On the collections of Indo-Australian Spirobolida (Diplopoda) kept in the Zoological Museum of the Moscow State University, Russia. 2. Two new species of Spirobolellus Pocock, 1894 from islands off Papua New Guinea and Australia

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ABSTRACT. Two new species of the millipede genus Spirobolellus are described: S. kurtschevae sp.n. from Lou Island, Admiralty Islands, Papua New Guinea, and S. tschernovi sp.n. from Norfolk Island, New South Wales, Australia. Because the telopodite of the anterior gonopods on the caudal face is swollen and directed not laterad, but mesad, S. tschernovi sp.n. seems to share this peculiar feature only with S. antipodarum (? = S. reischeki). This also allows us to confirm that Desmocricellus Attems, 1953 is a junior subjective synonym of Spirobolellus Pocock, 1894.

Introduction

This is the second contribution to the fauna of the millipede order Spirobolida of the southwestern Pacific based on the collections of the Zoological Museum of the Moscow State University (ZMUM), Russia. This time it is devoted to descriptions of two new species of Spirobolellus Pocock, 1894, Spirobolellidae, a diverse family that mainly occurs in the Indo-Australian region [Jeekel, 2001; Minelli, 2015]. Our previous contribution dealt with a new species of Pachybolidae from Papua New Guinea [Golovatch et al., 2020].

The samples were collected in 1976 and 1977 by Yuriy I. Chernov and Galina F. Kurcheva during two expeditions on board the research vessels “Kallisto” and “Dmitry Mendeleev”, respectively, to several islands and archipelagos in the southwestern Pacific.

The genus Spirobolellus presently comprises ca. 80 species occurring in the Indo-Pacific and Caribbean realms. The distribution ranges across Indonesia (Sumatra, Java, Sulawesi and the Moluccas), through Caroline Islands, Micronesia, to eastern Australia, Lord Howe Island, New Caledonia, Loyalty Islands and New

KEY WORDS: millipede, Spirobolellidae, taxonomy, new species, New Guinea, Australia.

КЛЮЧЕВЫЕ СЛОВА: двупарноногие многоножки, Spirobolellidae, таксономия, новый вид, Новая Гвинея, Австралия.
Zealand [Minelli, 2015], as well as from northern South America through Panama to the Greater Antilles. Only Jamaica in the West Indies remains a remarkable exception [Hoffman, 1999]. A global checklist and a distribution map of Spirobolellus, albeit neither very accurate, are available on https://www.gbif.org/species/1019087.

New Caledonia alone supports as many as 28 species of Spirobolellus, several of which are shared with Loyalty Islands [Carl, 1926], thus representing one of the most conspicuous examples of insular species swarms among millipedes [Enghoff, 1993; Minelli, 2015]. Carl [1926] compiled a key to most Spirobolellus spp. of the Indo-Pacific, while Hoffman [1999] provided a comprehensive catalogue of New World Spirobolellus occurring north of Panama. Jeekel’s [2001] catalogue of the Indo-Pacific Spirobolellus is nearly complete, supplemented since only by Jeekel [2002, 2003] who described further three new species from Australia. In addition, Johns [2010], when reviewing the fauna of New Zealand and probably based on a revision of pertinent type material, synonymized both S. drymophilus Chamberlin, 1920 and Desmocricellus reischeki Attems, 1953 with S. antipodarum (Newport, 1843)1. Therefore, Desmocricellus Attems, 1953 became still another genus added to Hoffman’s [1999] and Jeekel’s [2001] long rosters of the formal generic synonyms of Spirobolellus.

Describing new species of Spirobolellus is therefore fairly dangerous, especially because many original descriptions are very poor, in particular those by Chamberlin [1920a, b]. The latter author provided no illustrations at all for the numerous new genera and species he then described, causing them to be totally ignored by Carl [1926]. On the other hand, a few congeners tend to be widespread due to introduction, e.g. from Australia to California, U.S.A. [Chamberlin, 1920a]. In this paper, we dare describe two new species, how-

table Taxonomic part

**Family Spirobolellidae**

*Spirobolellus* Pocock, 1894

Type species: *Spirobolellus chrysodirus* Pocock, 1894, by original designation.

**DIAGNOSIS:** A genus of Spirobolellidae containing small- to medium-sized species (typically 15–90 mm long, but length usually 30–40 mm) with slender bodies, short and clavate antennae, nearly smooth, only finely striolate body rings, with small ozopores, but without scobinæ. anterior gonopods massive and relatively complex, their sternite a large and hyaline plate with a distinct antero-central elevation or process; coxite large, mostly simple, squarish and laterally swollen, apically supporting a similarly simple or more elaborated, stout or elongate, 1-segmented and move-
table telopodite with a thickened, sometimes ridge-like mesal margin. Posterior gonopods simple, connected basally with a small, weak and thin membranous sternite, each gonopod relatively small, blade-shaped, slightly curved mesad, with neither articulation between coxite and telopodite nor a ba-

sac chamber; a seminal groove, if traceable, with a distome-
sal opening.

**Included species:** >80 species [Hoffman, 1999; Jeekel, 2001, 2003; Johns, 2010], including *Spirobolellus kurtsevae* sp.n. and *S. tschernovi* sp.n.

**Spirobolellus kurtsevae** sp.n.

*Figs 1, 2, 4–7.*

**HOLOTYPE ♂ (ZMUM), Papua New Guinea, Admiralty Is-
lands, Lou Island, S2°24′, E147°21′, coconut plantation, 2.II.1977, G.F. Kurcheva leg.

**PARATYPES:** 2 ♀ (ZMUM), same data as holotype.

**NAME.** To honour the late Dr. Galina Fedorovna Kurche-
va, the collector.

**DIAGNOSIS.** Differs from all other species of *Spirobo-
lellus* in being one of the smallest congeners (10–15 mm long), devoid of a clear colour pattern, as well as by certain details of gonopodal structure: anterior gonopods featuring a high, squarish, apically bisinuate sternite nearly as high as a broad and simple telopodite, the latter bearing a relatively inconspicuous bulge directed laterad on caudal face; posterior gonopods with a broadened distal third and a subacumi-
tate tip (Figs 4–7).

**DESCRIPTION.** Holotype ♂ ca. 13.5 mm long and 1.0 mm wide, with 35p+1ap+T body segments. Smaller paratype ♀ ca. 10 mm long and 0.9 mm wide, with 28p+2ap+T body segments. Larger ♀ paratype ca. 16 mm long and 1.5 mm wide, with 34p+1ap+T body segments. Coloration uniform-
ly red-brown, pattern vague, slightly cingulate, sometimes also with an indistinct dark greyish line at ozopore level. Eye patches ovoid, dark brown (Figs 1, 2).

**Body slender, cylindrical, each segment distinctly con-
stricted only between meso- and prozonæ (Fig. 1). Postcole-
lum constriction faint (Fig. 2). Labrum with three middle teeth, a short axial suture, 3+3 supralabral and 4+5+4–5

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1 Johns [2010], in his endnote that advanced new synonymies, made several small mistakes. He slightly misspelled the name *S. antipodarum*, referring to it as *S. antipodarus*, which is incorrect because the end suffix *-arum* is *genitive plural* and remains unchanged regardless of gender. In addition, the correct year when Newport described his *S. antipodarum* was 1843, not 1844 [Newport, 1843]. The other species was misspelled as *S. drymophilus*, the correct spelling being *S. drymophilus* Chamberlin, 1920 [Chamberlin, 1920a].
labral setae. Epicranial suture fine, but visible. Antennae very short, clavate, setose, each located inside an evident cephalic hollow; antennomeres 1–5 subequal, 6th the largest, almost twice as long; 7th the shortest and ring-shaped, 8th with four apical sensilla (Figs 1, 2). Each eye patch composed of 21–25 ommatidia arranged in five or six subvertical rows, isthmus ca. 2x diameter of eye patch (Fig. 2).

Tegument bare, mostly smooth and shining (Figs 1, 2). Collum broadly and regularly rounded, clearly bordered both anteriorly and laterally (Fig. 1). Following segments/rings with evident constrictions solely between meso- and prozona, but only with faint transverse lines between meta- and mesozona (Fig. 1); metazonae very finely and mostly longitudinally striolate, clearly, densely and regularly striolate
Figs 4–7. *Spirobolellus kurtschevae* sp.n., ♀ holotype. 4, 5 — anterior gonopods, posterior and anterior views, respectively; 6 — left coxite and telopodite of anterior gonopods, mesoposterior view; 7 — left posterior gonopod, subcaudal view. Abbreviations: st — sternite; cx — coxite; te — telopodite; r — ridge; sg — seminal groove.

Рис. 4–7. *Spirobolellus kurtschevae* sp.n., гологен ♀. 4, 5 — передние гоноподы, соответственно сзади и спереди; 6 — левые коксит и телоподит передних гоноподов, одновременно изнутри и сзади; 7 — левый задний гонопод, почти сзади. Обозначения: st — стернит; cx — коксит; te — телоподит; r — гребень; sg — семенной канал.
ventrolaterally, striolations being increasingly sparse, irregular-confused and incomplete dorsolaterad, dorsum nearly smooth; striolations on meso- and, especially, prozoneae increasingly curved near metazonae, then subvertical anteriortly, likewise increasingly obliterate, finer and sparser dor-sad, luminate near stricture, but traceable also across dor-sum; ozopores small, inconspicuous, starting with segment 6, lying on line between meta- and mesozone (Figs 1, 2). Scobinaceae absent. Telson (Fig. 1) as usual, epiproct flat dorsoven-trally, very small and rounded caudally; paraprocts strongly and regularly convex, smooth, not bordered along caudal margin, with only a small and inconspicuous gutter between both valves; hypoproct roundly subtriangular, short. Only \( \delta \) segments 6 and 7 clearly swollen ventrally, \( \delta' \) being a complete ring due to a strong, slightly convex, ventral bridge in middle part, the bridge being ca. 1/3 as long as entire arms.

Legs short and slender, ca. 2/3 as long as midbody height, sparsely setose and each usually with a spine below and above claw; claw slightly curved ventrad, ca. 1/3 as long as tarsus; sole pads absent; only \( \delta \) legs 1 and 2 somewhat shorter; \( \delta' \) coxae 3–5 transversely squarish, each with an evident ventral swelling, this being the highest on coxa 3 and the lowest on coxa 5 (Fig. 2).

Gonopods (Figs 4–7) typical of Spirobolellus. Anterior gonopods with a broad, squarish, apically roundly bisinuate sternite (st), the latter being only barely shorter than both coxa (ex) and telopodite (te); ex and te subequal in size, rounded, te poorly swollen and drawn lateral on caudal face, with a characteristic, rounded, apical tooth extended proximad into a strong mesal ridge (r). Posterior gonopods simple, slender, blade-shaped; coxal part slightly undulate at mesal margin; seminal groove (sg) fully mesal, extended until a small, distal, mesal hook; middle third of gonopod narrowed, basal and distal thirds broadened, tip subtriangular, roundly acuminate.

REMARKS. This is the first Spirobolellus ever to be reported from the New Guinea region, formally the Admiralty Islands, Papua New Guinea. The geographically closest record belongs to \( S. \) chrysogrammus Pocock, 1894 from Kai Islands, Sulawesi and Ambon, Indonesia (Attens, 1914).

**Spirobolellus tschernovi** sp. n.

Figs 3, 8–14.

**HOLOTYPE** \( \delta \) (ZMUM), Australia, New South Wales, Phillip Island near Norfolk Island, 29º07′S, 167º57′E, rotten wood on supra-littoral stones, 30.XII.1976, Y.I. Chernov leg.

**PARATYPES:** 8 \( \delta \) \& \( \delta' \), 16 \( \delta \) (ZMUM), same data as holotype; 1 \( \delta \), 1 \( \delta' \), 3 juv. (ZMUM), Australia, New South Wales, Norfolk Island, 29º02′S, 167º57′E, mixed leaved and Araucaria forest, rotten wood, 31.XII.1976, Y.I. Chernov leg.

**NAME.** To honour the late Academician Yuriy Ivanovich Chernov, the collector.

**DIAGNOSIS.** Differs from most species of Spirobolellus by the relatively small body, the presence of a distinct colour pattern, and the telopodite of the anterior gonopods, much like in \( S. \) antipodarum (Newport, 1843), being double-headed, swollen and directed not laterad, but mesad on the caudal face. Differs from \( S. \) antipodarum by the central process of the anterior gonopod sternite being regularly rounded (vs. slightly bisinuate), and the posterior gonopod clearly narrowed in the middle third (vs. nearly parallel-sided) (cf. Figs 3, 8–14 and 15–18).

**DESCRIPTION.** Holotype \( \delta \) ca. 16 mm long and 1.6 mm wide, with 38+1ap+T body segments. Adult paratypes ca. 18–21 mm long and 1.7–2.2 mm wide (\( \delta \), \( \delta' \)), with 36–42p+2–0ap+T body segments, mostly 38+2ap+T. \( \delta \) usually being a little smaller than \( \delta' \). Coloration mostly dark brown, often purplish; pattern usually distinct: antennae, legs, venter, two large paramedian stripes in dorsal quarter, as well as caudal margins of body segments narrowly cingu-late, all contrasting light yellowish grey against a generally dark background. Eye patches ovoid, dark brown to blackish (Fig. 3).

All characters as in \( S. \) kurtchewae sp. n., except as follows.

Anterior gonopods (Figs 8, 9, 11–13) with a subtriangular, regularly rounded, central process of sternite (st); coxite (ex) and telopodite (te) subequal, likewise rounded, te double-headed, clearly higher than st, its apical part bulged and directed mesad like a smaller basal part, mesal ridge (r) thick and evident. Posterior gonopods (Figs 10, 14) blade-shaped, distinctly expanded in basal and apical thirds, nar-rowed in middle one, with two small spikes marking a dis-tomesal opening of a vague seminal groove; tip broadly subtriangular.

**REMARK.** There is a “Spirobolellus norfolkensis Mauri-ès, 1980” among the Spirobolellus spp. listed on https://www.gbif.org/species/1019087, apparently also coming from Norfolk Island. However, this is a *nomen nudum*, the valid name being Spirobolellus tschernovi sp. n.

**Spirobolellus vs. Desmocricellus**

Newport (1843) described his *Spirostreptus antipodarum* Newport, 1843 very briefly from an unknown locality in North Island, New Zealand. The number of syntypes, all kept in the London Museum, remained and still remains unspecified [Newport, 1843, 1844a, b]. Karsch (1881) repeated the original description verbatim, including the statement that all specimens were immature, with only 30 body segments (vs. about 50 in the adults) and 1.5–2 inches long (= ca. 36–51 mm). Again without any additional information on the type series, but apparently upon its revision, Pocock [1894] transferred that “spirostreptid” species to the newly created genus *Spirobolellus*, order Spiroboli-da, while Johns [2010] synonymized *S. antipodarum* with both *S. drymophilus* Chamberlin, 1920 and *Desmocricellus reischeki* Attens, 1953, all from New Zealand.

Peter Johns revised the type series of *Desmocricellus reischeki*, housed in the NHMW, back in 1967 (Fig. 19). We have also re-examined it, this resulting in the following account.

**Spirostreptus reischeki** (Attens, 1953)

Figs 15–19.

*Desmocricellus reischeki* Attens, 1953: 185, figs 93–96.

**TYPE MATERIAL:** Syntypes (NHMW 2346–2348, 9354): anterior body parts of 2 \( \delta \) and 11 \( \delta' \), 28 middle body parts, several detached segments, 25 posterior body parts; 1\( \delta \) vial: 1 head and two segments (Fig. 15), dissected \( \delta \) segments 3–6 and 7–11, four middle parts; 2\( \delta' \) vial: 1 \( \delta' \) complete; 3\( \delta' \) vial: 6 \( \delta' \) anterior body parts, 1\( \delta' \) anterior body part; 4\( \delta' \) vial (NHMW 9354): anterior body part, dissected gonopods (Figs 16, 17).

**TYPE LOCALITY:** New Zealand, “aus morschem Holz”, leg. & don. Andreas Reischek.
Figs 8–10. **Spirobolellus tschernovi** sp.n., ♂ paratype. 8, 9 — anterior gonopods, anterior and posterior views, respectively; 10 — left posterior gonopod, subcaudal view. Abbreviations: st — sternite; cx — coxite; te — telopodite.

Рис. 8–10. **Spirobolellus tschernovi** sp.n., паратип ♂. 8, 9 — передние гоноподы, соответственно спереди и сзади; 10 — левый задний гонопод, почти сзади. Обозначения: st — стернит; cx — коксит; te — телоподит.

**ALCOHOL LABELS:** “Neuseeland 22/ Reischek/ aus morschem Holz”; “Desmocricellus/ reischeki Att. Type/ Neuseeland/ aus morschem Holz./ Reischek” (A); “Desmocricellus reischeki Attems 1953/ = Spirobolellus dryomophilus/ Chamberlin 1920/ det. P.M. Johns 27.X.67”; vial: “Lectotype ♂ Lectoparatype ♂/ P.M. Johns 27.X.1967”

**SLIDES:** slide (NHMW 2346): 2 gonopods, “Desmocricellus/ Neuseeland/ Reischek” (A), “Desmocricellus reischeki Att/ P.M. Johns. 27.X.1967/ A? LECTOPARATYPE/ B? LECTOTYPE”; slide (NHMW 2347): gonopods, “Desmocricellus/ reischeki/ Neuseeland” (A), “Desmocricellus/ reischeki/ Att./ LECTOPARATYPE/ P.M. Johns 27.X.1967”; slide (NHMW 2348): gnathochilarium
and nine legs, “Desmocricellus/ reischeki Neuseeland/ 1.–6.Bp Gnath” (A), “Desmocricellus/ reischeki Att/ LECTOPARATYPE/ P.M. Johns 27.X.1967”.

CURRENT STATUS: synonymized with both Spirobolellus antipodarum Newport, 1843 and S. drymophilus Chamberlin, 1920 [Johns, 2010]. Jeekel [2001: 17] slightly misspelled the name as “reischecki”.

DISCUSSION. Peter M. Johns studied the material in October 1967, labelled the specimens as Spirobolellus drymophilus Chamberlin, 1920 [Chamberlin, 1920b: 213–214], and designed a ♂ lectotype and a ♀ paralectotype. However, this designation has since never been formalized and it requires publication even though the species was immediately synonymized with S. drymophilus, later with S. antipodarum as well [Johns, 2010].

If the synonymy is correct, Desmocricellus becomes another generic synonym of Spirobolellus. Both the genus Desmocricellus Attems, 1953 and its sole species, D. reischeki Attems, 1953, were diagnosed by Attems [1953] as being distinct primarily by the presence of a deep mesal
These two species seem to be similarly black with two para-
median rows of light spots. Slight differences are observed
in the shape of the collum (ventrally subtriangular, vs. broadly
and regularly rounded), and of the central process of the
anterior gonopod sternite (bisinuate (Figs 16, 17), vs. trun-
cate). All useful information derived from Newport’s [1843]
original description of \textit{S. antipodarum} can be reduced to
the animals being brown, apparently devoid of a specific
colour pattern, and the collum triangular and subacute on
the sides. The types of both \textit{S. antipodarum} and \textit{S. drymophilus}
are currently inaccessible to us for study, although available
in the London Museum and the Museum of Comparative
Zoology at Harvard, Mass, U.S.A., respectively. Their revision
remains necessary to reconfirm the synonymies of Johns
[2010].

What remains beyond doubt is that both \textit{S. antipodarum} (?= \textit{S. reischeki}, ?= \textit{S. drymophilus}) and \textit{S. tscernovi} sp.n.
are very similar (see Diagnosis above), as they share double-
headed telopodites of the anterior gonopods which are swol-
len and directed not laterad, but mesad on the caudal face. Yet both are definitely different, *S. tschernovi* sp.n. being considerably smaller, also showing a broadly and regularly rounded apex of the anterior gonopod sternite and a medially narrowed posterior gonopod.

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**Compliance with ethical standards**

**Conflict of Interest:** The authors declare that they have no conflict of interest.

**Ethical approval:** No ethical issues were raised during our research.

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