Acta Soc.Zool.Bohem. **58**: 195-203, 1994
ISSN 0862-5247

Isometrus zideki sp. n. from Malaysia and Indonesia, and a taxonomic position of *Isometrus formosus*, *I. thurstoni* and *I. sankariensis* (Arachnida: Scorpionida: Buthidae)

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Received September 15, 1994; accepted October 6, 1994
Published December 22, 1994

Taxonomy, descriptions, new species, new combination, Scorpionida, Buthidae, *Isometrus*, Oriental region

Abstract. *Isometrus (Reddyanus) zideki* sp. n. is described from Malaysia and Indonesia (Kalimantan). Taxonomic position of *Isometrus formosus* Pocock, *I. thurstoni* Pocock and *I. sankariensis* Tikader & Bastawade is discussed. *Isometrus formosus* is placed in the nominotypical subgenus *Isometrus* Hemprich & Ehrenberg on the basis of distribution of pedipalpal trichobothria. The validity of the subgenera Isometrus and Reddyanus Vachon is affirmed, whereas the subgenus Closotrichus Tikader & Bastawade is considered to be a synonymum to the nominotypical subgenus. The type and only known species of the latter subgenus, *I. sankariensis* is transferred in the subgenus *Isometrus*. A check list of all species of the genus *Isometrus* is included.

Isometrus (Reddyanus) zideki sp. n. (Figs 1-3, 9-12)

TYPE MATERIAL. Holotype - male, labelled: Malaysia, Cameron Highlands, 1992 [collector anonymous], in the author's collection. Paratypes - one male (no. 1) and nine females (nos 2-10) labelled: Malaysia, Cameron Highlands, 1992 (no. 2) and 1994 (nos 3-10) [collector anonymous]; one female (No. 11) labelled: Indonesia, Kalimantan, Nanga Pinoh, Tontang, leg. Jan Schneider 26.VII.1993. Female No. 3 is deposited in the Department of Invertebrate Zoology, National Museum (Natural History), Prague. All other paratypes are in the author's collection.

TYPE LOCALITY. A forest species occurring under tree bark.

DERIVATIO NOMINIS. Named after Jiří Zídek, a Czech palcontologist and zoologist at the New Mexico Tech University, Socorro, USA.

DESCRIPTION. The total length is 32.0 and 29.2 mm in the males and 25.7-30.2 mm in the females. Measurements of the carapace, telson, segments of the metasoma and segments of pedipalps, and numbers of pectinal teeth are given in Table 1. There are 11 and 12 pectinal teeth in the males and 10-12 in the females. For the position and distribution of trichobothria on the pedipalps see Figs 1-3. The base color is yellow to redish brown with numerous black spots over the entire body. On the chelicerae the black pigment forms an irregular lattice. The carapace, legs, femur and patella of the pedipalps are spotted. The carapace has a well defined black spot around the median eyes, and the mesosoma bears three longitudinal stripes that, however, may not be well developed or readily apparent. The finger is darker than the manus, which is yellow to light reddish brown with minute black spots chiefly on the external surface. In the females the base color of the first three metasomal segments is yellow and that of the last two segments and the telson is reddish brown to black. The posterior halves of the first four metasomal segments

Table 1. Measurements in millimeters of the species described. The column denoted "Pectinal teeth" contains numbers of both left and right teeth separated by a colon

		Isometrus (R.) zideki sp. n. holotype male	*Isometrus (R.) zideki* sp. n. paratype No. 2 female
Total	length	32	28
Carapace	length	3.5	3.2
	width	3.7	3.5
Metasoma	length	21.2	16.6
segment I	length	2.4	1.8
	width	1.5	1.3
segm. II	length	3.1	2.3
	width	1.5	1.3
segm. III	length	3.4	2.6
	width	1.4	1.2
segm. IV	length	4.0	3.0
	width	1.4	1.1
segm. V	length	4.9	3.7
	width	1.5	1.1
telson	length	3.4	3.0
Pedipalp			
femur	length	3.4	2.7
	width	1.1	1.0
patella	length	4.0	3.4
	width	1.5	1.4
tibia	length	6.4	5.0
manus	length	3.5	2.4
	width	1.9	1.2
finger m.	length	3.5	3.2
Pectinal	teeth	11:11	10:11

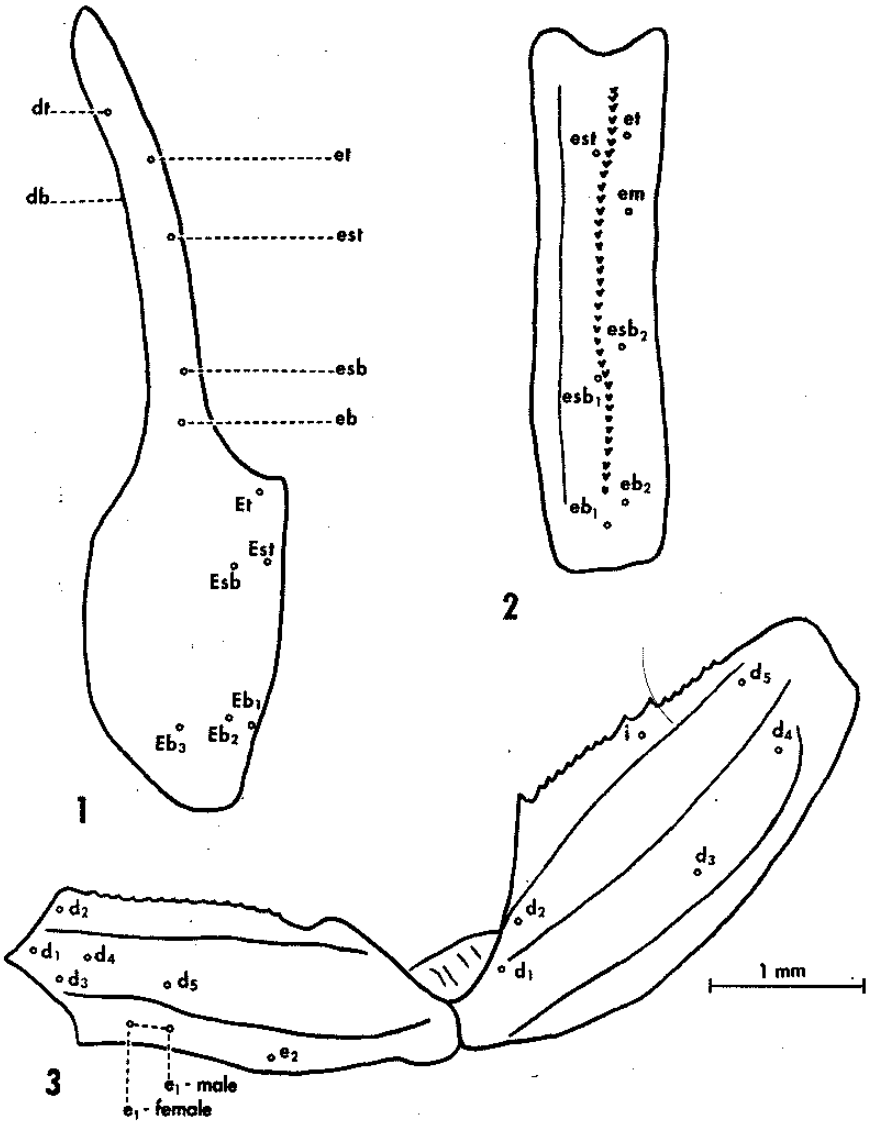
are spotted and darker, and the fifth segment is entirely black. In the males the metasoma is less spotted. The first three segments are yellow with but a few spots, the fourth segment is reddish brown to black, the fifth segments is black, and the telson is again reddish brown to black.

AFFINITIES. The species is characterized by distribution of trichobothria on the pedipalps (Figs 1-3), only two rows of granules on the subaculear tooth of the telson (Figs 9, 11), very thin metasoma in both sexes (Table 1), a well developed median keel on the underside of the fifth metasomal segment, and two well developed parallel keels on the undersides of third and fourth metasomal segments (Figs 10, 12). The space between these two keels contains a row of irregularly dispersed granules of uneven size, which are much less numerous in the males than in the females.

Geographically the nearest species of *Isometrus* is *I. formosus* Pocock, 1893 from Java. This species has not yet been placed into any subgenus. According to opinion of the author of this paper *I. formosus* is a member of the nominotypical subgenus (see belows). In this subgenus belongs also *I. (I.) maculatus* (De Geer, 1778), which has so far been the only species known from Malaysia and Kalimantan. In contrast, *Isometrus zideki* sp. n. belongs in the subgenus *Reddyanus* Vachon, 1972 (Vachon 1972, 1976 and 1982) and appears to be most closely related to *I. (R.) heimi* Vachon, 1976 from New Caledonia, which has similar proportions and also bears only two rows of granules on the subaculear tooth of the telson. This character differentiates these two species very well from the majority of other species of the subgenus *Reddyanus*. *I. (R.) zideki* sp. n. differs from *I. (R.) heimi* in having 10-12 pectinal teeth (12-13 in *I. heimi*) and a pronounced median keel on the underside of the fifth metasomal segment in both sexes (Figs 10,

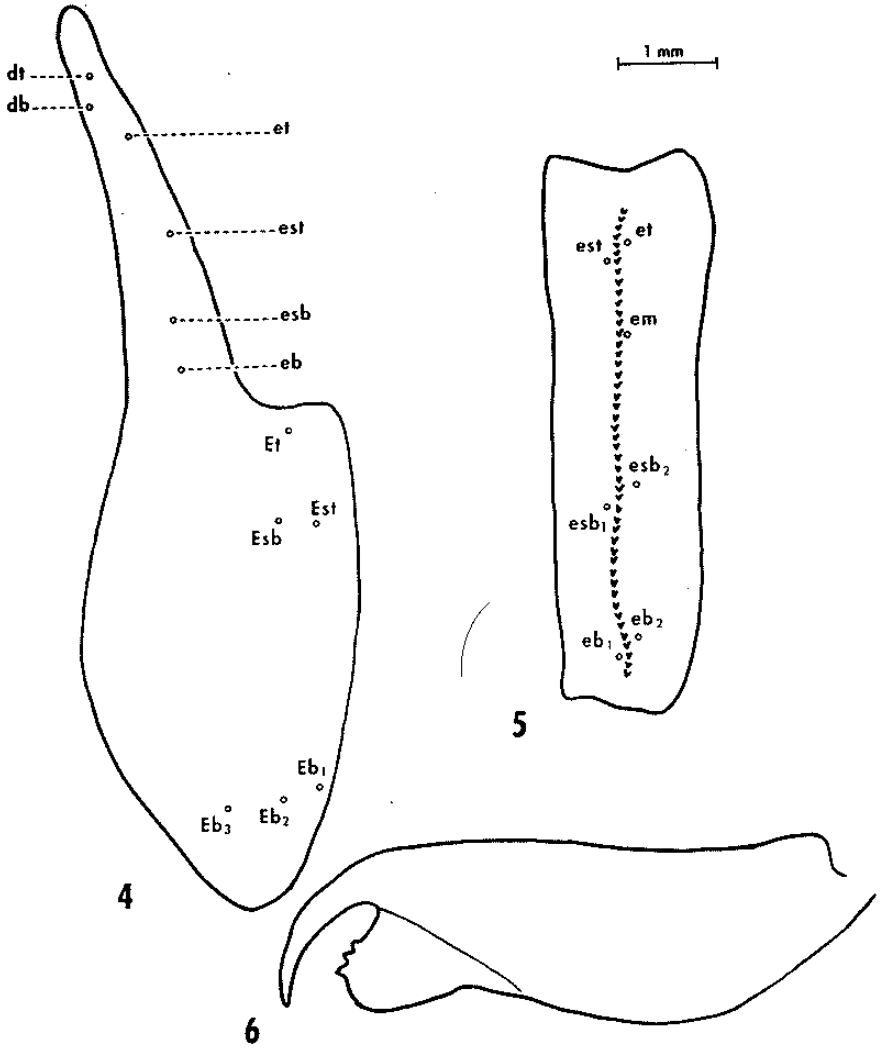
12; Vachon 1976, p.43, figs 12-13). Other differences can be seen in coloration, where for instance in the male of *I. (R.) zideki* sp. n. the fifth metasomal segment is entirely black.

DISCUSSION. Twelve species of scorpions belonging to five families are known to occur in Kalimantan. They are *Isometrus (Reddyanus) zideki* sp. n., *Isometrus (Isometrus) maculatus* (De Geer, 1778), *Lychas shelfordi* (Borelli, 1904) and *Lychas hosei* (Pocock, 1890) of the family Buthidae, *Heterometrus (Heterometrus) longimanus* (Herbst, 1800) of the family Scorpionidae,



Figs 1-3. *Isometrus (Reddyanus) zideki* sp. n. (Paratypus No. 2). Fig. 1. Tibia, Fig. 2. Patella, Fig. 3. Patella and femur. Denoted is position of trichobothrium e1 in the holotypus (male). The second male (Paratypus No. 1) has trichobothrium e1 situated between d4 and d5, but closer to d5 than in the female. In Fig. 1. the first capital letters denote trichobothria situated on the manus; the first lower case ones, those situated on the fixed finger of pedipalp. Explanations: First letters: d, dorsal, e, external i, internal. Second, or second plus third letters: b, basal, sb, suprabasal, m, medial, st, subterminal, t, terminal. Numerals distinguish individual trichobothria of the same classification. Designation and description of trichobothria according to Vachon (1973).

Liocheles australasiae (Fabricius, 1775) (Vachon & Lourenco 1985) and *Liocheles waigiensis* (Gervais, 1844) of the family Ischnuridae (Koch 1977), *Chaerilus celebensis* Pocock, 1893, *Chaerilus variegatus* Simon, 1877, *Chaerilus chapmani* Vachon & Lourenco, 1985 (Vachon & Lourenco 1985) and *Chaerilus laevimanus* Pocock, 1899 (Pocock 1899) of the family Chaerilidae, and *Parascorpiops montana* Banks, 1928 of the family Vaejovidae (Francke 1976).



Figs 4-6. *Isometrus (Isometrus) formosus* Pocock, 1893. Fig. 4. Tibia, Fig. 5. Patella, Fig. 6. Telson. In Fig. 4. the first capital letters denote trichobothria situated on the manus; the first lower case ones, those situated on the fixed finger of pedipalp. Explanations: First letters: d, dorsal, e, external. Second, or second plus third letters: b, basal, sb, suprabasal, m, medial, st, subterminal, t, terminal. Numerals distinguish individual trichobothria of the same classification. Designation and description of trichobothria according to Vachon (1973).

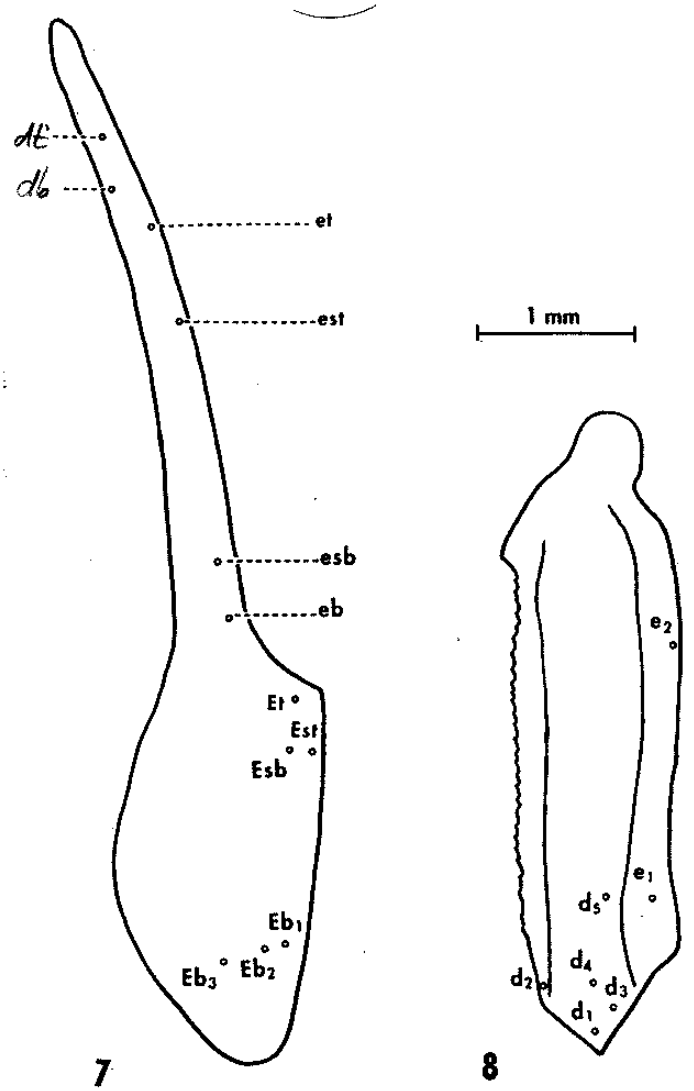
Isometrus (Isometrus) formosus Pocock, 1893 **comb. n.** (Figs 4-6)

Isometrus formosus Pocock, 1893: 88; Kraepelin, 1899: 67; Vachon, 1972: 177; Vachon, 1976: 39.

MATERIAL EXAMINED. A male - labelled: Java, Haldumulla, Buitenzorg, IV.1894, det. Pocock, deposited in collection of The Natural History Museum, London.

COMMENTS. The total length is 52.3 mm, of which the metasoma amounts to 34 mm. The distribution of the trichobothria on the pedipalps corresponds precisely to that given for the subgenus Isometrus by Vachon (1972, 1982). This species is very well characterized also by a pronounced subaculear lobe-like tooth (Fig. 6) with three rows of granules.

DISCUSSION. Kraepelin (1899) and Vachon (1972, 1976) listed this species only from Java and Sumatra, but Takashima (1948, 1950) found in the Tokyo Science Museum a male from Manokwari, New Guinea. According to Koch (1977) the New Guinea record is disputable, however, because the specimen may in reality belong to *I. melanodactylus* (C. L. Koch, 1867). Takashima (1950) characterized *I. formosus* by 10-13 (usually 11) pectinal teeth, whereas *I. melanodactylus* has 10-17 pectinal teeth (Koch 1977) and the specimen of *I. formosus* examined in this study has 14 pectinal teeth.



Figs 7-8. *Isometrus (Isometrus) sankariensis* (Tikader & Bastawade, 1983). Fig. 7. Tibia, Fig. 8. Femur. In Fig. 7. the first capital letters denote trichobothria situated on the manus; the first lower case ones, those situated on the fixed finger of pedipalp. Explanations: First letters: d, dorsal, e, external. Second, or second plus third letters: b, basal, sb, suprabasal, st, subterminal, t, terminal. Numerals distinguish individual trichobothria of the same classification. Designation and description of trichobothria according to Vachon (1973).

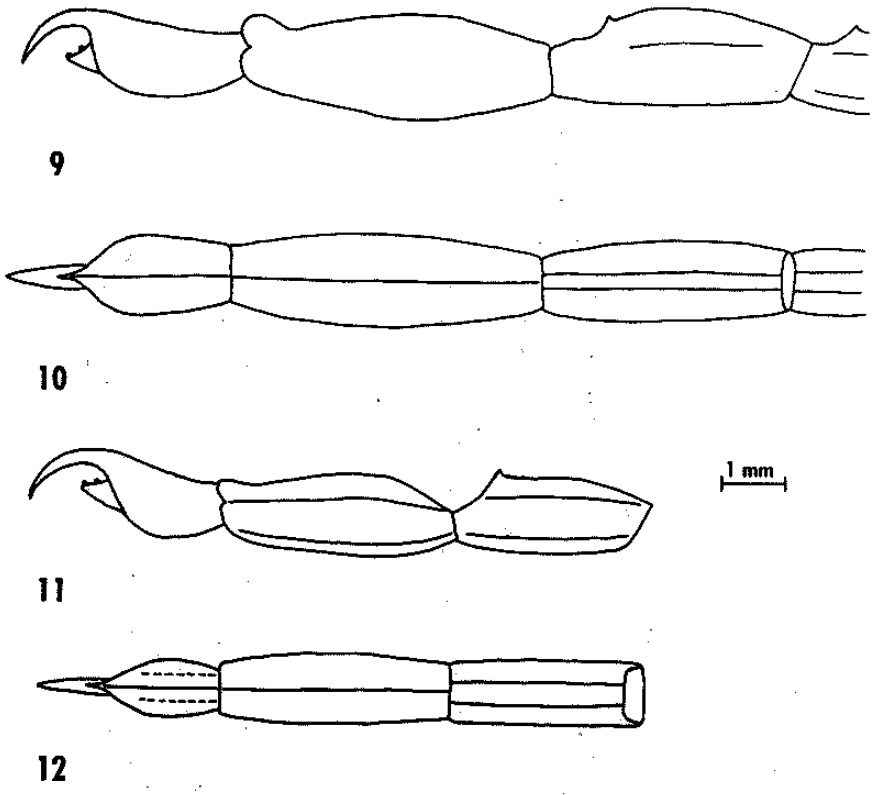
Isometrus (Isometrus) thurstoni Pocock, 1893

Isometrus thurstoni Pocock, 1893: 297; Kraepelin, 1899: 67.
Isometrus (Isometrus) thurstoni: Vachon, 1972: 177; Vachon, 1976: 38.
Isometrus (Raddyanus) thrustoni: Tikader & Bastawade, 1983: 273.

MATERIAL EXAMINED. A female - labelled: India, Tamil Nadu, Mudumalai, leg. Roman Sauer 18.VI.1994, in the author's collection.

COMMENTS. The total length is 45.2 mm, of which the metasoma amounts to 27.3 mm. There are 16 pectinal teeth. Subgeneric characters entirely agree with those of the type subgenus *Isometrus* (Vachon 1972, 1982).

DISCUSSION. Vachon (1982) placed this species in the subgenus *Isometrus*, but Tikader & Bastawade (1983) transferred it into the subgenus *Reddyanus*. A revision of subgeneric characters listed and discussed by Vachon (1972, 1982) reaffirms the placement of this species in the subgenus *Isometrus*.



Figs 9-12. *Isometrus (Reddyanus) zideki* sp. n. Fig. 9 male (Holotypus), lateral view of telson and fifth and fourth segments of the metasoma. Fig. 10 male (Holotypus), ventral view of telson and fifth and fourth segments of the metasoma. Fig. 11 female (Paratypus No. 2), lateral view of telson and fifth and fourth segments of the metasoma. Fig. 12 female (Paratypus No. 2), ventral view of telson and fifth and fourth segments of the metasoma.

Isometrus (Isometrus) sankariensis Tikader & Bastawade, 1983 **comb. n.** (Figs 7-8)

Isometrus (Closotrichus) sankariensis Tikader & Bastawade, 1983: 311.

MATERIAL EXAMINED. One female - labelled: India, Kerala, Peryar, leg. Pavel Senft 15.IV.1993; Two females - labelled: India, Kerala, Munar env., Kalar Vall., leg. Roman Sauer 29.- 31.V.1994, in the author's collection.

COMMENTS. The specimen from Peryar was found at the base of a tree under bark, at approximately 900 m elevation. Its total length is 33.5 mm, of which the metasoma amounts to 21.5 mm. This specimen has 17 pectinal teeth. The females from Kalar reach 36.2 and 35.9 mm, of which the metasomas amount to 22.3 and 21.5 mm, respectively. Both specimens have 14 pectinal teeth. The characters of the species match the description of Tikader & Bastawade (1983), but the subgeneric characters do not differ in any way from those of the type subgenus *Isometrus* (Vachon 1972, 1982). The features of the subgenus *Closotrichus* do not differ from those of the subgenus *Isometrus*.

DISCUSSION

Vachon (1976) divided the 14 known species into two subgenera: *Isometrus* Hemprich & Ehrenberg, 1829 with the species *I. maculatus* (De Geer, 1778), *I. thurstoni* Pocock, 1893 and *I. madagassus* Roewer, 1934; and *Reddyanus* Vachon, 1972 with the species *I. melanodactylus* (C. L. Koch, 1867), *I. assamensis* Oates, 1888, *I. acanthurus* Pocock, 1889, *I. brachycentrus* Pocock, 1889, *I. rigidulus* Pocock, 1897, *I. vittatus* Pocock, 1900, *I. papuensis* Werner, 1916 [= n. syn. *I. melanodactylus* (C. L. Koch, 1867), Koch 1977 p.156] and *I. heimi* Vachon, 1976. The remaining three species *I. basilicus* Karsch, 1879, *I. formosus* Pocock, 1893 and *I. twaitesi* Pocock, 1897, were not placed subgenerically. In 1982 Vachon placed *I. twaitesi* Pocock, 1897 and *I. basilicus* Karsch, 1879 in the subgenus Reddyanus, where he added also *I. besucheti* Vachon, 1982.

Tikader & Bastawade (1983) incorrectly transferred *I. thurstoni* from the nominotypical subgenus into the subgenus *Reddyanus*, where they placed also *I. isadensis* Tikader & Bastawade, 1983 and *I. corbeti* Tikader & Bastawade, 1983. They erected a new subgenus *Closotrichus* Tikader & Bastawade, 1983 containing the sole species *I. sankariensis* Tikader & Bastawade, 1983, and incorrectly transferred the type species of the genus *Isometrus, I. (I.) maculatus* (= *Isometrus (R.) europaeus*) into the subgenus *Reddyanus*. In so doing, they abolished the type subgenus *Isometrus* Hemprich & Ehrenberg, 1829.

Comparing the features characterizing subgenus *Closotrichus* with those characterizing subgenus *Isometrus*, I come to the conclusion that *I. sankariensis* (Tikader & Bastawade 1983) belongs in the subgenus *Isometrus* Hemprich & Ehrenberg, 1829, which is valid and best characterized by the features given by Vachon (1972 and 1982). The position of the *Isometrus* species which Tikader & Bastawade (1983) described as belonging in the subgenus *Reddyanus* ought to be re-examined. For this reason their placement in the subgenus *Reddyanus* is denoted by a asterisk in the following list of species of the genus *Isometrus*.

Check list of species of the genus *Isometrus* Hemprich & Ehrenberg, 1829

subgenus *Isometrus* Hemprich & Ehrenberg, 1829
= *Closotrichus* Tikader & Bastawade, 1983 **syn. n.**

1 - *formosus* Pocock, 1893 **comb. n.**: Indonesia (Java, Sumatra)

2 - *maculatus* (De Geer, 1778): South America, Antilles, USA (Florida), Costa Rica, Africa, Madagascar, Pakistan, India, Sri Lanka, China, Burma, Thailand, Laos, Cambodia, Malaysia, Indonesia, Australia, New Guinea
? = *Scorpio europaeus* Linnaeus, 1758
= *Isometrus europaeus* Lönnberg, 1897
= *Scorpio dentatus* Herbst, 1800
= *Scorpio americanus* Herbst, 1800
= *Buthus (Isometrus) filum* Hemprich & Ehrenberg, 1828
= *Lychas paraensis* C. L. Koch, 1845
= *Scorpio (Lychas) gabonensis* Lucas, 1858
= *Scorpio guineensis* Lucas, 1858
3 - *madagassus* Roewer, 1943: Madagascar
4 - *sankariensis* Tikader & Bastawade, 1983 **comb. n.**: India (Kerala, Karnataka)
5 - *thurstoni* Pocock, 1893: India (Madhya Pradesh, Maharashtra, Andhra Pradesh, Tamil Nadu)

subgenus *Red dyanus* Vachon, 1972

1 - *acanthurus acanthurus* Pocock, 1899: India (Maharashtra), Himalayas
2 - *acanthurus loebli* Vachon, 1982: Sri Lanka
3 - *assamensis* Oates, 1888: Assam, India (Uttar Pradesh), Nepal, Himalayas
4 - *basilicus* Karsch, 1879: Sri Lanka
5 - *besucheti* Vachon, 1982: Sri Lanka
6 - *brachycentrus* Pocock, 1899: India (Karnataka, Kerala)
7 - *heimi* Vachon, 1976: New Caledonia
8 - *melanodactylus* (C. L. Koch, 1867): Australia, New Guinea
= *Isometrus melanodactylus inflatus* Glauert, 1925
= *Isometrus gracilis* Thorell, 1877
= *Isometrus papuensis* Werner, 1916
9 - *rigidulus* Pocock, 1897: India (Madhya Pradesh)
10- *twaitesi* Pocock, 1897: Sri Lanka
11- *vittatus* Pocock, 1900: India (Maharashtra, Tamil Nadu), Indochina
12- *zideki* **sp. n.**: Malaysia, Indonesia (Kalimantan)
13- * *corbeti* Tikader & Bastawade, 1983: India (Uttar Pradesh)
14- * *isadensis* Tikader & Bastawade, 1983: India (Maharashtra)

Acknowledgements

I thank the Natural History Museum, London, for lending me the specimen of Isometrus formosus Pocock, 1893 and Czech entomologists Jan Schneider and Roman Sauer of Prague, and Pavel Senft of Ostrava for providing me with specimens collected by them in Kalimantan and India.

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