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SOME PRELIMINARY NOTES ON SURINAM STING RAYS, INCLUDING THE DESCRIPTION OF A NEW SPECIES

by

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In Dr. D. C. Geijskes' collection of Surinam fishes, mentioned in my previous paper on this subject (Boeseman, 1948), I found six specimens belonging to the so-called "sting rays" (Dasyatidae), representing three different species, and all very interesting in some respects.

I. *Dasyatis schmardae* (Werner).

Trygon schmardae Werner, 1904, p. 298 (Jamaica).

Dasybatus schmardae, Garman, 1913, p. 386 (after Werner).

Dasybatus schmardae, Meek & Hildebrand, 1923, p. 81 (Toro Point & Mindi Cut, Panama Canal).

Dasyatis schmardae, Fowler, 1931, p. 391 (Vessigny River at Brighton, Trinidad).

Four specimens, from Coppenam Point, Surinam, coll. Dr. D. C. Geijskes, Dec. 1942, 2 ♂♂ measuring 530 and 575 mm, 2 ♀♀ measuring 610 and 705 mm.

The condition of the specimens is excellent, even the tails, so often mutilated in these rays, are wholly undamaged. The agreement with the cited descriptions, especially the very extensive given by Meek & Hildebrand, is practically complete and, in my opinion, leaves no room for doubt as to the identification.

As far as I found in literature, this species hitherto never has been reported from the Guyanas, the most eastward report being Fowler's from Trinidad. Moreover, the previous literature on this species gives the impression of a very rare occurrence in its whole hitherto established geographical area: Werner (Jamaica) had but a single specimen, Meek &

Hildebrand (Panama) two specimens, and Fowler again but one specimen at his disposal. Garman has not seen any specimens, and just quotes Werner. All specimens hitherto reported were female.

Regarding these facts, the first conclusion must be that the area inhabited by this species must be considerably larger than hitherto suggested, at least reaching to Surinam, but probably even considerably more eastward (as it seems not rare at the latter locality, see below).

Secondly, although the total number of rays in Dr. Geijskes' collection must be considered too small for a sufficiently founded final opinion in this matter, the occurrence of four specimens of this species among so small a number of rays, seems to suggest a much more frequent occurrence, at least in the coastal areas near Surinam.

This argument becomes even more convincing in connection with the occurrence of but three specimens of the much more common Surinam species *Potamotrygon hystrix* (Müller & Henle) in the same collection, though we must not neglect the possibility that Dr. Geijskes somehow selected his collections, e.g., on account of the difficulties in handling and preserving larger specimens of rays (*P. hystrix* attains a considerably larger size than, as far as hitherto known, *D. schmardae*).

Thirdly, there seem to be no other than the common sexual differences between the sexes. The claspers are very small, somewhat flattened cylindrical, thus of the common shape, reaching but slightly more than halfway to the distal margin of the ventral fins, and with their distal third free only. Perhaps the specimens are not yet wholly adult.

In contradistinction to the description given by Meek & Hildebrand (l.c.), the anterior angle of the ventral fins reaches slightly beyond the posterior tip of the pectoral fins, consequently beyond the margin of the disc. Of the five papillae at the base of the lower jaw, those situated median and laterally are considerably smaller than the further two. Along the roof of the mouth there are three distinct longitudinal laminae.

A character which hitherto seems to have been overlooked, is the occurrence of a well developed median triangular flat point or process, directed rostrad, on the pelvis. It is but slightly (if any) smaller than that represented in Garman's figure of the pelvic process in *Myliobates fremin-villii* (Garman, 1913, pl. 54 fig. 3), and seems somewhat too well developed for the genus *Dasyatis*. As, however, I found no further discriminating characters, necessary to establish a new genus, I provisionally prefer to keep the old name: *Dasyatis schmardae* (Werner), instead of making the already thoroughly confused systematics in this group still more intricate.

According to Dr. Geijskes, the vernacular name of this species is „gan-

goe spari" (pronounce: gangoo (with a as in arm), sparee (with a as in ask)), in the so-called "negro-english".

II. *Dasyatis guttatus* (Bloch; Schneider)

- Iabebirete* Marcgrave, 1648, p. 175, fig. (Brazil).
Raie tuberculée Lacépède, 1800, p. 136, pl. 4 fig. 1 („mers voisines de Cayenne”).
Raja tuberculata Lacépède, 1800, p. 136 (idem) (preoccupied, Bonnaterre, 1788, p. 3).
Raja guttatus Bloch; Schneider, 1801, p. 361 (South America).
Raja tuberculata, Shaw, 1804, p. 290, pl. 137 (after Lacépède).
Trygon gymnura Müller, 1835, p. 25, pl. 13 (Rio de Janeiro).
Trygon osteosticta Müller, 1835, p. 25, pl. 14 figs. 1 & 2 (idem).
Trygon Jabebara Müller & Henle, 1841, p. 160 (Brazil).
Trygon sabina, Müller & Henle, 1841, p. 163 (partly; Brazil, Surinam).
Trygon (Trygon) tuberculatus, Duméril, 1865, p. 605 (Brazil).
Trygon tuberculata, Günther, 1870, p. 480 (partly; South America, Island of Grenada).
Dasibatris tuberculata, Garman, in Jordan & Gilbert, 1882, p. 66 (Cannavieras, Surinam, Para, Bahia, Rio de Janeiro).
Dasybatus tuberculatus, Garman, 1888, p. 99, pls. 41 & 42 (no locality).
Dasyatis gymnura, Jordan & Evermann, 1896, p. 84 (Surinam to Brazil, Grenada cf. Günther).
Trygon tuberculata, Goeldi, 1898, pp. 455 & 488 (Magoary).
Dasyatis gymnura, Ribeiro, 1907, p. 188 (West Indies to Rio de Janeiro).
Dasybatus guttatus, Garman, 1913, p. 391 (Brazil to West Indies).
Dasybatus guttatus, Meek & Hildebrand, 1923, p. 78 (Colon fish market, Panama).
Dasyatis guttatus, Jordan, Evermann & Clark, 1930, p. 28 (Surinam to Brazil; reported from Grenada).
Trygon tuberculata, Baughman, 1946, p. 42 (South America, Grenada, Panama).

One specimen, from Coppenam Point, Surinam, coll. Dr. D. C. Geijskes, Dec. 1942, ♂, measuring 1080 mm (disc 285 mm).

This is a very well preserved specimen, with even the very fragile tail, though broken, still complete. Its identification gave occasion to come to a new opinion on the synonymy, variability and geographical distribution of this species as well as of *D. sabinus* (Lesueur).

A close examination of the previous literature on Dasyatidae convinced me of the existence of but two possibilities, viz., *guttatus* Bl.; Schn. (for synonymy: see above) and *sabinus* Lesueur, but the discriminating characters given for these two species often proved insufficient (e.g., on account of the condition of the specimen) or not very convincing. Moreover, the material for comparison at my disposal was very poor, consisting of but two specimens: a stuffed specimen (no. 2458, "*Trygon osteosticta* Müll., Dieperink, Surinam") in which, as generally in dry preserved specimens, several characters could not be checked, and a specimen preserved in spirits (no. 4257, "*Trygon osteostictum* n.sp., Anc. cab., Ame-

rique") with the tail mutilated slightly behind the insertion of the spine.

The discriminating characters given in keys by previous authors are as follows:

Duméril (l.c., p. 599): in *guttatus* the disc broader than long, in *sabinus* longer than broad. However, according to more recent literature, this must be a very indistinct discriminating character: in *guttatus* the length of the disc being 1.1 in its width (cf. Meek & Hildebrand, l.c., p. 78), the disc a little broader than long (cf. Garman, 1882, p. 66, 1913, p. 391; Jordan & Evermann, l.c., p. 84), in *sabinus* the length of the disc 1-1.05 in its width (cf. Hildebrand & Schroeder, 1928, p. 67), the disc sub-circular (cf. Garman, 1882, p. 68, 1913, p. 397; Jordan & Evermann, l.c., p. 84); according to Duméril (l.c., p. 607), *sabinus* has the disc "à peine plus long que large" but he probably used a less accurate way of measuring his specimens.

In our specimens (the two identified as *osteostictum* included) this character proved to be quite constant, the length of the disc 1.07-1.08 in its width, but, although this seems to support my identification of these specimens as *guttatus*, I can hardly regard this character as discriminative as it seems quite possible that its range of variation in both species will prove to overlap.

Garman (1882, p. 65): in *guttatus* the tail more than twice the length of the disc, in *sabinus* less than 2 but more than 1.5 times. This wholly agrees with the data given in more recent literature.

In Dr. Geijskes' Surinam specimen, the tail is complete, its length 84.5 cm, almost 3 times the length of the disc (28.5 cm); in the stuffed specimen (no. 2458) the tail measures about 81.5 cm, and is about 3.6 times longer than the disc (22.5 cm); the third specimen (no. 4257), as mentioned before, has the tail mutilated, consequently needs a further distinctly discriminating character to establish its exact identity. The data of the first two specimens point to a very wide range of variation in this character; including the data in previous literature, the length of the tail probably varies between 2.5 and almost 4 times the length of the disc. As the ultimate length of the tail in *sabinus* never seems to exceed 2 times the length of the disc, probably reaches up to 1.7 times only, there remains a considerable discriminating range, and the possibility of an eventual synonymy between the two species obviously can be neglected.

Although this character provides a very easy way to discriminate both species, further distinctive characters are needed for the identification of the often occurring specimens with mutilated tails.

Garman (1882, p. 65, 1913, p. 375), Jordan & Evermann (l.c., p. 83)

and Meek & Hildebrand (l.c., p. 76): in *guttatus* the tail has a (low) keel above behind the spine, and a winglike expansion or free fold below; in *sabinus*, there is a narrow free membranous fold or expansion above, and a broader below.

For specimens like our no. 4257, with a considerably mutilated tail, this character too does not provide a means for discrimination. The two further specimens both have a low and narrow, rather indistinct keel above, and a distinct, rather broad membranous expansion below; in the stuffed specimen, the existence of a dorsal keel was rather difficult to establish, but I presume that even a very narrow dorsal membrane cannot be reduced by drying up and shrinking to a so indistinct ridge as found dorsally in this example.

It remains, however, doubtful whether this provides a reliable discriminating character. According to Ribeiro (l.c., p. 188), the dorsal keel on the tail sometimes becomes imperceptible, while in other related species a variability in this character, viz., an occasionally more developed dorsal expansion, has been reported.

Except the differences mentioned above, there seem to be some more hidden in the previous literature. A comparison with more recent descriptions of *sabinus* (Hildebrand & Schroeder, l.c., p. 67; Meek & Hildebrand, l.c., p. 77; Garman, 1913, p. 397; Jordan & Evermann, l.c., p. 84; Garman, 1882, p. 68) provides the following distinctive data:

In *guttatus* the pectorals show a distinct lateral angle, the disc being rhomboidal; in *sabinus*, the disc is subcircular. This agrees with our specimens, which all show a distinct lateral angle, consequently a rhomboidal disc.

The number of enlarged humeral tubercles in *guttatus* seems to be very variable (0-4), e.g., 2-4, cf. Meek & Hildebrand (l.c.), a short row (young specimens smooth!), cf. Garman (1913), one or more, cf. Jordan & Evermann (l.c.), while in *sabinus* there seems to be a less variable number: (0-) 1-2. Although being rather large, Dr. Geijskes' Surinam specimen shows no humeral enlarged tubercles, which makes the range of variation in this character for *guttatus* still larger; specimen no. 2458 has but one, specimen no. 4257, 2 humeral tubercles.

This character consequently gives an indication of the identity of specimens only in examples with more than 2 humeral tubercles.

The number of papillae at the base of the lower jaw in *guttatus*, as given in previous literature, is generally 3; only Duméril (l.c.) mentions 5,

while Müller (l.c.) gives the same number for his *osteostictus*. In *sabinus*, the number is unanimously given as 5.

In our stuffed specimen (no. 2458) this character could not be checked, but of the further specimens one (no. 4257) has 3 slender and distinct papillae, Dr. Geijskes' specimen 5. On account of this, there are two obvious possibilities: first, that specimen no. 4257 has been identified erroneously as *osteostictus* (a generally accepted synonym of *sabinus*), or, secondly, that *osteostictus* should be regarded as synonymous with *guttatus*, the number of papillae in the latter species being variable (3-5). As all further characters distinctly indicate the homogeneity of my material, I see no other possibility than to accept the latter point of view: a variability of the number of oral papillae.

In connection with the above statement, there remains no distinct reason to maintain the name "*osteosticta*" as a synonym for *sabinus*; the first species obviously has been founded on a specimen with a mutilated tail (Müller (l.c.) describes and represents the tail even much too short for *sabinus*: "so lang als der Körper", and with a remarkably blunt tip). The only remaining character in Müller's description that seems to indicate a synonymy with *sabinus*, is his description of a low membranous dorsal fold on the tail. However, as there seems to exist a considerable variation in this character in some Dasyatidae, as I have already mentioned before, and as the size and locality of Müller's specimen (see below) seem to make a synonymy of *osteostictus* with *sabinus* quite improbable, I suppose the better developed dorsal fold on the tail of Müller's type to be a mere anomalism, and regard *osteostictus* as synonymous with *guttatus*.

In *guttatus*: interorbital width 2.05 in snout (cf. Meek & Hildebrand, l.c.), about 2.5 in snout (cf. Müller & Henle, l.c., for their *sabinus*, obviously based on heterogeneous material), about 1.7-2.3 according to figures given in literature (Garman, 1888; Müller, l.c.; Shaw, l.c.; Lacépède, l.c.); in *sabinus*: interorbital width 3.8-4.3 in snout (cf. Hildebrand & Schroeder, l.c.). In our three specimens the data are as follows: about 2.1 (no. 2458), 2.2 (no. 4257), and 2.1 (Dr. Geijskes' specimen).

In *guttatus*: width of mouth 2.9 in snout (cf. Meek & Hildebrand, l.c.), about 3.3 in snout (cf. plate 41 in Garman, 1888); in *sabinus* 3.45-3.95 (cf. Hildebrand & Schroeder, l.c.). In our specimens: about 3.2 (no. 2458), 3.1 (no. 4257), 3.2 (Dr. Geijskes' specimen).

In *guttatus*: teeth on the upper jaws in about 37 rows (cf. Garman, 1913); in *sabinus* in about 48 rows (cf. Garman, 1913). In our stuffed specimen this character could not be checked, but the two further specimens

seem to confirm Garman's data: both with about 36-38 rows of teeth on the upper jaws.

The size also seems to give a distinct indication for the discrimination of adult specimens. According to previous literature, *guttatus* measures up to 1040 mm (cf. Meek & Hildebrand, l.c.), 1220 mm (cf. Duméril, l.c.). As this species seems to have been but rarely collected, considerably larger sizes seem quite possible. Accepting Marcgrave's (l.c.) opinion, proposing for this species the same size as he gives for his "Aiereba" (p. 175; = *Paratrygon orbicularis* (Bl.; Schn.)), viz., a length of body of "unum pedem & novem digitos" and a length of the tail of "quator pedes", thus a total length of about 170 cm, there can be hardly any doubt that Müller's type of *osteostictus* must belong to the same species. According to Müller (l.c.), his specimen had a length of body of about 47 cm; if this specimen belongs to *guttatus*, the tail must have measured about 130 cm, consequently the total length being about the same as that given by Marcgrave. If, on the contrary, we should accept a synonymy of *osteostictus* with *sabinus*, the tail should have been about 75 cm, making the total length of Müller's specimen about 122 cm, thus much too large for *sabinus*. The ultimate length hitherto given for *sabinus* seldom exceeds 70 cm, only Hildebrand & Schroeder (l.c.) mention a specimen with a width of the disc of 16 inches, thus a specimen with a total length of almost 100 cm.

Our specimens measure: 101 cm (no. 2458), 108 cm (Dr. Geijskes' specimen); the third specimen has a length of the disc of 23.5 cm, and must have measured slightly more than 100 cm. This character too supports my identification.

The area inhabited by *guttatus* seems to reach northwards only to the Panama Canal and the island Grenada (cf. Günther), while *sabinus* occurs on the Atlantic coasts of North and Middle America only. Several previous authors also mention Brazil as locality for *sabinus*, but this obviously depends on the erroneous synonymy with *osteostictus*. Everman & Marsh (1902, p. 65) not even mention *sabinus* from Porto Rico, but even if it proves to occur in these waters, it must be very rare, and an occurrence still more southwards seems very improbable. Nevertheless an occasional occurrence near the north coast of South America cannot yet be regarded as wholly impossible. Additional data on the distribution of *sabinus* are badly needed.

In consequence of the previous statements, there seem to remain no reasons to doubt the identity of our specimens: *Dasyatis guttatus* (Bl.; Schn.). According to Dr. Geijskes, the vernacular name of this species

is "oeproe spari" (pronounce: ooproo sparee, with a as in ask), in the so-called "negro-english".

III. *Dasyatis geijskesi* nov. spec. (figs. 1 and 2)

A single specimen, from Coppenam Point, Surinam, coll. Dr. D. C. Geijskes, July 1944, ♂, measuring 1060 mm (disc 360 mm), tail mutilated.

This specimen obviously differs from all hitherto described Dasyatid

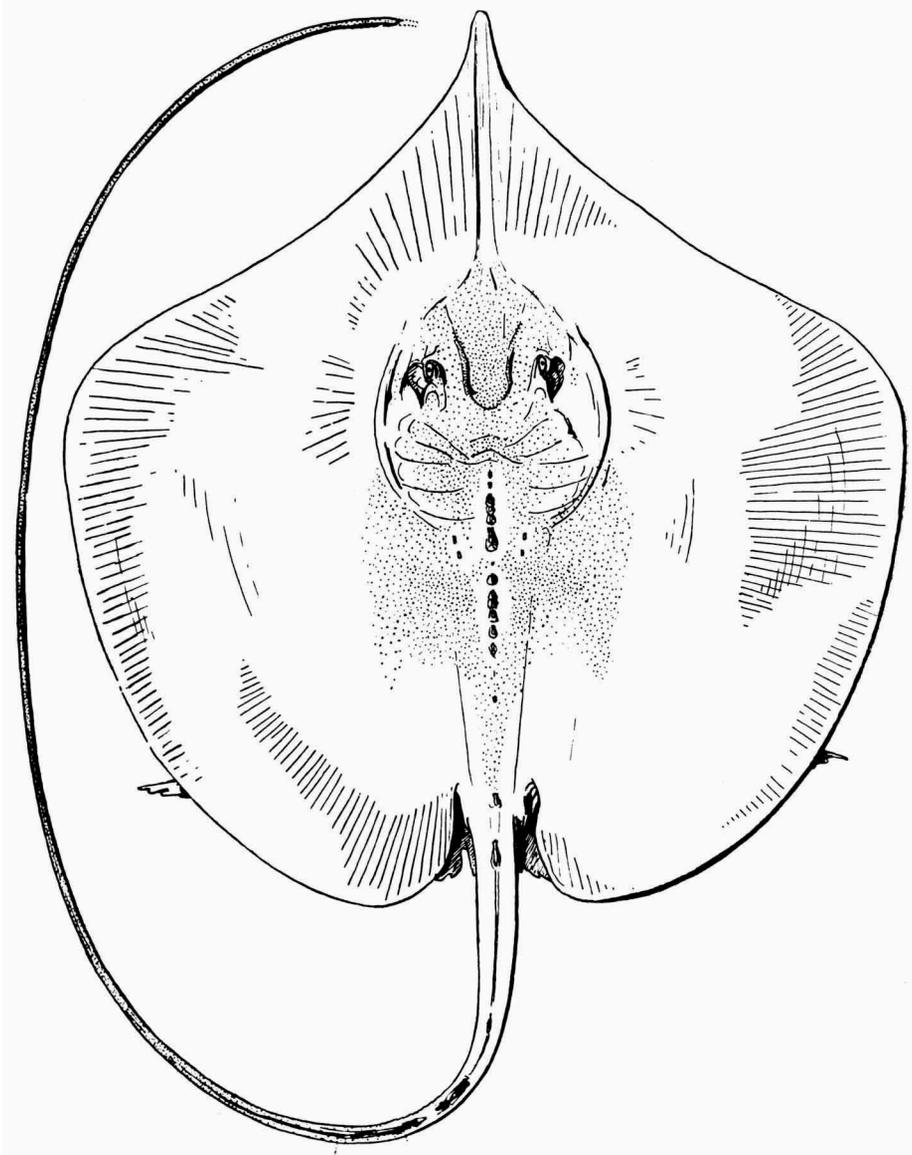


Fig. 1. *Dasyatis geijskesi* nov. spec., dorsal view of holotype. $\times \frac{1}{3}$.

species by its characteristically shaped snout; as for this character, it even better agrees with some of the Rajidae, e.g., *Sympterygia acuta* Garman (1913, pl. 27 figs. 1 & 2) and *Raia stabuliformis* Garman (l.c., pl. 22 fig. 2), but the snout is still distinctly slenderer.

Although the tail is mutilated it is still very long (about 2.35 times the length of the body, almost 2.1 times the greatest length of the disc) and shows not the slightest indication of eventual dorsal or caudal fins. Its

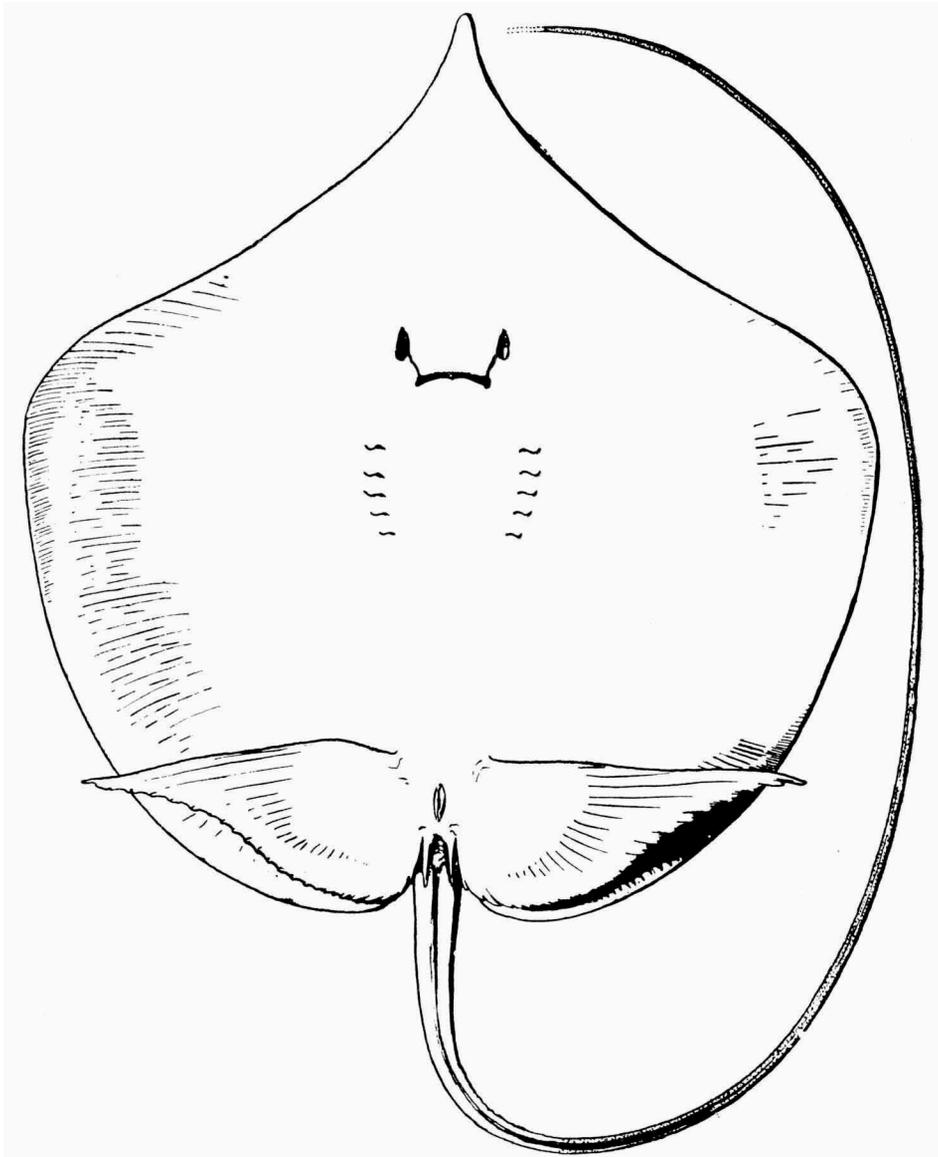


Fig. 2. *Dasyatis geijskesi* nov. spec., ventral view of holotype. $\times \frac{1}{3}$.

shape is typically Dasyatid: elongate, slender, whip-like with two serrated caudal spines.

The shape of the pelvis too is characteristically Dasyatid, viz., with a somewhat convex anterior margin, without a median process.

Description:

The disc is about pentagonal, with the antero-lateral margins distinctly concave, the part just beside the narrow projecting snout almost straight; the lateral margins of the pectoral fins convex, the lateral angles rounded; the gap between the rounded posterior angles of the pectorals and the tail more or less filled up by the ventral fins, which thus form the narrow fifth side.

The snout is very long and slender, characteristically projecting, its preorbital length 145 mm, not even 2.5 in the greatest length of the disc. The greatest width is slightly less than the length of the disc, almost 340 mm.

The eyes are very small, oval, longitudinal diameter 6 mm, 5.5 in bony interorbital (34 mm), 7 in interorbital measured between the margins of the upper eye-lids (42 mm). The spiracles are pear-shaped, almost 3 times the length of the eye (17.5 mm); width about 10 mm; they are situated immediately below and behind the orbit. The pear-shaped nostrils, before and slightly lateral of the angles of the mouth, are separated by a broad flap reaching almost to the mouth; the posterior margin of this flap is finely fringed and slightly curved in accordance with the mouth, though somewhat less wavy; length of nostrils about 10.5 mm, distance between the pointed anterior ends 40 mm, between the rounded posterior ends and the angles of the mouth about 11 mm, almost twice the length of the eye.

The mouth is transverse, a little wavy, the lower jaw with a small indentation at the symphysis and the upper jaw with a tip projecting into it. Width of mouth 29 mm, exactly 5 in preocular snout. There is but one very tiny median papilla inside of the mouth at the base of the lower jaw, while there seem to be several very indistinct rudiments in a transverse row on both sides of the median papilla. The teeth are very small, transverse oval or rounded rhomboidal, in pavement, in about 68 rows on the lower jaw, about 56-58 on the upper jaw, forming a slightly rough surface. The gill-slits are small, slightly but distinctly S-shaped, the longest 9.5 mm, 1.5 eye-diameter.

The central part of the upper surface of the disc, and the tail behind the insertion of the caudal spines, is distinctly spinose, covered with small, short, about semi-globular tubercles, with the top more or less flattened,

on the disc, and more conical and pointed, with about 7 radiating ridges and a star-shaped basal cross-section, on the tail. There further is a distinct median row of enlarged tubercles on the dorsal side, beginning 36 mm or about 6 times the diameter of the eye behind the posterior margin of the latter, continued, with some large interspaces on the posterior part of the disc and between those situated on the tail, to slightly before the insertion of the caudal spines. The shape of these larger tubercles is about the same as in *guttatus*: the base about pear-shaped in cross-section, the top formed by a rather narrow flattened ridge, rising from the surface of the body anteriorly to a considerable height backwards, and with the posterior end of this ridge slightly projecting (generally), therefore more or less spine-like. Two similar but rather small tubercles are situated on the humeral region; the distance between the two anterior humeral tubercles is about 27 mm, almost 5.5 in the preorbital snout.

The further dorsal as well as the whole ventral surface of the disc, and the basal part of the tail to the insertion of the caudal spines (except the few enlarged tubercles), are completely smooth.

There are in this specimen two caudal spines, a small one measuring about 2 eye-diameters situated close before the longer measuring about 4.5 eye-diameter. Both are very sharp and distinctly serrate along both sides, the serration rather fine in the long and slender posterior spine, somewhat more coarse in the shorter and, in comparison to its length, less slender anterior spine. The greatest width of both spines is about 2 mm, their length 12 and 26 mm, the latter about 5.6 in the preorbital snout.

The tail is distinctly depressed in advance of the spines, with obvious lateral keels, more rounded to the end. A narrow, low, very inconspicuous keel can be found originating slightly behind the tip of the second caudal spine, gradually disappearing backwards. The lower surface of the tail shows a distinct though shallow median groove along the basal part, disappearing backwards, and, somewhat before the insertion of the caudal spines, the beginning of a distinct, narrow ventral fold or cutaneous membrane, with an approximate length of 80 mm, about 4.5 in length of disc, a greatest width of about 1.8 mm, becoming gradually indistinct backwards. The length of the (mutilated) tail is 74.5 cm, 2.35 times the length of the body measured to the posterior end of the anus, 2.1 times the greatest length of the disc, 1.4 in the total length, but it may have been considerably longer.

The ventral fins are remarkably long and slender, with the anterior rays elongate, causing a falcate apical part, slightly projecting beyond the lateral

margins of the disc. The posterior rays rapidly shorten, the inner angle is broadly rounded. The whole surface is smooth.

As I have already stated before, there is no prepelvic process, the pelvis being of the normal Dasyatid kind.

Coloration: rather dark brown above, pale with darker margins underneath; teeth yellowish white.

According to Dr. Geijskes, the vernacular name of this species is "sesée spari" (pronounce: sesa (with e as in maker, a as in fate) sparee (a as in ask)), in the so-called "negro-english".

I name this species in honour of the collector of the type specimen.

According to the available data, e.g., Jordan, Evermann & Clark (1930, pp. 28 & 29), the following species may prove to occur in the Surinam coastal waters and estuaries:

Dasyatis (Pastinachus) schmardae (Werner),

Dasyatis (Pastinachus) torrei (Garman),

Dasyatis (D.) hastatus (De Kay),

Dasyatis (D.) guttatus (Bl.; Schn.),

Dasyatis (D.) geijskesi Boeseman,

Dasyatis (Amphotistius) say (Lesueur),

Dasyatis (Amphotistius) sabinus (Lesueur),

Pteroplatea altavela (L.),

Pteroplatea micrura (Bl.; Schn.),

Urobatis sloani (Blainville),

Urobatis vermiculatus (Garman).

These species may be identified with the following key, partly after Meek & Hildebrand (l.c., pp. 75, 76), while I add the diagnosis of the family after the same authors.

Family Dasyatidae. Stingrays.

Body, head and pectorals depressed, altogether forming a broad disc, the pectorals meeting in front of the cranium without a supporting rostral cartilage; spiracles large, close behind eye; nasal valves with a broad flap, confluent across a narrow isthmus and reaching mouth; mouth transverse, more or less curved; teeth small, numerous, in pavement, usually with ridges or tubercles; gill-slits small; skin smooth or rough with spines or tubercles or both; tail distinct, sometimes very long and whip-like, sometimes short, bearing a serrated spine in nearly all the genera, sometimes bearing a single dorsal and usually a vertical fold of skin either above or below, or both; ventrals small, placed below posterior part of pectorals.

Key to the genera and species.

- a. Tail very long, whip-like, without a fin fold at end *Dasyatis*.
- b. No dorsal keel or fold on tail, a low keel or fold below.
- c. Disc nearly circular; upper surface of disc and tail covered with short, rough tubercles; one greatly enlarged tubercle with radiating grooves on each shoulder; tail almost twice length of disc; 5 papillae inside of mouth at base of lower jaw *schmardae**.
- cc. Disc more polygonal; a group of several small tubercles, enlarged scales, appears at each side of the vertebral column on the shoulder girdle, tail about 1.5 disc; (cf. Garman, 1913, p. 386) *torrei*.
- bb. A low dorsal keel or ridge on tail, free ventral fold.
- d. Disc subquadrangular, snout blunt; body smooth in young, adults with scattered small spines and with a vertebral row of narrow depressed tubercles, directed backwards; a short row of tubercles on each shoulder, parallel with the median row and varying with age; tail about 1.5 disc; mouth with 3 papillae; (cf. literature) *hastatus**.
- dd. Disc more or less quadrangular, tip of snout notably produced; interorbital and median portion of back with short, broad tubercles, the tail beyond caudal spine also roughened by short tubercles; a median row of prominent, depressed spines on back-from nape to near caudal spine; 0-4 short spines on shoulder; tail 2.5- (almost) 4 disc; mouth with 3 (-5) papillae *guttatus**.
- ddd. Disc and snout as in figs.; median portion of back and tail beyond caudal spine with short tubercles, blunt on disc, pointed on tail; a vertebral row of enlarged depressed spines, directed backward, as in fig. 1a; 2 enlarged tubercles on shoulder; tail more than 2.1 disc; a single small median papilla in mouth *geijskesi**.
- bbb. A narrow free fold above on tail, a broader ventral fold.
- e. Disc subquadrangular, snout blunt (120°); body and tail almost or quite smooth, with 1(-3) median spines on back behind head, 3 on base of tail (cf. Meek & Hildebrand, l.c., p. 77); tail about 1.75 disc; mouth with 5 papillae (3 at bottom, 1 at each side); (cf. literature) *say*.
- ee. Disc subcircular, snout rather pointed (90°); top of head and median portion of back often roughened by small spines, usually a vertebral row of sharp, elongate, compressed and depressed tubercles, and (0-)1-2 enlarged tubercles on shoulder; tail about 1.7 disc; 5 papillae; (cf. literature) *sabinus**.
- aa. Tail a little shorter than disc, with a rather broad, rounded, rayed caudal fin *Urobatis*.
- f. Disc little longer than broad, roundish; tail about equal to disc; skin rough, no median tubercles; coloration: brown, spotted with yellow; (cf. Garman, 1913, p. 402) *sloani**.
- ff. As previous species, but coloration different: brownish, vermiculate with yellow; (cf. Garman, 1913, p. 402) *vermiculatus*.
- aaa. Tail very small, much shorter than disc, without rayed fin *Pteroplatea*.
- g. Disc transverse, rhomboidal; no spines at base of tail; no tentacles behind spiracles; lower dermal fold on tail weaker than upper; tail 3-4 in disc; (cf. literature) *micrura*.
- gg. Disc transverse, rhomboidal; one or more small spines at base of tail; a tentacle behind spiracle; dermal folds on tail narrow above and below; tail about 2.5 in disc; (cf. literature) *altavela**.

Only of the species marked with an asterisk, I have seen material.

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POSTSCRIPT

After the present paper was written, I remained aware of the fact that the small number of specimens of *D. guttatus*, and the complete lack of specimens of *D. sabinus*, available for my investigations, doubtlessly weakened the stress of my arguments concerning these species, and might provide an easy way to attack my deductions.

In consequence of this I gladly accepted a recent opportunity to examine the collection of specimens belonging to these species, in the British Museum (Natural History). I am very much obliged to Miss Ethelwynn Trewavas, D. Sc., for kindly placing these specimens at my disposal and for offering all assistance needed.

The collection in the British Museum consisted of thirteen specimens identified as "*Trygon tuberculata*", a synonym of *D. guttatus*, four of which also with name "*Tr. sabina*", obviously hitherto regarded as a synonym too.

It proved to be quite easy to discriminate three groups of specimens, viz., a group belonging to *Dasyatis guttatus* (Bl.; Schn.), a second belonging to *D. sabinus* (Lesueur), and a third with a more dubious identity; two further specimens from the West Indies, collected by Gerrard, can be neglected as they doubtlessly proved to belong to a completely different species: *D. schmardae* (Werner), a species which may prove to be not quite as rare as supposed.

The first group consists of six specimens: a male from Berbice, Br. Guiana, coll. Matthey, length of disc 188 mm, total length 748 mm; a male from Trinidad, coll. Guppy, 223 mm, 873 mm; females from "Br. Guiana", coll. Beckford, 170 mm, 645 mm; from Island of Grenada, coll. Higgens, 225 mm, 795 mm (tail probably slightly mutilated); from Marajo Island, Brazil, coll. Erhardt, 275 mm, 1155 mm; from "South America", coll. Schomburgk, 365 mm, 1130 mm (tail considerably mutilated, total length probably has been about 1500 mm).

All these specimens have the disc slightly broader than long, varying between 1.06 and 1.1 times; the tail thrice or more the length of disc; the tail with a low but generally quite distinct keel above, a very distinct fold below; shape of disc very distinctly angular; 0.2 humeral tubercles on each side; three oral papillae; interorbital width 2.0-2.3 in snout; width of mouth 3.1-3.2 (in one specimen 3.5) in snout.

Except that in parentheses of the last character, all data accurately agree with those given in the present paper for *Dasyatis guttatus* (Bl.;

Schn.), making it very hard to doubt such an identification for these specimens.

The second group consists of three male specimens: from the United States, collector unknown, length of disc 140 mm, total length 390 mm; from Galveston, Texas, Smithsonian Institution, 141 mm, 356 mm; from Lake Champlain, coll. Parzudaki, 152 mm, 436 mm.

These specimens have the disc about as long as broad; the tail not more than 1.9 times the length of the disc; distinct dorsal as well as ventral folds on the tail; the lateral and posterior parts of the disc much more rounded; no humeral tubercles; 5 oral papillae; interorbital width 2.5-2.9, width of mouth 3.1-3.35 in length of snout.

Except those of the last two characters, these data too completely agree with those I gave for *Dasyatis sabinus* (Lesueur) in the present paper; the differences in the last two characters partly may have been caused by the fact that these specimens probably are not yet wholly mature. These specimens consequently must belong to *sabinus*.

The two further specimens gave much more difficulties. The first, from "Sydney", coll. Gerrard, disc 510 mm, total length 1110 mm (tail considerably mutilated!), on the whole shows the same data as those mentioned above, identified as *guttatus*. It is a female, the disc is slightly broader than long (1.075), distinctly more angular than in *sabinus*; only the left side provided with a humeral tubercle; 3 oral papillae; interorbital width 1.8, width of mouth 2.75 in length of snout. Unfortunately the tail is mutilated, hardly longer than the disc, while it further distinguishes itself by having distinct folds not only ventrally but also dorsally along the tail. As I mentioned in the present paper, there may be some variation in this character; it may also prove to be an adult character which hitherto has been overlooked, large specimens of this species being quite rare in collections, which would confirm Müller's original description of *osteostictus* after a specimen of about the same size, and my opinion that *osteostictus* should be regarded as a synonym of *guttatus*.

Accepting this possibility, the locality given on the label must be erroneous. As, on the other hand, accepting the locality as reliable, it seems impossible to identify this specimen as one of the Dasyatid species hitherto reported from the Australian waters, I am inclined to consider this specimen as *Dasyatis guttatus* (Bl.; Schn.), from unknown locality.

The last, male specimen, without any indications as to locality or collector, shows the following characters: length of disc 213 mm, total length 563 mm (tail mutilated!); disc slightly broader than long (1.1); tail probably more than twice length of disc; tail with dorsal keel and distinct ventral fold;

disc angular; only on left side a single humeral tubercle; 3 oral papillae; interorbital width 2.14, width of mouth 3 in length of snout. All these characters are in complete accordance with the data given for *guttatus*, while also the shape and situation of the larger tubercles or bucklers on the dorsal side of disc and tail proved to be more or less intermediate between the same characters in some of the previously mentioned specimens.

An aberrant character, however, is that of the rough surface covering not only almost the whole dorsal side of the disc and the existing part of the tail, but also a considerable part of the ventral side of the disc. In connection with the unknown locality, this seemed to indicate that the specimen might prove to belong to a different species, but as no other possibilities could stand an accurate investigation, I am inclined to regard this specimen too as *Dasyatis guttatus* (Bl.; Schn.), and as possibly a new variation.

This examination consequently proved that there is indeed a distinct difference between the species *guttatus* and *sabinus*, and that these species easily can be discriminated by the characters given in the present paper, especially by the differing length of the tail, the locality, and the more angular shape of the disc in *guttatus*.