Siganus woodlandi, new species of rabbitfish (Siganidae) from New Caledonia

by

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ABSTRACT. - The rabbitfish *Siganus woodlandi*, first identified as *Siganus* sp. by Fourmanoir and Laboute (1976), is described as a new species from three specimens, 204-252 mm standard length, from New Caledonia. It has also been misidentified as *S. argenteus* because of its similarity in colour pattern and caudal-fin shape to this species. It differs principally from *argenteus* in having a deeper body (depth 2.35-2.4 in SL, compared to 2.5-2.95 for *argenteus*), steeper and more concave dorsal head profile, 6-7 instead of 4-6 upper-limb gill rakers, and more suborbital scales. A rabbitfish recently illustrated in Japanese publications as *Siganus* sp. seems to be either *S. woodlandi* or a very closely related species.

RÉSUMÉ. - *Siganus woodlandi*, une nouvelle espèce de poisson-lapin (Siganidae) de Nouvelle-Calédonie.

Le poisson-lapin *Siganus woodlandi*, antérieurement identifié comme *Siganus* sp. par Fourmanoir et Laboute (1976), est décrit comme nouvelle espèce à partir de trois spécimens (longueurs standard comprises entre 204 et 252 mm) de Nouvelle-Calédonie. Il a été aussi confondu avec *S. argenteus* en raison des ressemblances de couleur et de forme de la nageoire caudale chez cette espèce. Il diffère principalement de *S. argenteus* en ayant un corps plus haut (2,35 - 2,4 dans LS comparé à 2,5 - 2,95 pour *argenteus*), un profil dorsal de la tête plus abrupt et plus concave, 6-7 au lieu de 4-6 branchiospines supérieures et plus d'écailles suborbitales. Un poisson-lapin représenté dans des publications japonaises comme *Siganus* sp. semble être soit *S. woodlandi* soit une espèce très proche.

Key words. - Siganidae - *Siganus woodlandi* - New Caledonia - ISW - New species.

The Indo-Pacific fish family Siganidae, popularly known as rabbitfishes, consists of one genus, *Siganus*, two subgenera, and 27 species. In a revision of the family, Woodland (1990) wrote of the difficulty separating related species because of the "remarkable uniformity of the Siganidae". All the species have XIII dorsal spines preceded by a procumbent spine (embedded or with only the tip free), 10 dorsal soft rays, VII anal spines and 9 soft rays, and pelvic fins with an inner and outer spine and three soft rays between. The spines of all the fins are strong, with a groove on each side bearing a venom gland in the distal third. The pectoral-fin rays vary from 15-18; only modal differences in counts may be useful. Scales are small, cycloid, partially embedded, irregularly arranged, and difficult to count. The scale and gill-raker counts vary within a species. Although there may be differences in these counts between species, Woodland wrote, that the variation is usually so great that their ranges overlap too broadly to be of much diagnostic use. In addition, he commented on the dentition, "The teeth are only present in the jaws and their numbers as well as their shapes are, for all practical purposes, identical."

Much reliance in classification has been placed on colour pattern. While many species of *Siganus* are brightly and uniquely coloured, others are drab and may be difficult to separate by colour pattern. The most useful morphological characters have been the shape of the snout (five species with a prolonged, almost tubular snout are classified in the subgenus *Lo*), the body depth, and the shape of the caudal fin.

Fourmanoir and Laboute (1976) included nine species of *Siganus* in their book on the fishes of New Caledonia and the New Hebrides (now Vanuatu). One of these, identified only as *Siganus* sp., is illustrated on p. 217 by a school of light blue fish profusely marked with very small pale yellowish spots and short irregular narrow bands of the same colour. On the preceding page they correctly identified a figure of *Siganus argenteus* (Quoy and Gaimard) in its disruptive nocturnal colour pattern.

Woodland (1990: 39) listed *Siganus* sp. Fourmanoir and Laboute as a synonym of *Siganus argenteus*, perhaps because of the deeply emarginate caudal fin, the similarity in colour pattern, and because both may occur in schools.

In their *Poissons de Nouvelle-Calédonie*, Laboute and Grandperrin (2000: 440) also identified this fish as *Siganus argenteus*. They provided three colour figures: A school of slender individuals and two of single fish (one in night coloration), both distinctly deeper bodied than the fish of the school. The school of fish is correctly identified as *S. argenteus*, but the other two photographs are of a different, deep-

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er-bodied species. The second author and diving associates have observed this species while diving in New Caledonia and at nearby Isle of Pines, but no specimens were collected.

Our colleague Gerard Mou Tham purchased two specimens of *Siganus* sp. in the fish market in Nouméa, New Caledonia, along with a typical large specimen of *S. argenteus*. The second author later obtained a third specimen of *Siganus* sp. from the market in Nouméa. We are finally able to determine that the deeper-bodied fish is a new species of *Siganus*, which is described here.

MATERIALS AND METHODS

Type specimens are deposited in the Bishop Museum, Honolulu (BPBM); Museum national d'histoire naturelle, Paris (MNHN); and National Museum of Natural History, Washington, DC (USNM).

Lengths given for specimens are standard length (SL), the straight-line distance from the front of the upper lip to the base of the caudal fin (posterior end of the hypural plate). Head length is measured from the same median anterior point to the most posterior end of the opercle, and snout length from the same point to the bony edge of the orbit. Body depth is the maximum depth, and body width the greatest width just posterior to the gill opening. Orbit diameter is the greatest bony diameter, and interorbital width the least bony width. Cheek depth is measured vertically from the middle of the lower bony edge of the orbit to the ventral margin of the preopercle. Caudal-peduncle depth is the least depth; caudal-peduncle length is measured horizontally from the rear base of the anal fin to the caudal-fin base. Dorsal and anal-fin spines and rays are measured from the tip to the point where they emerge from the body. Caudal-fin length is measured horizontally from the fin base to a vertical at the tip of the longest ray; caudal concavity is the horizontal distance between verticals at the tips of the longest and shortest caudal rays.

Pectoral-ray counts include the uppermost rudimentary ray. The scales of the longitudinal scale series were counted just above the lateral line from the upper end of the gill opening to the base of the caudal fin. Scales above the lateral line were counted to the base of the middle dorsal spines. Gill-raker counts were made on the first gill arch; the upper-limb count is given first, and the raker at the angle is contained in the lower-limb count.

Proportional measurements are presented in table I as percentages of the standard length; those in the text are rounded to the nearest 0.05. Data in parentheses in the description refer to paratypes if different from those of the holotype.

SIGANUS WOODLANDI SP. NOV.

(Figs. 1-3; Tab. I)

Material examined

Holotype. - BPBM 39143, female, 204 mm, New Caledonia, fish market in Nouméa, M. Kulbicki, 5 April 2003.

Paratypes.- MNHN 2004-1197, female, 234 mm, New Caledonia, fish market in Nouméa, G. Mou Tham, 22 May 2003; USNM 377117, female, 252 mm, same data as preceding.

Diagnosis

Pectoral rays 17-18; scale rows above lateral-line 20-23; gill rakers 6-7 + 17-18; body depth 2.35-2.4 in SL; head length 4.1-4.4 in SL; dorsal profile of head from above front of eye to tip of recumbent dorsal spine concave; snout length 2.4-2.6 in head length; longest dorsal spine 2.05-2.1 in head length; caudal fin deeply emarginate, the caudal concavity 1.35 in head length; head and body light blue in life, with many small pale yellowish spots and very irregular narrow yellow bands, resulting in a fine reticular pattern for most of head and body.

Table I. - Proportional measurements of type specimens of *Siganus woodlandi* as percentages of the standard length. *[Mesures proportionnelles des spécimens types de* Siganus woodlandi *en pourcentages de la longueur standard.]*

	Holotype	Paratypes	
	BPBM 39143	MNHN 04-1197	USNM 377117
Standard Length (mm)	204	234	252
Body depth	42.6	42.5	42.0
Body width	13.1	12.3	13.9
Head length	24.0	24.3	22.8
Snout length	9.5	9.8	8.8
Orbit diameter	8.3	7.5	6.6
Interorbital width	6.9	6.9	6.7
Cheek depth	6.9	7.2	7.5
Upper-jaw length	6.8	6.9	6.2
Caudal-peduncle depth	4.7	5.5	5.5
Caudal-peduncle length	11.0	10.5	11.2
Predorsal length	28.3	27.8	27.5
Preanal length	51.9	52.2	50.4
Prepelvic length	32.2	32.5	30.5
First dorsal spine	7.7	7.4	7.0
Longest dorsal spine	11.3	11.5	11.1
Longest dorsal ray	9.7	10.2	10.2
First anal spine	8.1	7.7	8.0
Longest anal spine	10.3	10.2	10.4
Longest anal ray	8.3	8.6	8.7
Caudal-fin length	28.2	29.3	broken
Caudal concavity	17.6	17.9	--
Pectoral-fin length	17.7	17.2	15.4
First pelvic spine	11.8	11.2	12.3
Longest pelvic ray	12.5	12.4	12.5

Description

Dorsal rays XIII,10, preceded by a procumbent spine; anal rays VII,9; pectoral rays 17 (17-18); pelvic rays I,3,I; principal caudal rays 16, the middle 14 branched; upper procurrent caudal rays 10; lower procurrent caudal rays 11; scales in longitudinal series 243 (253-281); scales above lateral line 22 (20-23); gill rakers 6 + 18 (6-7 + 17); vertebrae 23.

Body ellipsoidal, the depth 2.35 (2.35-2.4) in SL; body compressed, the width 3.25 (3.0-3.45) in depth; head length 4.15 (4.1-4.4) in SL; snout length 2.5 (2.4-2.6) in head length; dorsal profile of head from base of upper lip to above posterior nostril straight, becoming convex to above front of orbit, then concave to tip of procumbent dorsal spine; orbit diameter 2.9 (3.25-3.45) in head length; interorbital space slightly concave medially and strongly rounded at edges, the least width 3.5 (3.05-3.4) in head length; cheek depth 3.5 (3.05-3.4) in head length; caudal-peduncle depth 5.1 (4.15-4.4) in head length; caudal-peduncle length 2.2 (2.05-2.3) in head length.

Mouth small, nonprotrusible, slightly ventral, and a little oblique; upper-jaw length 3.55 (3.5-3.7) in head length; upper part of maxilla fitting beneath ventral edge of preorbital; teeth incisiform, slender, close-set, and asymmetrically tricuspid, the main cusp strongly pointed; the lateral cusp tiny, and the medial one still smaller and more basal; upper jaw with 33 (32-36) teeth, and lower jaw with 32 (33-38) teeth; upper teeth overlapping lower teeth when mouth closed; no teeth on vomer or palatines. Upper lip thin, without a flap; lower lip more fleshy, with a flap of uniform width its entire length. Gill rakers small, about one-sixth length of longest gill filaments, all but the first and last branched.

Posterior preopercular margin free to level of upper edge of upper lip; ventral preopercular margin extending forward to a vertical at posterior end of maxilla; preopercular angle (as defined by Woodland, 1990) about 85°.

Posterior nostril small and triangular, on or slightly above level of centre of eye; a line connecting anterior and posterior nostrils projecting to upper bony edge of orbit; anterior nostril with a low fleshy rim and a thin dorsoposterior flap that reaches posterior nostril when laid back, the aperture slightly more than half distance from bony edge of orbit to median edge of snout at base of upper lip; internarial distance about half pupil diameter.

Scales cycloid, very small, and only slightly overlapping; head naked except for a band of small scales on suborbital region from behind corner of mouth to below posterior edge of pupil, with 8 horizontal scale rows at its broadest point; no median ventral prepelvic scales; no scales on fins except basally on nearly half of caudal fin (measured on shortest middle rays; scales do not extend farther out on lobes of fin).

Origin of dorsal fin (not the procumbent spine) above posterior edge of opercle, the predorsal length 3.55 (3.5) in SL; dorsal and anal spines alternating left and right of midline; first dorsal spine 3.1 (3.25-3.3) in head length; third to fifth dorsal spines longest, 2.1 (2.05-2.1) in head length; dorsal soft rays branched at about half their length; each branch dividing a second time (except the first); second dorsal ray longest, 2.5 (2.25-2.4) in head length; origin of anal fin below base of seventh dorsal spine, the preanal length 1.9 (1.9-2.0) in SL; first anal spine 2.95 (2.85-3.15) in head length; third anal spine longest, 2.35 (2.2-2.4) in head length; anal soft rays branched like dorsal rays, but some posterior rays with one branch dividing again (thus six free tips at ray end); longest anal soft ray 2.9 (2.85-2.9) in head length; caudal fin deeply emarginate (appears forked when not spread), 3.55 (3.4) in SL, the caudal concavity 1.35 in head length; first two and last two pectoral rays unbranched; third and fourth pectoral rays longest, 1.35 (1.4-1.5) in head length; origin of pelvic fins distinctly posterior to base of pectoral fins, the prepelvic length 3.1 (3.1-3.3) in SL; outer pelvic spine longer than inner spine, 2.05 (1.85-2.15) in head length; first pelvic soft ray longest, 1.9 (1.8-1.95) in head length.

Colour of holotype in alcohol: Brown, mottled with darker brown, with indistinct pale spots and variable bands over abdominal region; narrow dark brown bands on head, mostly horizontal; edge of gill opening with a dark brown band, broadest and most conspicuous from behind most posterior point of opercle to origin of lateral line; dorsal fin with brown spines and rays, cross banded with dark brown, the membranes translucent except for scattered large dark brown spots, especially on first three membranes of spinous portion of fin, and a triangular dark brown spot behind base of each spine and ray (more conspicuous behind spines than rays); caudal fin grey-brown with faint irregular transverse lighter bands; pectoral fins pale yellowish with a brown spot at base, the pigment extending a short distance out on each ray; pelvic fins with dark brown spines and rays, the membranes translucent with large dark brown spots.

Colour of holotype when fresh shown in figure 1. The four distinct small white spots above the lateral line are not found on the other side of the specimen, and they are not on the paratypes.

Colour in life, as seen in the underwater photographs of Fourmanoir and Laboute (1976: 217, left figure) and Laboute and Grandperrin (2000: 440, upper right figure, reproduced here as Fig. 2): body light blue with numerous, small, close-set, pale yellowish spots and irregular narrow bands, the bands forming a reticular or vermiculate pattern; yellowish spots larger on and preceding caudal peduncle and basally on caudal fin; head with reticular pattern dominating, the yellowish markings more yellow and broader than on body; a conspicuous black band at upper end of gill opening; soft portions of dorsal and anal fins with blue and yellow rays and transparent membranes; unscaled part of caudal fin yel-

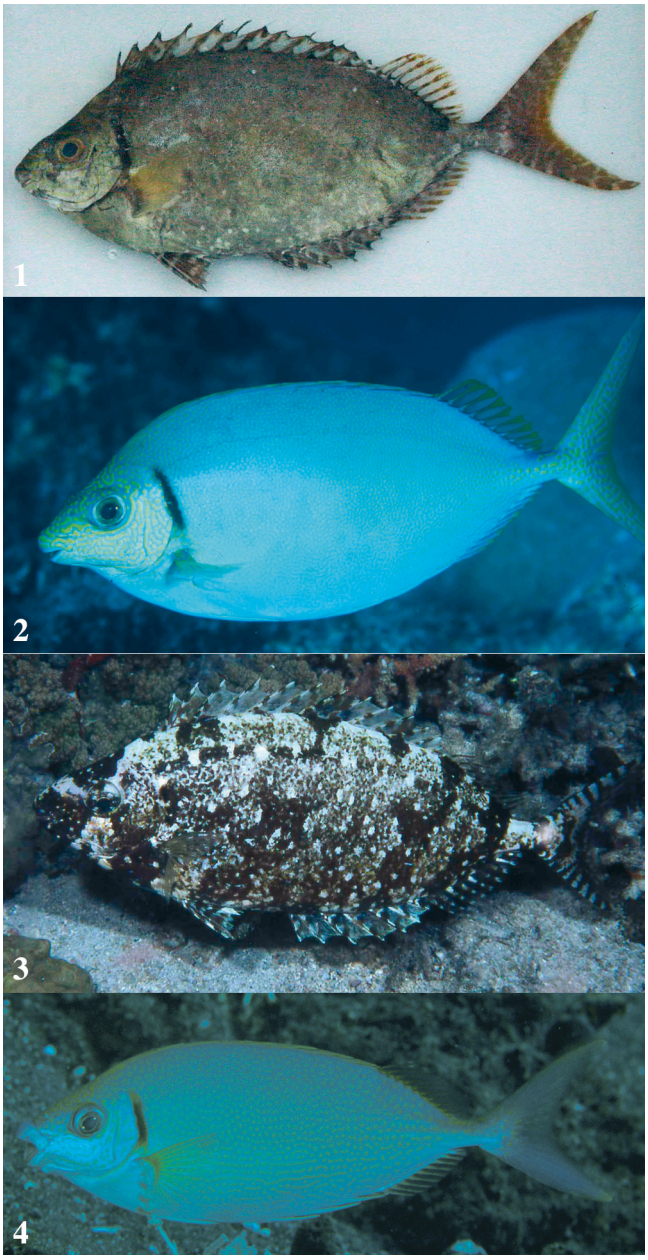

Figure 1. - Holotype of *Siganus woodlandi*, BPBM 39143, 204 mm SL, New Caledonia (Photo M. Kulbicki).

Figure 2. - Underwater photograph of *Siganus woodlandi*, New Caledonia (Photo P. Laboute). *[Photo sous-marine de* Siganus woodlandi, *Nouvelle-Calédonie (Photo P. Laboute).]*

Figure 3. - Underwater photograph of *Siganus woodlandi* at night, New Caledonia (Photo P. Laboute). *[Photo sous-marine, de nuit, de* Siganus woodlandi, *Nouvelle-Calédonie (Photo P. Laboute).]*

Figure 4. - Underwater photograph of small adult of *Siganus argenteus*, Bali (Photo J. Randall). *[Photo sous-marine d'un jeune adulte de* Siganus woodlandi, *Bali (Photo J. Randall).]*

low with transverse blue bands on lobes; pectoral fins with yellow rays, transparent membranes, and a curved blue band at base. The second figure of Laboute and Grandperrin (2000: 440, reproduced here as Fig. 3) shows the strikingly different night colour pattern of mottled bluish white and dark brown.

We have included an underwater photograph of *Siganus argenteus* taken in Bali (Fig. 4) so that the diurnal colour of this species can be compared with that of the new species.

Etymology

It is with pleasure that we name this species in honour of David J. Woodland of the University of New England, New South Wales, in recognition of his systematic research on the Siganidae.

Remarks

It seems clear that Fourmanoir and Laboute (1976) recognized this species as distinct when they identified it only as *Siganus* sp., following their account of *S. argenteus*. They noted the more perfectly oval body and the "pigmentation très discrète". The species was encountered in schools on the outer border of the barrier reef. They apparently had no specimens.

Woodland's decision to treat *Siganus* sp. of Fourmanoir and Laboute as a synonym of *S. argenteus* is understandable in view of his having no specimens of the former, a colour pattern otherwise known only in *argenteus*, the deeply emarginate caudal fin, and the occurrence in schools.

With three specimens for our study, we find the body depth of 2.35-2.4 in SL to be obviously greater than that of *argenteus*, 2.6-2.95 in SL. Another consistent difference is the size of the suborbital scaled area behind the mouth. It does not extend beyond a vertical at the front edge of the orbit in *argenteus*, but it reaches to below the rear edge of the pupil in *woodlandi*. Still another scale difference is the absence of any scales midventrally before the pelvic fins of *woodlandi*, in contrast to a few scales in a narrow band anterior to the pair of bony ridges that precedes the pelvic fins of *argenteus*.

The only meristic difference we found was the number of upper-limb gill rakers, 6-7 for *woodlandi*, compared to 4-6 (usually 5) for *argenteus*.

The dorsal and anal soft rays of *woodlandi* generally have more branches when compared to specimens of *argenteus* of about the same size.

A species of rabbitfish has been illustrated in colour in Japanese publications as *Siganus* sp. that appears to be either *Siganus woodlandi* or a very close relative (Masuda and Kobayashi, 1994: 380; Okamura and Amaoka, 1994: 634; cover photo of *I.O.P. Diving News* of February, 1997; and Okamoto *et al*., 2001). The illustrations are all underwater photographs except one photograph of a 264-mm specimen (Fig. 1 of Okamoto et Amaoka, 1997) collected at Okirai Bay, Sanriku, Iwate Prefecture, Japan. The authors noted that

this is the northernmost record of the species.

Some differences seem evident from comparing figure 1 of Okamoto *et al*. (2001) to our material of *S. woodlandi*. The fins are much more yellow on the former, the dorsal and anal spines seem shorter, and the front of the upper lip seems narrower.

Although Fourmanoir and Laboute (1976) reported the habitat of this species at New Caledonia as outside the barrier reef, the second author and associates have found it mainly in the southern lagoon in clear water near the barrier reef. It was seen at depths of about 5-15 m, hence generally deeper than *S. argenteus*. It was encountered mainly in schools of about 10 to 100 individuals moving from 1-3 m above the bottom. On a few occasions individuals seemed to be feeding in the water column, presumably on zooplankton. However, the long digestive tracts of our type specimens are filled with benthic algae. The presumed feeding above the substratum on zooplankton may only be opportunistic. When zooplankton is abundant, we have seen normally herbivorous acanthurid and scarid fishes move off the bottom to feed on it. Our observations of *S. woodlandi* occurring in schools may be the result of the species being most conspicuous at this time. We suspect that these schools are feeding aggregations like those one sees in some other herbivorous fishes such as the sea chub *Kyphosus bigibbus* and the surgeonfish *Acanthurus triostegus* that use their group numbers to overcome the territorial defences of resident herbivores such as damselfishes of the genus *Stegastes*.

The second author observed a small school of what he believed to be *Siganus woodlandi* off Lakeba, Vanua Levu, Fiji in 3 m in June, 2003. No specimens or photographs were taken, so this observation needs confirmation.

Material examined of *Siganus argenteus*

New Caledonia, BPBM 39145, 259 mm. Vanuatu, BPBM 1068, 270 mm. Solomon Islands, BPBM 16218, 224 mm. Palau, BPBM 15033, 2: 202-207 mm. Mariana Islands, BPBM 214, 228 mm. Marshall Islands, BPBM 18410, 248 mm. Rapa, BPBM 13025, 172 mm. Tuamotu Archipelago, BPBM 13498, 223 mm.

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