STUDIES ON THE FAUNA OF SURINAME
AND OTHER GUYANAS: No. 40.

NOTONECTIDAE OF SURINAME

WITH ADDITIONAL RECORDS OF OTHER NEOTROPICAL SPECIES

by

N. NIESER
(Zoölogisch Laboratorium, Utrecht)

The material studied was mainly collected by Drs. P. H. VAN DOESBURG, Jr. during his stay in Surinam and during a visit to Venezuela. In addition, specimens from the Western Hemisphere brought together in the Rijksmuseum at Leiden by various collectors and some samples taken in Surinam by Dr. P. WAGENAAR HUMMELINCK have been studied. Some specimens in the author's collection, with unknown collector were also examined.

The material has been deposited at the Rijksmuseum van Natuurlijke Historie at Leiden (LM); the Zoölogisch Museum at Utrecht (UM) and the collection of the author (N). The collection of Drs. P. H. VAN DOESBURG now belongs to the Leiden Museum and is consequently indicated LM too.

The author is indebted to Drs. VAN DOESBURG (Rijksmuseum van Natuurlijke Historie, Leiden) for allowing him to study his fine collection and the materials in the Leiden Museum of which he is in charge, and to Dr. WAGENAAR HUMMELINCK for further material. Both have read the manuscript critically and provided valuable suggestions for its completion.

The Notonectidae can be distinguished from other families of Hemiptera-Heteroptera by the following characteristics:

Antennae shorter than the head; eyes prominent; rostrum 4-segmented; head not fused with prothorax, without ocelli. Abdomen higher than wide, without respiratory funnel, with a ventral median carina laterally beset with hairs (in *Buenoa* sometimes few). The animals are aquatic raptorial insects and swim on their backs.

The family Notonectidae comprises nine genera (LANSBURY 1965), four of which occur in the Western Hemisphere. These can be separated by the following key, modified after HUNGERFORD 1933 and TRUXAL 1953.

TABLE 7

SPECIES AND LOCALITIES OF NOTONECTIDAE TREATED IN THIS PAPER

Species	N. & Centr. America	Venezuela	*Suriname*	Argentina	figures	page
Notonecta indica		×			107, 108	113
Notonecta lunata	×				109, 110	114
Notonecta sellata				×	111, 112	115
Martarega brasiliensis			×		117	120
Martarega gonostyla			×		116	120
Martarega hondurensis	×				113	121
Martarega hungerfordi			×		114	119
Martarega membranacea			×		115	119
Buenoa amnigenus			×		120, 121	122
Buenoa antigone		×			135, 136	130
Buenoa communis			×		122, 123	122
Buenoa doesburgi			×		124–126	124
Buenoa fuscipennis				×	137, 138	131
Buenoa incompta			×		127, 128	126
Buenoa nitida		×			139, 140	132
Buenoa platycnemis		×			141, 142	133
Buenoa rostra		×			143, 144	133
Buenoa salutis		×	×	×	129, 130	127
Buenoa truxali			×		131–134	128

KEY TO GENERA OF NOTONECTIDAE OCCURRING IN THE WESTERN HEMISPHERE

1a. Hemelytral commisure without a definite hair-lined pit at anterior end, subfamily NOTONECTINAE 2

1b. Hemelytral commisure with a definite hair-lined pit at anterior end, subfamily ANISOPINAE . . . . . *Buenoa*

2a. Anterolateral margins of pronotum not foveate. . . . . *Notonecta*

2b. Anterolateral margins of pronotum foveate. 3

3a. Intermediate femur with a subapical spur . . . . . *Enithares*

3b. Intermediate femur without a subapical spur. . . . . *Martarega*

Notonecta Linnaeus, 1758: has a world-wide distribution; the number of species per area being higher in the temperate and subtropical regions than in the tropics.

Enithares Spinola, 1837: has a world-wide tropical distribution. In the Western Hemisphere, however, up to now only two species have been found (BROOKS 1953). No species of this genus is represented in the material studied.

Martarega F. B. White, 1879: is principally a continental genus; one species is known to occur in Trinidad (HYNES 1948, TRUXAL 1949). Up till presently it was thought to be exclusively neotropical but recently one species was found to occur in Arizona (POLHEMUS 1966, MENKE & TRUXAL 1966).

Buenoa Kirkaldy, 1904: is restricted to the Western Hemisphere, where it has a wide distribution, ranging from Canada to Río Negro in Argentina; one species is known to occur on Hawaii.

METHODS

Methods used for identification have been discussed in TRUXAL 1953 and NIESER 1967. Only the most important points are mentioned here.

Fig. 104–106. Diagrams showing measurements of head width, vertex and synthlipsis (left), length of rostral prong (centre), length and apical width of fore femur (right).

Measurements were taken with the longitudinal and transverse axes of the animal in a horizontal plane. As head length in dorsal view is very variable according to preparation (glued *versus* pinned specimens) this measure was not used. The humeral width of the pronotum was taken as principal measurement for the width of the animal; this being somewhat better defined and less variable than the greatest width of the body. Greatest width of head, synthlipsis, anterior width of vertex, length of rostral prong, length of femur and its apical width have been measured as indicated by TRUXAL 1953. Diagrammatical indications for these measurements are shown by Fig. 104–106, redrawn after TRUXAL (1953, fig. 17–19). Following a suggestion of ŠTYS 1960, the ocular index was calculated in *Buenoa* and *Notonecta*.

The structural characteristics, used for the identification of males are: the rostral prong, the stridulatory area on the fore femur and the stridulatory comb on the fore tibia. In some species the male possesses some additional characteristics which will be mentioned in the descriptions.

Drawings were made by means of a camera lucida from preparations cleared in KOH (legs), or with the aid of an ocular provided with a squared graticule (rostral prong).

Measurements and proportions considered important are given with statistical parameters if the number of specimens is sufficient. The symbols used are: $\bar{x}$ = mean value; s = estimate of population standard deviation and n = number of individuals in sample. Assuming a normal distribution for a given measurement in the population, the extremes range from $\bar{x} - 3s$ to $\bar{x} + 3s$. If the sample is representative, generally only one specimen out of 200 will fall outside these limits.

The synonymy given with the species of older authors is abridged. For *Notonecta* older references not given here, can be found in HUNGERFORD 1933; for *Martarega* in TRUXAL 1949 and for *Buenoa* in TRUXAL 1953.

In the distributional records an exclamation mark (!) indicates a new locality.

Notonecta Linnaeus, 1758

For extensive synonymy and drawings the reader is referred to HUNGERFORD 1933.

Notonecta indica Linnaeus, 1771

Notonecta indica LINNAEUS, 1771, p. 534 ("West Indies").
Notonecta americana FABRICIUS, 1775, p. 690 ("America").
Notonecta variabilis FIEBER, 1852, p. 477 [var. *scutellaris*: from "Porto Rico" only].
Notonecta undulata Say, KIRKALDY 1899a, p. 29–30 (Jamaica).
Notonecta undulata; CHAMPION 1901, p. 370, pl. 22 fig. 10.
Notonecta howardii BUENO, 1905, p. 151, pl. 7.
Notonecta indica; HUNGERFORD 1930, p. 130.
Notonecta indica; HUNGERFORD 1933, p. 113–117, pl. 1 fig. 2, pl. 13 fig. 3 (North, Central and South America including the Antilles).
Notonecta indica; THOMAS 1939, p. 1–8 ("Región del Golfo").
Notonecta indica; HUNGERFORD 1940, p. 255–256 (Grand Cayman).
Notonecta indica; RICE 1942, p. 57–58, 64–65, pl. 1 fig. 3, pl. 2 figs. 3 and 11 (Tennessee).

Notonecta indica; PENN & ELLIS 1949, p. 159 (Mississippi).
Notonecta indica; HERRING 1951, p. 21–22 (Florida).
Notonecta indica; USINGER 1956, p. 182–228 (California).
Notonecta indica; WILSON 1958, p. 144–145 (Mississippi).
Notonecta indica; DE ABATE 1960, p. 16–17 (Costa Rica).
Notonecta indica; NIESER 1967, p. 166–167, fig. 49–51 (Lesser Antilles).

U.S.A., Maryland, N. and S. Carolina, Kentucky, Tennessee, Georgia, Florida, Mississippi, Louisiana, Arkansas, Texas, New Mexico, Arizona, California; MÉXICO, Tamaulipas, Sinaloa, Guadalajara, Cuernavaca, Yucatán; GUATEMALA; COSTA RICA (Heredia, one specimen known); COLOMBIA, Cundinam; VENEZUELA!; GREATER ANTILLES; LESSER ANTILLES.

VENEZUELA: El Limón, Aragua, 450 m, 14.V.1953, F. Fernández Y., 1 ♂ (LM).
Ocular index: 0.33(3).

The genital capsule (Fig. 107–108) and other characters agree in detail with specimens from the Antilles studied by NIESER (1967). So this specimen belongs to the taxon *Notonecta indica* L. which occurs principally in North and Central America. It does not belong to *Notonecta variabilis* Kirkaldy from Brazil, if the latter should be a distinct species.

Notonecta lunata Hungerford, 1926

Notonecta variabilis var. *maculata* FIEBER, 1852, p. 477 (Baltimore).
Notonecta variabilis KIRKALDY, 1897, p. 414 (the North American specimens).
Notonecta variabilis; auct. 1901–1926.
Notonecta lunata HUNGERFORD, 1926, p. 12.
Notonecta lunata; HUNGERFORD 1933, p. 107–108, pl. 1 fig. 5, pl. 13 fig. 5 (NE U.S.A., SE Canada).
Notonecta raleighi lunata HUTCHINSON, 1945, p. 603 (New England).
Notonecta lunata; MOORE 1950, p. 251 (Quebec).

CANADA, New Brunswick, Quebec, Ontario; U.S.A., Maine, New Hampshire, Vermont, Massachusetts, Connecticut, New York, Maryland, Wisconsin, Indiana, Nebraska, Kansas.

U.S.A.: Maryland, Anne Arundell Co., Annapolis, 29.V.1953, L. B. Holthuis, no 643, (1 ♂, 1 ♀) (LM).
Ocular index: male 0.33(4), female 0.35(5).
Male genital capsule and clasper, Fig. 109–110.

A common species in New England and SE Canada. The limits of its distribution are not known.

Notonecta sellata Fieber, 1852

Notonecta Polystolisma var. *sellata* FIEBER, 1852, p. 478 (Buenos Aires).
Notonecta variabilis Fieber, KIRKALDY 1897, p. 414 (in part).
Notonecta variabilis; KIRKALDY 1904, p. 95.
Notonecta bifasciata Guérin, HUNGERFORD 1926, p. 12, pl. 2 fig. 5.
Notonecta sellata; HUNGERFORD 1930, p. 140.
Notonecta sellata; HUNGERFORD 1933, p. 139–140, pl. 1 fig. 14, pl. 12 fig. 4 (Bolivia, Brasil, Paraguay, Argentina).
Notonecta sellata; BACHMANN 1961a, p. 24 (Argentina).
Notonecta sellata; BACHMANN 1963, p. 5 (Argentina).

BOLIVIA; BRASIL, Amazonas, Paraná; PARAGUAY, Guairá, Alto Paraná; ARGENTINA, Misiones, Corrientes, Formosa, Chaco, Stgo del Estero, Salta, Tucumán, La Rioja, Cordobá, Santa Fé, Entre Ríos, Buenos Aires, La Pampa.

ARGENTINA: Santiago del Estero, Fernández, II.1962, 3 ♂, 5 ♀ (N); Buenos Aires, Olivos, I.1962, 3 ♂, 7 ♀ (N), Río Matanza, XII.1961, 3 ♂, 6 ♀ (N).

Length (in mm)
male $\bar{x} = 8.44$ $s = 0.221$ $n = 8$ *female* $\bar{x} = 9.08$ $s = 0.386$ $n = 17$
Humeral width of pronotum (in mm)
male $\bar{x} = 2.81$ $s = 0.085$ $n = 8$ *female* $\bar{x} = 2.98$ $s = 0.113$ $n = 17$
Ocular index
male $\bar{x} = 0.281$ $s = 0.014$ $n = 8$ *female* $\bar{x} = 0.317$ $s = 0.023$ $n = 17$

Male genital capsule and clasper Fig. 111–112.

The distribution of this species in Argentina is quite well known (BACHMANN 1963). In the northern part of its area, however, the distribution is poorly known and the record from Bolivia needs confirmation.

Martarega F. B. White, 1879

This genus is abundantly represented in the northern part of the South American continent. Of the eleven species known, four have been found in the material from Surinam. From adjacent countries four further species are known, some of which, in all likelihood, will occur in Surinam. As it is difficult to obtain systematic literature in Surinam the following KEY, modified after TRUXAL 1949, is given. The modification primarily consists of an omission of some species not likely to occur in Surinam. Males have two segmented fore tarsi,

females one segmented fore tarsi. This makes it easy to distinguish the sexes.

KEY TO SPECIES OF *Martarega* POSSIBLY OCCURRING IN SURINAM
(brachypterous specimens only)

1a. Small species, males not longer than 4.3 mm; opaque median longitudinal stripe on hemelytra bifurcate near apex . . . 2
1b. Larger species, males at least 4.9 mm long; opaque median longitudinal stripe not bifurcate when present 3

2a. Ventral surface of mesotrochanter smooth; hemelytral process usually extending to tip of membrane; crotch at bifurcation of hemelytral opaque stripe acutely angled . . . . . *M. membranacea* White

2b. Ventral surface of mesotrochanter with a median nodule; hemelytral process not extending to tip of membrane; crotch at bifurcation of hemelytral opaque stripe rounded instead of acutely angled . . . . . *M. chinai* Hynes

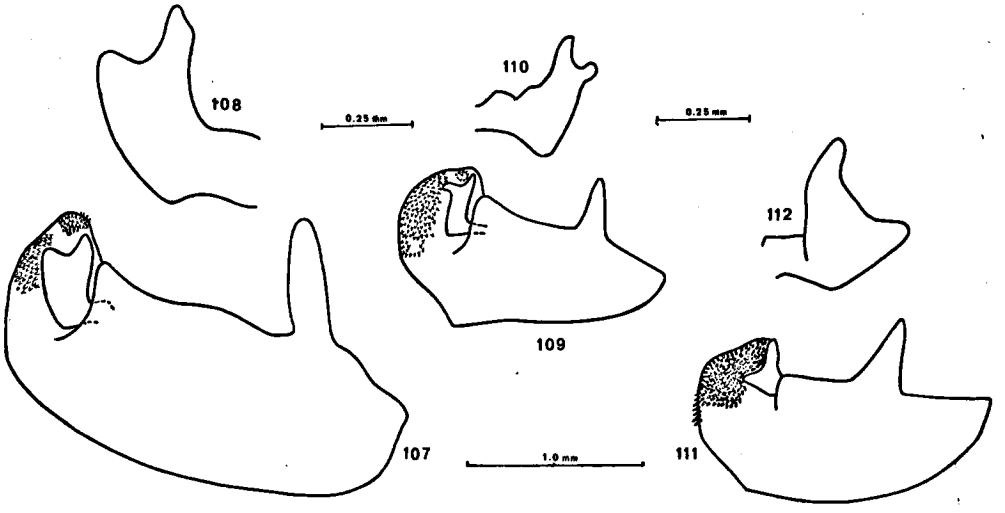

Fig. 107–112. Male genitalia in *Notonecta*: 107, genital capsule, 108, clasper of genital capsule in *N. indica* from Venezuela; 109, capsule, 110, clasper in *N. lunata* from Maryland; 111, capsule, 112 clasper in *N. sellata* from Argentina.

3a. Lateral margin of metatrochanter with sharp concavity at distal end (Fig. 114); females with emarginated costal margin of hemelytra toothed; mid-ventral keel with hair on antero-ventral and lateral surfaces . *M. hungerfordi* Truxal

3b. Lateral margin of metatrochanter normal; females without teeth on emarginated costal margin of hemelytra; mid-ventral keel with hairs on lateral margins only 4

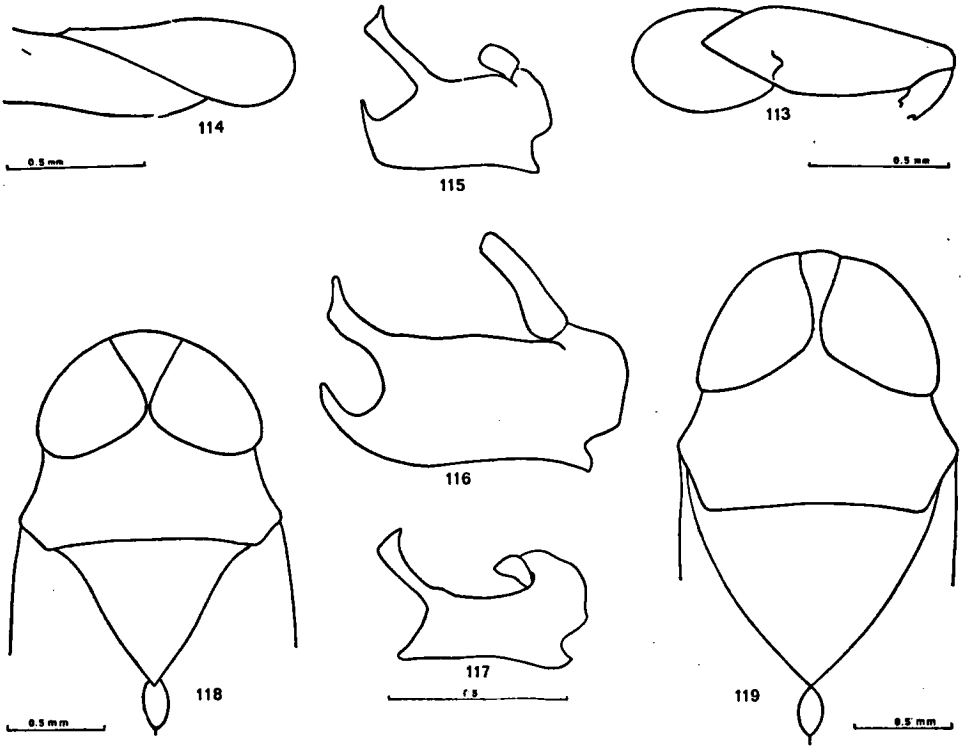

Fig. 113–117. Structural characteristics in *Martarega*: 113, male mesofemur with nodule in *M. hondurensis* from El Salvador; 114, metatrochanter with excavated apex in *M. hungerfordi* from Surinam; 115, male genital capsule in *M. membranacea* from Surinam; 116, male genital capsule in *M. gonostyla* from Surinam; 117, male genital capsule in *M. brasiliensis* from Surinam.

Fig. 118–119. Anterior part of body in female *Buenoa*: 118, *B. amnigenus* from Surinam; 119, *B. incompta* from Surinam.

4a. Hemelytra largely hyaline with a single longitudinal opaque stripe not median; mesotrochanter of male with three or more small groups of short bristles located ventrally near outer lateral margin; females with several scattered hairs near outer lateral margin; left clasper of male genital capsule three times as long as wide (Fig. 116). . . . . *M. gonostyla* Truxal

4b. Hemelytra not as above; mesotrochanter of male with or without one or two small groups of short bristles located ventrally near outer lateral margin; left clasper distinctly shorter 5

5a. Mesotrochanter of male with one or two groups of short bristles located ventrally near outer lateral margin; hemelytra with a short median stripe at base. . . . . *M. williamsi* Truxal

5b. Mesotrochanter without such groups of short bristles; hemelytra not as above 6

6a. Mesotrochanter of male without nodule but with a patch of yellow hairs on ventral surface . . *M. brasiliensis* Truxal

6b. Species with nodule on mesotrochanter of male 7

7a. Median longitudinal hyaline stripe of male hemelytra narrow, its median width approximately one-fifth the width of shiny costal area; female with basal exterior margin of hind femur emarginate; hemelytral process extends approximately one-third the length of membrane . . . . . *M. uruguayensis* (Berg)

7b. Median longitudinal hyaline stripe of male hemelytra wide, with its median width approximately two thirds the width of shiny costal area; female without emarginate hind femur; hemelytral process extends approximately one-half the length of membrane . . . . . *M. bentoi* Truxal

The following species mentioned in this key have not yet been recorded from Surinam:

M. bentoi Truxal 1949, known only from Brasil (Pernambuco).

M. chinai Hynes 1948, known from Trinidad, Venezuela, Brasil, Bolivia and Argentina.

M. uruguayensis (Berg) 1883, known from Argentina, Paraguay, Uruguay, Bolivia and Brasil (Pernambuco).
M. williamsi Truxal 1949, known from Canal Zone, Ecuador and Brasil (Amazonas).

Martarega membranacea White, 1879

Martarega membranacea WHITE, 1879, p. 271 (Amazonas).
Martarega membranacea; KIRKALDY & BUENO 1909, p. 201 (Brasil, Ecuador).
Martarega membranacea; DE CARLO 1935, p. 3–4 (Argentina).
Martarega membranacea; TRUXAL 1949, p. 7–8, pl. 1 fig. 4, pl. 2 fig. 10, pl. 3 fig. 1–2 (British Guiana, Brasil, Bolivia).
Martarega membranacea; TRUXAL 1957, p. 14 (Brasil, Goiás).

BRITISH GUIANA (=GUYANA); SURINAME!, Suriname; BRASIL, Amazonas, Pará, Goiás; ECUADOR; BOLIVIA, Llano de Mojos; ARGENTINA, Buenos Aires.

SURINAME: Suriname, Paranam, 26.VII.1962, 1 ♀; Paranam, "Blauwe Meertjes", 29.VIII.1962, 1 ♀; small ditch along road to Zanderij, km 34, 31.III. 1963, 2 ♂, 5 ♀; all leg. P. H. van Doesburg, Jr. (LM). All brachypterous specimens. – Suriname, Carolina Kreek, 29.VIII.1962, 1 ♂, van Doesburg (LM); macropterous specimen.

Length (brachypterous specimens, in mm): *male* 4.18–*4.28*–4.35 (n = 4); *female* 4.46–*4.59*–4.64 (n = 5).

These specimens seem to be slightly larger than those seen by TRUXAL 1949, although it is possible that the difference is due to slightly different methods of measuring. This species shows a very close resemblance to *M. chinai* Hynes, which most probably occurs in Surinam too; the characters given in the key will separate these species easily. Male genital capsule Fig. 115.

Martarega hungerfordi Truxal, 1949

Martarega hungerfordi TRUXAL, 1949, p. 12, pl. 1 fig. 6, pl. 2 fig. 4, pl. 4 figs. 1, 2 (British Guiana).

BRITISH GUIANA; SURINAME!, Nickerie, Saramacca, Suriname.

SURINAME: Nickerie, Coeroeni, airstrip, ca.VIII.1959, 6 ♂, 4 ♀, S. Ligori (LM). Saramacca, Coppename River, Raleigh Falls, 16.VII.1965, 1 ♀, P. H. van Doesburg, Jr. (LM). Suriname, Gran Rio, zijkreek bij Ligoro, 15.VIII.1964, 2 ♂, 4 ♀ 6 Lv, P. Leentvaar (LM), same locality and date, 1 ♀ Boeseman 266 (LM). All brachypterous specimens.

Length: *male* 5,11–*5,14*–5,21 mm (n = 4); *female* 5.76–*5.95*–6.05 mm (n = 3). Humeral width of pronotum, *male* 1.50–*1.53*–1.58 mm (n = 5); *female* 1.60–*1.63*–1.67 mm (n = 3).

These specimens are somewhat shorter and relatively stouter than those studied by TRUXAL 1949, however, the structural characteristics given in the key and those of the male genital capsule are identical.

Larvae of 5th instar are recognisable by the emargination of the metatrochanter which separates them easily from other *Martarega* larvae.

Martarega gonostyla Truxal, 1949

Martarega gonostyla TRUXAL, 1949, p. 12–13, pl. 1 figs. 5, 7, pl. 2 figs. 1, 5 (Brasil, Bolivia).

SURINAME!, Suriname; BRASIL, Amazonas; BOLIVIA.

SURINAME: Suriname, Kabel, (in rivulet), 20.X.1958, 1 ♂, 1 ♀; Brownsberg, (in rivulet), 1.III.1959, 2 ♂, 3 ♀; Carolinakreek, 10 km S. of Zanderij, 24.IV. 1962, 1 ♂; Carolinakreek, ca.IV.1962, 1 ♂; Carolinakreek, 29.VIII.1962, 1 ♂, 1 ♀. All P. H. van Doesburg, Jr., (LM), brachypterous specimens. – Suriname, Brownsberg, 1.III.1959, 3 ♂, 1 ♀ P. H. van Doesburg (LM); macropterous specimens.

Brachypterous specimens:
Length (in mm)
male $\bar{x} = 6.01$ $s = 0.164$ $n = 6$ *female* $\bar{x} = 6.69$ $s = 0.155$ $n = 5$
Humeral width of pronotum (in mm)
male $\bar{x} = 1.54$ $s = 0.0118$ $n = 6$ *female* $\bar{x} = 1.63$ $s = 0.0187$ $n = 5$
Macropterous specimens:
Length (in mm), *male* 6.08–*6.33*–6.62 (n = 3), *female* 6.91.
Humeral width of pronotum (in mm), *male* 1.72–*1.75*–1.81 (n = 3), *female* 1.89.

Contrary to the former series, the brachypterous specimens are distinctly longer than those seen by TRUXAL 1949, however, the structural characters, especially the genital capsule (Fig. 116) are in agreement.

Martarega brasiliensis Truxal, 1949

Martarega brasiliensis TRUXAL, 1949, p. 16, pl. 4 fig. 3, 4 (Brasil, Perú).

SURINAME!, Suriname; BRASIL, Ceará, Pernambuco; PERÚ, Lorete.

SURINAME: Suriname, Couroupina R., Republiek, 3.IX.1955, 9 ♂, 8 ♀, Hummelinck, *Sta 642A* (LM, UM and N); *brachypterous specimens.*

Length (in mm)

male $\bar{x} = 5.12$ s = 0.147 n = 9 *female* $\bar{x} = 5.55$ s = 0.167 n = 8

Humeral width of pronotum (in mm)

male $\bar{x} = 1.28$ s = 0.037 n = 9 *female* $\bar{x} = 1.37$ s = 0.030 n = 8

The specimens from Surinam differ from those seen by TRUXAL 1949 in a greater range of length. This is caused by occurrence of lower values, the upper limits being in accordance with those given by TRUXAL. The eyes are blackish or very dark reddish brown in the Surinam specimens, with the exception of one female with lighter reddish brown eyes. TRUXAL's description suggests a lighter colour.

On the other hand, the structural characters mentioned in the key, the male genital capsule (Fig. 117) and the patch of yellowish hairs on the ventral surface of the mesotrochanter in the male agree with the description and figures of TRUXAL.

Martarega hondurensis Bare, 1932

Martarega hondurensis BARE, 1932, p. 60–61 (British Honduras).
Martarega hondurensis; TRUXAL 1949, p. 10–11, pl. 2 fig. 8, pl. 4 figs. 5, 6 (México, Guatemala, British Honduras, Canal Zone, Perú).

MÉXICO, Campeche; GUATEMALA; BRITISH HONDURAS; EL SALVADOR!; PERÚ, Lima.

EL SALVADOR: Laguna de Apasiepeque, 1.III.1953, 1 ♂ brachypterous, leg. M. Boeseman (LM).

The characters mentioned by TRUXAL 1949, separate this species easily. It is not included in the Key on p. 116 as its occurrence in Surinam is not likely.

Mesofemur of male with a nodule (Fig. 113).

Buenoa Kirkaldy, 1904

This genus is widely distributed in the Western Hemisphere. As the distribution of many species is known only by the type series, it is difficult to predict how much and which species will actually occur

in Surinam. Moreover, new species have been found in two collections recently made in the neotropical region (TRUXAL 1957 and the present collection). So more collecting must be done in Surinam before drawing up a Key for this area makes sense.

Buenoa amnigenus (White), 1879

Anisops amnigenus WHITE, 1879, p. 271 (Amazonas).
Buenoa amnigenus; KIRKALDY, 1904, p. 120, 134.
Buenoa amnigenus; TRUXAL 1953, p. 1462–1465, figs. 36, 70 (British Guiana, Brasil, Peru, Bolivia, Paraguay).
Buenoa amnigenus; TRUXAL 1957, p. 17 (Brasil: Goiás).

BRITISH GUIANA; SURINAME!, Coronie, Saramacca; BRASIL, Ceará, Rio Grande do Norte, Parahiba, Pernambuco, Amazonas, Goiás, Matto Grosso, Paraná; PERU, Huanuco; BOLIVIA, Llano de Mojos, Sara; PARAGUAY.

SURINAME: Coronie, Coronieweg, 20.XII.1948, 2 ♂, 1 ♀, D. C. Geijskes; Saramacca, Post Groningen, IX.1911, 1 ♂, W. C. van Heurn; Makasser, X.1927–IV.1928, 1 ♂, J. Sonneveldt (LM).

Male foreleg Fig. 120, rostrum Fig. 121.

Females of this species resemble females of *B. incompta* Truxal very much, for distinguishing characters see under that species.

Buenoa communis, Truxal, 1953

Buenoa communis TRUXAL, 1953, p. 1442–1444, fig. 65 (Brasil, Bolivia).

SURINAME!, Suriname; BRASIL, Para, Paraíba; BOLIVIA.

SURINAME: Suriname, Compagniekreek, near Brokopondo, 16.II.1961, 1 ♂, 2 ♀, H. A. van Hoof; Carolina kreek (10 km S. of Zanderij), 24.IV.1962, 2 ♂, 2 ♀, P. H. van Doesburg, Jr. (LM); Brokopondo, 28.II.1964, 2 ♂, P. Leentvaar (LM).

Length, *male* 5.55–*6.00*–6.63 mm, *female* 5.76–*6.55*–7.30 mm.

Humeral width of pronotum, *male* 1.53–*1.61*–1.70 mm, *female* 1.57–*1.72*–1.86 mm (male n = 5, female n = 4).

MALE. Head: vertex nearly continuous with outline of eyes, median length of head: median length of pronotum about 0.6. Rostral prong longer than third rostral segment, originating in the apical third of the segment (Fig. 123). Ratio greatest width of head: vertex 5.50–*6.35*–6.78; ratio vertex : synthlipsis 2.58–*3.00*–3.28

(n = 5). Synthlipsis carinate. – Pronotum: ratio median length: humeral width about 0.7; pronotum distinctly tricarinate. Median length of scutellum about 0.8 times median length of pronotum. – Legs: Length of fore femur about three times its width at apex, triangular stridulatory area consisting of about thirty-one sclerotized ridges. Fore tibia with stridulatory comb consisting of about thirty-one teeth, basal ones thicker and slightly narrower than apicals; at the apex of the tibia a slight indentation (Fig. 122).

FEMALE. Head: vertex nearly continuous with the outline of the eyes. Median length of head: median length of pronotum about 0.5; greatest width of head: vertex 5.25–*5.83*–6.39; vertex: synthlipsis 2.62–*3.27*–3.79 (n = 4). Synthlipsis carinate. – Pronotum, ratio median length: humeral width about 0.57, disc faintly tricarinate.

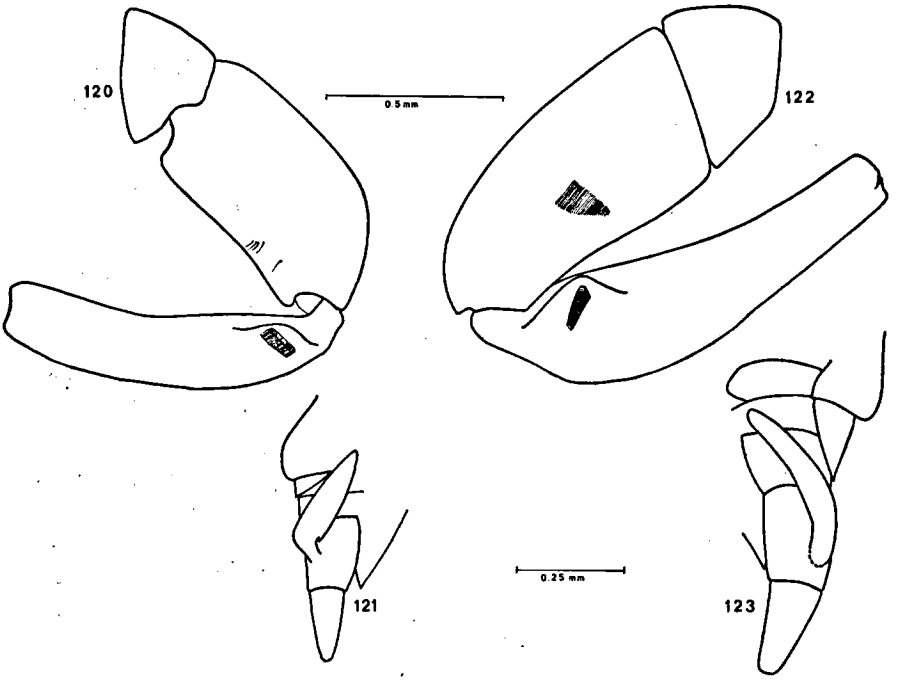

Fig. 120–121. *Buenoa amnigenus* male, from Surinam: 120, foreleg; 121, rostrum.
Fig. 122–123. *Buenoa communis* male, from Surinam: 122, foreleg; 123, rostrum.

Median length of scutellum about 1.1 times the median length of pronotum.

The present specimens agree in most respects, including the rostral prong, the fore leg of the male, and colour, with the description of *B. communis* TRUXAL. The specimens are, however, 0.5 mm longer on the average and relatively more slender.

Buenoa doesburgi sp. n.

SURINAME: Suriname, Marowijne, Nassaugebergte, lijn km 11,6 19.III.1949 Suriname expeditie 1 ♀, Sarakreek bij Maripaheuvel, 24.X.1959, 3 ♂, 4 ♀, P. H. van Doesburg, Jr.; Compagniekreek near Brokopondo, 16.II.1961, 1 ♀, H. A. van Hoof; Afobaka, 14.IX.1963, 1 ♂, 1 ♀ D. C. Geijskes (LM).

Colour: General appearance of dorsal side shining black, caused by the hyaline hemelytra over the black dorsum. Eyes brownish, vertex and rostrum lighter. Pronotum hyaline with a dark band along hind margin. Scutellum violet-black, apex lighter. Hemelytra with apex of corium dark, otherwise hyaline. Venter yellowish-brownish, on abdomen marked with black. Legs yellowish with faint darker patches.

Length (in mm): *male* 5.80–*5.93*–6.10 (n = 4), *female* 6.02–*6.12*–6.29 (n = 6); humeral width of pronotum (in mm); *male* 1.62–*1.635*–1.65, *female* 1.66–*1.71*–1.77.

MALE. Head: greatest width about seven times the anterior width of vertex, narrower than humeral width of pronotum. Vertex slightly indented, anterior width about 2¼ times synthlipsis. Ocular index 0.129–*0.136*–0.147 (n = 4). Rostrum (Fig. 126) slightly longer than third rostral segment, originating in the apical third of this segment. – Pronotum: length 0.94–*1.00*–1.02 mm, with faint median carina, not tricarinate. Lateral margins distinctly converging anteriorly. Scutellum longer than pronotum. – Legs. Foreleg: femur with length less than three times the width at apex, stridulatory area with seven to eight sclerotized ridges (Fig. 124). Tibia with length about four times the greatest width, tibial stridulatory comb with 24–27 teeth (Fig. 125).

FEMALE. Head: greatest width about seven times the anterior width of vertex, narrower than humeral width of pronotum. Vertex

slightly indented, anterior width about 2–2¼ times the width of synthlipsis. Ocular index 0.141–*0.154*–0.168 (n = 6). – Pronotum, length: 0.96–*1.01*–1.06 mm without carina. Lateral margins converging anteriorly. Scutellum longer than pronotum.

With the Key in TRUXAL 1953 this species runs to *B. nitida* Truxal. Males are to be separated by the number of teeth in the tibial comb; 31–33 in *B. nitida*, 24–27 in *B. doesburgi* which has a lower value of ocular index and relatively a slightly broader apex of fore femur.

Types: Holotype ♂, allotype ♀ and 1 ♂, 2 ♀ paratypes from Sarakreek, ♀ paratype from Compagniekreek, 1 ♂, 1 ♀ paratype from Afobaka, 1 ♀ paratype from Nassaugebergte in Leiden Museum, and 1 ♂, 1 ♀ paratype from Sarakreek in collection of author.

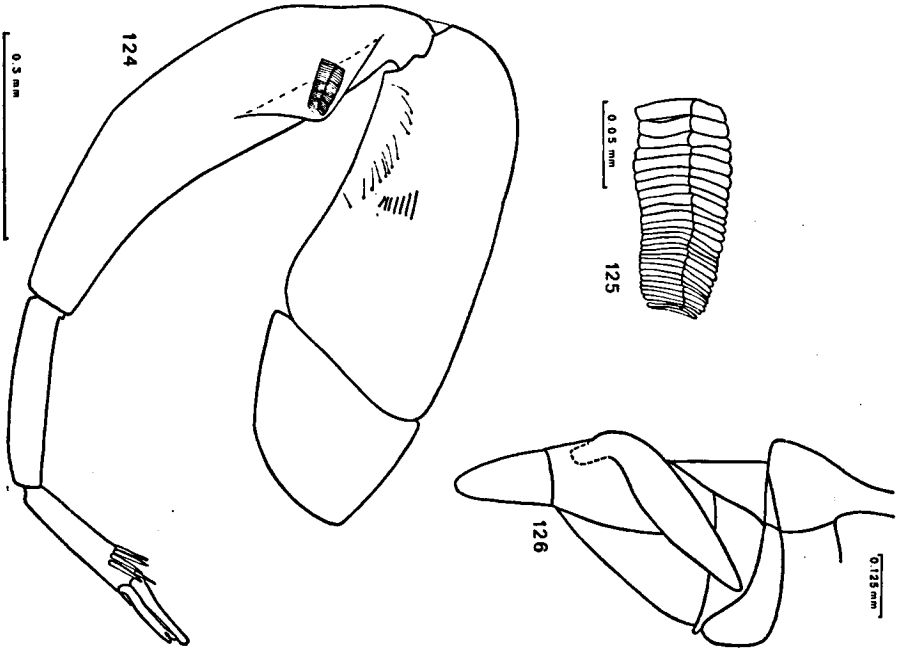

Fig. 124–126. *Buenoa doesburgi* male holotype, from Surinam: 124, foreleg; 125, tibial comb; 126, rostrum.

Buenoa incompta Truxal, 1953

Buenoa incompta TRUXAL, 1953, p. 1466–1467, fig. 73 (Brasil, Bolivia).
Buenoa incompta; TRUXAL 1957, p. 17 (Brasil, Goiás).

SURINAME!, Coronie, Saramacca, Suriname, Commewijne; BRASIL, Paraíba, Amazonas, Goiás; BOLIVIA, Llano de Mojos.

SURINAME: Coronie, Coronieweg 216 km, 20.XII.1948 1 ♂, 1 ♀ D. C. Geijskes; Saramacca, Post Groningen, IX.1911, 20 ♂, 37 ♀ W. C. van Heurn; Suriname, Brokobakka, begin 1961, 1 ♀ H. A. van Hoof; Brokopondo, 28.II.1964, 3 ♂ P. Leentvaar (LM); Surinamerivier, pools in dry riverbed at Brokopondo, *Sta 829*, 27.II.1964, 3 ♂, 3 ♀, Hummelinck (UM); Marowijne, Nassaugebergte, lijn 0,4 km, 16.XI.1949, 3 ♂, 1 ♀, Suriname Expeditie 1948/1949 (LM).

Length (in mm)
male $\bar{x} = 5.18$ $s = 0.104$ $n = 12$ — *female* $\bar{x} = 5.41$ $s = 0.108$ $n = 12$
Humeral width of pronotum (in mm)
male $\bar{x} = 1.28$ $s = 0.031$ $n = 12$ — *female* $\bar{x} = 1.39$ $s = 0.025$ $n = 12$
Ratio greatest width of head : vertex
male $\bar{x} = 5.13$ $s = 0.23$ $n = 12$ — *female* $\bar{x} = 5.47$ $s = 0.15$ $n = 12$

MALE. Head: narrow synthlipsis, about 0.03–0.04 mm, ratio vertex : synthlipsis 5.3–*6.1*–7.7. Ocular index 0.055–*0.068*–0.075. In these species with narrow synthlipsis the error in measuring it is about 20%, so this measurement and the ratio's derived from it are of little use in comparing different populations. Rostral prong equal to slightly longer than third rostral segment (Fig. 128). – Fore femur without femoral stridulatory area, apex not thickened. Fore tibia with stridulatory comb consisting of about twenty-seven to thirty teeth (Fig. 127).

FEMALE. Head: narrow synthlipsis, about 0.04 mm, ratio vertex: synthlipsis 5.5–*6.0*–7.3. Ocular index 0.048–*0.064*–0.070. Scutellum with apex somewhat obtuse.

Females of this species are much alike females of *B. amnigenus*. Separation is possible by the synthlipsis which is 0.01 mm to nearly zero in *B. amnigenus*, 0.04 mm in *B. incompta*; and the apex of the scutellum which is more pointed in *B. amnigenus* than in *B. incompta* (Fig. 118, 119).

Buenoa incompta seems to be one of the most widely distributed species in Surinam.

Buenoa salutis Kirkaldy, 1904

Bueonoa salutis KIRKALDY, 1904, p. 124 (Guyane française).
Buenoa mallochi JACZEWSKI, 1929, p. 129–130 (Brasil).
Buenoa salutis; TRUXAL, 1953, p. 1469–1472 (Venezuela; British Guiana; Guyane française; Brasil; Bolivia; Paraguay).
Buenoa salutis; TRUXAL, 1957, p. 17 (Goiás).
Buenoa salutis; BACHMANN, 1961a, p. 24 (Argentina).

VENEZUELA; BRITISH GUIANA; SURINAME!, Suriname; GUYANE FRANÇAISE; BRASIL, Pará, Ceará, Paraíba, Pernambuco, Amazonas, Goiás, São Paulo, Rio Grande do Sul; BOLIVIA: Sará, Llano de Mojos; PARAGUAY; ARGENTINA: Buenos Aires.

SURINAME: Suriname, Zanderij, *Sta. 408* (N), 3.VIII.1948, 1 ♀ (macropterous) Hummelinck.
VENEZUELA: Edo. Zulia, Encontrados, at light, 17.VII.1930, 1 ♂ (macr.) H. J. Mac Gillavry (Museum Amsterdam).
ARGENTINA: La Plata, 12.VII.1924, 1 ♀ (macr.) J. H. Jurriaanse (LM).

This species is characterized by its small size, 3.4–3.7 mm in males, 3.7–4.35 in females. Male foreleg Fig. 129, rostrum Fig. 130.

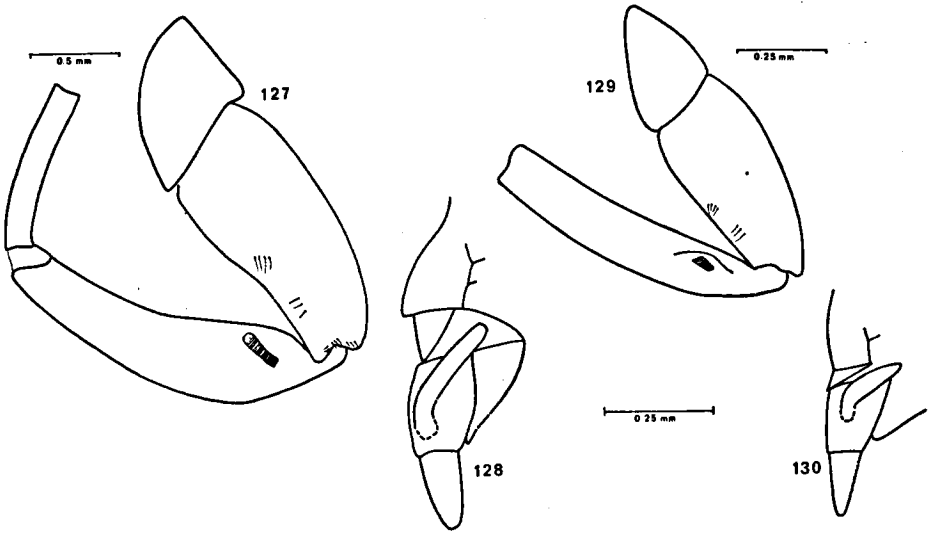

Fig. 127–128. *Buenoa incompta* male, from Surinam: 127, foreleg; 128, rostrum.
Fig. 129–130. *Buenoa salutis* male, from Venezuela: 129, foreleg; 130, rostrum.

Judging from the records in literature, about 15–20% of the specimens of *B. salutis* are macropterous. In populations studied, however, this proportion seems to be considerably smaller (TRUXAL 1957). The bias is caused by the fact that there are many records of single or small groups of specimens attracted by light, like the present materials.

Buenoa truxali sp. n.

SURINAME: Marowijne, Stoelmanseiland, Boszwampje, 14.VIII.1953, 1 ♂; Suriname, Road to Afobaka km 67, forestpool, 14.IX.1963, 1 ♂, 2 ♀ D. C. Geijskes; Sarakreek, Maripaheuvel, kamp MGD, 24.X.1959, 2 ♂, 4 ♀; Carolinakreek, 10 km S. of Zanderij, 24.IV.1962, 3 ♂, 3 ♀ P. H. van Doesburg, Jr.

Colour: Eyes brownish-grey, pronotum luteous with a dark band along the hind margin. Scutellum luteous to light brownish, abdomen in dorsal view luteous to greyish. Hemelytra hyaline with conspicuous dark markings along proximal margin of the clavus and the median border; on the apex of the corium a large dark brown patch.

Length (in mm)
male $\bar{x} = 5.15$ $s = 0.242$ $n = 7$ *female* $\bar{x} = 5.53$ $s = 0.172$ $n = 9$
Humeral width of pronotum (in mm)
male $\bar{x} = 1.34$ $s = 0.046$ $n = 7$ *female* $\bar{x} = 1.31$ $s = 0.047$ $n = 9$
Ocular index
male $\bar{x} = 0.090$ $s = 0.0065$ $n = 7$ *female* $\bar{x} = 0.087$ $s = 0.0083$ $n = 9$

MALE. Head: greatest width about 6½ times the anterior width of vertex, narrower than the humeral width of pronotum. Vertex slightly indented, anterior width 3.2–*3.6*–3.8 times synthlipsis. Rostral prong slightly larger than third rostral segment, originating about midway the segment (Fig. 134). – Pronotum 0.69–*0.76*–0.81 mm, without carina. Lateral margins concave, diverging anteriorly. Scutellum as long as or longer than pronotum. – Legs. Foreleg: length of femur about three times the width at apex, without stridulatory area on inner surface. Length of tibia about four times its greatest width, tibial comb (Fig. 133) with 23–28 dents. Outer apex of tibia produced in a sharp point, inner surface apically with a group of four or five pegs (Fig. 131, 132).

FEMALE. Head: greatest width six to seven times the anterior width of vertex, narrower than the humeral width of pronotum. Vertex slightly indented, anterior width 3.2–*3.8*–4.2 times synthlipsis. Pronotum length 0.69–*0.75*–0.79 mm, without carina. Lateral margins concave, diverging anteriorly. Scutellum longer than pronotum.

With the key of TRUXAL 1953 this species runs to *B. thomasi* Truxal. Males are to be separated by the pointed outer apex of the fore femur in *B. truxali*, which is lacking in *B. thomasi* and the num-

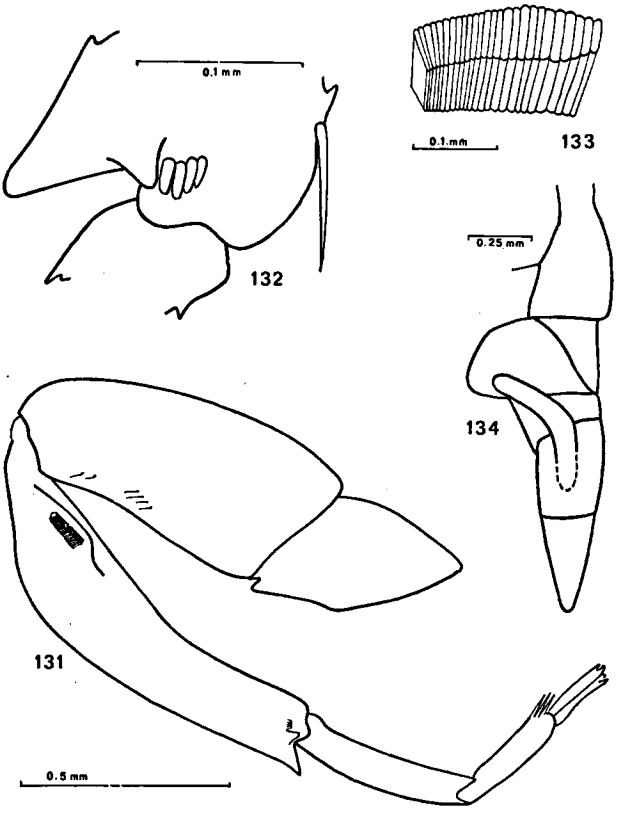

Fig. 131–134. *Buenoa truxali* male, from Surinam; 131–133, holotype: 131, foreleg; 132, apex of fore tibia; 133, tibial comb; 134, rostrum of paratype.

ber of pegs apically on the inner surface of the fore tibia which is 4–5 in *B. truxali* and 10–17 in *B. thomasi*.

Types: Holotype ♂, allotype ♀, 1 ♂, 1 ♀ paratypes from Carolinakreek, 1 ♂, 3 ♀ paratypes from Sarakreek and 1 ♂, 2 ♀ paratypes from Afobaka in Leiden Museum; 1 ♂, 1 ♀ paratypes from Carolinakreek in collection of F. S. TRUXAL (Los Angeles Ca.); 1 ♂, 1 ♀ paratypes from Sarakreek in collection of author.

With great pleasure I dedicate this species to DR. F. S. TRUXAL, whose 1953 revision of the genus *Buenoa* made further work in this group possible.

SPECIES NOT YET RECORDED FROM SURINAM

Buenoa antigone antigone (Kirkaldy), 1899

Anisops antigone KIRKALDY, 1899a, p. 30 (Jamaica).
Buenoa antigone; KIRKALDY, 1904, p. 120, 122, 134.
Buenoa antigone; KIRKALDY & TORRE-BUENO, 1909, p. 200 (Cuba, Jamaica, S. Domingo).
Buenoa antigone; HUNGERFORD, 1940, p. 256 (Cayman Islands).
Buenoa antigone antigone; Truxal, 1953, p. 1376–1379, fig. 42 (West Indies, México, Guatemala, Brasil, Ecuador, Perú, Bolivia, Paraguay, Argentina).
Buenoa antigone antigone; Nieser 1967, p. 168–171, fig. 53, 60, 70, 75 (Lesser Antilles).
? *Buenoa margaritacea*; ANCONA 1937, p. 228–232, fig. 8–13 (México).

MÉXICO, Tamaulipas, Hidalgo, Vera Cruz, Chiapas; GUATEMALA; GREATER ANTILLES; LESSER ANTILLES; VENEZUELA!; BRASIL, Rio Grande do Norte, São Paulo, Santa Catarina; ECUADOR; PERÚ, Tarma, San Martín; PARAGUAY; ARGENTINA, Salta.

VENEZUELA, Maracay, Aragua, 15.XI.1958, 4 ♂, 21 ♀ P. H. van Doesburg, Jr. (LM).

Length (in mm)
male $\bar{x} = 7.80$ $s = 0.232$ $n = 4$ *female* $\bar{x} = 8.58$ $s = 0.234$ $n = 21$
Ocular index
male $\bar{x} = 0.222$ $s = 0.0156$ $n = 4$ *female* $x = 0.234$ $s = 0.0049$ $n = 21$
Male, foreleg Fig. 135, rostrum Fig. 136.

If this series is compared with the material from Aruba, Bonaire, Curaçao and St. Martin studied earlier (NIESER 1967) it appears that the present material shows great affinity to that from Aruba and that rather great differences are to be observed from the material from St. Martin. The general trend of variation in length of this species seems to be greater length in the SE part of the distributional area N of the equator, which is somewhat contrary to Bergmann's rule.

Buenoa fuscipennis (Berg), 1879

Anisops fuscipennis Berg, 1879, p. 198–199 (Argentina).
Anisops naias Kirkaldy, 1899d, p. 194 (Chile).
Buenoa naias; Kirkaldy, 1904, p. 120, 134.
Buenoa dentipes Jaczewski, 1928, p. 127–129 (Brasil).
Buenoa naias; De Carlo, 1935, p. 110.
Buenoa fuscipennis; Truxal, 1953, p. 1460–1462, fig. 7, 28, 71 (Venezuela, Brasil, Bolivia, Chile, Paraguay, Uruguay, Argentina).
Buenoa fuscipennis; Bachmann, 1961, p. 24 (Argentina).
Buenoa fuscipennis; Bachmann, 1963, p. 36 (Argentina).

Venezuela; Brasil, Paraná, Santa Catarina; Bolivia; Paraguay; Uruguay; Argentina, Corrientes, Entre Ríos, Santa Fé, Córdoba, Buenos Aires, Río Negro; Chile, Valparaíso, Santiago, Maule.

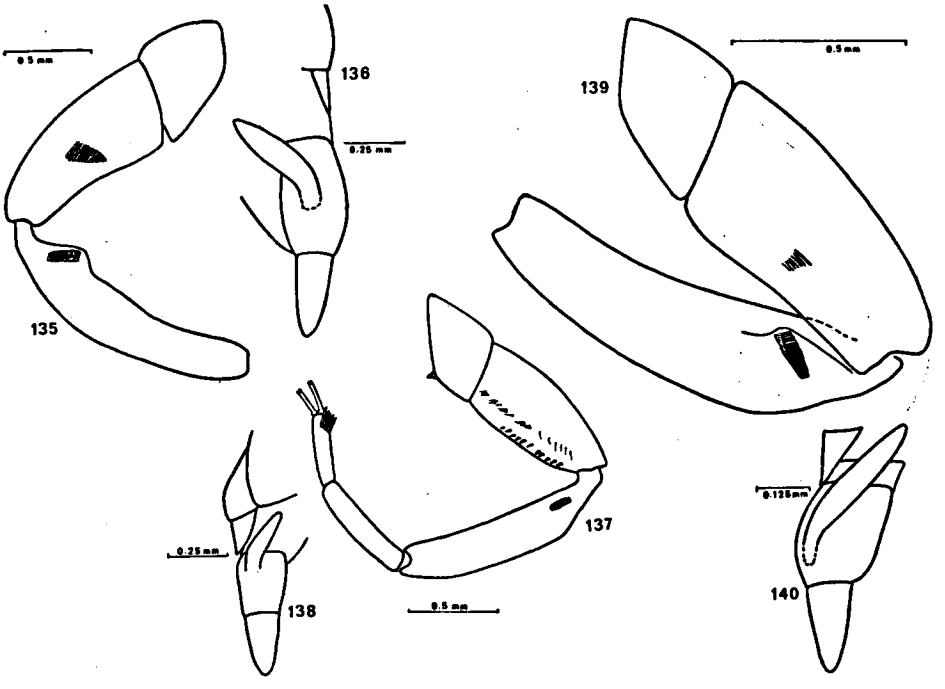

Fig. 135–136. *Buenoa antigone antigone* male, from Venezuela: 135, foreleg; 136, rostrum.
Fig. 137–138. *Buenoa fuscipennis* male, from Argentina: 137, foreleg; 138, rostrum.
Fig. 139–140. *Buenoa nitida* male, from Venezuela: 139, foreleg; 140, rostrum.

ARGENTINA: La Plata, 12.VII.1924, 1 ♀ J. H. Jurriaanse (LM); Buenos Aires, Río Matanza, XII.1961, 2 ♂ (N).
Male, foreleg Fig. 137, rostrum Fig. 138.

Buenoa nitida Truxal, 1953

Buenoa nitida TRUXAL, 1953, p. 1430–1432, fig. 60 (Brasil, Perú).

VENEZUELA!; BRASIL, Amazonas; PERÚ, Amazonas.

VENEZUELA, Maracay, Aragua, 15.XI.1958, 3 ♂ P. H. van Doesburg, Jr. (LM).
Male, foreleg Fig. 139, rostrum Fig. 140.
This species is much alike to *B. doesburgi* n. sp.; see for comparative notes under the latter.

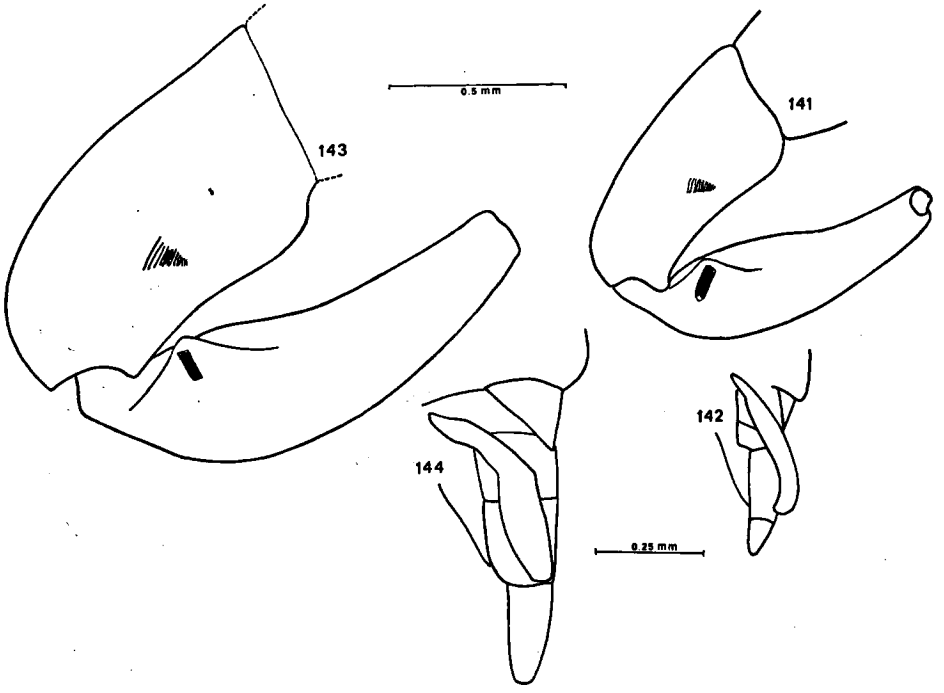

Fig. 141–142. *Buenoa platycnemis* male, from Venezuela: 141, foreleg; 142, rostrum.
Fig. 143–144. *Buenoa rostra* male, from Venezuela: 143, foreleg; 144, rostrum.

Buenoa platycnemis (Fieber), 1851

Anisops platycnemis FIEBER, 1851, p. 485 (Puerto Rico).
Buenoa platycnemis; TORRE-BUENO, 1909, p. 75–77.
Buenoa platycnemis; TRUXAL, 1953, p. 1421–1426, fig. 57 (U.S.A.; México; Panamá; Canal Zone; Costa Rica; Greater Antilles; Lesser Antilles; Colombia; Venezuela; Brasil; Perú).
Buenoa platycnemis; TRUXAL, 1957, p. 16 (Goiás).
Buenoa platycnemis; DE ABATE, 1960, p. 21–23.
Buenoa platycnemis; NIESER, 1967, p. 181–182, figs. 58, 64, 69, 80. (Lesser Antilles, Venezuela).

U.S.A.; Texas, Florida; MÉXICO, Sonora, Jalisco, Vera Cruz, Micoacán, México D.F., Morelos, Guerrero, Chiapas, Campeche, Yucatán; COSTA RICA; PANAMÁ; CANAL ZONE; COLOMBIA; VENEZUELA; BRASIL, Maranhão, Goiás; PERÚ, Amazonas; GREATER ANTILLES; LESSER ANTILLES.

VENEZUELA: N. Higuerote, 30.VII.1936, 1 ♀ Hummelinck *Sta. 1*; Maracay Aragua, 15.XI.1958, 9 ♂, 9 ♀ P. H. van Doesburg, Jr. (LM).
Male, foreleg Fig. 141, rostrum Fig. 142.

Buenoa rostra Truxal, 1953

Buenoa rostra TRUXAL, 1953, p. 1395–1396, fig. 50 (Venezuela, Trinidad).
Buenoa rostra; NIESER, 1967, p. 184, figs. 54, 66, 73, 78 (Trinidad).

VENEZUELA; TRINIDAD.

VENEZUELA: Maracay Aragua, 15.XI.1958, 1 ♂, 1 ♀ P. H. van Doesburg, Jr. (LM).
Male, foreleg Fig. 143, rostrum Fig. 144.

REFERENCES

ANCONA, L. H., 1937. Contribución al conocimiento de los Hemípteros acuáticos del Valle del Mezquital. *Ann. Inst. Biol. México 8*: 217–253, 41 figs.

BACHMANN, A. O., 1961a. Apuntes para una hidrobiologia Argentina. IV. Los Hemiptera Cryptocerata del Delta del Paraná. *Rev. Soc. Ent. Arg. 23* (1960): 24–25.

BACHMANN, A. O., 1961b. El género Martarega en la Argentina. *Rev. Soc. Ent. Arg. 23*: 30.

BACHMANN, A. O., 1963a. El género Notonecta en la Argentina, al norte del Río Colorado (Hemiptera, Notonectidae). *Rev. Soc. Ent. Arg. 36*: 5–6.

BACHMANN, A. O., 1963b. Apuntes para una hidrobiologia Argentina VI. Los Hemiptera Cryptocerata de la Patagonia Extracordillerana. *Physis 24*: 35–37.

BARE, C. O., 1928. Haemoglobin cells and other studies in the genus Buenoa (Hemiptera, Notonectidae). *Univ. Kansas Sci. Bull. 18*: 265–349, pl. 44–57.

BERG, G., 1897. *Hemiptera Argentina*: 18–316.

BERG, C., 1883. A new genus of Notonectidae (Hemiptera). *Ann. Soc. Ci. Arg. 16*: 122.

BROOKS, G. T., 1953. A new subgenus and species of Enithares. *J. Kansas Ent. Soc. 26*: 74–75, 4 figs.

CHAMPION, G. C., 1901. Biologia Centrali Americana. Rhynchota Heteroptera II, 416 pp., 22 pl. [Notonectidae p. 368–375, pl. 22 fig. 6–16].

DE ABATE, J. L., 1960. Studies on the backswimmers of Costa Rica (Notonectidae). *Tulane Stud. Zool. 8*: 1–28, 48 figs.

DE CARLO, J. A., 1935. Hemípteros acuáticos y semiacuáticos II. Especies no citadas para la Argentina. *Rev. Arg. Ent. 1*: 3–5.

FABRICIUS, J. C., 1775. *Systema Entomologiae.* (32) + 832 pp. [Notonecta p. 689–690].

FIEBER, F. X., 1852. Rhynchotographieen III. Die Gruppe der Notonectae. *Abh. Köngl. Böhm. Ges. Wiss. 7*: 469–486.

GUÉRIN-MÉNEVILLE, M. F. E., 1857. Animaux articulés a pieds articulés; in: RAMON DE LA SAGRA, *Histoire physique, politique et naturelle de l'île de Cuba.* Paris. [Notonecta, p. 421–422].

HERRING, J. L., 1951. The aquatic and semiaquatic Hemiptera of northern Florida. Part 3: Nepidae, Belostomatidae, Notonectidae, Pleidae and Corixidae. *Florida Ent. 34*: 17–29.

HUNGERFORD, H. B., 1919. Biology and ecology of aquatic and semiaquatic Hemiptera. *Univ. Kansas Sci. Bull. 11*: 1–194.

HUNGERFORD, H. B., 1926. Some Notonecta from South America. *Psyche 33*: 11–15, 1 pl.

HUNGERFORD, H. B., 1930. A report on the nomenclature of some neotropical Notonecta, with the description of some new species. *Bull. Brookl. Ent. Soc. 25*: 138–143.

HUNGERFORD, H. B., 1933. The genus Notonecta of the world. *Univ. Kansas Sci. Bull. 21*: 1–195, 17 pl.

HUNGERFORD, H. B., 1940. Results of the Oxford University Cayman Islands Biological Expedition of 1938. Aquatic Hemiptera. *Ent. Month. Mag. 76*: 255–256.

HUNGERFORD, H. B., 1944. Some Venezuelan aquatic Hemiptera. *Zoologica 29*: 129.

HUNGERFORD, H. B., 1958. Some interesting aspects of the world distribution and classification of aquatic and semiaquatic Hemiptera. *Proc. 10th Int. Congr. Ent. 1956 (1)*: 337–348, 12 maps.

HUTCHINSON, G. E., 1945. On the species of Notonecta (Hemiptera-Heteroptera) inhabiting New England. *Trans. Connect. Acad. Arts Sci. 36*: 599–605, 6 figs.

HYNES, H. B. N., 1948. Notes on the aquatic Hemiptera-Heteroptera of Trinidad and Tobago, B.W.I., with a description of a new species of Martarega B. White (Notonectidae). *Trans. R. Ent. Soc. London 99*: 341–360, 1 fig.

JACZEWSKI, T., 1928. Notonectidae from the state of Paraná. *Ann. Mus. Zool. Pol. 7*: 121–136, pl. 19–23 (43 figs).

KIRKALDY, G. W., 1897. Revision of the Notonectidae. Part I. Introduction and systematic revision of the genus Notonecta. *Trans. Ent. Soc. London 1897*: 393–426.

KIRKALDY, G. W., 1899a. On some aquatic Rhynchota from Jamaica. *Entomologist 32*: 28–30.

KIRKALDY, G. W., 1899b. Viaggio del Dr. Enrico Festa nell'Ecuador e regioni vicine. XIX. Aquatic Rhynchota. *Boll. Mus. Zool. Anat. Comp. Torino 14, 350*, 9 pp., 7 figs.

KIRKALDY, G. W., 1899c. On some aquatic Rhynchota from South America in the collections of the Museum of Zoology and Comparative Anatomy of the Royal University of Turin. *Boll. Mus. Zool. Anat. Comp. Torino 14, 347*, 2 pp.

KIRKALDY, G. W., 1899d. Notes on aquatic Rhynchota. *Entomologist* 32: 193–196.

KIRKALDY, G. W., 1904. Über Notonectiden (Hemiptera) I, II. *Wien. Ent. Zeit. 23*: 93–110, 111–131, 1 fig.

KIRKALDY, G. W., 1904. Verzeichnis der Gattungen und Arten der Notonectidae. *Wien. Ent. Zeit. 23*: 132–135.

KIRKALDY, G. W. & TORRE-BUENO, J. R. DE LA, 1909. A catalogue of American aquatic and semiaquatic Hemiptera. *Proc. Ent. Soc. Wash. 10*: 173–215.

KLEEREKOPER, H., 1955. Limnological observations in Northeastern Rio Grande do Sul I. *Arch. Hydrobiol. 50*: 553–567.

LANSBURY, I., 1965. A new tribe and genus of Notonectidae (Heteroptera: Notonectidae) from Borneo. *Pacif. Ins. 7*: 327–332, 24 figs.

LARSÉN, O., 1938. Untersuchungen über den Geschlechtsapparat der aquatilen Wanzen. *Opusc. Ent. Suppl. I*, 288 pp., 151 figs.

LINNAEUS, C., 1771. *Mantissa Plantarum 2* [p. 534, description of Notonecta indica]. (n.v).

MENKE, A. S. & TRUXAL, F. S., 1966. New distribution data for Martarega, Buenoa and Abedus, including the first record of the genus Martarega in the United States (Hemiptera: Notonectidae, Belostomatidae). *Los Ang. Co. Mus. Contr. Sci. 106*, 6 pp., 1 fig.

MOORE, G. A., 1950. Catalogue des Hémiptères de la Province de Québec. *Naturaliste Canad. 21*: 233–282.

NIESER, N., 1967. The Heteroptera of the Netherlands Antilles VI. Notonectidae. *Stud. Fauna Cur. 24*: 157–189, fig. 45–80.

PENN, H. & ELLIS, L. L., 1949. Notes on aquatic Hemiptera from Lafayette and Marshall Counties, Mississippi. *Fla. Ent. 32*: 158–159.

POISSON, R. A., 1942=1952. Hydrocoridae; in: E. TITSCHACK, *Beitr. Fauna Perus 2*, 1942. Reprinted in *3*, 1952: 102–106, 8 figs. [Bd. 2 was destroyed during the war].

POLHEMUS, J. T., 1966. Some Hemiptera new to the United States. *Proc. Ent. Soc. Wash. 68*: 57.

RICE, L. A., 1942. Notes on the biology and species of the three genera of Notonectidae found at Reelfoot Lake, Tennessee. *J. Tenn. Ac. Sc. 17*: 55–67, 2 pl.

RICE, L. A., 1954. Observations on the Biology of ten Notonectoid species found in the Douglas Lake, Michigan Region. *Am. Midl. Nat. 51*: 105–132, 3 pl.

SPINOLA, M., 1837. *Essais sur les genres d'insectes appartenants à l'ordre des Hémiptères Linn. ou Rhyngotes Fabr. à la section des Hétéroptères Dufour.*

ŠTYS, P., 1960. The Czechoslovak populations of Notonecta reuteri Hungf. *Act. Soc. Ent. Czech. 57*: 129–135, 9 figs.

THOMAS, H. D., 1939. The distribution of the genus Notonecta in Mexico. *Bull. Brookl. Ent. Soc. 34*: 1–8, 5 maps.

TORRE-BUENO, J. R. DE LA, 1905. The genus Notonecta in America north of Mexico. *J. New York Ent. Soc. 13*: 163–167, 1 pl.

TORRE-BUENO, J. R. DE LA, 1909. The notonectid genus Buenoa Kirkaldy. *J. New York Ent. Soc. 17*: 74–77.

TRUXAL, F. S., 1949. A study of the genus Martarega. *J. Kansas Ent. Soc. 22*: 1–24, 5 pls.

TRUXAL, F. S., 1952. Morphology of male genitalia in Notonectidae. *J. Kansas Ent. Soc. 25*: 30–38, 4 pls.

TRUXAL, F. S., 1953. Revision of the genus Buenoa. *Univ. Kansas Sci. Bull. 35*: 1351–1523, pl. 101–117.

TRUXAL, F. S., 1957. The Machris Brazilian Expedition. Entomology: general, systematics of the Notonectidae. *Contr. Sci. 12*: 1–22, 1 pl., 8 figs.

USHINGER, R. L., 1956. Aquatic Hemiptera; in: R. L. USHINGER (Ed.), *Aquatic Insects of California*: 182–228, ill.

WHITE, F. B., 1879. List of the Hemiptera collected in the Amazons by Prof. J. W. Trail, M.A., M.D., in the years 1873–1875, with description of the new species. *Trans. Ent. Soc. London 1897*: 267–276.

WILSON, C. A., 1958. Aquatic and semiaquatic Hemiptera of Mississippi. *Tulane Stud. Zool. 6*: 115–170.