Checklist and Bibliography of Millipedes (Diplopoda) of Taiwan.

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Abstract. Fifty-six (56) species of millipedes belonging to ten different orders of Diplopoda are listed as members of the Taiwanese fauna. All literature records are cited, and a number of new records are included as well. Representatives of four millipede orders (Glomerida, Polyzoniida, Siphonocryptida, and Platydesmida) are reported for the first time to the island as a result of recent collections. Nine species, including four undescribed ones, are new records from the island. These are *Hyleoglomeris* sp. (Glomerida: Glomeridae), Andrognathidae, two undescribed species (Platydesmida), *Rhinotus purpureus* (Pocock, 1894) (Polyzoniida: Siphonotidae), Siphonocryptidae sp. (Siphonocryptida), *Orinisobates* sp. (Julida: Nemasomatidae), *Spirobolus walkeri* Pocock, 1895 (Spirobolida: Spirobolidae), *Trigoniulus corallinus* (Gervais, 1842) (Spirobolida: Trigoniulidae), and *Chondromorpha xanthotricha* Attems, 1898 (Polydesmida: Paradoxosomatidae). The Taiwanese millipede fauna consists of 23 endemic species, 17 East Asiatic elements, and 11 synanthropic species. The following new synonymies are established: *Glyphiulus tuberculatus* Verhoeff, 1936 under *G. granulatus* Gervais, 1847; *Aponedyopus jeanae* (Wang, 1957) and *A. reesi* (Wang, 1957) under *A. montanus* Verhoeff, 1939; *Nedyopus cingulatus* (Attems, 1898) under *N. patrioticus* (Attems, 1898); Three species: "*Habrodesmus*" *inexpectatus* Attems, 1944, *Orthomorpha bisulcata* Pocock, 1895, and *O. flavomarginata* Gressitt, 1941 are removed from the list of Taiwanese millipedes because of their uncertain taxonomic statuses/unconfirmed occurrences. Descriptions and figures of every species are referred to wherever available to initiate further studies on the Taiwanese fauna. A complete bibliography on the millipedes of Taiwan is also presented.

Key words: Checklist, Diplopoda, localities, millipedes, synonymies.

INTRODUCTION

The island of Taiwan, R.O.C. (Republic of China), lies about 150 km east of mainland China, and has a projected area of about 36,000 km^2 (394 x 140 km). It was discovered for Europe by Portuguese boatmen in 1517, and given the name "Ilha Formosa". The island frequently appeared by that name in the scientific literature, even throughout its Japanese occupation in the first half of 20th century, until 1943.

Taiwan has a relatively young geological history, existing for about 5 million years. Its terrain is conspicuously rugged with high mountain chains and deep valleys alternating. For human settlements, only the western-northwestern side of the island is really suitable, and the vast majority of the total population of 22 million is concentrated here. The eastern two-thirds of the island is mountainous with three main chains running from north to south, with more than 300 peaks exceeding 3,000 m elevation. The highest peak is Yu-Shan (Jade Mts) with 3,950 m. This high montane massif serves as a ruling factor in the formation of the island's biota, having a great importance in insular speciation and also in harbouring expansive elements of the surrounding regions. The mountain chains, their forests and open biotopes, especially above 1,000 m altitude, have a northern temperate climate, despite the southern location of the island (the Tropic of Cancer crosses the island near midlength). Moreover, Taiwan lies on the border of three zoogeographical regions, so its fauna provides an interesting mixture of Palaearctic, Oriental, and Australasian elements. Judging from such relatively well-studied animal groups as Lepidoptera, the faunal affinities of Taiwan are

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closest to the Himalayas (László *et al.*, 2000; Ronkay, 2002). More than one-fourth of the species of the moth family Noctuidae on Taiwan are endemic to the island, and about one-tenth of the species show direct Himalayan origins. Additionally, there is a surprisingly low similarity between the Japanese and the Philippine noctuid species, despite the geographical proximity of the "archipelagos". These results, however, can only be generalized cautiously because moths are obviously much better migrants than poorly vagile soil organisms, which are thus better subjects of isolated speciation.

Approximately 52 % of the island is still forested, and the high ratios of endemism (mean 60 %) and protected territories (19.2 %) show that Taiwan is a good subject for biodiversity research. The vertebrate fauna and certain invertebrate groups are relatively well investigated, and preliminary checklists of several insect orders have recently been published. A framework of projects named "Fauna of Taiwan" has been inititated by the National Science Council to enumerate all animal species in form of catalogues and illustrated guide books. However, some soil groups like millipedes are still poorly known, and probably only a fragment of their diversity has been revealed.

Myriapodological research has been a neglected field of Taiwanese zoology for a long time. The only species list, a preliminary one, was compiled by Prof. Yu-Shi Moltze Wang in 1964, who published a dozen myriapodological papers, all listed in the bibliography herein. He described a number of new species, whose types were indicated as being deposited in the collection of the Department of Zoology, National Taiwan University, but despite helpful efforts by Taiwanese colleagues, this collection cannot be traced. In 1964, Dr. Wang moved from Taiwan to Singapore, where he retired and died in 1968.

Apart of Wang's work, papers contributing to the Taiwanese millipede faunas, are sporadic and scattered throughout the literature. Attems, Pocock and Verhoeff described new forms from the island with the help of Japanese collectors, and Takakuwa also contributed to the knowledge of the myriapod fauna. Gressitt (1941) described three new species, and new species can also be found in Keeton (1960), Ishii (1990) and Shear (1990, 1999) who revised the families Spirobolidae (Spirobolida), Polyxenidae (Polyxenida), and Diplomaragnidae (Chordeumatida), respectively. A couple of pantropical, synanthropic species were also recorded by various authors. Wang and Mauriès (1996) summarized the myriapod fauna of China, including Taiwan, but, unfortunately, they did not identify the species occurring on the latter. More recently, Chen and Chang (2002) and Korsós (2002) presented additional records of Taiwanese millipedes, but judging from unevaluated recent collections, many species await description, in practically every diplopod order.

MATERIALS AND METHODS

In order to compile the following up-to-date list of Taiwanese millipedes, the complete myriapodological literature has been consulted as far as possible. The paper also contains information originating from Dr. Henrik Enghoff (Copenhagen, Denmark), who scanned the personal collections of Dr. Sheng-Hai Wu (National Chung-Hsing University, Taichung) and of Ms. Chao-Chun Chen (National Sun Yat-Sen University, Kaohsiung) during a trip to the island in March 2002. Although there was not time to properly identify all species, some of the most obvious records (with reference to their origin, but without closer locality details) are presented herein. In addition, collections in Taichung (National Museum of Natural Science) and in Taipei (Taiwan Forestry Research Institute) were checked during trips to the island in 2003 and 2004, both containing material of other undescribed species.

Species noted for Taiwan are listed following the systematic order of Shelley (2003). Names are annotated with references to important historical notes (figures cited where published); literature records of Taiwanese diplopods are included with original details on the number of specimens, localities, date, and collector. Repositories (where data were available) are indicated with abbreviations (see below). Records from expeditions conducted by the author are only mentioned if they present new data for millipede orders.

Institutional abbreviations are as follows:

AMNH: American Museum of Natural History, New York, NewYork, USA

BBMH: Bernice P. Bishop Museum, Honolulu, Hawaii, USA

CAS: California Academy of Sciences, San Francisco, California, USA

DUSM: Dokkyo University School of Medicine, Mibu, Tochigi, Japan
HNHM: Hungarian Natural History Museum, Budapest, Hungary
MCZ: Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA
MNHP: Muséum national d'Histoire naturelle, Paris, France
NMNS: National Museum of Natural Science, Taichung, Taiwan
TFRI: Taiwan Forestry Research Institute, Taipei, Taiwan
ZMHU: Zoological Museum, Humboldt University, Berlin, Germany
ZMUC: Danish Museum of Natural History (formerly Zoological Museum, University of Copenhagen), Copenhagen, Denmark

Fig. 1. Map of Taiwan with new millipede collecting localities. 1. Ilan County, Taipenshan, 2. Ilan County, Ming Chyr, Forest Recreation Area, 3. Nantou County, Meifeng, 4. Nantou County, Tzuchung, 5. Nantou County, Rinnei Nature Conservation Area, between Meifeng and Tsuifeng, 6. Hualien County, Rei Suei, 7. Hualien County, Taroko NP, Visitor Centre, 8. Hualien County, Taroko NP, Hsipan, 9. Hualien County, Tienshiang, Bailyang Trail, 10. Taichung County, Anma-shan, Tahsueh-shan Forest Recreation Area, 11. Taitung County, above Liyuan, 12. Taitung County, Hsiangyang, 13. Taitung County, Chihpen, 14. Pingtung County, Mutan, 15. Pingtung County, Kenting.

Localities. Because of the political history of Taiwan (e.g. most villages and mountains had different names during the Japanese occupation) and the difficulty of transcribing Chinese characters into English or another language with Latin letters, names of Taiwanese (and Chinese) localities appear in several different manners. Pronunciation, unfortunately, cannot be a guideline either because Chinese vowels and consonants are difficult to reproduce in European-based languages. At the moment, an accepted standard for transcription of Chinese names does not exist; and despite several uniforming trials one can still find printed varieties of a single geographical name.

In the ensuing species list, I attempted to place all geographical names mentioned in the literature in the proper county (province) in Taiwan, noting that the Chinese words,"xian" (="hsien") and "shan", mean "county" and "mountain", respectively. The map in Fig. 1 shows the collecting localities visited by the author in 1998 and 2003.

RESULTS

List of species

POLYXENIDA

Polyxenidae

1. ***Lophoturus okinawai*** Nguyen Duy-Jacquemin et Condé, 1982
   Lophoturus obscurus okinawai Nguyen Duy-Jacquemin et Condé, 1982 (figs 1-12)
   Lophoturus okinawai: Ishii 1988, 1990 (figs 55-68)

Literature records: Nguyen Duy-Jacquemin & Condé (1982): 4 ♂, 1 ♀, "Archipel des Riu Kiu, Okinawa, Nakagusuku" , Japan, June 1976, leg. J. Haupt (MNHP-Ishii (1990): 1 ♀, Kendin, Pindong-xian [Kenting, Pingtung County], southern Taiwan, evergreen broadleaved forest, about 300 m alt. , 2 Aug 1988, leg. K. Ishii (DUSM).

Remarks: As this species was described from Okinawa, Ryukyu Islands, Japan, only about 500 km to the northeast, its discovery in Taiwan is not surprising.

Lophoproctidae

2. ***Eudigraphis taiwaniensis*** Ishii, 1990
   Eudigraphis taiwaniensis Ishii, 1990 (figs 1-54)

Literature records: Ishii (1990): 2 ♂♂, 5 ♀♀, "Deji, Taizhong-xian [Taichung County], Taiwan, Villebrunea-Begonia forest, 1590 m alt.", 30 Aug 1988, leg. K. Ishii — 2 ♂♂, "Lishan-Dayuning, Nantou-xian [Lishan-Tayuling, Nantou County], Pinus-Acer forest, 2,050 m alt.", 29 July 1988, leg. K. Ishii — 1 ♀, "Riyuetanf, Nantou-xian [Nantou County], Castonopsis-Helicia forest, 910 m alt.", 1 Aug 1988, leg. K. Ishii — 1 ♀, "Nanshanxi, Nantou-xian [Nantou County], evergreen broadleaved forest, 7-800 m alt.", 2 Aug 1988, leg. K. Ishii (DUSM).

New material: 2 ♀♀, Nantou County, Meifeng, 24°06'N—121°12'E, 2,300 m, 5-6 Sept. 2003, leg. G. Csorba & Z. Korsós, No. 157 (HNHM, DUSM), det. K. Ishii (2003).

Remarks: This species is known only from Taiwan, at several localities in different mountaneous forest habitats. The type material is deposited in the Department of Biology, Dokkyo University School of Medicine, Mibu, Tochigi, Japan (Ishii pers. comm. 2003).

GLOMERIDA

Glomeridae

3. ***Hyleoglomeris*** sp.

New material: 1 ♂, 1 ♀, Hualien County, Taroko NP, Visitor Centre, 50 m, 24°09.51'N—121° 37.33'E, 9 Dec 1998, leg. Gy. Fábián & Z. Korsós (HNHM) — 1 spec., Nantou County, Meifeng, 24°06'N—121°12'E, 2300 m, 5-6 Sept. 2003, leg. G. Csorba & Z. Korsós, No. 157. (HNHM). **NEW RECORD**

Remarks: The order Glomerida has not been reported from Taiwan, but specimens exist in different Taiwanese collections as well as those cited above. They are thought to belong to *Hyleoglomeris*. (In a recent *pers. comm*. S.I. Golovatch calls the attention to *Hyleoglomeris vittata* Verhoeff, 1929 which was described and never subsequently cited from "Kankan, Formosa". If this locality is in Taiwan, then it is the single record of *Hyleoglomeris* from the island.)

PLATYDESMIDA

4. ***Andrognathidae*** sp. 1. (Fig. 2A)

New material: 4 ♂♂, 2 ♀♀, Pingtung County, Mutan, 8 Dec. 1998, leg. Gy. Fábián & Z. Korsós (HNHM) — 1 ♀, Nantou County, Meifeng, 24°06'N—121°12'E, 2,300 m, 5-6 Sept. 2003, leg. G. Csorba & Z. Korsós, No. 157 (HNHM). **NEW RECORD**

Remarks: The order Platydesmida also is new to Taiwan; these specimens probably represent a single endemic species.

5. ***Andrognathidae*** sp. 2.

New material: 2 ♂♂, 12 ♀♀, 6 juvs., Anma-shan, Tahsueh-shan Forest Recreation Area, 2,900 m, 24°16.66'N-121°01.50'E, 2 Dec. 1998, leg. Gy. Fábián & Z. Korsós (HNHM). **NEW RECORD**

Remarks: This slender, long-bodied species, somewhat resembling a representative of the family Siphonorhinidae (order Siphonophorida) has a different body form from that above but is also referable to the Andrognathidae, though probably a different subfamily (Hoffman 1980); specimens also exist in the National Museum of Natural History, Taichung. Judging from its occurrence at a high elevation, it is probably an endemic species.

POLYZONIIDA

Siphonotidae (Fig. 2B)

6. ***Rhinotus purpureus*** (Pocock, 1894)

Siphonotus purpureus Pocock 1894

Rhinotus purpureus: Loomis 1934, Mauriès & Silva 1971, Golovatch & Korsós 1992 (figs 1-4), Shelley 1998b

Siphonotus brasiliensis Brandt, 1837: Hoffman 1977 (figs 1-7)

New material: Pingtung County, Kenting, 29 March 2002, leg. H. Enghoff (ZMUC). **NEW RECORD**

Remarks: Shelley (1998b) cited "the most obvious diagnostic feature" of this species as "the subacuminate, triangular-shaped head with one large ocellus". It is a widespread synanthrope that represents the first record of the Polyzoniida from Taiwan.

SIPHONOCRYPTIDA

Siphonocryptidae (Fig. 2C)

7. Gen. et sp. n.

New material: 2 ♂♂, 4 ♀♀, Taichung County, Mt. Da-Hsueh, 2,000 m a.s.l., soil sample, 9 Dec 1995, 8 Feb 1996, 28 May 1996, 4 Nov 1996 (NMNS). **NEW RECORD**

Remarks: The polyzoniidan family Siphonocryptidae was elevated to separate ordinal status

by Shelley (2003), and this is also the first record of the taxon from Taiwan. The specimens warrant a new genus and species, which will be proposed in a separate paper.

JULIDA

Julidae (Fig. 2D)

8. ***Anaulaciulus simplex*** (Verhoeff, 1936)
   Fusiulus simplex Verhoeff, 1936b (figs 19-22)
   Anaulaciulus simplex: Enghoff 1986, Korsós 1996

Literature record: Wang (1963c): without further detail.

Remarks: Although the species was originally described from the northern islands of Japan (Verhoeff 1936b: Hirosaki (Nordjapan) und Atami bei Tokyo), Wang (1963c) implied its occurrence in Taiwan, when he compared his "Fusiulus trilolius (sic!) quemoyensis Sp. nov." to *F. simplex*. Addition material of *Anaulaciulus* in the TFRI can potentially further clarify the status of this species.

9. ***Anaulaciulus tonginus*** (Karsch, 1881)
   Julus tonginus Karsch, 1881
   Anaulaciulus tonginus: Enghoff 1986, Korsós 1994 (figs 1-8), Korsós 1996
   Fusiulus trilobus khuuae Wang, 1963c (fig. 3)

Literature record: Wang (1963c): "Yan Min Shan and Yin Ko".

Remarks: This species was originally described from Hong Kong (types in ZMHU), and was redescribed based on topotypical material by Korsós (1994). He also place Wang's (1963) "species": *Fusiulus trilobus khuuae* in synonymy, so *A. tonginus* thus has only one record from Taiwan.

10. ***Anaulaciulus trapezoidus*** (Wang, 1955)
    Fusiulus trapezoidus Wang, 1955a (figs 2-3)
    Anaulaciulus trapezoidus: Enghoff 1986, Korsós 1996

Literature records: Wang (1955a): 1 ♂, leg. Jansen Chang, 6 ♀♀, "Hsin-Tien, Taipei", 8 May 1953, leg. Chu Kwang-Yu; 21 Dec 1953, leg. Ho Tung-Yung, Yuan Zen-Chuan and Yang Ting-Yao. — Wang (1958b): 4 ♂♂, 6 ♀♀, "Taipei", Feb. — Wang (1963c): 1 ♂, 4 ♀♀, "Dah Ren Jen", 20 Jan 1961, leg. Yu-hsi M. Wang.

Remarks: Wang (1955a) described and illustrated *A. trapezoidus*, and then provided several locality records. New material is needed to decide its proper position.

11. ***Anaulaciulus trilobus*** Wang, 1963
    Fusiulus trilolius (sic!) *quemoyensis* Wang, 1963c (figs 1-2)
    Anaulaciulus trilobus: Enghoff 1986, Korsós 1996

Literature record: Wang (1963c): 1 ♂, 4 ♀♀, "Quemoy (Kin-Men) Island, Fukien Province" [Kingman Island, Fu-chien Province], 20 Dec 1960, leg. Tchaw-ren Chen.

Remarks: Wang (1963c) described *A. trilobus* (as a subspecies!) from Quemoy (Kingman) Island, a part of R.O.C., off mainland China, about 160 km west of Taiwan. Until its recollection and closer study, I have to maintain its separate species status.

Nemasomatidae

12. ***Orinisobates*** sp.

New material: 1 ♂, 1 ♀, Nantou County, Sungkang, Meimu, Meifeng, 2,200 m, 30 Nov. 1998, leg. Gy. Fábián & Z. Korsós (HNHM). — 1 ♀, Anma-shan, Tahsueh-shan Forest Recreation Area, 2900 m, 24°16.66'N-121°01.50'E, 2 Dec. 1998, leg. Gy. Fábián and Z. Korsós (HNHM). **NEW RECORD**

Remarks: This is the first record of the Nemasomatidae from Taiwan and and the southernmost representative of the genus, otherwise known in the eastern part of the Palaearctic subregion, from Kirgizia east to Kamchatka and the Kuril Islands (see Enghoff 1985). It will be described in a separate paper.

SPIROBOLIDA

Rhinocricidae

13. ***Salpidobolus oceanicus*** Verhoeff, 1944
    Polyconoceras oceanicus Verhoeff, 1944 (figs 1-6)
    Salpidobolus oceanicus: Hoffman 1974, Jeekel 2001c, Marek et al. 2003

Literature record: Verhoeff (1944): 1 ♂, "Insel Formosa", leg. Y. Takakuwa.

Remarks: *Salpidobolus oceanicus* was described and properly illustrated by Verhoeff (1944) from the above Taiwanese male; no more individuals have been found. Marek *et al*. (2003) also considered it as a valid species.

Spirobolellidae

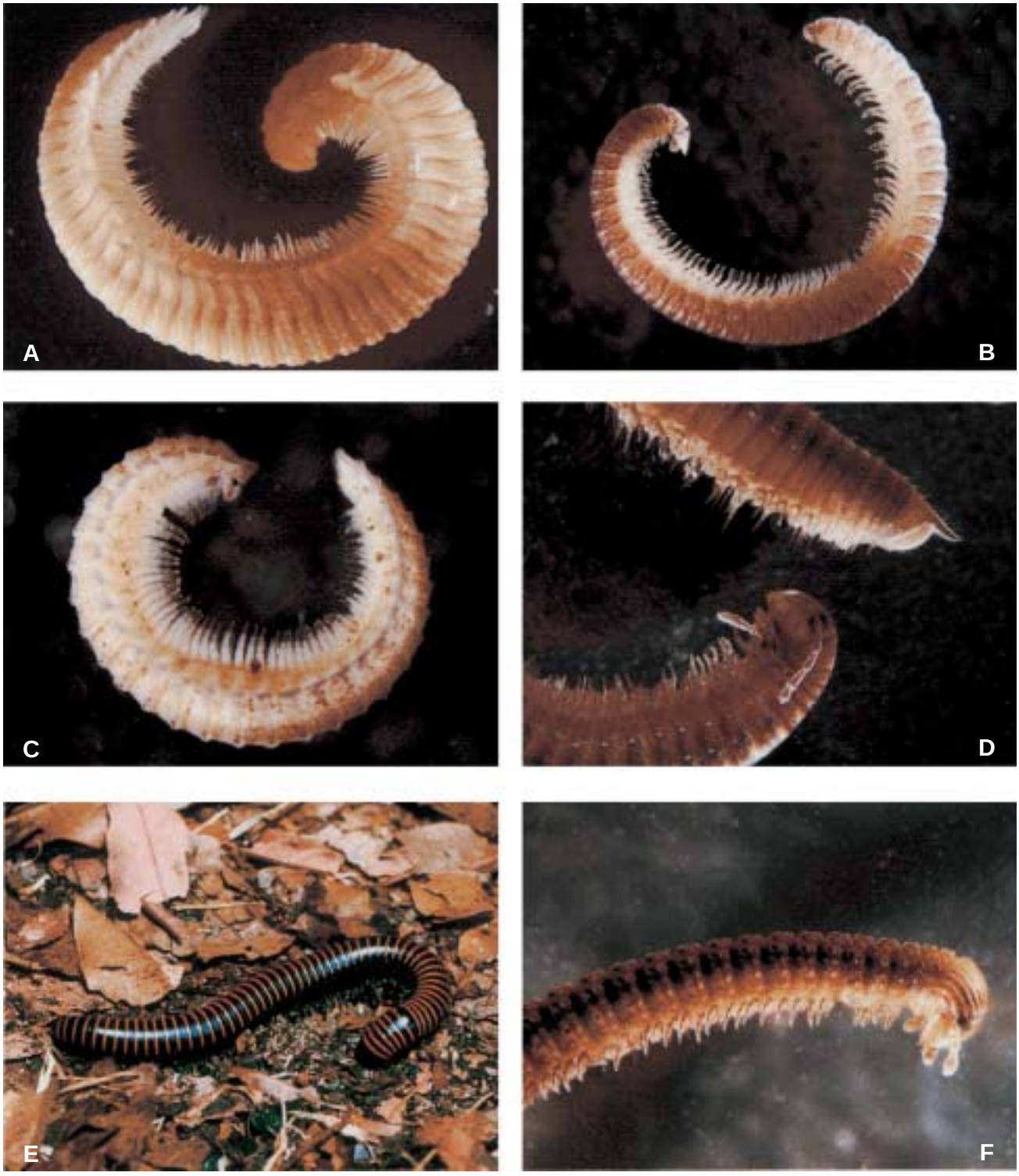

Fig. 2. Some representatives of the Taiwanese millipede fauna. A. Platydesmida: Andrognathidae unidentified species, B. Polyzoniida: *Rhinotus purpureus*, C. Siphonocryptida: Unnamed genus and species, D. Julida: *Anaulaciulus* unnamed species, E. Spirobolida: *Spirobolus* cf. *walkeri*, F. Spirostreptida: *Glyphiulus granulatus*.

14. ***Paraspirobolus lucifugus*** (Gervais, 1836)
Julus lucifugus Gervais, 1836
Spirobolus dictyonotus Latzel, 1895: Jeekel 2001a
Spirobolus teledapus Attems, 1900: Schubart 1934, Jeekel 2001a
Paraspirobolus paulistus Brölemann, 1902: Hoffman 1969, Jeekel 2001a
Microspirobolus excursans Chamberlin, 1920: Jeekel 2001a
Sechellobolus dictyonotus: Schubart 1934, Golovatch and Korsós 1992, Jeekel 2001a
Sechellobolus dictyonotus var. *mauritianus* Verhoeff, 1939: Jeekel 2001a

Physobolus striatus Attems, 1953: Hoffman 1981, Jeekel 2001a
Spirobolellus phosphoreus Takakuwa, 1941: Takakuwa 1954 (figs 213-214), Jeekel 2001a
Spirobolellus takakuwai Wang, 1961: Wang 1963 (as *S. t.* Wang, 1960!), Shinohara and Higa 1997, Jeekel 2001a
Paraspirobolus dictyonotus: Hoffman 1969, Enghoff 1975, Jeekel 2001a
Paraspirobolus lucifugus: Jeekel 2001c

Literature records: Wang (1961): "Botanical Garden, Taipei, under rotten palm woods", Dec. 1959. — Wang (1963): 1 ♀, "Terrestrium National Taiwan University" [Taipei], 22 May 1961.

Remarks: This widespread circumtropical, ubiquitouos species was reported from Taiwan by Wang (1961, 1963) as *Spirobolellus takakuwai*. Its synonymy with *Paraspirobolus lucifugus* was established by Jeekel (2001a) and is supported by the synanthropic occurrences on the island. However, Shinohara & Higa (1997) still referred to it as a valid species from Okinawa Island, Japan. An overview of the taxonomy of Oriental and Australian representatives of the whole order Spirobolida is available in Jeekel (2001c).

Spirobolidae

15. ***Spirobolus bungii*** Brandt, 1833
Spirobolus bungii Brandt, 1833: "Peking, China", Keeton 1960 (figs 4, 97, 127-131), Jeekel 2001c
Spirobolus joannesi Brölemann, 1896

Literature record: Wang (1963c): 1 ♀, "Wai San Chi Shan, Taipei", 13 Apr. 1961, leg. Chin-Siang Wang. — Wang (1964): listed.

New material: 6 ♂♂, 9 ♀♀, Hualien County, Taroko National Park, Lien-Huachin, 5 Dec. 1998, leg. Gy. Fábián & Z. Korsós (HNHM).

Remarks: Although Wang (1963c, 1964) recorded S. *joannisi* (sic!) Brölemann from Taiwan, it is not clear whether he was referring to *S. bungii* or the following species. Fresh material, however, proves that *S. bungii* occurs on the island.

16. ***Spirobolus formosae*** Keeton, 1960
Spirobolus formosae Keeton, 1960 (figs 101, 135, 149-153, 163)
Sinobolus joannsi (sic!) (Brölemann): Chamberlin and Wang 1953 (in part.)
Sinobolus joannisi (Brölemann, 1896): Wang 1955a
Prospirobolus joannsi (sic!) (Brölemann, 1896): Wang 1958b
Spirobolus joannisi Brölemann, 1896: Wang 1963c

Literature records: Keeton (1960): 1 ♀, "Formosa, Shirin", 10 Aug. 1922, leg. R. Takahashi (MCZ) — Chamberlin and Wang (1953): 1 ♂, "Shirin, Formosa", Aug. 1923, leg. R. Takahashi (AMNH) — Wang (1955a): 1 ♂, 3 ♀♀, "Taiwan", date and collector unknown. — Wang (1958b): 9 ♂♂, 9 ♀♀, "Tze San Yen, Taipei", Feb. — 1 ♂, 2 ♀♀, "Ta Pin Shan, Ilan", Aug. — Wang (1963c): 1 ♀, "Wai San Chi Shan, Taipei", 13 Apr. 1961, leg. Chin-Siang Wang.

New material: 1 ♂, Ilan County, Taipenshan, 31 July 1998, leg. S. P. Wu (HNHM).

Remarks: Keeton (960) described *S. formosae* from a single female and referred Wang's concept of *S. joannisi* to this species. In 1953, Chamberlin & Wang erected the new genus, *Sinobolus*, for *joannisi*, which was later synonymized under *Spirobolus* by Hoffman (1957). There is, nevertheless, some confusion about the Taiwanese records of *S. joannisi*. Chamberlin and Wang (1953) recorded two specimens (both supposedly housed in the AMNH), a female from Chekiang, China, and a male from Shirin, Formosa. Keeton (1960) assigned the Chinese to *S. bungii* and erected *S. formosae* for a Taiwanese female collected by R. Takahashi and deposited in MCZ. One wonders why he did not notice the male in the AMNH collected by the same person exactly one year later, and only mentioned the possibility of conspecific status of Chamberlin and Wang's specimen.

17. ***Spirobolus walkeri*** Pocock, 1895 (Fig. 2E)
Spirobolus walkeri Pocock, 1895 (fig. 14-14a)
Spirobolus walkeri: Keeton 1960 (figs 5, 98, 132, 136-138, 145-148, 161)

New material: 1 ♂, Ilan County, Taipenshan, 31 July 1998, leg. S. P. Wu (HNHM). **NEW RECORD**

Remarks: This name was originally proposed for a form from Chusan Island, China (Pocock 1895). In Taiwan, however, there are at least three relatively large-bodied forms of Spirobolus (Enghoff pers. obs. based on Dr. Wu's collection), which are well-known because of their colourful appearance. These forms may correspond to the three species

cited here, and study of the material in Taiwanese institutions will clarify the situation; *S. walkeri* formally represents a new record for Taiwan.

Pachybolidae

18. ***"Spirostrophus" lanyusis*** Wang, 1955
Spirostrophius (sic!) lanyusis Wang, 1955b (figs 4-5)
Spirostrophus lanyusensis (sic!) Wang, 1955: Wang 1963c
"Spirostrophus" lanyusis Wang, 1955: Jeekel 2001c

Literature records: Wang (1955b): 21 ♂♂, 23 ♀♀, 12 juv., "Lan Yu Islet (Botel Tobago)"[Orchid Island], 29 July-6 Aug. 1954. — Wang (1963c): 1 ♂, 1 ♀, "Botel Tobago (Lan Yu Islet)" [Orchid Island], July 1960, leg. Tchaw-ren Chen.

Remarks: Although its generic allocation is still uncertain (Jeekel 2001c: "Pachybolidae incertae sedis"), "*Spirostrophus*" *lanyusis* should be listed as component of the Taiwanese fauna. It was described and subsequently reported by Wang (1955b, 1963c) from Lan Yu (Orchid) Island, about 60 km east from the southern end of Taiwan.

Trigoniulidae

19. ***Leptogoniulus sorornus*** (Butler, 1876)
Spirostreptus sorornus Butler, 1876
Spirobolus naresi Pocock, 1893
Trigoniulus takahasii Takakuwa, 1940a (figs 1-3): Takakuwa 1954 (fig 224): Jeekel 2001c
Trigoniulus niger Takakuwa, 1940a (figs 4-6): Takakuwa 1954 (figs 229-230): Jeekel 2001c
Trigoniulus segmentatus Takakuwa, 1940b (fig. 3): Takakuwa 1954 (fig. 221): Jeekel 2001c
Leptogoniulus naresi (Pocock, 1893): Golovatch & Korsós 1992
Leptogoniulus sorornus (Butler, 1876): Hoffman 1994, Shelley and Lehtinen 1999 (figs 1-7)

Literature record: Takakuwa (1940a, 1940b): "Formosa".

Remarks: Based on Taiwanese specimens, Takakuwa (1940a, b) proposed three new species for this widespread synanthropic millipede, all of which are synonymized by Jeekel (2001c). Comparative drawings of the gonopods and midbody segments are available in Shelley and Lehtinen (1999). New material seen by H. Enghoff (pers. comm. 2002) also approves its occurrence on the island.

20. ***Trigoniulus corallinus*** (Gervais, 1842)
Iulus corallinus Gervais, 1842
Spirobolus lumbricinus Gerstäcker, 1873: Attems 1909
Spirobolus goesi Porat, 1876: Shelley and Lehtinen 1999
Trigoniulus lumbricinus (Gerstäcker, 1873): Attems 1914, Golovatch and Korsós 1990 (figs 14-22)
Trigoniulus sanguineus Tömösváry, 1885: Shelley and Lehtinen 1999
Trigoniulus corallinus (Gervais, 1842): Hoffman 1994, Shelley 1998a, Shelley and Lehtinen 1999 (figs 8-14)
Trigoniulus takakuwai Verhoeff, 1938: Takakuwa 1954 (figs 226-227): Shelley and Lehtinen 1999

New material: Pingtung County, Kenting, 29 March 2002, leg. H. Enghoff (ZMUC). **NEW RECORD**

Remarks: Another widespread, synanthropic trigoniulid species, *T. corallinus* represents a new record (though not a surprising one) for Taiwan.

21. ***Trigoniulus tertius*** Takakuwa, 1940
Trigoniulus tertius Takakuwa, 1940b (fig. 2), Takakuwa 1954 (fig. 228), Wang 1955a, Wang 1958b (as Trigoniulus tertius Takakuwa, 1944!), Wang 1963c, Jeekel 2001c

Literature records: Takakuwa (1940b): "Kanakan, Formosa". — Wang (1955a): 1 ♂, 2 ♀♀, date, collector and locality unknown. — Wang (1958b): 7 ♂♂, 15 ♀♀, "Urai", March, Oct. — Wang (1963c): 1 ♀, "Kao Hsiung" [Kaohsiung], 16 Aug 1961, leg. Tchaw-ren Chen.

Remarks: *Trigoniulus tertius* was described from Taiwan by Takakuwa (1940b), and subsequently reported from several localities by Wang (1955a, 1958b, 1963c). Jeekel (2001c) considered it to be a valid species.

SPIROSTREPTIDA

Cambalopsidae

22. ***Glyphiulus granulatus*** Gervais, 1847 (Figs . 2F)
Glyphiulus granulatus Gervais, 1847, Attems 1900 (figs 20-24), Mauriès 1970, Murakami 1975, Mauriès 1977, Mauriès 1983
Formosoglyphius tuberculatus Verhoeff, 1936a

(figs 7-9): Takakuwa 1954 (fig. 237) **NEW SYNONYMY**!
Glyphiulus tuberculatus (Verhoeff, 1936): Takakuwa 1950, Wang 1957a (figs 1-6), Mauriès 1970, Murakami 1975, Mauriès 1977, Mauriès 1983

Literature records: Verhoeff (1936a): 1 ♀, "Formosa", leg. J. Takakuwa. — Takakuwa (1950): 1 ♀ , "Taichun" [Taichung]. — Chamberlin and Wang (1953): 3 ♀♀, "Formosa", Sept 1933, leg. Takakuwa. — Wang (1955a): 1 ♀, "locality unknown", 8 May 1953, leg. Chu Kwang-Yu. — Wang (1957a): 1 ♀, "Wu-shi, Makung islet", 12 Aug 1956, leg. Yu-hsi Moltze Wang. — 1 ♂, 1 ♀, "Wanan islet", 11 Aug 1956.

New material: Pingtung County, Kenting, 29 March 2002, leg. H. Enghoff (ZMUC).

Remarks: Mauriès (1970, 1977, 1983) discussed the possible identity of the two nominal species, *Glyphiulus tuberculatus* and *G. granulatus*. Based on the fresh material at hand (figs 2-3) I formally establish the synonymy of *G. tuberculatus* (Verhoeff, 1936) with the widespread, synanthropic species, *G. granulatus* Gervais, 1847. The locality records by Wang (1957a) are from the Penghu (Pescadores) Islands in the Taiwan Strait, about 40 km west from the main island of Taiwan.

CHORDEUMATIDA

Diplomaragnidae

23. ***Diplomaragna australis*** Shear, 1999
Diplomaragna australis Shear 1999 (figs 2-3)

Literature record: — "Taiwan, Chito, experimental forest, Nanto hsiensip" [Nantou County], 1000 meters, Sept. 1957, leg. T. Maa. (BBMH).

Remarks: The relationships of the three Taiwanese species of *Diplomaragna* need clarification, which may develop with more material; *D. australis* is endemic.

24. ***Diplomaragna gracilipes*** (Verhoeff, 1914)
Syntelopodeuma gracilipes Verhoeff, 1914 (figs 10-14)
Syntelopodeuma gracilipes: Verhoeff 1936b, Takakuwa 1954 (figs 142-144)
Diplomaragna gracilipes: Miyosi 1959
Diplomaragna gracilipes: Shear 1990 (figs 83-87)
Diplomaragna gracilipes: Mikhaljova 1999

Literature record: Wang (1958b): 1 ♀, "Ali San", Aug.

Remark: Verhoeff (1914) described *Diplomaragna gracilipes* from "Hokkaido, Japan", and it was subsequently recorded from Taiwan by Wang (1958b).

25. ***Diplomaragna formosana*** (Verhoeff, 1936)
Syntelopodeuma formosanum Verhoeff, 1936b (figs 23-26)
Syntelopodeuma formosanum: Takakuwa 1954 (fig. 145)
Diplomaragna formosanum: Shear 1990
Diplomaragna formosana: Mikhaljova 1999
Diplomaragna formosana: Shear 1999 (fig. 1)

Literature record: Verhoeff (1936b): "Insel Formosa".

Remarks: Although Verhoeff (1936b) gave a detailed comparison of *D. formosana* to *D. gracilipes*, Shear (1999) concluded that the differences mentioned were insufficient for separate specific status.

Speophilosomatidae

26. ***Speophilosoma montanum*** Takakuwa, 1949
Speophilosoma montanus Takakuwa, 1949 (figs 1-3): Takakuwa 1954 (figs 150-152)
Speophilosoma sp.: Wang 1958b
Speophilosoma montanum: Jeekel 1970, Shear, Tsurusaki and Tanabe 1994

Literature record: 1 ♀, "Yu shan", Aug.

New material: 4 ♂♂, 3 ♀♀, Ilan County, Shiji (=Szji), 2200 m a.s.l., coniferous forest, pitfall traps, spring 2002 and 2003, leg. Y. M. Chen and W. C. Yeh (TFRI).

Remarks: Wang (1958b) reported *Speophilosoma* from Taiwan based only on one female, found at Yu shan. It is believed to be conspecific with *S. montanum*, also found at a high elevation on Mt. Fuji in Japan. Unfortunately, Takakuwa's collection, including the holotype of *S. montanum*, was lost during World War II (Shear *et al*. 1994, Tanabe pers. comm.). The new material contains males, so the establishment of *S. montanum* (or a closely related species) on Taiwan will be possible when these individuals are studied.

POLYDESMIDA

Xystodesmidae

27. ***"Pachydesmus" attemsi*** Wang, 1960

Pachydesmus attemsi Wang, 1960 (fig. 1)

Literature record: Wang (1960): 2 ♂♂, "Sah Mao Shan, Yan Ming Mountain", 16 May 1959; "Fu Shu Shan, Yan Ming Mts", 18 May 1959, leg. Yu-Hsi M. Wang.

Remarks: *Pachydesmus* is an American genus with two species in the southeastern United States (Hoffman 1980, 1999), so the generic allocation of this species is incorrect. Without new material, it is not possible to evaluate this species.

28. ***"Rhysodesmus" cohaesivus*** Wang, 1957
Rhysodesmus cohaesivus Wang, 1957b (fig. 5)
Rhysodesmus cohaesivus Wang, 1958: Wang 1958b

Literature records: Wang (1957b): 8 ♂♂, 5 ♀♀, "Urai, Taipei", 18 April 1957, leg. Yu-hsi M. Wang. — Wang (1958b): 8 ♂♂, 6 ♀♀, "Urai", March, Oct.

29. "***Rhysodesmus***" ***contiguus*** Wang, 1957
Rhysodesmus contiguus Wang, 1957b (fig. 6)
Rhysodesmus contiguus Wang, 1958: Wang 1958b

Literature records: Wang (1957b): 2 ♂♂, 4 ♀♀, "Urai, Taipei", 30 March 1957, leg. Yu-shi M. Wang. — Wang (1958b): 2 ♂♂, 4 ♀♀, "Urai", March.

Remarks: Both species originally assigned to *"Rhysodesmus"* by Wang (1957b) are certainly not members of that genus, since *Rhysodesmus* is a Nearctic millipede genus (Hoffman 1980, Tanabe pers. comm.).

30. ***Riukiaria holstii*** (Pocock, 1895)
Fontaria holstii Pocock, 1895 (figs 9-9a)
Riukiaria holstii (Pocock, 1895): Verhoeff 1937, Hoffman 1949, Tanabe 1988
Rhysodesmus holstii: Takakuwa 1954 (fig. 63)
Rhysolus holsti: Wang 1963c

Literature record: Wang (1963c): 1 ♂, 1 ♀, "Doh Li Shan, Ilan", 26 July 1961.

New material: 1 ♂, Pingtung County, 10 km E of Mutan, 400 m, 13-14 June 1997, leg. L. Ronkay and B. Herczig (HNHM).

Remarks: In describing *R. puella* from Japan, Tanabe (1988) compared it to *R. holstii*: "this species is similar to *R. holstii* from Is. Okinawa-jima···". This island is only about 500 km away from Taiwan, which assures the validity of its first record, especially because it was originally described from China (by Pocock 1895: "Great Loo-Choo"). Recently, a single male proved its present occurrence in Taiwan.

31. ***Riukiaria ochracea*** (Gressitt, 1941)
Rhysodesmus ochraceus Gressitt, 1941 (no drawings)
Riukiaria ochraceus: Wang and Mauriès 1996

Literature record: Gressitt (1941): "Sozan, alt. 400 metres, northern Formosa", 29 March 1932, leg. J. L. Gressitt (CAS).

Remarks: A reexamination of the holotype's gonopods (housed at the CAS) proved to be those of a valid species.

32. ***Riukiaria taiwana*** (Takakuwa, 1942)
Rhysodesmus taiwanus Takakuwa, 1942a (fig. 1): Takakuwa 1954 (figs 58-59), Wang 1963c
Riukiaria taiwanus (Takakuwa, 1942): Wang and Mauriès 1996
Riukiaria taiwanalis (Takakuwa, 1942): Wang and Mauriès 1996

Literature record: Takakuwa (1942a): "Taityu (Formosa)" — Wang (1963c): 2 ♀♀, "Ta Pin Shan, Ilan", 25 July 1961.

Remarks: Wang and Mauriès (1996) listed both *R. taiwanus* and *R. taiwanalis* in their catalogue of Chinese myriapods, attributing both names to Takakuwa (1942), who only described *R. taiwanus*. This name was also cited by Takakuwa (1954), so Wang and Mauriès erred in listing *R. taiwanalis*.

33. ***Riukiaria uraensis*** (Wang, 1956)
Rhysolus uraensis Wang, 1956 (fig. 2): Wang 1958a, Hoffman 1980

Literature records: Wang (1956): 1 ♂, "Ayo mountain, 800 m sea level, Urai, Taipei, Taiwan", under rotten leaves, 2 Feb 1955, leg. Yü Chin-San.

Remarks: *R. taiwana* and *R. uraensis* need a revision, too, similarly to the species pair "*Rhysodesmus*" cohaesivus and "*R.*" *contiguus*.

Paradoxosomatidae

34. ***Aponedyopus maculatus*** Takakuwa, 1942
Aponedyopus maculatus Takakuwa, 1942c (figs 3-4): Takakuwa 1954 (figs 49-50), Chamberlin and Wang 1953, Wang 1958b,

Wang 1963c, Jeekel 1968 (as *Aponedyopus maculatus* Takakuwa, 1954!)

Literature records: Chamberlin and Wang (1953): 4 ♂, "Arisan, Formosa", 1 Dec 1923, leg. Takahashi. — Wang (1958b): 1 ♀, "Yusan", Aug. — Wang (1963c): 1 ♂, 1 ♀, "Lan Yu (Botel Tobago)" [Orchid Island], July 1960, leg. Tchaw-ren Chen.

Remarks: Original described from Ikao, Japan (Takakuwa 1942c), Chamberlin and Wang (1953) and Wang (1963c) reported *A. maculatus* from Taiwan, and from Lan Yu (Orchid) Island, which zoogeographically belongs to the Philippines although it lies less than 60 km southeast of Taiwan.

35. ***Aponedyopus montanus*** Verhoeff, 1939
Aponedyopus montanus Verhoeff, 1939 (figs 5-7): Takakuwa 1942c, 1954 (fig. 48)
Nedyopus reesi Wang, 1957b (fig. 2): Wang 1958b **NEW SYNONYMY**!
Nedyopus montanus jeanae Wang, 1957c (fig. 8) **NEW SYNONYMY**!
Nedyopus jeanae Wang, 1958: Wang 1958b
Aponedyopus montanus jeanae (Wang, 1958): Wang 1963c
Aponedyopus jeanae, Aponedyopus montanus: Jeekel 1968

Literature records: Wang (1957b) as *Nedyopus reesi*: 1 ♂, 1 ♀, "Urai, Taipei; Ali San, Tsu San, Tai San and Yu San, Kia-Yi". — 3 ♀♀, "Ali San ranges, Chia-Yi, 10-13 Aug 1957, leg. Yu-hsi M. Wang. — Wang (1957c) as *Nedyopus montanus jeanae*: 3 ♂♂, 11 ♀♀, "Urai, Taipei", 30 March 1957, leg. Jean C. C. Shieh. — Wang (1958b): 3 ♂♂, 17 ♀♀, "Urai", April, Oct. — 1 ♂, 4 ♀♀, "Alisan ranges", Aug. — Wang (1963c): 1 ♀, "Ta Ping Shan, Ilan", 25 July 1961, leg. Yu-hsi M. Wang.

New material: 1 ♂, 1 ♀, Taichung County, above Liyuan, 1950 m, 17 June 1997, leg. L. Ronkay and B. Herczig (HNHM). — 1 ♀, Nantou County, Meifeng, 24°06'N-121°12'E, 2,300 m, 5-6 Sept. 2003, leg. G. Csorba and Z. Korsós, No. 157 (HNHM).

Remarks: The new synonymies of these three species were established from gonopod illustrations, and from studying fresh material. The length and curve of the solenophore vary, depending on the orientation of the gonopod under the microscope. The synonymy of *N. montanus jeanae* was foreseen by Wang (1958b) by his statement that he could not decide the subspecific or specific status of "*jeanae*".

36. ***Asiomorpha coarctata*** (De Saussure, 1860)
Polydesmus coarctata De Saussure, 1860: Pocock 1895
Polydesmus spinalis Eschscholtz, 1831: "*nomen oblitum*" Shelley and Lehtinen 1998
Orthomorpha coarctata: Attems 1898 (fig. 85), Attems 1937 (fig. 75)
Asiomorpha coarctata: Shelley *et al*. 1998 (figs 4-6)

Literature records: Wang (1956): 154 ♂♂ & ♀♀, "Hua-Lien", Jan-Feb 1955, leg. Tsai Chu-Fa and Ho Ming-Chuan. — 1 ♀, "Taipei", 28 March 1956, leg. Chu Pao-Ching. — 1 ♂, 2 ♀♀, "University Farm", 4 April 1955, leg. Tsai Chia Tai. — Wang (1957a): 5 ♂♂, 4 ♀♀, "Chao-chow, Ping-tung", 25 Sept 1956, leg. Kien Shih-Ming. — 13 ♂♂, 37 ♀♀, 15 juvs, "Changhua", 20 July 1956, leg. Yang Chang-Tai. — 2 ♀♀, "Taipei", 28 Sept 1956, leg. Chu Kwang-Yu. — 2 ♀♀, "Campus National Taiwan University" [Taipei], 23 July 1956, leg. An Ron. — Wang (1958b): 9 ♂♂, 44 ♀♀, "Ilan, Chio-chi, Nan Tou, Puri, Wu Szae, Sun-Moon Lake, Taichung and Kao Yung", Jan, May, Aug & Sept. — Wang (1963c): 1 ♀, "Loh Chang Li", 3 Feb 1960, leg. Yu-hsi M. Wang. — 6 ♀♀, "Yan Ming-Shan", 28 Jan 1961, leg. Y. H. Wang. — 1 ♂, "National Taiwan University" [Taipei], 22 May 1961. — 3 ♂♂, 23 ♀♀, 1 juv., "Ta Ping Shan", 22 July 1961, leg. Wang. — 1 ♀, "Taipei", July, leg. Tai. — 4 ♀♀, "Zeh-Tan", 12 Aug 1961.

Remarks: *Asiomorpha coarctata* is a widespread, synanthropic species, that occurs throughout Taiwan.

37. ***Cawjeekelia kanoi*** (Takakuwa, 1943)
Kronopolites kanoi Takakuwa, 1943 (fig. 1): Takakuwa 1954 (figs 24-26)
"*Kronopolites*" kanoi: Jeekel 1968
Cawjeekelia kanoi: Jeekel 1988, Golovatch 1995

Literature record: Takakuwa (1943): "Musha, Taiwan".

New material: 1 ♂, Nantou County, Tzuchung, 23 29'19"N-120 51'13"E, 2,375 m, 23 Nov. 2002, leg. L. Ronkay & O. Merkl, No. 49 (HNHM).

Remarks: Jeekel (1968) mentioned that this

species cannot belong to *Kronopolites* and later (1988) found that it is congeneric with the Korean species *Cawjeekelia koreana* Golovatch, 1980, for which Golovatch established *Cawjeekelia* in his honour. It was recollected in Taiwan, and the gonopod illustration and characteristic body colouration (almost entirely black body rings with strikingly pale yellow, quite long legs) ensured an accurate identification.

38. ***Cawjeekelia nordenskioeldi*** (Attems, 1909)
Strongylosoma nordenskiöldi Attems, 1909 (figs 22-25, 80)
Orthomorpha nordenskjoeldi: Attems 1914
Orthomorpha nordenskiöldi: Attems 1937 (figs 108-109), Takakuwa 1954 (fig. 39)
Oxidus nordenskioldi: Wang 1955a
"*Orthomorpha*" *nordenskioeldi*: Jeekel 1968
Cawjeekelia nordenskioeldi: Jeekel 1988, Golovatch 1995

Literature record: Wang (1955a): 1 ♀, "Hsin-Tien", 21 Dec 1953, leg. Tsai Chu-Fa.

Remarks: The remarks to the previous species apply almost exactly *C. nordenskioeldi*. Jeekel (1968) noticed that it represents an "unnamed genus" and (1988) assigned it to *Cawjeekelia*. It was described by Attems (1909) from Japan ("Kiu Siu, Mizo"), and Wang (1955a) reported a female from Taiwan.

39. ***Chamberlinius hualienensis*** Wang, 1956
Chamberlinius haulienensis (sic!) Wang, 1956 (fig. 1)
Chamberlinius hualiensis (sic!) Wang, 1956: Wang 1958a
Chamberlinius hualienensis: Wang 1958b, Wang 1963c
Chamberlinius hauliensis (sic!) Wang, 1956: Jeekel 1968, Jeekel 1970
Chamberlinius hualienensis: Hoffman 1973 (figs 19-22)

Literature records: Wang (1956): 8 ♂♂, 16 ♀♀, "Milan, Tso-Kiang, Taruko, Kail-Wan, Hualien". — Wang (1958b): 2 ♂♂, 1 ♀, 3 juvs, "Su-Ao, Ilan", May — 4 ♂♂, 6 ♀♀, "Ta-Ru-Ko", Jan. — Wang (1963c): 1 ♂, 2 ♀♀, "Ta Ping Shan, Ilan", 22 July 1961.

New material: 1 ♀, Taitung County, Hsiangyang, 2,200 m, 13-14 June 1997, leg. L. Ronkay and B. Herczig (HNHM). — 1 ♂, 3 ♀♀, 1 juv., Sungkang, Meimu, Meifeng, 2200 m, 30 Nov. 1998, leg Gy. Fábián and Z. Korsós (HNHM). — 1 ♂, 1 ♀, Tienshiang, Bailyang Trail, 4 Dec. 1998, leg. Gy. Fábián and Z. Korsós (HNHM). — 2 ♂♂, 1 ♀, Taroko National Park, Visitor Centre, 50 m, 24°09.51'N-121°37.33'E, 9 Dec. 1998, leg. Gy. Fábián and Z. Korsós (HNHM). — 2 ♂♂, 2 ♀♀, Nantou County, Meifeng, 24°06'N-121°12'E, 2300 m, 5-6 Sept. 2003, leg. G. Csorba and Z. Korsós, No. 157 (HNHM).

Remarks: Although the original material of Wang is untraceable, *C. hualienensis* was identified by its first gonopod drawing, then redescribed and fully illustrated by Hoffman (1973). From the literature and recent collections the milliped is common in Taiwan, though endemic to the inland forests.

40. ***Chamberlinius piceofasciatus*** (Gressitt, 1941)
Prinopeltis piceofasciatus Gressitt, 1941 (no fig.): Jeekel 1968
Chamberlinius piceofasciatus: Hoffman 1973 (figs 23-27)

Literature record: Gressitt (1941): 1 ♂, 1 ♀, "Arisan, alt. 2,000 metres, central Formosa", 24 May 1934, leg. J. L. Gressitt (CAS).

New material: 1 ♂, Anma-Shan, Taehsuehshan Forest Recreation Area, 2,900 m, 24°16.66'N-121°01.50'E, 2-3 Dec. 1998, leg. Gy. Fábián and Z. Korsós (HNHM).

Remarks: Jeekel (1968) believed that this species "cannot be referred to any of the recognized generic categories". The type specimens (incl. a male, CAS) were illustrated and redescribed by Hoffman (1973); recently collected specimens agree with Hoffman's description.

41. ***Chamberlinius shengmui*** Wang, 1957
Chamberlinius shengmui Wang, 1957b (fig. 4), Wang 1958b (as *Chamberlinius shengmui* Wang, 1958), Jeekel 1968, Hoffman 1973

Literature records: Wang (1957b): 5 ♂♂, 4 ♀♀, "Ali San ranges, Chia-Yi", 13. Aug. 1957, leg. Yuhsi M. Wang. — Wang (1958b): 5 ♂♂, 4 ♀♀, "Alisan", Aug.

Remarks: Unlike the two previous species in the lack of proper illustrations, the status of this species remain uncertain. I can only hope that the single, rather schematic gonopod drawing by Wang (1957b) will be sufficient for recognition should new material be encountered in the future.

42. ***Chondromorpha xanthotricha*** Attems, 1898
Chondromorpha xanthotricha Attems, 1898: Shelley & Lehtinen 1998 (figs 10-12), Shelley 2000, Chen and Chang 2002. **NEW RECORD**

Remarks: A common, widespread circumtropical species, properly illustrated by Shelley and Lehtinen (1998). *C. xanthotricha* has not been reported from Taiwan, but specimens were seen in the collection of Ms. Chao-Chun Chen (Kaohsiung).

43. ***Helicorthomorpha holstii*** (Pocock, 1895)
Strongylosoma holstii Pocock, 1895 (fig. 3)
Helicorthomorpha holstii: Attems 1914, Attems 1937, Jeekel 1968, Jeekel 1980 (figs 12-14), Shelley and Lehtinen 1998 (figs 22-24)
Helicorhabdosoma holstii: Brölemann 1916
Chinosoma hodites Chamberlin, 1923: Jeekel 1968
Kochliopus trivittatus Verhoeff, 1933: Jeekel 1968

Literature records: Wang (1955a): 1 ♀, "Hsin-Tien, Taipei", 21 Dec 1953, leg. Tsai Chu-Fa. — Wang (1958b): 1 ♂, "Lu San, Nan Tou", Aug.

New material: 3 ♂♂, 4 ♀♀, Hualien County, Hsipan, Taroko National Park, 270 m, 5 Apr. 1997, leg. G. Csorba and L. Ronkay (HNHM). — 1 ♂, Taitung County, Chihpen, 390 m, 10 June 1997, leg. L. Ronkay and B. Herczig (HNHM). — Pintung County, 10 km E of Mutan, 400 m, 13-14 June 1997, leg. L. Ronkay and B. Herczig (HNHM). — 1 ♂, Hualien County, Rei Suei, 1 Sep. 2003, leg. G. Csorba and Z. Korsós, No. 125 (HNHM).

Remarks: Pocock (1895) described this species from Japan (Okinawa = "Great Loo-Choo"), which is believed to be the source area of this widespread, synanthropic species.

44. ***Helicorthomorpha orthogona*** (Silvestri, 1898)
Eustrongylosoma orthomorpha Silvestri, 1898 (figs 1-2)
Strongylosoma philippina Chamberlin, 1921
Orthomorpha viatoria Chamberlin, 1924
Orthomorpha hodites Chamberlin, 1941
Oxidius (V.) (sic!) *kosingai* Wang, 1958b (fig. 1)
Oxidius (Varyomorpha) (sic!) *kosingai* Wang, 1958: Wang 1963c
Helicorthomorpha kosingai (Wang, 1958): Jeekel 1968
Helicorthomorpha orthogona (Silvestri, 1898): Jeekel 1968, Jeekel 1980, Wang and Mauriés 1996

Literature records: Wang (1958b): 1 ♂, "Kao-Yung, Southern Taiwan", 14 September 1957, leg. Chao-Ren Kosinga (Chen). — Wang (1963c): 1 ♀, "Kao Hsiung" [Kaohsiung], July, leg. Tchaw-ren Chen.

Remarks: The synonymy of Wang's "*Oxidius*" (then *Varyomorpha*) *kosingai* was already established by Jeekel (1968, 1980).

45. ***Kronopolites swinhoei*** (Pocock, 1895)
Strongylosoma swinhoei Pocock, 1895
Kansupus (Parakansupus) formosanus Verhoeff, 1939
Kronopolites formosanus: Chamberlin and Wang 1953, Takakuwa 1954 (fig. 23), Hoffman 1963
Kronopolites swinhoei: Attems 1936 (fig. 44), Hoffman 1963 (figs 1-2), Wang and Mauriès 1996
Kronopolites ralphi Wang, 1957b (fig. 3): Hoffman 1963, Jeekel 1968, Wang 1958b (as *Kronopolites ralphi* Wang, 1958)

Literature records: Chamberlin and Wang (1953): 2 ♂♂, "Baikei, Formosa", 23 May 1924, leg. Takahashi. — Wang (1957b): 4 ♂♂, 6 ♀♀, "Shirin, Taipei", leg. Wang Ching-Siang, 7 Feb 1957. — Wang (1958b): 4 ♂♂, 6 ♀♀, "Shirin, Taipei", Feb.

Remarks: Hoffman (1963) and Jeekel (1968) established the synonymies of *K. formosanus* Verhoeff, 1939 and *K. ralphi* Wang, 1957 with *K. swinhoei*. Hence, although it was originally described from China (by Pocock 1895: "Chee Foo"), there are valid records from Taiwan. Wang's drawing (1957b) is uninformative, but proper gonopod illustration and a redescription of the species were provided by Hoffman (1963).

46. ***Nedyopus patrioticus*** (Attems, 1898)
Strongylosoma patrioticum Attems, 1898
Nedyopus patrioticus: Attems, 1914, Takakuwa 1954, Wang 1955a
Nedyopus cingulatus (Attems, 1898): Takakuwa 1954, Wang 1955a, Attems 1937 — **NEW SYNONYMY**!

Literature record: Wang (1955a): 3 ♂♂, 2 ♀♀,

"Hsin-Tien, Taipei", leg. Chu Pao-Ching and Jean Jean Shieh.

Remarks: This species has never been illustrated; even Attems (1937) said when he described it from Japan, that "Die Gonopoden gleichen ganz denen von *N. cingulatus*." Wang (1955a) followed his idea by saying "I think that *Nedyopus cingulatus* (Attems) is probably of the same species of this one, *N. patrioticus*, because their gonopods are similar to each other and they are able to be interbred, thus, they are synonyms." Because *N. patrioticus* was described in the same paper some 20 pages before *N. cingulatus*, the latter should be considered — and is here formally established — as a junior synonym. (A recent paper in press by Chen Chao-Chun, S.I. Golovatch and Chang Hseuh-Wen: "The millipede tribe Nedyopini, with special reference to the fauna of Taiwan" will substantially contribute to the clarification of the *Nedyopus* species listed here.)

47. ***Orthomorphella pekuensis*** (Karsch, 1881)
Polydesmus (Paradesmus) pekuensis Karsch, 1881: Hoffman 1963
Orthomorpha pekuensis (Karsch, 1881): Attems 1898, Attems 1937 (fig. 102)
Oxidus circofera (Verhoeff, 1931): Wang 1957a
Oxidius (K.) circofera Verhoeff, 1931: Wang 1958b, Wang 1963c
Oxidius (K.) pekuensis (sic!) Karsch, 1881: Wang 1963c
Orthomorpha circofera Verhoeff, 1931: Hoffman 1963, Jeekel 1968
Orthomorphella pekuensis (Karsch, 1881): Hoffman 1963, Hoffman 1973a, Jeekel 1988 Hoffman in litt. 2003
Chamberlinius pekuensis: Jeekel 1968

Literature records: Wang (1957a): 2 ♀♀, "Changhua", 20 July 1956, leg. Yang Chang-Tai. — 2 ♂♂, 7 ♀♀, same locality, 24 Aug 1956, leg. Yang. — Wang (1958b): 2 ♀♀, "Kao Yunf", Sept; "Blue Lake, Taipei", May. — Wang (1963c): 1 ♂, "Yin-Ko", 3 Jan 1961, leg. Yu-hsi M. Wang. — 3 ♂♂, 1 ♀, "Sae Tou, Chang Hua", 11 June 1960, leg. H. T. Teng.

Remarks: This common, widespread synanthropic species was recorded from Taiwan under two different names by Wang (1957a, 1958b, 1963c); however, *O. circofera* was recognized as a junior synonym of *O. pekuensis* by (Hoffman 1963). Later, only its generic allocation was somewhat debated, but both Jeekel (1988) and Hoffman (in litt. 2003) agreed that it is not referrable to *Chamberlinius*, and for *pekuensis, Orthomorphella* is the proper genus.

48. ***Oxidus gracilis*** (C. L. Koch, 1847)
Fontaria gracilis C. L. Koch, 1847
Paradesmus gracilis: Tömösváry 1882
Orthomorpha gracilis: Pocock 1895
Oxidus gracilis: Cook 1914, Schubart 1934 (fig. 283), Attems 1937 (fig. 101), Blower 1985 (fig. 72), Golovatch & Enghoff 1993 (figs 12-14, 115-116), Shelley *et al*. 1998, Shelley and Lehtinen 1999 (figs 1-3)

Literature records: Chamberlin & Wang (1953): 4 ♀♀, "Formosa", Sept 1933, leg. Takakuwa. — 1 ♂, 1 ♀, "Baikei, Formosa", 23 May 1924, leg. Takahashi. — Wang (1955a): 1 ♂, 4 ♀♀, "Taipei", 8 May 1953, leg. Kwang-Yu Chu. — Wang (1958b): 22 ♂♂, 71 ♀♀, "Ilan, Urai, Taipei, Ta Ru Kuo, Alisan and Kwan Tze Ling", Jan, Feb, April, May and Aug.

Remarks: A widespread, synanthropic species whose distribution is expanding, *O. gracilis* occurs throughout the tropical belt and has even been introduced to temperate Palaearctic habitats. Its gonopods have been illustrated many times, providing opportunities for comparisons in different views, different methods (incl. scanning microscopy), and different drawing styles.

49. ***Varyomorpha hsientienensis*** (Wang, 1957)
Oxidus (Varyomorpha) hsientienensis Wang, 1957b (fig 1)
Varyomorpha hsientienensis (Wang, 1957): Jeekel 1968
Oxidius (V.) hsientienensis Wang, 1958 (sic!): Wang 1958b

Literature records: Wang (1957b): 3 ♂♂, 2 ♀♀, "Hsientien, fairy Temple, Taipei", 21 Dec 1953, leg. Jean Jean Shieh and Pao-ching Chu. — Wang (1958b): 3 ♂♂, 3 ♀♀, "Hsientien, Urai", March, Apr.

Remarks: This species was described by Wang (1957) whose collection is lost. However, his drawing is sufficiently detailed to maintain the specific status for this species.

50. ***Varyomorpha pectinata*** (Wang, 1957)
Oxidus (Varyomorpha) pectinatus Wang, 1957c (fig. 7)

Oxidius (V.) Pectinatus Wang, 1958 (sic!): Wang 1958b
Varyomorpha pectinata (Wang, 1957): Jeekel 1968

Literature records: Wang (1957c): 1 ♂, "Urai, Taipei", 12 March 1957, leg. Yu-hsi M. Wang. — Wang (1958b): 1 ♂, "Urai", March.

New material: 1 ♂, 1 ♀, Ilan County, Ming Chyr, Forest Recreation Area, 1.297 m, 24°39.21'N-121°28.19'E, 28 Nov. 1998, leg. Gy. Fábián & Z. Korsós (HNHM). — 1 ♀ , Anma-Shan, Taehsuehshan Forest Recreation Area, 2,900 m, 24°16.66'N-121°01.50'E, 2 Dec. 1998, leg. Gy. Fábián & Z. Korsós (HNHM). — 1 ♂, Taroko National Park, Visitor Centre, 50 m, 24°09.51'N-121°37.33'E, 9 Dec. 1998, leg. Gy. Fábián and Z. Korsós (HNHM).

Remarks: The new samples could be safely assigned to this species, but without material of the previous species, the distinctions between them cannot be adequately stated.

Pyrgodesmidae

51. ***Thelodesmus armatus*** Miyosi, 1951
Thelodesmus armatus Miyosi, 1951 (fig. 1), Wang 1958b (as *Thelodesmus armatus* Miyosi, 1950), Wang and Mauriès 1996

Literature record: Wang (1958b): 1 ♂, "Urai", 31 March 1957.

Remarks: The only Taiwanese representative of the Pyrgodesmidae, *T. armatus* was described from Japan ("Yosihuzi-Mura, Kaminada-Mati (Ehimé-Ken)") and later recorded from the region of Taipei based on one male.

Haplodesmidae

52. ***Prosopodesmus jacobsoni*** Silvestri, 1910
Prosopodesmus jacobsoni jacobsoni Silvestri, 1910 (figs 6-7)
Prosopodesmus jacobsoni: Attems 1940 (figs 418-421), Jeekel 1970, Hoffman 1980, Blower & Rundle 1980 (figs 4-5), Enghoff 1993 (fig. 4), Shelley and Golovatch 2000

Literature record: Wang (1957a): 3 ♂♂, 6 ♀♀, "Kao-Yung", 21 Sept 1956, leg. Cheng Chao-Seng.

Remarks: *Prosopodesmus jacobsoni* is a widespread, tropical, synanthropic species which has been discussed and illustrated properly in a number of recent papers.

Cryptodesmidae

53. ***Niponia nodulosa*** Verhoeff, 1931
Niponia nodulosa Verhoeff, 1931 (figs 46-55), Jeekel 1971 (see also Hoffman 1973b), Shinohara 1999
Niponiella nodulosa: Verhoeff 1936b (figs 1-3)
Onomatoplanus nodulosus (Verhoeff, 1931): Attems 1940 (fig. 309), Wang 1955a, Takakuwa 1954 (133-135)

Literature record: Wang (1955a): 1 ♂, "Tzu-Nan Palace, Taipei", 3 April 1954.

Remarks: Based on the three males collected by Y. Takakuwa in Japan, Verhoeff (1931) erected *Niponia* for this species. He later (Verhoeff 1936b), erroneously thinking that the name was preoccupied, proposed *Niponiella*, but Jeekel (1971) demonstrated that *Niponia* was in fact available.

54. ***Niponia simplexus*** (Wang, 1957)
Onomatoplanus simplexus Wang, 1957c (fig. 9), Wang 1958b
Niponia simplexus (Wang, 1957): Jeekel 1971 (Hoffman 1973b)

Literature records: Wang (1957c): 2 ♂♂, 4 ♀♀, "Urai, Taipei", 12 March 1957, leg. Yu-hsi M. Wang. — Wang (1958b): 2 ♂♂, 5 ♀♀, "Urai", March, Oct.

Remarks: In contrary to the previous species, *N. simplexus* is endemic to Taiwan. However, the gonopod drawings of both Verhoeff (1936b) and Wang (1957c) do not clearly show specific differences, and without fresh material, it is difficult to say anything about the statuses of the species.

Polydesmidae

55. ***Epanerchodus orientalis*** Attems, 1901
Epanerchodus orientalis orientalis Attems, 1901: Wang 1956, Wang 1963c
Epanerchodus takakuwai Verhoeff, 1931
Epanerchodus orientalis takakuwai Verhoeff, 1931: Verhoeff 1936 (fig. 14), Attems 1937, Wang 1958b
Epanerchodus orientalis: Attems 1937 (figs 208-209)
Epanerchodus orientalis orientalis Attems, 1901:

Literature records: Wang (1956): 1 ♀, "Sze Tou Mountain, Hsin-Chu", 6 May 1956, leg. Tasi Chu-Fa. — Wang (1958b): 1 ♂, 7 ♀♀, "Urai, Tah-

shan, Ali Shan and Kao Yung", March, Aug, Sept 1958. — Wang (1963c): 3 ♂♂, 12 ♀♀, "Ta Ping Shan, Ilan", 22 July 1961, leg. Yu-hsi M. Wang.

Remarks: Attems (1901) described the nominal form of this species from Japan, and he put *E. takakuwai* Verhoeff, 1931 (also from Japan) under it as a subspecies.

56. ***Nipponesmus shirinensis*** (Chamberlin et Wang, 1953)
Nipponesmus shirinensis Chamberlin et Wang, 1953 (fig. 2): Golovatch 1991
Epanerchodus shirinensis: Hoffman 1980

Literature record: Chamberlin and Wang (1953): 1 ♂, "Shirin, Formosa", Aug 1923, leg. R. Takahashi.

New material: 1 ♂, 2 ♀♀, Nantou County, Rinnei Nature Conservation Area, between Meifeng and Tsuifeng, 2,100 m, 16 Nov. 2002, leg. L. Ronkay L. and O. Merkl, No. 39 (HNHM).

Remarks: Based solely on gonopod morphology, Golovatch (1991) resurrected the genus *Nipponesmus* for *shirinensis* and the anatomically similar *"Polydesmus" tangonis* Murakami, 1973. He only considered *N. shirinensis* occurring in Taiwan; freshly collected material will resolve the true number of components.

Species to be deleted from the Taiwanese list

POLYDESMIDA

Paradoxosomatidae

"***Habrodesmus***" ***inexpectatus*** Attems, 1944
Habrodesmus inexpectatus Attems, 1944 (figs 30-31)
"*Habrodesmus*" *inexpectatus*: Jeekel 1968

Remarks: Jeekel (1968) listed this species as belonging to an "unnamed genus? close to *Aponedyopus*". Originally described from "Japan, Takao", *H. inexpectatus* appears with a questionmark in the "Millipedes of Taiwan" section of Wang's "Wallacea—paper" (1964). Its inclusion is puzzling because there are no records whatsoever from Taiwan; *H. inexpectatus* definitely is not a component of the Taiwanese fauna.

Orthomorpha bisulcata Pocock, 1895
Orthomorpha bisulcata Pocock, 1895, Attems 1937, Wang 1957a, Wang 1964, Jeekel 1968, Golovatch 1997

Literature record: Wang (1957a): 1 ♀, "Chao-chow", 25 Sept 1956, leg. Kien.

Remarks: Although Golovatch (1997) included this species in his key to *Orthomorpha* (in the *karschi*-group), he also mentioned its status as *incertae sedis*. This was formerly stated by Attems (1937: "unsichere Art"), and Jeekel (1968) noted that it "cannot be assigned to any of the recognized categories". The original description was based on a female from "Burma" (Pocock 1895), and the only Taiwanese record also (Wang 1957a) was also a female that he subsequently listed in his "Wallacea—paper" (Wang 1964). I believe that non-sexual morphological characters in the Paradoxosomatidae rarely suffice to securely identify a species, so *O. bisulcata* should be deleted from the Taiwanese millipede list. The only illustration appeared in Wang (1951, fig. 44), and is the "dorsum of the sixth somite, based upon the plesiotype." The statement by Wang (1964) that this species is "common to Philippines and Australia" seems an exaggeration.

Orthomorpha flavomarginata Gressitt, 1941
Orthomorpha flavomarginata Gressitt, 1941 (no figures), Jeekel 1968

Literature record: Gressitt (1941): 1 ♀, "Hori (Horisha), alt. 550 metres, central Formosa", 5 May 1934, leg. J. L. Gressitt (CAS).

Remarks: Jeekel (1968) could not refer this species to any of the recognized generic categories, and Golovatch (1997), when compiling the key to all (42) recognizable species of *Orthomorpha*, omitted this species. Because it was based on a single female, even a reexamination of the holotype may not be sufficient to establish the identity of *O. flavomarginata*; hence the species should be deleted from the list of Taiwanese millipedes.

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臺灣馬陸（倍足綱）之物種清單及參考書目

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本文羅列隸屬於倍足綱的十目、五十六種臺灣產馬陸，引用了所有相關的馬陸文獻紀錄，並包括一些新紀錄種。本文亦就晚近在臺灣採集的標本，首度報告了四目（Glomerida，Polyzoniida，Siphonocryptida及 Platydesmida）的代表物種，新紀錄種（包括四種未描述種）共計九種。臺灣的馬陸相由二十三個特有種、十七個東亞（East Asiatic）種和十一個人爲環境出現的（synanthropic）種所組成。本文設立的新同種異名（Synonymies）如下：*Glyphiulus tuberculatus* Verhoeff, 1936 = *G. granulatus* Gervais, 1847；*Aponedyopus jeanae* (Wang, 1957) and *A. reesi* (Wang, 1957) = *A. montanus* Verhoeff, 1939； *Nedyopus cingulatus* (Attems, 1898) = *N. patrioticus* (Attems, 1898)。"*Habrodesmus*" *inexpectatus* Attems, 1944，*Orthomorpha bisulcata* Pocock, 1895 及 *O. flavomarginata* Gressitt, 1941 三種則因爲分類地位及其出現尚不確定，故自臺灣馬陸的物種清單中除名。本文儘可能提及各種的描述及圖片，以促進臺灣馬陸相更進一步的研究，同時呈現了臺灣馬陸完整的參考書目。

關鍵詞：同種異名，物種清單，倍足綱，馬陸，採集地點。