (161) (CZW); **Leyte**: 3 ♂♂ (mi), Leyte, Hilusig, rivers, 14.2.2000, leg. H. Zettel (238) (NHMW, ViSCA); 4 ♂♂, 1 ♀ (mi), Leyte, Baybay, Mt. Pangasugan, Calbigaa River, 2.8.1980, leg. A.A. Barroso (VPG); 1 ♂ (mi), Leyte, Baybay, ViSCA, 50 m, small stream, 8.3.2001, leg. H. Zettel (296a) (NHMW); **Camiguin**: 2 ♂♂, 3 ♀♀ (mi), W Mambajao, Katibawasan Falls, 15.11.1996, leg. H. Zettel (96) (NHMW); **Bayagnan** (Surigao del Norte): 1 ♂ (mi), San José, Buyho water falls, 7.2.2000, leg. H. Zettel (229) (NHMW); **Mindanao**: 1 ♂ (mi), Zamboanga del Sur, 14 km N Pagadian, Datagan, Kendis Cave, 10.3.1997, leg. H. Zettel (127) (CZW); 1 ♂ (mi), Bukidnon, Malaybalay, Woodstock area, 650 m, 5.11.1996, leg. H. Zettel (89) (NHMW); 2 ♂♂, 4 ♀♀ (mi) Bukidnon, Malaybalay, Kaamulan Site, 650 m, 6.-7.11.1996, leg. H. Zettel (90c) (NHMW); 1 ♂ (mi), same locality, 12.11.1996, leg. H. Zettel (90e); 2 ♂♂, 1 ♀ (mi), same locality, 15.-20.3.2000, leg. H. Zettel (247) (CZW); 3 ♂♂, 2 ♀♀ (mi), 2 ♂♂ (ma), Davao, Mt. Apo, Ugis Creek, 3000 ft, 17.5.1979, leg. V.P. Gapud (VPG); 1 ♀ (mi), Davao, Mt. Apo, Catigan River, 18.5.1979, leg. V.P. Gapud (VPG); 1 ♀ (mi), Sarangani, Lake Sebu area, small tributary fed by seepage, 8.12.1993, leg. N. Nieser (N9376) (ZRCs); **Busuanga** (Palawan Province): 2 ♂♂, 1 ♀ (mi), 1 ♂ (ma), 13 road km WNW Coron, Balulu Falls, 24.2.1996, leg. H. Zettel (81) (CZW); 1 ♂, 1 ♀ (mi), 2 ♂♂, 1 ♀ (ma), same locality, 2.2.1999, leg. H. Zettel (171) (CZW, UPLB); 1 ♂, 1 ♀

(mi), 1 ♂, 1 ♀ (ma), 5 km NW Coron, Mabintangen River, 25.-29.2.1996, leg. H. Zettel (82) (CZW); 2 ♂♂ (mi), 3 ♂♂ (ma), 5 km NW Coron, Mabintangen Forest Reserve, 1.-7.2.1999, leg. H. Zettel (170) (CZW, UPLB); 1 ♂, 1 ♀ (mi), 1 ♂ (ma), Conception, Conception Falls, 27.2.1996, leg. H. Zettel (83) (CZW); 3 ♂♂ (ma), W Borac, 31.1.1999, leg. H. Zettel (169) (CZW); **Palawan:** 1 ♂ (mi), 20 km W Puerto Princesa, Tacduan Area, Tacduan River, 25.3.1994, leg. H. Zettel (49d) (NHMW); 1 ♀ (ma), Puerto Princesa, Cabayugan, Cabayugan River, spring, CR1 2.VI.2001, leg. H. Freitag (UPLB); 1 ♂ (mi), same data except stream in secondary forest, CR2, 16.XI.-11.XII.2000 (UPLB); 1 ♀ (mi), same data except 17.VI.2001 (UPLB); 1 ♀ (mi), Puerto Princesa, Marofinas, Panugaman River, estuary, PR2, 2.VII.2001, leg. H. Freitag (UPLB); 1 ♀ (mi), same data except 15.XI.-10.XII.2000 (UPLB); 1 ♂ (mi), same data except stream, PR1, 30.III.2001 (UPLB); 2 ♂♂, 2 ♀♀ (mi), Central Palawan, Sabang, 50 - 100 m, degraded forest on slope, 30.XI.1995, leg. J. Kodada & B. Rigová (NHMW); 1 ♂ (ma), 7 km N Narra, Estrella Falls, 5.4.1994, leg. H. Zettel (59) (NHMW); 1 ♂ (mi), 10 km NE Quezon, Tumarbon Falls, 3.-4.4.1994, leg. H. Zettel (58) (NHMW).

Distribution in the Philippines (Fig. 24): Luzon: Ilocos Sur (m.e.), Mountain Province (m.e.), Benguet (m.e.), Pampanga (POLHEMUS & REISEN 1976), Zambales (m.e.), Nueva Vizcaya (m.e.), Nueva Ecija (m.e.), Cavite (POLHEMUS & POLHEMUS 1995, m.e.), Laguna (m.e.), Quezon (POLHEMUS & POLHEMUS 1995, m.e.), Camarines Sur (m.e.), Albay (m.e.); Polillo (m.e.); Mindoro: Occidental Mindoro (POLHEMUS & REISEN 1976; type locality!), Oriental Mindoro (m.e.); Marinduque (m.e.); Catanduanes (m.e.); Ticao (m.e.); Masbate (m.e.); Negros: Negros Occidental (m.e.), Negros Oriental (m.e.); Siquijor (m.e.); Cebu (m.e.); Bohol (m.e.); Samar: Western Samar (m.e.); Biliran (m.e.); Leyte: Leyte (POLHEMUS & POLHEMUS 1995, m.e.); Camiguin (m.e.); Bayagnan (m.e.); Mindanao: Zamboanga del Sur (POLHEMUS & POLHEMUS 1995, m.e.), Bukidnon (m.e.), South Cotabato (POLHEMUS & POLHEMUS 1995), Davao (m.e.), Sarangani (m.e.); Busuanga (m.e.); Palawan (POLHEMUS & POLHEMUS 1995, m.e.).

Hydrometra orientalis LUNDBLAD, 1933 (Figs. 5, 9, 13, 17, 21, 22)

Hydrometra orientalis LUNDBLAD, 1933: 430 (description, illustrations). - POLHEMUS & REISEN 1976: 284 (key, records). - POLHEMUS & POLHEMUS 1995: 38 (key, redescription, illustrations, distribution). - POLHEMUS & LANSBURY 1997: 24 (key, redescription, illustrations, distribution).

Hydrometra insularis HUNGERFORD & EVANS, 1934: 76 (key, description, illustrations) (syn. POLHEMUS & REISEN 1976: 284).

Hydrometra sumatrana RUHOFF, 1964: 32 (unnecessary replacement name for *H. insularis* HUNGERFORD & EVANS, 1934).

Material examined: Luzon: 2 ♂♂ (ma), Ilocos Norte, Vintar, Vintar Dam, 22.20.1976, leg. A.A. Barroso (VPG); 1 ♀ (ma), same locality and date, leg. D.C. Caballes (VPG); 1 ♀ (ma), Ilocos Sur, Bantay, Caniaw BFD Station, pond, 20.10.1976, leg. A.A. Barroso (VPG); 2 ♂♂, 1 ♀ (ma), same locality and date, leg. D.C. Caballes (VPG); 2 ♂♂, 1 ♀ (ma), same locality, 21.10.1976, leg. H.O. San Valentin (VPG); 1 ♀ (ma), Ilocos Sur, Santa, near beach, 20.10.1976, leg. D.C. Caballes (VPG); 2 ♂♂ (ma), La Union, Tubao, Alipang River, 18.10.1976, leg. A.A. Barroso (VPG); 1 ♂ (br), same locality and date, leg. D.C. Caballes (VPG); 2 ♀♀ (ma), same locality and date, leg. H.O. San Valentin (VPG); 2 ♂♂, 3 ♀♀, La Union, Lloren, Tubao, rice paddy, 18.10.1976, leg. A.A. Barroso (VPG); 1 ♀ (ma), La Union, Bacnotan, DMMSU, stream, 19.10.1976, leg. A.A. Barroso (VPG); 2 ♂♂, 2 ♀♀ (ma), same locality and date, leg. H.O. San Valentin (VPG); 6 ♂♂, 5 ♀♀ (ma), Abra, Bangued, Abra River, 23.10.1976, leg. A.A. Barroso (VPG); 1 ♀ (ma), same locality and date, leg. D.C. Caballes (VPG); 2 ♂♂ (ma), leg. H.O. San Valentin (VPG); 1 ♂, 2 ♀♀ (ma), Zambales, Sta. Cruz, Acoje Mine Site, creek, 16.5.1977, leg. H.O. San Valentin (VPG); 1 ♀ (ma), Bataan, Bagac, Umagol Creek, 24.4.1979, leg. F.A. Mulimbayan (VPG); 1 ♂, 2 ♀♀ (ma), Nueva Ecija, San Jose, Sibut, Talavera River, 7.11.1976, leg. A.A. Barroso (VPG); 1 ♀ (ma), Nueva Ecija, Carranglan, Maringalo BFD Station, rice paddy, 6.11.1976, leg. D.C. Caballes (VPG); 1 ♀ (ma, with aberrant abdomen) Laguna, Los Baños, Mt. Makiling, Molawin Creek at College of Forestry, 8.2.1996, leg. H. Zettel (72) (CZW); 1 ♀ (ma), Laguna, Mt Makiling,

rain pool, 6.10.1976, leg. V.P. Gapud (VPG); 2 ♀♀ (ma), Laguna, Mt Makiling, Molawin Creek, 27.12.1976, leg. H.O. San Valentin (VPG); 2 ♀♀ (ma), Cavite, Alfonso, Pajo, Humayao Creek, 17.5.1977, leg. A.A. Barroso (VPG); 1 ♂, 1 ♀ (ma), same locality and date, leg. V.P. Gapud (VPG); **Mindoro**: 1 ♀ (ma), Oriental Mindoro, Puerto Galera, canal near rice paddy, 27.2.1977, leg. A.A. Barroso (VPG); **Busuanga** (Palawan Province): 1 ♂ (ma), 13 road km WNW Coron, Balulu Falls, 24.2.1996, leg. H. Zettel (81) (CZW); 1 ♀ (ma), same locality, 2.2.1999, leg. H. Zettel (171) (CZW); **Palawan**: 1 ♂ (ma), 17 km WSW Puerto Princesa, Tagbuna River, 26.3.1994, leg. H. Zettel (51) (NHMW); 1 ♀ (ma), Puerto Princesa, Cabayugan, Underground River, estuary, UR6, 14.XI.-12.XII.2000, leg. H. Freitag (UPLB).

Distribution in the Philippines (Fig. 22): Luzon: Ilocos Norte (m.e.), Ilocos Sur (m.e.), La Union (m.e.), Abra (m.e.), Pampanga (POLHEMUS & REISEN 1976), Zambales (m.e.), Bataan (m.e.), Nueva Ecija (m.e.), Cavite (m.e.), Laguna (m.e.); Lubang (POLHEMUS & REISEN 1976); Mindoro: Oriental Mindoro (m.e.); Mindanao: Zamboango del Sur (POLHEMUS & POLHEMUS 1995), Surigao del Sur (YANO & al. 1981), Davao (YANO & al. 1981), South Cotabato (POLHEMUS & POLHEMUS 1995); Busuanga (m.e.); Palawan (m.e.).

Discussion

Distribution: POLHEMUS & POLHEMUS (1995) documented four species of *Hydrometra* from the Philippine Islands. No additional species were found, despite intensive collections in many parts of the country. None of the four species is endemic in the Philippines, and their general distributions are good examples for the origins of the Philippine fauna:

Hydrometra julieni is an Oriental species, which is recorded from Indochina, the Malay Peninsula, Borneo, and Mindoro (POLHEMUS & POLHEMUS 1995). The single record (male) from Mindoro is the only record outside of the Asian mainland and the Sunda Shelf area. The fauna of Mindoro is generally more closely related to that of Luzon, but other species are also known to invade Mindoro from the southwest, e.g., the gerrid *Metrocoris tenuicornis* ESAKI, 1926.

Hydrometra lineata is distributed on the mainland of China, Philippines, Sulawesi, Ambon, and New Guinea (POLHEMUS & POLHEMUS 1995, POLHEMUS & LANSBURY 1997). It is apparently not inhabiting Indochina and the Sunda Shelf areas of the Malay Archipelago, except northern Borneo where it probably has migrated from the Philippines.

Following recent revisions by POLHEMUS & POLHEMUS (1995) and POLHEMUS & LANSBURY (1997), *Hydrometra mindoroensis* is distributed from the Philippines southwards and eastwards to northern Borneo, Sulawesi, and New Guinea. One of the authors has also examined material from the Moluccas (Ambon and Ceram; in NHMW), which agrees well with the Philippine populations. There are two closely related species described, *H. cracens* POLHEMUS & POLHEMUS, 1995 from the Malay Peninsula and Borneo and *H. lombok* POLHEMUS & POLHEMUS, 1995 from Bali, Flores, Lombok, Sumba, Sumbawa, and Timor. Some of the key characteristics used by POLHEMUS & POLHEMUS (1995) to separate these three taxa are highly variable in *H. mindoroensis*, e.g., the ratio of the tergite 5, the distance between the mesocoxae (which is strongly correlated with the wing-polymorphism, but also variable within one morph), the ratio of anterior to posterior part of head, and the extent of erect setae on female connexivum 6. The ratio of the ventral length of sternite 7 and segment 8 of the male is strongly dependent on the protrusion

of segment 8. The short, dark setae posterioventrally on sternite 7 and on segment 8 of the male (Fig. 12) appear more distinct in light than in blackish coloured specimens. The validity of these taxa (*H. cracens*, *H. lombok*), therefore, should be examined in a morphometrical analysis. The "*H. mindoroensis* complex" consists of numerous isolated meta-populations, which is due to the fact that specimens are predominantly wingless and prefer to stay in their shaded habitats (see below), which probably inhibits gene flow between islands. Populations from the Palawan Region tend to share characteristics with populations from Borneo, which have a similar, but not completely identical, set of characteristics with typical specimens of *H. cracens* from the Malay Peninsula.

Hydrometra orientalis is most widely distributed from Indochina to Australia (POLHEMUS & POLHEMUS 1995, POLHEMUS & LANSBURY 1997). It is a more southern species, and it seems that it is more common in those areas, where *H. lineata* is not present. In contrast, *H. orientalis* is more rarely encountered in the Philippines than *H. lineata*. According to our data, *H. orientalis* does not occur in the Visayas. It seems that it has reached the Philippines from Borneo in two ways, via Palawan and Mindoro to Luzon and via the Sulu Archipelago to Mindanao. Most populations from Luzon tend to have a reduced pilosity on sternites 6 and 7 of the male, but those from the Palawan Region have dense and long pilosity. However, differences are not stable enough to separate the Luzon population taxonomically.

Habitats: Generally, species of *Hydrometra* inhabit the transition zone between land and freshwater, preferably stagnant or slowly flowing waters. Published data on the habitat preferences of *Hydrometra* species in the Philippines are scarce in literature.

POLHEMUS & REISEN (1976) write that *H. lineata* is "ubiquitous on Luzon, in mountain and lowland streams, ponds, irrigation canals, and flooded rice fields." POLHEMUS & POLHEMUS (1995) state that *H. lineata* "occurs on both streams and ponds throughout a wide elevational range, and does not seem to have any distinct habitat preferences". According to our field observations, shorelines of stagnant waters are distinctly preferred to shaded mountain streams, where this species is only exceptionally encountered. In the Philippines, *H. lineata* has been recorded at elevation from 0 - 1600 m a.s.l. *Hydrometra lineata* is predominantly fully winged and seems not sensitive to full sun-light. This enables it to successfully inhabit rice paddies and other temporary aquatic habitats in the open farmland and makes it to one of the most common water bugs in the Philippines. Marshlands and vegetated puddles on the banks of large streams seem to be the preferred natural habitats.

In contrast, *H. mindoroensis* is found mainly at the margins of shaded running waters. Paratypes have been collected by W.K. Reisen in "a series of small, shaded, cobble-bottomed streams" (POLHEMUS & REISEN 1976). According to POLHEMUS & POLHEMUS (1995), this species "generally occurs in upland habitats, often on headwater streamlets with a large amount of submerged leaf litter overlain by a shallow film of water." In the Philippines *H. mindoroensis* has been recorded at elevations from 0 - 1500 m a.s.l., and collectings by the authors do not confirm a preference for higher elevations. However, *H. mindoroensis* prefers relatively small streams, which is probably due to smaller changes of the water level, and shaded areas, which could be explained by less tolerance to high air temperatures.

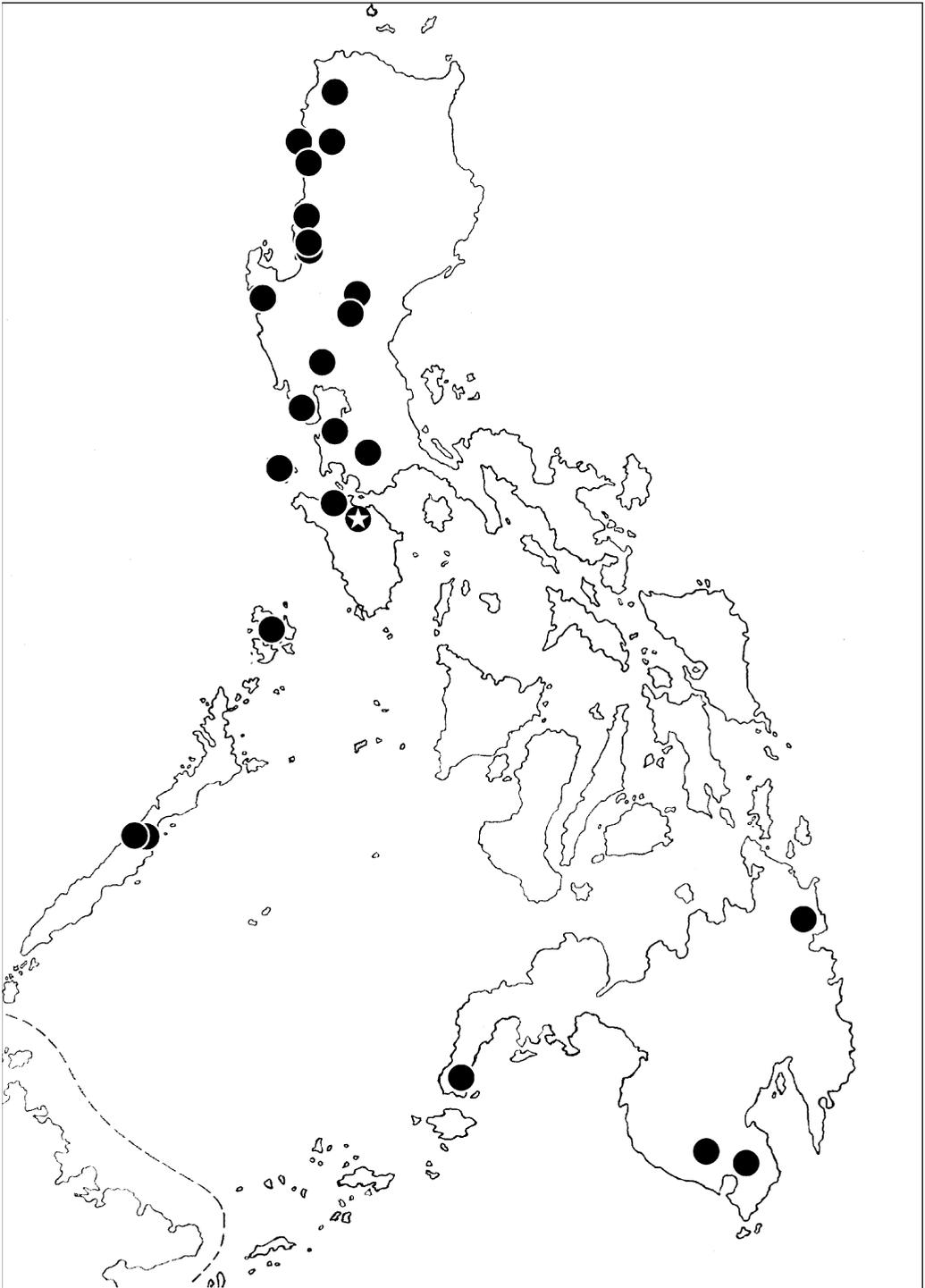


Fig. 22: Distributions of *H. orientalis* (dots) and *H. julienni* (asterisk) in the Philippines.

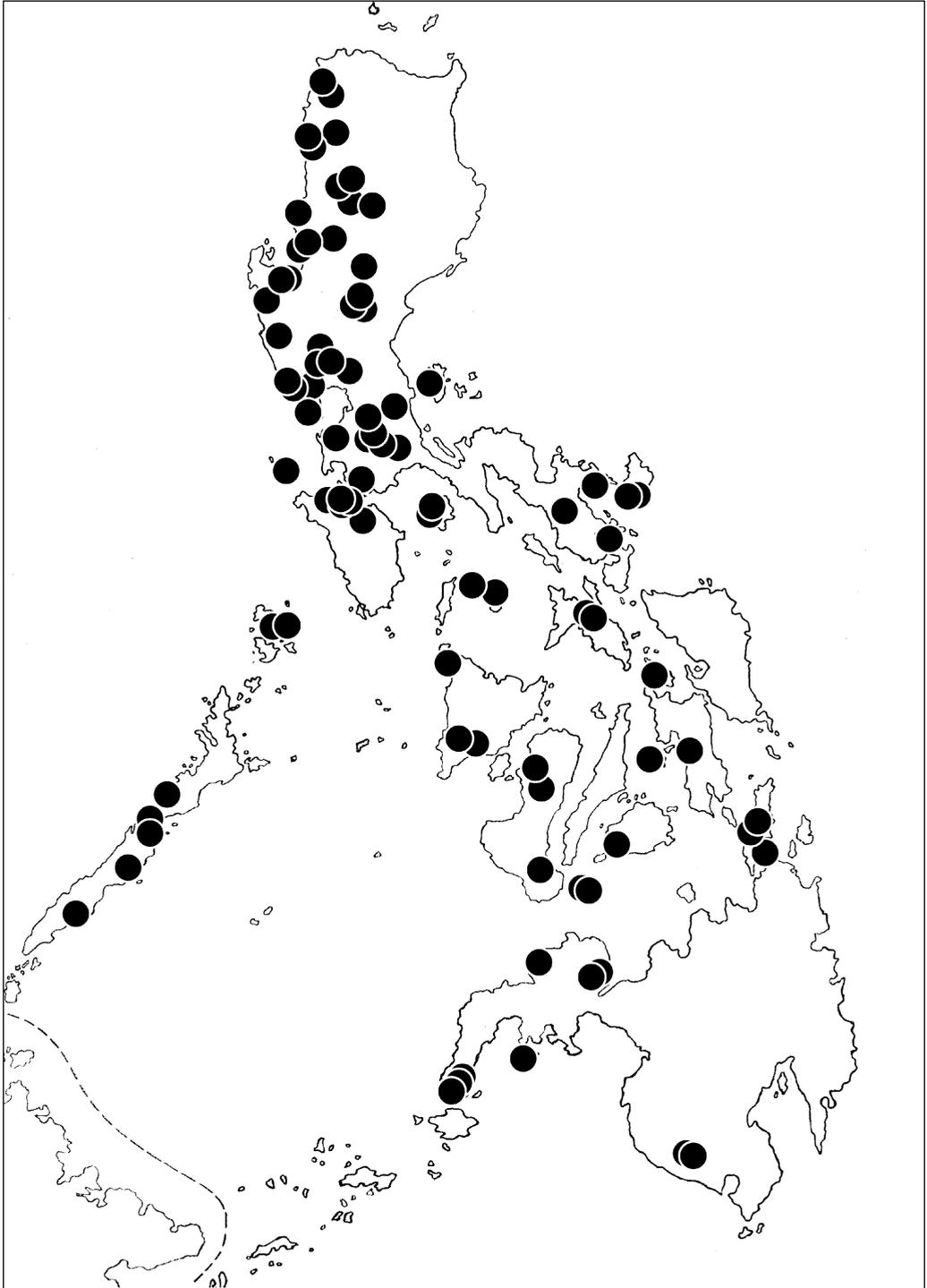


Fig. 23: Distribution of *H. lineata* in the Philippines.

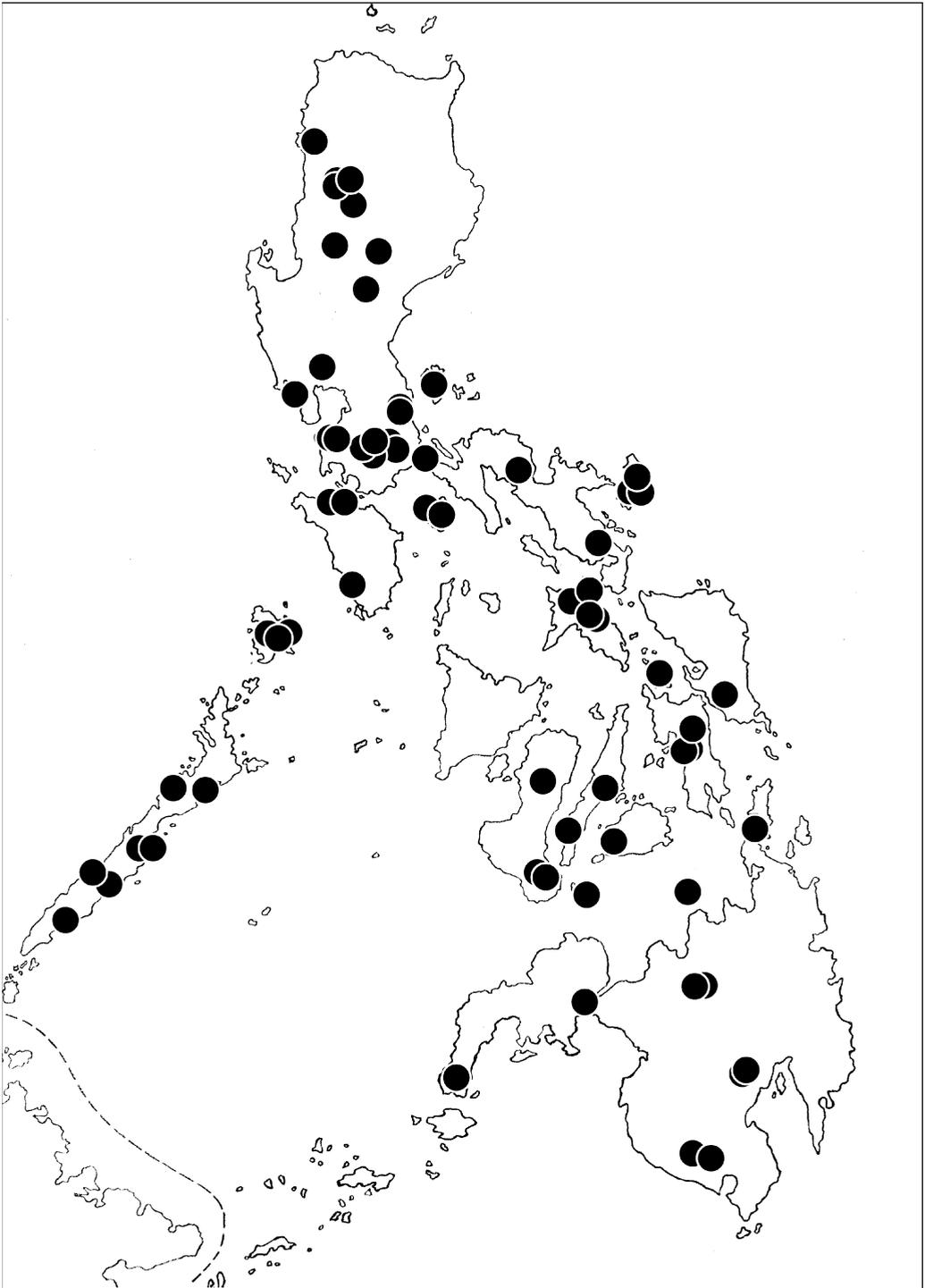


Fig. 24: Distribution of *H. mindoroensis* in the Philippines.

POLHEMUS & POLHEMUS (1995) state that "*Hydrometra orientalis* generally occurs along pools on rocky upland streams, and has been taken across a wide elevational range, from 100 to over 800 meters above sea level." But LUNDBLAD (1933) reported this species from three localities of stagnant waters which are not related with streams, i.e. from a garden pond and from the shorelines of two lakes in Sumatra and Java. Our materials of *H. orientalis* were collected from a wide range of habitats including streams, rain pools, rice paddies, and even estuaries.

Little is known about the habitats of *H. julienni*, because this species is generally rare. According to POLHEMUS & POLHEMUS (1995) it "is a lowland species found on ponds and slow streams." The authors have studied specimens from lowland streams and peat swamps, but also from one rocky stream in Thailand.

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