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Contributions to the Myriapod fauna of Thailand - New records of millipedes and centipedes from Thailand (Myriapoda: Diplopoda, Chilopoda)

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Abstract

New records for 25 millipedes and centipede species from Thailand are given with notes on the biology. Three species are new for the Thai fauna: *Platyrbachus andersoni* (Pocock, 1889), *Leptogoniulus sorornus* (Butler, 1876) and *Otostigmus spinosus* Porat, 1876.

Keywords: biology, distribution, first record, Thailand, Diplopoda, Chilopoda

Zusammenfassung

Beiträge zur Myriapodenfauna von Thailand – Neue Nachweise von Hundert- und Tausendfüßern für Thailand (Myriapoda: Diplopoda, Chilopoda). Im Rahmen der vorliegenden Untersuchung konnten in Thailand 25 Tausend- und Hundertfüßerarten nachgewiesen werden. Ergänzend werden Hinweise zur Biologie der Arten gegeben. Drei Arten sind neu für die thailändische Fauna: *Platyrbachus andersoni* (Pocock, 1889), *Leptogoniulus sorornus* (Butler, 1876) und *Otostigmus spinosus* Porat, 1876.

1. Introduction

Thailand, as one of the world biodiversity hot spots on our planet, hosts a very unique inventory of Diplopoda. The Thai millipede fauna is very rich but poorly explored. Most of the known species were described in the 1960's and later. ENGHOFF (2005) listed 105 species of Diplopoda for Thailand. Within the last years additional 13 species in the family Harpagophoridae (PIMVICHAI et al. 2009a, 2009b, 2010), five new species in the family Paradoxsomatidae (ENGHOFF et al. 2007, LIKHITRAKARN et al. 2010 a, 2010b) and one species in the suborder Sinocallipodidea (STOEV et al. 2007) were described from Thailand, and many new species remain to be discovered and described.

There is no overview for the Thai centipede fauna but only scattered records of some species, e. g. in ATTEMS (1938, 1953), FLOWER (1901) and EASON (1986).

The Thai fauna of millipedes and centipedes, their distribution and biology are still poorly known. Many species are known only from the type localities and there is no information about their total distribution. There are only scarce notes in literature about the biology of Thai millipedes provided by e. g. FLOWER (1901), HIRST (1907) and JEEKEL (1964a).

This paper presents additional records of 25 species from various localities in Thailand, three species are new for the Thai fauna, and notes on the biology of some species, observed by the author, are given.

2. Materials and methods

Millipedes and centipedes were collected by the author and Nicole Laufer in August and September 2008. Most of the specimens are deposited in the collections of the Natural History Museum of Denmark (Zoological Museum), University of Copenhagen, Denmark (ZMUC), Senckenberg Museum of Natural History Görlitz (SMNG) and Field Museum of Natural History, Chicago (FMNH). Additional material from the Museum of Natural History, Geneva (MHNG) and Senckenberg Museum Frankfurt (SMF) was examined.

Geographical coordinates are provided according to the information on the labels from MHNG and SMF. All geographical coordinates of Jäger, Schwendinger and Decker follow the WGS84 system.

3. Results

Class **DIPLOPODA**

Order **GLOMERIDA**

Family **GLOMERIDAE**

Rhopalomeris carnifex (Pocock, 1889)

Material examined:

- Prov. Krabi, Krabi District, on road Krabi, Ao Luk, near Provincial Forestry Office, 8°10'54"N, 98°50'30"E, 70 m, disturbed semi-evergreen rainforest, 17.IX.2006, 1♀, leg. P. Schwendinger (MHNG).
- Prov. Krabi, ca. 15 km N of Krabi, near Saengphet Cave, 8°9'46"N, 98°53'12"E, 80 m, evergreen forest at foot of limestone hill, 24./26.VII.2005, 2♂♂, leg. P. Schwendinger (MHNG).
- Prov. Krabi, Ko Lanta District, Ko Lanta Island and National Park, 80 m, patch of secondary forest surrounded by evergreen rainforest, 13-16.X.1999, 3♂♂, 5♀♀, leg. P. Schwendinger (MHNG).
- Prov. Krabi, Krabi District, Ban Khlong Jilat, ca. 6 km W Krabi City, 8°05'18"N, 98°52'56"E, 60 m, remnants of evergreen rainforest at foot of limestone hill, 16.VI.2008, 1♂, leg. P. Schwendinger (MHNG).
- Prov. Phang Nga, Ko Yao District, Ko Yao Noi, hill near Ban An Pao, 8°09'53"N, 98°37'20"E, 150 m, semi evergreen rainforest near stream, 21./22.IX.2006, 1♀, leg. P. Schwendinger (MHNG).
- Prov. Phang Nga, Thap Put District, Had Lek Beach (= Small Sandy Beach), 1,5 km south of the Khao Lak–Lamru National Park headquarters, 8°37'N, 98°13'E, 10 m, evergreen rainforest, leaf litter, 31.VIII.2008, 1♀, leg. P. Decker & N. Laufer.
- Prov. Phang Nga, Thap Put District, Highway No. 4 / Phet Kasem about 0,5 km north of the headquarters of the Khao Lak–Lamru National Park, 8°37'N, 98°14'E, 30-40 m, secondary rainforest, leaf litter, 29.VIII.-12.IX.2008, 1♀, leg. P. Decker & N. Laufer (ZMUC).
- Prov. Phuket, Mueang Phuket District, Ko Siray, 50 m, old secondary forest, 12.VIII.2000, 4♂♂, 4♀♀, leg. P. Schwendinger (MHNG); 15.VIII.2000, 4♂♂, 4♀♀, leg. P. Schwendinger (MHNG).
- Prov. Phuket, Mueang Phuket District, Ko Siray, 7°53'7"N, 98°26'14"E, 20-50 m, old secondary forest, 8./11.XII.2001, 1♂, leg. P. Schwendinger (MHNG); 28.IX.2006, 1♂, leg. P. Schwendinger (MHNG).

- Prov. Surat Thani, Ko Samui District, Ko Samui, Khao Phlu, 10-500 m, coconut and rubber plantations, 8.I.1992, 1♂, leg. P. Schwendinger (MHNG).
- Prov. Surat Thani, Ko Pha Ngan District, Phangan Island, Than Sadet – Ko Phangan National Park, above Phaeng waterfall, 9°44'7"N, 100°1'10"E, 320 m, evergreen forest, 1.IX.2004, 1♀, leg. P. Schwendinger (MHNG).
- Prov. Surat Thani, Ko Samui District, Ko Samui, Nam Tok Na Muang Forest Park, 30 m, remnants of evergreen gallery forest, 5.I.1992, 1♀, 8 juv., leg. P. Schwendinger (MHNG).
- Myanmar: Taninthay Division, Thatay Kyun (= Pulo Ru, Ko Son), 9°56'20"N, 98°32'22"E, 60 m, old secondary forest, 4.VII.2007, 1♂, 1♀, leg. P. Schwendinger (MHNG).

Distribution: *R. carnifex* is also known from Myanmar (POCOCK 1889) and Phuket Island (Phang Nga Province) and Nai Chong (Krabi Province) (ENGHOFF 2005).

Order **SPHAEROTHERIIDA**

Family **ZEPHRONIIDAE**

Zephronia cf. *siamensis* Hirst, 1907

Material examined:

- Prov. Rayong, Mueang Rayong District, Ko Samet, Ko Samet National Park, near Ao Wai, 12°32'N, 101°2'E, 7 m, mixed deciduous forest, leaf litter, 19.IX.2008, 1♀, leg. P. Decker & N. Laufer (ZMUC).

Distribution: Thai endemic. Other records are known from Ko Sichang (Prov. Chonburi) and Province Chanthaburi (HIRST 1907).

Order **SPIROBOLIDA**

Family **PSEUDOSPIROBOLELLIDAE**

Benoitolus siamensis (Attems, 1936)

Material examined:

- Prov. Rayong, Mueang Rayong District, Ko Samet, Ao Wai, 12°32'N, 101°26'E, 2 m, inside rotten tree trunk on the beach, 18-19.IX.2008, several specimens, leg. P. Decker & N. Laufer.
- Prov. Rayong, Mueang Rayong District, Ko Samet, Ao Wong Duan, 12°33'N, 101°26'E, 2 m, inside rotten tree trunk on the beach, 18.IX.2008, several specimens, leg. P. Decker & N. Laufer (SMNG).

Distribution: Thai endemic. This species is hitherto only known from the island Ko Samae San (Prov. Chonburi) (ATTEMS, 1936).

Biology: This species was mainly found on Tamanu tree / Punnaga (*Calophyllum inophyllum*) growing on coral sand at the Ao Wai Ao Wong beach. During the stay on Ko Samet it was drizzling most of the time. Several dozen *B. siamensis* were found climbing on the bark during the whole day- and nighttime. All these trees or stumps had crotches or holes that provided space where leaf litter and humus were accumulated. In some cases juveniles in different stadia from about 7 mm upwards were found in this debris. Also an ant species was frequently found on these trees having its nests in the same place and seemingly tolerating the millipedes. Although the author was searching at the trees and leaf litter of the adjacent vegetation near the beach and the forests in the inland of Ko Samet no specimen of *B. siamensis* could be found. It is likely that this species only live arboreally at the seashore

and maybe restricted only to the Tamanu tree or similar branching trees. The arboreal way of living shows up in the absence of soleation of the male prefemora and long legs.

***Pseudospirobolellus avernus* (Butler, 1876)¹**

Material examined:

- Prov. Phang Nga, Thap Put District, Had Lek Beach (= Small Sandy Beach), 1,5 km south of the Khao Lak - Lamru National Park headquarters, 8°37'N, 98°13'E, 10 m, evergreen rainforest, leaf litter, 31.VIII.2008, 1♂, 3♀♀, leg. P. Decker & N. Laufer (SMNG).

Distribution: This species is widespread especially on tropical islands (ENGHOFF 2001) and is so far only known from Thailand from the island Phuket (Prov. Phuket) (ENGHOFF 2005).

Family **PACHYBOLIDAE**

***Leptogoniulus sorornus* (Butler, 1876)**

Material examined:

- Prov. Phang Nga, Thap Put District, Khao Lak, Highway No.4 / Phet Kasem about 0,5 km north of the headquarters of the Khao Lak-Lamru National Park, 8°37'N, 98°14'E, 30-40 m, secondary rainforest, under wood, 29.VIII.-12.IX.2008, 1♂, 1♀, leg. P. Decker & N. Laufer (FMNH).

Distribution: This is the first record of *L. sorornus* for Thailand. This species is a widespread tropical tramp known from numerous localities around the world (SHELLEY & LEHTINEN 1999).

Family **TRIGONIULIDAE**

***Trigoniulus corallinus* (Gervais, 1847)**

Material examined:

- Prov. Phang Nga, Thap Put District, Khao Lak, Phet Kasem, 29.VIII.-12.IX.2008, several specimens, leg. P. Decker & N. Laufer (FMNH).
- Prov. Prachuap Khiri Khan, Mueang Prachuap Khiri Khan District, S of Prachuap Khiri Khan, Ao Manao, in scrub, 23.VII.2006, 1♂, 1♀, leg. G. Hantke & F. Brand (SMF).
- Prov. Surat Thani, Phanom District, Khao Sok National Park, 8°54'N, 98°31'E, 80 m, 10.IX.2008, several specimens, leg. P. Decker & N. Laufer (SMNG).
- Bangkok, XI.1965, 1♂, 1♀, leg. P. Thaweratana (SMF).

Distribution: This species is the most widespread member of the order Spirobolida in the tropics (SHELLEY & LEHTINEN 1999) and also known from several localities in Thailand (ENGHOFF 2005).

Biology: This species could be observed by the author in Khao Lak in numerous numbers along the mainroad Phet Kasem and in hotel resorts. *T. corallinus* was mainly found at night crawling in the grass and on the adjacent sidewalk and was also found under bark of wooden frames on palm trees up to 1.7m height. On the parking area near the visitor center at Khao Sok National Park this species was found in large number in a big heap of leaf litter.

Order **SPIROSTREPTIDA**Family **HARPAGOPHORIDAE***Thyropygus enghoffi* (Demange, 1989)Material examined:

- Prov. Phang Nga, Thap Put District, Khao Lak, Highway No. 4 / Phet Kasem about 0,5 km north of the headquarters of the Khao Lak - Lamru National Park, 8°37'N, 98°14'E, 30-40 m, secondary rainforest, 29.VIII.-12.IX.2008, several specimens, leg. P. Decker & N. Laufer (ZMUC).
- Prov. Phang Nga, Thap Put District, Had Lek Beach (= Small Sandy Beach), 1,5 km south of the Khao Lak-Lamru National Park headquarters, 8°37'N, 98°13'E, 10 m, evergreen rainforest, 31.VIII.2008, several specimens, leg. P. Decker & N. Laufer.
- Prov. Phang Nga, Thap Put District, Khao Lak, Phet Kasem, 29.VIII.-12.IX.2008, 1♂, leg. P. Decker & N. Laufer (ZMUC).

Distribution: Thai endemic. *T. enghoffi* is known from the Province Phang Nga and Phuket island (DEMANGE 1989, PIMVICHAI et al. 2009b).

Biology: This species was mostly observed at the branches of small bushes and on the lower region of tree trunks (max. 1,5m) at night. One specimen was found while raining on the forest floor near Had Lak Beach during daytime. Another specimen was found at night on the street in the center of Khao Lak.

Thyropygus quietus Attems, 1938Material examined:

- Prov. Rayong, Mueang Rayong District, Ko Samet, Ko Samet National Park, near Ao Wai, 12°32'N, 101°2'E, 4-7 m, mixed deciduous forest, 18-19.IX.2008, several specimens, leg. P. Decker & N. Laufer (ZMUC).

Distribution: *T. quietus* is also known from Khao Saming (Prov. Trat) (DEMANGE 1961) and the South of Vietnam (ATTEMS 1938).

Biology: *T. quietus* was observed in large numbers on the forest floor, on rotten tree trunks and climbing in bushes in rain during day and night.

Order **POLYDESMIDA**Family **PLATYRHACHIDAE***Platyrhachus andersoni* (Pocock, 1889)Material examined:

- Prov. Krabi, Raylay Beach, “vers le lagon”, 8°29'44"N, 96°48'57"E, 70 m, rain forest, 14.IX.2001, 1♂, leg. L. Monod (MHNG).
- Prov. Phang Nga, Thap Put District, Highway No. 4 / Phet Kasem about 0,5 km north of the headquarters of the Khao Lak-Lamru National Park, 8°37'N 98°14'E, 30-40 m, secondary rainforest, leaf litter, 29.VIII.-12.IX.2008, 1♂, leg. P. Decker & N. Laufer (SMNG).
- Prov. Phang Nga, Sai Rung Waterfall, N of Ban Khao Bao 8°44'N, 98°17'E, 70-90 m, semi-evergreen rainforest, leaf litter, 08.IX.2008, 1♀, leg. P. Decker & N. Laufer (SMNG).

- Prov. Ranong, Kapoe District, Khlong Nakha Wildlife Sanctuary, 30 m, semi-evergreen rain forest, 7.XII.1991, 1♂, leg. P. Schwendinger (MHNG).
- Prov. Surat Thani, Phanom District, Khao Sok National Park, 8°54'N, 98°31'E, primary rainforest, found dead in a puddle, 10.IX.2008, 1♀, leg. P. Decker & N. Laufer.

Distribution: This is the first record for the Thai millipede fauna. This species is so far only known from the Mergui Archipelago, Myanmar (POCOCK 1889).

Biology: Very sluggish species that secretes big amounts of cyanide when disturbed. One living specimen was able to fill a complete room with the characteristic almond like smell.

***Platyrhachus bouvieri* Brölemann, 1896**

Material examined:

- Prov. Nakhon Ratchasima, Khao Yai National Park, 750-850 m, 26.XI.-3.XII.1985, 3♂♂, 3♀♀, leg. Burckhardt Löbl (MHNG).
- Prov. Nakhon Ratchasima, Pang Chong District, Khao Yai National Park, Kong Kaeo Waterfall, 680 m, semi-evergreen rain forest, 28.IX.1994, 1♂, leg. P. Schwendinger (MHNG).

Distribution: Thai endemic. Up to now only known from the Province Nakhon Nayok (BRÖLEMANN 1904, GOLOVATCH & DUC ANH 2007).

Family PARADOXSOMATIDAE

***Desmoxytes acantherpestes* Golovatch & Enghoff, 1994**

Material examined:

- Prov. Krabi, Ao Luk District, Thanboke Khoranee National Park, 8°23'12"N, 98°44'16"E, 50 m, semi-evergreen forest, 18./19.IX.2006, 1♂, leg. P. Schwendinger (MHNG).

Distribution: Thai endemic. Also known from Hua Hin (Prov. Prachuap Khiri Khan) (GOLOVATCH & ENGHOFF 1994). The two records are about 500 km away. Maybe this species is distributed along the scarcely investigated east coast of southern Thailand.

***Desmoxytes delfae* (Jeekel, 1964)**

Material examined:

- Prov. Surat Thani, Phanom District, Khao Sok National Park, near park headquarters, 8°54'55"N, 99°31'38"E, 100 m, secondary forest near limestone hill, 12./14.V.2003, 1♂, leg. P. Schwendinger (MHNG).
- Prov. Surat Thani, Phanom District, Khao Sok National Park, 70 m, secondary forest and bamboo forest, 6.XII.1991, 1♂, leg. P. Schwendinger (MHNG).

Distribution: Thai endemic. Nawnchila, Bukit Besar, has been given as type locality for this species, at ca. 760 m (2500 ft.) (JEEKEL 1964b). Maybe the locality refers to the mountain Gunung China (881 m) in the Thale Ban National Park near Kaki Bukit (Malaysia) and Padang Besar (Thailand/Malaysia) in the Province Satun in Southern Thailand.

***Desmoxytes jeekeli* Golovatch & Enghoff, 1994**Material examined:

- Prov. Chiang Mai, Doi Suthep-Pui National Park, evergreen hill forest, near reservoir, 1320 m, 1.XI.1994, 1♂, leg. P. Schwendinger (MHNG).
- Prov. Chiang Mai, Doi Saket District, Doi Sanyao, 950 m, 20.X.1990, 1♂, leg. P. Schwendinger (MHNG).
- Prov. Chiang Mai, Chiang Dao District, Doi Chiang Dao Wildlife Sanctuary, 510 m, 23.XI.1990, 4♂♂, 1♀, leg. P. Schwendinger (MHNG).
- Prov. Chiang Mai, Chiang Dao District, Doi Chiang Dao 510 m, 25.X.1987, 1♂, leg. P. Schwendinger (MHNG).
- Prov. Chiang Mai, Chiang Dao District, Doi Chiang Dao Wildlife Sanctuary, Huay Mae Kok, 1500 m, evergreen patch in mixed deciduous forest 27.I.1996, 1♀, leg. P. Schwendinger (MHNG).
- Prov. Chiang Mai, Fang District, Doi Angkhang, 1500 m, 30.X.1987, 1♂, leg. P. Schwendinger (MHNG).
- Prov. Chiang Rai, Doi Thung, 1350 m, evergreen rainforest, 30.X.1991, 2♂♂, leg. P. Schwendinger (MHNG).

Distribution: Thai endemic. The other two records are also from the Province Chiang Mai (GOLOVATCH & ENGHOFF 1994). *D. jeekeli* is the only species of *Desmoxytes* found in the mountainous region of Northern Thailand.

***Desmoxytes planata* (Pocock, 1895)**Material examined:

- Prov. Chanthaburi, Chanthaburi District, Nam Tok Phliu – Khao Sabap National Park, 50-100 m, semi-evergreen rainforest, 12./13.XI.1998, 1♂, leg. P. Schwendinger (MHNG).
- Prov. Chiang Mai, District Mae Rim, Mae Sa, 600 m, 14.X.1990, 2♂♂, leg. P. Schwendinger (MHNG).
- Prov. Kanchanaburi, Sri Sawat District, Chalerm Rattanakosin (Tham Than Lod) National Park, 350 m, evergreen gallery forest, 12.XI.1992, 2♂♂, leg. P. Schwendinger (MHNG).
- Prov. Nakhon Rachasima, Pak Chong District, Khao Yai National Park, Kong Kao Waterfall and Heo Waterfall, 580-680 m, semi-evergreen rainforest, 28.-30.IX.1994, 1♂, 1♀, leg. P. Schwendinger (MHNG).
- Prov. Prachuab Khiri Khan, Hua Hin District, ca. 65 km W Hua Hin, Kaeng Krachan National Park, Pala-U waterfall, 12°32'17"N, 99°27'47"E, 300 m, evergreen gallery forest, 19.VIII.2004, 1♂, leg. P. Schwendinger (MHNG).
- Prov. Prachuab Khiri Khan, Hua Hin District, ca. 65 km W Hua Hin, Kaeng Krachan National Park, Pala-U waterfall, 12°32'10"N, 99°27'37"E, 300 m, evergreen gallery forest, 21.XI.2004, 1♂, 1♀, leg. P. Schwendinger (MHNG).
- Prov. Prachuab Khiri Khan, Thap Sakae District, Kuay Yang National Park, 600-700 m, evergreen hill forest, 29.XI.1991, 5♂♂, 1♀, leg. P. Schwendinger (MHNG).
- Prov. Rayong, Klaeng District, Khao Chamao National Park, 50-100 m, semi-evergreen rainforest, 11.IX.1994, 2♂♂, leg. P. Schwendinger (MHNG).
- Prov. Tak, Doi Musoe, 950 m, 18.IX.1990, 4♂♂, 1♀, leg. P. Schwendinger (MHNG).

- Prov. Trat, Laem Ngop District, Ko Chang, Ko Chang National Park, forest above Sayam Bay, 20-80 m, semi-evergreen rainforest, 15.XI.1998, 2♂♂, leg. P. Schwendinger (MHNG).

Distribution: *D. planata* is the only widespread member of the genus *Desmoxytes* and, apart from several locations in Southeast Asia (SHELLEY & LEHTINEN 1998), is also known from Chiang Mai (GOLOVATCH & ENGHOFF 1994).

***Desmoxytes pterygota* Golovatch & Enghoff, 1994**

Material examined:

- Prov. Krabi, Raylay Beach, “vers le lagon”, 8°29'44"N, 96°48'57"E, 70 m, rain forest, 14.IX.2001, 1♀, leg. L. Monod (MHNG).
- Prov. Krabi, Krabi District, Ban Khlong Jilat, 8°5'18"N, 98°52'56"E, ca. 6 km W of Krabi city, 60 m, remnants of evergreen rainforest at foot of limestone hill, 16.VI.2008, 1♂, leg. P. Schwendinger (MHNG).
- Prov. Krabi, Krabi District, valley behind What Tam Suea (= Tiger Cave Temple), 8°7'30"N, 98°55'45"E, 50 m, semi-evergreen rainforest, 14.IX.2006, 3♂♂, leg. P. Schwendinger (MHNG).
- Prov. Phang Nga, Mueang Phangnga District, Phang Nga, near Tapan Cave, 8°27'15"N, 98°31'42"E, limestone cliff, 9.IX.2004, 1♂, leg. P. Schwendinger (MHNG).
- Prov. Phang Nga, Thap Put District, Highway No. 4 / Phet Kasem about 0,5 km north of the headquarters of the Khao Lak–Lamru National Park, 8°37'N, 98°14'E, 30-40 m, on the street next to secondary rainforest, 29.VIII.-12.IX.2008, 1♂, 1♀, leg. P. Decker & N. Laufer (ZMUC).

Distribution: Thai endemic. Up to now only known from the type locality near Kapoe (Prov. Ranong) (GOLOVATCH & ENGHOFF 1994).

***Desmoxytes rubra* Golovatch & Enghoff, 1994**

Material examined:

- Prov. Nakhon Si Thammarat, Lan Saka District, Khao Luang National Park, near Karom Waterfall, 8°22'45"N, 99°44'22"E, 380 m, rainforest, 17.VII.2005, 1♂, leg. P. Schwendinger (MHNG).

Distribution: Thai endemic. *D. rubra* is also known from the Provinces Satun and Yala in the south of Thailand (GOLOVATCH & ENGHOFF 1994).

***Orthomorpha coarctata* (Saussure, 1860)**

Material examined:

- Bangkok, Rat Burana, near Big-C, 13°40'56"N, 100°30'3"E, 18.IX.2008, 1♂, leg. P. Decker & N. Laufer (SMNG).
- Prov. Chiang Mai, Mueang Chiang Mai District, Chiang Mai, 330 m, city, in room, 20.X.1991, 1♂, leg. P. Schwendinger (MHNG).
- Prov. Chiang Mai, Fang District, Doi Angkhang, 1500 m, 30.X.1987, 1♂, leg. P. Schwendinger (MHNG).
- Prov. Phang Nga, Thap Put District, Khao Lak, Phet Kasem, hotel resort, 8°37'N, 98°14'E, 29.VIII.-12.IX.2008, 1♂, leg. P. Decker & N. Laufer (SMNG).

- Prov. Rayong, Mueang Rayong District Ko Samet, Ko Samel National Park, Ao Phrao, 5 m, mixed deciduous forest, 9.IX.1994, 1♂, leg. P. Schwendinger (MHNG).
- Prov. Surat Thani, Ko Samui District, Ko Samui, 10-500 m, coconut and rubber plantations, 8.I.1992, 2♂♂, leg. P. Schwendinger (MHNG).

Distribution: Beside *Oxidus gracilis* (Koch, 1847) and *Desmoxytes planata* (Pocock, 1895), *O. coarctata* is the most widespread member of the polydesmidan family Paradoxsomatidae (SHELLEY & LEHTINEN 1998). This species is known from numerous localities in Thailand (ENGHOFF 2005).

Biology: This species was observed by the author during daytime after rain crawling on the sidewalk.

***Orthomorpha horologiformis* Golovatch, 1997**

Material examined:

- Prov. Phang Nga, Katang District, along Highway No. 4 / Phet Kasem from Khao Lak to the headquarters of the Khao Lak–Lamru National Park, 8°37'N, 98°14'E, 29.VIII.-12.IX.2008, several specimens, leg. P. Decker & N. Laufer (ZMUC, SMNG).
- Prov. Trang, Katang District, Ko Muk, limestone hill on W coast, near Morakot cave, 7°21'52"N, 99°17'30"E, 60 m, disturbed semi-evergreen rainforest, 28./29.V.2009, 1♂, leg. P. Schwendinger (MHNG).

Distribution: Thai endemic. This species is also known from the Province Trang and Phuket island (ENGHOFF 2005, GOLOVATCH 1997).

Biology: *O. horologiformis* was very abundant at night and mainly found climbing on trees (up to 3 m), on bushes, on stones and also on the forest floor. Some matings and many mating attempts were observed. Coloration of the light markings on tergites varied from yellowish, orange to reddish light brown.

***Orthomorpha intercedens* Attems, 1937**

Material examined:

- Prov. Prachuab Kiri Khan, Thap Sakae District, Huay Yang National Park, 600-700 m, evergreen hill forest, 29.XI.1991, 1♂, leg. P. Schwendinger (MHNG).

Distribution: This species is known from Myanmar, the mountains between Myanmar and Thailand (ATTEMS 1937) and Chiang Mai (ENGHOFF 2005).

***Orthomorpha pterygota* Golovatch, 1997**

Material examined:

- Prov. Krabi, Katang District, Koh Lanta, Ban Saladan, Koh Lanta, 7°38'34"N, 99°2'9"E, 60 m, rainforest, 18.IX.2001, 1♀, leg. L. Monod (MHNG).
- Prov. Krabi, Nuea Khlong District, Ko Jam, W side of Ko Pu Hill, 7°50'8"N, 98°57'29"E, 270 m, disturbed semi-evergreen rainforest, 26.VI.2008, 1♂, leg. P. Schwendinger (MHNG).
- Prov. Phuket, Mueang Phuket District, Ko Siray, 7°53'7"N, 98°26'14"E, 20-50 m, old secondary forest, 8./11.XII.2001, 1♂, leg. P. Schwendinger (MHNG).

Distribution: Thai endemic. Also known from Krabi and Phuket (GOLOVATCH 1997).

Remarks: Except the coloration and some slight differences in body size there are no characters to distinguish *O. horologiformis* from *O. pterygota*. In both species the coloration was

very variable. The distribution pattern of *O. horologiformis* north and also south to *O. pterygota* suggests that these may represent mere local varieties.

***Orthomorpha subkarschi* Golovatch, 1997**

Material examined:

- Prov. Chumphon, Lang Suan District, 5 km south of Pak Nam Chumphon estuary, Ri Beach, Mo Phon Traditional Herbal Garden, 28.VII.2006, 1♂, leg. G. Hantke & Brand (SMF).

Distribution: Thai endemic. Up to now only known from the type locality in Phuket (GOLOVATCH 1997).

***Orthomorpha subsericata* Golovatch, 1997**

Material examined:

- Prov. Prachuap Khiri Khan, Mueang Prachuap Khiri Khan, S of Prachuap Khiri Khan, Ao Manao, in scrub, 23.VII.2006, several specimens, leg. G. Hantke & F. Brand (SMF).

Distribution: Thai endemic. Further records of *O. subsericata* are known from Hua Hin (GOLOVATCH 1997), Mueang Prachuap Khiri Khan District and Bang Saphan District in the Province Prachuap Khiri Khan (LIKHITRAKARN et al. 2010a).

***Orthomorpha thalebanica* Golovatch, 1997**

Material examined:

- Prov. Rayong, Mueang Rayong District, Ko Samet, Ko Samet National Park, Ao Phrao, 5 m, mixed deciduous forest, 23.IX.1996, 1♂, leg. P. Schwendinger (MHNG).
- Prov. Rayong, Mueang Rayong District, Ko Samet, Ao Wai, 12°32'N, 101°26'E, 2 m, inside rotten tree trunk on the beach, 19.IX.2008, 1♂, leg. P. Decker & N. Laufer (ZMUC).
- Prov. Trat, Ko Chang District, Ko Chang, Hat Sai Kao, 12°6'47"N, 102°16'15"E, 48 m, forest, at stream, in foliage, fern, bushes, day and night, 30.X.2009, 1♂, 3♀, leg. P. Jäger & S. Beyer (SMF).

Distribution: Thai endemic. *O. thalebanica* is also known from the type locality on the west coast of south Thailand (Prov. Satun) (GOLOVATCH 1997). The new records from the gulf of Thailand indicate that this species may be dispersed by human activities.

Class **CHILOPODA**

Order **SCOLOPENDRIDA**

Family **SCOLOPENDRIDAE**

***Scolopendra subspinipes dehaani* Brandt, 1840**

Material examined:

- Prov. Nakhon Sawan, 1987, 1 specimen, leg. Thielen (SMF).
- Prov. Rayong, Mueang Rayong District, Ko Samet, Ko Samet National Park, near Ao Wai, 12°32'N 101°2'E, 4-7 m, mixed deciduous forest, leaf litter and inside a rotten tree trunk, 18-19.IX.2008, 2 specimens, leg. P. Decker & N. Laufer.

Distribution: Bangkok, Ko Sichang (Prov. Chonburi), Province Chanthaburi, Kabin (Prov. Prachinburi), Muok Sek and Dong Phay Phai (FLOWER 1901). *S. subspinipes debaani* is a widespread subspecies in tropical Asia (ATTEMS 1930, LEWIS 2010a).

***Otostigmus spinosus* Porat, 1876**

Material examined:

- Prov. Phang Nga, Thap Put District, near Sai Rung Waterfall, N of Ban Khao Bao, 8°44'N, 98°17'E, 70 m, shrubberies next to a field, leaf litter, 08.IX.2008, 1 specimen, leg. P. Decker & N. Laufer (SMNG).

Distribution: This is the first record of *Otostigmus spinosus* for Thailand. The species is known from several countries in Southeast Asia, like Myanmar, Indonesia and Malaysia (ATTEMS 1930, LEWIS 2001, 2010b).

4. Discussion

14 out of 25 species studied in this publication are known to be endemic to Thailand, six are tropical tramps and four are also yet known from adjacent countries. Looking at the list above, we can see that the knowledge of the distribution of some species has considerably increased. At the moment it is too early to make conclusions about the biogeography of these species.

Since ENGHOFF (2005) the number of known millipede species of Thailand increased from 105 to 132 (ENGHOFF et al. 2007, LIKHITRAKARN et al. 2010a, 2010b, PIMVICHAI et al. 2009a, 2009b, 2010, STÖEV et al. 2007 and this paper). Until now 80% species (105 out of 132) are known as Thai endemics. But some of them (e. g. *D. delfae*) can be expected to occur also in the adjacent countries. Most of these countries, like the Malay Peninsula, Myanmar, Laos and Cambodia are still very poorly known. Nine species are widespread species in Southeast Asia or tropical tramps and the remaining 18 species are also known from the adjacent countries.

Due to the current work of Pimvichai (Spirostreptida: Harpagophoridae), Likhitrakarn (Polydesmida: Paradoxsomatidae), the author (Platydesmida), Enghoff and Golovatch the number of new species and the general knowledge will increase within the next years. Many groups like Sphaerotheriida, Spirobolida and different families of Polydesmida still need a revision. For example no species of Siphonophorida, Platydesmida and Pterodesmidae is known from Thailand yet. It can be estimated that the total species number of Thai Diplopoda is more than 400.

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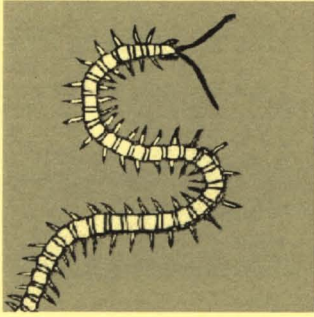
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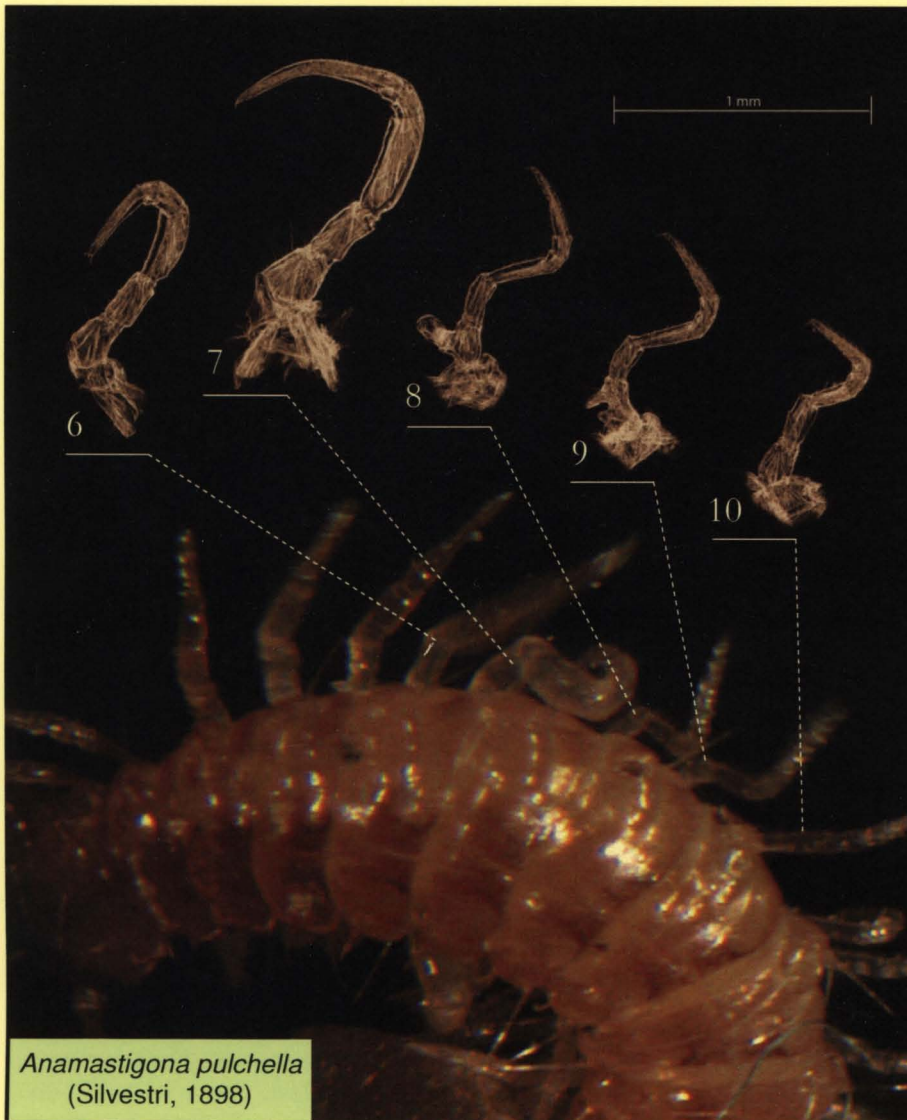


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Anamastigona pulchella
(Silvestri, 1898)

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