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Phylogeny and biogeography of the Platystictidae (Odonata)

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Citation

Tol, J. van. (2009, February 26). *Phylogeny and biogeography of the Platystictidae (Odonata)*. Retrieved from <https://hdl.handle.net/1887/13522>

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5. Revision of the Platystictidae of the Philippines (Odonata), excluding the *Drepanosticta halterata*-group, with descriptions of twenty-one new species

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Tol, J. van. Revision of the Platystictidae of the Philippines (Odonata), excluding the *Drepanosticta halterata* group, with descriptions of twenty-one new species. Zool. Meded. Leiden 79-2 (10), 22.vii.2005: 195-282, figs 1-109, 1 table. – ISSN 0024-0672.

Key words: Odonata; Platystictidae; *Drepanosticta*; *Protosticta*; *Sulcosticta*; Philippines; new species; new genus.

Thirty-one species of the family Platystictidae of the Philippines are revised, i.e. all species recognised, excluding the species of the *Drepanosticta halterata*-group. The following new taxa are described: 16 species in *Drepanosticta* Laidlaw: *D. acuta* sp.n., *D. aurita* sp. n., *D. centrosaurus* sp. n., *D. clados* sp. n., *D. flavomaculata* sp. n., *D. furcata* sp. n., *D. hermes* sp. n., *D. krios* sp. n., *D. luzonica* sp. n., *D. malleus* sp. n., *D. myzouris* sp. n., *D. paruatia* sp. n., *D. pistar* sp. n., *D. quadricornu* sp. n., *D. rhampbis* sp. n., *D. trachelocele* sp. n., two in *Protosticta* Selys, viz. *P. lepteca* sp. n. and *P. plicata* sp.n., and three in *Sulcosticta* gen. n., viz. *S. striata* sp. n., *S. pallida* sp. n. and *S. viticula* sp. n. The status of eleven previously discribed nominal taxa is established. One, *D. septima* Needham & Gyger, is doubtfully considered a synonym of *D. mylitta* Cowley.

Based on a preliminary phylogenetic analysis, the species of *Drepanosticta* are divided into informal species groups. Most species of the Philippines have affinities to species of Sulawesi,

the Moluccas and New Guinea. Several species confined to Palawan have sister-group relationships with species from Borneo. The affinities of various other species confined to the Sulu archipelago, are unsettled as yet. The species of Platystictidae here assigned to *Protosticta* Selys are presumably not closely related to the type species, *P. simplicinervis* Selys from Sulawesi. However, a better placement has to await a more detailed phylogenetic study of the family. For three species the new genus *Sulcosticta* gen. n. is erected. These species are closely allied based on the structure of the appendages, but should have been assigned to different genera if based on the present generic definitions.

Many species here described have small distributional ranges, a common phenomenon in Platystictidae. Since most forests in the Philippines are heavily under threat or have already disappeared in the last fifty years, several taxa described in this paper should be considered under threat of immediate extinction.

Introduction

Forest damselflies, Platystictidae, are among the most characteristic elements of seepage areas, trickles and small streams of virgin forests in Southeast Asia.

Both the mainland and many of the islands of this region are inhabited by great variety of species of the genera *Protosticta* Selys and *Drepanosticta* Laidlaw (Fig. 1). Most platystictid species of Southeast Asia were described by Lieftinck (e.g. 1937, 1939, 1961,

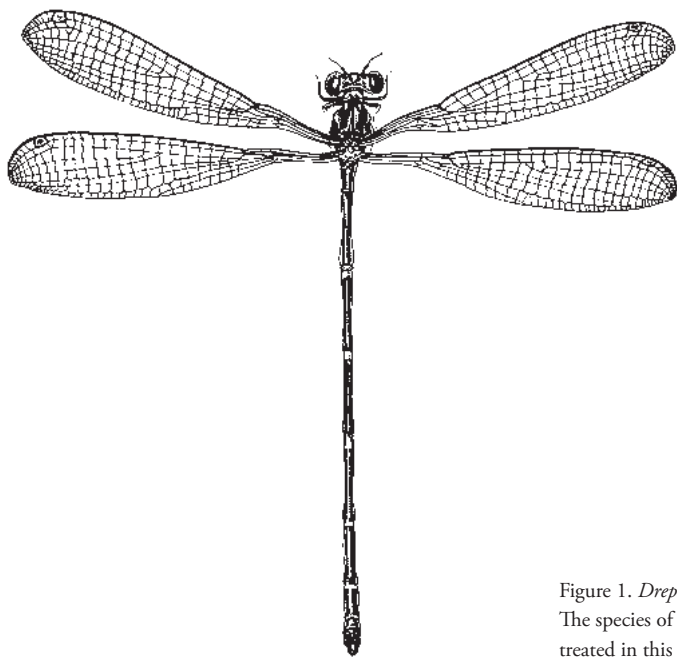


Figure 1. *Drepanosticta halterata* complex. Habitus of male. The species of the *D. halterata* species group are not fully treated in this paper.

1965), while more recently mainly Asahina (e.g. 1984), Hämäläinen (1991, 1999), Wilson (1997), Wilson & Reels (2001) and Van Tol (2000) have contributed to the regional knowledge of this family. For the Philippines, especially the publications by Needham & Gyger (1939, 1941) are relevant, although the first Philippine species were already described by Brauer (1868).

Drepanosticta and *Protosticta* species generally have small distributional ranges, and island endemism at the species level is high, e.g. on Sulawesi for the genus *Protosticta* it is hundred percent (Van Tol, 2000). The same picture of small ranges and high island endemism is apparent for platystictids of many other islands of Indonesia, and is also true for species of this damselfly family of the Philippines as well. Hämäläinen & Müller (1997) mentioned the high number of species, especially in the genus *Drepanosticta*. They enumerated 35 species in the family, 32 species of *Drepanosticta* and three species of *Protosticta*. Only twelve valid Philippine species in the genus *Drepanosticta* have been described so far, and one other nominal taxon is considered a synonym. So, twenty

species in *Drepanosticta* and three species in *Protosticta* awaited description.

The paper by Hämäläinen & Müller (1997) was based on a careful study of the specimens available in museums, but focussed on the collection brought together by Mr. Roland A. Müller (St. Gallen, Switzerland) and his collaborators between 1985 and 1997 (Fig. 2). The Müller collection is the first collection of Philippine Odonata representative of all parts of the country. It is also outstanding in the documentation of localities. The National Museum of Natural History Naturalis at Leiden and Mr. Roland A. Müller were able to reach an agreement on the deposition of this collection in Leiden in 1998. The collection is rich in species of previously neglected families as Platycnemididae and Platystictidae. Some presently still undescribed species are represented with more than 200 specimens. Nearly all material of the Müller collection was identified by Dr Matti Hämäläinen (Espoo, Finland). His pioneering work has revealed the value of this collection in many ways. Hämäläinen himself published a series of papers describing taxa new to science (see Hämäläinen

& Müller, 1997 for an overview; and Hämäläinen 1997, 2000; Gassmann & Hämäläinen 2002, Van Tol & Müller, 2003 for results published since that time).

This paper is part of a series of papers in which I hope to revise the Platystictidae of the Oriental and Papuan regions, and to reconstruct the phylogeny of this family, including the *Palaemnema* species of the New World. New species of *Drepanosticta* from various parts of the mainland of Southeast Asia, and from several islands in Indonesia, await description. Also, the generic division of the Oriental species is far from satisfactory, as it is mainly based on one wing venational character, which seems to contradict a grouping of species based on an analysis including various other characters (see also Orr, 2003: 69-72).

The present papers includes all Philippine species of Platystictidae, except the species of the *Drepanosticta halterata* group. The latter group is widespread in Luzon (incl. Batan), the West Visayas (Panay, Negros, Cebu, Sibuyan) and East Visayas (Samar, Bohol). Although material is available in sufficient numbers, and clearly recognisable variation in characters exists between populations, the distinction of species needs further study of the material, including some type specimens.

Three obviously closely related species are assigned here to a new genus, as a first step to define monophyletic groups within this family. The studies of the forest damselflies of Southeast Asia by others and myself, partly still unpublished, slowly unravel a fascinating image of diversity as a result of millions of years of evolution. Most species are dull-coloured, small and inconspicuous insects, superficially looking very similar. The variation in small details of the male anal appendages is remarkable in the species of the mainland. Most species of the Philippines have structurally similar anal appendages in the male, but they show the most exuberant structures in projections of the pronotum. The information of these features to

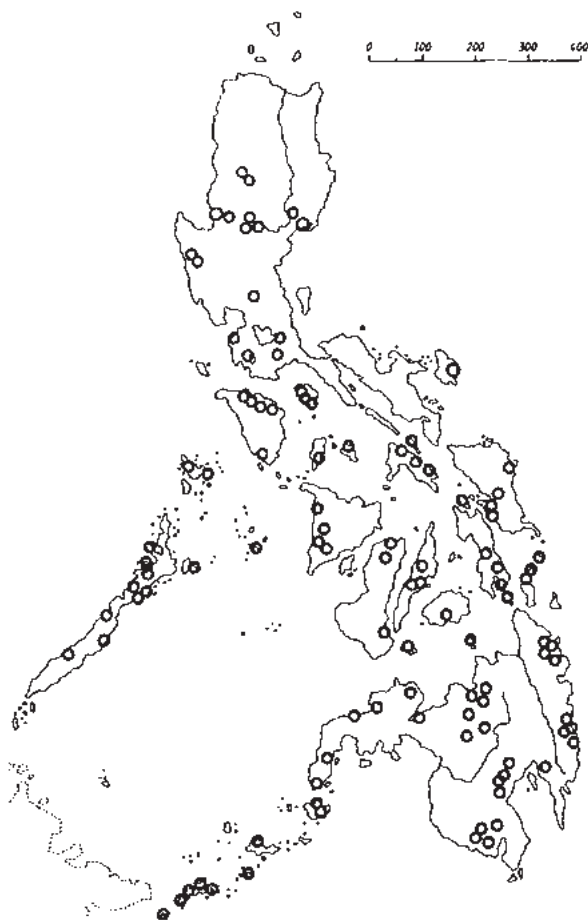


Figure 2. Approximate position of localities of the specimens in the Roland Müller collection (from: Hämäläinen & Müller 1997: 250). Scale bar in kilometers.

reconstruct the phylogenetic relationships have only just started.

The uneasy observation must be made that many of the spectacular life forms described in this paper are on the verge of extinction. Several species are described here from only one or very few specimens collected from a forest reserve of one hectare or less. Since several of such precious sites already got lost since the collections were made, we must fear for their survival. One may only be hopeful that the present paper may contribute to the awareness in the Philippines of the huge, unique and irreplaceable diversity of insect life of this country.

Material and methods

This paper is based on the material in the National Museum of Natural History (Leiden), including the former collections of Roland A. Müller (St. Gallen, Switzerland) (see above) and Dr. Matti Hämäläinen (Espoo, Finland). The latter collection, although much smaller than the Müller collection, was also valuable since it includes both duplicates from the Müller collection retained after his identifications, as well as specimens collected by Hämäläinen himself. Types were examined, if necessary, for several previously described species. The study of the types of species described by Needham and Gyger had to be postponed. I have relied on the descriptions, or material in the Leiden museum identified by M. A. Liefstinck after comparison with types. Deposition of other material is documented, with collections identified by codens as follows: BMNH, Natural History Museum, London, UK [= British Museum (Natural History)]; CASC, California Academy of Sciences, San Francisco, USA; CUIC, Cornell University, Ithaca, New York, USA; FMNH, Field Museum Natural History, Chicago, Illinois, USA; IRSN, Institut royal des Sciences Naturelles de Belgique, Bruxelles, Belgium; MCZC, Museum of Comparative Zoology, Cambridge, Massachusetts, USA; MNHN, Museum National d'Histoire Naturelle, Paris, France; RMNH, National Museum of Natural History, Leiden, The Netherlands [formerly Rijksmuseum van Natuurlijke Historie]; SMFD, Senckenberg Museum, Frankfurt a. M.; ZMUC, Zoological Museum University of Copenhagen. Descriptions of all species start with a diagnosis, enumerating the most distinct characters as compared to other Philippine species, especially in the species groups distinguished. Terminology generally follows Watson & O'Farrell (1991), and Cowley (1936) for specialised terminology of the head structure. For most species the description of the male is based on the holotype. Measurements are also for the holotype, with variation of the paratypes in brackets. The descriptions of the females are concise, typically comparing the female with the male. Measurements for the females

are presented separately. Illustrations are based on specimens in the RMNH collection (except for the holotype of *Drepanosticta megametia* Cowley); the references to the actual specimens are given in the captions. The distributions are summarized at the end of each description. A series of distribution maps is presented at the end of the paper (Figs 99-109).

Phylogenetic relationships

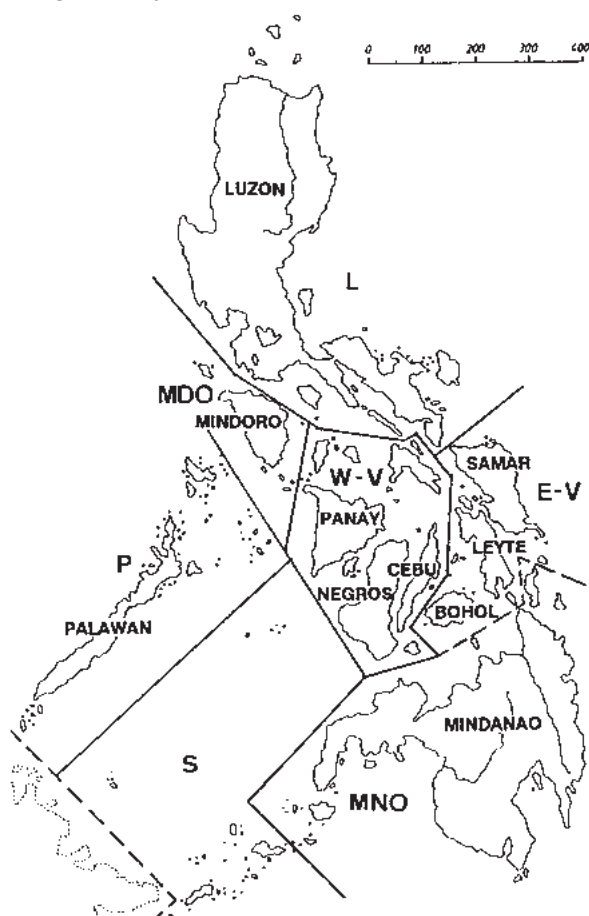
Although a more elaborate analysis of the phylogeny of the Philippine Platystictidae has to await the analysis of all species of this family for Southeast Asia, a few remarks can be made.

Firstly, various species of Palawan and Busuanga have little in common with most other species of the Philippines. Species such as *D. ceratophora* Liefstinck and *D. paruatia* sp. n. have sister-group affinities with species of Borneo. The relationship of another species of the Palawan area, *D. quadricornu* sp. n., is uncertain. Based on the remarkably similar structure of the male anal appendages of almost all other species of Philippine *Drepanosticta*, these species are presumably derived from one common ancestor. Based on the structure of both anal appendages and pronotum, the closest affinities of this group are definitely with species as *D. ephippiata* Liefstinck from Sulawesi, or *D. clavata* Liefstinck from New Guinea (see also Liefstinck 1937: 72-74). The males of the Philippine species, although also showing subtle differences in the structure of the anal appendages, are most easily distinguished by the structure of the pronotum. Both the anterior and the posterior lobe of the pronotum can be furnished with the most exuberant projections, sometimes even exceeding in length the size of the pronotum itself. The characters of the pronotum as mentioned here are those of the male. In some species male and female have very similar projections on the pronotum, while seemingly closely related species male and female are structurally different in this respect.

Within this group of closely related species, various species groups could be identified based on a preliminary analysis of the characters. These groups have been used in this publication to provide a first

structuring of the variation. Some more widespread species show clinal variation in the structure of e.g. the projections of the pronotum. Also, some islands forms were recognisable. Decisions whether such forms had to be considered as separate species, were difficult and are debatable. For instance, the 'form' of *D. belyshevi* Hämäläinen from Samar was considered so distinct that it is raised here to species level. On the other hand,

Figure 3. Faunal regions in the Philippines, with names of islands mentioned in the text. Abbreviations for regions as follows: L: Luzon region, MDO: Mindoro region, WV: West-Visayan region, EV: East Visayan subregion, MNO: Mindanao subregion (EV plus MNO together form Mindanao region), P: Palawan group (part of Greater Sunda region), S: Sulu region. Luzon, Mindoro, West-Visayan and Mindanao regions comprise the Philippine biogeographic region proper (from: Hämäläinen & Müller 1997: 251). Scale bar in kilometers.



the group of 'geographically recognizable forms' of *D. mylitta* Cowley was not split, but kept under the name *D. mylitta*. Further studies, including molecular studies, are needed to provide an understanding of the relationships of these complexes, thus also providing a better basis for such taxonomic decisions.

Various species in this paper are assigned to the genus *Protosticta* Selys, based on the absence of the anal bridge vein (Ab) at the base of the wing. However,

it is unlikely that these species are closely related to the type species of *Protosticta*, *P. simplicinervis* Selys from Sulawesi. It is certain that the venational character distinguishing *Protosticta* and *Drepanosticta* will prove to be of little phylogenetic significance. It has to remain open for further research whether all Philippine '*Protosticta*' belong to the *Drepanosticta*-complex of the Philippines, or should be regarded as a distinct genus. Unfortunately, all species of this group of species are rare in the collection, and presently no material is available for molecular analysis. Such an analysis may also provide further insight in the relationships of the species here assigned to the new genus *Sulcosticta*.

The generic placement of most species in the genus *Drepanosticta* in the present sense seems rather unproblematic. However, the genus is based on a synplesiomorphy, and its monophyly is both unestablished as well as unlikely. A further division into monophyletic groups has to await the revision of the species of the mainland of South-East Asia. The assignment of other species to *Protosticta* is, as explained above, preliminary. The character presently defining the genus *Protosticta*, viz. the absence of the Ab vein, is clearly not a unique apomorphy in the family, and will prove unsuitable for the definition of a monophyletic group. For example, one of the species here included in *Protosticta* on the characters of the male would have to be included in *Drepanosticta* if

Table 1

Distribution of Platystictidae described in this paper, per faunal region. The East Visayan and Mindanao regions are usually considered subregions of one single region.

× Present. — o Absent. — (x) Status uncertain. — ? Locality uncertain.

	Luzon	Mindoro	West Visayan	East Visayan	Mindanao	Sulu	Palawan
<i>Drepanosticta acuta</i> sp. n.	×	o	o	o	o	o	o
<i>Drepanosticta aries</i> Needham & Gyger	o	o	o	o	×	o	o
<i>D. krios</i> sp. n.	o	o	o	?	×	×	o
<i>D. rhamphis</i> sp. n.	×	o	o	o	o	o	o
<i>D. belyshevi</i> Hämäläinen	o	o	o	×	o	o	o
<i>D. flavomaculata</i> sp. n.	o	o	o	o	×	o	o
<i>D. trachelocele</i> sp. n.	o	o	o	×	o	o	o
<i>D. luzonica</i> sp. n.	×	o	o	o	o	o	o
<i>D. moorei</i> Van Tol & Müller	×	o	o	o	o	o	o
<i>D. clados</i> sp. n.	o	o	o	o	×	o	o
<i>D. furcata</i> sp. n.	o	o	×	o	o	o	o
<i>D. hermes</i> sp. n.	o	o	o	o	×	o	o
<i>D. lymetta</i> Cowley	o	o	o	o	×	o	o
<i>D. taurus</i> Needham & Gyger	o	o	o	o	×	o	o
<i>D. centrosaurus</i> sp. n.	o	o	o	o	×	o	o
<i>D. megametta</i> Cowley	o	o	o	o	×	o	o
<i>D. aurita</i> sp. n.	o	×	o	o	o	o	o
<i>D. ceratophora</i> Lieftinck	o	o	o	o	o	o	×
<i>D. malleus</i> sp. n.	o	o	o	o	×	o	o
<i>D. mylitta</i> Cowley	(x)	o	o	×	(x)	o	o
<i>D. myzouris</i> sp. n.	×	o	o	o	o	o	o
<i>D. paruatia</i> sp. n.	o	o	o	o	o	o	×
<i>D. pistor</i> sp. n.	×	o	×	o	o	o	o
<i>D. quadricornu</i> sp. n.	o	o	o	o	o	o	×
<i>Protosticta annulata</i> Selys	×	o	o	o	o	o	o
<i>P. lepteca</i> sp. n.	×	o	o	o	o	o	o
<i>P. plicata</i> sp. n.	o	o	×	o	o	o	o
<i>Sulcosticta pallida</i> sp. n.	×	o	o	o	o	o	o
<i>S. striata</i> sp. n.	×	o	o	o	o	o	o
Total	11	1	3	3-4	10-11	1	3

based on the wing venation of the female.

Three species with different wing venation, but otherwise evidently closely related, are placed in a new genus based on the similar structure of the male

genitalia. It is expected that a further phylogenetic analysis may reveal that more species will have to be placed in this genus.

Distributional patterns

This is not the place to provide a profound zoogeographical analysis based on the Platystictidae, since the prerequisites for such an analysis are not fulfilled. Nevertheless, some brief remarks on the distributions of presumed monophyletic groups, or sister-group relationships with other areas in South-East Asia, may contribute to the definition of a more detailed zoogeographical study. The platystictids will be discussed based their occurrence in the faunal regions as defined by e.g. Vane-Wright (1990) (see Fig. 3). The biogeography of the Philippines has been discussed several times the last decades, also in relation to the palaeogeography of the region. A relevant discussion is De Jong & Treadaway (1993: 81-111). Their study was hampered by insufficient knowledge of the phylogeny of the HesperIIDae, making a cladistic biogeographical analysis impossible as well. Instead, they compared hypothesized distribution patterns derived from geological events with actual patterns found. If such patterns cannot be traced, dispersal rather than a geological event was supposed to be the cause of such a pattern. Mainly based on terrestrial vertebrates, the Philippines were subdivided in faunal regions. Interestingly, this subdivision is similar to the regions as defined by Semper (1892) based on butterflies around hundred years earlier.

The palaeogeography of the region is very complicated indeed. Continental fragments are restricted to the western part of the Philippines, while most islands were formed along the Philippine plate during the last 40 million years. These islands were formed along the westside of the Philippine Sea Plate by closewise rotation of the plate from the late Eocene (42 Ma). Further to the west, not far from the mainland, parts of Palawan, Panay and Mindoro (Calamian block) were situated. The Calamian block rifted eastward by seafloor spreading during the Oligocene. Even during the Miocene, the islands arc along the westside of the Philippine Sea Plate still existed, including (parts of) Luzon, Zambales, East Mindanao, North Sulawesi and (more to the east) Halmahera. The Zamboanga

peninsula of Mindanao had a more western position at the northern part of the Celebes Sea. In the late Miocene, the island of Luzon arc still moved northward, and partly collided with northern Palawan. Also the during the Pliocene the clockwise rotation of the plate continued. As a result, for instance, the island of Halmahera was still north of the Vogelkop peninsula in the Pliocene, 500 km east of its present position. The island of Luzon, in its present shape, was only formed during the late Pliocene (2 Ma). Another important, and geologically recent, phenomenon is the lowering of the sea level during the ice ages of the Quaternary. Many of the island were connected when sea level was c. 150 m lower than today. The channel between Borneo and the Philippines is not deeper than 145 m and Borneo and Palawan formed one island, while also many of the Sulu islands were connected at the time.

As discussed above, the Palawan group of species seems to be most closely related to the species of Borneo, and not to the other species of the Philippines. This phenomenon is well known in other groups as well, and can be understood with present knowledge of recent geology. It should, however, be realised that various lineages with many autapomorphies living in Palawan have not reached Borneo, or have become extinct in Borneo.

The area of highest diversity in the Platystictidae (table 1) is the eastern part of the island of Mindanao. Many species widespread in Mindanao, and in some cases also in other islands, occur in this area together with many species with extremely small distributional ranges and endemic to this area. This is best shown in the *D. lymetta* group.

The fauna of Luzon is most diverse on the level of species-groups. The *belyshevi* group, the *halterata* group, the *moorei* group, the *Protosticta* group and several unplaced species are all confined to, or strongly represented in, Luzon. From most other islands only one or very few species are known. Although this observation may partly be an artifact due to insufficient collecting, or massive deforestation in some parts of the Philippines in recent times, it is in agreement with the generally recognized biogeographical pattern. The small

number of species on Mindoro, however, is remarkable and should be studied further.

Systematic part

Key to the males of Platystictidae of the Philippine Islands

1. Inferior appendages (ventral view) broad and short, the top bifid or with top shining brown sclerotized and flattened (Fig. 95); synthorax with variegated pattern of longitudinal stripes (*Sulcosticta* gen. n.) 2
 - Inferior appendages much broader at base than at top, usually base stout, the distal half much more slender, without shining brown sclerotization at distal margin; synthorax usually uniform brown or with one longitudinal stripe; if synthorax with variegated pattern, then inferiors long and slender 5
2. Inferior appendage undivided, the top flattened and sclerotized, directed dorsad, the margin with a row of teeth (Polillo) *Sulcosticta* sp. n. [unnamed]
 - Inferior appendage bifid, or with distinct inward directed projection 3
3. Inferior appendage subterminally with distinct, inward directed projection ending as flat sclerotized surface *S. viticula* sp. n.
 - Inferior appendage bifid, both parts subequal, inner part sclerotized, but not ending in a flat surface 4
4. Synthorax very pale, mesepisternum greyish yellow, except along dorsal carina; anterior lobe of prothorax simple without processes; Anal bridge present but not connected with Anal crossing *S. pallida* sp. n.
 - Synthorax with a complex pattern of dark and pale markings, mesepisternum predominantly black with a narrow pale stripe against humeral suture; anterior lobe of prothorax with a paired of long processes, curved anteriad, twice as long as length of anterior lobe itself *S. striata* sp. n.
- 5 (1). Anal bridge (Ab) present and connected with Anal crossing as Y-shaped vein (*Drepanosticta*

- Laidlaw) 6
- Anal bridge absent (*Protosticta* Selys) 31
- 6 (5) Posterior margin of posterior lobe of pronotum with a single, median process, curved anteriad (Fig. 55) *D. ceratophora* Lieftinck
- Posterior margin of posterior lobe of pronotum simple without processes, or with a pair of shorter or longer processes 7
- 7. Anterior and posterior lobes with conspicuous, paired processes on hind margin, the processes distinctly longer than length of lobes themselves 8
 - Anterior or posterior lobes (not both) with conspicuous processes longer than length of lobes themselves, or processes lacking on both anterior and posterior lobes 11
- 8. Transverse occipital carina poorly developed, at least without conspicuous angulate lateral extremities 9
 - Transverse occipital carina well developed with distinct, angulate lateral extremities 10
- 9 (8). Paired processes of anterior lobe of pronotum filiform, much more slender than the processes of posterior lobe (Fig. 28); hind wing c. 22 mm (Luzon) *D. moorei* Van Tol & Müller
 - Paired processes of anterior lobe of pronotum flat and triangular; paired processes of posterior lobe hornlike (Figs 77-78); hind wing c. 18 mm (Palawan, Busuanga) *D. quadricornu* sp. n.
- 10 (8) Base of posterior processes of posterior lobe of pronotum (dorsal view) very close together, distance between both processes c. two times the width of process; processes smoothly curved abaxiad (Fig. 16) *D. belyshevi* Hämäläinen
 - Base of posterior processes wide apart, distance between both processes more than five times the width of process; processes curved somewhat dorsad, the distal three-quarters ventrad (Fig. 22) *D. trachelocele* sp. n.
- 11 (7) Transverse occipital carina poorly developed, at least without conspicuous angulate lateral extremities; hind wing 25 mm or more 12
 - Transverse occipital carina with distinct lateral extremities; hind wing shorter than 25 mm 15
- 12 (11) Hind margin of posterior lobe of pronotum

- with a pair of processes, longer than the median length of the posterior lobe 13
- Hind margin of posterior lobe of pronotum with smoothly rounded, or somewhat lifted, but without a process longer than median line of posterior lobe 14
13. Tip of inferior appendage with a long subterminal, medially directed tooth (Figs 69-70); processes of posterior lobe with top widening as a funnel, top flat as a sucker (Fig. 68) *D. myzouris* sp. n.
- Tip of inferior appendage on innerside smooth or somewhat projected, but without a distinct tooth; processes of posterior lobe tapering or club-shaped, but tip not flat *D. halterata* group
- The following described species are included in this group: *D. halterata* Brauer, *D. philippa* Lieftinck, and *D. trimaculata* Lieftinck; several undescribed species are available in collections. The status of various nominal taxa is uncertain. This group is common and widespread in Luzon. A special publication on this group is in preparation.
- 14 (12) Superior appendages with distinct dorsal tooth (Figs 59-60); lateral sides of hind lobe of pronotum flat and sharp (Fig. 58); head very smooth and shining, without microsculpture (c. 30 times magnification) *D. lestoides* Brauer
- Superior appendages without distinct ventral tooth (Figs 26-27); lateral sides of hind lobe of pronotum somewhat uplifted and broadly rounded (Fig. 25); head coriaceous *D. luzonica* sp. n.
- 15 (11) Metepisternum and metepimeron predominantly creamish white; mesepisternum with a bluish antehumeral stripe *Drepanosticta paruatia* sp. n.
- Metepisternum and metepimeron brown; pale coloration, if present, a squarish, creamish white marking against posterior margin of synthorax; no antehumeral stripe. 16
16. Synthorax with a complex coloration of brownish black and pale markings; superior appendages in lateral view strongly curved (Figs 75-76) *D. pistor* sp. n.
- Synthorax concolorous; superior appendages in lateral view nearly straight 17
17. Synthorax castaneous; lateral corners of posterior lobe of pronotum sharply projected (Fig. 64). *D. mylitta* Cowley
- Synthorax brownish black; lateral corners of posterior lobe of pronotum rounded, or distinct processes longer than median length of posterior lobe itself on hind margin 18
18. Posterior lobe of pronotum with lateral corners broadly rounded ('ears'), the projections densely set with long setae (Fig. 52) *D. aurita* sp. n.
- Posterior lobe of pronotum with distinct processes, longer than the median line of the lobe 19
19. Posterior lobe of pronotum with paired collar-like processes, broadly rounded at top, constricted at base and broadly connected with the lobe 20
- Posterior lobe of pronotum with paired processes, usually slender, the top in some species split into branches or hammer-like structure 21
20. Paired processes of posterior lobe of pronotum approximately as long as wide, only somewhat constricted in the middle (Figs 49-50) *D. megametta* Cowley
- Paired processes of posterior lobe of pronotum much wider than long, the middle distinctly constricted, thus the top with long projections (Fig. 46) *D. centrosaurus* sp. n.
- 21 (19). Paired processes of posterior lobe of pronotum curved, undivided, usually approximately as long as the length of posterior lobe itself (*D. aries* group) 22
- Paired processes of posterior lobe of pronotum erect, not distinctly curved, but tip frequently split and developed as a knob, or a fork, or a disk . . . 24
22. Posterior part of metepisternum and metepimeron with creamish yellow squarish markings; abdominal segment 10 and appendages pale (Figs 20-21) *D. flavomaculata* sp. n.
- Posterior part of metepisternum and metepimeron dark brown, concolorous with other parts of synthorax; at least segment 10 brown, colour not different from segment 9 23
23. Px 16-17 in fore wing, 15-16 in hind wing (Mindanao, Mt Apo) . *D. aries* Needham & Gyger
- Px 14-15 in fore wing, 13-14 in hind wing

- (Mindanao, but not in Mt. Apo region)
 *D. krios* sp. n.
- 24 (21). Superior appendages in lateral view curved, the inferiors distinctly surpassing the level of the superiors (Figs 32-33) *D. clados* sp. n.
- Superior appendages in lateral view more or less straight, the inferiors and superiors in lateral view approximately of equal length 25
25. Top of paired processes of posterior lobe of pronotum ending abruptly in a smaller or larger hook 26
- Top of paired processes straight or split, but branches of splitting not forming an angulate hook with main stem of process 28
26. Paired processes of posterior lobe of pronotum very long and heavy, length more than twice the median line of the posterior lobe itself; branches of T-splitting also strongly built (Fig. 61); Y-vein at base of wing distinctly stalked . . . *D. malleus* sp. n.
- Paired processes of posterior lobe of pronotum approximately as long as median line of posterior lobe itself; Y-vein (sub)-sessile 27
27. Superior appendage (dorsal view) with a very short, mediad tooth near appendage base, and a hardly discernable tubercle at base of club-shaped part of appendage; paired posterior processes of posterior lobe of pronotum with distinct stem (Fig. 13) (Catanduanes Id.) *D. rhamphis* sp. n.
- Superior appendage with a long and acute, ventro-mediad tooth at base of club-shaped top; paired posterior processes of posterior lobe of pronotum club-shaped part with short stem (Fig. 4) (Luzon) *D. acuta* sp. n.
- 28 (25). Paired processes of posterior lobe of pronotum straight and erect (perpendicular to body axis), the top somewhat thicker (Fig. 43)
 *D. taurus* Needham & Gyger
- Paired processes of posterior lobe of pronotum split in branches, usual of unequal length, the process not 90° erect, but more directed posteriad . . . 29
29. Synthorax castaneous; paired processes of posterior lobe of pronotum divided in two short branches similar to the stem (Fig. 34) (Siquijor Id)
 *D. furcata* sp. n.
- Synthorax brownish black; paired processes of posterior lobe of pronotum divided into two longer, usually asymmetrical branches which are more slender than the stem (Mindanao Id). 30
30. Distal half of inferior appendage curved like as clasper; outer branch of paired processes of posterior lobe of pronotum distinctly longer than inner branch (Fig. 37). *D. hermes* sp. n.
- Distal half of inferior appendage straight; inner branch of paired processes of posterior lobe of pronotum typically longer than outer branch, but in some specimens difference indistinct (Fig. 40) . . .
 *D. lymetta* Cowley
- 31 (5). Anterior lobe of pronotum with paired processes, approximately as long as median line of anterior lobe itself; hind lobe of pronotum with a pair of longer processes, which are curved anteriad (Fig. 84) *Protosticta lepteca* sp. n.
- Anterior lobe of pronotum simple, without processes; hind lobe with short processes never bent anteriad 32
32. Paired processes of hind lobe of pronotum erect, the top sharp (Fig. 81). *P. annulata* (Selys)
- Paired processes of hind lobe of pronotum with rounded top, formed since the process is halfway recurved distad the fully 180° (Fig. 87)
 *P. plicata* sp. n.

List of Platystictidae of the Philippines

The species are arranged by species-group. The sequences of the species-groups, and the species within the species-groups, are alphabetical.

Drepanosticta Laidlaw, 1917

D. aries group

1. *D. acuta* sp. n. 141
2. *D. aries* Needham & Gyger, 1941 143
3. *D. krios* sp. n. 144
4. *D. rhamphis* sp. n. 146

D. belyshevi group

5. *D. belyshevi* Hämäläinen, 1991 147
6. *D. flavomaculata* sp. n. 149
7. *D. trachelocele* sp. n. 151

[<i>D. halterata</i> group]	
[not reviewed in this paper]	
<i>D. halterata</i> Brauer, 1868	
<i>D. philippa</i> Lieftinck, 1961	
<i>D. trimaculata</i> Lieftinck, 1939	
<i>D. moorei</i> group	
8. <i>D. luzonica</i> sp. n.	152
9. <i>D. moorei</i> Van Tol & Müller, 2003	154
<i>D. lymetta</i> group	
10. <i>D. clados</i> sp. n.	155
11. <i>D. furcata</i> sp. n.	157
12. <i>D. hermes</i> sp. n.	158
13. <i>D. lymetta</i> Cowley, 1936	159
14. <i>D. taurus</i> Needham & Gyger, 1941	161
<i>D. megametia</i> group	
15. <i>D. centrosaurus</i> sp. n.	163
16. <i>D. megametia</i> Cowley, 1936	164
<i>Drepanosticta</i> : other species	
17. <i>D. aurita</i> sp. n.	165
18. <i>D. ceratophora</i> Lieftinck, 1974	167
19. <i>D. lestoides</i> Brauer, 1868	168
20. <i>D. malleus</i> sp. n.	170
21. <i>D. mylitta</i> Cowley, 1936	172
22. <i>D. myzouris</i> sp. n.	174
23. <i>D. paruatia</i> sp. n.	175
24. <i>D. pistior</i> sp. n.	176
25. <i>D. quadricornu</i> sp. n.	178
<i>Protosticta</i> Selys, 1885	
26. <i>P. annulata</i> Selys, 1886	180
27. <i>P. lepteca</i> sp. n.	182
28. <i>P. plicata</i> sp. n.	183
<i>Sulcosticta</i> gen. n.	
29. <i>S. pallida</i> sp. n.	185
30. <i>S. striata</i> sp. n.	185
31. <i>S. viticula</i> sp. n.	188
Unplaced specimens	189

***Drepanosticta* Laidlaw**

Drepanosticta Laidlaw, 1917: 339.

Drepanosticta Laidlaw is traditionally distinguished within the Platystictidae by the combination of a

straight, rather than fractured, IR3 vein, and the presence of an Anal bridge, joining the Anal crossing or the hinder margin of the wings. Here, a new genus is erected for three Philippine species based on the shape of the superior appendages. One of these species does have an Anal bridge, which does not join the Ac before or at the wing margin ('sessile Y-vein'), but meets the hinder margin of the wing far from the Ab.

The Philippine species of *Drepanosticta* are placed here in various informal groups based on preliminary phylogenetic studies, as explained above. The following groups have been defined (in alphabetical order): *D. aries* group, *D. belyshevi* group, *D. moorei* group, *D. lymetta* group, *D. megametia* group. The groups are named after the species of the group that was first described.

***Drepanosticta aries* group**

Transverse occipital carina well developed, with distinct lateral extremities; anterior lobe of pronotum smooth and flat; posterior lobe of pronotum with flat and curved processes, approximately the median length of the posterior lobe; synthorax brown; pterostigma wider than high; superior appendages with dorsal tooth; inferior appendages straight, the tip curved medio-dorsad.

Included species: *D. acuta* sp. n., *D. aries* Needham & Gyger, *D. krios* sp. n., *D. rhamphis* sp. n.

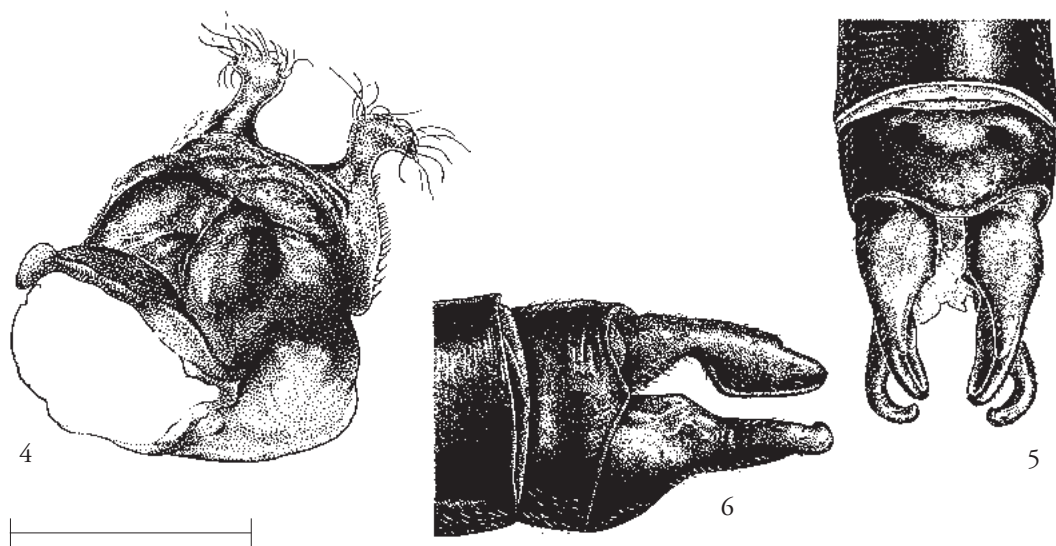
Distribution: Luzon, Catanduanes, Mindanao, Sulu archipelago; Samar doubtful.

***Drepanosticta acuta* van Tol, sp. n.**

(Figs 4-6, 99)

Drepanosticta sp. n. 10. – Hämäläinen & Müller 1997: 257, 277 (Luzon).

Type material. – Holotype male [JvT 18985] in RMNH: 'Philippines. Luzon Id. Camarines Sur. Pili. Bungao Curry. Mt. Isarog. Caririca river. 200-400 m. 4-15 Aug 1997, Celso Nazareno'. – Paratypes (all Philippine Islands). **Luzon:** Mt. Isarog, 8.iv.1916 (G. Boettcher) 1 female (in SMFD); P. I., M.T. Iriga / Camarines Sur, 6.iv.1962 (H.M. Torrevillos) 1 male; Camarines Sur. Pili. Bungao Curry. Mt. Isarog. Caririca river. 200-400 m, 4-15.viii.1997 (Celso Nazareno) 8 males 4 females.



Figures 4-6. *Drepanosticta acuta* sp. n., male [JvT 18981, Luzon, Camarines Sur, Pili, Bungao Curry, Mt Isarog, 200-400 m, 4-15 Aug 1997]. – 4, pronotum, oblique view. – 5, anal appendages, dorsal view. – 6, idem, left lateral view. Scale bar 1 mm.

Diagnosis. – Medium-sized; very broad superior appendages in lateral view, which also have a remarkably long and sharp ventro-mediad tooth at the base of the widened part. The three other species in this group with short to very short, inconspicuous tooth at base of widened part. Females without projections on posterior margin of posterior lobe of pronotum; the same structure in *D. rhamphis* sp. n. with distinct projections.

Male [holotype, JvT 18985]. – **Head.** Labrum, mandibles and anteclypeus bluish white; anterior border of labrum with narrow black line; rest of head bronze-black, postclypeus and frons shining brownish black, dorsal side of head coriaceous, with many elongate striae lateral to ocelli; transverse occipital carina with distinct acutely angulate extremities; antenna with scapus brownish black, pedicellus yellowish white, tip of pedicellus and flagellum lightbrown.

Thorax. Pronotum (Fig. 4) with central part of anterior and posterior lobe, median and lateral lobes (except ventralmost part) brownish black, rest of anterior and posterior lobes castaneous; posterior lobe with caudal processes rather wide apart, base solid, tapering, the

top directed 90° abaxiad, as head of woodpecker, distal part with long setae. Synthorax unicolorous bronze-black, especially metepisternum and metepimeron shining black, rest coriaceous. Legs dirty yellow, femora near joints of tibiae with brownish black ring. Wings hyaline; venation brown, somewhat darker in posterior part; Px 17 in fore wing, Px 16 in hind wing; R4+5 arising just distal to subnodus, IR3 just distal to that level; Arculus arising just distal to Ax2; quadrangle somewhat widening posteriorly in fore wing; pterostigma castaneous, c. two times as wide as high, proximal side acutely angulate; cells between Costa and R1 distal to pterostigma undivided.

Abdomen. Segments 1-7 brown to brownish black, with distinct pale yellow basal annulae covering 1/8 to 1/5 of length of each segment; segments 8-10 brownish black. Appendages (Figs 5-6) with superiors stout at base, distal three-fifths tapering, a distinct ventro-mediad triangular tooth at base of distal club-shaped part, distal part in inner-lateral view club-shaped with a short dorsal tubercle at half of the length; inferiors in ventral view with triangular basal part one-third of length; caudal part with basal half straight and cylindrical, top constricted, bent in semicircle 90° dorso-axiad.

Measurements. Abdomen including appendages 29 (29-30) mm, hind wing 19 (19-20) mm.

Female. – As the male, but posterior margin of posterior lobe of pronotum without projections.

Measurements. Abdomen 27-28 mm, hind wing 20 mm.

Etymology. – *Acutus* (Latin), sharp; for the acute tooth on superior appendage. An adjective.

Distribution (Fig. 99). – Philippine Islands: Luzon (Camarines Sur).

***Drepanosticta aries* Needham & Gyger**
(Figs 7-9, 99)

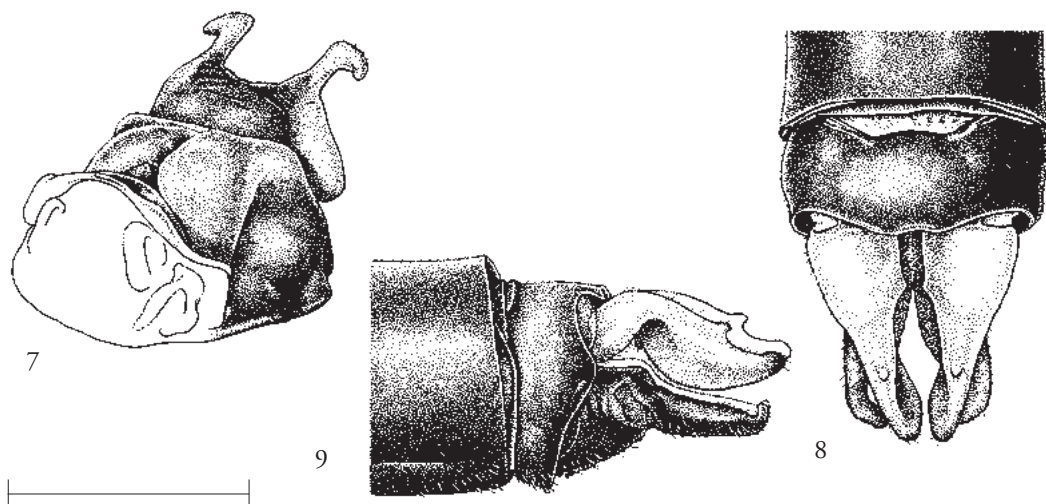
Drepanosticta aries Needham & Gyger, 1941: 144-145, figs 3, 4, 8, 9 (original description, type locality Mindanao, Mnt Apo, Galog river, in MCZC) [type MCZN 23831, not examined]. – Hämäläinen & Müller 1997: 257, 276 (distribution Mindanao).

Material examined (all specimens Philippines, in RMNH). – **Mindanao.** Tra'ankina. Lake Sebu. 21-23.xi.1991 (J. de los Reyes) 1 male; Tra'ankina. Lake Sebu. 3-5.i.1992 (J. de los Reyes) 1 female; Lake Sebu, Lamalahak, Talubek. 26.i. - 1.ii.1994 (L. Vinciguerra & E. Horn) 3 females; North Cotabato, Mt. Apo, Philipp. National Oil Comp. forest area,

1600-1800 m, 12-25.iii.1994 (Alex Buenafe) 1 female; North Cotabato, Mt. Apo, Marbel river, 700-900 m, 12-25.ix.1994 (Alex Buenafe) 1 male; Davao del Sur, Mt Talomo, Malagos, Baguio, Eagle Camp, Kal-lay Creek, 700-1000 m, x.1994 (Alex Buenafe) 1 female; North Cotabato. Mt. Apo. Lake Agko. 1200-1300 m, 29.iii. -2.iv.1995 (R. A. Müller) 5 males 4 females; North Cotabato, Mt. Apo, Ilomavis, Lake Agko, Dum Creek. 1100-1200 m, ix.1995 (Alex Buenafe) 7 males 1 female; North Cotabato, Mt. Apo, Ilomavis, Kal-ay Creek, Sitio Sayaban. 1200-1300 m, ix.1995 (A. Buenafe) 3 males; North Cotabato, Mt. Apo, Ilomavis, Lake Agko, Babang Creek. 1600-1700 m, ix.1995 (A. Buenafe) 1 female.

Diagnosis. – Dark and medium-sized *Drepanosticta*; differs from other species in the *aries* group by the robust superior appendages, i.e. approximately two times as long as wide in dorsal view (appr. three times in *D. krios* sp. n.), and the complete dark segment 8 of the abdomen. Superior appendages robust in lateral view, but those of *D. acuta* sp. n. (from Luzon) are significantly wider. Confined to Mt. Apo and Lake Sebu on Mindanao.

Male. – Head. Labrum, mandibles, anteclypeus dirty white, narrow brownish black line along anterior border of labrum and mandibles; rest of head bronze-



Figures 7-9. *Drepanosticta aries* Needham & Gyger, male [JvT 20089, Mindanao, North Cotabato, Mt Apo, Ilomavis, Lake Agko, 1100-1200 m, ix.1995]. – 7, pronotum, oblique view. – 8, anal appendages, dorsal view. – 9, idem, left lateral view. Scale bar 1 mm.

black; antenna with scapus and pedicellus yellowish white, tip of pedicellus and flagellum brown; transverse occipital carina well developed with lateral extremities apiculate.

Thorax. Pronotum (Fig. 7) medium brown, but middle of posterior lobe, and lateral lobe dark brown; anterior lobe simple, but anterior ridge distinct; median and lateral lobes without distinct features; posterior lobe with both sides approximately halfway a caudally directed, flat and not erect process, approximately as long as median length of posterior lobe of pronotum, process ending in a 90° outward directed tip, somewhat more robust than base, ca. one-fourth the length of base. Synthorax dark brown, except for a paler spot around spiracle. Legs pale, except for darker rings on femora near tibiae. Wings hyaline, venation dark brown; Px 16-17 in fore wing, 15-16 in hind wing; origin of R4+5 at subnodus, IR3 just distal to that level; Arculus arising just distal to Ax2, quadrangle in forewing widening distally, anal veins shortly stalked; pterostigma castaneous, subquadrangular and oblique, proximal corner acute, distal side distinctly convex, cells between Costa and R1 distal to pterostigma rarely divided.

Abdomen. Dark brown, but paler basal annulae on segments 3-7. Appendages (Figs 8-9) middle brown, superiors base stout, in dorsal view tapering towards the tip, length ca. 2.5 times largest width, superiors actually fully flattened, thus hollow underside at base, dorsally at three-fifths from base a very short dorsal triangular tooth; inferiors in ventral view somewhat shorter than superiors, somewhat diverging, but tips directed inwards at c. 70°.

Measurements. Hind wing 24-25 mm, abdomen including appendages 35-36 mm, one specimen very small with hind wing 20 mm, abdomen including appendages 30 mm.

Female. – Very similar to the male, but posterior lobe of pronotum with lateral processes distinctly shorter, without terminal knob, approximately the length of hind lobe and semi-erect; wings with anal veins sessile, 17 Px in fore wing and hind wing. Some females presumably conspecific with males of *D. aries* (collected

on same sites) with lateral extremities of postorbital carina acute rather than apiculate; pronotum with posterior lobe indistinct, the erect lateral processes absent, only with short erect collar.

Measurements. Hind wing 22-24 mm, abdomen 31-32 mm.

Status. – The name *Drepanosticta aries* Needham & Gyger is used here exclusively for specimens from Mount Apo, the type locality, and Lake Sebu, which is situated c. 120 km south of Mt. Apo. Other specimens with similar pronotum and appendages are known from other places in Mindanao, from Eastern Samar, Tawi Tawi and Sanga Sanga. They are assigned to *Drepanosticta krios* sp. n. The other two species of this group occur in Luzon.

Distribution (Fig. 99). – Philippine Islands: Mindanao (Mt. Apo, Lake Sebu)

Drepanosticta krios van Tol, sp. n.

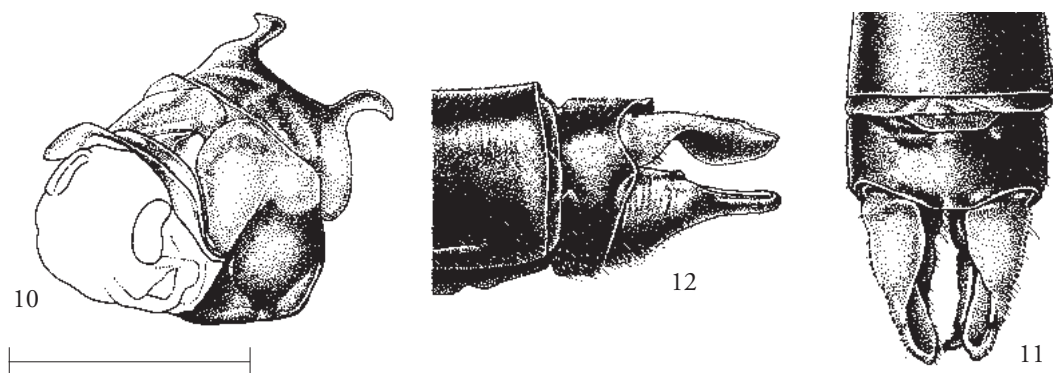
(Figs 10-12, 99)

Drepanosticta sp. n. 3. – Hämäläinen & Müller 1997: 257, 276.

Type material. – Holotype male [JvT 18867] in RMNH: 'Philippines, Tawi Tawi / Languyan, 80-100 m / June 8, 1990 / Roland A. Müller legit'. – Paratypes (all Philippine Islands, in RMNH, 112 males 22 females): **Mindanao**. Lanao del Norte, Kapatagan, Mt. Puting, Bato Sapad, 250 ft., x.1988 (W. Catal) 10 males 1 female; Lanao del Norte, Sitio Tinago, 10-16.viii.1997 (A. Buenafe) 37 males 11 females; Lanao del Norte, Iligan, Mimbalo Falls. 8°10'50"N 124°10'10"E. 29 m asl. 25.iii.2004 (V. Kalkman & J. van Tol) 14 males; Zamboanga del Norte Prov., 20 km S of Manucan, Labauan Mts, 680 m, 15.x.1959 (Quate) 1 male; Zamboanga del Norte Prov., Tampilisan, Gampoy river, 5-9.i.1991 (Th. Borromeo Jr) 3 males 1 female; Idem, Zamboanga del Sur, Tigbao, Mt Timolan, Tigbao Creek, 12-21.viii.1994 (Th. Borromeo) 28 males 4 females. – **Sulu archipelago**, Tawi Tawi Id. Languyan, 80-100 m. 6-9.vi.1990 (R. A. Mueller) 15 males 3 females; Batu Batu, 14-16.iii.1991 (Th. Borromeo) 2 males; Sanga Sanga Id. 2.vi.1992 (Th. Borromeo) 1 male; Tawi Tawi Id., Tarawakan. 100 m. 22-26.vi.1992 (Treadaway) 1 male 2 females.

Excluded from type series. – **Samar**. Eastern Samar, Oras, 10-22.viii.1994 (Th. Borromeo leg) 1 male (locality doubtful).

Diagnosis. – A rather small *Drepanosticta*, similar in structural details to *D. aries* Needham & Gyger, but



Figures 10-12. *Drepanosticta krios* sp. n., male [JvT 22092, Tawi Tawi, Languyan, 80-100 m, 9.vi.1990]. – 10, pronotum, oblique view. – 11, anal appendages, dorsal view. – 12, idem, left lateral view. Scale bar 1 mm.

of smaller size, with flatter processes of the posterior lobe of the prothorax, the superior appendages much more slender (especially visible in dorsal view), a lower number of postnodal crossveins in both fore and hind wings, and a conspicuous oblong bluish spot on abdominal segment 8; differs from both *D. acuta* sp. n. and *D. rhampis* sp. n. in the smaller projections of the posterior lobe of the pronotum, and from the former in the straight rather than curved and tapered inferior appendages, and from the latter in the dorsal tooth of the superior appendage.

Male (JvT 18867, holotype). – Head. Labrum, mandibles, anteclypeus bluish white with a brownish black line along anterior border of labrum and mandibles, line on labrum in middle approximately one-fifth the height of labrum, and tapering towards the corners; rest of head bronze-black, coriaceous, with light-brown oval spots somewhat smaller than ocelli, anterior to anterior ocellus and lateral to lateral ocelli; antenna with scapus and pedicellus yellowish white, tip of pedicellus and flagellum brown; transverse occipital carina well developed with lateral extremities apiculate. Thorax. Pronotum (Fig. 10) pale brown or dirty yellow, but middle of posterior lobe, and lateral lobe brown; anterior lobe simple, with anterior ridge distinct; median and lateral lobe without distinct features; posterior lobe with both sides approximately halfway a caudally directed, flat and not erect process, somewhat shorter than median length of posterior lobe of

pronotum, both ending in smoothly recurved, tapering tip. Synthorax vivid brown, except for a paler spot around spiracle and a narrow, oblong spot along lower margin of metepimeron. Legs pale, except for darker rings on femora near tibiae. Wings hyaline, venation brown; Px 14-15 in fore wing, 13-14 in hind wing; origin of R4+5 at subnodus, IR3 halfway first cell distal to that level; Arculus arising at Ax2, quadrangle in forewing hardly widening posteriorly, anal veins shortly stalked; pterostigma castaneous, width 1.6 times the height, oblique, proximal corner acute, distal side distinctly convex, cells between Costa and R1 distal to pterostigma rarely divided.

Abdomen brown, but paler basal annulae on segments 3-7, segment 8 anteriorly with an oblong, bluish white spot, approximately two-fifths the length of segment, and posteriorly rounded. Appendages (Figs 11-12) middle brown, superiors base stout, in dorsal view tapering towards the tip, length ca. 3.5 times largest width, superiors flattened and curved, thus hollow underside at base, dorsally at five-sevenths from base a very short dorsal triangular tooth; inferiors in ventral view somewhat longer than superiors, parallel-sided, but tips directed inwards at c. 70°.

Measurements. Hind wing 18.5 mm (18-19 mm); abdomen, including appendages 29 mm (29-30 mm).

Female. – Similar in coloration as male; structure of hind margin of posterior lobe more simple, straight, lateral parts ending sharp, below that level a broadly

rounded lobe; Px fore wing 16, hind wing 15; anal appendages brown, valves pointed and surpassing tip of cercus.

Measurements. Hind wing 19–20 mm; abdomen 28–29 mm.

Note. – Dr. M. Hämäläinen confirms that the specimen from Samar may be a case of mislabelling.

Most specimens collected by Mr Borromeo are reliably labelled, but there are some other clear cases of mislabelling in the collection. Usually, mislabelling is much higher in collections of commercial collectors. This is an opportunity to emphasize the professionalism of the collectors working for Roland A. Müller.

Etymology. – *Krios* (Greek), ram; for its resemblance to *D. aries* Needham & Gyger. A noun in apposition.

Distribution (Fig. 99). – Philippine Islands: Mindanao, Tawi Tawi, Sanga Sanga. The locality of the specimen from Samar is considered doubtful, and not on the map.

Drepanosticta rhamphis van Tol, **sp. n.**

(Figs 13–15, 99)

Drepanosticta sp. n. 11. – Hämäläinen 1997: 257, 277 (distribution Catantuanes I.).

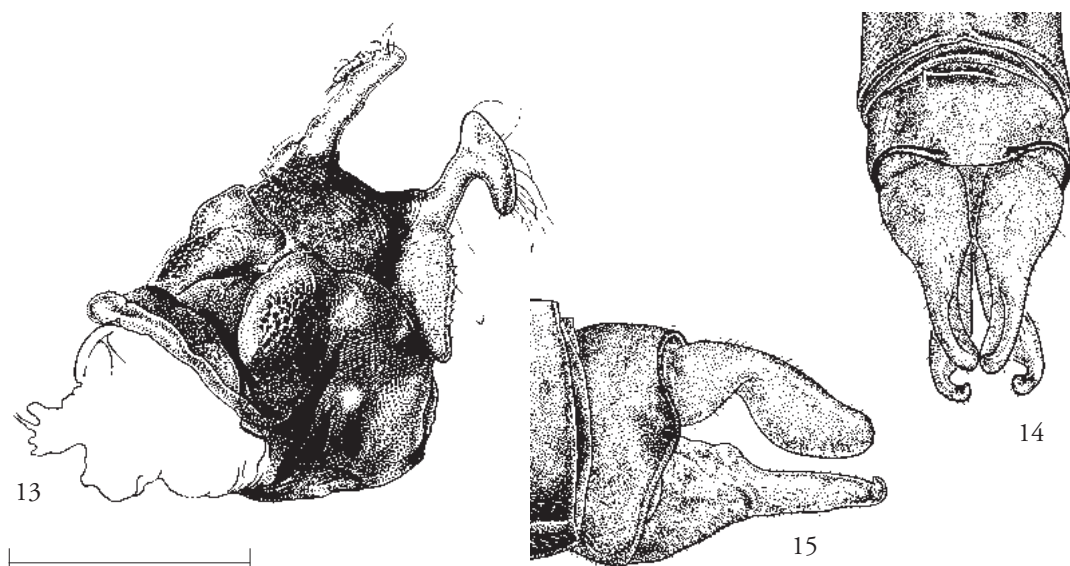
Type material. – Holotype male [JvT 18991] in RMNH: ‘Philippines, Catanduanes [sic] Id / Gigmoto, San Pedro / Egwang Tapayas Creeks / June 20.–30. 1996, 300–500 m / Alex Buenafe legit / Coll. Roland A. Müller’. – Paratypes (all Philippine Islands, in RMNH): **Catanduanes Id**, Gigmoto, San Pedro, Simohe Creeks, 300–500 m, 20–30.vi.1996 (A. Buenafe) 4 males; same, Tongao Creeks, 400–500 m, 20–30.vi.1996 (A. Buenafe) 1 female.

Non-type material. – **Luzon Id**, Camarines Norte, Sn Lorenzo Ruiz, San Isidro, Sitio Bakalid, Patag river, 300–500 m, 26–27.ix.1997 (C.M. Nazareno) 1 female.

Diagnosis. – A medium-sized species with dark synthorax and paler brown abdomen with distinct small bluish markings anteriorly on abdominal segments 3–6; hind margin of hind lobe of pronotum with a pair of hammer-like projections. The female of *D. rhamphis* sp. n. has similar projections on the posterior lobe of the pronotum as the male, while the

female of *D. acuta* sp. n. is distinctly different from the male; for differences with *D. aries* Needham & Gyger and *D. krios* sp. n., see under these species.

Male [JvT 18991, holotype]. – Head. Labium brown; labrum bluish white, anteriorly with narrow brown line, fading towards pale coloured part of labrum; mandibles bluish white with narrow brown anterior line; anteclypeus bluish white, rest of head coriaceous, black with metallic shine; transverse occipital carina well-developed, the lateral extremities acutely angulate. Thorax. Pronotum (Fig. 13) multi-coloured, with middle part of anterior lobe, central parts of both halves of median lobe, posterior part of lateral lobe, and central part of posterior lobe brownish black, rest much paler; structure of anterior, median and lateral lobes simple, posterior lobe relatively long, with a paired posterior process, long, ending abruptly in an antero-laterally directed part, turned 110–120° backward, the tip with long and stout setae. Synthorax completely brownish black, legs fully yellowish white. Wings hyaline, venation brown, lighter in basal half; Px 16 in fore wing, Px 16 in hind wing; R4+5 at or even just proximal to Ax2; IR3 arising halfway first cell distal to that level; Arculus just distal to Ax2; quadrangle somewhat widening distally in fore wing; anal veins asymmetrical, sessile or very shortly stalked; pterostigma oblique, width c. 1.7 times the height, proximal side acutely angulate, distal side convex; cells beyond pterostigma between Costa and R1 undivided. Abdomen. Middle brown with pale, bluish white, anterior markings on each segment as follows: segment 2 narrow, covering anterior 2/5th of segment, segments 3–6 with dorso-anterior spot of 1/10th of segment length, segment 7 pale in anterior 1/6th of segment, rest of anterior half of this segment lightbrown, segment 9 with small bluish anterior spot, segment 10 pale bluish (?). Appendages (Figs 14–15) creamish; superiors in dorsal view with stout base, approximately 2/3 of segment length ending in small dorsal tooth, distal part scoop-like and vertically oriented; inferiors rather slender, distal half bent outwards, the tip strongly tapered and first bent axiad, then dorsad. Measurements. Hind wing 19 mm, abdomen including appendages 28.5 mm.



Figures 13-15. *Drepanosticta rhamphis* sp. n., male [JvT 18858, Catanduannes, Gigmoto, San Pedro, Simohe Creeks, 20-30. vi.1996]. – 13, pronotum, oblique view. – 14, anal appendages, dorsal view. – 15, idem, left lateral view. Scale bar 1 mm.

Female. – As the male, but posterior processes of posterior lobe of pronotum somewhat shorter, of similar shape as in the male.

Measurements. Hind wing 19 mm, abdomen 28 mm.

Etymology. – *Rhamphis* (Greek): hook; after the structure of the processes at hind margin of posterior lobe of pronotum. A noun in apposition.

Distribution (Fig. 99). – Philippine Islands (Luzon region): Catanduanes, Luzon.

Drepanosticta belyshevi group

Transverse occipital carina distinct, with lateral extremities sharp, but not apiculate; lateral corners of anterior lobe or pronotum distinctly widened or even with a long process; posterior lobe with a pair of rather short, flat, curved or folded processes; synthorax with characteristic pale markings in posterior corner of metepisternum and metepimeron; pterostigma somewhat wider than high; superior appendages with ventral side of base (lateral view) curved sharp dorsad, a sharp ventral tooth near base, but size variable between

species; inferiors in ventral view more or less clasper-like, the tip curved medio-dorsad.

Presumably the sister-group of the *D. lymetta* + *D. megametta* group.

Included species: *D. belyshevi* Hämäläinen, *D. flavomaculata* sp. n., *D. trachelocele* sp. n.

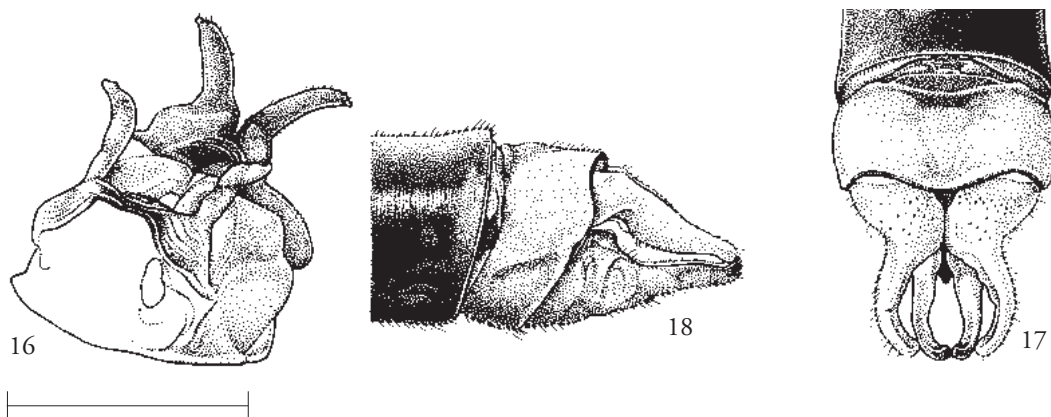
Distribution: Bohol, Leyte, Panaon, Samar, Mindanao, Camiguin Id.

Drepanosticta belyshevi Hämäläinen

(Figs 16-18, 100)

Drepanosticta belyshevi Hämäläinen, 1991: 65-68, figs 1-4 (original description, holotype male Philippines, Panaon Id., San Francisco, Anislagon Gamay (200 ft), Aug 1988, W. Catal leg. [in Müller collection, now in RMNH] [examined], distribution Panaon Id.). – Hämäläinen & Müller 1997: 257, 276 (distribution East Visayan subregion: Leyte, Panaon, Bohol).

Material examined (all Philippine Islands, in RMNH). – **Bohol**, Sierra Bullones, Pilar, 10-11.iv.1989 (W. Catal) 4 males. – **Samar**, Samar Prov., Hinubangan, San Isidro, San Isidro river, 90-200 m, 31.iii. – 5.iv.1997 (R.A. Müller) 1 female. – **Leyte**, S. Leyte, Mahaplag, Hilusag, Mt Balocau,



Figures 16-18. *Drepanosticta belyshevi* Hämäläinen, male [JvT 22216, Bohol, Sierra Bullones, Pilar, 10-11.iv.1989]. – 16, pronotum, oblique view. – 17, anal appendages, dorsal view. – 18, idem, left lateral view. Scale bar 1 mm.

700 m, 30.xi. - 2.xii.1989 (Th. Borromeo jr) 2 males 1 female; idem, Magsuganao river, 18-30.ix.1990 (Th. Borromeo jr) 2 males. – **Panaon**, Southern Leyte prov., San Francisco. Mt Kaneo, 400 ft, viii.1988 (W. Catal) 2 males 1 female; idem, San Francisco, Anislagon Gamay, 200 ft, viii.1988 (W. Catal) 1 male (holotype) 1 female; idem, San Francisco, Panan-awan Creek, viii.1988 (W. Catal) 1 male; idem, San Francisco, Batong Lapad, viii.1988 (W. Catal) 1 male; idem, San Francisco, Gabing Gamay, big river, x.1988 (W. Catal) 1 male; idem, San Francisco, Tabon river Lilo-an, x.1988 (W. Catal) 1 male; idem, San Francisco, Mt Anislagon, 350 ft, viii.1988 (W. Catal) 2 male; idem, Anislagon river, 10-12.x.1990 (Th. Borromeo jr) 3 males 3 females.

Diagnosis. – A relatively slender and pale brown coloured *Drepanosticta*, with conspicuous processes on the sides of both the anterior and the posterior lobe of the pronotum, and posterior one-third of metasternum and metepimeron bluish or yellowish white. Shares remarkable structure of anterior lobe of pronotum with *D. trachelocele* sp. n., *D. moorei* Van Tol & Müller, *D. quadricornu* sp. n. and *Protosticta lepteca* sp. n. The projected corners of the anterior lobe of the pronotum, although only known for species in the Philippines, is considered a parallel evolution, and not a synapomorphy. Its closest relative is *Drepanosticta trachelocele* sp. n. from Samar (for differences see under that species); *D. moorei* can immediately be distinguished on the presence of a broad pale band over metepisternum and dorso-posterior third of metepimeron; *D. quadricornu* from

Palawan has an extensive pale stripe over posterior three-quarters of metepisternum and very distinct superior appendages; *Protosticta lepteca* sp. n. can be distinguished by the absence of the Ab vein, and the structure of dorsal appendages, which are not clasper-like. *D. flavomaculata* sp. n. is considered to be closely allied, but lacks the projections of the anterior lobe of the pronotum.

Male. – Head. Labium brown, labrum and anteclypeus bluish white, labrum with apical third brown, mandibles pale, bluish, but somewhat darker than labrum; rest of head brownish black, frons and vertex coriaceous; transverse occipital carina distinct, lateral extremities sharp, but not apiculate. Antenna with scapus and pedicellus yellowish white, flagellum brown. Thorax. Pronotum (Fig. 16) pale brown, the median lobe pale yellowish, anterior lobe laterally with a pair of dorsally erect cylindrical processes, the tip directed outward, length in lateral view nearly as high as lateral lobe; median and lateral lobes simple; hind margin of posterior lobe medially acute, laterally with a paired flat process, in lateral view approximately as long as median lobe, directed posteriad, curved outward, with a short triangular spine as base. Synthorax medium brown, but the following parts yellowish: small marking of mesepimeron, approximately one-third of metepisternum posterior to metastigma, and approximately one-third of metepimeron. Wings

hyaline, venation brown, Px 15-16 in fore wing, Px 14-15 in hind wing; R4+5 arises well distal to subnodus, IR3 approximately halfway first cell distal to that level; Arculus arises distal to Ax2; quadrangle somewhat widening in fore wing, scarcely so in hind wing; anal veins asymmetrical and shortly stalked, pterostigma width c. 1.9 times the height, brown with narrow pale line against veins; some cells distal to pterostigma between Costa and R1 divided.

Abdomen. First segments medium brown, more caudal segments darker, especially segment 3-6 with yellow basal annulae. Appendages (Figs 17-18) with superiors in dorsal view basal half very stout, the caudal half slender and dorso-ventrally flattened, bent as a forceps, the tip squarish; inferiors in ventral view somewhat longer than superiors, nearly straight, the tip bent 90° dorsad.

Measurements. Hind wing 18-20 mm, abdomen including appendages 27-32 mm.

Female. – As the male, but abdomen distinctly stouter; structure of prothorax as male, but processes of anterior and posterior lobe of prothorax shorter and more slender; last abdominal segments stout, brown, the valve relatively slender, the stylus not surpassing the cercus.

Measurements. – Hind wing 20-22 mm, abdomen 28-32 mm.

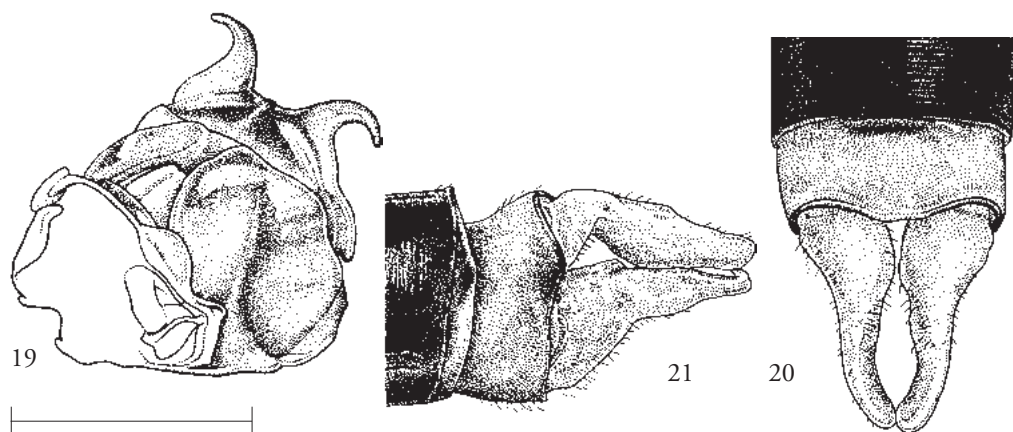
Occurrence. – Apparently occurring only in low densities on most sites, since only short series are available. Rather widespread, but specimens from Samar are here considered specifically distinct, *Drepanosticta trachelocele* sp. n.

Distribution (Fig. 100). – Philippine Islands (East Visayan subregion): Leyte, Panaon and Bohol.

***Drepanosticta flavomaculata* van Tol, sp. n.**
(Figs 19-21, 100)

Drepanosticta sp. n. 18. – Hämäläinen & Müller 1997: 258, 277 [Mindanao, Camiguin].

Type material. – Holotype male [JvT 20359] in RMNH: 'Philippines. Mindanao Id / Bukidnon, Kalatungan Mts / Pangantocan, Brgy Mendes / Mikaramagan Creek, Mandom / June 1995. 900-1200 m / Alex Buenafe legit'. – Paratypes (all Philippine Islands, in RMNH, total 160 specimens) (by island in chronological order): **Camiguin Id.** Mambajao. Brgy Pandan, Mt Timpo-ong, Katibawasan Falls, 500-700 m, 22.v.1995 (A. Buenafe) 6 males 1 female; Catarman, Tuasan Falls, 29.x.2003 (R.J. Villanueva) 2 males. – **Mindanao.** Zambo[a]nga d. Norte. Manucan, 20 km So. Labuan Mts, 680 m, primary forest, 15.x.[19]59 (Quate) 1 male; South Cotabato, Salacafe, El Milil, 1250 m, 7.iv.1985 (R.A. Müller) 2 males; [South Cotabato, Koronadal], Barrio 8, 13.iv.1985 (R.A. Müller) 2 males; South Cotabato, Koronadal, Barrio 8, 100-200 m, 12-14.vii.1986 (R.A. Müller) 11 males 5 females; South Cotabato, Koronadal, Barrio 8, 19.vii.1987 (J. de los Reyes) 1 male; South Cotabato, Koronadal, Barrio 8, 30.vi.1991 (J. de los Reyes) 1 male 1 female; North Cotabato,



Figures 19-21. *Drepanosticta flavomaculata* sp. n., male [JvT 20225, Mindanao, Koronadal, Barrio 8, 4.ii.1994]. – 19, pronotum, oblique view. – 20, anal appendages, dorsal view. – 21, idem, left lateral view. Scale bar 1 mm.

Alamada, Mt Makatoring, 700-900 m, 1000 m, 1.ii.1992 (Th. Borromeo) 10 males; South Cotabato, Koronadal, Barrio 8, 29.viii.1993 (J. de los Reyes) 5 males; South Cotabato, Mt Matutum, 500-700 m, 16-19.ix.1993 (Th. Borromeo) 2 males; South Cotabato, Koronadal, Barrio 8, 4.ii.1994 (L. Vinciguerra & E. Horn) 2 males; Davao del Sur, Malagos, Baguio, Eagle Camp, 500-600 m, 28.iii.1995 (R.A. Müller) 1 male; Davao Oriental, Baganga, Brgy Upper Mikit, Mangoy Falls, 300-350 m, 6.iv.1995 (A. Buenafe & A. Gorostiza) 1 female; Davao Oriental, Cateel, Aliwagwag Falls, 200-300 m, 10.iv.1995 (A. Buenafe & A. Gorostiza) 1 male 1 female; Data as holotype, 5 males 1 female; Bukidnon, Mt Kalatungan, Talakag, Brgy Mebadiang, Magamanason Creek, Sitio Olayan, 1000-1100 m, 5-18.viii.1995 (A. Buenafe) 4 males 6 females; Bukidnon, Mt Kalatungan, Pangantocan, Sitio Mandon, Mekaramagan Creek, 1800 m, 12-15.viii.1995 (A. Buenafe) 4 males; Bukidnon, Mt Katanglad, Impasugong, Brgy Impulatao, Gantongan Creek, 800-900 m, 19-29.viii.1995 (A. Buenafe) 9 males; Bukidnon, Mebadiang, Dumatap, Mt Kalatungan, Mansabilan Creek, 1000-1300 m, 24.xi.1995 (A. Buenafe) 3 males 1 female; Bukidnon, Mebadiang, Dumatap, Mt Kalatungan, Muntian Creek, 1200-1400 m, 24-25.xi.1995 (A. Buenafe) 6 males 2 females; Surigao del Sur, Tabon, Tabon Falls, 100-200 m, 26.v.-8.vi.1996 (A. Gorostiza & A. Buenafe) 9 males 3 females; Davao Oriental, Boston, Mt Agtuaganon, Camp 55, 1020 m, 29.v.-7.vi.1996 (R.A. Müller et al.) 4 males 4 females; Davao Oriental, Sigaboy, Tandang Sora, Yakal, Tabamban River, Lakahan Creek, 400-800 m, 5-14.x.1996 (A. Buenafe) 7 males 3 females; Davao Oriental, Sigaboy, Tandang Sora, Yakal, Tabamban River, Buyo Creek / Tubonol Creek / Langanisan Creek, 400-800 m, 5-14.x.1996 (A. Buenafe) 3 males; Lanao del Norte, Linamon, Sitio Tinago, 200-400 m, 10-16.viii.1997 (A. Buenafe) 15 males 6 females; Bukidnon, Katanglad Mts, Impasugong, Impalutao, Gantongan Creek, 1200-1400 m, 17-28.viii.1997 (A. Buenafe) 4 males; Davao City, Datu Salunay, 25 Feb 2004 (R.J. Villanueva) 1 males; Iligan, Tinago Falls, 8°09'33"N 124°11'11"E, 160 m, 25.iii.2004 (V. Kalkman & J. van Tol) 4 males.

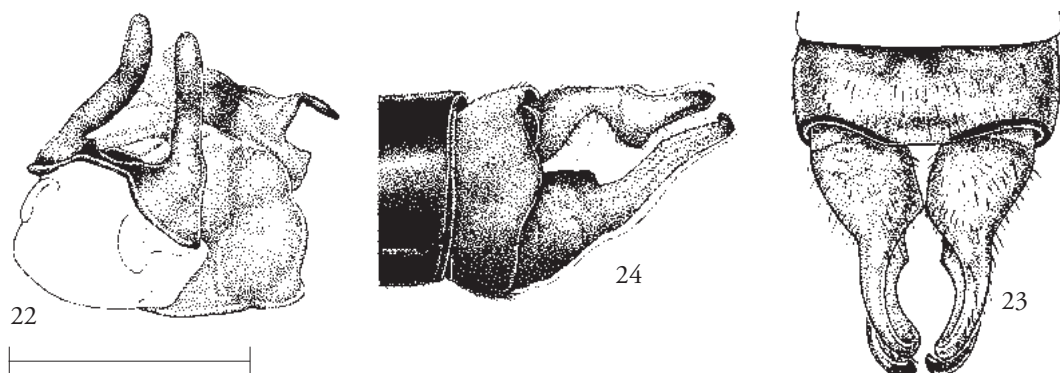
Diagnosis. – Based on the structure of the anal appendages, and the coloration of the synthorax, in one group with *D. belyshevi* Hämäläinen. Distinguishable from other species in this group by the absence of a conspicuous, paired process on the anterior lobe of the pronotum, the curved and flat processes on the posterior margin of the posterior lobe of the pronotum, and a poorly developed ventro-medial tooth on the superior appendage of the male.

Male [JvT 20359, holotype]. – Head. Labrum, mandibles, and anteclypeus ivory white, anterior one-fifth of labrum and mandibles brownish black; rest of head bronze-black, frons and vertex coriaceous; transverse occipital carina distinct, lateral extremities sharp, not apiculate. Antenna with scapus and pedicellus dirty yellow, flagellum brown, somewhat paler at base.

Thorax. Pronotum (Fig. 19) with anterior lobe castaneous, dull, median and lateral lobes dirty yellow, only dorsal parts somewhat obscured; posterior lobe brown; anterior lobe erect, lateral sides broad and flat, median and lateral lobes simple; posterior lobe with lateral portion on innerside with flat, short, recurved process, just somewhat longer than length of median portion of posterior lobe. Synthorax castaneous, coriaceous except for metepimeron and metepisternum, with a squarish pale marking just before posterior margin of metepisternum, and a similar marking in posterior corner of metepimeron. Wings hyaline, venation brown; Px 16 in fore wing, PX 15 in hind wing; R4+5 arising at or just distal to subnodus; IR3 circa halfway first cell distal to that level; Arculus arising distinctly distal to Ax2 in fore wing, c. distance between R+M and CuP; quadrangle widening in fore wing; anal vein long and symmetrical; pterostigma width c. 1.5 times the height, a narrow pale border against veins; many cells between Costa and R1 distal to pterostigma divided.

Abdomen. Segment 1 brown, each more caudal segment darker, except for segment 10, which is completely blue dorsally; segments 3-7 with basal one-sixth to one-eighth with yellow marking. Appendages (Figs 20-21) dirty yellow, superiors with stout base, distal three-fifths in dorsal view clasper-like, tip squarish, in lateral view distal half distinctly flat, a sharp, but rather inconspicuous, ventro-medial tooth near base; inferiors approximately as long as superiors, stout at base, distal three-fifths approximately cylindrical, bent 80° inward, innerside emarginate, tip directed dorsad (caudal view).

Measurements. Hind wing 24 (20-24) mm, abdomen (including appendages) 34 (30-34) mm.



Figures 22-24. *Drepanosticta trachelocele* sp. n., male [JvT 20331, Samar, Hinabangan, San Isidro, 100-200 m, 29.viii-20. ix.1996]. – 22, pronotum, oblique view. – 23, anal appendages, dorsal view. – 24, idem, left lateral view. Scale bar 1 mm.

Female. – Coloration as the male, but structure of pronotum distinctly different, with processes on posterior lobe short and erect, flat, although with much variation in length and shape between specimens. Innerside of these processes rounded, outside sharply projected in some specimens, broadly rounded in others, but process may even be shaped as a small triangular, erect projection.
Measurements. Hind wing 22-23 mm, abdomen 30-32 mm.

Etymology. – *Flavomaculatus* (Latin), with yellow markings; for the coloration of the synthorax. An adjective.

Distribution (Fig. 100). – Philippine Islands (Mindanao subregion): Camiguin Island, Mindanao. Rather widespread in Eastern Mindanao region.

***Drepanosticta trachelocele* van Tol, sp. n.**
(Figs 22-24, 100)

Type material. – Holotype male [JvT 20323] in RMNH: 'Philippines, Samar Id / Samar Prov., Hinubangan / Arizona, 100-280 m / March 29.-April 6. 1997 / R.A. Müller leg. et coll.', '*Drepanosticta belyshevi* Hämäl. (ssp. ?) M. Hämäläinen det.' – Paratypes (all Philippine Islands, in RMNH, 18 specimens): **Samar Id**, Hinabangan, Bagakay, Arizona, 100-200 m, 29.viii-20.ix.1996 (A. Buenafe) 4 males 1 female; same site, but San Isidro, 100-200 m, 100-200 m, 29.viii-20. ix.1996 (A. Buenafe) 1 male 3 females; same site as holotype, 3 males 1 female; same site, but San Isidro, San Isidro river, 90-200 m, 31.iii.-5.iv.1997 (R.A. Müller) 1 male 2 females;

Western Samar province, San Jose de Buan, Mt Hurao, San Andres. 14-20.v.1997 (A. Buenafe) 2 males.

Diagnosis. – One of the very few species of *Drepanosticta* with paired processes on hind margin of both the anterior and the posterior lobe of the pronotum; most closely related to *D. belyshevi* Hämäläinen, from which it differs particularly by the structure of the processes of the posterior lobe of the pronotum: the processes in *D. belyshevi* are placed close to the median line and curved over the abdomen, whereas the processes in *D. trachelocele* are placed near the lateral corners, with a short erect base and the rest recurved ventrad. For differences with other Philippine *Drepanosticta* species with projections on anterior lobe of pronotum, see *D. belyshevi* Hämäläinen.

Male [JvT 20323, holotype]. – Head. Labium, mandibles and anteclypeus bluish white, a brownish black margin on anterior one-fifth of labium and one-eighth of mandibles; rest of head brownish black with bronze metallic shine, frons and vertex coriaceous; transverse occipital carina well developed, with acute lateral extremities, more angulate than in *D. belyshevi*; antenna with scapus and pedicellus dirty yellow; flagellum castaneous.

Thorax. Pronotum (Fig. 22) with anterior lobe castaneous, somewhat darker at hind margin, middle and lateral lobes dirty yellow, posterior lobe pale brown with a rounded or sub-triangularly shaped marking in

middle, hind margin of posterior lobe also somewhat darker; anterior lobe with a paired process, laterally on lobe, rounded and directed antero-dorsad, total length surpassing median length of pronotum; hind margin of posterior lobe with a paired process, distance between bases of processes more than five times the width of process at base, process halfway curved backward (ventrad) and inconspicuous in many specimens (much variation), but not a long, flat and curved process as in *D. belyshevi*. Synthorax castaneous, but meso- and metakatepisternum somewhat paler, a subsquarish bluish white spot posteriorly on metepisternum, and a similar spot on metepimeron, the latter one with a ventro-lateral projection. Legs dirty yellow, obscure brown rings on two-thirds the length of femora. Wings hyaline, venation brown; Px 16 in fore wing 16, Px 15 in hind wing; R4+5 distal to subnodus, IR3 halfway first cell distal to subnodus; Arculus distal to Ax2; Ab vein joining Ac just before wing margin (Y-veins subsessile); pterostigma castaneous, oblong, c. two times wider than high; veins distal to pterostigma numerous, but undivided.

Abdomen castaneous, with creamish or bluish white markings as follows: segments 3-6 with a narrow ring against anterior border of segment, the white marking projecting posteriorly on both sides of median line of tergites against borders; segment 8 with yellowish white anterior ring, c. one-fourth of length of segment. Appendages (Figs 23-24) very pale brown, superiors dorsally stoutly built, distal half as a clasper in dorsal view, and club-shaped on innerside; inferiors in ventral view very slender, straight, the top bent medio-dorsad. Measurements. Hind wing 19 (18-19) mm; abdomen including appendages 30 (28-32) mm.

Female. – Similar to male, including structural details of the processes of the anterior and posterior lobes of the pronotum, although both pairs of processes are somewhat smaller, especially the ones on the anterior lobe.

Measurements. Hind wing 18-20 mm, abdomen 27-29 mm.

Affinities. – Based on the structure of the pronotum,

this species is considered the sister-species of *D. belyshevi* Hämäläinen.

Etymology. – *Trachelocele*: a genus of antelopes; for the shape of the processes on the pronotum. A noun in apposition.

Distribution (Fig. 100). – Philippine Islands: Samar.

D. moorei group

Transverse occipital carina poorly developed, lateral extremities absent or just discernable; pronotum with processes on anterior and posterior lobe distinctly different between species; synthorax with long and distinct stripes over mesepisternum and mesepimeron; pterostigma slightly wider than high; superiors strongly flattened dorso-ventrally, and broadly triangular in lateral view; base of inferiors in ventral view subparallel, the top as a clasper, with a more or less distinct ridge on inner margin; tip sharp.

Based on structure of male anal appendages and the coloration of the synthorax, the species of this group are not members of the group of 'typical Philippine *Drepanosticta*' species. Their affinities are presently unsettled.

Included species: *D. luzonica* sp. n., *D. moorei* Van Tol & Müller.

Distribution: Luzon.

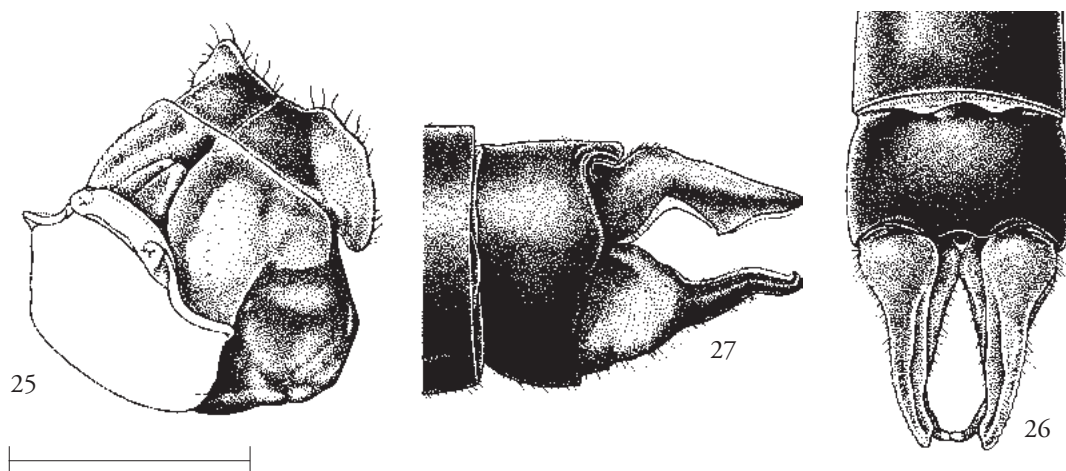
Drepanosticta luzonica van Tol, sp. n.

(Figs 25-27, 101)

Drepanosticta sp. n. 9. – Hämäläinen & Müller 1997: 257, 277.

Type material. – Holotype male [JvT 9451] in RMNH: 'Philippines / [Luzon] Ifugao Province / Jacmal Bunhian / 24 km E Mayoyao 800- / 1000m 7-8.iv.1967'.

Diagnosis. – A relatively large species, with conspicuous yellow markings on synthorax. Based on synthoracic pattern, superficially resembling *Drepanosticta lestoides* Brauer, but superior anal appendages distinctly different, lacking the superior tooth, and the tip squarish rather than smoothly rounded. Differs from *D. moorei* Van Tol & Müller by



Figures 25-27. *Drepanosticta luzonica* sp. n., male [JvT 9451, holotype]. – 25, pronotum, oblique view. – 26, anal appendages, dorsal view. – 27, idem, left lateral view. Scale bar 1mm.

the absence of conspicuous processes on anterior and posterior lobes of pronotum.

Male [JvT 9451]. – Labrum, anteclypeus and mandibles bluish white, partly yellowish white; anterior one-fourth of mandibles brownish black; rest of head bronze-black, frons and vertex coriaceous; postoccipital carina without extremities; antenna with scapus brownish black, pedicellus brown, flagellum broken in type.

Thorax. Pronotum (Fig. 25) dark with distinct, pale yellowish white markings; anterior and median lobe yellowish white with higher parts of median lobe brown; posterior lobe with median portion brownish black, lateral portions greyish brown, lateral lobes brownish black, but central parts with pale spots; anterior, median and lateral lobes simple; posterior lobe with lateral portions semi-erect, somewhat extended ventrad, broadly rounded caudally. Synthorax bronze-black with pale yellow markings as follows: dorsal carina, a small and narrow line dorso-posteriorly on mesepisternum; metepisternum nearly fully pale, except for posteriormost part, anteriorly extending over lower part of mesepimeron and mesokatepisternum; lower half of metepimeron, pale marking extending posteriad and covering the full width in posterior quarter of metepimeron.

Wings hyaline, venation brown, basal half paler; Px 13 in fore wing, Px 12 in hind wing; Arculus arising at Ax2; R4+5 arising at subnodus; IR3 halfway cell distal to R4+5; quadrangle oblong and quadrangular, not widening posteriorly; pterostigma rhomboid, ca 1.5 times as wide as high; cells between Costa and R1 beyond pterostigma undivided.

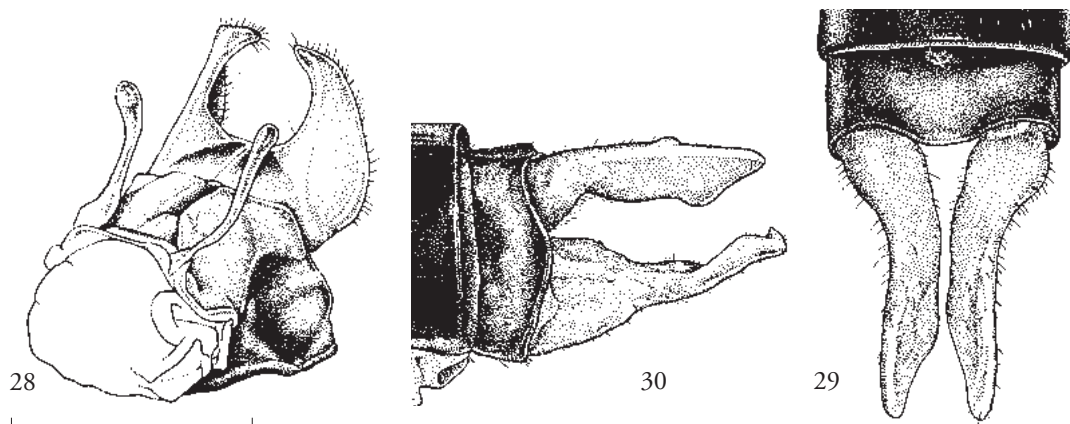
Abdomen. Brown, lower parts of segments 1-2 yellowish white, antero-basal part of segments 3-7 pale (partly discoloured in type), but dark line extending over full length; lower half of segments 8-9 pale; appendages (Figs 26-27) brown, superior club-shaped distal part with tip squarish, the ventral margin forming a broad triangular tooth; superiors without dorsal tooth; inferiors in distal half very slender, curved inward, the very tip dorsad, lacking an inward directed tooth.

Measurements. Hind wing 23 mm, abdomen including appendages 38 mm.

Female. – Unknown.

Etymology. – *Luzonicus* (Latin), from Luzon, for the type locality. An adjective.

Distribution (Fig. 101). – Philippine Islands: Luzon



Figures 28-30. *Drepanosticta moorei* Van Tol & Müller, male [JvT 18624, Luzon, Nueva Viscaya, Sta Fe, Atbo river, 550-800 m, 10.vi.1991]. – 28, pronotum, oblique view. – 29, anal appendages, dorsal view. – 30, idem, left lateral view. Scale bar 1 mm.

(central northern part). Apparently a local or rare species; not represented in the Müller collection.

***Drepanosticta moorei* Van Tol & Müller**
(Figs 28-30, 101)

Drepanosticta moorei Van Tol & Müller, 2003: 42 [original description, holotype male Luzon, Nueva Viscaya, Sta Fe, Atbo River, 550-800 m, 10 Jun 1991, R.A. Müller] [examined].

Platysticta annulata Selys, 1886: 156 [partim].

Drepanosticta sp. – Liefstinck 1961: 136 [specimen '588' in Selys collection, IRSN Brussels, a paralectotype of *D. annulata* (Selys), not conspecific with lectotype].

Drepanosticta sp. n. 7. – Hämäläinen & Müller 1997: 257, 276-277 [distribution Luzon].

Material examined [all Philippine Islands, in RMNH]. – **Luzon.** Nueva Viscaya, Dalton Pass, 850-900 m, 8-9.vi.1991 (R.A. Müller) 1 male; Nueva Viscaya, Sta Fe, Atbo river, 550-800 m, 10.vi.1991 (R.A. Müller) 12 males 10 females [including holotype]; Nueva Ecija, Caranglab, Batching river, 700-850 m, 11.vi.1991 (R.A. Müller) 2 males; Aurora Prov., Dilalangan, Sitio Biyak, Dibaraybay, 300-500 m, 3-15.vii.1996 (C.M. Nazareno) 1 female; Zambales Prov., Masinloc, Mt Coto, Tal-tal, 400-700 m, 1-8.iv.1997 (C.M. Nazareno) 1 female.

Diagnosis. – Unmistakable species by the combination of long processes on the anterior lobe of the pronotum,

and the conspicuous greenish yellow stripe over synthorax. For a comparison of species with long projections of the anterior lobe, see *D. belyshevi* Hämäläinen; for a comparison with other species with pale stripe over synthorax, see *D. luzonica* sp. n.

Male [holotype, JvT 22225]. – Head. Labrum and anteclypeus very clear blue, anterior border of labrum with narrow black line; mandibles brown, but inner basal corner blue; rest of head bronze-black; antenna with scapus and pedicellus dirty yellow, the tip of pedicellus somewhat darker, flagellum brown; transverse occipital carina indistinct and lacking conspicuous extremities.

Thorax. – Pronotum (Fig. 28) with anterior and median lobe yellowish, lateral lobe brown, posterior lobe dirty yellow; anterior lobe approximately halfway each side with very long subcylindrical process, touching median lobe, and reaching virtually hind margin of central portion of posterior lobe; median and lateral lobes simple; hind lobe laterally with enormous collar, half-round, nearly twice as long as basal part of posterior lobe; lateral margin with long and thin setae. Synthorax bronze-black, but metepisternum nearly fully greenish yellow, and dorso-posterior third of metepimeron greenish yellow. Legs dirty yellow. Wings hyaline, venation brown; Px 13 in fore wing, Px 13 in hind wing; origin of R4+5 just distal to subnodus,

IR3 arises six cells distal to nodus in fore wing, five cells in hind wing; Arculus just distal to Ax2, distinctly stalked; Ac and Ab forming a Y, sessile; number of cells between distal end of quadrangle and place where CuP meets hind margin in fore wing 5, in hind wing 7; pterostigma brown, with a narrow line against veins; ca. 1.6 times longer than high, the proximal side oblique, the distal side convex; cells between Costa and R1 posterior to pterostigma undivided.

Abdomen brown, but basal one-tenth of segment 3, basal one-sixth of segments 4-6, basal one-third of segment 7 dirty yellow; segments 8-10 tergites brown. Appendages (Figs 29-30) greyish brown, top of inferiors castaneous; superiors with basal one-fourth stout, rest narrow in dorsal view, actually strongly flattened dorso-ventrally, and broadly triangular in lateral view; inferiors in ventral view subparallel, the top bent outward, then inward in a semicircle, in lateral view the top bends in 90°.

Measurements. Hind wing 22 (20-22) mm; abdomen including appendages 37 (31-37) mm.

Female. – Very similar to male, including coloration and structure of pronotum; segments 8-10 brown, anal appendage light brown, genital valves surpassing apex of appendages.

Measurements. Hind wing 21-22 mm, abdomen 30-31 mm.

Affinities. – Van Tol & Müller (2003: 44) assumed a close relationship of this species with *D. belyshevi* Hämäläinen, particularly based on the structure of the processes of the anterior lobe of the pronotum. A more recent analysis revealed that the structure of the pronotum of both species is distinctly different, and the projections cannot be considered homologous. Based on the coloration of the synthorax and the structure of the anal appendages of the male, *D. moorei* must be considered the sister-species of *D. luzonica* sp. n.

Distribution (Fig. 101). – Philippine Islands: Central Luzon (provinces Nueva Viscaya, Nueva Ecija, Aurora and Zambales). Apparently occurring in low densities over a relatively large area; in larger numbers on type locality only.

D. lymetta group

Transverse occipital carina distinct, with acutely angulate lateral extremities; anterior lobe of pronotum simple, without projections or processes; posterior lobe of pronotum with a pair of processes on hind margin, typically divided or hooked at top; synthorax castaneous; pterostigma distinctly wider than high; superior appendages with a blunt dorsal tooth and a sharp medially directed one on inner surface; inferior appendages slender and straight, the tip emarginate, curved 90° medio-dorsad, undivided. Based on the structure of the anal appendages, presumably the sister-group of the *D. megametta* group.

Included species: *D. clados* sp. n., *D. furcata* sp. n., *D. hermes* sp. n., *D. lymetta* Cowley, *D. taurus* Needham & Gyger.

Distribution: Mindanao and Siquijor.

Drepanosticta clados van Tol, sp. n.

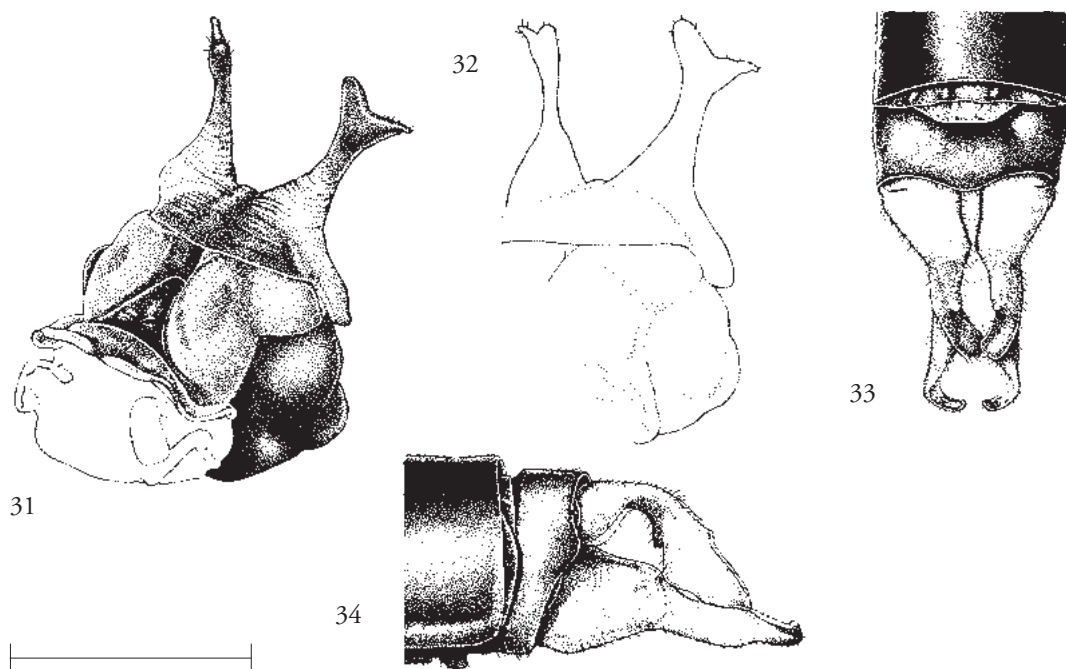
(Figs 31-34, 102)

Type material. – Holotype male [JvT 26817] in RMNH: '[Philippine Islands, Mindanao] 002-XII-7-2003 / Spring -Malabog, Pakibato Dist., Davao City / R.J. [Villanueva]'. – Paratype: 1 male, same data [in RMNH].

Diagnosis. – An inconspicuous brown species; posterior processes of hind lobe of pronotum extremely long, c. 80% of median length of pronotum, the tip bifid, both branches of equal length; also characterised in the *lymetta*-group by its long inferior appendages, distinctly surpassing the hooked superiors in lateral view (Fig. 33).

Male [holotype, JvT 26817]. – Head. Labrum, anteclypeus and mandibles ivory or bluish white, anterior one-third of labrum and mandibles brown; rest of head bronze-black; transverse occipital carina distinct, with distinctly angulate lateral extremities; antenna with scapus brownish-black, pedicellus brown, flagellum unknown (missing).

Thorax. Pronotum (Figs 31-32) rather dark, with anterior lobe wide, but relatively simple with only anterior margin distinctly erect, brown in median part,



Figures 31-34. *Drepanosticta clados* sp. n., male [JvT 26816, Mindanao, Davao City, Pakibato District, Malabog, 7.xii.2003]. – 31, pronotum, oblique view. – 32, pronotum, frontal view of projection of hind lobe. – 33, anal appendages, dorsal view. – 34, idem, left lateral view. Scale bar 1 mm.

paler in lateral corners; median lobe with a paired, convex, brownish black protuberance, better defined than in *D. lymetta*; posterior lobe castaneous, medially somewhat darker, posteriorly with a paired long process, c. 80% of length of pronotum itself, apically V-shaped, the branch of equal length and stoutly built. Synthorax castaneous, but mesokatepisternum, metakatepisternum, metepimeron and anterior part of metepisternum darker, no pale markings. Legs with fore coxa and upper part of middle coxa dark brown, rest of legs yellowish or reddish brown. Wings hyaline, veins brown; Px 15-16 in fore wing, Px 15 in hind wing; R4+5 arising from subnodus, IR3 arising half a cell distal to that level; Arculus just distal to Ax2; Y-shaped anal veins virtually sessile, distinctly asymmetrical; pterostigma 1.8 times as wide as high, innerside angulate; cells between Costa and R1 distal to pterostigma undivided.

Abdomen. Brown, with pale hastate markings dorsally on segment bases as follows: segment 2 very small,

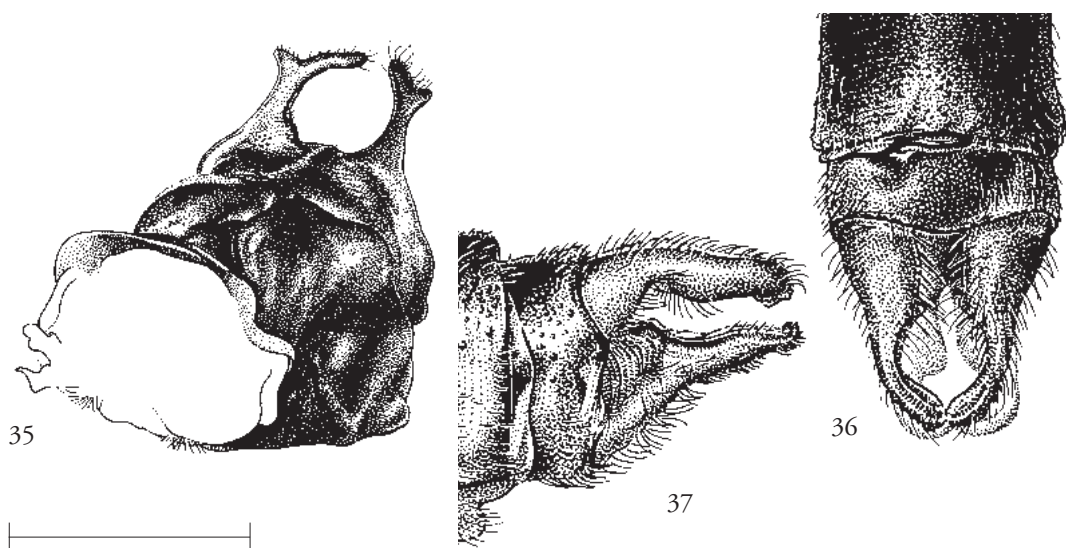
one-sixth of segment length, one-seventh on segments 3-4, one-eighth on segments 5-6, and one-seventh on segment 7; segments 8-10 brown, but segment 10 presumably paler in life. Appendages (Figs 33-34) yellow; superiors in lateral view distinctly hooked, basal third directed dorsad, distal two-thirds slightly ventrad; base of terminal part with short, triangular tooth, and just distal to that a similar distal tooth; terminal two-thirds flattened, the tip squarish; inferiors in ventral view straight, the terminal one-sixth more slender, tapering and curved dorso-medial.

Measurements. Hind wing 21.5 mm; abdomen including appendages 33 mm.

Female. – Unknown.

Etymology. – *Clados*: branch (Greek), for the structure of the processes of the posterior lobe of the pronotum. A noun in apposition.

Distribution (Fig. 102). – Philippine Islands: Eastern Mindanao, around Davao City.



Figures 35-37. *Drepanosticta furcata* sp. n., male [JvT 18862, Siquijor, Barrio Bandilaan, 28-23.iv.1993]. – 35, pronotum, oblique view. – 36, anal appendages, dorsal view. – 37, idem, left lateral view. Scale bar 1 mm.

***Drepanosticta furcata* van Tol, sp. n.**

(Figs 35-37, 102)

Drepanosticta sp. n. 4 (cf. *lymetta*). – Hämäläinen & Müller 1997: 257, 276 [Siquijor, 7 males in collection].

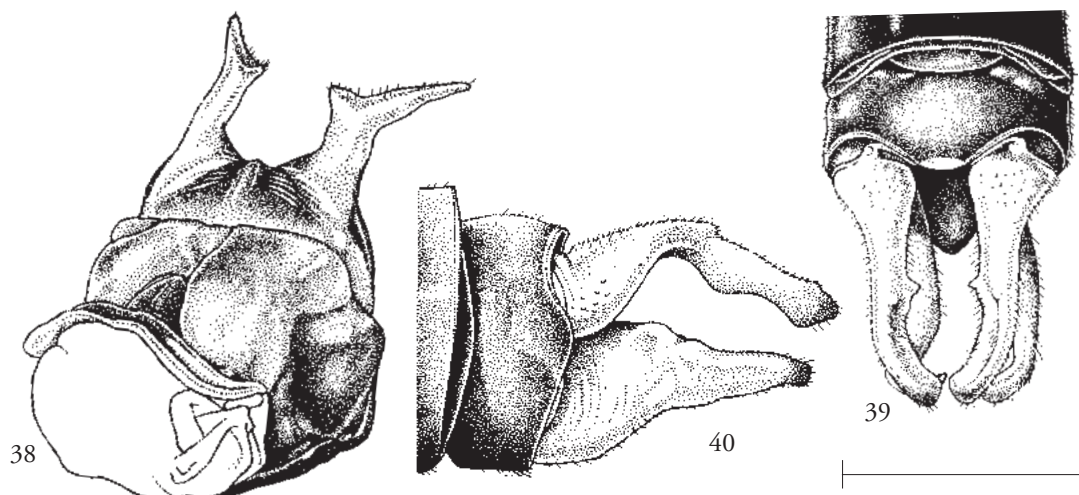
Type material. – Holotype male [JvT 18860] in RMNH: 'Philippines. Siquijor Id / Barrio Bandilaan / April 18.-23. 1993. / Th. Borromeo legit / Coll. Roland A. Müller'. – Paratypes. Same data as holotype, 6 males (in RMNH).

Diagnosis. – Medium-sized species with brown pronotum; pronotum with a paired and forked process; distinguishable from other species in the *D. lymetta* group by the long inner branch of the forked process; the superior appendage with a subbasal, very sharp, medio-ventrad tooth, a second and more distal tooth as present in *D. lymetta* is only discernable as a knob-like structure; confined to Siquijor Id. See also remarks under *D. lymetta*.

Male [holotype, JvT 18860]. – Head. Labium brown; labrum yellowish white, but anterior two-fifths pale brown; mandibles yellowish white, with anterior one-sixth brown; anteclypeus bluish white, rest of

head bronze-black, especially on dorsum of head with coppery shine; transverse occipital carina well developed with sharp lateral extremities; antennae yellowish, flagellum brown (right flagellum missing in holotype).

Thorax. Pronotum (Fig. 35) with anterior lobe pale brown, darker in centre, well-developed, with anterior margin erect; middle lobe flat, yellowish brown; lateral lobe brown as lower part of synthorax; posterior lobe brown, narrow, hind margin with paired process approximately twice as long as median length of posterior lobe, more or less erect or lying flat over synthorax, ending in a bifurcation of which inner branch is distinctly longer than outer brach (virtually symmetrical bifurcation in one specimen). Synthorax castaneous. Legs dirty yellow, only somewhat darker at joints of femora (right fore leg missing in holotype). Wings hyaline, Px 14 in fore wing (left wing with two additional cross-veins), Px 14 in hind wing; origin of R4+5 at subnodus, IR3 halfway first cell distal to that level; Arculus arising distinctly distal to Ax2; quadrangle of fore wing somewhat widening posteriorly; anal veins shortly stalked, slightly asymmetrical; pterostigma castaneous, c. 2.4 times as



Figures 38-40. *Drepanosticta hermes* sp. n., male [JvT 18824, Mindanao, Davao Oriental, Boston, Mt Agtuaganon, 1020 m, 29.v-7.vi.1996]. – 38, pronotum, oblique view. – 39, anal appendages, dorsal view. – 40, idem, left lateral view. Scale bar 1 mm.

long as high; proximally obtusely angulate, distal side somewhat convex; cells between Costa and R1 distal to pterostigma rather frequently divided.

Abdomen. Brown, but with paler yellowish white markings as follows: ventro-anterior part of segment 2, anterior one-fifth of segment 3, anterior one-fourth of segment 4-6 (segment 6 somewhat darker yellow), segment 10 pale brown. Appendages (Figs 36-37) yellowish brown; superiors in dorsal view stout in basal half, on innerside ending in sharp tooth directed ventro-axiad; distal half of superiors scope-like, ending subacute; inferiors in ventral view with stout base, distal half straight, cylindrical, the tip strongly constricted and outer margin curved 80° inward. Measurements. Hind wing 21.5 (21-22) mm, abdomen including appendages 33 (31-33) mm; one theratological specimen with abdomen of 24 mm.

Female. – Unknown.

Etymology. – *Furcatus* (Latin), forked; for the shape of the processes of the hind margin of the posterior lobe of the pronotum. An adjective.

Distribution (Fig. 102). – Philippines Islands (West Visayan region): Siquijor Island.

Drepanosticta hermes van Tol, sp. n.

(Figs 38-40, 102)

Drepanosticta sp. n. 16. – Hämäläinen & Müller 1997: 258, 277 (distribution Mindanao, Davao Oriental).

Type material. – Holotype male [JvT 18850] in RMNH: 'Philippines, Mindanao Id / Davao Oriental, Boston / Mt Agtuaganon, Camp 55 / May 29. - Juni 7, 1996, 1020 m / Müller/Buenafe/Gorostiza leg. / Coll. Roland A. Müller'. – Paratypes (43 specimens, all in RMNH): same data als holotype, 42 males; same, Boston, Caatijan, 500-550 m, 28.v.1996 (Müller, Buenafe & Gorostiza), 1 male.

Diagnosis. – Relatively small, dark, castaneous brown species, closely allied to *D. lymetta* Cowley; the processes of the hind lobe of the prothorax long, bifurcate at top with a short inner branch and a longer outer branch; the very slender superior appendages (dorsal view) diagnostic; base of superiors in lateral view distinctly directed dorsad; ventral teeth of superiors with basalmost one approximately in middle of appendage, the other tooth poorly developed. See also under *D. lymetta* Cowley.

Male [JvT 18819]. – Head. Labium brown; labrum, mandibles and anteclypeus creamish white; anterior one-third of labrum pale brown, mandibles with

narrow anterior dark line; rest of head brownish black; parorbital carina and postocular carina well developed with distinct, acutely angulate lateral extremities; antennae dirty yellow, flagellum brown.

Thorax. Pronotum (Fig. 38) laterally and medially brownish black; rest dirty yellow to pale brown; anterior lobe short, with anterior margin distinctly erect; posterior lobe with a paired process on hind margin, process as long as middle lobe, lying more or less flat over synthorax; bifurcate at top, with a short tooth directed mediad, and a long tooth directed abaxiad, this tooth approximately as long as base of fork. Synthorax castaneous; some parts slightly paler, but no significant creamish white stripes; legs dark yellow. Wings hyaline, venation brown; Px 17 in fore wing and Px 15 in hind wing; R4+5 arising from subnodus; IR3 halfway first cell distal to that level; Arculus just distal to Ax2; quadrangle widening distally in forewing; anal veins subequal, stalked; pterostigma width 1.5 times the height; several cells between Costa and R1 beyond pterostigma divided.

Abdomen. Brown, but anterior one-sixth to one-fifth of segment 3-7 somewhat paler; appendages (Figs 39-40) dark yellow; superior appendages slender, base short, distal part forcipate with very short dorsal tooth, and short and sharp ventral tooth in middle and a broader process distal to the sharp tooth, top of appendage blunt; inferiors with slender base, distal half of inferior subcylindrical, somewhat bent outward, the top slender and directed inward, the tip curved dorsad. Measurements. Hind wing 21.5 (21-23) mm, abdomen including anal appendages 34 (33-34) mm.

Female. – Unknown (but see below under remarks).

Remark. – The female of this species is almost certainly among the specimens collected by Müller and collaborators in Davao Oriental. However, *Drepanosticta taurus*, a species with similar coloration as the present species, is syntopic. Females (8 specimens) collected on Mt Agtuaganon with coloration as *D. hermes* sp. n. or *D. taurus* Needham & Gyger have a very different hind margin of the hind lobe of the pronotum. Consequently, the status of these females

will remain uncertain until pairs are found in copula. Hämäläinen & Müller (1997: 277) mention 45 males. One specimen (JvT 18825) was identified as the present species, but is in my view not conspecific, and concerns *Drepanosticta flavomaculata* sp. n.

Etymology. – *Hermes* (Greek), herald of the Olympian gods, usually depicted with a winged hat; for the structure of the paired processes of the posterior lobe of the pronotum. A noun in apposition.

Distribution (Fig. 102). – Philippine Islands: Mindanao (Davao Oriental).

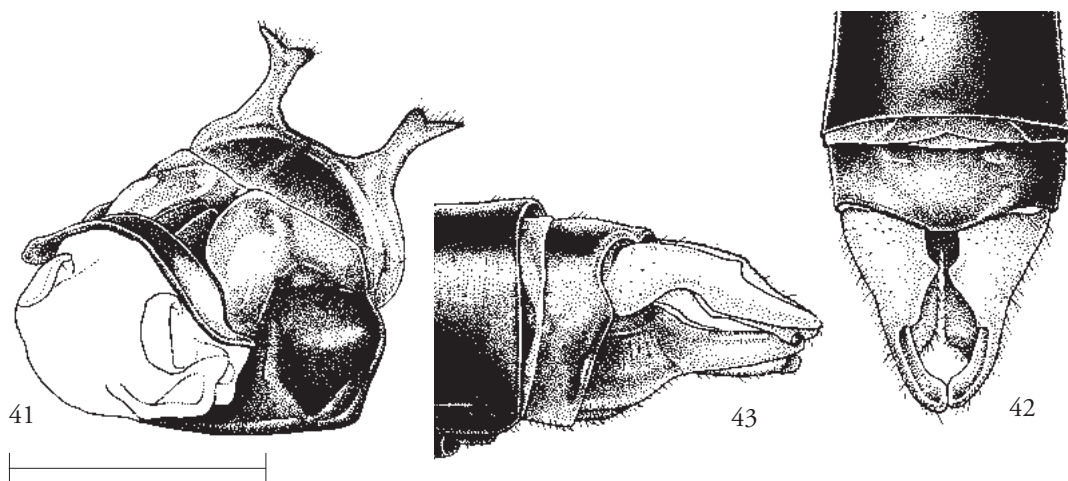
Drepanosticta lymetta Cowley

(Figs 41-43, 102)

Drepanosticta lymetta Cowley, 1936: 161-163, figs 13-14 (original description, holotype male, Philippine Islands, Surigao, Mindanao, C. F. Baker [BMNH] [examined]). – Needham & Gyger 1939: 263-264, figs 197-198, 200, 202, 205, 310 (description, material from type locality); Hämäläinen & Müller 1997: 257 (distribution Mindanao subregion: Mindanao).

Material examined (all Philippines, in coll. RMNH, except given otherwise). – **Mindanao**. Surigao, 21.v.1915 (G. Boettcher) 1 female (ex SMFD); Surigao, 12.xi.1915 (G. Boettcher) 1 female in SMFD; Surigao, 23.viii.1916 (G. Boettcher) 1 male (ex SMFD) and 2 males 2 females in SMFD; Surigao, before 1920 (C.F. Baker) 1 male (in BMNH) [holotype of *Drepanosticta lymetta* Cowley]; Agusan [del Sur], San Fran[cisco] (Quate) 1 female; Davao del Norte, Maco, Mainit, Mait Creek, 500-700 m, 14-17.ix.1995 (A. Buenafe) 6 males; Davao del Norte, Maco, Mainit, Masara Mine, 500-700 m, 27-28.xi.1995 (A. Buenafe) 1 male.

Diagnosis. – A rather inconspicuous brown species, the males characterized (but see below under remarks) by a pair of shortly branched processes on the hind margin of the hind lobe of the pronotum, and rather straight superior anal appendages with halfway a dorsal tooth and two medially directed teeth at innerside, of which the basalmost one is sharp. This species is closely related to *D. hermes* sp. n. from northern Davao Oriental (Boston region), which differs by the much longer outer branch of the pronotal process, a more slender base of the superior appendage (dorsal view),



Figures 41-43. *Drepanosticta lymetta* Cowley, male [JvT 18613, Mindanao, Davao del Norte, Maco, Mainit, 500-700 m, 14-17. ix.1995]. – 41, pronotum, oblique view. – 42, anal appendages, dorsal view. – 43, idem, left lateral view. Scale bar 1 mm.

and by the inferior appendages, which are curved rather than straight in the distal half. It is also close to *D. furcata* sp. n. from Siquijor, which differs by a significantly longer inner branch of the pronotal process, also by the absence of the dorsal tooth on the superior appendages, and a poorly developed second ventral tooth on superior appendage.

Male. – Head. Labrum, anteclypeus, mandibles ivory white; anterior one-fourth of labrum brown; rest of head bronze-black; transverse occipital carina distinct, with distinctly angulate lateral extremities. Antenna with scapus brown; pedicellus and flagellum yellowish brown.

Thorax. Pronotum (Fig. 41) predominantly brown, but sides of anterior and median lobe white; central part of posterior lobe and lateral lobes brownish black; anterior, median and lateral lobes simple; posterior lobe with lateral portions narrow, with elongate stout process on posterior border, process ending in a terminal tooth at outer surface, approximately as long as width of process; synthorax bronze-black, a paler marking over humeral suture; legs yellow. Wings hyaline, venation middle brown, but Costa somewhat darker; Px 15 in fore wing, 13 in hind wing; R4+5 arising from subnodus, IR3 arising half a cell distal to that level, Arculus distinctly distal to Ax2, anal veins shortly stalked, distinctly asymmetrical; pterostigma

c. 1.8 times as wide as high, rhomboid; cells between Costa and R1 posterior to pterostigma undivided. Abdomen. Brown, anterior one-tenth of segment 3-6 yellow, dorsally bluish white; appendages (Figs 42-43) yellow; superiors in dorsal view very stout, converging into a short, blunt dorsal tooth at circa three-fifths from base, distal two-fifths laterally compressed, semicircular; at base of club-shaped top a pair of characteristic ventral teeth, the basal one sharp; inferiors in ventral view basal one-third rather stout, distal two-thirds straight, subterminally constricted at innerside, the tip curved nearly 90° mediad, hardly directed dorsad.

Measurements. Abdomen incl. appendages 30-33 mm, hind wing 20-21 mm.

Female. – As the male, but hind margin of posterior lobe of pronotum without projections.

Measurements. Abdomen 27 mm, hind wing 19 mm.

Status. – The holotype of *Drepanostigma lymetta* Cowley is incomplete (abdominal segments 6-10 missing), while the only paratype, also a male, lacks head and abdominal segments 3-10. The incomplete status of both types was already so when this species was described, so that the structure of the abdominal segments and the anal appendages has remained unknown. Material available for comparison was

collected in Surigao by G. Boettcher in 1915/1916, but unfortunately, *Drepanosticta* material from this area is not well represented in the R.A. Müller collection. The structure of the pronotum of a male collected by Boettcher, now in the RMNH collection [JvT 19767], is rather close to the holotype (see also Cowley 1936, Fig. 13) and was identified as *D. lymetta* by Liefstinck. The structure of the anal appendages of the specimens from Davao del Norte: Maco agrees rather well with JvT 19767, but the structure of the rather characteristic processes of the hind lobe of the pronotum is distinctly different. The divided processes are better developed axiad than abaxiad in the type, but in the specimens from Maco (e.g. JvT 18613) the outer branch is distinctly larger than the inner branch. Also, the appendages of JvT 19767 are brown and concolorous with the abdomen, while the appendages of all Davao specimens are dirty white, and clearly distinct from the abdomen, including segments 9-10. The differences may prove sufficient to distinguish more than one taxon in due time. For the present, I have refrained from naming these forms, awaiting further material from Surigao, and also from the region between San Francisco (Agusan) and Maco. Distribution (Fig. 102). – Philippine Islands: Mindanao region (Eastern Mindanao).

***Drepanosticta taurus* Needham & Gyger**
(Figs 44-46, 102)

Drepanosticta taurus Needham & Gyger, 1941: 145-146, figs 1, 2, 5-7, 10 (original description, holotype male, type locality Mindanao, Davao Province, La Lun river (in MCZC).

Drepanosticta taurus Needham & Gyger. – Hämäläinen & Müller 1997: 258 [distribution Mindanao subregion: Mindanao).

Drepanosticta sp. n. 17. – Hämäläinen & Müller 1997: 258, 277 [distribution Mindanao].

Material examined. – Philippines, Mindanao Id., Davao Oriental, Boston, Mt. Agtuuganon, Camp 55, 1020 m, 29.v. - 7.vi.1996, Muller, Buenafe & Gorostiza, 42 males 1 female.

Diagnosis. – Medium-sized dark species; long and erect posterior projections of posterior lobe pronotum in the

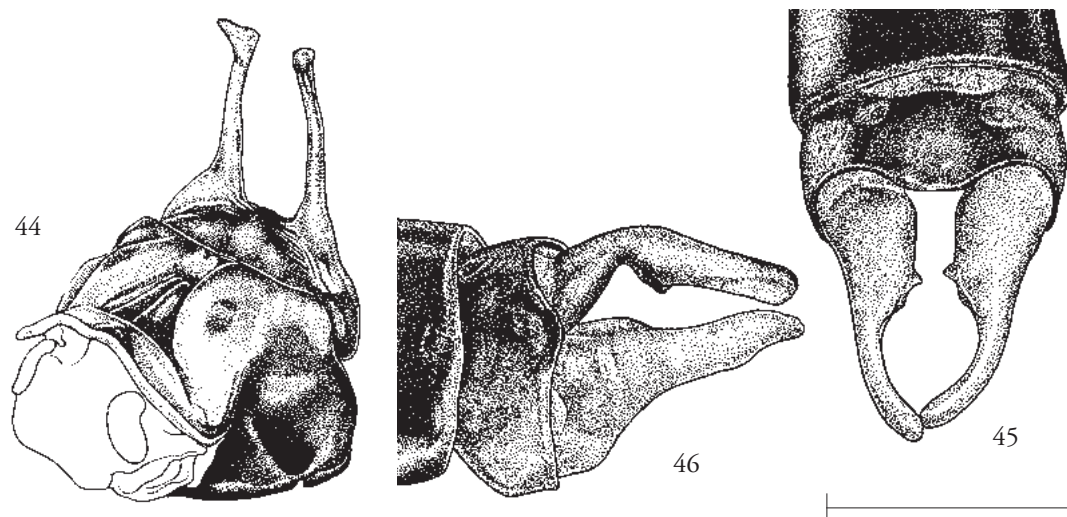
male diagnostic; superior appendages of male in dorsal view with stout base, the distal half slender.

Male. – Head. Labrum, mandibles and anteclypeus white or bluish white, anterior fourth of labrum with brown line; rest of head bronze-black, frons and vertex coriaceous; antenna with scapus brownish black, pedicellus dirty yellow, flagellum brown; transverse occipital carina distinct, with sharp triangular extremities.

Thorax. Pronotum (Fig. 44) with anterior and median lobe, and lateral portions of posterior lobe brown, rest brownish black. Anterior lobe large, erect at 45°; lateral parts of median lobe somewhat protuberant; posterior lobe short, with lateral portions with very sharp and long processes, directed dorsad, length of process of same length as median lobe of pronotum, both processes running more or less parallel. Synthorax castaneous, dorsally bronze-black; legs yellow. Wings hyaline, venation brown; Px 17 in fore wing, Px 15 in hind wing; R4+5 at subnodus, IR3 approximately halfway first cell distal to that level; Arculus distal to Ax2; quadrangle fore wing distinctly widening; anal veins subequal, unstalked; pterostigma brown, with narrow pale margin against veins, oblong, c. 1.7 times as wide as high, the proximal side acutely angulate. Abdomen. Segments 1-6 brown, segments 7-10 brownish black, anterior portions of segments indistinctly paler; appendages (Figs 45-46) dark yellow, base of superiors dark grey, somewhat conical, distal half semi-circular, bent inwards, tip sub-squarish; at base of basal portion three teeth as follows: one dorsal directed caudad, a larger, sharp tooth directed inward just basal to first, and a broad and inconspicuous tooth just distal to first; inferiors with stout base, distal part with base straight, just directed outwards, the top bent 90° inward, innerside emarginate, tip not directed dorsad.

Measurements. Hind wing 21-24 mm, abdomen including appendages 33-36 mm.

Female. – Females of this species and *D. hermes* sp. n. are indistinguishable.



Figures 44-46. *Drepanosticta taurus* Needham & Gyger, male [JvT 18765, Mindanao, Davao Oriental, Boston, Mt. Agtuuganon, 1020 m, 29.v-7.vi.1996]. – 44, pronotum, oblique view. – 45, anal appendages, dorsal view. – 46, idem, left lateral view. Scale bar 1mm.

Status. – The specimens here assigned to *D. taurus* Needham & Gyger, do not fully agree with the original description, and were identified as a new species by Hämäläinen & Müller (1997). Although the present specimens have the same characteristic projections of the posterior lobe of the pronotum, the size of the specimens is very different from the type. Needham & Gyger explicitly mention the very elongate abdomen, measuring 47 mm, and a hind wing 25 mm for the male. However, I presume that the size of the abdomen is a printing error for 37 mm, a size that would better fit the given measurements of wings, female abdomen, and the measurements of the specimens in the Müller collection. Unfortunately, I have not been able to study the type to confirm my supposition. According to Needham & Gyger, the type was deposited in MCZN. Dr. Philip D. Perkins of the Museum of Comparative Zoology informs me (e-mail 28 May 2004) that the type is not present in MCZN collection. On his suggestion, I also contacted Dr. James K. Liebherr at Cornell University, where Needham worked, who informed me that the type could not be traced in that collection as well. Awaiting the recovery of the type, and possible more material from the Davao region in Mindanao, I have decided to consider the present

specimens representing *D. taurus*.

Distribution (Fig. 102). – Philippine Islands: Mindanao (Davao Oriental). The type locality of *D. taurus*, La Lun river, was not found in any atlas or gazetteer, and is not represented on the map.

Drepanosticta megametia group

Transverse occipital carina distinct, with acutely angulate lateral extremities; anterior lobe of pronotum erect, at least in *D. centrosaurus* sp. n. partly folded; posterior lobe of pronotum with a pair of processes on hind margin, very wide and broadly connected with the posterior margin of the posterior lobe; pterostigma distinctly wider than high; superior appendages slender without dorsal tooth, but a sharp tooth directed medially on innerside; inferior appendages slender and straight, the tip emarginate, curved 90° mediad. Based on the structure of the anal appendages, presumably the sister-group of the *D. lymetta* group.

Included species: *D. centrosaurus* sp. n. and *D. megametia* Cowley.

Distribution: Mindanao.

***Drepanosticta centrosaurus* van Tol, sp. n.**

(Figs 47-49, 103)

Drepanosticta sp. n. (14). – Hämäläinen & Müller 1997: 258, 277 (distribution Mindanao, Surigao del Sur).

Type material. – Holotype male [JvT 18715] in RMNH: 'Philippines, Mindanao Id / Surigao del Sur, Tago / Meme River, 100-300 m / June 12.-18., 1996 / Buenafe A. / Gorostiza A. leg / Coll. Roland A. Müller'. – Paratypes (all Philippines, in RMNH, 98 males 19 females), **Mindanao**. Surigao del Sur: San Miguel, Suba River, 150-250 m, 13.iv.1995 (Müller, Buenafe & Gorostiza) 29 males 3 females; Tandag, Hitaub Creek, 500-600 m, 16-19.iv.1995 (Buenafe & Gorostiza) 26 males 2 females; Carmen, 2. Equipment Shop, km 9 and 11 Lanang Line, 500 and 600-650 m, 21-24.iv.1995 (Müller, Buenafe & Gorostiza) 1 male 2 females; Lingig, Mandus, 100 m, 27.v.1996 (Müller, Buenafe & Gorostiza) 3 males 1 female; same locality as holotype, 38 males 11 females; San Miguel, foot of Diuata Mountains, Castillo, Kagda-o Creek, 300-500m, 2-5.iv.1998 (Piamonte) 1 male.

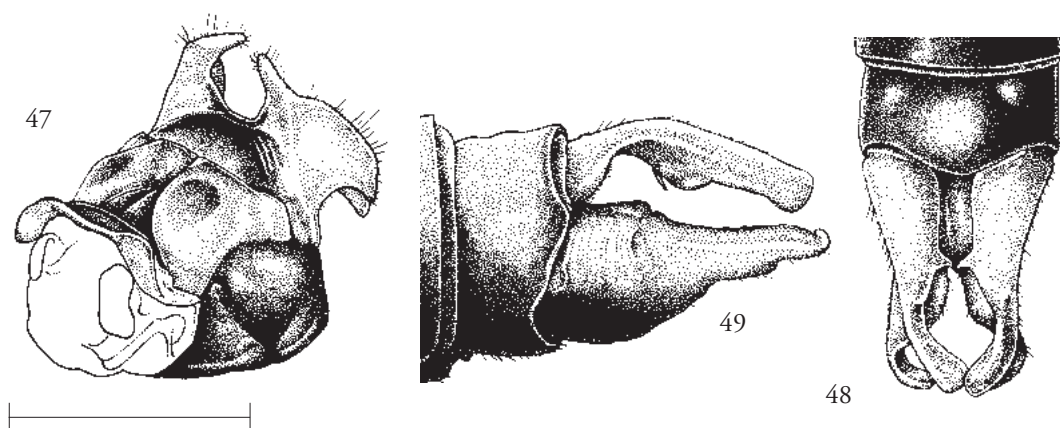
Diagnosis. – Small and dark species, characterized by very broad processes of the posterior lobe of pronotum, the bases wider than the distance between the processes; superior appendages with a large laterally, but hardly ventrally directed tooth at base of distal, clasper-like part.

Male [JvT 18715]. – Head. Labrum, mandibles,

anteclypeus ivory white, anterior one-third of labrum pale brown, rest of head bronze-black, frons and vertex coriaceous; transverse occipital carina distinct, lateral extremities apiculate; antenna with scapus and flagellum brown, pedicellus dirty yellow.

Thorax. Pronotum (Fig. 47) with central part of anterior, median and posterior lobe, and complete lateral lobe dark brown; lateral portions of anterior and median lobe bluish white, lateral portions of posterior lobe middle brown; anterior lobe large and erect; median and lateral lobes simple; posterior lobe with lateral portions large, each approximately as large as half of median lobe, base ca. one-third of hind margin of posterior lobe, distal half somewhat wider on innerside, and significantly broadened on outer surface. Synthorax concolorous castaneous, without bronze shine, dorsal part finely coriaceous. Legs yellow. Wings hyaline, venation brown; Px 15 in fore wing, Px 14 in hind wing; R4+5 arising distal to subnodus, IR3 in distal half of first cell distal to subnodus; quadrangle of fore wing slightly widening posteriorly; Arculus arising distal to Ax2; anal veins somewhat asymmetrical, sessile; pterostigma brown, with paler margin against veins, c. 1.6 times wider than high; one cell between Costa and R1 beyond pterostigma in left hind wing divided, remaining cells undivided (divided cells also rare in paratypes).

Abdomen. Castaneous brown, base of segments 3-6 dorsally with oblong ivory white spot. Appendages



Figures 47-49. *Drepanosticta centrosaurus* sp. n., male [JvT 18625, Mindanao, Surigao del Sur, Tandag, Hitaub Creek, 500-600 m, 16-19.iv.1995]. – 47, pronotum, oblique view. – 48, anal appendages, dorsal view. – 49, idem, left lateral view. Scale bar 1 mm.

(Figs 48-49) pale brown or yellow; superior appendages very slender, in dorsal view base more or less straight, a conspicuous tooth on innerside halfway of superiors (well visible in lateral view in the holotype, but inconspicuous in many other specimens), superiors in distal half bent semicircular, ending abruptly squarish; inferiors in ventral view with basal two-fifths stout, distal part narrow at base, then slightly widening, the distalmost part abruptly constricted, bent 60° inward, the tip acute.

Measurements. Hind wing 20 (19-21) mm, abdomen including appendages 31 (30-32) mm.

Female. – As the male, but posterior margin of posterior lobe of pronotum rather simple, with a paired, very short process, in shape more as a denticle with a group of setae, rather close to the middle of the lobe, hind margin laterally of processes emarginate, then rounded towards lateral corner.

Measurements. Abdomen 26-28 mm, hind wing 18-20 mm.

Etymology. – *Centrosaurus* (Latin), a genus of dinosaurs, for the similarity of the 'collar'. A noun in apposition.

Distribution (Fig. 103). – Philippines: Mindanao (Surigao del Sur).

***Drepanosticta megametia* Cowley**

(Figs 50-51, 103)

Drepanosticta megametia. – Cowley 1936: 163-167, figs 15-22 (original description, type locality Philippine Islands, Surigao, Mindanao (BMNH)).

Drepanosticta megametia Cowley. – Lieftinck, 1937: 72-74 (*D. ephippiata* from Celebes considered most closely to *D. megametia*); Needham & Gyger, 1939: 263, 264 (key, no new material); Hämäläinen & Müller 1997: 257 (distribution Mindanao subregion: Mindanao).

Material examined. – Mindanao, Surigao, 23.viii.1916 (G. Boettcher) 2 males (juv) in SMFD; Mindanao, Surigao (Baker) 1 male (holotype) in BMNH.

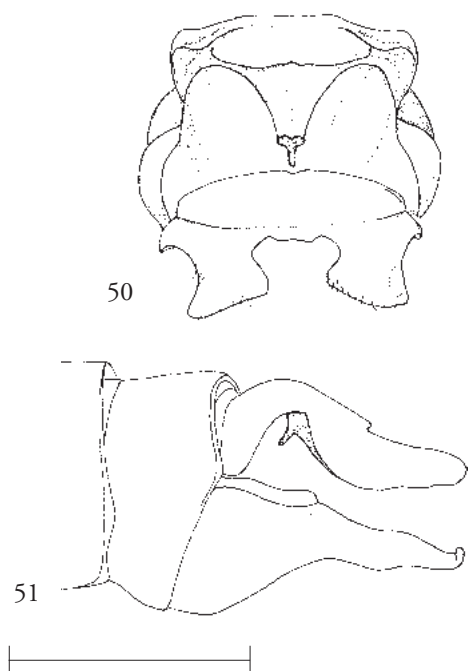
Diagnosis. – A medium-sized species; distinguishable from most other Philippine *Drepanosticta* by the

wide posterior processes of the posterior lobes of the pronotum; differs from *D. centrosaurus* sp. n. by the shape of the processes, which are subrectangular in *D. megametia* and distinctly laterally projected at the top in *D. centrosaurus*; anal appendages of males of both species very similar.

Male [based on description in Cowley 1936]. – Head. Labium pale brown, labrum and mandibles pale yellow with narrow anterior brown border; anteclypeus pale yellow; rest of head black, with small exterior brown spot against lateral ocelli; transverse occipital carina well developed, with acutely angulate lateral extremities. Antenna with scapus and pedicellus yellowish brown, flagellum darker apically.

Thorax. Pronotum (Fig. 50) brown, median lobe paler; anterior lobe erect, posterior lobe produced posteriorly as two caudally directed processes, extending over synthorax, slightly convex, apical corners rounded, only external corner slightly projecting; no specialised tufts of setae on processes. Synthorax dark brown, mesepisternum with black stripe against dorsal carina, mesepimeron paler dorsally and anteriorly, extending on to the dorso-posterior corner of mesepisternum; metepisternum with pale yellow ovoid dorso-anterior spot; about dorsal third of metepimeron pale yellow. Legs pale yellow. Wings hyaline, venation dark brown. Px 15 in fore wing, Px 13 in hind wing; R4+5 arising at subnodus, extending to beyond level of pterostigma; IR3 arising half a cell distal to subnodus; quadrilateral long, very slightly widened distally in fore wing, scarcely so in hind wing; anal veins forming a Y-shaped brace with very short stem; pterostigma brown, subquadrangular, surmounting one cell.

Abdomen brown; segments 1, 2, 8-10 without any pale markings, 3 to 7 with a complete basal yellow ring extending further apicad dorsally than laterally, occupying the basal 0.08 of segment 3, 0.10 of segment 4, 0.12 of segment 5, 0.13 of segment 6 and 0.24 of segment 7. Anal appendages (Fig. 51) brown, superior appendages about three times the length of segment 10, inferiors subequal to superiors; superiors in dorsal view basally broad with short mesal spine directed meso-ventrad at 0.22 of length, concave



Figures 50-51. *Drepanosticta megametia* Cowley, male [holotype]. – 50, pronotum, dorsal view. – 51, anal appendages, left lateral view. Scale bar 1 mm.

exteriorly, becoming narrower and concave interiorly, convex exteriorly, hollowed out mesally, apices turned meso-caudad; inferiors convex exteriorly, apices turned mesad, interiorly straight with a preapical mesal projection, thereafter strongly concave; in lateral view superiors directed dorso-caudad basally, then sharply caudad and slightly ventrad; inferiors almost straight, apices turned mesad and slightly dorsad; no specialised tufts of setae.

Female. – As the male, but the posterior projections of the posterior lobe of the pronotum shorter, subquadrangular, the top more rounded. See further Cowley (1936: 165-166).

Note. – This species is not represented in the R.A. Müller collection in RMNH.

Distribution (Fig. 103). – Philippine Islands: Mindanao (Surigao province).

Drepanosticta: other species

The following species here assigned to *Drepanosticta* do not share a unique character or character set with other species in the Philippines. Some of the species definitely have Bornean affinities, others apparently are sister to one of the species groups defined here. A more detailed phylogenetic analysis is needed to reveal their relationships. For the time, all these species are taken together in the rest-group. The species are treated in alphabetical order.

Included species: *D. aurita* sp. n. (Mindoro), *D. ceratophora* Lieftinck (Palawan, Balabac), *D. lestoides* (Brauer) (Samar, Panaon Id., Dinagat, Mindanao), *D. malleus* sp. n. (Mindanao), *D. mylitta* Cowley (Luzon, Samar, Leyte, Homonhon, Panaon), *D. myzouris* sp. n. (Luzon), *D. paruatia* sp. n. (Palawan), *D. pistior* sp. n. (Sibuyan, Negros, Panay, Luzon ?), *D. quadricornu* sp. n. (Busuanga, Palawan).

Drepanosticta aurita van Tol, **sp. n.**

(Figs 52-54, 107)

Drepanosticta sp. n. 12. – Hämäläinen & Müller 1997: 257-258, 277 (Mindoro).

Type material. – Holotype male [JvT 22190] in RMNH: 'Philippines, Mindoro Id / Mindoro Or. Prov., Calapan / Comonal, Mt Tarugin, um [= c.] 350 m / July 17./26. 1990 / Adrian Gorostiza legit / Coll. R.A. Müller'. – Paratypes (all in RMNH). **Mindoro**. As holotype, 14 males 3 females; Mt Halcon, 1000-1500 m, 2-20.v.1994 (N. Mohagan) 8 males 3 females.

Other material examined (all in RMNH). – **Lubang Island**. Mindoro Occidental, Looc, Mt. Gonting, Sitio Gonting, 300-500 m, 8-15.vii.1997 (C. Nazareno) 5 males 1 female.

Diagnosis. – Transverse occipital carina poorly developed, lateral extremities hardly discernable; processes on anterior lobe of pronotum indistinct in specimens from Mindoro, with a distinct paired anterior projection in specimens from Lubang Island; posterior lobe of pronotum with swollen lateral portions of posterior lobe with long and sturdy setae; synthorax brownish black, without pale markings;



Figures 52-54. *Drepanosticta aurita* sp. n., male [JvT 18749, Lubang Island, Mt. Gonting, Sitio Gonting, 300-500 m, 8-15. vii.1997; not a paratype]. – 52, pronotum, oblique view. – 53, anal appendages, dorsal view. – 54, idem, left lateral view. Scale bar 1 mm.

pterostigma somewhat wider than high; superior appendages without teeth or protuberances; inferior appendages in ventral view straight, only the very tip curved axiad (not dorsad).

Male [JvT 22190, holotype]. – Head. Labrum and anteclypeus bluish white, anterior border of labrum brown; mandibles pale brown, except for blue innerbasal corner, rest of head bronze-black; transverse occipital carina narrow with inconspicuous lateral extremities; antenna with scapus and flagellum brown, pedicellus dirty yellow.

Thorax. Pronotum (cf. Fig. 52) with central part of anterior, median and posterior lobe, and complete lateral lobe, brownish black; rest brown; anterior lobe simple, with anterior margin erect, but without conspicuous projections (for specimens from Lubang, see under variation); median and lateral lobes simple; posterior lobe with lateral third of both sides erect at c. 60°, stout, subrectangular, somewhat wider than high, hind margin densely covered with long and sturdy setae; synthorax fully bronze-black; legs yellowish. Wings hyaline, venation brown, pale brown in basal half; Px 16 in fore wing, Px 15 in hind wing; R4+5 distal to subnodus in forewing, at subnodus in hind wing; IR3 distinctly in distal half of first cell distal to subnodus in fore wing, a little beyond the middle in

hind wing; Arculus distinctly distal to Ax2; anal veins more or less symmetrical, shortly stalked; pterostigma brown, subquadrangular, width 1.4 times the height; proximal corner angulate, the distal side somewhat convex.

Abdomen. – Brownish black, basal one-eighth of segment 3, one-sixth of segments 4-6, one-third of segment 7 yellowish; a basal spot at ventro-anterior margin of segment 8; abdominal segments 8-9 distinctly broader than other segments, brownish black. Appendages (cf. Figs 53-54) dirty yellow, base of inferiors greyish brown; superiors in dorsal view, the top dorso-ventrally flattened, the scoop-like caudal half subrectangular; inferiors with stout base, distal half slender, top rounded, the tip acute, hollow. Measurements. Hind wing 20 (20-22) mm, abdomen including appendages 33 (33-35) mm.

Female. – As the male, but the posterior processes of the posterior lobe of the pronotum somewhat shorter than in the male, but also with long setae; last abdominal segments brownish black, with anal appendages yellowish white, valves long, surpassing the cerci. Measurements. Hind wing 21-23 mm, abdomen 32-35 mm.

Variation. – Pterostigma is many males more squarish

than holotype, width c. 1.3 times the height. Males from Lubang Island with anterior lobe of pronotum (Fig. 52) medially with a broad, unpaired process, approximately as high as the median length of anterior lobe, the upper margin of the process itself bifid, the corners laterally projected, acutely angulate. Females with the projections on anterior lobe of pronotum less distinct.

Although specimens from Mindoro and Lubang are distinct by the shape of the anterior lobe of the pronotum, the Lubang form has not been named separately, since no other structural characters seem to distinguish both populations.

Etymology. – *Auritus* (Latin), eared; for the shape of the processes of the posterior lobe of the pronotum. An adjective.

Distribution (Fig. 107). – Philippine Islands: Mindoro, Lubang Island.

***Drepanosticta ceratophora* Liefstinck**

(Figs 55-57, 107)

Drepanosticta ceratophora Liefstinck, 1974: 117-120, figs 3-5 (original description, holotype male Palawan, Mantalingajan, Pinigisan, 600 m (in ZMUC)). – Hämäläinen & Müller 1997: 257 (distribution Palawan).

Material examined (all Philippine Islands, in RMNH).

– **Palawan.** Mantalingajan, Pinigisan, 600 m, 1.ix.1961, Noona Dan Exp. 61-62, 1 female (incomplete, paratype) (ex ZMUC); Quezon, Lamakan, Magmuni Stream, 27.v. - 1.vi.1991 (Borromeo & Buenafe) 6 males 2 females; idem, Magmuni Stream, 1000 ft, 16-22.v.1992 (Borromeo T) 8 males 2 females; idem, Quezon, Malatgao, Bugon, ii.1994 (E. Vinciguerra & E. Horn) 1 female. – **Balabac,** Palawan Prov., Brgy. Dalahun, 5-30 m, 8-14.ii.1997 (A. Buenafe) 7 males 1 female.

Diagnosis. – Small species. Transverse occipital carina and lateral extremities indistinct; anterior lobe of pronotum simple without projections; posterior lobe with a single median spine, diagnostic within the Philippine *Drepanosticta* species; synthorax castaneous; pterostigma slightly wider than high; superior appendages long, slender and straight; inferior appendages also slender, the distal half hooked laterad,

the tip curved medio-dorsad, with a subterminal medially directed sharp tooth.

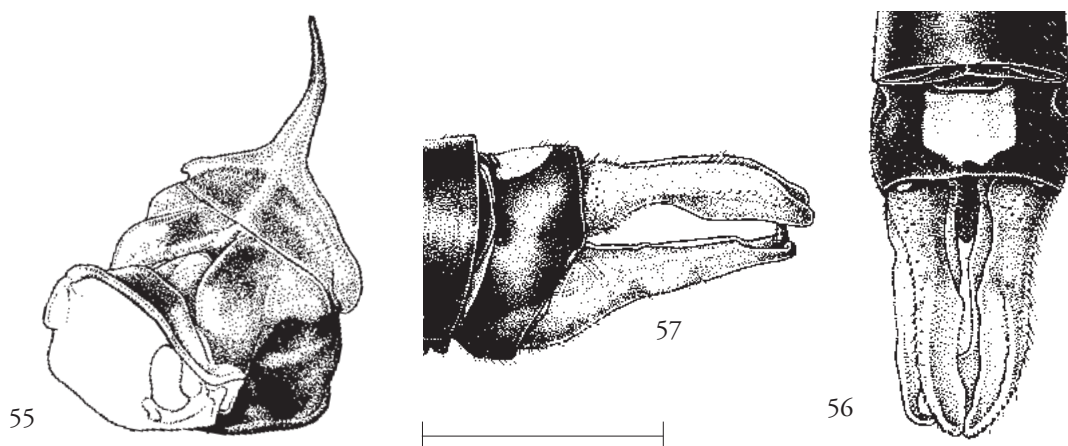
Male. – Head. Labrum and anteclypeus ivory white, anterior border of labrum brown, mandibles greyish brown, rest of head bronze-black, narrow transverse occipital carina with indistinct lateral extremities; antenna with scapus and pedicellus dirty white, flagellum pale brown.

Thorax. Pronotum (Fig. 55) dirty yellow, with lateral portion of median lobe, median portion of posterior lobe, and lateral lobes brownish black; anterior lobe large, not distinctly erect, posterior lobe with median portion diagnostic with long (unpaired) process, smoothly curved dorsad, at least as long as median length of rest of pronotum, but with much variation between specimens; lateral portion of posterior lobe simple; synthorax castaneous, lower parts brownish black; legs yellow. Wings hyaline, venation brown; Px 14-15 in fore wing, Px 13-14 in hind wing; R4+5 arising at subnodus, IR3 arising half a cell distal to that level; Arculus arising just distal to Ax2, anal veins stalked in most specimens; pterostigma subquadrangular, proximal side 80° angulate, distal side slightly more convex; cells distal to pterostigma between Costa and R1 undivided.

Abdomen. Segment 1 yellow, segment 2 brown, posteriorly somewhat paler, segments 3-6 brown, each segment with anterior and posterior one-fifth yellow, segment 7 brown with anterior third yellow, segments 8-10 brownish black, dorsum of segment 10 with irregular oval, blue marking. Appendages (Figs 56-57) yellow, slender; superiors with base far apart and gradually tapering, distal three-fifths laterally compressed, somewhat hollow; inferiors stout at base, distal half slender, more or less straight, the tip curved inward; subterminally a toothlike process on innerside, directed 90° inward.

Measurements. Hind wing 17-18 mm, abdomen including anal appendages 28-30 mm.

Female. – Coloration very similar to the male; posterior lobe of pronotum rounded without any indication of median posterior process; last abdominal segments



Figures 55-57. *Drepanosticta ceratophora* sp. n., male [JvT 20169, Balabac, Brgy Dalahuan, 5-30 m, 8-14.ii.1997]. – 55, pronotum, oblique view. – 56, anal appendages, dorsal view. – 57, idem, left lateral view. Scale bar 1 mm.

stoutly built, castaneous, but segment 10 and cerci dirty white.

Measurements. Hind wing 17-18 mm; abdomen 25-26 mm.

Affinities. – Although there is no other Philippine species of *Drepanosticta* known with an unpaired erect posterior process of the pronotum, this species resembles the Bornean *Drepanosticta monoceros* Liefstinck, only known from one male and one female specimen. The latter species, however, is very small, has distinctly different coloration, while not only the male, but also the female is provided with a conspicuous median process on the posterior lobe of the pronotum. Liefstinck considered *D. monoceros* a close relative of *D. crenitis* Liefstinck.

Distribution (Fig. 107). – Philippine Islands: Palawan, Balabac.

Drepanosticta lestoides (Brauer)

(Figs 58-60, 104)

Platysticta lestoides Brauer, 1868: 552-553 (original description, type male, type locality Mindanao [in IRSN, not examined]). – Selys 1882: 30 (no new records, dates provided).

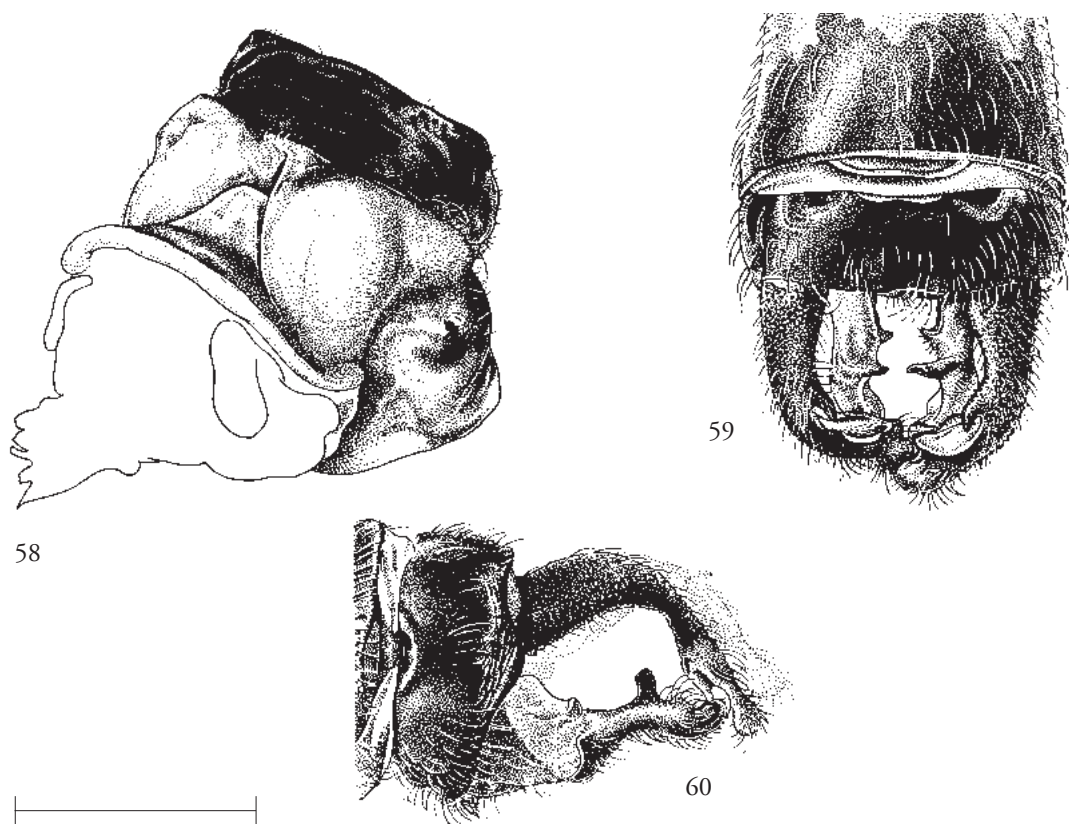
Platysticta (*Platysticta*) *lestoides*. – Selys 1886: 154-155 (description).

Drepanosticta lestoides Brauer. – Needham & Gyger 1939: 263, 264 (key, no new material); Liefstinck 1961:

133-135, fig. 47 (redescription, additional male from Surigao); Hämäläinen & Müller 1997: 257 (distribution East Visayan region: Panaon, and Mindanao subregion: Mindanao, Dinagat).

Material examined. – (All Philippine Islands, and in RMNH; arranged per island, from north to south). – **Samar**, Samar Prov., Hinubangan [=Hinabangan], Arizona, 100-280 m, 29.iii.-6.iv.1997 (R.A. Müller) 1 female, idem, San Isidro, San Isidro river, 90-200 m, 31.iii.-5.iv.1997 (R.A. Müller) 1 female. – **Panaon Id**, San Francisco (various places), viii.1988 (W. Catal) 3 males 2 females. – **Dinagat Id.**, Surigao del Norte, Loreto, Mt Canbinlio, Canbinlio river, 4.vi.1988 (A. Buenafe) 1 male. – **Mindanao**, Surigao, 30.x.1915 (G. Boettcher) 1 male; South Cotabato, Mt. Matutum, 500-700 m, 16-19.ix.1993 (Th. Borromeo) 1 male; Lanao del Norte, Iligan, Tinago Falls. 8°09'33"N 124°11'11"E. 160 m, 25.iii.2004 (V. Kalkman & J. van Tol) 3 males; Davao Oriental, Boston, Mt Agtuuganon, 1020 m, Camp 55, 29.v.-7.vi.1996 (Müller, Buenafe & Gorostiza) 2 males 1 female; Mt Gantongan, Gantongan river, x.1991 (A. Buenafe) 1 male; Surigao del Sur, Tabon, Tabon Falls, 100-200 m, 26.v., 8.vi.1996 (Gorostiza & Buenafe) 1 male.

Diagnosis. – Large species with colourful thorax, pronotum with dirty white anterior, median and lateral lobes, and brownish black hind lobe, synthorax with wide yellowish white stripes over metepisternum and metepimeron. Only other Philippine species of



Figures 58-60. *Drepanosticta lestoides* (Brauer), male [JvT 18620, Mindanao, Davao Oriental, Boston, Mt Agtuuganon, 1020 m, 29.v-7.vi.1996]. – 58, pronotum, oblique view. – 59, anal appendages, dorsal view. – 60, idem, left lateral view. Scale bar 1 mm.

Drepanosticta with similar coloration are *D. moorei* Van Tol & Müller and *D. luzonica* sp. n. from Luzon; appendages of both species, however, are distinctly different, especially long tubercle directed mediad halfway on inferior appendage of *D. lestoides* diagnostic (Figs 59-60).

Male. – Head. Labrum and anteclypeus bluish white, but anterior one-sixth of labrum black, mandibles black except for bluish white inner basal corner; rest of head bronze-black and very shining, microsculpture only partly, very superficial and without conspicuous longitudinal striae between eyes; hind margin of head without transverse occipital carina, but parorbital carina present; antenna with scapus brownish black, pedicellus and flagellum brown.

Thorax. Pronotum (Fig. 58) with anterior, median and

anterior portion of lateral lobe pale yellow, posterior part of lateral lobe and most of posterior lobe dark brown, lateral portion of latter slightly paler; anterior, median and lateral lobes simple; posterior lobe short, flat, only lateral corners at hind margin with triangular erect structure. Synthorax brownish black, but with conspicuous bluish yellow transversal markings on metepisternum against mesepimeron and lower half of metepimeron, apically continuing on lower hind part of metakatepisternum. Legs yellowish, femora at joints greyish brown. Wings hyaline, venation brown, but Costa brownish black in basal half and other main veins pale brown in basal half; venation rather open; R4+5 arising at or just distal to subnodus, IR3 arising just distal to that level; Arculus arising just distal to Ax2; quadrangle only slightly widening in fore and

hind wing; anal veins asymmetrical and almost sessile; pterostigma brown with broad pale lines against veins, subquadangular, width c. 1.5 times the height, proximal lower corner acutely angulate.

Abdomen. Segments 1-7 pale brown, segments 1-2 ventrally yellowish, rest abdomen brownish black, but basal half of segment 9 with a paired irregular squarish blue marking. Appendages (Figs 59-60) with superiors semicircular, the tip distinctly wider, approximately halfway a dorsal tooth directed inward, its length approximately as diameter of appendage; inferiors straight, the tips sharply bent inward and touching, subbasally at ventral surface an inward directed triangular process, at dorsal surface a stout and long tubercle, directed inward and touching opposite tubercle.

Measurements. Hind wing 25-27 mm; abdomen including anal appendages 44-46 mm.

Female. – Generally similar in coloration to the male; structure of pronotum as male; abdominal segments with segment 1 yellowish white, dorsally a brown annule against hind margin connected with a paired brown longitudinal line; segments 2-7 brown, the first segments paler than the last, segment 2 with a narrow longitudinal line over middle of segment and a broad yellow stripe against sternite; segments 8-10 brownish black, segment 8 with a semi-circular spot against sternite; valvifer brownish black, valve pale, dirty yellow, reaching distinctly beyond cerci.

Measurements. Hind wing 25-27 mm, abdomen 37-40 mm.

Affinities. – Not closely related to any other Philippine *Drepanosticta* species. Within the Philippines, the characteristic structure of the male appendages is unique to the present species. *D. lestoides* (Brauer) seems to have closer affinities to species from Borneo, e.g. *D. actaeon* Laidlaw, or the mainland of Southeast Asia, e.g. *D. quadrata* (Selys).

Distribution (Fig. 104). – Samar, Panaon, Dinagat and Mindanao. A rather widespread but uncommon species where found.

Drepanosticta malleus van Tol, sp. n.

(Figs 61-63, 107)

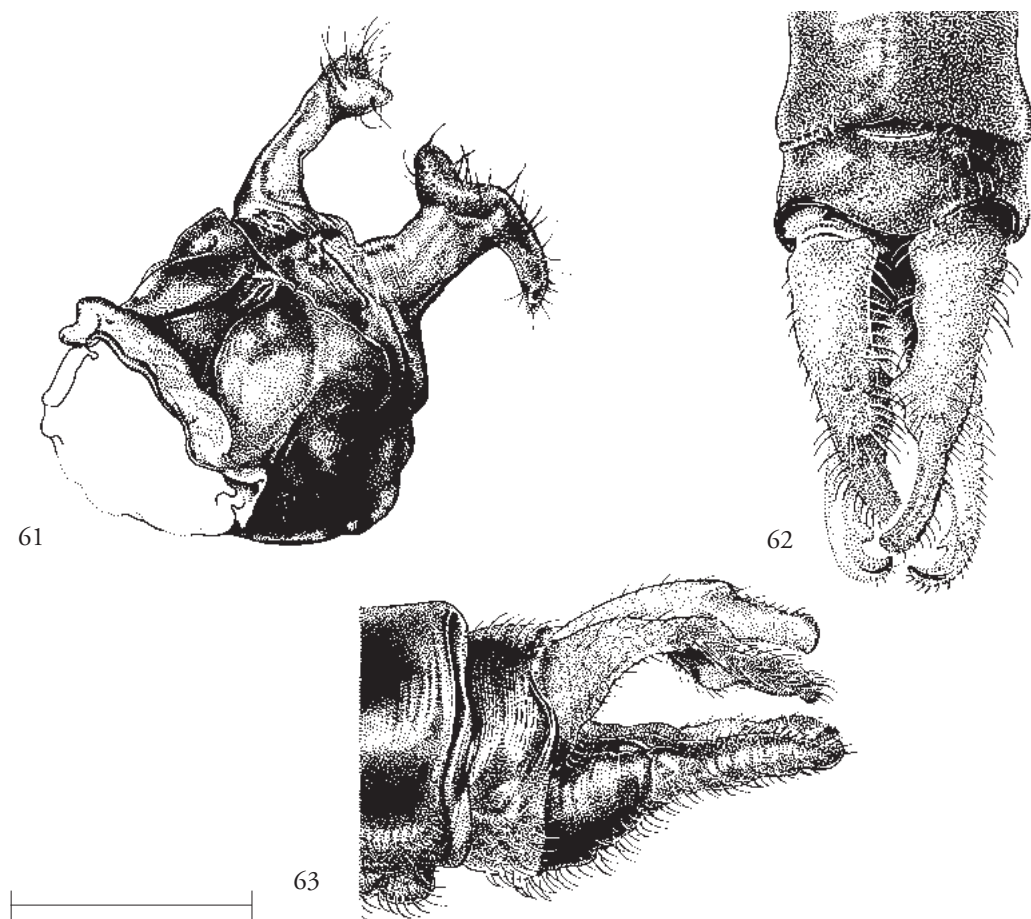
Drepanosticta sp. n. 15. – Hämäläinen & Müller 1997: 258, 277 (Mindanao).

Type material. – Holotype male [JvT 18794] in RMNH: 'Philippines, Mindanao Id / Davao Oriental, Cateel, Aliwagwag Falls, 200-300 m / April 10, 1995 / Buenafe / Gorostiza legit / Coll. Roland A. Müller'. – Paratype: Same data [head broken to pieces], 1 male (in RMNH).

Diagnosis. – Male (female unknown) unmistakable by its huge posterior processes of posterior lobe of pronotum; appendix inferior with subterminal inward directed tooth. The last character shared with *D. myzouris* sp. n., of which the structure of posterior process is very different.

Male [JvT 18794, holotype]. – Head. Labrum and anteclypeus ivory white, labrum with anterior third light brown, mandibles greyish brown; rest of head brownish black, frons and vertex coriaceous; transverse occipital carina distinct, with acutely angulate triangular extremities; antenna with scapus brown, rest of antenna dirty yellow.

Thorax. Pronotum (Fig. 61) with anterior, median and middle part of posterior lobe middle brown, upperparts somewhat darker; median portion of posterior lobe, and lateral lobe brownish black; anterior lobe distinct and erect, middle and lateral lobes simple, posterior lobe with lateral portions distinctly developed, nearly as long as median line from anterior to posterior lobe, base broad and long, the top abruptly connected to a transversal structure, strong and relatively short on innerside, longer and more slender outside, transversal structure with sturdy setae. Synthorax castaneous. Legs yellow, femora against tibiae with a narrow brown ring. Wings hyaline, venation brown; Px 16 in fore wing, Px 15 in hindwing; R4+5 at subnodus, IR3 halfway first cell distal to that level; Arculus just distal to Ax2; quadrangle widening posteriorly in fore wing; anal veins distinctly stalked; pterostigma oblique, width c. 1.8 times the height, anterior and posterior side parallel-sided, distal side somewhat convex; several cells between Costa and R1 distal to pterostigma divided.



Figures 61-63. *Drepanosticta malleus* sp. n., male [JvT 18793, Mindanao, Davao Oriental, Cateel, Aliwagwag Falls, 200-300 m, 10.iv.1995]. – 61, pronotum, oblique view. – 62, anal appendages, dorsal view. – 63, idem, left lateral view. Scale bar 1 mm.

Abdomen. Castaneous, basal one-tenth of segments 3-5 paler; anal appendages (Figs 62-63) long and slender, superiors smoothly tapering from base to top, approximately halfway on innerside a sharp triangular tooth, a shorter and broader protuberance just distal to this tooth; tip of superiors rounded dorsally, acutely pointed ventrally; inferiors distinctly longer than superiors, base stout, distal half nearly straight, the top 80° bent inward, slender; subterminally a short triangular tooth directed axiad.

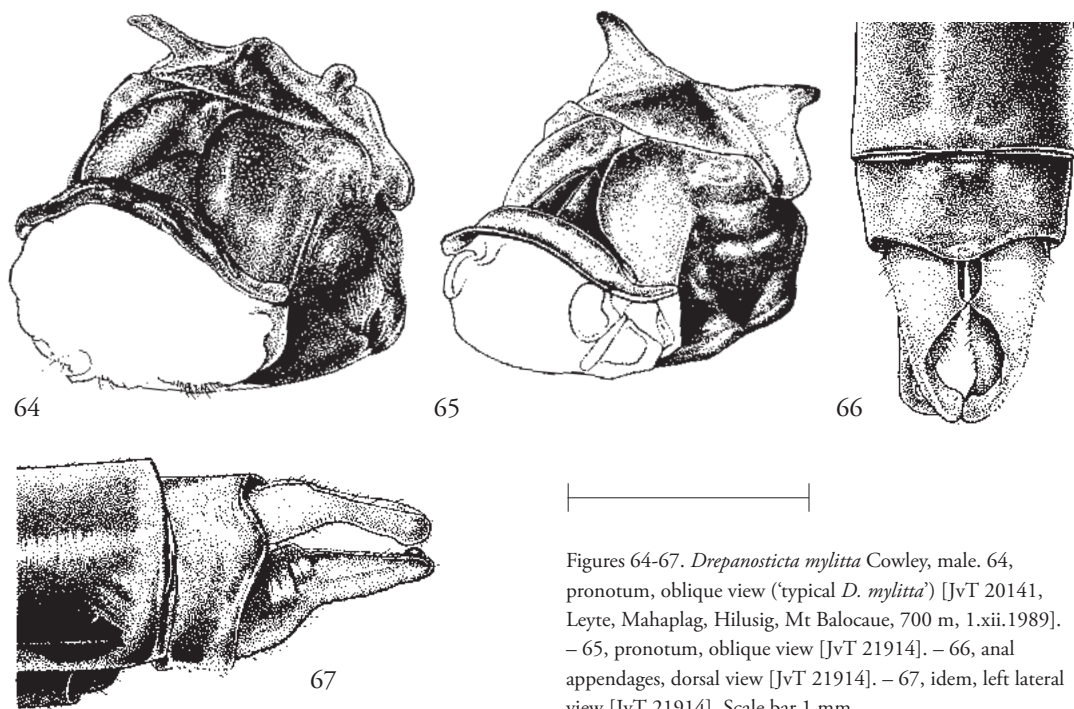
Measurements. Hind wing 21 mm, abdomen including appendages 32 (34) mm.

Female. – Unknown.

Affinities. – The inward directed, subterminal tooth of the inferior appendage is shared, among the Philippine taxa, with *D. myzouris* sp. n. Clustering into one group is unrealistic, since they do not share characters in the transverse occipital carina, the structure of the pronotum and the pterostigma. The subterminal tooth of the inferior appendages occurs widely in Platystictidae, including *Drepanosticta*, and has to be considered the plesiomorphic character state.

Etymology. – *Malleus* (Latin), hammer; for the structure of the paired process of the posterior lobe of the pronotum. A noun in apposition.

Distribution (Fig. 107). – Philippine Islands: Mindanao (Davao Oriental).



Figures 64-67. *Drepanosticta mylitta* Cowley, male. 64, pronotum, oblique view ('typical *D. mylitta*') [JvT 20141, Leyte, Mahaplag, Hilusig, Mt Balocau, 700 m, 1.xii.1989]. – 65, pronotum, oblique view [JvT 21914]. – 66, anal appendages, dorsal view [JvT 21914]. – 67, idem, left lateral view [JvT 21914]. Scale bar 1 mm.

Drepanosticta mylitta Cowley

(Figs 64-67, 105)

Drepanosticta mylitta. – Cowley 1936: 160-161, figs 1-12 (original description, holotype Philippine Islands, Borongan, Samar [BMNH] [examined]). – Needham & Gyger, 1939: 263, 264 (key, no new material); Hämäläinen & Müller 1997: 257, 276 (distribution East Visayan subregion: Samar, Leyte, Biliran, Homonhon, Panaon; Mindanao subregion: Dinagat; *D. septima* presumably a synonym).

? *Drepanosticta septima* Needham & Gyger, 1939: 264-265, figs 201, 204 (original description, holotype female, Samar, 29 Apr 1924, R.C. McGregor [in CUIC?]).

Drepanosticta sp. n. 6 (cf. *mylitta*). – Hämäläinen & Müller 1997: 257, 276.

Material examined (all Philippine Islands, all in RMNH, except specified otherwise). – **Luzon**, [Zambales], Subic Bay, 2.vii.1907 (J. C. Thompson) 1 male [ex CASC]; [Sorsogon], Bulusan, Mt Bulusan, San Francisco, Pagjasaan river, 400-600 m, 4-5.xii.1997 (C.M. Nazareno) 2 males; Same, Obak river, 6.xii.1997 (C.M. Nazareno) 1 female; Same, Sioton river, 6-7.xii.1997 (C.M. Nazareno) 2 females; Same, San Roque, Masacrot spring, 10-11.xii.1997 (C.M. Nazareno) 1 male. – **Samar**, Borongan, date unknown, 1 male [holotype]

[in BMNH]; Las Navas, Brgy San Isidro, 100-350 m, 22-28.v.1997 (A. Buenafe) 9 males 3 females. – Bilaran: Naval, Sayao Mtn, Horonan Creek, 200-400 m, 30.x.-3.xi.1992 (Th. Borromeo) 2 males; Same, Sayao Mtn, Villaconsuelo, 4-7.xi.1992 (Th. Borromeo) 1 male. – **Leyte**: Mahaplag, Hilusig, Balocau Mtn, 600 m, 29.viii.-14.ix.1986 (Th. Borromeo) 7 males 4 females; Same, 700 m, 29.xi.1989 (Th. Borromeo) 10 males 2 females; Same, Magsuganao river, 18-30.ix.1990 (Th. Borromeo) 20 males 5 females. – **Homonhon**: Magallanes Point, 17.v.1988 (C. Treadaway) 1 male. – Dinagat: Loreto, Sinayao, June 1989 (A. Buenafe) 1 male. – **Panaon**: San Francisco, Batong Lapad, viii.1988 (W. Catal) 2 males; same, Kaneo Mtn, 400 ft (W. Catal) 1 male; Same, Gabing Gamay: big river, x.1988 (W. Catal) 2 males 2 females; San Francisco, Anislagon Mtn, 100-150 m, 2.ii.1990 (Th. Borromeo) 1 male; Same, Anislagon river, 10.x.1990 (Th. Borromeo) 3 males 2 females.

Diagnosis. – Medium-sized, nearly completely castaneous species. Pronotum typically with short and 90° erect projections on hind margin of hind lobe, but some populations on Samar with these processes flat, but otherwise structurally similar.

Male. – Head. Labrum and anteclypeus bluish white, anterior one-fourth of labrum brown; mandibles

greyish white, frons middle brown, a reniform middle-brown spot posterior of lateral ocelli; rest of head bronze-black, frons and vertex coriaceous; transverse occipital carina distinct with acutely angulate lateral extremities; antenna with scapus and pedicellus very pale brown, flagellum brown, the basal part somewhat paler.

Thorax. Pronotum (Figs 64-65) with median parts of anterior, median and posterior lobes dark brown, lateral parts creamish, lateral lobes dark brown; anterior, median and lateral lobes simple; posterior lobe short, median portion with hind margin acute in the middle, lateral portions with hind margin on innerside with an erect, slender, round process, approximately as long as length of median axis of posterior lobe (see also Remarks, below). Synthorax castaneous, somewhat obscured in lower frontal part. Legs yellowish white, the coxae somewhat darker on posterior side. Wings hyaline, venation basal to nodus castaneous, rest dark brown; Px 18 in fore wing, Px 16 in hind wing; origin of R4+5 distal to or, more frequently, at subnodus; IR3 halfway first cell distal to that level; Arculus arising just distal to Ax2; quadrangle in fore wing somewhat widening posteriorly; anal veins sessile; pterostigma middle brown, subrectangular, width c. 1.8 time the height; cells between Costa and R1 undivided.

Abdomen. Middle brown, segments 3-7 with base of segments dorsally with a bluish white pale marking, subtriangular (segment 3) or panduriform (spear-like) (other segments). Appendages (Figs 66-67) dark yellow to lightbrown, superiors in dorsal view with stout basal two-fifths, distal three-fifths much more slender, curved outward, then inward, the tips not quite touching, subsquarish, base of distal portion with a short inward directed, very sharp tooth; inferiors as long as superiors, in ventral view with basal third stout, distal two-thirds in basal half straight, rest forming a heart-shaped figure with the other appendage, the top bent 90° inwards, the tip curved dorsad.

Measurements. Hind wing 18-21 mm; abdomen including appendages 28-32 mm; some specimens from Samar without spiny projections on hind margin of posterior lobe of pronotum are larger, hind wing up to 22 mm, abdomen up to 34 mm.

Female. – Similar to the male, but posterior lobe of pronotum with indistinct or even hardly discernable spiny projection just before hind margin.

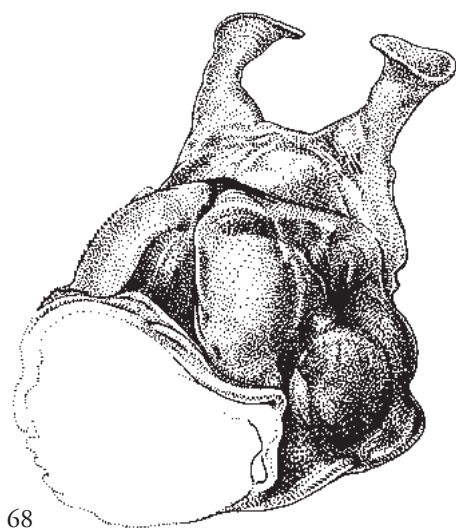
Measurements. Hind wing 18-22 mm, abdomen 26-31 mm.

Variation. – A very variable species in the structure of the posterior margin of the posterior lobe of the pronotum, and the anal appendages of the male. Males 'typically' have a short and paired spiny projection just before the posterior margin of the posterior lobe, but some populations of Samar Id. (e.g. Hinabangan) have the corners of the hind margin of the lobe slightly projecting, but are lacking the spine. These specimens were considered a separate species by Hämäläinen & Müller (1997) ('sp. n. 6'). The type of *D. mylitta* is also from Samar (Borongan, 11°38'N 125°27'E) and is provided with spines on the hind margin of the posterior lobe. Presently, the variation of this taxon within Samar is not understood.

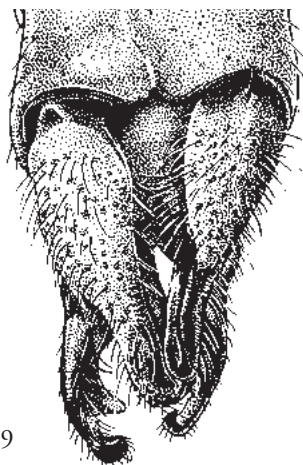
Also variation in the male appendages was observed. The width of the basal part of the superior appendages (dorsal view) is very variable, but all populations are characterised by the ventro-mediad tooth at the base of the clasper-like part of the superiors; inferior appendages (ventral view) with distal part usually straight, only the tip distinctly tapering, hooked mediad, the very tip dorsad; in some specimens, however, the distal halves diverging, but otherwise similar. In some populations (e.g. Leyte Id, Mt Balocau) the male inferiors are very robust, viz. terminal part c. two times as long as wide, as compared to c. four times in 'typical' specimens).

These differences may indicate that *D. mylitta* actually consists of a group of closely related species. More material is needed to map the geographical distributions of all character-states, and to re-evaluate the value of the documented variation, while also a molecular study of this species may contribute to understand the morphological variation.

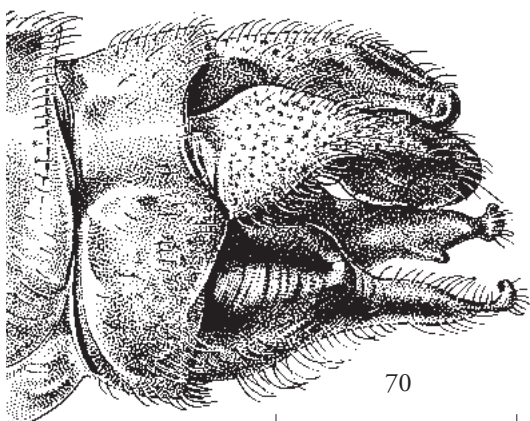
Distribution (Fig. 105). – Philippines Islands (from north to south): Luzon, Samar, Biliran, Leyte, Homonhon, Dinagat, Panaon. Widespread species, including several small islands.



68



69



70

***Drepanosticta myzouris* Van Tol, sp. n.**

(Figs 68-70, 107)

Type material. – Holotype male [JvT 22124] in RMNH: 'Philippines, Luzon Id / Camarines Sur, Pili / Bungao Curry, 200-400 m / Mt Isarog, Caririca River / August 4.-15. 1997 / Celso Nazareno legit / Coll. Roland A. Müller'. – Paratypes (all in RMNH). Same data as holotype, 3 females.

Diagnosis. – Relatively large species, with distinct pale markings in posterior part of synthorax. Male unmistakable by its remarkable, sucker- or proboscis-like posterior processes of the posterior lobe of the pronotum; the same structure absent in female. Appendix inferior of male with a subterminal inward tooth (for interpretation of phylogenetic relevance, see *D. malleus* sp. n.).

Male [JvT 22124, holotype]. Head. Labrum and anteclypeus pale blue, anterior border of labrum light brown; mandibles light brown; rest of head bronze-black, small blue marking at abaxial side of lateral ocelli; transverse occipital carina without extremities. Antenna with scapus pale brown, pedicellus dirty yellow with the tip castaneous, flagellum castaneous. Thorax. Pronotum (Fig. 68) with anterior, median, upper part of lateral and posterior lobes dirty yellowish white; lower part of lateral lobes brown; anterior, median and lateral lobes simple; innerside of lateral portion of posterior lobe with a broad and flat process ending in a disc; length of process approximately median length of median lobe. Legs dirty white. Synthorax light brown, but an irregular brownish black stripe against dorsal carina, and bluish white, more or less rectangular markings in posterior quarter of mesepimeron, metasternum and metepimeron. Wings hyaline, venation rather open, brown; Px 13 in fore wing, Px 12 in hind wing; R4+5 arising at level of subnodus, IR3 arising just distal to that level; Arculus well distal to Ax2; quadrangle hardly widening

Figures 68-70. *Drepanosticta myzouris* sp. n., male [JvT 22124, holotype]. – 68, pronotum, oblique view. – 69, anal appendages, dorsal view. – 70, idem, left lateral view. Scale bar 1 mm.

posteriorly, anal veins symmetrical; pterostigma brown, with narrow paler lines against the veins, width in fore wing ca. 1.1 times the height, subtrapezoid, proximal side only somewhat shorter than distal side, in hind wing with proximal side more oblique, shorter than distal side; a few cells between Costa and R1 divided in one wing only.

Abdomen. Segments 1-6 middle brown, basal one-tenth to one-eighth of segments 2-5 ivory white, segments 8-9 castaneous, segment 10 dorsally blue, ventral side of tergites brown. Appendages (Figs 69-70) brown, but dorsum of basal two-thirds of superiors blue; base stout, the distal half laterally compressed, high, top subsquarish, a triangular tooth at base of club-shaped distal part; inferiors as long as superiors, in ventral view with stout base, the distal half smoothly curved outward, then inward, the tip curved dorsad; subterminally a long, sharp, inward directed tooth. Measurements. Hind wing 25 mm; abdomen including appendages 38 mm.

Female. – As the male, but process on posterior lobe of pronotum simple and relatively short, the top bent inward, approximately the length of median line of posterior lobe; abdominal segments with segments 8-9 brown, segment 10 dorsally pale blue, the anal appendages ivory white; valves long, surpassing tip of appendages.

Measurements. Hind wing 26 mm; abdomen 37 mm.

Etymology. – *Myzouris*, sucker (Gr.), for the structure of the projection of the posterior process of the pronotum. A noun in apposition.

Distribution (Fig. 107). – Philippine Islands, Luzon, Mt Isarog. Only known from the type locality.

***Drepanosticta paruatia* van Tol, sp. n.**

(Figs 71-73, 107)

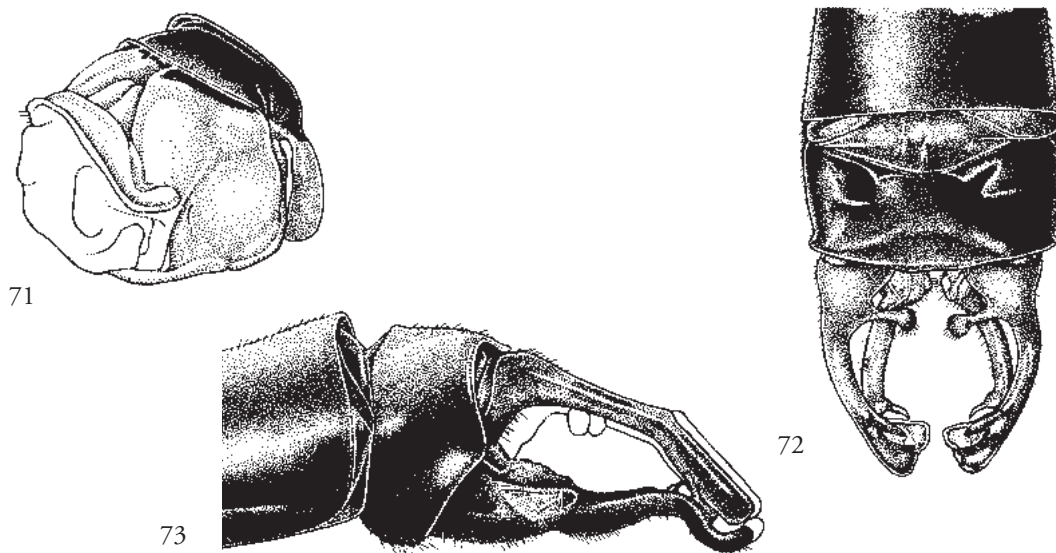
Drepanosticta sp. n. 19. – Hämäläinen & Müller 1997: 258, 277.

Type material. – Holotype male [JvT 20337] in RMNH: 'Philippines, Palawan Id / Port Barton, Waterfalls / May 28, 1991 / Roland A. Müller legit / Coll. R. A. Müller'.

Diagnosis. – Male unmistakable among the described *Drepanosticta* of the Philippines. Large, with conspicuous antehumeral stripe, remarkable pending appendages of the posterior lobe of the pronotum, and the structure of the appendages with a clavate mediad directed tubercle on innerside of superior appendage. Not closely related to any of the other species of *Drepanosticta* from the Philippines, but sharing several characters with Bornean species, as *Drepanosticta dupophila* Lieftinck. Only one specimen known.

Male [JvT 20337, holotype]. Head. Labrum, anteclypeus and inner basal corner of mandibles bluish white; anterior two-fifths of labrum and larger part of mandibles black; rest of head bronze-black, microsculpture very superficial, dorsal part of head very shining; transverse occipital carina distinct, with lateral extremities apiculate. Antenna with scapus and pedicellus dirty yellow, flagellum broken.

Thorax. Pronotum (Fig. 71) with anterior, median and lateral lobes ivory white, main part of posterior lobe black, the lateral portion brown; anterior, median and lateral lobes simple, posterior lobe short, the extreme lateral corners narrow based, elongate appendage directed ventrad, reaching beyond ventral side of lateral lobe, and not immediately conspicuous. Synthorax bronze-black with extensive pale markings as follows: wide antehumeral blue stripe anteriorly starting the width of stripe from anterior side of mesepisternum, length approximately three-quarters mesepisternum; lower posterior corner of mesokatepisternum ivory white, as well as complete metepisternum except for a triangular black marking in posterior corner, and complete metepimeron, except for a narrow brown line against metapleural suture; legs yellow, brown rings around joints on femora and tibiae. Wings hyaline, venation brown up to nodus, rest brownish black; Px 14 in fore wing, Px 13 in hind wing; R4+5 arising at or a trifle distal to subnodus, IR3 arising well distal to that level; Arculus arising distinctly distal to Ax2, quadrangle somewhat widening posteriorly in fore wing; anal veins somewhat asymmetrical in both fore and hind wing, shortly stalked; pterostigma short, width 1.3 times height,



Figures 71-73. *Drepanosticta paruatia* sp. n., male [JvT 20337, holotype]. – 71, pronotum, oblique view. – 72, anal appendages, dorsal view. – 73, idem, left lateral view. Scale bar 1 mm.

all sides indistinctly convex, proximal sides acutely angulate.

Abdomen. Segment 1 ivory white, segments 2 to 7 mostly brown, but segment 2 ivory white in lower part of tergite, and narrow ivory white rings anteriorly on segment 3-6; anterior three-quarters of segment 8, and anterior half of segment 9 pale, presumably blue in life, segment 10 completely brownish black, sternites of segments 8-9 blue. Appendages (Figs 72-73) brown, basal parts dark brown; both superior and inferior appendages long and slender; superiors with basal one-fifth relatively stout, ending in a bifurcation, consisting of an inward directed process approximately the length of basal part of superior; main stem of superiors curving smoothly towards each other, the distal one-fourth widening ventrally; inferiors also with stout base, distal three-quarters curved semi-circularly, the top wider and scooplike, subterminally a very slender tooth directed inward, a trifle longer than width of stem.

Measurements (type only). Abdomen including appendages 39 mm; hind wing 21 mm.

Female. – Unknown.

Etymology. – *Paruatia* (latinized version of Greek), with hanging ears; for the structure of posterior lobe of the pronotum. An adjective.

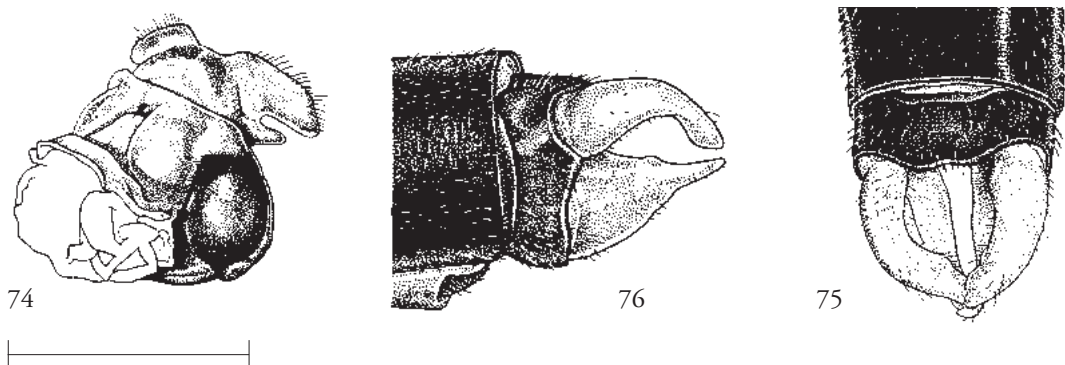
Distribution (Fig. 107). – Philippine Islands: Palawan.

Drepanosticta pistor van Tol, sp. n.

(Figs 74-76, 106)

Drepanosticta sp. n. 13. – Hämäläinen & Müller 1997: 258, 277 [distribution Negros, Panay, Sibuyan]

Type material. – Holotype male [JvT 20260] in RMNH: 'Philippines. Negros Id. / Negros Occ., Murcia / Mt Mawa, Brgy Canlandog / Balantak River, 400-500 m / May 4.-8. 1995 / Alex Buenafe legit / Coll. Roland A. Müller'. – Paratypes (25 specimens, all Philippine Islands, in RMNH, arranged per island in chronological order). **Sibuyan.** Romblon province, Magdiwang, Mt Guiting-Guiting, 300 m, 22-23.vi.1986 (leg. ?) 1 male 1 female; Magdiwang, Tampayan, Pawala river, 50-200 m, 19-31.vii.1986 (R.A. Müller) 2 males 1 female; Magdiwang, Silum, 5-100 m, 3.viii.1986 (R.A. Müller) 1 female; Magdiwang, Tampayan,



Figures 74-76. *Drepanosticta pistar* sp. n., male [JvT 18799, Negros Occ., Murcia, Mt. Maura, Balantak river, 4-8.v.1995]. – 74, pronotum, oblique view. – 75, anal appendages, dorsal view. – 76, idem, left lateral view. Scale bar 1 mm.

Camp Ga-ong, 80-150 m, 18-31.iii.1987 (R.A. Müller) 3 males 1 female; Magdiwang, foot of Mt Guiting Guiting, 200 m, 20-25.ii.1997 (ex coll. Treadaway) 1 male. – **Negros**. Negros Occidental Prov., Murcia, Mambucal, 2000 ft, 1-31.viii.1987 (A. Buenafe, C. Carzon) 2 females; Murcia, Mt Canlaon, Pula River, 3000 ft, 19.iv.1988 (A. Buenafe) 1 male; same, Asia River (no altitude given), 13.iv.1988 (A. Buenafe) 2 females; same, Pula River, ix.1990 (A. Buenafe) 1 male; Murcia, Mt Mawa, Brgy Canlandog, Balantak River, 400-500 m, 4-8.v.1995 (A. Buenafe) 1 male; same, Intalocan Creek, 800-900 m, 26.v.1995 (A. Buenafe) 1 male. – **Panay**. Antique province. San Remigio, Aningalam, Mt Clara, 600-850 m, 28.vii-10.viii.1996 (A. Buenafe) 1 male 3 females; idem, Mt Clara, 600-850 m, 28 Jul-10.viii.1996 (A. Buenafe) 2 females. Excluded from type series. – **Luzon**. Camarines Sur, Pili, Bungao Curry, Mt Isarog, Caririca River, 200-400 m, 4-15.viii.1997 (C. Nazareno) 3 males 3 females; same, Himaao River, 200-400 m, 4-15.viii.1997 (C. Nazareno) 1 male 3 females.

Diagnosis. – Medium-sized, variegated species; differs from other Philippine *Drepanosticta* by the simple structure of the anal appendages of the male without any teeth or tubercles, and the cleft sides of the posterior projections of the posterior lobe of pronotum (see below for variation between populations).

Male [JvT 20260, holotype]. – Labrum, mandibles and anteclypeus bluish white; narrow black line along anterior border of labrum; rest of head bronze-black with longitudinal striae between eyes, clypeus, frons

and vertex coriaceous; transverse occipital carina distinct, but without lateral extremities. Antenna with scapus and pedicellus dirty yellow, flagellum (damaged in holotype) castaneous.

Thorax. Pronotum (Fig. 74) with following coloration: anterior, median and posterior lobe dirty yellow, some parts more obscure; lateral lobes brown; anterior, median and lateral lobes simple; posterior lobe in lateral corners with bifurcate appendage, anterior portion narrow and directed abaxiad, posterior portion twice as long and wide, at base running abaxiad, distal part bent ventrad; synthorax bronze-black with dirty yellow parts as follows: dorsal carina, an oblong triangular marking in distal three-quarters of both sides of humeral suture, metastigma, and another oblong triangular marking on posterior part of metepisternum. Legs yellow. Wings hyaline, venation brown; Px 13 (13-14) in fore wing, Px 13 in hind wing; R4+5 at subnodus, IR3 halfway first cell distal to that level; Arculus distinctly distal to Ax2; anal veins symmetrical, not stalked (even divided in left fore wing of holotype); pterostigma brown, width 1.5 times the height; proximal side acutely angulate; first cell distal to pterostigma between Costa and R1 large; all cells in that area undivided.

Abdomen. Segments 1-2 and 8-10 dark brown, other segments middle brown, with narrow ivory-white markings in anterior one-tenth of segment 3-6, and

anterior two-fifths of segment 7. Appendages (Figs 75-76) yellow, base of inferiors obscured; superiors flat, in dorsal view more or less parallel-sided over full length, distal two-fifths bent c. 60° towards each other; in lateral view distal part bent ventrad; inferiors with base stout, distal two-fifths narrow, base straight, the tip bent 80° towards each other.

Measurements. Hind wing 19 (18-21) mm; abdomen including appendages 32 (26-32) mm.

Female. – Similar to the male, but more robust; structure of pronotum as in male; last abdominal segments stout, segment 9 subsquarish in lateral view; segments 8-10 brown; cerci dirty white; valves long, reaching at or beyond tip of cerci.

Measurements. Hind wing 19-21 mm, abdomen 29-31 mm.

Variation. – Specimens from Luzon are similar in most respects, but some differ from the type in the structure of the posterior process of the posterior lobe of the pronotum with the cleft dividing the lateral border of the process more equally.

Females. – Females are remarkably well represented in the collection.

Etymology. – *Pistor* (Latin): miller; named after Roland A. Müller, St. Gallen; Müller is German for miller. A noun in apposition.

Distribution (Fig. 106). – Philippine Islands: Sibuyan, Negros, Panay and Luzon. A rather widespread species, but apparently uncommon where found.

***Drepanosticta quadricornu* van Tol, sp. n.** (Figs 77-80, 107)

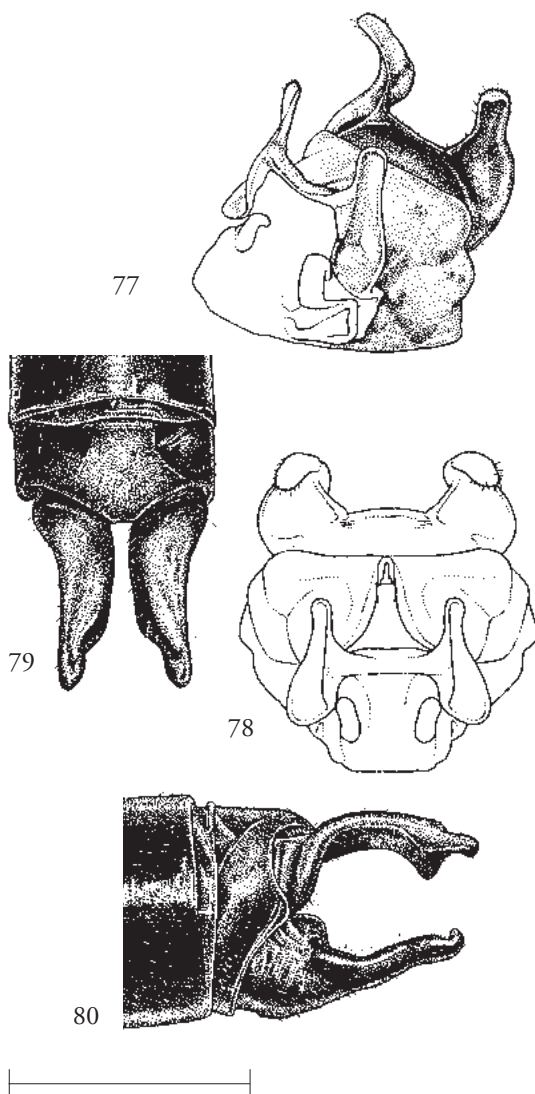
Drepanosticta sp. n. 20. – Hämäläinen & Müller 1997: 258, 277 (Palawan, Busuanga).

Type material. – Holotype male [JvT 20349] in RMNH: 'Philippines, Palawan Id / Mt Capoas, Bo Banbanan / Camp Inunugan River / 16./22. March 1992 / Vinciguerra / Gorostiza leg.'. – Paratypes (all specimens Philippines, in RMNH) by island in chronological order. **Busuanga island**, Busuanga, 1.viii.1990 (Th. Borromeo Sr) 1 male (incomplete); Coron, 2.viii.1990 (Th. Borromeo Sr) 1 female; Coron, Mabentangan river, 4-7.v.1991 (Th.

Borromeo) 2 males 1 female. – **Palawan**, Port Barton, 50-100 m, 15.vi.1985, [R.A. Müller], 1 female; Quezon district, Malatgao, Magmuni stream, 25-27.v.1991 (M. Hämäläinen) 1 male; Quezon, Lamaken [= Lamakan], Magmuni stream, 27.v.-1.vi.1991 (Borromeo / Buenafe) 1 female; Port Barton, waterfalls, 28.v.1991 (R.A. Müller) 4 males 2 females; Mt Capoas, Sitio Caoban, Camp Neutcio, ca 280 m, 11-15.iii.1992 (Vinciguerra / Gorostiza) 2 females; Mt Capoas, Bo Bandanan, Camp Inunugan River, 16-22.iii.1992 (Vinciguerra / Gorostiza) 1 male 4 females; Mt Saint Paul, Tagabinit, Babuyan River, ca 160 m, 25-30.iii.1992 (Vinciguerra / Gorostiza) 2 males; Idem, ca. 350 m, 27.iii.1992, 1 male.

Diagnosis. – Small species, with distinct projections on both the anterior and the posterior lobes of the pronotum and pale stripe over metepisternum; other species with two pairs of processes on the pronotum are *D. belyshevi* Hämäläinen, *D. trachelocele* sp. n., and *D. moorei* Van Tol & Müller. Apart from structural differences in the projections of the pronotum, both *D. belyshevi* and *D. trachelocele* have distinctly clasperlike superior appendages, while *D. moorei* can most easily be distinguished on the pale stripe over the synthorax that extends over metepisternum and metepimeron. *D. quadricornu* also differs from Philippine congeners by the structure of the anal appendages of the male; in lateral view the superior appendage is strongly convex with a subterminal, medio-ventrally directed triangular tooth.

Male [JvT 20341]. – Head. Labrum, mandibles and anteclypeus ivory white, a narrow black anterior line on mandible; rest of head black and very shining without microsculpture; transverse occipital carina indistinct, without extremities. Antenna with scapus and pedicellus creamish white, flagellum castaneous. Thorax. Pronotum (Figs 77-78) with anterior, median and lateral lobes dark yellow, posterior lobe brown; anterior lobe erect, large, lateral corners with sharp process, approximately twice as long as height of anterior lobe, directed dorsad; median and lateral lobes simple, posterior lobe short, but lateral portions with long process, base directed caudad, distal half curved upright, or just somewhat antiad.



Figures 77-80. *Drepanosticta quadricornu* sp. n., male [JvT 20343, Palawan, Port Barton, 28.v.1991]. – 77, pronotum, dorsal view. – 78, pronotum, oblique view. – 79, anal appendages, dorsal view. 80, idem, left lateral view. Scale bar 1 mm.

Synthorax castaneous, but posterior three-quarters of metepisternum with wide bluish-white stripe, anteriorly sharp, posteriorly nearly touching hind margin of metepisternum, ventrally a narrow brown stripe along metapleural suture; posterior quarter of metepimeron white. Legs yellow, dark rings on

femora and joints of femora and tibiae. Wings hyaline, venation brown in basal part up to nodus, rest brownish black; Px 15 in fore wing, Px 13 in hind wing; R4+5 at level of subnodus, IR3 halfway first distal to that level; Arculus just distal to Ax2; quadrangle somewhat widening posteriorly in fore wing only; anal veins sessile; pterostigma brown, with narrow pale lines against the veins, oblong, width 1.8 times the height, proximal side acutely angulate; cells between Costa and R1 undivided (rarely divided in other specimens).

Abdomen. Segment 1 ivory white; segment 2-8 with extensive ivory white rings as follows: anterior one-fifth of segment 2, anterior and posterior one-fifth of segments 3-6, segment 8 ivory-white in anterior two-fifths; segments 9 and 10 brownish black. Anal appendages (Figs 79-80) brownish black, convex; superiors in dorsal view with relatively slender base, gradually tapering towards acute tip, inner lateral view shows tip as a long process on solid base, which abruptly ends and bends ventrad; inferiors with stout base, rest nearly straight, the tips bent 50° towards each other and nearly touching.

Measurements. Hind wing 17.5 mm, abdomen including appendages 28 mm.

Female. – Very similar to male, including structure of pronotum, and coloration; all specimens in collection with abdomen discoloured, but presumably abdominal segment 8 pale, segment 9 brown, segment 10 dark brown. Valves long and slender, surpassing level of cerci.

Measurements. Hind wing 17-18 mm; abdomen ca 25 mm.

Affinities. – The sister-species of *D. quadricornu* sp. n. is presumably to be found on Borneo; further studies are needed.

Etymology. – *Quadricornu* (Latin), four horns; for the structure of the anterior and posterior lobes of the pronotum. A noun in apposition.

Distribution (Fig. 107). – Philippines: Palawan and Busuanga.

***Protosticta* Selys**

Protosticta Selys, 1885: cxlvi–cxlvii.

The genus *Protosticta* Selys is traditionally distinguished from other Platystictidae by combination of a straight, rather than fractured, IR3 vein, and the absence of an Anal bridge (only the anal crossing is present).

Three platystictids with characteristic and similar anal appendages, but differing in the vein venation, are assigned here to the new genus *Sulcosticta*.

Three other species with wing venation as the type species of *Protosticta* Selys, are described here as *Protosticta*. They are apparently not closely related to *P. simplicinervis* Selys, nor to each other. As indicated in the introduction, a more definitive arrangement has to await a detailed phylogenetic analysis.

Included Philippine species: *P. annulata* (Selys), *P. lepteca* sp. n., *P. plicata* sp. n.

Distribution: Luzon.

***Protosticta annulata* (Selys)**

(Figs 81–83, 108)

Platysticta (*Platysticta*) *annulata* Selys, 1886: sep. 156–157 (original description, type female, type locality Luçon (in coll. Selys, IRSN).

Platysticta annulata Selys. – Selys 1891: 218 (considered close relative of *rufostigma* from Borneo).

Protosticta annulata Selys. – Needham & Gyger 1939: 263, 264 (key, no new material).

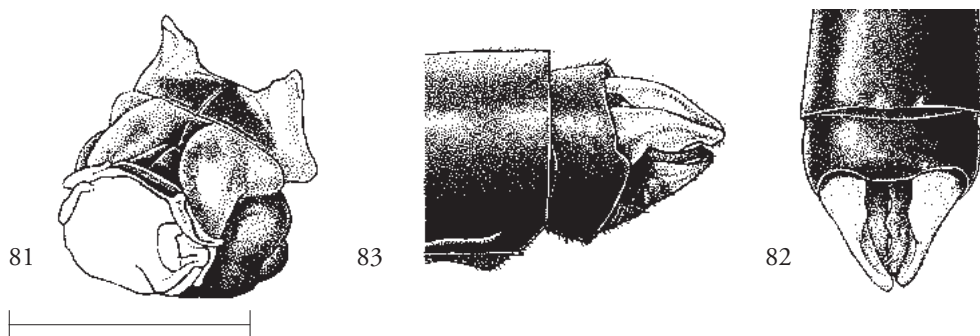
Drepanosticta annulata (Selys). – Liefinck, 1961: 135–136 (two females left, presumably not conspecific, no 577 selected as lectotype, number 588 paralectotype; both in poor condition and status unclear); Hämäläinen & Müller 1997: 257, 276 (distribution Luzon).

Material examined. – Luzon, Nueva Viscaya, Sta Fe, Dalton Pass area, 900 m, 8–17.viii.1991 (A. Gorostiza) 1 male.

Diagnosis. – Small and delicate species, synthorax with longitudinal pale stripes as in taxa here assigned to *Sulcosticta*, last abdominal segments of male swollen; posterior margin of posterior lobe of pronotum with a paired, triangular projection.

Male [JvT 20075]. – Head. Labrum, mandibles,

anteclypeus bluish white; narrow brownish black line along anterior border of labrum, approximately one-tenth of height of labrum, tapering towards corners and not quite reaching lateral corners; rest of head bronze-black, coriaceous; transverse occipital carina well developed without lateral extremities; antenna lost. Thorax. Pronotum (Fig. 81) with anterior lobe brown in median one-third, lateral to that marking a small reddish brown triangular projection from anterior border of lobe directed posteriad, lateral quarters of lobe bluish white; median lobe with antero-median depressed part brownish black, the lateral portions vaulted, brown on mediad surface, rest bluish white, somewhat darkening posteriorly; lateral lobes brownish black, median portion somewhat paler; posterior lobe medially with triangular brownish black marking, lateral thirds dirty yellow, with erect, triangular, auriculate projections, approximately as long as median line of posterior lobe. Synthorax with dorsal carina anteriorly with a small yellow marking, mesepisternum black, a narrow dirty yellow line against humeral suture and dorsal side of mesokatepisternum; mesokatepisternum black with a dirty yellow stripe against coxa; mesepimeron black, a dirty yellow line against humeral suture, starting anteriorly the distance of dorsal side of mesokatepisternum from posterior-dorsal corner of mesokatepisternum, running along suture, posteriorly covering posterior margin of mesepimeron, continuing anteriorly along first suture almost to level of metastigma; metepisternum with longitudinal, dirty yellow stripe from anterior-ventral corner to metastigma, and another pale stripe arising just posterior to metastigma, anteriorly acute, widening posteriorly, not quite reaching posterior side of synthorax; metepimeron black with rectangular bluish white marking against posterior margin. Legs dirty white, hardly visible darker rings on femora, approximately one-quarter from joints with tibiae. Wings hyaline, venation brown, the posterior half darker; Px 12 in fore wing, Px 12 in hind wing; origin of R4+5 at subnodus, IR3 half a cell distal to that level; Arculus arising well distal to Ax2; quadrangle somewhat widening posteriorly in fore wing; Ab vein absent in all wings; pterostigma subquadrangular,



Figures 81-83. *Protosticta annulata* (Selys), male [JvT 20075, Luzon, Nueva Viscaya, Sta Fe, Dalton Pass area, 900 m, 8-17. viii.1991). – 81, pronotum, oblique view. – 82, anal appendages, dorsal view. – 83, idem, left lateral view. Scale bar 1 mm.

proximal side oblique, width 1.3 times the height; cells between Costa and R1 distal to pterostigma undivided. Abdomen brown, segments 1-2 castaneous, segments 3-6 light brown, segments 7-10 brownish black, with basal creamish white annulae as follows (lateral view): segments 2-3 one-tenth of segment, segment 4 anterior one-eleventh, segment 5 one-fifteenth, segments 6-7 one-twentieth, segment 8 half; segments 8-9 much wider than other segments. Appendages (Figs 82-83) with creamish white superiors, and inferiors with dark base and yellowish white terminal half; superiors rather slender in dorsal view, a short tooth at c. 40% from base, distal part curved inward and ventrally widened; inferiors straight, smoothly tapering towards the top, the top sharp and curved dorsad. Measurements. Hind wing 17 mm, abdomen including appendages 27 mm.

Female. – No additional data.

Status of *P. annulata*. – Liefstinck (1961) re-examined the type material in the Selys collection, and found that the type series consisted of two very immature females. The poor status of preservation of these specimens made it impossible to match the selected lectotype with any of the described or undescribed species known to Liefstinck. Besides, the two remaining specimens were not conspecific. The second female, a paralectotype of *D. annulata*, is a female of *Drepanosticta moorei* Van Tol & Müller (see also Hämäläinen & Müller 1997: 276-277). Thirdly, a third specimen available

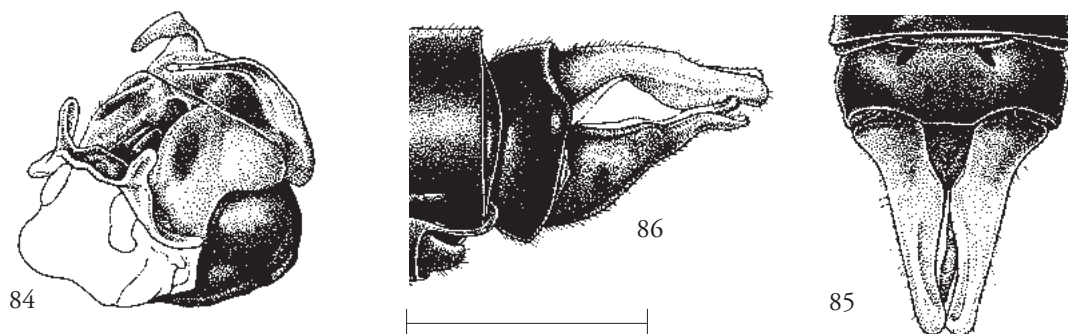
to Selys when describing this taxon with 'le rudiment du secteur inférieur du triangle manquant tout à fait, comme chez la *Protosticta simplicinervis*' was no longer available at all.

This information is valuable. One male platystictid in the Müller collection (data as above [JvT 20075]) was identified by M. Hämäläinen as the first male of *Drepanosticta annulata* (Selys). However, the wing venation of this male is clearly as described for *Protosticta*, i.e. with missing anal bridge. This specimen is here described as the male of *D. annulata*, but its status can only be ascertained after males and females from one site will be available, and can be compared with the lectotype.

Needham & Gyger already placed *Platysticta annulata* Selys in the genus *Protosticta*, based on the note by Selys on the state of the anal bridge. However, they clearly missed the first word of the sentence '... L'un deux présente une anomalie singulière: le rudiment ... [as above]', or: 'One of them has an aberration ...'.

Affinities. – Based on structure of the pronotum and the coloration of the synthorax, this species is considered the sister-group of the species here included in *Sulcosticta* gen. n. A further phylogenetic analysis has to reveal whether the more simple structure of the inferior appendage of *P. annulata* is plesiomorphous or apomorphous compared with the structure in *Sulcosticta* gen. n. If it will appear to be an apomorphy, *P. annulata* should be included in *Sulcosticta*.

Distribution (Fig. 108). – Philippines: Luzon (Nueva Viscaya).



Figures 84-86. *Protosticta lepteca* sp. n., male [JvT 19212, Luzon, Aurora province, Dinalungan, Mt Anaguao, Alebit river area, 600-900 m, 9-14.iii.1997]. – 84, pronotum, oblique view. – 85, anal appendages, dorsal view. – 86, idem, left lateral view. Scale bar 1 mm.

***Protosticta lepteca* van Tol, sp. n.**

(Figs 84-86, 108)

Protosticta sp. n. 25. – Hämäläinen & Müller 1997: 258, 277
(1 male Quirino province).

Type material. – Holotype male [JvT 19218] in RMNH.
– ‘Philippines, Luzon Id / Aurora province, Dinalungan / Mt Anaguao, Alebit river / area, 600-900 m, March 9.-14. 1997 / R.A. Müller leg u. coll.’ – Paratypes 7 males 1 female (all Philippine Islands, in RMNH): **Luzon**. Quirino province, Maddela, Sulong river, 500-650 m, 26-27.iv.1991 (Th. Borromeo) 1 male; Aurora province, Dinalungan, Mt Anaguao, Alebit river, 600-900 m, 9-14.iii.1997 (R.A. Müller) 1 male 1 female; same, Bungo river, 200-500 m, 15-18.iii.1997, 5 males.

Diagnosis. – Delicate species, synthorax with narrow longitudinal stripes, especially anterior to humeral suture, and over metepisternum posterior to metastigma; differs from other such species with a missing Ab vein by the following combination of characters (male): long and slender inferior appendage, pronotum with a pair of short projections on anterior lobe, and a paired, triangular, erect process directed anteriad on posterior lobe; other species have short and compact appendages and / or more rounded processes on the posterior lobe of the pronotum; the projections on the anterior corner is also present in *Sulcosticta striata* sp. n., which has distinctly different appendages.

Male [JvT 19128, holotype]. – Head. Labium bluish white, with narrow line along anterior border;

mandibles bluish white in basal third, rest brownish black; remaining part of head brownish black with metallic shine, finely punctulate; transverse occipital carina poorly developed, without lateral extremities. Antenna with scapus brown, pedicellus dirty yellow, flagellum castaneous.

Thorax. Pronotum (Fig. 84) predominantly greyish yellow, with brown markings as follows: medio-posterior part of anterior lobe, antero-median part of middle lobe, and central parts of tubercles of median lobe, central part of posterior lobe; lateral lobes fully brown; anterior lobe with a paired erect process, flat, top rounded, approximately as long as median length of anterior lobe; posterior lobe with a paired process as well, fairly close together, narrow and bent at 60° anteriad.

Synthorax brownish black with creamish markings as follows: narrow line over mesepisternum against humeral suture, widening both anteriorly and posteriorly, ending just before posterior margin of synthorax; mesepimeron with squarish marking against posterior margin of synthorax, dorso-anteriorly connected with a fine line against humeral suture, starting c. two-fifths from posterior corner of mesokatepisternum; metepisternum with oblong marking against first suture posterior to metastigma, a longer and broader line along metapleural suture from metastigma to hind margin of metepisternum, the posteriormost part widening and bent towards middle of metepisternum; metepimeron with crescent-shaped

marking against posterior margin. Wings hyaline, venation brown; Px 13 in fore wing, Px 12 in hind wing; R4+5 arising just distal to subnodus, IR3 half a cell distal to that level; Arculus just distal to Ax2; Ab vein missing; pterostigma reddish brown, width 1.3 times the height, anterior side convex; cells between Costa and R1 posterior to pterostigma undivided.

Abdomen with segment 1 brown, segment 2 brown with a paired creamish stripe along anterior margin; segments 3-6 castaneous, anterior one-tenth of each segment creamish white; segment 7 with anterior one-third bluish white, rest of segment 7 and segments 8-10 brownish black; segments 8-10 much wider than preceding segments, shining. Appendages (Figs 85-86) with superiors creamish white, base darker, slender, the distal two-thirds ventrally projecting on innerside, inconspicuous tooth; inferiors also slender, basal three-fifths castaneous, rest pale brown, apical third nearly straight with very tip bent 90° inward.

Measurements. Hind wing 18 mm, abdomen including appendages 31 mm.

Female [JvT 19213, from Dinalungan, Alebit river]. – Structure of pronotum and coloration of synthorax differ from male of same site as follows: anterior lobe with anterior margin dilated but without projections, hind margin of posterior lobe with short and flat posterior tubercles, lateral corners tapered; synthorax distinctly paler than in male, the creamish white markings as follows: narrow line over mesepisternum against humeral suture, widening both anteriorly and posteriorly, ending just before posterior margin of synthorax; mesepimeron fully creamish white in posterior two-fifths, except for a narrow black line against humeral suture, the pale marking extending anteriorly in dorsal half, not reaching anteriormost corner, first suture with pale stripe over its full length; metepisternum with oblong marking posterior to metastigma, covering ca. half the space distal to metastigma, and a pale stripe in ventral part of metepisternum from metastigma to posterior marking; metepimeron with crescent-shaped marking against posterior margin and pale spot just in front of that. Measurements. Hind wing 18 mm; abdomen 27 mm.

Etymology. – *Lepteke* (Greek): fine-pointed, delicate; for the structure of the projections of the posterior lobe of the pronotum. An adjective (latinized form of Greek).

Distribution (Fig. 108). – Philippine Islands: Luzon (Quirino and Aurora provinces).

***Protosticta plicata* van Tol, sp. n.**

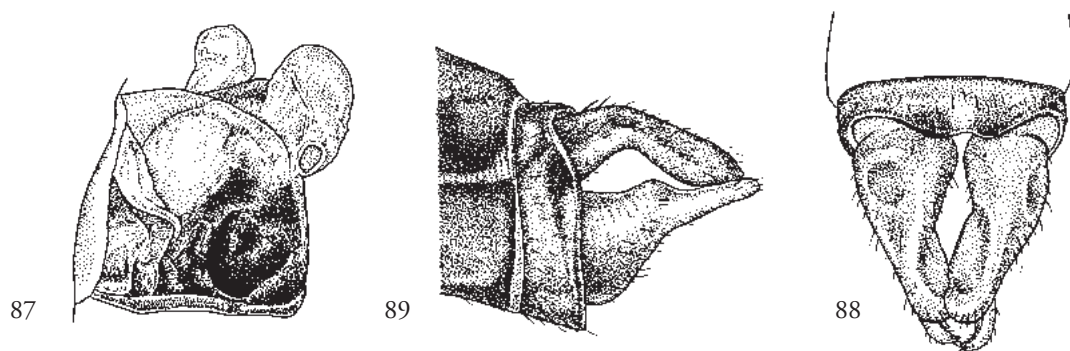
(Figs 87-89, 108)

Type material. – Holotype male [JvT 25060] in RMNH: [Philippine Islands]: 'Kawasan Falls / Badian, Cebu / 2/13/2001 / T. Borromeo'. – Paratype (in RMNH): same data as holotype, 1 female.

Diagnosis. – Relatively large and dark species of Philippine *Protosticta*; males differs from other species by the structure of the posterior lobe of the pronotum, a distinctly folded projection with the fold globularly swollen; appendages slender as in *P. lepteca* sp. n., but posterior lobe of pronotum diagnostic. Female with wing venation as *Drepanosticta* Laidlaw (Ab vein present), but otherwise very similar to male, including structure of posterior projections of posterior lobe of pronotum.

Male [JvT 25060, holotype]. – Head. Labium, mandibles and anteclypeus bluish white, a very fine black line along anterior border of labium and mandibles, hardly visible from above; rest of head black, punctulate, with coppery metallic shine; transverse occipital carina poorly developed, no lateral extremities; antenna with scapus and pedicellus creamish white, flagellum brown.

Thorax. Pronotum (Fig. 87) with anterior, median and posterior lobes fully creamish white, lateral lobe brownish black; structure of anterior lobe simple, posterior lobe with a paired posterior process, halfway bent back nearly 180° towards pronotum, the new top bulbous and very shiny. Synthorax brownish black, with creamish white markings as follows: dorsal carina over its full length, a subulate marking in posterior fourth over humeral suture, a poorly indicated pale mark on metepisternum. Legs very pale creamish white. Wings hyaline, venation brown; Px 13 in



Figures 87-89. *Protosticta plicata* spec. nov., male [JvT 25060], holotype, Cebu, Badian, Kawasan Falls, 13.ii.2001]. – 87, pronotum, oblique view. – 88, anal appendages, dorsal view. – 89, idem, left lateral view. Scale bar 1 mm.

fore wing 13, Px 12 in hind wing; R4+5 arising at subnodus, IR3 half a cell distal to that level; Arculus distal to Ax2; Ab vein absent; pterostigma width 1.2 times the height, the proximal side somewhat convex, but distinctly acutely angulate, distal side less so; cells between Costa and R1 distal to pterostigma undivided. Abdomen with segment 1 brownish black, segment 2 dark brown, segments 3-6 dark brown with anteriorly on each segment a creamish white mark, covering approximately one-eighth, and three times one-sixth of segment-length; creamish white marking on segment 8 more extensive, c. two-fifths segment length, rest brown, the brown part anteriorly with subulate projection; segments 8-10 brownish black, much wider than preceding segments. Anal appendages (Figs 88-89) with superiors greyish brown, stoutly built, somewhat projected on innerside; inferiors surpassing length of superiors, stout at base, distal two-fifths very slender and straight, only the very tip hooked axiad (not dorsad).

Measurements. Hind wing 19 mm, abdomen, including appendages, 31 mm.

Female. – Similar to the male, but, remarkably, Ab vein present as in *Drepanosticta* Laidlaw; structure of posterior lobe of pronotum more or less as male, although the folded projection somewhat smaller. Measurements. Hind wing 21 mm, abdomen 31 mm.

Etymology. – *Plicatus* (Latin), folded, for the structure of the paired process of the posterior lobe of the pronotum. An adjective.

Conservation status. – One of the most threatened species of damselflies in the Philippines. The type locality is one of three very small remaining patches of forest in Cebu. It has not been recorded from the other two sites by the research group of Dr. Franz Seidenschwarz. Kawasan Falls is not a conservation area, but it may receive some protection since it is a favourite nature travel destination (M. Hämäläinen, personal communication, June 2004).

Distribution (Fig. 108). – Philippine Islands: southern Cebu (Badian). Only known from type locality.

***Sulcosticta* van Tol gen. n.**

Diagnosis. – Inferior appendage short and stout, with the tip flattened and with shining brown sclerotization, or more or less bifid, and inner part with or without shining brown sclerotization; synthorax with variegated pattern of longitudinal stripes. Wing venation as in *Drepanosticta* Laidlaw or as in *Protosticta* Selys.

Remarks. – As already explained in the introductory chapter, it is presently, without extensive phylogenetic analysis, impossible to judge which other species will ultimately be placed in this genus. The similarity in the structure of the inferior appendage is such that a homoplasy is considered unlikely. Since both *Protosticta*

and *Drepanosticta* are based on characters in wing venation, a proper placement of these species in one of the present genera appeared impossible. It might appear that the variegate coloration of the synthorax will prove to be a phylogenetically informative character for a monophyletic clade, so that also all Philippine *Protosticta* can be placed here.

Type species. – *Sulcosticta pallida* sp. n.

Included species: *S. pallida* sp. n., *S. striata* sp. n. and *S. viticula* sp. n., and possibly two undescribed species (damaged male, or only female known).

Distribution: Luzon.

***Sulcosticta pallida* van Tol, sp. n.**

(Figs 90-92, 109)

Drepanosticta sp. n. 8. – Hämäläinen & Müller 1997: 257, 277 (Nueva Vizcaya, Nueva Ecija and Quirino provinces).

Type material. – Holotype male [JvT 22675] in RMNH: 'Philippines, Luzon Id / Nueva Viscaya, Sta Fe / Atbo River, 550-800 m / June 10, 1991 / Roland A. Müller legit / Coll. R.A. Müller'. – Paratypes (all Philippines, in RMNH, 7 females): **Luzon Id.** Data as holotype, 2 females; Nueva Viscaya, Sta Fe, Dalton Pass area, 900 m, 8-17.viii.1991 (A. Gorostiza) 1 female; Nueva Ecija, Caraglan, Batching river, 700-850 m, 11.vi.1991 (R.A. Müller) 1 female; Quirino / Aurora boundary, Maddela, Mt Anaguao, 800-1100 m, 9-14.viii.1996 (C.M. Nazareno) 2 female; Aurora, Dinalungan, Mt Anaguao, Bungo river, Lumot creek, 1200-1400 m, 20.vi.1997 (M. Dusayen) 1 female.

Diagnosis. – The characteristic Y vein of *Drepanosticta* not closed, but separate at base, and male appendages very aberrant with inferiors short, the top bifid; the shape of the inferior appendage of the male also present in *S. striata* sp. n., which differs considerably in the shape of the hind lobe of the pronotum.

Male [JvT 22675, holotype]. – Head. Labrum, mandibles and anteclypeus pale, some parts bluish, other parts brownish; a distinct oval depression central in labrum; rest of head bronze-black; postoccipital carina with indistinct extremities; parocular suture distinct; antenna incomplete, scapus and pedicellus pale, the flagellum broken.

Thorax. – Pronotum (Fig. 90) with anterior, median

and posterior lobe dirty yellow, lateral lobe brown; anterior border of anterior lobe with indistinct triangular extremity; median and lateral lobes simple; posterior lobe with lateral corners erect, triangular, with a sharp, constricted top. Synthorax dirty yellow, except for a narrow stripe against dorsal carina, the humeral line, an oblong marking over mesepimeron from just above metastigma, and posterior corner of metepimeron. Legs yellow. Wings hyaline, venation brown; Px 14 in fore wing, Px 13 in hind wing; origin of R4+5 distinctly distal to subnodus; origin of IR3 in middle of cell distal to subnodus; quadrangle parallel-sided, not widening distally; anal veins complete separated at base; pterostigma rhomboid, width c. 1.5 times the height; cells between Costa and R1 complete, undivided.

Abdomen. – Segments 1-6 pale brown, with distinct basal yellow annulae; segments 7-10 dark brown or brownish black. Appendages (Figs 91-92) grey, short and stout, superiors in dorsal view tapering, inner view shows large triangular top; inferiors very short, c. two-thirds the length of superiors, stout, the tip bifurcate. Measurements. Hind wing 21; abdomen including appendages (approximate measurements, the abdominal segments 8-10 are broken) 31.5.

Female. – As the male, but posterior margin of posterior lobe straight without projections, lateral corners angulate; coloration of synthorax as the male. Measurements. Hind wing 22-23 mm, abdomen 29-32 mm.

Etymology. – *Pallidus* (Latin), pale; for the coloration of the synthorax. An adjective.

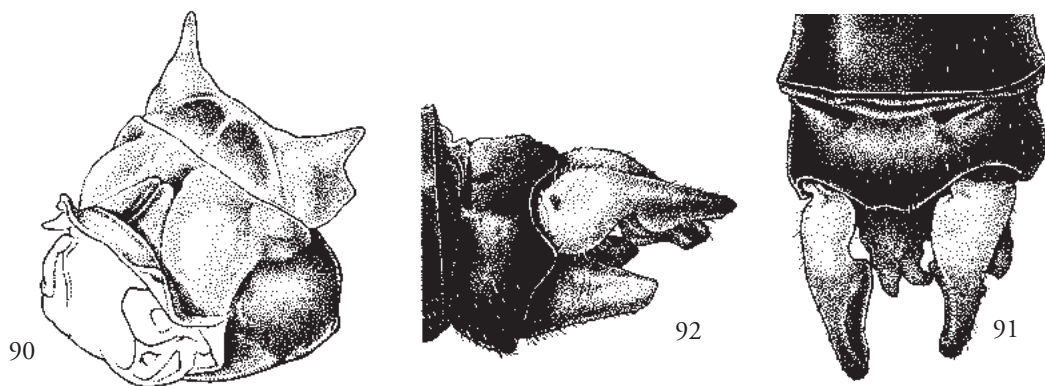
Distribution (Fig. 109). – Philippines: Luzon (Nueva Vizcaya, Nueva Ecija, Quirino and Aurora provinces).

***Sulcosticta striata* van Tol, sp. n.**

(Figs 93-95, 109)

Protosticta sp. n. 26. – Hämäläinen & Müller 1997: 258, 277 (Luzon).

Type material. – Holotype male [JvT 19219] in RMNH: 'Philippines, Luzon Id / Quirino/Aurora Boundary / Maddela, Mt Anaguao / 9.-14. August 1996, 800-1100 m / Celso M. Nazareno legit / Coll. Roland A. Müller'. – Paratypes (all



Figures 90-92. *Sulcosticta pallida* sp. n., male [JvT 22675, holotype, Luzon, Nueva Viscaya, Sta Fe, Atbo river, 550-800 m, 10.vi.1991]. – 90, pronotum, oblique view. – 91, anal appendages, dorsal view. – 92, idem, left lateral view. Scale bar 1 mm.

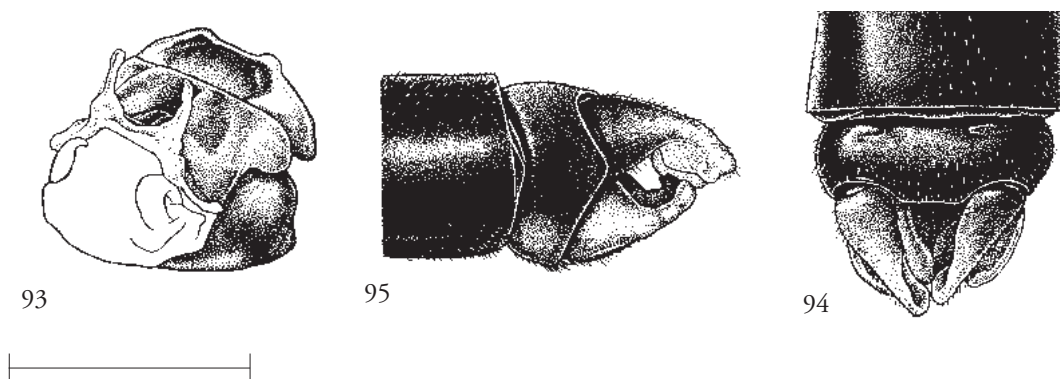
Philippine Islands, in RMNH, 7 males 1 female): **Luzon**. Quirino, Maddela, Sierra Madre, Mt Yadan, Sitio Yadan, 400-600 m, 15-30.viii.1996 (C.M. Nazareno) 1 male; Aurora province, Dinalungan, Mt Anaguao, Alebit river, 600-900 m, 9-14.iii.1997 (R.A. Müller) 1 male; Aurora Prov., Villa Maria, La-ab river, 360-500 m, 20-24.iii.1997 (R.A. Müller) 5 males 1 female.

Other material examined (Philippines, in RMNH). – Excluded from type series: Luzon, Camarines Norte, Sn Lorenzo Ruiz, Sitio Bay-Bay, Patag, 400-700 m, 24-25. ix.1997 (C.M. Nazareno) 1 female [JvT 25064].

Diagnosis. – Wing venation as in *Protosticta* Selys, male appendages distinct, with inferiors short, the top bifid; the shape of the inferior appendage of the male is also present in *S. pallida* sp. n., which differs considerably in the shape of the hind lobe of the pronotum, while that species also lacks the projections of the anterior lobe of the pronotum.

Male [JvT 19211, holotype]. – Head. Labium and mandibles bluish white, labium with a very narrow brown line along anterior border, and anterior one-fourth with brownish shade; anteclypeus bluish white, rest of head black, distinctly punctulate with bronze metallic shine; transverse occipital carina clearly defined, but without lateral extremities; antenna with scapus and pedicellus dirty yellow, flagellum brown. Thorax. Pronotum (Fig. 93) predominantly dirty

yellow, with brownish black markings as follows: centre of middle lobe anterior to paired pronotal tubercles, lateral lobes in anterior and posterior quarters, median part of posterior lobe leaving a narrow pale line anterior and posterior to this marking. Anterior lobe with a paired long tapering process from anterior border of lobe, bending posteriad, the apical half curved nearly 90° from body axis; posterior lobe simple, posterior border only with sides indistinctly produced. Synthorax with complex markings of brownish black and creamish white: mesepisternum brownish black with narrow pale line along humeral suture, anteriorly above mesokatepisternum slightly widened, line not reaching posterior border of synthorax; mesokatepisternum brown with pale oblong marking near mesepisternum and against mesocoxa; mesepimeron pale, a dark stripe over humeral suture, a triangular dark marking against first suture anterior to level of metastigma, and an irregular oblong line posterior to that level; metepisternum pale, the lower half anterior to metastigma brown, a longer line over middle of metepisternum posterior to metastigma, covering approximately one-third of metepisternum, a small spot against first suture just anterior to posterior margin; metakatepisternum brown, metepimeron pale, a dark stripe over metapleural suture somewhat widening in middle, a small dark spot near anterior



Figures 93-95. *Sulcosticta striata* sp. n., male [JvT 19220, Luzon, Aurora province, Dinalungan, Mt Anaguao, Alebit river area, 600-900 m, 9-14.iii.1997]. – 93, pronotum, oblique view. – 94, anal appendages, dorsal view. – 95, idem, left lateral view. Scale bar 1 mm.

corner, a dark oblong marking in lower posterior corner. Legs very pale. Wings hyaline, venation brown; Px 13 in fore wing, Px 12 (or $12\frac{1}{2}$) in hind wing; R4+5 arising distinctly posterior to subnodus, especially in fore wing, IR3 arising at c. one-third of length of cell posterior to that level; Arculus distinctly posterior to Ax2; quadrangle not widening posteriorly, not even in fore wing; anal bridge absent (as in *Protosticta*); pterostigma approximately as wide as high, anterior and posterior sides convex in fore wing, proximal side more straight, but angulate, in hind wing; cells distal to pterostigma undivided.

Abdomen generally pale coloured with darker parts of segments 2-6 very pale brown; segment 1 dark brown, lateral parts and an annule against segment 2 creamish white; segment 2 creamish with large, crescent-shaped brown marking over full segment, enclosing medio-posteriorly a dark spot; segments 3-6 pale brown, all segments both anteriorly and posteriorly paler with annules of segments dark; segment 7 with anterior two-fifths bluish white, rest of segment 7 and segments 8-10 brownish black; segments 8-10 distinctly wider than preceding segments. Appendages (Figs 94-95) pale and short; base of superiors dorsally somewhat darker, base relatively slender and both appendages widely separate, the distal half turned 90° and thus dorso-ventrally oriented, the lower and distal margins sharp;

inferiors wide and flattened, somewhat hollow, shorter than superiors, the tip emarginate with inner-tooth longer and curved dorsad.

Measurements. Hind wing 19 mm, abdomen including appendages c. 30 mm.

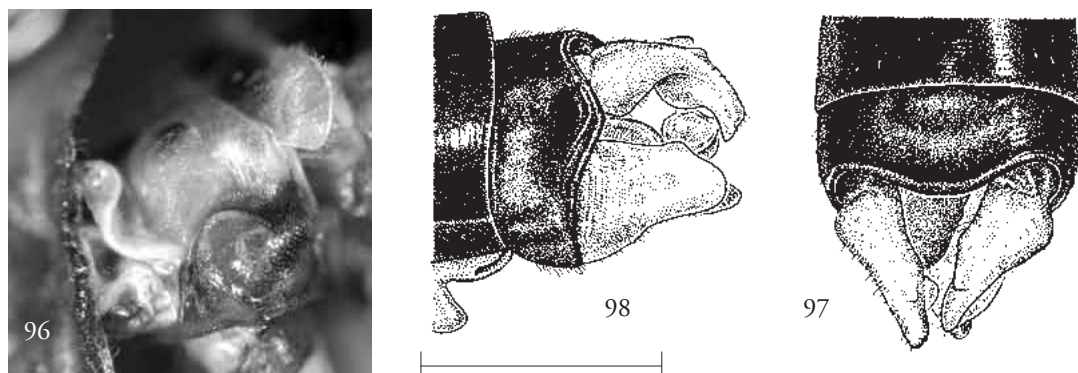
Female. – The only female assigned to this species is teneral and in rather poor condition; the processes of the anterior lobe of pronotum present, but much shorter than in male.

Measurements. Hind wing 19 mm, abdomen including appendages c. 30 mm.

Note. – The female from Quirino province mentioned in Hämäläinen & Müller (1997: 277) under note 26 [JvT 26990] is not conspecific and mentioned separately below under *Sulcosticta* sp. B. The female mentioned above and excluded from the type series [JvT 25064] is teneral and in poor condition. The projections of the posterior lobe of the pronotum are somewhat larger than in the other female assigned to this species. This specimen is preliminarily identified as *S. striata* sp. n.

Etymology. – *Striatus* (Latin), striped, for the coloration of the synthorax. An adjective.

Distribution (Fig. 109). – Philippine Islands: Luzon (Quirino, Aurora).



Figures 96-98. *Sulcosticta viticula* spec. nov., male [JvT 25062, holotype. Luzon, Zambales province, Masinloc, Mt Coto, Tal-tal, 400-700 m, 1-8.iv.1997]. – 96, pronotum, oblique view. – 97, anal appendages, dorsal view. – 98, idem, left lateral view. Scale bar 1 mm (for figures 97-98).

***Sulcosticta viticula* van Tol, sp. n.**

(Figs 96-98, 109)

Type material. – Holotype male [JvT 25062]: Philippines, Luzon Id., Zambales Prov., Masinloc, Mt Coto, Tal-tal, 400-700 m, 1-8.iv.1997 (C.M. Nazareno) [in RMNH]. – Paratype (in RMNH): same data as holotype, 1 female.

Diagnosis. – Small and slender species with distinct pale longitudinal stripes over synthorax; Ab vein absent; male differs from other Philippine species with this combination of characters (*Protosticta annulata*, *P. lepteca* and *Sulcosticta striata*) by structure of inferior appendage: a subterminal process approximately diameter of appendage directed axiad, then posteriad, the tip brownish black and directed abaxiad; top of appendix rounded; combination of tips of appendage and large subterminal process superficially looking as bifid top. This combination otherwise only in the unnamed species from Polillo (*Sulcosticta* sp. A).

Male [JvT 25062, holotype]. – Head. Labium bluish white, anterior border with brownish shade only; mandibles with anterior two-thirds pale brown, rest bluish white; anteclypeus bluish white; rest of head black, distinctly coriaceous with bronze metallic shine; transverse occipital carina distinct, but without lateral extremities; antenna with scapus and pedicellus dirty yellow, flagellum brown.

Thorax. Pronotum (Fig. 96) predominantly dirty yellow, with dark brown markings as follows: centre of middle lobe anterior to paired pronotal tubercles, the lateral lobes, and median part of posterior lobe leaving a narrow pale line posterior to this marking. Anterior lobe erect with a paired projection near lateral corners, the projections short and erect; posterior lobe simple, posterior border laterally with rounded projections, approximately as long as median line of posterior lobe. Synthorax with complex markings of brownish black and creamish white: mesepisternum brownish black with narrow pale line along humeral suture, anteriorly above mesokatepisternum slightly widened, line not reaching posterior border of synthorax; mesokatepisternum brown with small pale marking above mesocoxa; mesepimeron pale, a dark stripe over humeral suture, an oblong triangular brownish black marking against first suture, anteriorly from halfway between mesocoxa and metastigma, tapering posteriorly to four-fifths of length of mesepimeron; metepisternum pale, the lower three-quarters anterior to metastigma brown, a longer line over middle of metepisternum posterior to metastigma, covering approximately one-third of metepisternum, narrow brown stripe against metapleural suture; metakatepisternum brown, metepimeron brown, a small pale spot in posterior corner. Legs very pale. Wing hyaline, venation brown; Px 11 in fore wing, Px

11 in hind wing; R4+5 arising at subnodus, IR3 arising halfway length of cell posterior to that level; Arculus distinctly posterior to Ax2; quadrangle somewhat widening posteriorly in fore wing; anal bridge absent (as in *Protosticta*); pterostigma 1.4 times as wide as high, anterior side acutely angulate; posterior side more rectangular; cells between Costa and R1 distal to pterostigma very few and undivided.

Abdomen rather pale coloured, with darker parts of segments 2-6 very pale brown; segment 1 dark brown; segment 2 brown with crescent-shaped pale markings in anterior lower corners; segments 3-6 pale brown, all segments with anterior one-tenth to one-seventh dirty white; segment 7 with anterior two-fifths white with a brown annule anteriorly, rest of segment 7 and segments 8-10 brownish black, shiny; segments 8-10 distinctly wider than preceding segments. Appendages (Figs 97-98) pale and short; base of superiors dorsally slightly darker; base relatively slender and the pair widely separate, curved inward, distal half turned 90°, club-shaped, with inconspicuous dorsal tooth, ventral side straight; inferiors wide and flattened, top rounded, distal two-fifths with complicated curled structure: a subterminal, stoutly built process directed axiad, then posteriad, the tip brownish black and turned abaxiad. Measurements. Hind wing 17 mm, abdomen including appendages c. 26 mm.

Female. – Generally as the male, but projections of anterior lobe of pronotum missing, lateral projections of posterior lobe of pronotum much smaller; pale markings on mesepimeron and metepisternum dististly larger in male, but generally of similar shape. Measurements. Hind wing 18 mm; abdomen 29 mm.

Etymology. – *Viticula* (Latin), tendril; for the shape of the inward directed process of the inferior appendage. A noun in apposition.

Distribution (Fig. 109). – Philippine Islands: Luzon (Zambales).

Unplaced specimens

Drepanosticta indet. A

A female with coloration of synthorax as *D. moorei*, but without conspicuous projections on pronotum. Hind wing 24 mm, abdomen ca. 33 mm. Transverse occipital carina without lateral extremities.

Material examined (Philippines, in RMNH). – Luzon Id., Aurora Prov., Villa Maria, La-ab River, 360-500 m, 20-24. iii.1997 (R.A. Müller) 1 female [JvT 26989].

Drepanosticta indet. B

Material examined (Philippines, in RMNH). – Panaon Id., San Francisco, Batong Lapd, viii.1988 (W. Catal) 1 female [JvT 18618], and second label '*Drepanosticta lestoides* (Brauer), M. Hämäläinen det'.

A female with distinct lateral extremities of transverse occipital carina, pair of long projections on anterior lobe of pronotum and smoothly rounded posterior lobe of pronotum, synthorax with white stripe over metepisternum presumably represents a new species. Hind wing 20 mm, abdomen ca. 30 mm.

Sulcosticta sp. A

Material examined. – "Polillo, Philipp., 20.VIII.1915. G. Boettcher", 1 male (in SMFD) [JvT 26975].

Diagnosis. – Small and slender species with distinct pale longitudinal stripes over synthorax; Ab vein absent; male differs from other Philippine species with this combination of characters by structure of inferior appendages: short and tapering, distal one-fifth compressed and shining brown, the tip recurved dorso-axiad, tip ending in a comb of teeth. Apart from appendages very similar to *S. viticula* sp. n.

Male [JvT 26975]. – Head. Labium bluish white, anterior border with brownish shade only; mandibles with anterior two-thirds pale brown, rest bluish white; anteclypeus bluish white; rest of head black, distinctly coriaceous with bronze metallix shine; transverse

occipital carina distinct, but without lateral extremities; antenna broken.

Thorax. Pronotum predominantly dirty yellow, with brown markings as follows: centre of middle lobe anterior to paired pronotal tubercles dark brown; lateral lobes castaneous; median part of posterior lobe brown, leaving a narrow pale line anterior and posterior to marking. Anterior lobe erect with a paired projection near lateral corners, the projections short and erect; posterior lobe simple, posterior border laterally with rounded projections, approximately as long as median line of posterior lobe. Synthorax with complex markings of brownish black and creamish white: mesepisternum brownish black with narrow pale line along humeral suture, anteriorly above mesokatepisternum broadly widened, the line itself just reaching posterior border of synthorax; mesokatepisternum brown with small pale marking above mesocoxa; mesepimeron pale, a narrow dark stripe of humeral suture; metepisternum pale, the lower anterior three-quarters pale brown, a narrow brown stripe against metapleural suture; metakatepisternum castaneous; metepimeron castaneous, a small pale spot in anterior corner, posterior part somewhat paler than rest. Legs very pale yellowish white. Wings hyaline, venation brown; Px 12 in fore wing, Px 11 in hind wing; R4+5 arising well distal to subnodus, IR3 arising halfway length of cell posterior to that level; Arculus arising at Ax2; quadrangle hardly widening posteriorly; anal bridge absent (as in *Protosticta*); pterostigma 1.3 times as wide as high, subrectangular, anterior and posterior veins convex; cells between Costa and R1 distal to pterostigma very few and undivided. Abdomen (broken and partly repaired). Rather pale coloured, with darker parts of segments 2-6 very pale brown; segment 1 castaneous with posterior pale yellow annule; segment 2 pale with crescent-shaped dark markings from lower latero-posterior corners to middle of segment anteriorly, a brown posterior

annule; segments 3-6 pale brown, all segments with anterior one-tenth to one-seventh paler (indistinct, but this possibly due to poor preservation); segment 7 with anterior two-fifths pale brown, rest of segment 7 and segments 8-10 brownish black, shiny; segments 8-10 distinctly wider than preceding segments. Appendages (damaged and right superior appendage missing) pale and short, base relatively slender and the pair originally widely separate, curved inward, distal half turned 90° dorso-ventrad, club-shaped with inconspicuous dorsal tooth, ventral side curved, the tip distinctly angulate; inferiors wide, short, stout, and tapering, distal one-fifth compressed and shining brown, the tip recurved dorso-axiad, tip ending in a comb of short teeth.

Measurements. Hind wing 17 mm; abdomen with anal appendages ca. 26 mm.

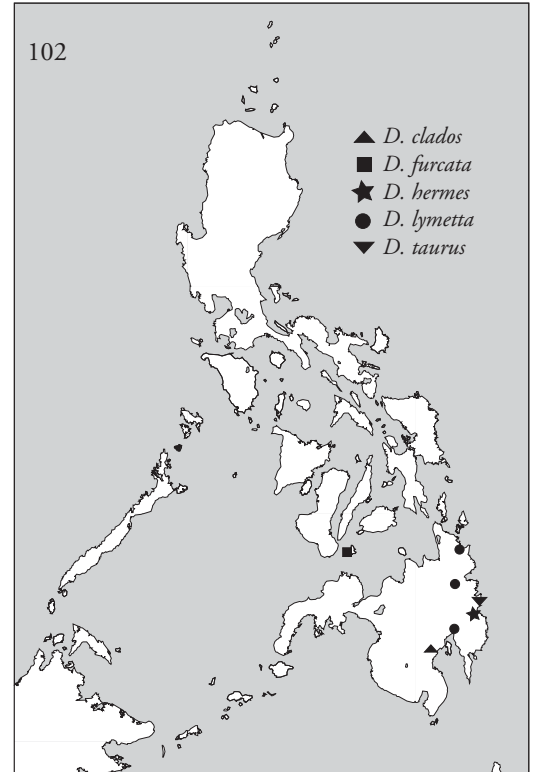
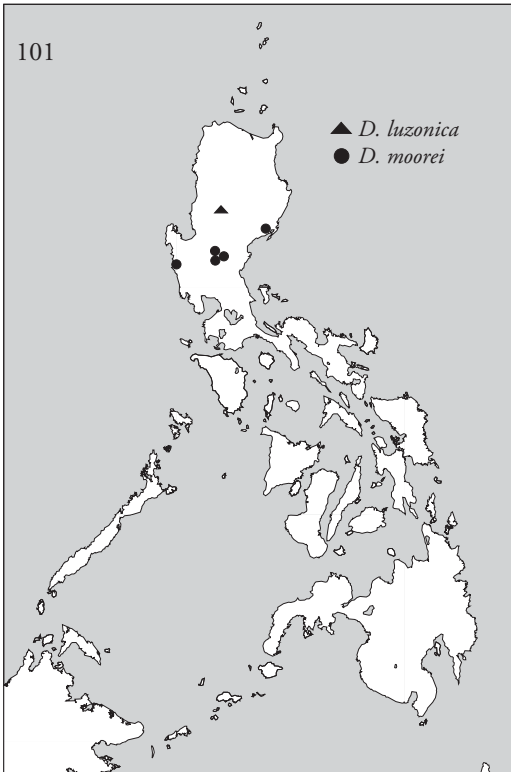
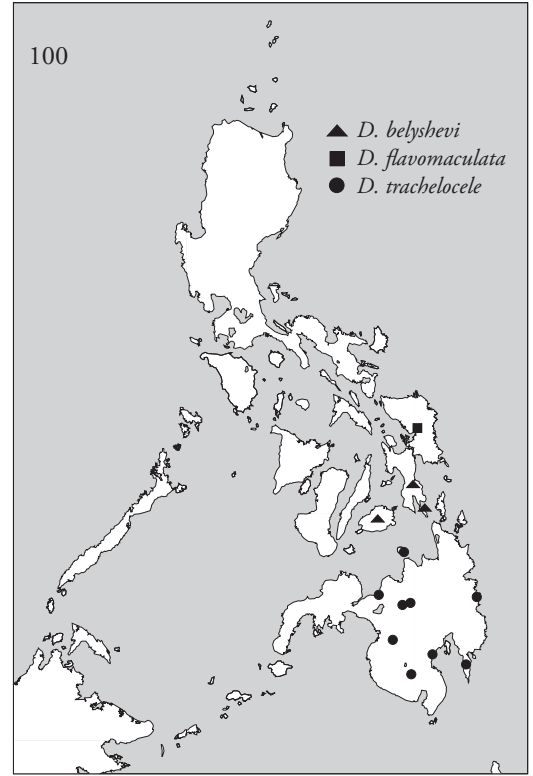
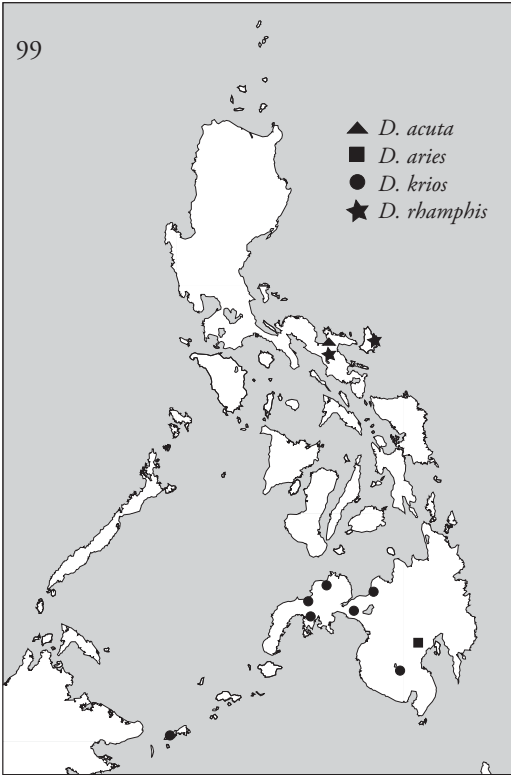
Note. – Due to the poor state of conservation I have refrained from naming this specimen. Further studies on Polillo island may reveal new material of this phylogenetically interesting taxon.

Distribution. – Polillo Island (off eastern Luzon).

Sulcosticta sp. B

Material examined. – Philippines, Luzon Id. Quirino, Maddela, Sierre Madre, Mt Yadan, Sitio Yadan, 400-600 m, 15-30.viii.1996 (C.M. Nazareno), 1 female [JvT 26990].

One female from Mt Yadan in RMNH possibly belongs to the genus *Sulcosticta* as defined here, with pale thoracic markings and an Ab and Ac vein present, but separate at wing margin. Coloration of the synthorax is clearly different from *S. pallida* sp. n., while the presence of the Ab vein, plus the structure of the pronotum is distinct from *S. striata*. The latter species was also recorded from Mt. Yadan, so a further study of this interesting complex of species is needed when more material becomes available. Hind wing 24 mm, abdomen ca. 33 mm.



Acknowledgements

The names of Roland A. Müller and Dr. Matti Hämäläinen will remain associated with the advancement of our knowledge of the odonates of the Philippines during the last 25 years of the 20th century. Roland A. Müller (St Gallen, Switzerland) brought together a huge and extremely rich collection between c. 1980 and 1997. Dr Matti Hämäläinen (Espoo, Finland) sorted, studied and identified all material. I am grateful to both colleagues for entrusting their collections to Museum Naturalis, and leaving the scientific study of some parts to me. Matti Hämäläinen had expertly sorted the specimens, and I have followed most, but not all, of his opinions on species delimitation; of course all decisions shall be considered mine. Dr. Hämäläinen showed me for study the specimens of SMFD he had on loan, and also kindly reviewed a draft of this paper.

Thanks are due to the staff artists of the National Museum of Natural History, Leiden, the Netherlands, Bas (S.B.) Blankevoort, Erik Jan Bosch and Inge M. van Noortwijk for preparing such attractive illustrations of this remarkable group of damselflies.

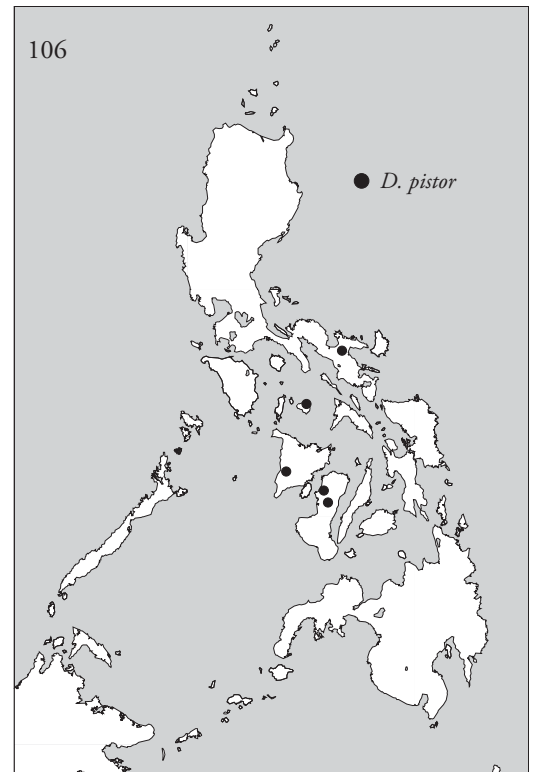
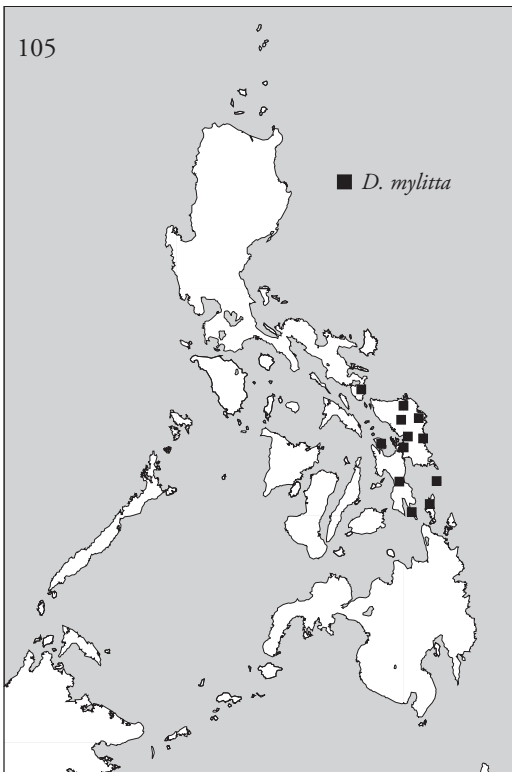
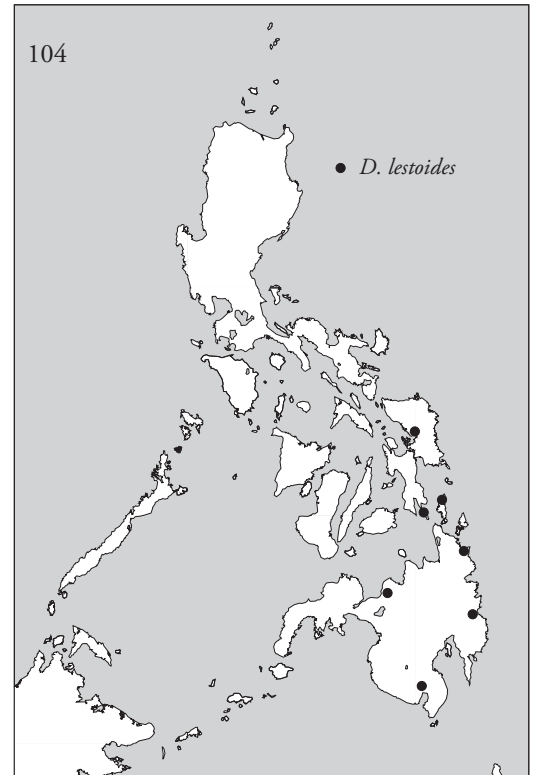
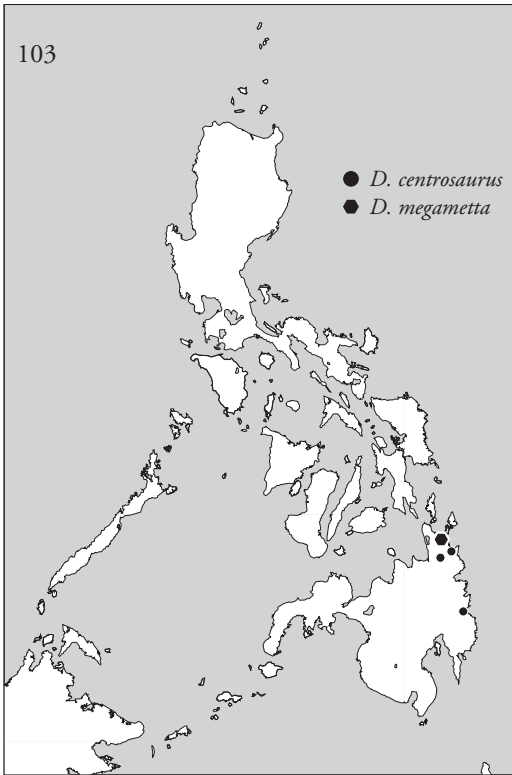
The specimens of *Protosticta plicata* sp. n. were collected by Dr. F. Seidenschwarz and Mr. Borromeo during a biodiversity survey on Cebu, and were kindly put at my disposal for this paper via Dr. M. Hämäläinen. Mr. Reagan J. Villanueva (Davao City, Philippines) presented the specimens of *Drepanosticta clados* sp. n. to the Leiden Museum, and guided me to some interesting sites in northern Mindanao in April 2004.

Finally, I am grateful to Steve Brooks (BMNH), James K. Liebherr (CUIC) and Philip D. Perkins (MCZC) for loan of material or information on material in the collections under their care.

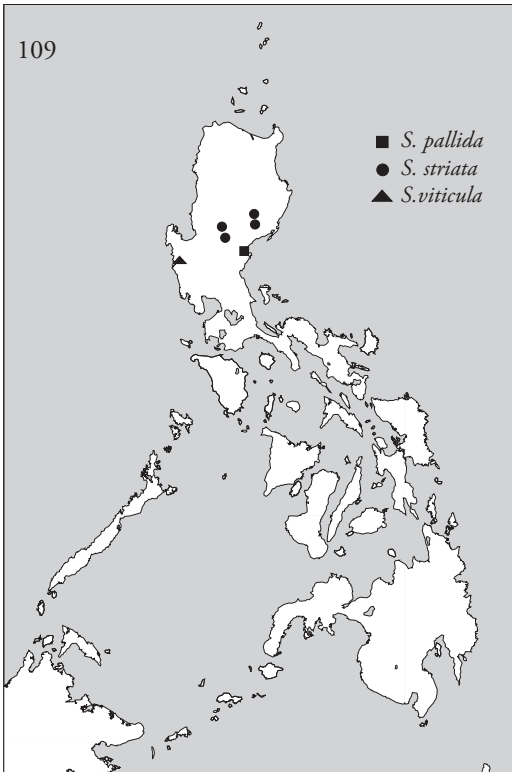
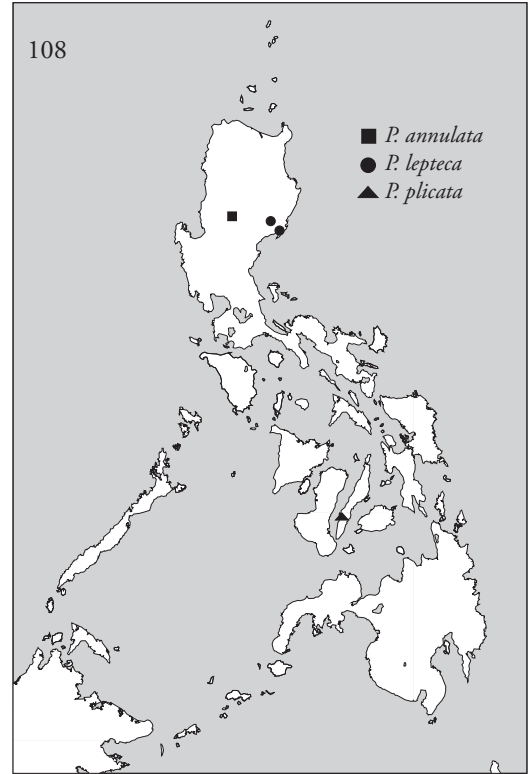
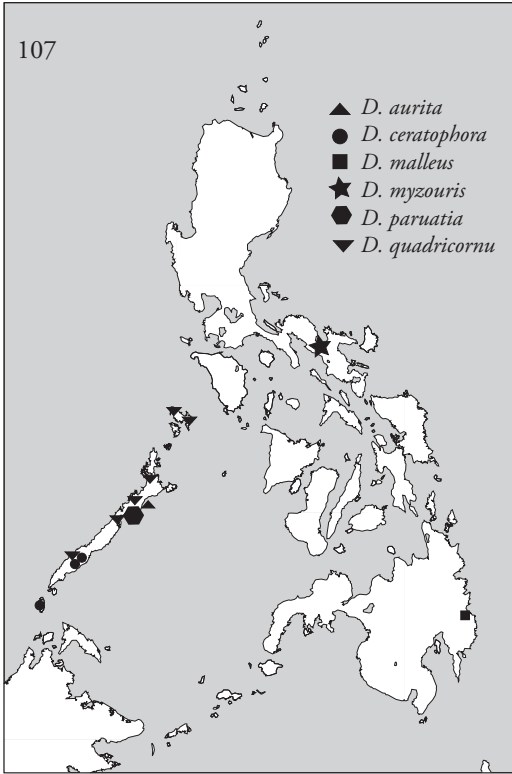
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Figures 103-106. Distribution of *Drepanosticta* species in the Philippines. – 103, *Drepanosticta megametia* group. – 104, *Drepanosticta lestoides* Brauer. – 105, *Drepanosticta mylitta* Cowley. – 102, *Drepanosticta pistor* sp. n.



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Figures 107-109. Distribution of Platystictidae in the Philippines. – 107, Distribution of *D. aurita* sp. n., *D. ceratophora* Lieftinck, *D. malleus* sp. n., *D. myzouris* sp. n., *D. paruatia* sp. n., *D. quadricornu* sp. n. – 108, Distribution of the species of *Protosticta* Selys. – 109. Distribution of the species of *Sulcosticta* gen. n.

