

A new species and first record of a Toadbug
(Insecta: Heteroptera: Gelastocoridae) from New Caledonia
and zoogeography

Новый вид и первое указание Gelastocoridae
(Insecta: Heteroptera) из Новой Каледонии
с зоогеографическим анализом

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КЛЮЧЕВЫЕ СЛОВА. Heteroptera, Gelastocoridae, *Nerthra*, новый вид, Новая Каледония, зоогеография.

ABSTRACT. A new species of the toad bug, *Nerthra kerzhneri* sp.n. (Heteroptera: Gelastocoridae), is described from New Caledonia. The species is assigned to the *Nerthra rugosa* species-group. Illustrations of the morphology of the species are provided. This is the first record of the family from New Caledonia and the distribution of this species is discussed in a critique of the zoogeography of the genus in the Melanesian sub-region of the Australian zoogeographic region.

РЕЗЮМЕ. Описан новый вид *Nerthra kerzhneri* sp.n. (Heteroptera: Gelastocoridae) из Новой Каледонии. Вид отнесён к группе видов *Nerthra rugosa*. Приведены рисунки особенностей строения данного вида. Семейство Gelastocoridae впервые отмечается для Новой Каледонии. Распространение нового вида обсуждается в контексте биогеографии рода в Меланезийской подобласти Австралийской зоогеографической области.

Introduction

Toadbugs (Insecta: Gelastocoridae) are a distinctive family of flightless Heteroptera belonging to the infraorder Nepomorpha [Schuh & Slater, 1995; Andersen & Weir, 2004]. The majority of nepomorphan taxa are truly aquatic with specialized respiration. Gelastocoridae and Ochteridae in contrast are found often in riparian [Menke, 1979], and sometimes littoral habitats [Todd, 1955], with a few species in Australia occurring far from moist conditions, in desert environments [Cassis & Silveira, 2001: e.g. *Nerthra adspersa* (Stål) and *N. plauta* Todd]. Toadbugs are known to feed on a variety of small arthropods and are cryptozoic in their habits [Parsons, 1959; Cassis & Gross, 1995; Andersen & Weir, 2004].

Gelastocoridae are divided into two subfamilies, the Gelastocorinae and the Nerthrinae, each comprised of a single genus (*Gelastocoris* and *Nerthra* respectively). *Gelastocoris* is restricted to the Western Hemisphere, with the majority of species occurring in South America. *Nerthra* is composed of about 100 species [Cassis & Gross, 1995] and has a near cosmopolitan distribution, with centres of diversity in the Neotropical and Australian biogeographic regions. The genus is surprisingly absent from New Zealand, when one considers the presence of the family throughout all the remaining continental areas of Gondwana [Todd, 1955].

Todd [1955] divided *Nerthra* into eight informal species groups, each of which are mostly confined to a single zoogeographical region: *alaticollis* — Australia; *laticollis* — Australian region, including Melanesia; *elongata* — Australian region; *amplicollis*, *fuscipes*, and *raptoria* — Neotropical region; *stygica* — Nearctic region; *grandicollis* — Afrotropical, Oriental and Palearctic regions; and, *rugosa* — Australia + Oriental regions. Cassis & Silveira [2004] introduced an additional, monobasic species-group for the Western Australian endemic species, *N. tuberculata* (Montandon). Cassis and Silveira (in preparation) are currently reviewing the supraspecific classification of the Nerthrinae.

Nerthra is best represented in the Australian and Melanesian subregions of the Australian zoogeographic regions. The genus is relatively well documented in mainland Australia [Todd, 1960; Cassis & Silveira, 2001, 2002, 2004; Andersen & Weir, 2004]. The genus is also well-represented in Melanesia, from Papua New Guinea, through the eastern arc of islands stretching to Guadalcanal in the Solomon Islands. Previous to this study the Nerthrinae were not recorded east of the Solomon Islands, aside from a probable introduction of *N. macrothorax* (Montrouzier) in Tonga, which is more likely to be natively found in New Guinea.

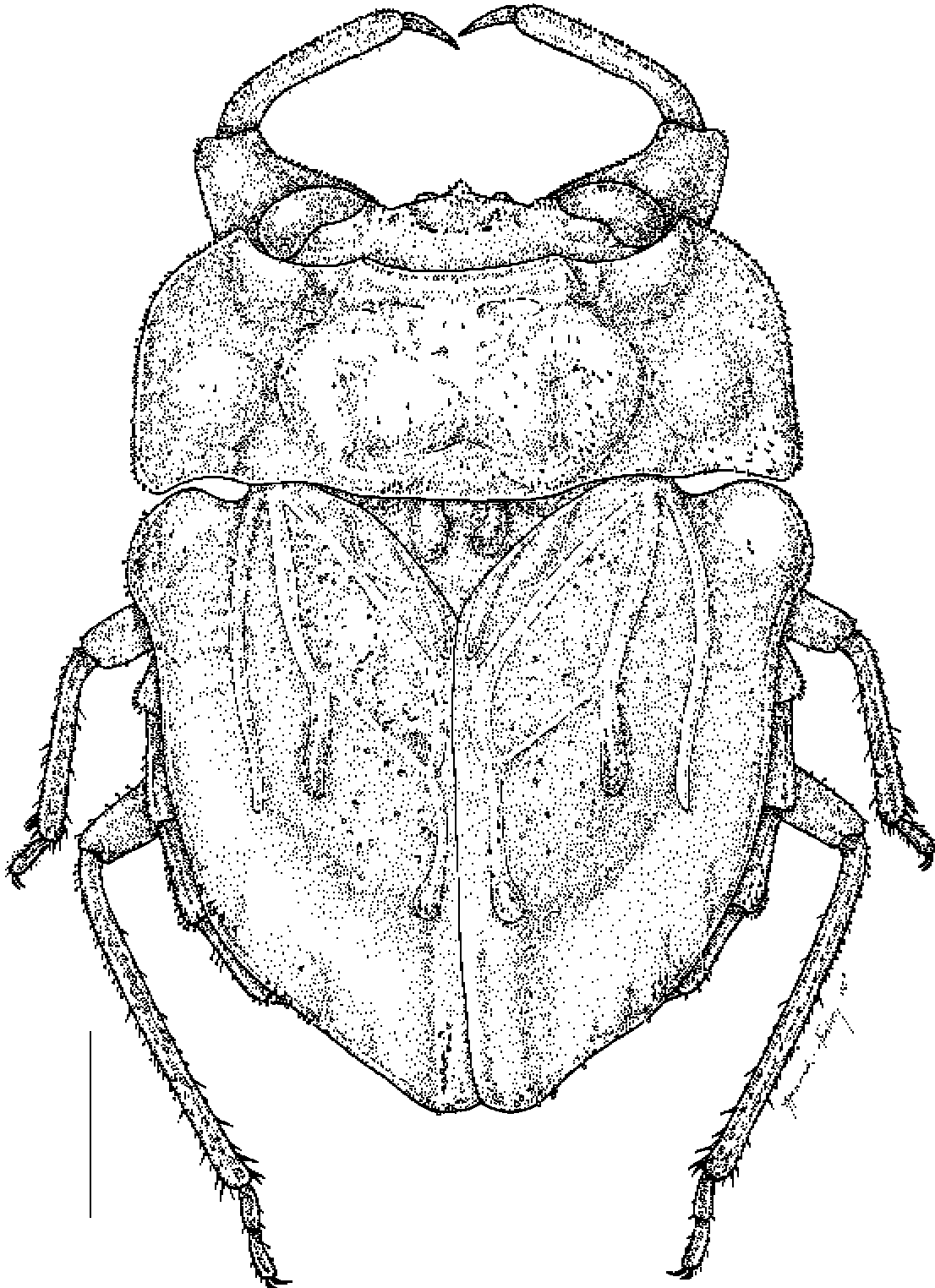


Fig. 1. Habitus of *Nerthra kerzhneri* sp.n. Scale bar — 1 mm

Рис. 1. Внешний вид *Nerthra kerzhneri* sp.n. Масштабная линейка — 1 мм

This work extends the range of *Nerthra* to New Caledonia, with the description of a new species based on three specimens collected by Dr Geoff Monteith of the Queensland Museum, from the Grande Terre and

Loyalty Islands of New Caledonia. New Caledonia is well-known as a critical area for biodiversity in terms of endemism and taxon richness [Mittermeier et al., 2004], and in addition, harbours taxa of ancient biogeographic

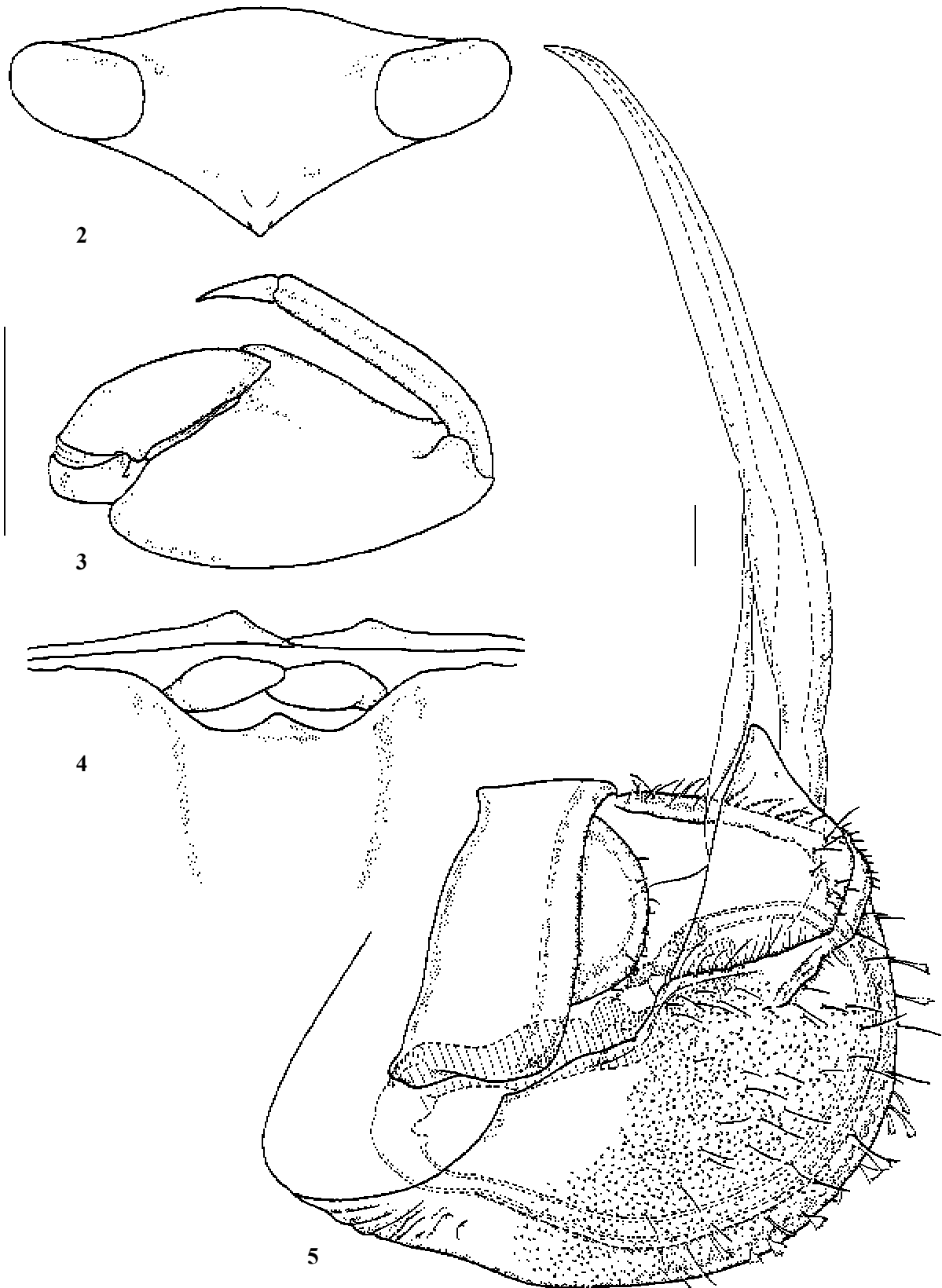


Figure 2–5. *Nertbra kerzhneri* sp.n.: 2 — head, anterior view; 3 — foreleg, lateral view; 4 — female abdominal sternite VIII, terminal view; 5 — male genitalia, lateral view. Scale bars — 1 mm

Рис. 2–5. *Nertbra kerzhneri* sp.n.: 2 — голова, вид спереди; 3 — передняя нога, сбоку; 4 — VIII стернит брюшка самки, сзади; 5 — гениталии самца, сбоку. Масштабная линейка — 1 мм

connections [Holloway, 1979; Cassis et al., 2003]. The distribution of the new species is discussed in a wider narrative of the zoogeography of the Nerthrinae in the Melanesian subregion.

We are delighted to dedicate this species to our friend and eminent colleague Professor Izya Kerzhner. Dr Kerzhner's contribution to Heteropterology are of global significance, with his work on the Nabidae and Miridae, and systematic cataloguing, providing the highest benchmarks in true bug research. We can safely predict that his work will endure well into the future.

Material and Methods

The description of the new species is based on three specimens, deposited in the following collections: Australian Museum (AM); Muséum national d'Histoire naturelle (MNHN); and the Queensland Museum (QM).

Specimens were examined using a Leica MZ16A stereomicroscope and illustrations were prepared using a camera lucida. The male genitalia were illustrated using a Leica DMB compound microscope.

Systematics

Nerthra kerzhneri Cassis & Silveira sp.n.

Figs 1–5

Holotype: NEW CALEDONIA: 1 ♂, 1043, Port Boise (G. Kanua), 22°21'S 166°58'E, 21 Nov[ember] 2001, GB Monteith, QM Berlesate, 20 metres, rainforest sieved litter (MNHN). Paratypes: ♀, same data as holotype (QM); LOYALTY ISLANDS: 1 ♂, 1026, Lifou, Xepenehe, 20°47'E 167°11'S, 6 December 2000, GB Monteith, QM Berlesate, 20 metres, sieved rainforest litter (AM).

DIAGNOSIS. This species is recognised by the following characters: small species, dorsum with scattered obovate setae; head with pair of rounded setate pads; apical tubercle present; lateral tubercles absent; pronotum subrectangulate, short, lateral margins relatively straight, slightly divergent posteriorly; scutellum greatly reduced, apex and lateral margins weakly swollen; forewing veins carinate; costal margins of forewings sinuate, base of embolium expanded, ovate; anterior margin of embolium excavate (space visible between posterior margin of pronotum and embolium); ventral margin of foretibiae scalloped; left paramere C-shaped, distally tapered; apex of aedeagus with membranous lobe; and, posterior margin of abdominal sternite VIII of female bisinuate, without processes, external female genitalia covered.

DESCRIPTION. *Colouration.* Dorsum yellowish-brown. Thoracic pleura and sterna alternating brown and yellow. Femora mostly yellow; tibiae and tarsi more browned. Abdominal venter yellow-brown. *Vestiture.* Dorsum with scattered obovate setae. *Structure.* Body small, males 5.30–5.46 mm, female 6.05 mm; ovoid; brachypterous (membrane shortened) (Fig. 1). Head: subtriangular, pitted and tuberculate, with pair of rounded setate pads (Fig. 2); apical tubercle present; lateral tubercles absent; eyes laterally oriented; ocelli absent. Pronotum subrectangulate, short, lateral margins relatively straight, strongly convergent anteriorly, slightly divergent posteriorly; median lobe deeply sculptured, not tricarinate; humeral angles rounded, subperpendicular; posteriorly sinuate, laterally excavate, revealing anterior margins of embolium. Scutellum greatly reduced, apex and lateral

margins weakly swollen, without prominent tumescences. Forewings with membrane reduced; fused medially; without claval lock; veins strongly carinate; costal margins of forewings sinuate; base of embolium expanded, ovate, widest point of forewings; anterior margin of embolium excavate. Legs: ventral margin of foretibiae scalloped; apex of foretrochanter expanded, digitiform, extended beyond basal margin of forefemora (Fig. 3); foretarsus short; foretibiae weakly arcuate; meso and metatibiae carinate. Abdomen: connexiva visible laterally beyond the costal margins of the forewings. Sinistrolateral process of male abdominal sternite VIII digitiform, well developed. Medial carina of abdominal sternite VIII absent. Male genitalia: left paramere elongate, not bifurcate, simple, weakly C-shaped, shaft grooved, with apex acute, weakly deflexed (Fig. 5). Aedeagus narrow, apex with membranous lobe (Fig. 5). Posterior margin of female abdominal sternite VIII bisinuate (Fig. 4), without lateral processes, external female genitalia covered.

DISTRIBUTION. Endemic to New Caledonia (Grande Terre and Loyalty Islands).

HABITAT. This species has been collected from sieved litter taken in wet rainforests.

REMARKS. *Nerthra kerzhneri* belongs to the *Nerthra rugosa* species-group, primarily because of the pair of clypeal pads, the distally expanded foretrochanters, and the bisinuate posterior margin of the female abdominal sternite VIII. This species-group previously comprised three species, *N. rugosa* (Desjardins), *N. macrothorax* and *N. nervosa* (Montandon), which together are distributed disjunctively across the Indo-Pacific [Todd, 1955, 1959, 1960, 1961], with outliers in the Western Hemisphere. The new species, *N. kerzhneri*, is distinctively smaller, less dorso-ventrally flattened, the pronotum is strongly sculptured, has a more prominent expansion of the embolium, and the anterior margin of the embolium is excavate (Fig. 1). The left paramere is also greatly elongate, and relatively more so than in other species of the *rugosa* species-group. The hemelytral veins are strongly carinate in both *N. kerzhneri* and *N. macrothorax*, and distinctly more so than in *N. rugosa*.

Zoogeography

Aside from the well-documented diversity of *Nerthra* in continental Australia [Cassis & Silveira, 2001, 2002, 2004; Andersen & Weir, 2004] the genus is also well-represented in parts of the Melanesian subregion of the Australian zoogeographic region [Todd, 1960, 1961; Table 1]. On the main island of Papua New Guinea, 17 species of *Nerthra* are recorded, and aside from a single species belonging to the *rugosa* species-group (*N. macrothorax*), belong to the *laticollis* species-group. Many of the species belonging to the *laticollis* species-group have putatively restricted distributions with seven species known from either the type locality or the type locality and a handful of adjacent locations (*cheesmanae* Todd, *hamata* Todd, *infecta* Todd, *improcera* Todd, *monticola* Todd, *petila* Todd and *robusta* Todd). Only a few species are known more broadly in Papua New Guinea [*ampliata* (Montandon), *conabilis* Todd, *hirta* Todd, *laticollis* Todd and *mixtella* Todd], with two species also occurring in Irian Jaya [*colaticollis* Todd and *mixta* (Montandon)]. Two species of the *laticollis* species-group are known from the Moluccas (*tenuistyla* Todd

Table 1: *Nerthra* species and species groups found in the Melanesian and Micronesian subregions of the Australian zoogeographic region.
 Таблица 1: Виды и группы видов рода *Nerthra*, отмеченные для Меланезийской и Микронезийской подобластей Австралийской зоогеографической области.

| <i>Nerthra</i> species-group | <i>Nerthra</i> species | Distribution |
|---------------------------------|---------------------------|---|
| | <i>ampliata</i> | North eastern New Guinea |
| | <i>cheesmanae</i> | North eastern New Guinea |
| | <i>colaticollis</i> | New Guinea, Waigeu Island, Irian Jaya, New Georgia, Solomon Islands |
| | <i>conabilis</i> | Central New Guinea |
| | <i>gurneyi</i> | Bougainville, Solomon Islands |
| | <i>hamata</i> | South east New Guinea |
| | <i>hiria</i> | Central & northern New Guinea, Waigeu Island |
| | <i>infecta</i> | North central New Guinea |
| | <i>improcera</i> | West central New Guinea |
| | <i>laticollis</i> | New Guinea, New Britain |
| | <i>lurida</i> | Sulawesi |
| <i>laticollis</i> | <i>macrostyla</i> | Bougainville, Kolombangara, New Georgia and Guadalcanal, Solomon Islands |
| | <i>mixta</i> | Eastern & northern New Guinea, Irian Jaya |
| | <i>mixtella</i> | New Guinea |
| | <i>monticola</i> | North central New Guinea |
| | <i>occidua</i> | Sulawesi |
| | <i>omani</i> | Bougainville, Guadalcanal, Solomon Is. |
| | <i>parallelus</i> | New Georgia, Solomon Is. |
| | <i>petila</i> | North central New Guinea |
| | <i>stevensi</i> | North eastern New Guinea |
| | <i>recta</i> | Northern & southern New Guinea |
| | <i>robusta</i> | North central, New Guinea |
| | <i>tenuistyla</i> | South Moluccas, Buru |
| | <i>toxopeusi</i> | Buru, Ceram, Halmahera |
| | <i>macrothorax</i> | New Guinea, Irian Jaya, Solomon Is., Tonga, Indonesia, Philippines, Japan, Comoro Islands |
| <i>rugosa</i> | <i>nervosa</i> | Mariana Is. |
| | <i>rugosa</i> | ? Australian region, Mauritius, Panama, USA |

and *toxopeusi* Todd), with only two species occurring further west (*lurida* Todd and *occidua* Todd — Sulawesi). The *laticollis* species-group is not represented in the island archipelagos of the Micronesian subregion. West of Wallace's Line *Nerthra* is only represented by species belonging to the *grandicollis* species-group, which is not represented in the Australian zoogeographic region. In the Eastern Melanesian Island biodiversity hotspot [Mittermeier et al., 2004], the *laticollis* species-group is represented by a single species in the Bismarck Archipelago (*laticollis* — New Britain) which is also known from the main island of Papua New Guinea. Further east, the *laticollis* species-group extends at most to the Solomon Islands, with three species occurring in Bougainville (*gurneyi* Todd, *macrostyla* Todd and *omani* Todd); *N. macrostyla* also occurs on the more eastern Solomon Islands of New Georgia, Kolombangara and Guadalcanal; *N. colaticollis* is known from New Georgia, as well as New Guinea; and, *N. omani* is also found on Guadalcanal. One species, *N. parallelus* Lansbury, is known only

from New Georgia in the Solomon Islands [Lansbury, 1988]. The *laticollis* species-group is not known from Vanuatu, the most eastern island archipelago of the Eastern Melanesian Islands biodiversity hotspot. Polhemus & Polhemus [1998] have discussed the biogeography of water bugs in the Melanesian subregion, postulating an island arc theory based on recent mobilistic earth history findings for the region. The *Nerthra* data as presented in this paper are too preliminary to test against this theory.

In this work, we document the first record of the genus *Nerthra* from New Caledonia, with *N. kerzhneri* being the eastern most naturally distributed species of *Nerthra* in the Eastern Hemisphere. This species conclusively belongs to the *rugosa* species-group which has a less well-defined distribution, and is known more broadly across the Eastern Hemisphere (Table 1). This is however, confounded by the likely adventitious distribution of *N. macrothorax* and *N. rugosa* which have highly disjunct distributions, mostly from coastal locations. Todd [1960] reported *N. macrothorax* from decaying

vegetation of dune inhabiting plants such as *Pandanus* and *Erythrina indica*, which implicates *N. macrothorax* as a long-distance disperser in recent times. The natural distribution of *N. rugosa* is also poorly understood, with the type locality obscure [Todd, 1960], but possibly from New Guinea [as 'N.G., N. Holl.']; see Todd, 1960 for fuller explanation]. The species has been recorded from Mauritius, Panama and the USA (Florida), and suggests a dispersion scenario analogous to that found for *N. macrothorax*. *N. nervosa*, which also belongs to the *rugosa* species-group is only known from the Mariana Islands.

The restricted distribution of *N. kerzhneri* to New Caledonia is on one hand, suggestive of a relictual distribution. This is a well known attribute for many taxa of the New Caledonia biota [e.g. Heteroptera: Miridae: *Austrovannius* — Cassis et al., 2003; Grandcolas et al., 2004]. However, this species is known from the Grande Terre as well as the Loyalty Islands, with the latter only a recent land mass of volcanic origin [Grandcolas et al., 2004]. The possibility of a relictual distribution for *N. kerzhneri* in New Caledonia is supported by our ongoing work on *Nerthra* phylogenetics and biogeography. We have found that species of the *rugosa* species-group are basal within the *Nerthra* phylogeny and distantly related to the *laticollis* species-group which is a more derived element in the *Nerthra* phylogeny [Cassis & Silveira, *in prep.*]. In contrast, the known close association of the New Caledonian biota with continental Australia and New Zealand is not supported by the presence of *N. kerzhneri* in New Caledonia, as the *rugosa* species-group does not likely occur naturally in continental Australia, and the Gelastocoridae are absent from New Zealand. The *alaticollis*, *elongata* and *tuberculata* species-groups which are diverse in continental Australia, are absent from across Melanesia, including New Caledonia, but are more closely related to the *laticollis* species-group. It is also noteworthy that a few species of the *laticollis* species-group also occur natively in Australia.

Many hypotheses exist regarding New Caledonian area relationships. Sanmartin and Ronquist [2004] have summarized various hypotheses for different taxa, where New Caledonia is sister to New Guinea (plants) or in a more equivocal position relative to New Guinea and Australia (animals). Other hypotheses concerning New Caledonian area relationships are also not instructive to the present discussion [e.g. New Caledonia + Samoa — Welzen et al. 2003] as gelastocorids do not occur naturally east of New Caledonia. Any enhancement of our understanding of the biogeography of toad bugs in the Melanesian subregion of the Australian region, requires further sampling, including untangling the natural distribution of species of the *rugosa* species-group.

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