

Solea bleekeri Boulenger, 1898, a junior synonym of *Pegusa nasuta* (Pallas, 1814), with the recognition and redescription of *Solea turbynei* Gilchrist, 1904 (Pleuronectiformes: Soleidae)

by

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ABSTRACT. - *Solea bleekeri* Boulenger, 1898, which was described from a single specimen, is not a valid species; the holotype of this nominal species belongs to *Pegusa nasuta* (Pallas, 1814). *Solea turbynei* Gilchrist, 1904 is recognized and redescribed to include all specimens of *Solea* that have been traditionally described as belonging to *S. bleekeri*. *Solea simonensis* Bonde, 1922 based on a single anomalous specimen is confirmed as a junior synonym of *S. turbynei*.

RÉSUMÉ. - *Solea bleekeri* Boulenger, 1898, synonyme junior de *Pegusa nasuta* (Pallas, 1814), avec reconnaissance et nouvelle description de *Solea turbynei* Gilchrist, 1904 (Pleuronectiformes : Soleidae).

Solea bleekeri Boulenger, 1898, décrit à partir d'un seul spécimen, n'est pas une espèce valide parce que l'holotype de cette espèce nominale appartient à *Pegusa nasuta* (Pallas, 1814). *Solea turbynei* Gilchrist, 1904 est réhabilité et décrit à nouveau à partir de tous les spécimens connus jusque là sous le nom de *S. bleekeri*. *Solea simonensis* Bonde, 1922, fondé sur un spécimen anormal, est un synonyme junior de *S. turbynei*.

Key words. - Soleidae - *Solea bleekeri* - *Solea turbynei* - Taxonomy - Nomenclature.

Boulenger (1898) described *Solea bleekeri* from a specimen (RMNH 3571) that Bleeker (1863) had previously described under the name *Solea impar*. The description of Boulenger (1898) does not indicate the presence of an enlarged nostril on the blind side, which is a diagnostic trait of *Pegusa* (Chabanaud, 1929; Desoutter-Meniger, 1997) and which is observed on the holotype. Subsequent descriptions of specimens reported to be *S. bleekeri* (see Heemstra and Gon, 1986) do not correspond with features listed in the original description or with our observations made on the holotype of that species. Consequently, the objective of this study was to examine type and non-type material of *Solea bleekeri* and of all other nominal species associated with that name to clarify the status of these species.

MATERIALS AND METHODS

We examined the holotype of *Solea bleekeri* Boulenger, 1898, RMNH 3571, 143 mm SL, Cape of Good Hope, South Africa; syntypes and non-type material of *S. turbynei* (some considered previously as *S. bleekeri* – see list in species description); the holotype of *S. simonensis* von Bonde, 1922, BMNH 1922.3.27.15, 109 mm SL, False Bay,

South Africa and the holotype of *S. impar* Bennett, 1831, BMNH 1852.9.13.163, 156 mm SL. The supracranial portion of the dorsal fin was codified using a 3-digit formula (Chapleau, 1989). The first digit indicates the number of pterygiophores associated with the erisma (first modified pterygiophore). The next digit indicates the number of pterygiophores inserted on the cranium. The last digit gives the number of pterygiophores inserted on the posterior side of the neural spine of the second vertebrae. The angle between ventral and dorsal branches of the urohyal was measured as in Chabanaud (1929) and Desoutter-Meniger (1997).

Meristic and morphometric features examined are: standard length, head length, body depth, eye diameter, snout length, length of pectoral of eyed (e.s.) and blind sides (b.s.), number of dorsal and anal fin rays, number of pectoral and pelvic fin rays of eyed and blind sides, number of lateral line scales in the straight portion, number of precaudal and caudal vertebrae. Methods for meristics and morphometrics follow Hubbs and Lagler (1974) except for eye diameter, which was measured on the ventral eye. All meristic features, except scale counts and number of pectoral and pelvic fin rays, were observed from radiographs. Abbreviations for institutions follow Eschemeyer (1998).

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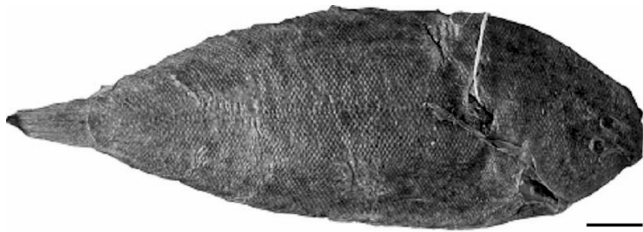


Figure 1. - Holotype of *Solea bleekeri*, Boulenger, 1898. RMNH 3571, 143 mm SL. Scale bar = 15 mm.

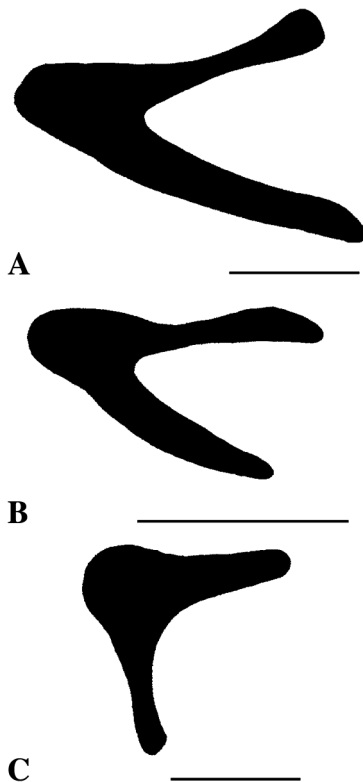


Figure 2. - Urohyals. **A:** *Solea bleekeri*, holotype RMNH 3571, SL = 143 mm; **B:** *Pegusa nasuta*, MNHN 0000-3296, SL = 161 mm; **C:** *Solea turbynei*, syntype SAM 15409, SL = 78 mm. Scale bars = 3 mm.

RESULTS AND DISCUSSION

Examination of the holotype of *Solea bleekeri* Boulenger, 1898 (Fig. 1) confirms that it belongs to *Pegusa* as Bleeker (1863) first pointed out. *Pegusa* species are characterized by the enlarged disc-shaped and fimbriated anterior blind side nostril (see fig. 21 in Chabanaud, 1929; Quéro, 1981). This nostril is a short fleshy tube in most of the other Soleidae, including *Solea* (Quéro, 1981). The two branches of the urohyal in the holotype of *S. bleekeri* (Fig. 2A) have an angle of about 45°, which is also found in *Pegusa* species (Fig. 2B) (Chabanaud, 1928, 1929; Desoutter-Meniger, 1997), while in *Solea*, the angle of the two branches (Fig. 2C) of the urohyal is nearer to 80° (Desoutter-Meniger, 1997). Also, the

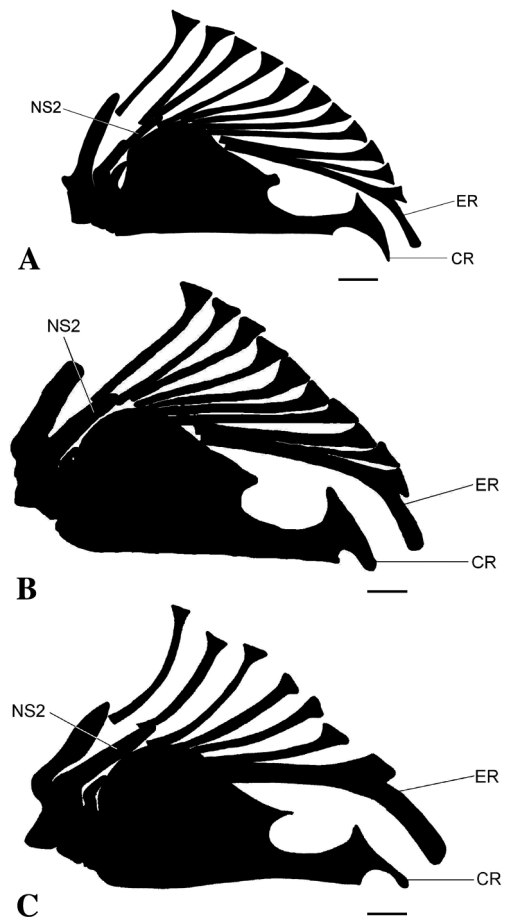


Figure 3. - Supracranial complexes. **A:** *Solea bleekeri*, holotype RMNH 3571, SL = 143 mm; **B:** *Pegusa nasuta*, MNHN 0000-3296, SL = 161 mm; **C:** *Solea turbynei*, syntype SAM 15409, SL = 95 mm. Scale bars = 3 mm. ER: erisma; CR: cranium; NS2: neural spine of second precaudal vertebrae. [Complexe supracrânien. ER : erisme ; CR : crâne ; NS2 : épine neurale de la deuxième vertèbre précaudale.]

holotype has a supracranial formula of 2-5-2 (Fig. 3A), more typical of that of *Pegusa* (Fig. 3B) than of *Solea*, which is usually 1-3-1 (Fig. 3C). Bleeker (1863) pointed out that the specimen did belong to the species *impar*, now placed (Desoutter, 1990; Desoutter-Meniger, 1997) in synonymy with *Pegusa nasuta* (Pallas, 1814). Chabanaud (1927) examined the specimen and suggested that it belonged to *P. lascaris*, but Chabanaud (1929) considered *P. nasuta* as a junior synonym of *P. lascaris*. Based on available evidence, it is concluded that *S. bleekeri* is a junior synonym of *Pegusa nasuta* (Pallas, 1814).

Bleeker (1863) indicated that the holotype of *S. bleekeri* was captured near the Cape of Good Hope (South Africa). Bonde (1922) noted that specimens of *Pegusa impar* had never been captured at this locality. Moreover, no species of *Pegusa* are found in this area (Bonde, 1922; Desoutter-Meniger, 1997). In fact, the southernmost specimen of *Pegu-*

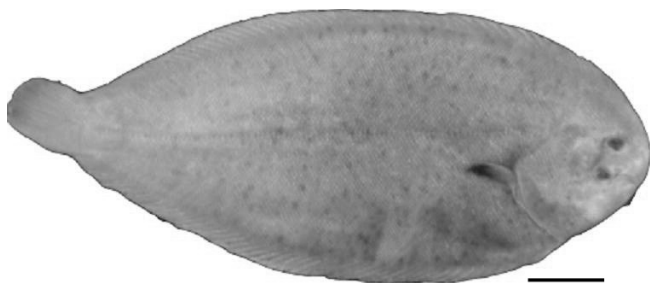


Figure 4. - Syntype of *Solea turbynei*, Gilchrist, 1904. SAM 15409, 95 mm SL. Scale bar = 15 mm.

sa was captured in Angola located some 2,000 km distant from the Cape of Good Hope (Desoutter-Meniger, 1997). The questionable locality data for the holotype of *Solea bleekeri* remains unsolved.

Since *S. bleekeri* is a synonym of *Pegusa nasuta* and the South African specimens belong to a species of *Solea*, this raises the question as to the identity of the specimens that have been traditionally associated with the name *Solea bleekeri*. These specimens show typical characteristics of *Solea*: straight neural spine associated with the second abdominal vertebra, supracranial formula 1-3-1, branches of urohyal nearly at 80° and various meristics are different from the holotype of *Solea bleekeri*. The origin of this confusion stems from the work of Barnard (1925) who synonymized the following nominal species with *Solea bleekeri*: *Solea turbynei* Gilchrist (1904) and *Solea simonensis* Bonde (1922). Barnard (1925) erroneously argued that differences in meristics between these nominal species resulted from size differences between the specimens.

Solea turbynei was described by Gilchrist (1904) based on 12 specimens (syntypes) (Fig. 4) from Mossel Bay and other localities in South Africa. *Solea simonensis* Bonde (1922) was described from one specimen taken at False Bay, Simonstown. Our observations on 46 specimens of *S. turbynei* (including the 12 syntypes) and the holotype of *S. simonensis* indicate that *S. turbynei* is the valid name for specimens that have been traditionally assigned to *S. bleekeri* (see description below). We agree with Barnard (1925) that *S. simonensis* is an abnormal specimen of *S. turbynei* (listed as *S. bleekeri* in his publication). A radiograph of the holotype of *S. simonensis* shows a hypercalcification and compression of centra in the median portion of the vertebral column resulting in a deeper body depth than in a typical *S. turbynei*. Since the unusual body depth is the only character that distinguishes *S. simonensis* from *S. turbynei*, it is suggested that the former nominal species is a junior synonym of the latter.

SOLEA TURBYNEI GILCHRIST, 1904

Solea turbynei Gilchrist, 1904 (Gilchrist (1904) mentions that specimens used for the description of this species are from Mossel Bay, South Africa, and other localities in South Africa). Common name: Blackhand sole.

Solea simonensis Bonde, 1922: 17 (type locality: Simonstown, False Bay, South Africa).

Material examined

South Africa: BMNH 1903.12.31.11, Syntype (1 ex.; 114 mm SL) Mossel Bay; SAM 15409, syntypes (11 ex.; 70-100 mm SL), Mossel Bay and other localities; SAM 15410 (1 ex.; 100 mm SL), Mossel Bay; SAM 25569 (6 ex.; 85-107 mm SL), Knysna Lagoon; SAM 10474 (1 ex.; 81 mm SL), Durban; SAM 16218 (1 ex.; 115 mm SL), Durban; SAM 10480 (1 ex.; 107 mm SL), False Bay; SAM 15411 (1 ex.; 95 mm SL), Amatikulu River; SAM 15412 (1 ex.; 101 mm SL), Cape St Blaize; USNM 326064 (2 ex.; 63-64 mm SL), Eastern Cape Province, Sundays Estuary; USNM 153505 (1 ex.; 83 mm SL), Knysna Estuary; RUSI 58697 (6 ex.; 69-95 mm SL), Cape Boknes Bushman's River Estuary. *Solea simonensis*: BMNH 1922.3.27.15, holotype (1 ex.; 109 mm SL), Simonstown, False Bay.

Mozambique: ANSP 64092 (2 ex.; 44-54 mm SL), Beira; ANSP 77597 (2 ex.; 56-94 mm SL), Delagoa Bay; USNM 286995 (1 ex.; 72 mm SL), South shore of junction of Delagoa Bay and harbor estuary (Espírito Santo) to Lourenço Marques; USNM 286997 (1 ex.; 65 mm SL), South shore of estuary from mouth to opposite port area of Lourenço Marques, Espírito Santo; USNM 286996 (3 ex.; 38-76 mm SL), near Costa del Sol between the landing and West side of Delagoa Bay and about 7 miles N.E. of Lourenço Marques.

Tanzania: SAM 31481 (4 ex.; 92-118 mm LS), 5.9°S-43.2°E.

Diagnosis

A species of *Solea* with the following combination of characters: 61-71 dorsal fin rays, 47-55 anal fin rays, 88-116 lateral line scales, 25-28 caudal vertebrae, rounded snout, scale width half its length, ctenii about one fourth of scale length, small transparent membrane joining base of dorsal and anal fins to base of caudal fin.

Description

Meristic and morphometric characters are indicated in table I. Body oval. Mouth extending posteriorly to a vertical through centre of lower eye; more fleshy and curved on b.s. Lips not fringed. Numerous rows of small pointed teeth present on blind side jaws only. E.s. anterior nostril a thin tube reaching or almost reaching anterior margin of ventral eye; posterior nostril a slit oriented ventrally near anterior margin of ventral eye, at same level as anterior nostril. B.s. anterior nostril a short fleshy tube situated dorsally to midpoint of mouth length; posterior nostril a short tube in line with commissure of mouth, but situated more dorsally than anterior

Table I. - Range of meristic and morphometric characteristics of type and non-type specimens of *Solea bleekeri*, *S. turbynei* and *S. simonensis*. Values in parentheses are mean and standard deviation. BD = Body depth. SL = Standard length. H = Head length. E = Eye diameter. e.s. = Eyed side. b.s. = Blind side. DCP = Depth of caudal peduncle. a: The lateral line scales count for *S. bleekeri* holotype includes an estimation of 6 missing scales because of damaged skin; b: n = 33; c: n = 11. [Caractères méristiques et morphométriques des spécimens types et non types de *Solea bleekeri*, *S. turbynei* et *S. simonensis*. Les valeurs entre parenthèses sont la moyenne et l'écart-type. BD = hauteur du corps, SL = longueur standard. H = longueur de la tête. E = diamètre de l'œil. e.s. = Face oculée. b.s. = Face aveugle. DCP = hauteur du pédoncule caudal. a : Le nombre d'écailles de la ligne latérale pour l'holotype de *S. bleekeri* comprend une estimation de 6 écailles manquantes à cause de la peau endommagée ; b : n = 33 ; c : n = 11.]

	<i>S. bleekeri</i> Boulenger, 1898 holotype	<i>S. bleekeri</i> non-type specimens n = 34	<i>S. turbynei</i> Gilchrist, 1904 syntypes n = 12	<i>S. simonensis</i> Von Bonde, 1922 holotype
Dorsal fin rays	75	61-71(65.9; 2.3)	62-69 (65.7; 1.8)	63
Anal fin rays	58	46-55 (50.2; 4.6) ^b	48-51 (49.9; 1.1) ^c	49
Caudal fin rays	20	19-21 (20.1; 0.3)	20-21 (20.2; 0.4)	20
Pectoral fin rays, e.s.	9	6-8 (7.0; 0.7)	6-7 (6.9; 0.3)	7
Pectoral fin rays, b.s.	9	5-8 (6.8; 0.9)	5-7 (6.2 ; 0.6) ^c	5
Lateral line scales (straight portion)	100 ^a	88-117 (103.7; 8.1)	88-108 (96.6 ; 6.0)	91
Caudal vertebrae	33	25-28 (26.4; 1.2)	25-26 (25.6; 0.5)	26
BD/SL	0.35	0.37-0.42 (0.40; 0.02)	0.36-0.42 (0.40; 0.01)	0.53
H/SL	0.22	0.20-0.25 (0.23; 0.02)	0.23-0.25 (0.24; 0.01)	0.24
E/H	0.15	0.15-0.25 (0.19; 0.03)	0.16-0.22 (0.18; 0.02)	0.16
Pectoral e.s./Pectoral b.s.	1.0	0.93-1.47 (1.09; 0.11)	1.06-1.37 (1.18; 0.08) ^c	1.02
DCP/BD	0.25	0.18-0.26 (0.23; 0.02)	0.20-0.26 (0.23; 0.00)	0.20
Urohyal angle	42	69-90 (78.8; 6.5)	76-91 (79.2; 2.83)	86

nostril. Cirri covering anterior portion of head on b.s. Interorbital space scaly. Dorsal (D), anal (A) and caudal (C) fins scaly. D begins at a horizontal through dorsal margin of dorsal eye. Proportional halves of last ray of A and D joined, respectively, by a thin membrane to bases of ventralmost and dorsalmost caudal fin rays. E.s. and b.s. pectorals (P) nearly equal in length. Scales ctenoid on both sides of body. Supratemporal line not clearly visible on e.s. 9 precaudal vertebrae, 5 b.s. and e.s. pelvic fin rays.

Coloration in alcohol

Pale brown (almost yellowish) to dark grey-brown with a black spot on dorsoposterior margin of e.s. pectoral fin. Darker speckles on body and on D, A and C; less concentrated and generally smaller in middle portion of body. Blind side uniformly whitish, without conspicuous pigmentation.

Distribution

Found in South and East Africa, from about Cape Town, South Africa to Tanzania.

Remarks

Solea turbynei is distinguished from the three Atlantic and Mediterranean congeners, *S. solea* (Linnaeus, 1758), *S. aegyptiaca* Chabanaud, 1927 and *S. senegalensis* Kaup, 1858, by its lower values for meristics (Atlantic-Mediterranean *Solea* species D rays: 65-90, A rays: 53-74, caudal vertebrae: 32-41 and lateral line scales: 104-168; see table I for comparative characters for *S. turbynei*). There are five *Solea*

species in the Indo-Pacific region. *Solea turbynei* is easily distinguished from *S. heinii* Steindachner, 1903, by its more rectangular scales on the e.s. with shorter ctenii. *Solea heinii* has its longest ctenii almost as long as the squared-shaped scale (on the e.s.) while *S. turbynei* has ctenii that fit about four times into the length of the scale. *Solea turbynei* is distinguishable from *S. ovata* Richardson, 1846, by its more elongated shape and generally greater number of D (51-67 for *S. ovata* and 61-72 for *S. turbynei*) and A (39-50 for *S. ovata* and 47-57 for *S. turbynei*) fin rays (Vachon, pers. obs.). *Solea turbynei* differs from *S. elongata* Day, 1877 by the more pointed snout in the latter, by the smaller eyes (with an average of 19% of head length for *S. turbynei*, compared to 25% for *S. elongata*) and the more rectangular scales (width/length = 1/2 for *S. turbynei* and 2/3 for *S. elongata*) (Vachon, pers. obs.). *Solea turbynei* differs from *S. stanalandi* Randall and McCarthy, 1989, by the lack of a brown spot on the b.s. pectoral fin, a shallower body depth (*S. stanalandi* body depth/standard length = 0.4), smaller eyes (*S. stanalandi* eye diameter/head length = 0.22) and generally greater values for D and A fins rays (*S. stanalandi* D: 57-59; A: 46) (Vachon, pers. obs.).

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