

Tetraodontiform fishes, mostly from deep waters, of New Caledonia

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ABSTRACT

A study of the tetraodontiforms collected mainly from deep water off New Caledonia by ORSTOM resulted in finding many significant range extensions and numerous specimens of several poorly known species, especially of spikefishes and boxfishes. The New Caledonian collections include 20 species of tetraodontiforms: six of Triacanthodidae, five of Monacanthidae, one of Aracanidae, one of Ostraciidae, one of Triodontidae, and six of Tetraodontidae. Two especially poorly known species of triacanthodids, *Paratriacanthodes retrospinis* and *Triacanthodes intermedius*, are described in detail on the basis of many specimens. The monacanthid *Thamnaconus fijiensis*, hitherto only known from the holotype, is recorded for the first time from outside the type locality. The rarely collected boxfish *Kentrocapros flavofasciatus*, which has been known only from the China seas and Japan, is recorded for the first time from the south Pacific, and this suggests that this species is antitropical in distribution.

RÉSUMÉ

Tétraodontiformes, principalement des eaux profondes, de Nouvelle-Calédonie.

L'étude des Tétraodontiformes récoltés par l'ORSTOM dans les eaux profondes de Nouvelle-Calédonie a permis d'étendre notablement les aires de distribution de nombreuses espèces et de récolter plusieurs spécimens d'espèces peu connues, notamment des poissons-tridents et des poissons-coffres. Cette collection de Nouvelle-Calédonie comprend 20 espèces de

Tétraodontiformes: six Triacanthodidae, cinq Monacanthidae, une espèce d'Aracanidae, une espèce d'Ostraciidae, une espèce de Triodontidae, et six Tetraodontidae. Deux espèces de Triacanthodidae particulièrement peu connues, *Paratriacanthodes retrospinis* et *Triacanthodes intermedius*, sont décrites en détail à partir de nombreux spécimens. Le poisson-bourse *Thamnaconus fijiensis*, connu jusqu'à présent par son holotype, est signalé pour la première fois en dehors de sa localité-type. Le poisson-coffre rarement récolté *Kentrocapros flavofasciatus*, qui n'était connu que des mers de Chine et du Japon, est signalé pour la première fois dans le Pacifique Sud, ce qui suggère une distribution antitropicale pour cette espèce.

INTRODUCTION

The deep-water fish collections made by ORSTOM in the waters around New Caledonia obtained an excellent series of tetraodontiform fishes, with many significant range extensions and numerous specimens of several poorly known species, especially of Triacanthodidae and Aracanidae. The number of species of tetraodontiforms represented is 20; six of Triacanthodidae, five of Monacanthidae, one of Aracanidae, one of Ostraciidae, one of Triodontidae, and six of Tetraodontidae. We take this opportunity to describe in detail the poorly known species and comment on morphological variation, distribution records, and ecological information for other species.

METHODS

Counts and measurements follow the conventions in TYLER (1968) and MATSUURA (1982) for the Triacanthodidae, MATSUURA (1980) for the Monacanthidae, MATSUURA and YAMAKAWA (1982) for the Aracanidae and Ostraciidae, TYLER (1968) for the Triodontidae, and DEKKERS (1975) for the Tetraodontidae. Fin-ray counts include all elements visible externally, even if short (e.g., uppermost pectoral-fin ray) or rudimentary (e.g., posterior dorsal-fin spines and pelvic-fin rays in some triacanthodids and all dorsal-fin spines in triodontids). However, in monacanthids the uppermost rudimentary pectoral-fin ray is excluded from the count. Body length is standard length (SL) unless otherwise specified. Length is recorded to tenths of mm only for sizes under 100 mm. Caudal-fin counts are not mentioned unless they are at variance with the familial norm. Fin-ray counts have the modal value followed in parentheses by any variation in the count among the materials examined, unless a more detailed account of variation is given. A full account of the station data for the various ORSTOM deep-water cruises off New Caledonia between 1978-1989 is given in RICHER DE FORGES (1990), supplemented with the data for ORSTOM's BERYX cruises of 1991-1992 in GRANDPERRIN and LEHODEY (1992) and LEHODEY *et al.* (1993). Specimens are deposited in the collections of Muséum national d'Histoire naturelle, Paris (MNHN), Museum of New Zealand Te Papa Tongarawa (NMNZ) and National Science Museum, Tokyo (NSMT).

SYSTEMATIC ACCOUNT

Family TRIACANTHODIDAE

The Triacanthodidae is one of the few families of tetraodontiforms that occur primarily in deep water, usually in waters deeper than 100 m (but with one western Atlantic species occasionally taken as shallow as about 40 m; TYLER, 1968: 85). It is the most speciose of the deep-water groups of tetraodontiforms and is well represented in the ORSTOM collections from New Caledonia. The other primarily deep-water families of tetraodontiforms are the Aracanidae and the monotypic Triodontidae, both also represented in these ORSTOM collections.

Triacanthodids occur in the western Atlantic, Indian and western Pacific oceans, as well as a single species in the central Pacific at Hawaii (*Hollardia goslinae*). In the western Pacific nearly all records of capture are from Japan and China through the Philippines and Indonesia, with discoveries only recently from off the east coast of Australia (MATSUURA & PAXTON, MS). There are only two records of triacanthodids from the south-western

Pacific to the east of Australia: *Triacanthodes ethiops* and *T. intermedius* from New Caledonia (MATSUURA & FOURMANOIR, 1984); and *Macrorhamphosodes uradoi* from New Zealand (MATSUURA, 1987; STEWART & CLARK, 1988). The ORSTOM collections of triacanthodids greatly extend the ranges of several other species into the south-western Pacific, along with new size and depth records. These collections confirm the suggestion by MATSUURA (1987) that the scarce records of triacanthodids in the south Pacific are due to lack of extensive collections there, and that expeditions such as those of ORSTOM in deep water off New Caledonia have a high probability of collecting additional species of triacanthodids.

Genus *BATHYPHYLAX* Myers, 1934

Bathyphylax bombifrons Myers, 1934

Fig. 1

Bathyphylax bombifrons Myers, 1934: 10, fig. 1 (Hong Kong).

MATERIAL EXAMINED. — 3 specimens.

Chesterfield and Bellona Plateaus. MUSORSTOM 5: stn CC 383, 19°40.85'S, 158°46.10'E, 600-615 m depth, otter trawl, R. V. "Coriolis", 21 October 1986: 3 specimens, 86.2-93.0 mm SL (MNHN 1995-529) (photograph of all three specimens in Fig. 1).

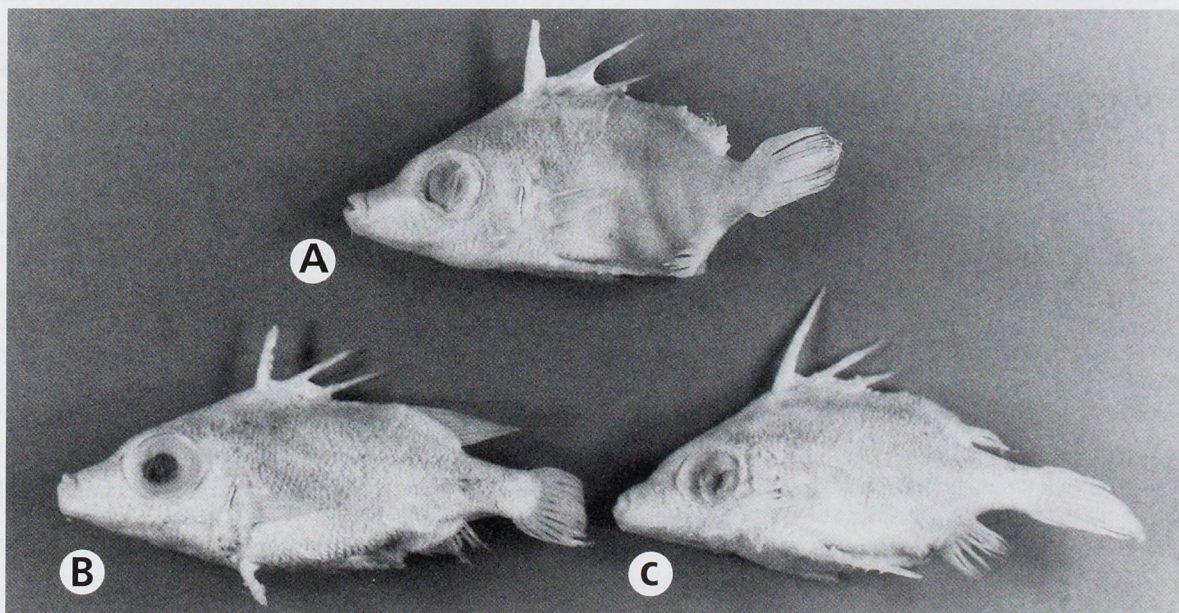


FIG. 1. — *Bathyphylax bombifrons*, MUSORSTOM 5, stn CC 383, all 3 specimens. A, B, C: 92.7 mm, 93.0 mm and 86.2 mm SL (MNHN 1995-529).

DESCRIPTION. — Meristics. Dorsal VI (last four short), 13; anal 12 (11); pelvic I, 1 (ray short; ray absent on both sides in specimen of 92.7 mm SL); pectoral 13; teeth in upper jaw 18-21; teeth in lower jaw 24-25; total gill rakers 20-23; lamellae in pseudobranch 12-16 (reaching ventrally to level of top of pectoral-fin base).

Because only five specimens (70.9-84.0 mm SL) of this species have been known previously, we record the following measurements for the three newly collected and slightly larger specimens in order to help clarify the mostly minor differences in morphometrics between *B. bombifrons* and its only congener, *B. omen* (the latter known on the basis on three specimens, 37.5-93.4 mm SL).

Head length 37.1-38.2% SL; snout length 13.8-14.6% SL; snout depth midway between the tips of the teeth and the anterior edge of the orbit (depth of middle of snout) 11.7-11.9% SL; mouth width 6.6-7.1% SL; orbit diameter 14.6-16.1% SL; postorbital length 6.8-8.4% SL; body depth 35.4-38.4% SL; pelvic width 10.7-12.4% SL; pelvic length 33.8-36.0% SL; ratio of pelvic width into pelvic length 2.7-3.3.

When the two species of *Bathyphylax* were first contrasted, the main features of difference between *B. bombifrons* and *B. omen* were thought to be that the former has a narrower pelvis, a shorter postorbital portion of the head, a less distinctly supraternal mouth, perhaps a few more teeth in each jaw, and a much more concave snout profile (TYLER, 1966, 1968). Some of these differences were thought to be due in part to the size difference between the holotypes of *B. bombifrons* (77.6 mm SL, from South China Sea off Hong Kong) and *B. omen* (37.5 mm SL, from western Indian Ocean off Kenya). When four additional specimens (70.9-84.0 mm SL) of *B. bombifrons* and two additional specimens (67.0-93.5 mm SL) of *B. omen*, all from off Kenya, were compared with the holotypes (TYLER, 1983), it became evident that: the width of the pelvis and length of the postorbital portion of the head both decreased with increasing specimen size and that these proportions were similar in the larger specimens of both species; the mouth was about equally slightly supraternal in both species; and the teeth were of similar number in both species. The difference in the concavity of the snout became the main distinguishing feature between the two species, along with a possible difference in the color pattern observed in the holotypes. The greater concavity of the snout in *B. bombifrons* was quantified by the measurement of the depth of the snout in the middle of its length, being 10.8-13.4% SL (average 12.0) in *B. bombifrons* and 12.5-15.5% SL (average 13.9) in *B. omen*.

The three specimens of *Bathyphylax* from New Caledonia have the distinctly concave snout typical of *B. bombifrons*, with middle of snout depth measurements of 11.7% SL in one specimen and of 11.9% SL in the other two specimens. Additionally, one of these specimens has enough remains of a color pattern for it to be sure that the lowermost dark stripe on the body, which begins behind the eye and courses over the pectoral-fin base, curves distinctly downward toward the anus and anal-fin origin, as in the holotype of *B. bombifrons* and in contrast to the condition in the holotype of *B. omen*, in which this stripe does not curve distinctly downward but, rather, continues along the body toward the end of the anal-fin base. On the basis of the deeply concave snout profile and coloration, we are confident that the New Caledonian specimens represent *B. bombifrons*.

The three New Caledonian specimens of *B. bombifrons* have 13 dorsal-fin rays while the other five specimens have 14 (as do all specimens of *B. omen*), which difference we attribute to either small sample size or intraspecific variation, perhaps between populations in the Indian Ocean and western Pacific. All of the other meristic features of the New Caledonian specimens are within the norm of both species of *Bathyphylax*.

The scales in the relatively large New Caledonian specimens have six to eight upright spinules per scale plate, a few of which are branched distally, with occasional supplemental spinules irregularly placed to the main vertical row, about the norm for specimens of about this size in both species of *Bathyphylax*.

DISTRIBUTION. — South China Sea, Chesterfield and Bellona Plateaus.

REMARKS. — The 93.0 mm SL specimen is a male and the other two specimens females, the 92.7 mm SL female being especially ripe.

The single station at which *Bathyphylax bombifrons* was collected also yielded *Macrorhamphosodes uradoi*.

Genus *HALIMOCHIRURGUS* Alcock, 1899*Halimochirurgus alcocki* Weber, 1913

Figs 2-3

Halimochirurgus alcocki Weber, 1913: 571, pl. 9, fig. 6.

MATERIAL EXAMINED. — 11 specimens.

New Caledonia. CHALCAL 2: stn CH 7, 29°55.50'S, 168°21.10'E, 494-590 m depth, otter trawl, R. V. "Coriolis", 28 October 1986: 2 specimens, 208 mm SL for the specimen in which the tubular snout is intact (MNHN 1994-596) (photographs of this specimen in Figs 2-3); the other specimen has the end of the snout missing, but, on the basis of the size of the body behind the eye, it is slightly larger than the preceding specimen, approximately 215 mm SL (MNHN 1994-597).

MUSORSTOM 4: stn CP 155, 18°52.80'S, 163°19.50'E, 500-570 m depth, beam trawl, R. V. "Vauban", 15 September 1985: 1 specimen, 122 mm SL (MNHN 1994-624). — Stn CP 216, 22°59.50'S, 167°22.00'E, 490-515 m depth, beam trawl, 29 September 1985: 1 specimen, 135 mm SL (MNHN 1994-591).

BERYX 2: stn 5, 24°54.4'S, 168°21.60'E (Seamount "B"), 535-545 m depth, otter trawl, R. V. "Alis", 24 October 1991: 1 specimen, 183 mm SL (NMNZ-P.27448).

BERYX 11: stn C3, 24°56.60'S, 168°21.25'E (seamount "B"), 502-610 m depth, otter trawl, R. V. "Alis", 14 October 1992: 3 specimens, 185-216 mm SL (NMNZ-P.29406). — Stn C29, 23°40.50'S, 167°44.20'E (Stylaster Seamount), 440-480 m depth, otter trawl, 18 October 1992: 1 specimen, 212 mm SL (NMNZ-P.29277). — Stn C 30, 23°36.85'S, 167°42.15'E (Stylaster Seamount), 420-470 m depth, 18 October 1992: 1 specimen, 198 mm SL (NMNZ-P.29173). — Stn CP 51, 23°44.5'S, 168°16.70'E (Jumeaux Seamount), 390-400 m depth, beam trawl, 21 October 1992: 1 specimen, 83.4 mm SL (NMNZ-P.29347).

DESCRIPTION. — Meristics. Dorsal VI (last four spines short), 14 (13); anal 12 (13); pelvic I, 1 (ray short and not visible externally in one specimen); pectoral 13.

There are three to about 14 small conical teeth in the upper and lower jaws of all but two of the 11 specimens, as is typical for this species (TYLER, 1968: 197), with the upper jaw teeth usually slightly smaller than those of the lower jaw. Two of the specimens have exceptional dentition or jaws. One of these, 212 mm SL, has especially well developed and numerous teeth, about 16 in both the upper and lower jaws and with some of them irregularly placed internal to the main series. The other, 208 mm SL, has no teeth evident externally along the relatively firm and smooth gum in either jaw, while the bones in the jaws are immovably bound together in a circular opening (Fig. 3), with the mouth far more rigid than previously known for this species, based on smaller specimens examined. Consolidation (fusion?) of the jaw bones in the small narrow mouth apparently is an occasional condition among larger specimens of this species.



FIG. 3. — *Halimochirurgus alcocki* Weber, 1913, CHALCAL 2, stn CH 7, dorsal view of inflexible mouth of specimen with consolidated bones: 208 mm SL (MNHN 1994-596).

In contrast to the two species of *Macrorhamphosodes*, in which the mouth becomes twisted to one side or the other with increasing specimen size, the mouth remains straight in all previously reported specimens of the two species of *Halimochirurgus*. However, in the 208 mm SL specimen of *H. alcocki* with the unusually inflexible mouth, the mouth is twisted to the left about 20°, an additional unusual feature of this specimen; the frequency of occurrence of this snout twisting and jaw inflexibility among larger specimens of this species remains to be seen.

DISTRIBUTION. — Japan to East Africa.

REMARKS. — The largest specimen of this species previously recorded with precision is 165 mm SL by TYLER (1968), with MATSUURA (1984) giving 170 mm SL as the maximum standard length, although TOMIYAMA and ABE (1958) state that it reaches about 200 mm total length. The two specimens of 212 mm SL (233-238 mm total length) and that of 216 mm SL (245 mm total length) are larger than any previously reported specimens of *H. alcocki*, variously as 165 mm SL (TYLER, 1968), 170 mm SL (MATSUURA, 1984), or about 200 mm TL (TOMIYAMA & ABE, 1958).

One specimen, 212 mm SL, is a ripening female, and four others, 185-216 mm SL, appear to be males with well-developed testes. Nothing was apparent in the alimentary canal.

Halimochirurgus alcocki was collected sympatrically with other triacanthodids at the following ORSTOM stations: with *Macrorhamphosodes uradoi* at CHALCAL 2, stn CH 7 and at BERYX 11, stn C 30; with *Paratriacanthodes retrospinis* at MUSORSTOM 4, stn CP 216; and with both *M. uradoi* and *P. retrospinis* at BERYX 2, stn 5 and BERYX 11, stn C 29.

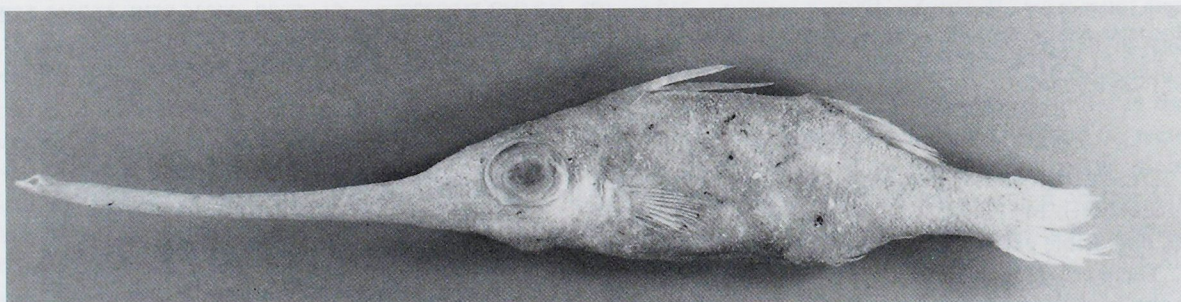


FIG. 2. — *Halimochirurgus alcocki* Weber, 1913, CHALCAL 2, stn CH 7, 1 of 2 specimens: 208 mm SL (MNHN 1994-596).

Genus *MACRORHAMPHOSODES* Fowler, 1934

Macrorhamphosodes uradoi (Kamohara, 1933)

Figs 4-5

Halimochirurgus uradoi Kamohara, 1933: 392, figs 1-3 (Japan).

MATERIAL EXAMINED. — 20 specimens.

New Caledonia. BIOCAL: stn CP 67, 24°55.44'S, 168°21.55'E, 500-510 m depth, beam trawl, R. V. "Jean Charcot", 3 September 1985: 1 specimen, 46.2 mm SL (MNHN 1994-635) (photograph in Fig. 4).

MUSORSTOM 4: stn CC 201, 18°55.80'S, 163°13.80'E, 500 m depth, otter trawl, R. V. "Vauban", 20 September 1985: 1 specimen, 110 mm SL (MNHN 1994-634). — Stn CC 202, 18°58.00'S, 163°10.50'E, 580 m depth, otter trawl, 20 September 1985: 1 specimen, 85.5 mm SL (NSMT-P.46810, ex-MNHN 1994-633).

CHALCAL 2: stn CH 7, 29°55.50'S, 168°21.10'E, 494-590 m depth, otter trawl, R. V. "Coriolis", 28 October 1986: 2 specimens, 178-211 mm SL (MNHN 1994-598 & 599) (photograph of both specimens in Fig. 5). — Stn CC 1, 24°54.96'S, 168°21.91'E, 500-580 m depth, otter trawl, 28 October 1986: 2 specimens, 148-157 mm SL (MNHN 1994-594 & 595). — Stn CC 2, 24°55.48'S, 168°21.29'E, 500-610 m depth, otter trawl, 28 October 1986: 1 specimen, 80.0 mm SL (MNHN 1994-621).

BERYX 2: stn 5, 24°54.40'S, 168°21.60'E (Seamount "B"), 535-545 m depth, otter trawl, R. V. "Alis", 24 October 1991: 4 specimens, 111-185 mm SL (NMNZ-P.27447). — Stn 16, 23°35.60'S, 169°36.52'E (Seamount « D »), 660-675 m depth, otter trawl, 29 October 1991: 3 specimens, 131-156 mm SL (NMNZ-P.27497).

BERYX 11: stn C28, 23°36.85'S, 167°41.85'E (Stylaster Seamount), 430-490 m depth, otter trawl, R. V. "Alis", 18 October 1992: 1 specimen, 160 mm SL (NMNZ-P.29252). — Stn C29, 23°40.50'S, 167°44.20'E (Stylaster Seamount), 440-480 m

depth, otter trawl, 18 October 1992: 1 specimen, 108 mm SL (NMNZ-P.29278). — Stn C30, 23°36.85'S, 167°42.15'E (Stylaster Seamount), 420-470 m depth, otter trawl, 18 October 1992: 2 specimens, 114-123 mm SL (NMNZ-P.29174).

Chesterfield and Bellona Plateaus. MUSORSTOM 5: stn CC 383, 19°40.85'S, 158°46.10'E, 600-615 m depth, otter trawl, R. V. "Coriolis", 21 September 1986: 1 specimen, 128 mm SL (MNHN 1994-631).

DESCRIPTION. — Meristics. Dorsal VI (last three spines short), 14 (13-15); anal 13 (12-14); pelvic I, 1 (ray short); pectoral 13 (14).

Among the four species of triacanthodids with long tubular snouts, *Macrorhamphosodes uradoi* is distinctive in having the wide mouth (about twice as wide as the snout immediately behind it, versus about the same width in *Halimochirurgus*) bearing relatively few flattened spatula-like teeth that are distally rounded in adults (versus more numerous and distally truncate teeth in *M. platycheilus*).

The 20 specimens from New Caledonia have the same pattern of slightly increasing number and distal rounding of the teeth with increasing specimen size as illustrated by TYLER (1968: 210) for this species: the two smallest specimens, 46 and 80 mm SL, have three or four teeth in the upper jaw and ten in the lower jaw, with those in the lower jaw tapering to points distally; the specimens of 86 and 111 mm SL have two teeth in the upper jaw and 12-13 in the lower jaw that are more rounded than pointed distally; all of the larger specimens, 114 to 211 mm SL have two teeth in the upper jaw and 13-15 (usually 14-15) in the lower jaw that are rounded distally, except that one of these specimens has only 12 teeth in a damaged and healed lower jaw. The mouth is only slightly twisted (to the right) in the 46 mm SL specimen but distinctly twisted to one side or the other with increasing specimen size in all of the larger specimens, eight to the right and eleven to the left, up to about 70° in the 178 mm SL specimen but to only about 45° in the two largest specimens, 185 and 211 mm SL.

DISTRIBUTION. — This species is frequently recorded from Japan and extends to east Africa (TYLER, 1983, 1986) but has previously been reported in the south-west Pacific only from New Zealand (MATSUURA, 1987; STEWART & CLARK, 1988), at slightly greater depths than elsewhere; respectively 519 m and 480-528 m. The New Caledonian specimens were collected at depths of 420-675 m.

REMARKS. — Two (178 and 211 mm SL) of the largest three specimens are ripe females, while many of the other larger specimens appear to be males with well-developed testes. No scales are present in the gut of any of the specimens in this species which is known to feed on the scales of other fishes (TYLER, 1968).

The largest specimen of this species previously recorded with precision is 195 mm SL by AMAOKA (1982), who states that the species reaches about 200 mm SL. The 211 mm SL (243 mm total length) specimen from New Caledonia represents a slight increase in the maximum known size. The smallest specimen previously recorded is 41 mm SL by MATSUURA (1985), and the smallest New Caledonian specimen, at 46 mm SL, is a valuable addition to our knowledge of the juveniles of the species.

Macrorhamphosodes uradoi has not previously been taken in the company of other triacanthodids (TYLER, 1968, 1983) but off New Caledonia it was collected sympatrically with other triacanthodids at the following ORSTOM stations: with *Halimochirurgus alcocki* at CHALCAL 2, stn CH 7 and BERYX 11, stn C 30; with *Paratriacanthodes retrospinis* at CHALCAL 2, stn CC 1 and stn CC 2, BIOCAL, stn CP 67, MUSORSTOM 4, stn CC 202, and BERYX 2, stn 16; with both *H. alcocki* and *P. retrospinis* at BERYX 2, stn 5 and BERYX 11, stn C 29; with *Triacanthodes intermedius* at MUSORSTOM 4, stn CC 201; and with *Bathypylax bombifrons* at MUSORSTOM 5, stn CC 383.

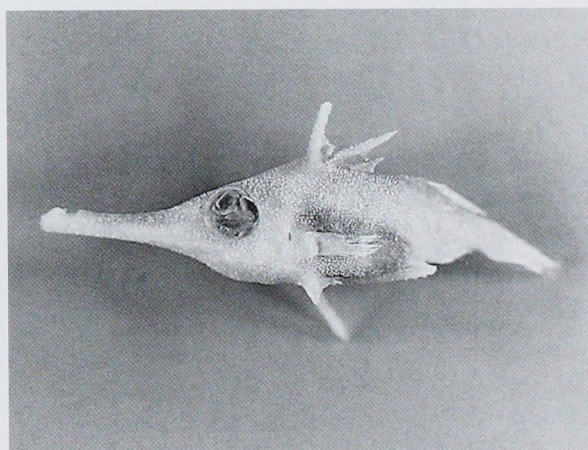


FIG. 4. — *Macrorhamphosodes uradoi* (Kamohara, 1933), BIOCAL, stn CP 67: 46.2 mm SL (MNHN 1994-635).

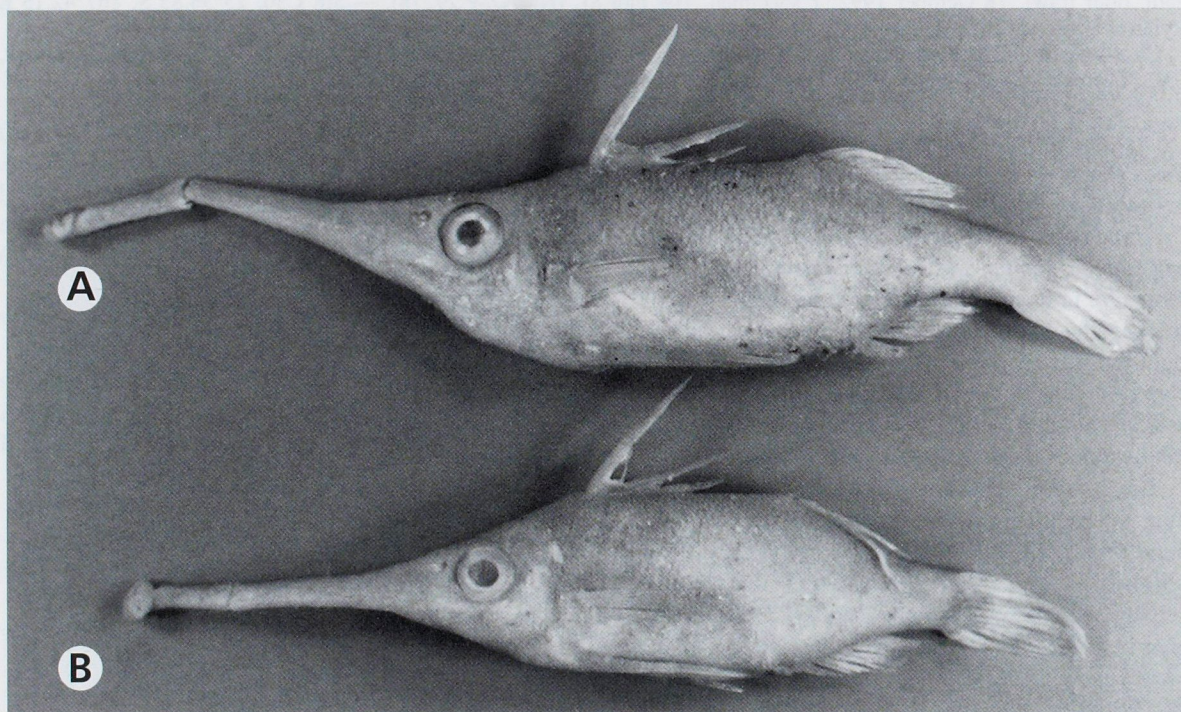


FIG. 5. — *Macrorhamphosodes uradoi* (Kamohara, 1933), CHALCAL 2, stn CH 7. A, B: 211 mm and 178 mm SL (MNHN 1994-598 & 599).

Genus *PARATRIACANTHODES* Fowler, 1934

Paratriacanthodes retrospinis Fowler, 1934

Figs 6-9

Paratriacanthodes retrospinis Fowler, 1934: 364, fig. 114 (Formosa).

MATERIAL EXAMINED. — 61 specimens.

New Caledonia. BIOCAL: stn CP 67, 24°55.44'S, 168°21.55'E, 500-510 m depth, beam trawl, R. V. "Jean Charcot", 3 September 1985: 5 specimens, 27.5-53.3 mm SL (MNHN 1994-641 to 645). — Stn CP 109, 22°10.03'S, 167°15.22'E, 495-515 m depth, beam trawl, 9 September 1985: 1 specimen, 37.7 mm SL (MNHN 1994-640).

MUSORSTOM 4: stn CP 180, 18°56.80'S, 163°17.70'E, 450 m, beam trawl, R. V. "Vauban", 18 September 1985: 2 specimens, 21.9-33.5 mm SL (MNHN 1994-638 & 639). — Stn CP 194, 18°52.80'S, 163°21.70'E, 550 m depth, beam trawl, 19 September 1985: 2 specimens, 60.5-64.0 mm SL (MNHN 1994-600 & 601). — Stn CP 198, 18°49.40'S, 163°18.80'E, 590 m depth, beam trawl, 20 September 1985: 1 specimen, 74.5 mm SL (MNHN 1994-632). — Stn CP 200, 18°53.80'S, 163°14.10'E, 545 m depth, beam trawl, 20 September 1985: 1 specimen, 92.5 mm SL (MNHN 1994-637). — Stn CP 202, 18°58.00'S, 163°10.50'E, 580 m depth, beam trawl, 20 September 1985: 8 specimens, 60.0-80.0 mm SL (MNHN 1994-612 to 619). — Stn CP 216, 22°59.50'S, 167°22.00'E, 490-515 m depth, beam trawl, 29 September 1985: 3 specimens, 61.2-86.3 mm SL (MNHN 1994-581 to 583) (photographs of both sides of all three specimens in Figs. 8-9).

CHALCAL 2: stn CC 1, 24°54.96'S, 168°21.91'E, 500-580 m, R. V. "Coriolis", otter trawl, 28 October 1986: 5 specimens, 34.2-91.0 mm SL (MNHN 1994-607 to 611). — Stn CC 2, 24°55.48'S, 168°21.29'E, 500-610 m depth, otter trawl, 28 October 1986: 9 specimens, 29.4-87.9 mm SL (MNHN 1994-584 & 585; MNHN 1994-625 to 630; MNHN 1994-636) (photograph of 69.6 and 83.3 mm SL specimens in Fig. 6). — Stn CP 25, 23°38.60'S, 167°43.12'E, 418 m depth, beam trawl, 30 October 1986: 5 specimens, 33.5-90.3 mm SL (MNHN 1994-586 to 590) (photograph of all five specimens in Fig. 7).

BERYX 2: stn 5, 24°54.40'S, 168°21.60'E (Seamount "B"), 535-545 m depth, otter trawl, R. V. "Alis", 24 October 1991: 2 specimens, 86.6-91.6 mm SL (NMNZ-P.27452). — Stn 16, 23°35.60'S, 169°36.52'E (Seamount "D"), 660-675 m depth, otter trawl, 29 October 1991: 3 specimens, 52.1-88.8 mm SL (NMNZ-P.27496).

BERYX 11: stn C3, 24°56.60'S, 168°21.25'E (Seamount "B"), 502-610 m depth, otter trawl, R. V. "Alis", 14 October 1992: 5 specimens, 67.5-98.8 mm SL (NMNZ-P.29407). — Stn C4, 24°52.70'S, 168°21.80'E (Seamount "B"), 550-920 m depth, otter trawl, 14 October 1992: 3 specimens, 73.3-86.5 mm SL (NMNZ-P.29226). — Stn C6, 24°53.80'S, 168°21.50'E (Seamount "B"), 505-620 m depth, otter trawl, 15 October 1992: 1 specimen, 70.9 mm SL (NMNZ-P.29366). — Stn CP7, 24°54.75'S, 168°21.30'E (Seamount "B"), 510-550 m depth, beam trawl, 15 October 1992: 2 specimens, 28.3-33.2 mm SL (NMNZ-P.29206). — Stn CP 8, 24°53.65'S, 168°21.50'E (Seamount "B"), 540-570 m depth, beam trawl, 15 October 1992: 1 specimen, 74.0 mm SL (NMNZ-P.29058). — Stn C29, 23°40.50'S, 167°44.20'E (Stylaster Seamount), 440-480 m depth, otter trawl, 18 October 1992: 2 specimens, 91.5-92.7 mm SL (NMNZ-P.29276).

Chersterfield and Bellona Plateaus. MUSORSTOM 5: stn CC 366, 19°45.40'S, 158°45.62'E, 650 m depth, otter trawl, R. V. "Coriolis", 19 October 1986: 4 specimens, 88.0-110 mm SL (MNHN 1994-623 & 623; NSMT-P.46002).

DESCRIPTION. — The two most comprehensive descriptions of this species have both been based on a relatively small number of specimens: seven specimens of 25.9-89.2 mm SL from Japan, China, and east Africa in TYLER's (1968) systematic monograph of the family; and five specimens of 92-119 mm SL from Japan and Taiwan by AMAOKA (1982). The ORSTOM collections from New Caledonia contain 65 specimens of 21.9 - 110 mm SL and we take this opportunity to record more substantial morphometric and meristic data for this species than previously possible.

Meristics (except for pelvic-fin rays, counts were recorded for only a majority of the 65 specimens). Dorsal VI (spines decreasing gradually in length to the short last element), 15 rays in 50 specimens, 14 in 5 specimens, 16 in 3 specimens; anal 13 in 53 specimens, 12 in 2 specimens, 14 in 3 specimens; pelvic I, 1 (ray short) in all 65 specimens; pectoral 14 in 102 fins, 13 in 6 fins, 15 in 6 fins; teeth in upper jaw 10-18, 14.6 average in 38 specimens; teeth in lower jaw 15-24, 19.0 average in 38 specimens; no inner series teeth in any of these 38 specimens; total gill rakers 17-23, 20.4 average in 30 specimens; lamellae in pseudobranch 12-16, average 13.5 in 29 specimens (reaching ventrally from one-fourth to two-thirds down pectoral-fin base).

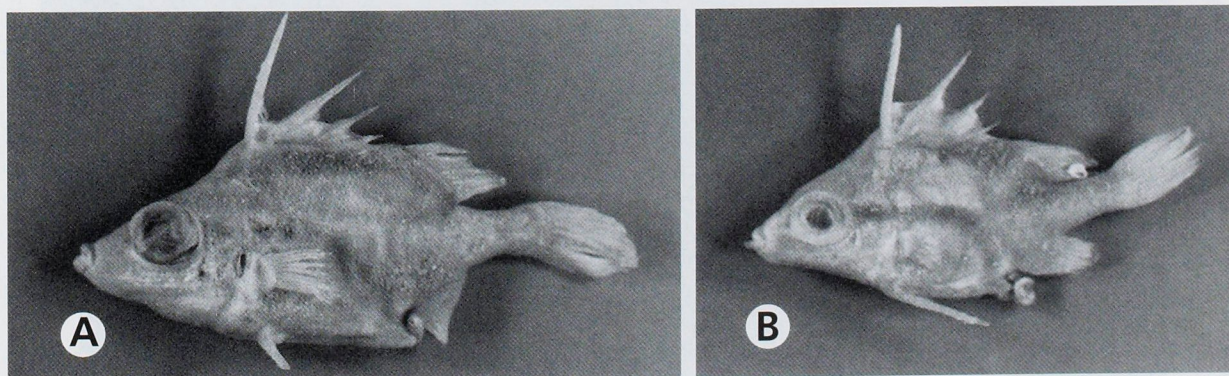


FIG. 6. — *Paratriacanthodes retrospinis* Fowler, 1934, CHALCAL 2, stn CC 2, 2 of 9 specimens. A, B: 83.3 mm and 69.6 mm SL (MNHN 1994-584 & 585).

Because there are substantial allometric changes with increasing specimen size in certain body proportions, especially in those of the divisions of the head, in body depth, and in pelvic width relative to pelvic length, we

have divided the specimens into two size groups at a gap in their size distribution and give the measurements for the smaller specimens, of 21.9-40.4 mm SL, separately from those of the larger specimens, of 51.1-110 mm SL, in both cases with the range of the measurement in percent of standard length followed in parentheses by the average value. The data for the smaller specimens are based on nine to 14 specimens and that for the larger specimens on 28 specimens in all cases.

Head length 35.9-44.7% SL (39.7) in smaller and 32.8-39.4% SL (36.3) in larger specimens. Snout length 10.3-13.9% SL (12.3) in smaller and 10.5-13.6% SL (12.1) in larger specimens. Orbit diameter 16.4-19.6% SL (17.7) in smaller and 14.1-18.8% SL (16.2) in larger specimens. Postorbital length (here and elsewhere, least distance from rear of orbit to upper end of gill opening) 8.5-10.5% SL (9.2) in smaller and 8.0-9.9% SL (9.1) in larger specimens. Gill opening length 3.8-5.0% SL (4.4) in smaller and 3.7-6.7% SL (5.1) in larger specimens. Body depth 38.5-52.1% SL (46.3) in smaller and 36.9-43.9% SL (40.3) in larger specimens. Pelvic width (here and elsewhere, between bases of pelvic-fin spines at locking flanges) 10.4-17.4% SL (13.6) in smaller and 8.2-12.1% SL (10.5) in larger specimens. Pelvic length (here and elsewhere, between level of middle of bases of pelvic-fin spines and distal tip of pelvis just in front of anus) 32.5-42.5% SL (36.5) in smaller and 29.6-36.6% SL (33.2) in larger specimens. Ratio of pelvic width into pelvic length 2.3-3.0 (2.7) in smaller and 2.7-4.1 (3.2) in larger specimens.

The specimens of less than 30 mm SL have one or two upright spinules per scale plate, while those of 30 to 50 mm SL have two or three spinules, those of 50 to 80 mm SL three to seven spinules in a major row plus one or two accessory spinules, and those of 80 to 110 mm SL seven to ten spinules in a major row plus two to five accessory spinules. While the spinules in the larger specimens sometimes arise from a single base or have closely adjacent bases, the distal ends of the spinules remain unbranched.

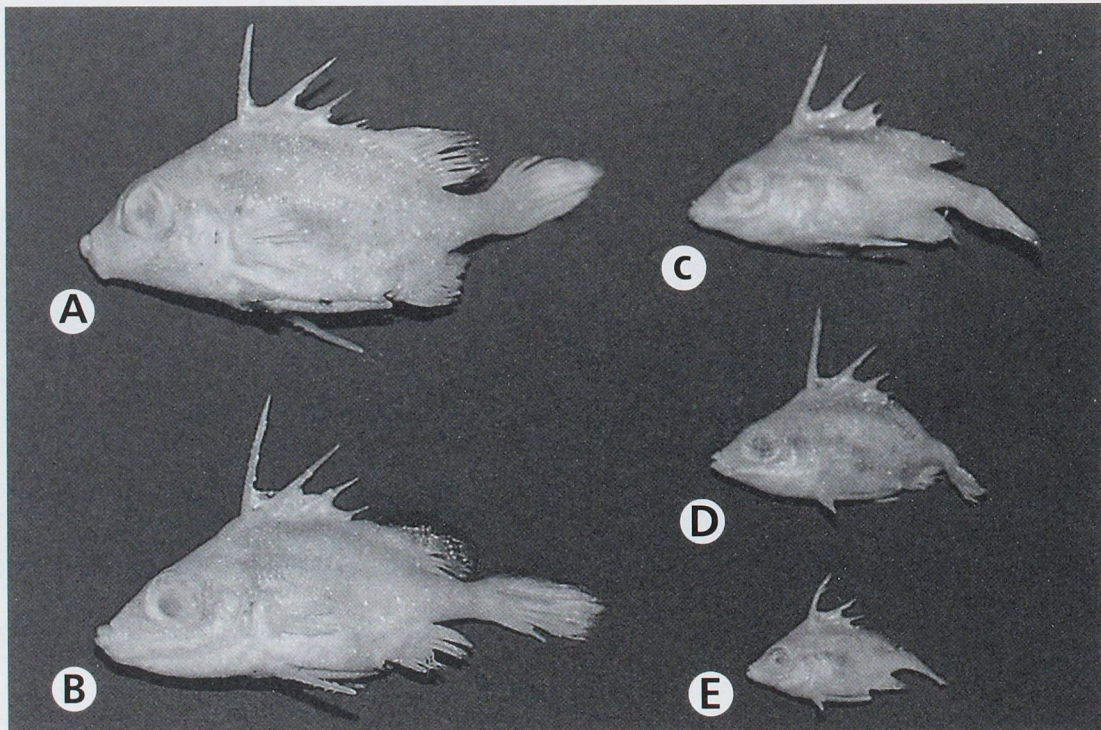


FIG. 7. — *Paratriacanthodes retrospinis* Fowler, 1934, CHALCAL 2, stn CP 25, all 5 specimens. A, B, C, D, E: 90.3 mm, 79.5 mm, 57.5 mm, 51.1 mm and 33.5 mm SL (MNHN 1994-586 to 590).

The average values for all of these meristics and morphometrics of the New Caledonian materials are closely similar to those given for *P. retrospinis* in TYLER (1968) and confirm the diagnostic differences between it and its congener, *P. herrei*. Predictably, with the larger number of specimens available from New Caledonia, the ranges of the values in *P. retrospinis* are somewhat extended in many cases.

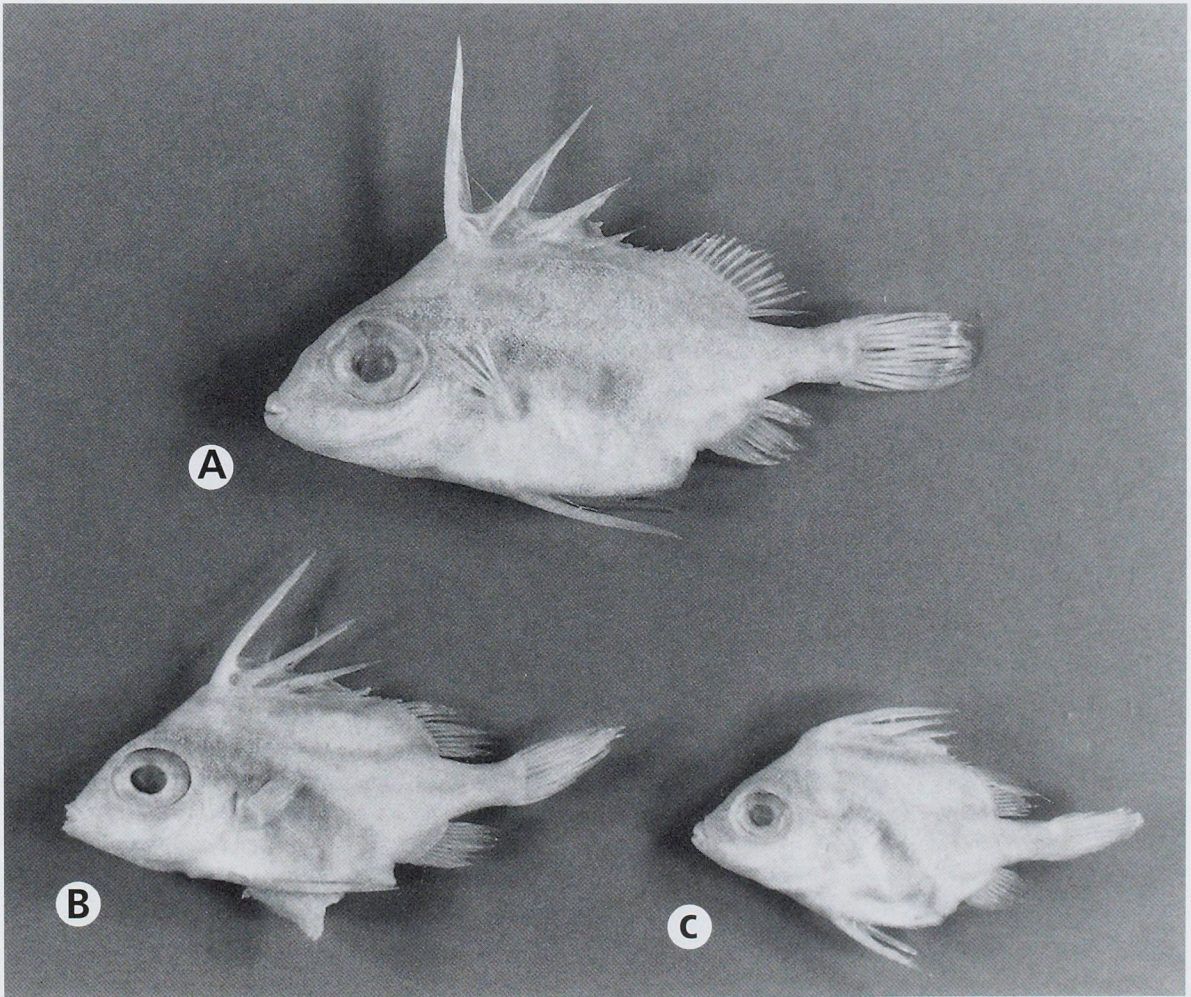


FIG. 8. — *Paratriacanthodes retrospinis* Fowler, 1934, MUSORSTOM 4, stn CP 216, left side view of all 3 specimens. A, B, C: 86.3 mm, 72.3 mm, and 61.2 mm SL (MNHN 1994-581 to 583); note the irregular occurrence of the pale circle color pattern variant from one side to the other of the same specimen (see Fig. 9).

The color pattern is relatively well preserved in many of these specimens, far more so than in the specimens described in TYLER (1968), including the holotype illustrated therein (fig. 51). That illustration of the holotype, collected in 1908, emphasizes the three pale lines (now known to be blue in life) between the three major dark stripes (reddish) present horizontally along the upper two-thirds of the body. This same emphasis on the pale lines is given in the color illustrations of fresh specimens of this species in TOMIYAMA and ABE (1958) and KAMOHARA (1961), with the upper two pale lines shown terminating in the region below the soft dorsal-fin base but the lowermost pale line as continuing posteriorly to the middle of the caudal-fin base, and all of the lines shown with relatively straight margins. However, the photographs of fresh specimens in AMAOKA (1982) and MATSUURA (1984) indicate that the pale lines are less straight and precisely outlined than shown in the above referenced illustrations. It is now obvious that in fresh specimens it is the three pale blue lines that strike the eye and that in

preserved materials it is the dark stripes (reddish in life but brownish-black in preservation) that dominate the color pattern. Of the dark stripes in preserved specimens, it is the upper stripe along the base of the dorsal fins and the lower stripe from the eye over the pectoral-fin base to the rear of the abdomen that are more prominent than the less well-defined band in between them (Figs. 6-7 show this pattern in specimens of both small and large size).

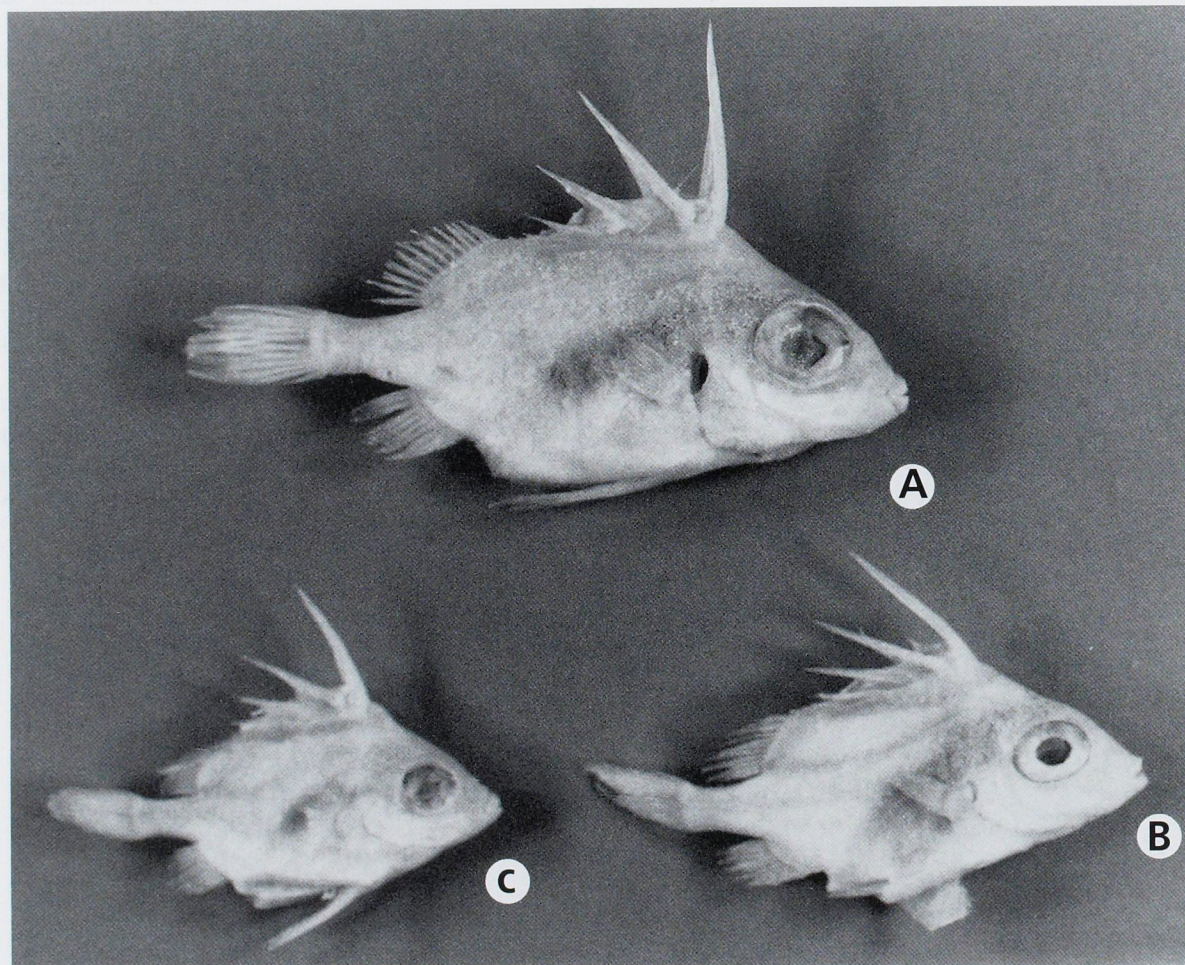


FIG. 9. — *Paratriacanthodes retrospinis* Fowler, 1934, MUSORSTOM 4, stn CP 216, right side view of the specimens shown in Fig. 8 (MNHN 1994-581 to 583).

Based on both fresh and preserved materials, the sequence of the stripes and lines from dorsal to ventral is as follows: the general red background color of the head and body forming a dark stripe, with a wavy lower edge, from below the front of the spiny dorsal-fin base to below the anterior one-third of the soft-dorsal fin base; an upper narrow wavy pale blue line from about the level of the middle of the distance between the eye and the spiny dorsal-fin origin to about the middle of the soft dorsal-fin base, where it is slightly expanded and upturned; a relatively diffuse red stripe from the level of just above the eye to the posterior half of the soft dorsal-fin base, where it is slightly expanded and most deeply pigmented; a middle narrow wavy pale blue line from just above the middle of the eye to about the middle of the body at the level of the middle of the soft dorsal-fin base, where it may be continuous with the lower pale line; an especially distinct red stripe from the middle of the rear of the eye to just above the pectoral-fin base and along the region just above the top of the abdominal cavity, turning slightly downward at the level of the anus; a lower narrow wavy pale blue line from the lower rear of the eye to the top of the pectoral-fin base and along the region just below the top of the abdominal cavity where at the level of the anus

it either anastomoses with or closely approaches the posterior region of the middle pale line and then turns slightly upward to continue on posteriorly to the middle of the caudal-fin base; the general red background color of the body present as a band below the lower pale line in the upper half of the abdominal region but the lower half of the abdomen being silvery blue; in the region of the posterior half of the body and caudal peduncle there are irregular pale blue anastomoses, especially in the region of the lower pale line.

Exceptional in color pattern among the ORSTOM materials are the three specimens of *P. retrospinis* from MUSORSTOM 4, stn CP 216. Each of these has an indication of a prominent pale circle on the body, but this is only distinctly present on one side of the body and not on both sides in all three specimens and it is of irregular placement (Figs. 8-9 show both sides of these specimens). The pale circle is most prominent and most symmetrical on the abdomen of the right side of the 61.2 mm SL specimen; its prominence is due in part to the dark peritoneum being seen through the abdominal wall at the center of the circle. The pale circles are higher and/or more posterior on the body in the other two specimens and the centers are not especially dark in appearance. In all other respects except the presence of the pale circles, these three specimens have typical features of *P. retrospinis*, including morphometric and meristic values that are the norm for this species. Two of these three specimens are mature males and the other, the smallest, is probably a developing male, but many mature and developing males (and females) are present among the far more numerous specimens of *P. retrospinis* without pale circles from New Caledonia and the color pattern differences do not seem to be correlated with sex. Because these pale circles are so irregular in occurrence, as is their placement, in these three specimens, and further because they are not present on other specimens from New Caledonia and elsewhere, we are confident the circles are a color pattern variant based on the pattern of anastomosing pale lines observed on the lower posterior half of the body in many specimens, as described above. Therefore, we consider these three specimens to be *P. retrospinis*.

This explanation probably applies as well to the specimen of *Triacanthodes intermedius* collected from off New Caledonia (one of the two specimens from MUSORSTOM 4, stn CP 171), which alone among the numerous specimens of that species also has a similar pale circle on one side but not on the other.

We presume that the pale circles (presumably blue in life) are an infrequent and irregular aspect of the normal color pattern of a small minority of specimens of *Paratriacanthodes retrospinis* and, even less frequently, of *Triacanthodes intermedius*.

The pattern of dark stripes in *Paratriacanthodes retrospinis* described above is basically similar to that in *P. herrei*, and the color pattern distinction between these two species of the genus described by TYLER (1968), in over-emphasizing the pale lines of *P. retrospinis*, probably does not exist, because the dark stripes are essentially the same in both species.

DISTRIBUTION. — Japan, China, Mozambique, Natal, New Caledonia, Chesterfield and Bellona Plateaus.

REMARKS. — The specimens of *P. retrospinis* collected at 660-675 m off New Caledonia represent a new depth record for this species, previously known as deep as 550 m (AMAOKA, 1982). This species obtains a slightly larger size than the largest specimen (110 mm SL) from New Caledonia, up to 120 mm SL (TOMIYAMA & ABE, 1958; AMAOKA, 1982; MATSUURA, 1984), while the smallest specimen (21.9 mm SL) from New Caledonia is slightly smaller than previously reported (25.9 mm SL, TYLER, 1968), with the 12 specimens in the 21.9 - 40.4 mm SL size range representing by far the largest number of young juveniles yet available for study.

Paratriacanthodes retrospinis has not previously been taken in the company of other triacanthodids (TYLER, 1968, 1983), but off New Caledonia it was collected together (and therefore approximately sympatrically) with other triacanthodids at the following ORSTOM stations: with *Triacanthodes intermedius* at MUSORSTOM 4, stn CP 180; with *Macrorhamphosodes uradoi* at BIOCAL, stn CP 67, MUSORSTOM 4, stn CC 202, CHALCAL 2, stn CC 1 and stn CC 2, and BERYX 2, stn 16; with *Halimochirurgus alcocki* at MUSORSTOM 4, stn CP 216; and with both *M. uradoi* and *H. alcocki* at BERYX 2, stn 5 and BERYX 11, stn C 29.

Of the 24 specimens in which sex could be determined with confidence by gross examination of the gonads under a dissecting microscope, at sizes of greater than about 60 mm SL, 8 are females (64.0-110 mm SL) with ripening ovaries and 16 are males (60.5-110 mm SL) with developing to well-developed testes, and this

unbalanced sex ratio seems to apply to the numerous other specimens of this species in which sex determination was less certainly suggested.

Genus *TRIACANTHODES* Bleeker, 1858

Triacanthodes ethiops Alcock, 1894

Fig. 10

Triacanthodes ethiops Alcock, 1894: 137, pl. 7 (Bay of Bengal).

MATERIAL EXAMINED. — 28 specimens.

Chesterfield and Bellona Plateaus. CHALCAL 1: stn CH 2, 22°34.41'S, 159°17.39'E, 330 m depth, otter trawl, R. V. "Coriolis", 28 July 1984: 15 specimens, 70.4-86.7 mm SL (MNHN 1995-556).

MUSORSTOM 5: stn CH 271, 24°48.24'S, 159°34.60'E, 250-276 m depth, otter trawl, R. V. "Coriolis", 9 October 1986: 1 specimen, 70.5 mm SL (MNHN 1995-555). — Stn CP 318, 22°26.51'S, 159°21.36'E, 330 m depth, beam trawl, 13 October 1986: 2 specimens, 72.7-73.3 mm SL (MNHN 1995-552) (photograph of both specimens in Fig. 10).

New Caledonia. MUSORSTOM 4: stn CC 245, 22°07.00'S, 167°11.00'E, 415-435 m depth, otter trawl, R. V. "Vauban", 3 October 1985: 9 specimens, 47.1- 65.6 mm SL (MNHN 1995-554). — Stn CC 246, 22°08.50'S, 167°11.50'E, 410-420 m depth, otter trawl, 3 October 1985: 1 specimen, 48.6 mm SL (MNHN 1995-553).

DESCRIPTION. — Meristics. Dorsal VI, 15 (14); anal 13 (12-14); pelvic I, 2; pectoral 14 (13).

Triacanthodes ethiops is one of the most commonly collected triacanthodid fishes and has been described in detail by TYLER (1968). The New Caledonian materials contain a specimen of 86.7 mm SL, slightly larger than the largest previously reported (81.9 mm SL by TYLER, 1968).

The meristics of the New Caledonian specimens mostly overlap those previously reported, although the ranges of dorsal and anal-fin ray counts are extended respectively to 14 (the previous lowest count was 15) and 14 (the previous highest count was 13).

DISTRIBUTION. — *Triacanthodes ethiops* is known in the Pacific from Japan, the Philippines, Indonesia and New Caledonia (TYLER, 1968; MATSUURA & FOURMANOIR, 1984), and in the Indian Ocean along the east coast of Africa (TYLER, 1968); it has recently been discovered off the east coast of Australia (MATSUURA & PAXTON, unpublished).

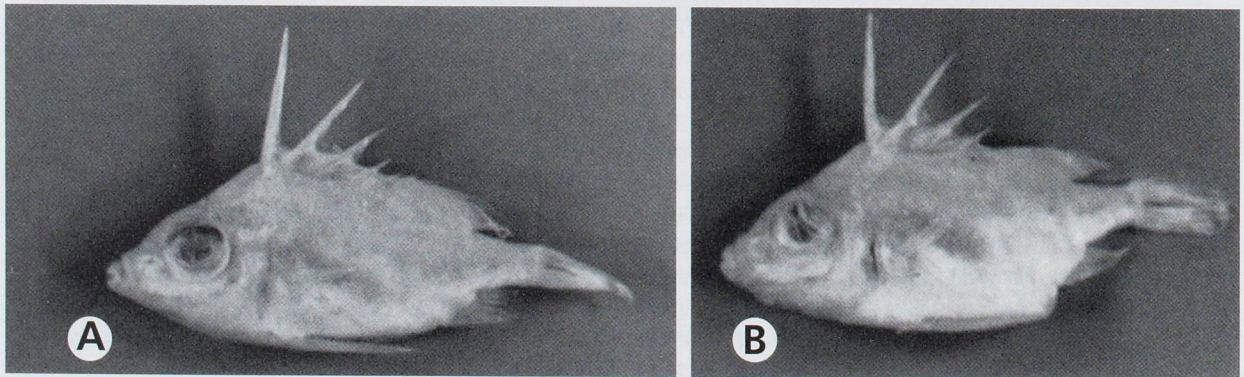


FIG. 10. — *Triacanthodes ethiops* Alcock, 1894, MUSORSTOM 5, stn CP 318, both specimens. A, B: 73.3 mm and 72.7 mm SL (MNHN 1995-552).

Triacanthodes intermedius Matsuura & Fourmanoir, 1984

Fig. 11

Triacanthodes intermedius Matsuura & Fourmanoir, 1984: 32, fig., holotype 71.7 mm LS (NSMT-P.22373), Isle des Pins (New Caledonia), 1 April 1978, 360-415 m.

MATERIAL EXAMINED. — 16 specimens.

New Caledonia. BIOCAL: stn CP 42, 22°45.14'S, 167°12.12'E, 380 m depth, beam trawl, R. V. "Jean Charcot", 30 August 1985: 3 specimens, 41.7-68.0 mm SL (MNHN 1995-546) (photograph of all three specimens in Fig. 11).

MUSORSTOM 4: stn CP 171, 18°57.80'S, 163°14.00'E, 435 m depth, beam trawl, R. V. "Vauban", 17 September 1985: 2 specimens, 52.1-61.3 mm SL (MNHN 1995-549). — Stn CP 180, 18°56.80'S, 163°17.70'E, 450 m depth, beam trawl, 18 September 1985: 1 specimen, 59.7 mm SL (MNHN 1995-544). — Stn CP 201, 18°55.80'S, 163°13.80'E, 500 m depth, beam trawl, 20 September 1985: 2 specimens, 59.5-71.5 mm SL (MNHN 1995-545). — Stn CP 214, 22°53.80'S, 167°13.90'E, 425-440 m depth, beam trawl, 28 September 1985: 2 specimens, 49.0-59.4 mm SL (MNHN 1995-547). — Stn CC 245, 22°07.00'S, 167°11.00'E, 415-435 m depth, otter trawl, 3 October 1985: 3 specimens, 48.9-63.1 mm SL (NSMT-P.46809). — Stn CC 246, 22°08.50'S, 167°11.50'E, 410-420 m depth, otter trawl, 3 October 1985: 1 specimen, 60.6 mm SL (MNHN 1995-548). — Stn CC 247, 22°09.00'S, 167°13.30'E, 435-460 m depth, otter trawl, 4 October 1985: 2 specimens, 54.0-65.9 mm SL (MNHN 1995-543).

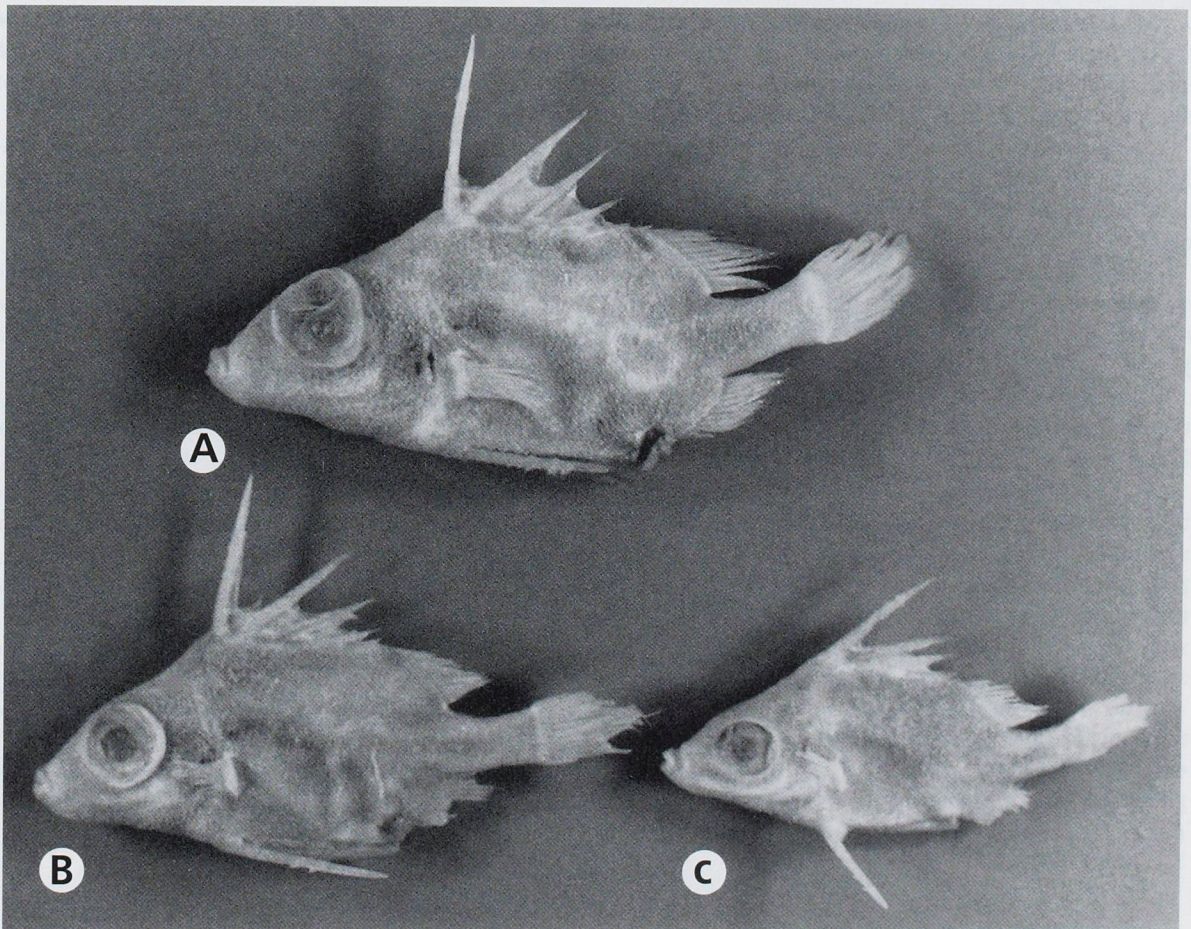


FIG. 11. — *Triacanthodes intermedius* Matsuura & Fourmanoir, 1984, BIOCAL, stn CP 42, all 3 specimens. A, B, C: 68.0 mm, 41.7 mm and 52.1 mm SL (MNHN 1995-546).

DESCRIPTION. — Meristics. Dorsal VI, 15 rays in 14 specimens, 14 in 1 specimen, 16 in 1 specimen; anal 13 in 15 specimens, 12 in 1 specimen; pelvic I, 2 rays in 20 fins, 1 ray in 12 fins; pectoral 14 in 24 fins, 13 in 3 fins, 15 in 5 fins; outer teeth in upper jaw 12-17, 14.8 average, 2 inner teeth in 8 specimens, 1 in 6 specimens, none in 2 specimens; outer lower jaw teeth 14-21, 17.9 average, 2 inner teeth in 13 specimens, 1 in 2 specimens, none in 1 specimen; total gill rakers 15-22, 18.8 average; lamellae in pseudobranch 17-24, 18.4 average (reaching ventrally from halfway down to level of lower edge of pectoral-fin base); olfactory lamellae 12-15, 13.2 average.

Proportional measurements of all specimens are followed in parentheses by the average value. Head length 42.2-51.8% SL (39.4), snout length 12.1-14.9% SL (13.7), orbit diameter 16.8-20.1% SL (18.2), postorbital length 8.2-11.8% SL (10.0), interorbital width 10.2-13.7% SL (11.5), gill opening length 4.8-6.9% SL (6.1), snout to spiny dorsal fin 41.0-46.8% SL (44.5), body depth 42.2-51.8% SL (45.0), first dorsal spine length 28.9-41.0% SL (36.0), length of soft dorsal-fin base 15.3-19.2% SL (17.3), soft dorsal-fin height 10.1-16.3% SL (13.4), length of anal-fin base 10.9-14.1% SL (12.8), anal-fin height 10.3-13.9% SL (11.8), caudal-fin length 23.5-28.6% SL (25.4), caudal peduncle depth 8.4-11.1 % SL (9.5), caudal peduncle length 15.4-19.7 % SL (17.7), pelvic width 4.4-5.9% SL (5.1), pelvic length 26.6-32.6% SL (29.6), olfactory organ diameter 3.2-5.3% SL (4.5), distance between olfactory organs 3.8-5.9% SL (4.8).

Triacanthodes intermedius is a rarely collected and poorly known species, until now represented only by the two type specimens collected from New Caledonia (MATSUURA & FOURMANOIR, 1984). The ORSTOM collections off New Caledonia obtained 16 specimens of this species, permitting us to better characterize it.

MATSUURA & FOURMANOIR (1984) stated that *T. intermedius* shows the intermediate conditions of many of the distinguishing characters between *Triacanthodes* and *Paratriacanthodes*. The counts and morphometrics of the large numbers of New Caledonian materials of *T. intermedius* confirm this statement, and many of the ranges of the character values in *T. intermedius* are extended.

The gill opening of *T. intermedius* is moderate in length, extending ventrally about halfway down the pectoral-fin base. The lamellae of the pseudobranch reach ventrally from halfway down to the level of the lower edge of the pectoral-fin base. In these two features *T. intermedius* is more similar to *Paratriacanthodes* than to the other members of *Triacanthodes*.

There are usually inner teeth in both the upper and lower jaws of *T. intermedius*, though two specimens have no inner teeth in the upper jaw and one specimen has no inner teeth in the lower jaw. A similar situation has been reported by TYLER (1968) in *T. ethiops*; 10% of the specimens examined by him have no inner teeth in the upper jaw.

The shape of the pelvis of *T. intermedius* differs from that of the other species of *Triacanthodes* but resembles that of *Paratriacanthodes herrei* (MATSUURA & FOURMANOIR, 1984). The narrower pelvis (4.4-5.9 % SL) of *T. intermedius* clearly separates it from the congeners having a wider pelvis (7.0-10.7% SL).

The color pattern is much better preserved in several specimens of the New Caledonian materials than in the two type specimens described by MATSUURA & FOURMANOIR (1984). The yellowish-tan body of preserved specimens is marked by three principal dark lines, as well as by a short longitudinal dark line on the caudal peduncle. The uppermost line runs from the base of the first dorsal spine to the origin of the soft dorsal fin. The middle line runs from above the anterior part of the eye to the end of the soft dorsal-fin base. The lowermost line starts from the mid-posterior edge of the eye and runs postero-ventrally to the anus. This color pattern is the same as that observed in *T. anomalus*, and differs from that in *T. ethiops*.

One of the two specimens of *T. intermedius* from MUSORSTOM 4, stn CP 171 has a pale circle on one side of the body. Similar pale circles are found in three specimens of *Paratriacanthodes retrospinis* from MUSORSTOM 4, stn CP 216, and we consider these circles to be variations of the anastomosing pale lines observed on the lower posterior half of the body in many specimens of *P. retrospinis* and *T. intermedius* (see comments under *P. retrospinis*).

DISTRIBUTION. — New Caledonia.

REMARKS. — *Triacanthodes intermedius* was collected together with *P. retrospinis* at MUSORSTOM 4, stn CP 180 and with *T. ethiops* at MUSORSTOM 4, stn CC 245 and stn CC 246.

Family **MONACANTHIDAE**

Although many species of filefishes are found in shallow waters, usually shallower than 50 m, some groups of filefishes, particularly the large-sized species (e.g., those of *Thamnaconus*), inhabit continental slopes as deep as 450 m (see account of *Thamnaconus tessellatus*, below), whereas the small-sized species, such as *Paramonacanthus japonicus* and *Pseudalutarius nasicornis*, are found in depths less than 60 m.

Genus *PARAMONACANTHUS* Bleeker, 1865

Paramonacanthus japonicus (Tilesius, 1801)

Fig. 12

Monacanthus japonicus Tilesius, 1801: 212, pl. 13 (Japan).

MATERIAL EXAMINED. — 8 specimens.

New Caledonia. MUSORSTOM 4: stn CC 146, 19°53.40'S, 163°47.10'E, 34 m depth, otter trawl, R. V. "Vauban", 13 September 1985: 5 specimens, 70.1-84.5 mm SL (MNHN 1995-539) (photograph of 70.1, 72.8, 73.0 and 84.5 mm SL specimens in Fig. 12). — Stn CC 147, 19°35.00'S, 163°39.60'E, 46 m depth, otter trawl, 13 September 1985: 3 specimens, 80.7-90.5 mm SL (MNHN 1995-538).

DESCRIPTION. — Meristics. Dorsal II, 28 (27-29); anal 28 (27-29); pectoral 11 (12).

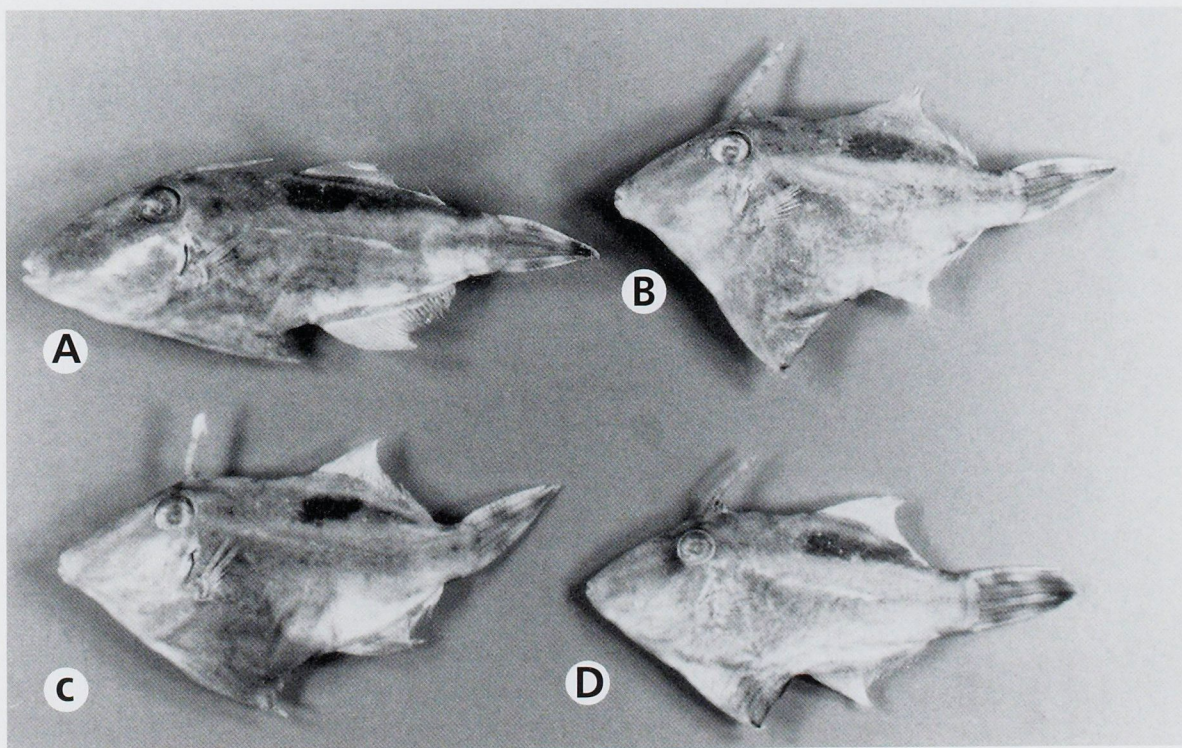


FIG. 12. — *Paramonacanthus japonicus* (Tilesius, 1801), MUSORSTOM 4, stn CC 146, 4 of 5 specimens. A, B, C, D: 84.5 mm (male), 73.0 mm (female), 72.8 mm (female) and 70.1 mm (female) SL (MNHN 1995-539).

REMARKS. — *Paramonacanthus japonicus* is widely distributed in shallow waters in the Indo-west Pacific, usually in sandy-muddy otters. This species, like others of the genus, shows sexual dimorphism in the shape of the body and caudal fin, and in color. The male has a shallower body (31.0-32.6% SL) and filamentous caudal fin rays, whereas the female has a deeper body (41.6-41.8% SL) and no produced rays in the caudal fin. *Paramonacanthus curtiorhynchus* (Bleeker) is a junior synonym of *P. japonicus* (B. HUTCHINS, pers. comm.).

Genus *PSEUDALUTARIUS* Bleeker, 1865

Pseudalutarius nasicornis (Temminck & Schlegel, 1850)

Fig. 13

Alutera nasicornis Temminck & Schlegel, 1850: 293, pl. 131, fig. 2 (Japan).

MATERIAL EXAMINED. — 3 specimens.

New Caledonia, MUSORSTOM 4: stn CP 148, 19°23.40'S, 163°31.90'E, 59 m depth, beam trawl, R. V. "Vauban", 14 September 1985: 3 specimens, 104-119 mm SL (MNHN 1995-527) (photograph of 104 and 119 mm SL specimens in Fig. 13).



FIG. 13. —*Pseudalutarius nasicornis* (Temminck & Schlegel, 1850), MUSORSTOM 4, stn CP148, 2 of 3 specimens. A, B: 119 mm and 104 mm SL (MNHN 1995-527).

DESCRIPTION. — Meristics. Dorsal II, 47 (49); anal 43-46; pectoral 11.

Pseudalutarius nasicornis is a derived monacanthid, distinguished from all others in having the dorsal spine anterior to the eye.

DISTRIBUTION. — This species is distributed in shallow waters in the subtropical and tropical regions in the Indo-west Pacific from South Africa eastward through Indonesia to the east coast of Australia (HUTCHINS, 1986; KUITER, 1993), and northward to southern Japan (MATSUURA, 1988).

Genus *THAMNACONUS* Smith, 1949

Thamnaconus fijiensis Hutchins & Matsuura, 1984

Fig. 14

Thamnaconus fijiensis Hutchins & Matsuura, 1984: 387, figs 1-2-3 (Fiji).

MATERIAL EXAMINED. — 1 specimens.

New Caledonia. BIOCAL: stn CP 84, 20°42.94'S, 167°01.50'E, 150-210 m depth, beam trawl, R. V. "Jean Charcot", 6 September 1985: 1 specimen, 102 mm SL (MNHN 1995-528).

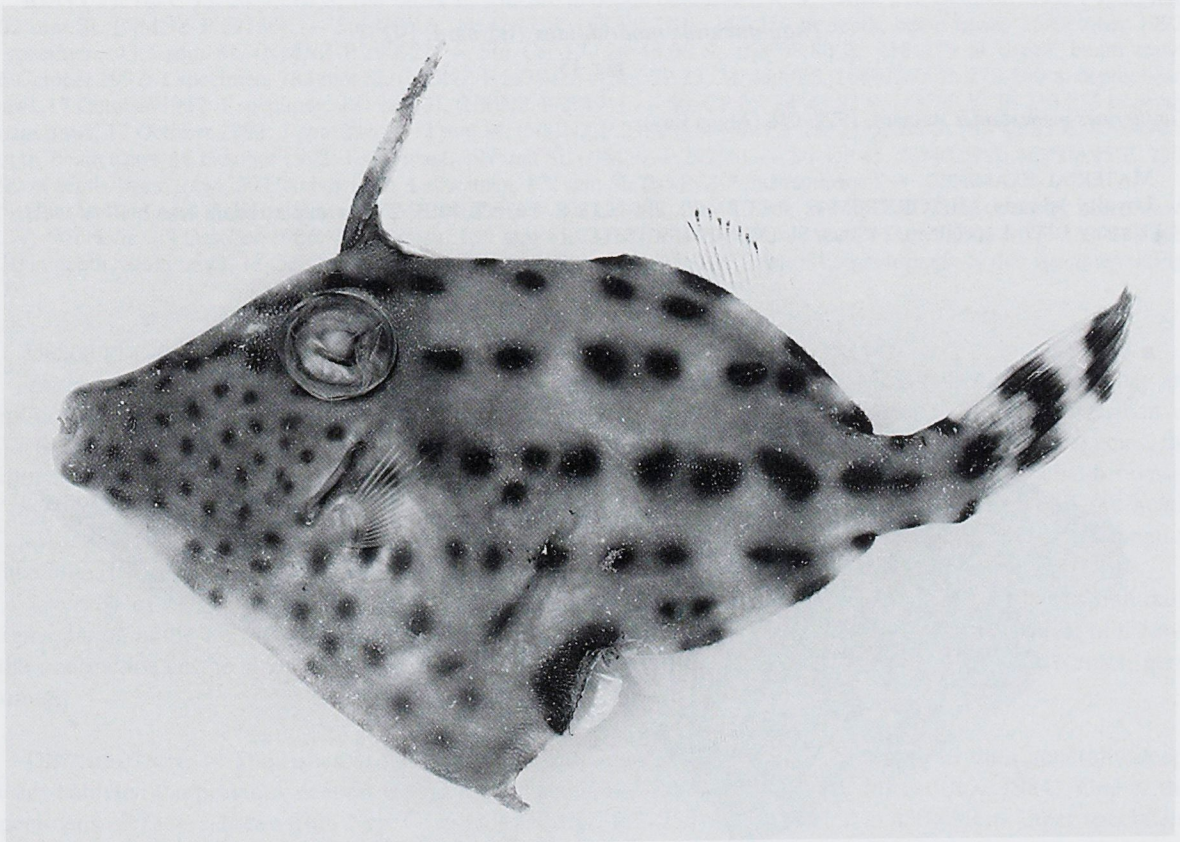


FIG. 14. — *Thamnaconus fijiensis* Hutchins & Matsuura, 1984, BIOCAL, stn CP 84, 1 specimen: 102 mm SL (MNHN 1995-528).

DESCRIPTION. — Meristics. Dorsal II, 34; anal 33; pectoral 13.

The proportional measurements of the New Caledonian specimen are: head length 34.2% SL, snout length 26.6% SL, eye diameter 12.0% SL, interorbital width 11.7% SL, gill opening length 10.0% SL, snout to spiny dorsal fin 35.9% SL, snout to anal fin 69.1% SL, body depth 41.6% SL, body width 13.9% SL, first dorsal-spine length 27.1% SL, length of longest dorsal-fin ray (5th) 12.6% SL, length of longest anal-fin ray (5th) 12.5% SL, length of soft dorsal-fin base 34.2% SL, length of anal-fin base 31.2% SL, pectoral-fin length 13.2% SL, caudal-fin length 30.6% SL, caudal peduncle depth 10.1% SL, caudal peduncle length 9.8% SL.

Thamnaconus fijiensis was described on the basis of a single specimen collected in a fish trap outside Suva Barrier Reef, Fiji, at the depth of 183 m (HUTCHINS & MATSUURA, 1984). The New Caledonian specimen, though smaller than the 137 mm SL holotype, does not differ from it in general appearance. However, the fin-ray counts of the New Caledonian specimen are slightly different from those of the holotype (shown in parentheses); dorsal rays 34 (33) and anal rays 33 (32).

DISTRIBUTION. — Fiji, New Caledonia.

REMARKS. — Judging from the collection depths of the holotype and the New Caledonian specimen, *T. fijiensis* is a relatively deep-dwelling species. The closest relative of this species is *T. fajordoi*, known from the east coast of Africa (HUTCHINS & MATSUURA, 1984).

Thamnaconus modestoides (Barnard, 1927)

Fig. 15

Cantherines modestoides Barnard, 1927: 958 (Algoa Bay).

MATERIAL EXAMINED. — 2 specimens.

Loyalty Islands. MUSORSTOM 6: stn CP 400, 20°42.18'S, 167°00.40'E, 270 m depth, beam trawl, R. V. "Alis", 14 February 1989: 1 specimen, 145 mm SL (MNHN 1995-531).

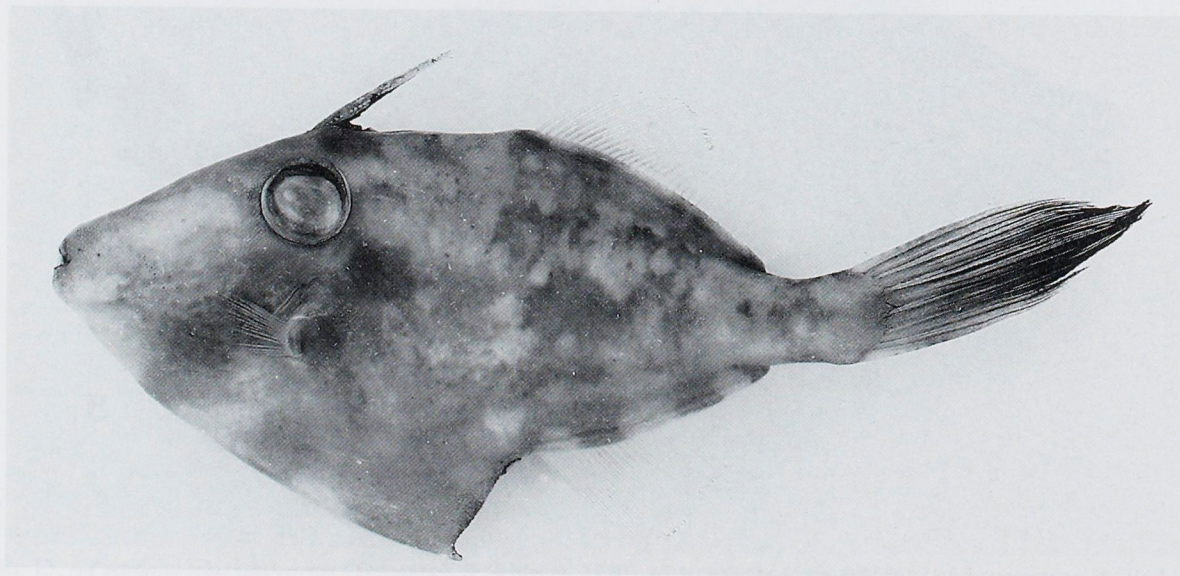


FIG. 15. — *Thamnaconus modestoides* (Barnard, 1927), MUSORSTOM 6, stn CP 400, 1 specimen: 145 mm SL (MNHN 1995-531).

New Caledonia. BERYX 11: stn C41, 23°39.20'S, 168°00.50'E, 230-360 m depth, R. V. "Alis", otter trawl, 20 October 1992: 1 specimen, 246 mm SL (NMNZ-P.29304).

DESCRIPTION. — Meristics. Dorsal II, 35; anal 32-33; pectoral 13.

The New Caledonian materials have slightly lower dorsal-fin ray counts than previously reported from South Africa (36-38 by HUTCHINS, 1986), but their dorsal fin-ray counts fall within the ranges reported from Japan (33-34 by ZAMA & YASUDA, 1979; 34-35 by MATSUURA, 1985).

DISTRIBUTION. — *Thamnaconus modestoides* has been reported from the east coast of Africa, northwestern Australia, and Japan (ZAMA & YASUDA, 1979; ALLEN & SWAINSTON, 1988; MATSUURA, 1988).

Thamnaconus tessellatus (Günther, 1880)

Figs 16-17

Monacanthus tessellatus Günther, 1880: 54, pl. 23, fig. B (Philippines).

MATERIAL EXAMINED. — 13 specimens.

New Caledonia. CHALCAL 2: stn CP 26, 23°18.15'S, 168°03.58'E, 296 m depth, beam trawl, R. V. "Coriolis", 31 October 1986: 4 specimens, 53.0-130 mm SL (MNHN 1995-550) (photograph of 54.0 and 61.0 mm SL specimens in Fig. 16).

BERYX 11: stn C 13, 24°43.16'S, 168°08.92'E, 230-240 m depth, otter trawl, R. V. "Alis", 16 October 1992: 1 specimen, 292 mm SL (NMNZ-P.29180). — Stn CP 16, 24°47.12'S, 168°08.71'E, 240-250 m depth, beam trawl, 16 October 1992: 1 specimen, 43.3 mm SL (NMNZ-P.29092). — Stn CP 17, 24°48.00'S, 168°08.80'E, 250-270 m depth, beam trawl, 16 October 1992: 1 specimen, 184 mm SL (NMNZ-P.29384). — Stn CP 23, 24°43.40'S, 168°07.75'E, 270-290 m depth, beam trawl, 17 October 1992: 1 specimen, 181 mm SL (NMNZ-P.29191). — Stn CP 25, 24°43.52'S, 168°08.52'E, 230-235 m depth, beam trawl, 17 October 1992: 1 specimen, 172 mm SL (NMNZ-P.29316). — Stn CP 28, 23°36.85'S, 167°41.85'E, 430-490 m depth, beam trawl, 18 October 1992: 1 specimen, 199 mm SL (NMNZ-P.29256). — Stn CP 45, 23°40.27'S, 168°00.95'E, 270-290 m depth, beam trawl, 20 October 1992: 1 specimen, 172 mm SL (NMNZ-P.29316).

Chesterfield and Bellona Plateaus. MUSORSTOM 5: stn CP 268, 24°44.70'S, 159°39.20'E, 280 m depth, beam trawl, R. V. "Coriolis", 9 October 1986: 1 specimen, 130 mm SL (MNHN 1995-530). — Stn CP 318, 22°26.51'S, 159°21.36'E, 330 m depth, beam trawl, 13 October 1986: 1 specimen, 189 mm SL (MNHN 1995-531) (photograph of this specimen in Fig. 17).

DESCRIPTION. — Meristics. Dorsal II, 36 (35-38); anal 33 (32-35); pectoral 13 (14).

Thamnaconus tessellatus has been confused with *T. hypargyreus* (Cope) (e.g., MASUDA *et al.*, 1975). They are similar in having many spots on the body; however, the number of spots are greater in *T. tessellatus* than in *T. hypargyreus*. Although the color of the spots in preserved specimens is dark brown in both of these species, the color of the spots in fresh specimens is dark brown in *T. tessellatus* and dark yellow or yellowish-brown in *T. hypargyreus*. *Thamnaconus tessellatus* also differs from *T. hypargyreus* in the color pattern of the head; *T. tessellatus* has dark brown spots on the snout whereas *T. hypargyreus* has no spots on the snout but has longitudinal blue (pale in preserved specimens) lines on the snout.

Juveniles of two species are distinguished by the color pattern; *Thamnaconus tessellatus* has the overall dark pigmentation in the caudal fin and the obvious rows of dark spots extending posteriorly from the middle of the eye (the contraction in the size of the spots is a variation occasionally found in both species) (B. HUTCHINS, pers. comm.).

DISTRIBUTION. — The fishes of the genus *Thamnaconus* are poorly known because of their generally deep-water habitats; the previous deepest record for the genus is 360 m (HUTCHINS & MATSUURA, 1984). One of the specimens of *T. tessellatus* from New Caledonia (NMNZ-P.29256) was collected at 430-490 m; other specimens from New Caledonia were collected at depths of 230-296 m. *Thamnaconus tessellatus* has been recorded from southern Japan southward through the Philippines and Indonesia to eastern Australia (SAINSBURY *et al.*, 1985; B. HUTCHINS, pers. comm.).

The population of *Thamnaconus hypargyreus* in the East China Sea was erroneously described as a new species *Thamnaconus xanthoptera* by XU & ZHAN (1988). However, judging from their original description, it is a junior synonym of *T. hypargyreus*.

Thousands of specimens of *Thamnaconus tessellatus* have been observed washed up on the beaches in the Ogasawara Islands in winter (MATSUURA & TACHIKAWA, 1994).

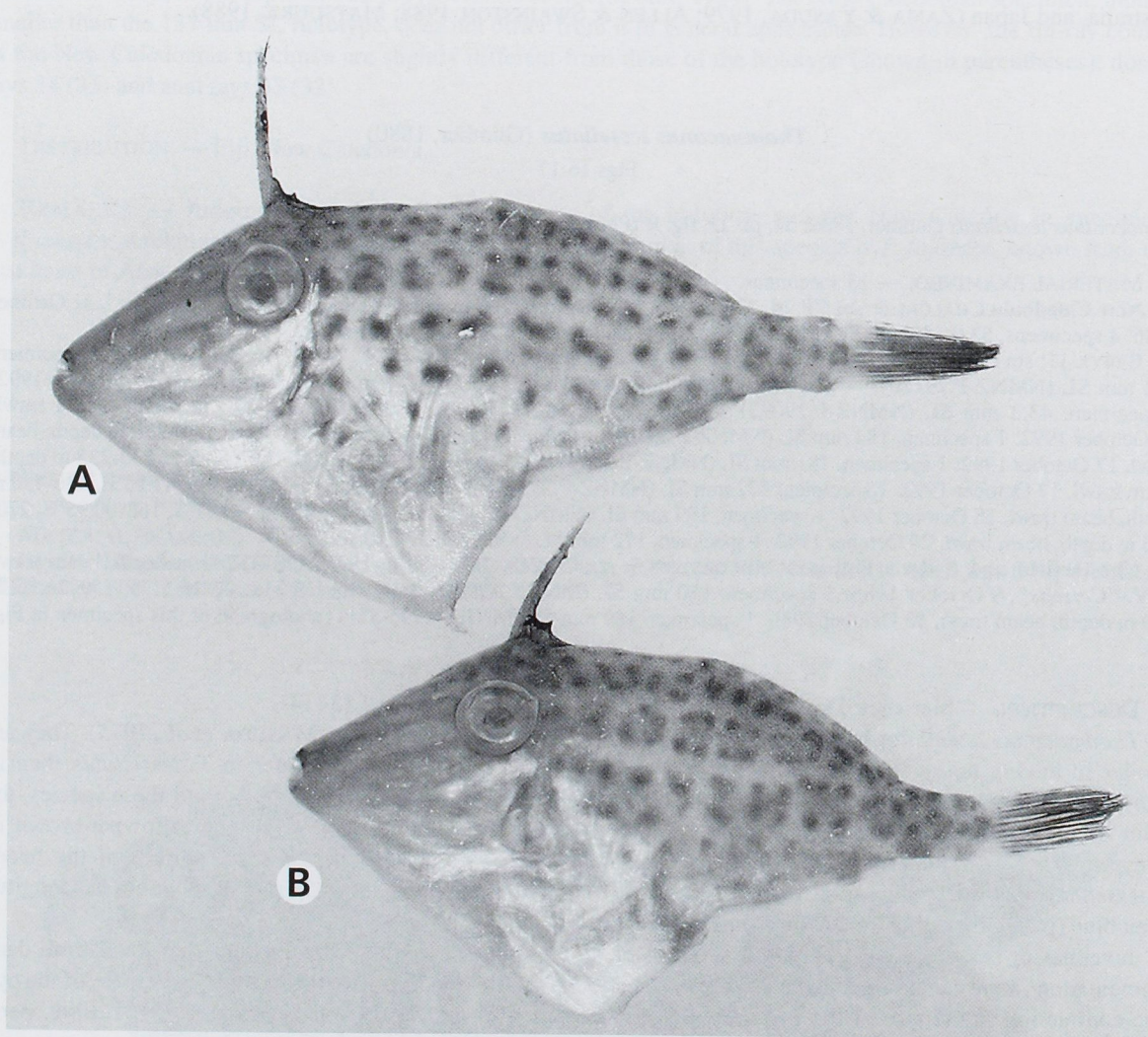


FIG. 16. — *Thamnaconus tessellatus* (Günther, 1880), CHALCAL 2, stn CP 26, 2 of 4 specimens. A, B: 61.0 mm and 54.0 mm SL (MNHN 1995-550).

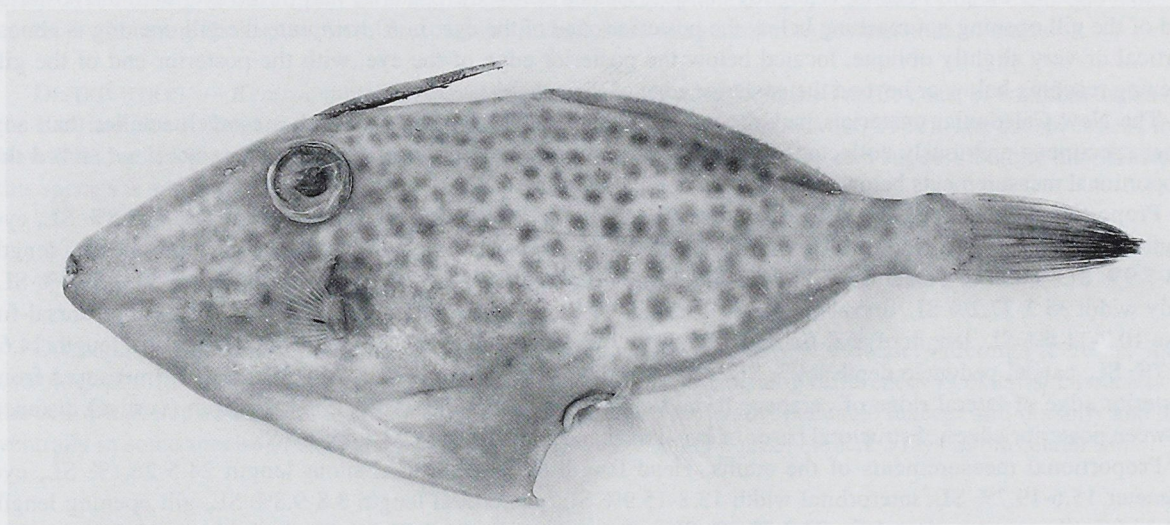


FIG. 17. — *Thamnaconus tessellatus* (Günther, 1880), MUSORSTOM 5, stn CP 318, 1 specimen: 189 mm SL (MNHN 1995-551).

Family ARACANIDAE

Aracanids are primitive boxfishes, most of whose species are found in relatively deep waters in temperate and tropical seas in the Indo-west Pacific, although a few species (e.g., *Aracana aurita* and *A. ornata*) occur in shallow waters. The greatest number of species of aracanids is found in the waters of Australia; however, none of the species of *Kentrocapros* have been found there.

Genus *KENTROCAPROS* Kaup, 1855

Kentrocapros flavofasciatus (Kamohara, 1938)

Fig. 18

Aracana flavofasciata Kamohara, 1938: 44, fig. 23 (Japan).

MATERIAL EXAMINED. — 6 specimens.

New Caledonia. CHALCAL 2: stn CP 27, 23°15.29'S, 168°04.55'E, 289 m depth, beam trawl, R. V. "Coriolis", 31 October 1986: 1 specimen, 89.2 mm SL (MNHN 1995-542). — Stn DW 78, 23°41.30'S, 167°59.60'E, 233 - 360 m depth, Waren dredge, 30 October 1986: 1 specimen, 63.6 mm SL (MNHN 1995-540). — Stn DW 82, 23°13.68'S, 168°04.27'E, 304 m depth, Waren dredge, 31 October 1986: 1 specimen, 89.0 mm SL (NSMT-P.46811).

MUSORSTOM 4: stn CP 172, 19°01.20'S, 163°16.00'E, 275-330 m depth, beam trawl, R. V. "Vauban", 17 September 1985: 1 specimen, 108 mm SL (MNHN 1995-541) (photograph of this specimen in Fig. 18).

BERYX 11: stn CP 16, 24°47.12'S, 168°08.71'E, 240-250 m depth, beam trawl, R. V. "Alis", 16 October 1992: 1 specimen, 44.8 mm SL (NMNZ-P.29089). — Stn CP 24, 24°43.40'S, 168°07.65'E, 260-280 m depth, beam trawl, 17 October 1992: 1 specimen, 38.2 mm SL (NMNZ-P.29082).

DESCRIPTION. — Meristics. Dorsal 11 (10); anal 10; pectoral 12.

Kentrocapros flavofasciatus was previously known from only eight specimens (MATSUURA & YAMAKAWA, 1982; MATSUURA, 1988). Although this species is similar to *K. rosapinto* (Smith, 1949), known from the southwestern Indian Ocean and South Africa, it differs from the latter by the position of the gill opening; in

K. flavofasciatus the gill opening is slightly oblique, located below the posterior half of the eye, with the posterior end of the gill opening not reaching below the posterior edge of the eye; in *K. rosapinto* the gill opening is almost vertical or very slightly oblique, located below the posterior edge of the eye, with the posterior end of the gill opening reaching below or beyond the posterior edge of the eye.

The New Caledonian materials include two juveniles, 38.2-44.8 mm SL, which are much smaller than any other specimens previously collected. Because there are allometric changes in many characters, we record the proportional measurements below separately for the juveniles and adults.

Proportional measurements of the juveniles. Head length 38.8-41.9% SL, snout length 25.7-28.8% SL, eye diameter 19.0-22.3% SL, interorbital width 22.3-23.3% SL, postorbital length 8.3-10.2% SL, gill opening length 7.8-7.9% SL, snout to dorsal fin 77.7-80.6% SL, snout to anal fin 75.9-78.3% SL, body depth 54.0-59.9% SL, body width 35.3-37.2% SL, dorsal-fin height 19.9-22.0% SL, anal-fin height 20.1-21.2% SL, length of dorsal-fin base 10.7-11.6% SL, length of anal-fin base 10.5% SL, pectoral-fin length 25.7-28.0% SL, caudal-fin length 24.6-27.7% SL, caudal peduncle depth 8.9% SL, caudal peduncle length 15.7-20.1% SL, tail length (measured from posterior edge of lateral ridge of carapace to mid-caudal-fin base) 17.3-19.0% SL, tail depth (vertical distance between posterior edges of structural bases of last dorsal and anal-fin rays) 22.5-23.0% SL.

Proportional measurements of the adults. Head length 32.8-36.9% SL, snout length 24.5-26.1% SL, eye diameter 15.6-19.7% SL, interorbital width 13.8-15.9% SL, postorbital length 8.8-9.8% SL, gill opening length 9.9-13.9% SL, snout to dorsal fin 72.7-77.0% SL, snout to anal fin 71.7-77.0% SL, body depth 45.1-50.3% SL, body width 26.4-31.8% SL, dorsal fin height 19.5-20.4% SL, anal-fin height 17.4-19.3% SL, length of dorsal-fin base 10.9-11.1% SL, length of anal fin base 9.5-10.5% SL, pectoral fin length 22.4-25.6% SL, caudal-fin length 20.3-25.5% SL, caudal peduncle depth 8.1-8.6% SL, caudal peduncle length 19.5-21.1% SL, tail length 20.8-21.9% SL, tail depth 21.1-23.2% SL.

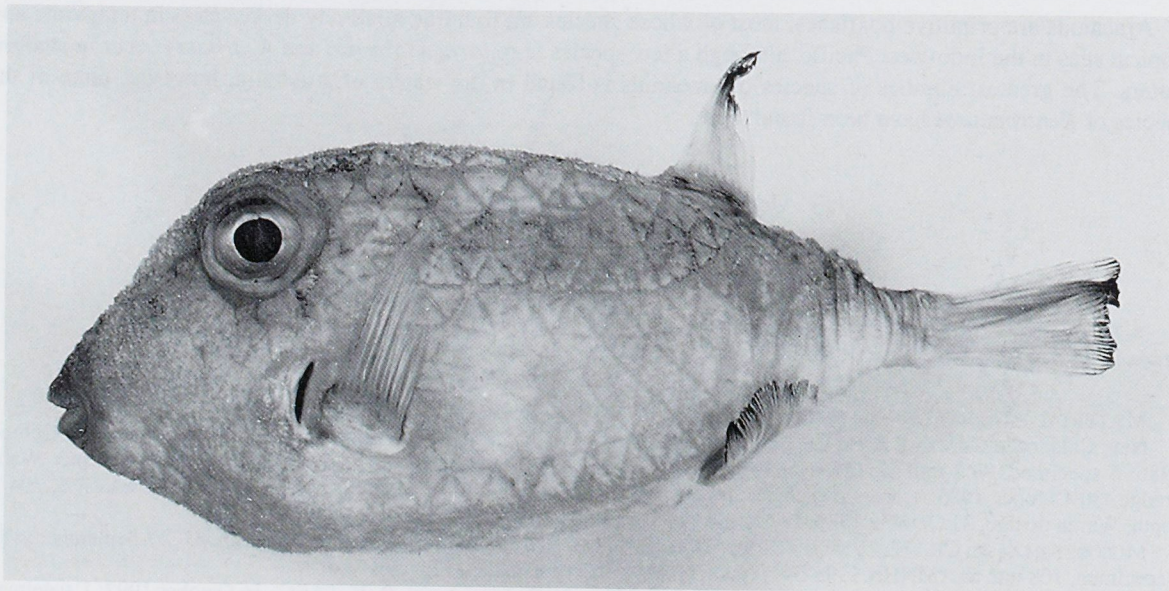


FIG. 18. — *Kentrocapros flavofasciatus* (Kamohara, 1938), MUSORSTOM 4, stn CP 172, 1 specimen: 108 mm SL (MNHN 1995-541).

The two juveniles from New Caledonia differ from the adults in several morphometrics, such as head length, eye diameter, interorbital width, and body depth. However, these differences are considered to be allometric and similar to such changes as found in other tetraodontiform fishes. The juveniles also differ in color from the adults.

They have no longitudinal dark bands on the sides of the body, whereas the dorsal half of their sides and back are covered with many dark spots. In this respect the juveniles are more similar to females than to males.

DISTRIBUTION. — *Kentrocapros flavofasciatus* has been recorded from the Pacific coast of southern Japan and the East and South China seas in depths of 80-120 m (MATSUURA & YAMAKAWA, 1982). The six specimens from New Caledonia represent the first record of this species from the south Pacific, and suggest that the distribution of this species is antitropical.

Family OSTRACIIDAE

Ostraciid boxfishes are distributed in shallow waters in tropical seas worldwide. Although there are many osteological differences between ostraciids and aracanids, the most striking differences in external characters are the following: in ostraciids there are no isolated bony plates on the caudal peduncle (except mid-dorsally and mid-ventrally in some species of *Acanthostracion*), and there are eight (vs. nine) branched rays in the caudal fin.

Genus *TETRASOMUS* Swainson, 1839

Tetrosomus gibbosus (Linnaeus, 1758)

Fig. 19

Ostracion gibbosus Linnaeus, 1758: 332 (India).

MATERIAL EXAMINED. — 3 specimens.

New Caledonia MUSORSTOM 4: stn CC 146, 19°53.40'S, 163°47.10'E, 34 m depth, otter trawl, R. V. "Vauban", 13 September 1985: 3 specimens, 125-166 mm SL (MNHN 1995-533) (photograph of 130 mm SL specimen in Fig. 19).

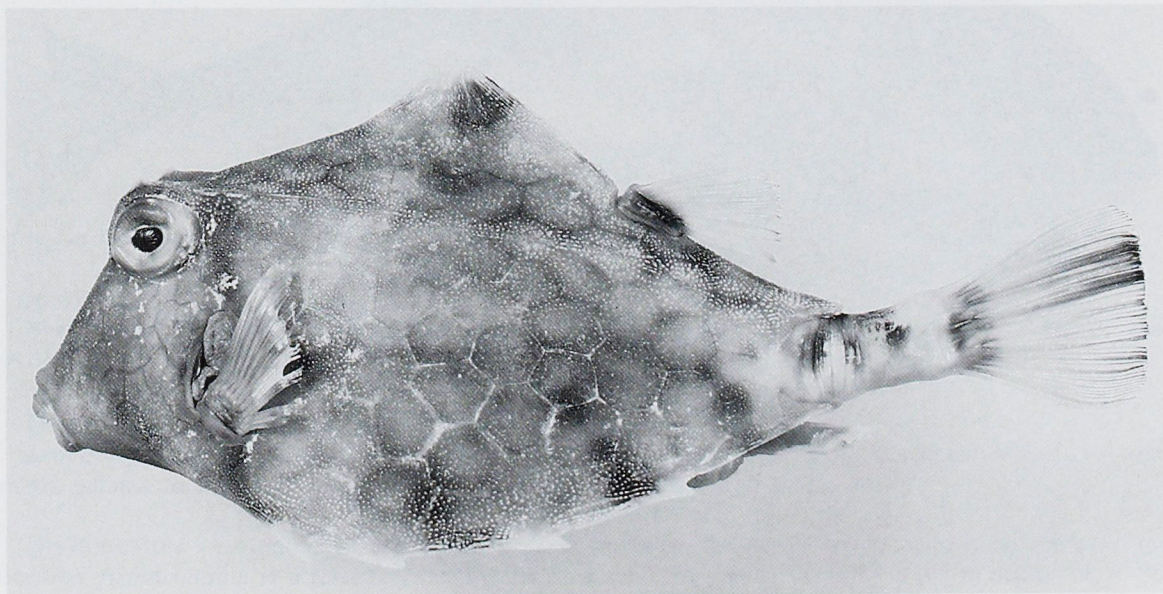


FIG. 19. — *Tetrosomus gibbosus* (Linnaeus, 1758), MUSORSTOM 4, stn CC 146, 1 of 3 specimens: 130 mm SL (MNHN 1995-533).

DESCRIPTION. — Meristics. Dorsal 9; anal 9; pectoral 10.

Tetrosomus gibbosus is similar to *T. reipublicae* (Ogilby) in having the body triangular in cross section. However, it differs from the latter by having a deeper body and only one dorsal carapace spine (vs. two spines) on the dorsal ridge.

DISTRIBUTION. — *Tetrosomus gibbosus* is a common ostraciid boxfish in the tropical regions in the Indo-west Pacific (MATSUURA, 1988).

Family **TRIODONTIDAE**

The only extant species of this family is one of the deeper water species of tetraodontiforms and is still relatively rare in museum collections. This family is the most primitive extant sister group of all other extant tetraodontoid families (the tetraodontid-diodontid clade and the molids), with only the Eocene eoplectids being more morphologically primitive than triodontids.

Genus *TRIODON* Cuvier, 1829

Triodon macropterus Lesson, 1829

Fig. 20

Triodon macropterus Lesson, 1829: pl. 4; 1830: 103 (to accompany 1829 illustration) (Mauritius).

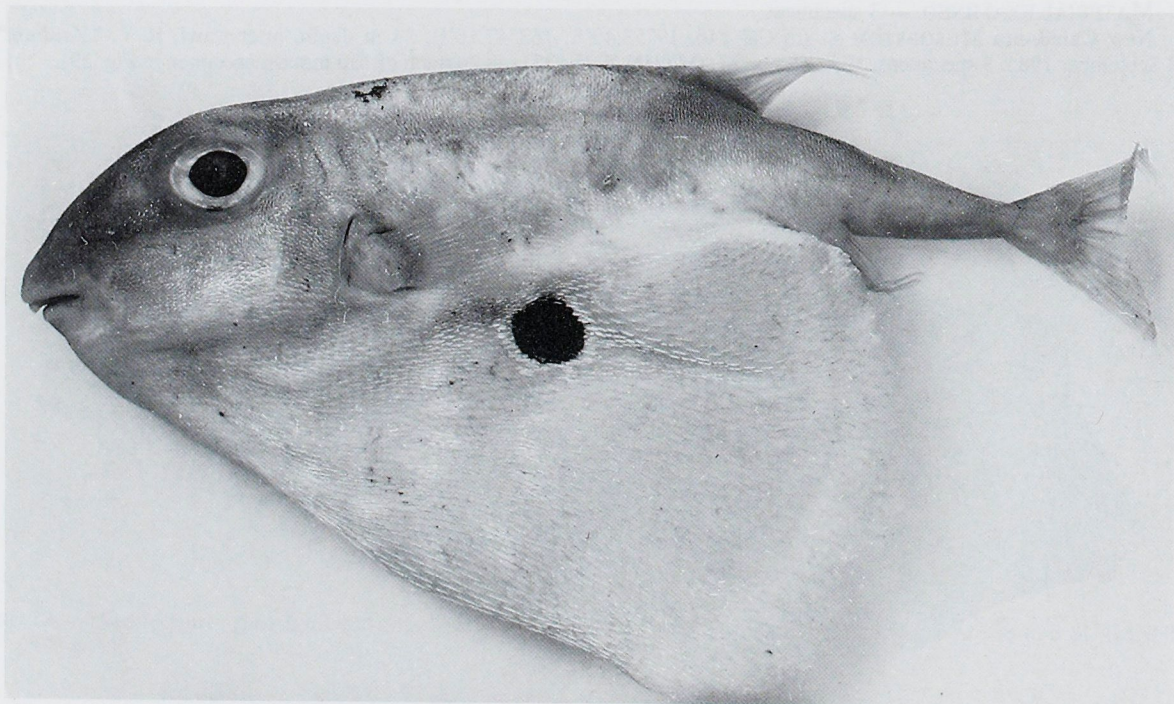


FIG. 20. — *Triodon macropterus* Lesson, 1829, MUSORSTOM 5, CP 279, 1 of 2 specimens: 235 mm SL (MNHN 1994-592).

MATERIAL EXAMINED. — 2 specimens.

New Caledonia. MUSORSTOM 5: stn CP 279, 24°08.72'S, 159°37.76'E, 160-270 m depth, beam trawl, R. V. "Coriolis", 10 October 1986: 2 specimens, 235-377 mm SL (MNHN 1994-592 & 593) (photograph of 235 mm SL specimen in Fig. 20).

DESCRIPTION. — Meristics. Dorsal II (rudimentary), 11; anal 10; pectoral 15-16.

The presence of a rudimentary spiny dorsal fin is typical of specimens of the western Pacific populations of this species, while in specimens from the Indian Ocean the rudimentary dorsal-fin spines are usually absent (TYLER, 1967, 1980).

The sac-like nature of the extension of the coelomic cavity into the dewlap of skin that can be flared between the body and the long shaft-like pelvis is especially evident in both specimens because of its distention with fluid.

Until recently this species has only been known on the basis of large adults, mostly 300 to 550 mm SL, with only a few specimens as small as 224 mm SL, to which the ORSTOM specimen of 235 mm SL is similar in morphometrics. Five much smaller specimens of 89-103 mm SL were collected in 1986 off Queensland, Australia (TYLER & PATTERSON, 1991).

DISTRIBUTION. — This species has been recorded in 50-300 m from Japan through Indonesia, Australia, and the Philippines to east Africa (TYLER & PATTERSON, 1991, and contained references) but not previously as far east in the south-west Pacific as New Caledonia.

Family TETRAODONTIDAE

Puffers are peculiar in having an inflatable stomach and, in many species of the Indo-west Pacific, strong poison in their viscera, blood, and even in the muscles. Most species of tetraodontids are shallow water inhabitants, occurring in various habitats such as coral reefs, rocky reefs, sandy-muddy flats, and estuaries; however, several members of the family, such as *Arothron firmamentum*, *Sphoeroides pachygaster*, and a few species of large-sized *Takifugu*, are taken from continental shelves and slopes deeper than 100 m.

Genus *AROTHRON* Müller, 1841

Arothron firmamentum (Temminck & Schlegel, 1850)

Fig. 21

Tetraodon firmamentum Temminck & Schlegel, 1850: 280, pl. 126, fig. 2 (Japan).

MATERIAL EXAMINED. — 1 specimen.

New Caledonia. BERYX 11: stn C41, 23°39.20'S, 168°00.50'E, 230-360 m depth, otter trawl, R. V. "Alis", 20 October 1992: 1 specimen, 242 mm SL (NMNZ-P.29244).

DESCRIPTION. — Meristics. Dorsal 16; anal 14; pectoral 16.

Arothron firmamentum differs from all other species of *Arothron* by the higher dorsal and anal-fin ray counts and the pointed dorsal and anal fins.

DISTRIBUTION. — Although all other species of *Arothron* inhabit coastal waters, usually around coral reefs, *Arothron firmamentum* is a relatively deep-water inhabitant, frequently taken by trawl in depths of 30-80 m (HARDY, 1980). The New Caledonian specimen was taken at a much deeper depth than previously recorded (180 m, see HARDY, 1980). *Arothron firmamentum* is antitropical in distribution and has been recorded from Japan, Australia and New Zealand (HARDY, 1980). Three specimens of this species have recently been collected

from South Africa; the counts, measurements and color patterns of these specimens all agree well with specimens from Japan (P. C. HEEMSTRA, pers. comm.)

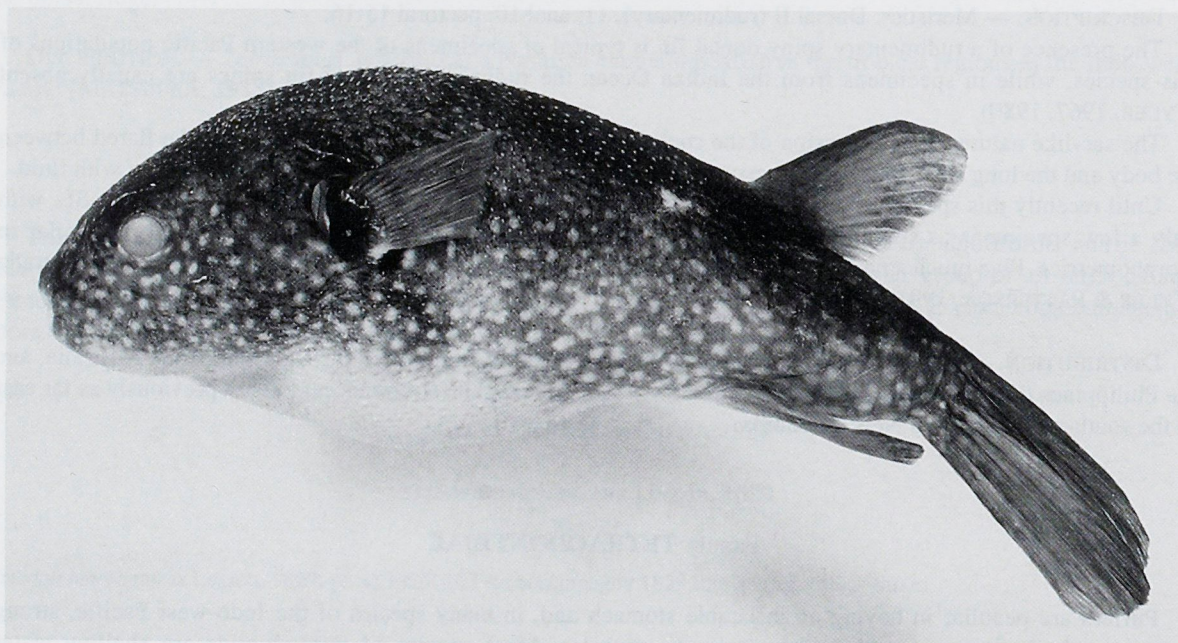


FIG. 21. — *Arothron firmamentum* (Temminck & Schlegel, 1850), BERYX 11, stn C 41, 1 specimen: 242 mm SL (NMNZ-P.29244).

Genus *CANTHIGASTER* Swainson, 1939

Canthigaster callisterna (Ogilby, 1889)

Fig. 22

Tetrodon callisternus Ogilby, 1889: 74, pl. 3, fig. 5 (Lord Howe Island).

MATERIAL EXAMINED. — 1 specimen.

New Caledonia. BERYX 11: stn CP 44, 23°41.30'S, 168°00.57'E, 230-250 m depth, beam trawl, R. V. "Alis", 20 October 1992: 1 specimen, 45.5 mm SL (NMNZ-P.29043).

DESCRIPTION. — Meristics. Dorsal 11; anal 10; pectoral 17.

Canthigaster callisterna is similar to *C. rivulata* (Temminck & Schlegel) and *C. flavoreticulata* Matsuura in having longitudinal bands on the sides of the body. *Canthigaster callisterna* differs from *C. rivulata* in having 11 (vs. 10) dorsal-fin rays, and from *C. flavoreticulata* in 11 (vs. 10) dorsal-fin rays and 17-18 (vs. 16) pectoral-fin rays.

DISTRIBUTION. — *Canthigaster callisterna* has been recorded from New South Wales, Australia, Lord Howe and Norfolk islands, northern New Zealand, and the Kermadec Islands (ALLEN & RANDALL, 1977). Judging from the previous records, the occurrence of this species in New Caledonia is not surprising. The New Caledonian specimen was collected much deeper than any previously reported specimens.

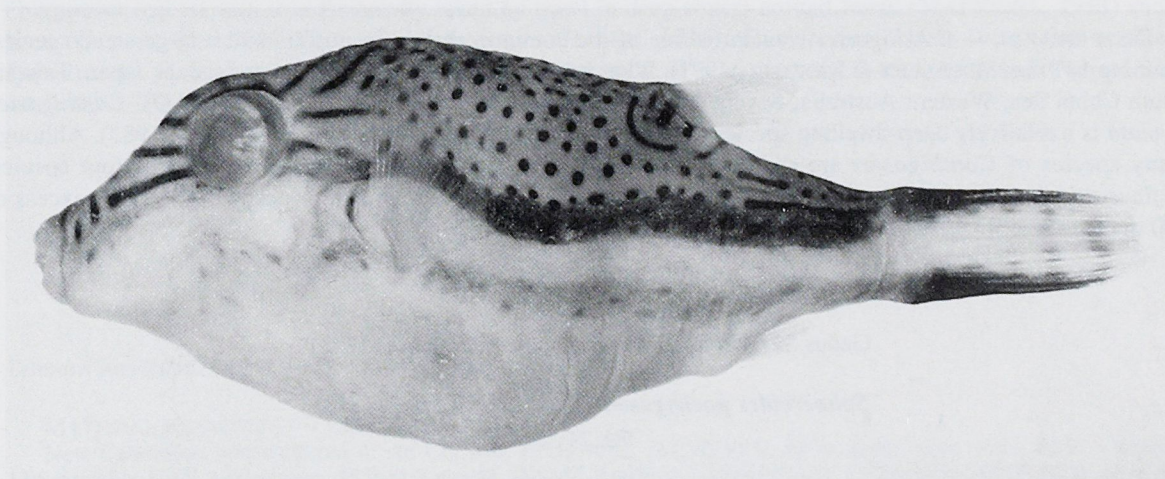


FIG. 22. — *Canthigaster callisterna* (Ogilby, 1889), BERYX 11, stn CP 44, 1 specimen: 45.5 mm SL (NMNZ-P.29043).

Canthigaster rivulata (Temminck & Schlegel, 1850)

Fig. 23

Tetraodon rivulata Temminck & Schlegel, 1850: 285, pl. 124, fig. 3 (Nagasaki Bay, Japan).

MATERIAL EXAMINED. — 1 specimen.

New Caledonia. MUSORSTOM 4: stn DW 204, 22°37.00'S, 167°05.70'E, 120 m depth, Waren dredge, R. V. "Vauban", 27 September 1985: 1 specimen, 36.8 mm SL (MNHN 1995-532).



FIG. 23. — *Canthigaster rivulata* (Temminck & Schlegel, 1850), MUSORSTOM 4, stn DW 204, 1 specimen: 36.8 mm SL (MNHN 1995-532).

DESCRIPTION. — Meristics. Dorsal 10; anal 10; pectoral 16.

DISTRIBUTION. — *Canthigaster rivulata* is one of the common sharpnose puffers and a large-sized species, attaining 147 mm SL (ALLEN & RANDALL, 1977). It has been recorded from the Hawaiian Islands, Japan, Taiwan, South China Sea, Western Australia, Seychelles Islands, and Somali (ALLEN & RANDALL, 1977). *Canthigaster rivulata* is a relatively deep-dwelling species, taken from depths as great as 230 m (MATSUURA, 1985). Although many species of *Canthigaster* are shallow water inhabitants, usually found around coral reefs, four species, *C. flavoreticulata*, *C. investigatoris*, *C. inframacula*, and *C. rivulata*, are known to occur in depths in excess of 100 m (ALLEN & RANDALL, 1977; MATSUURA, 1986).

Genus *SPOEROIDES* Anonymous (Lacepède, 1798)

Sphoeroides pachygaster (Müller & Troschel, 1848)

Fig. 24

Tetrodon pachygaster Müller & Troschel, 1848: 677 (Barbados).

MATERIAL EXAMINED. — 3 specimens.

Chesterfield and Bellona Plateaus. CHALCAL 1: stn CH 2, 22°34.41'S, 159°17.39'E, 330 m depth, otter trawl, R. V. "Coriolis", 28 July 1984: 1 specimen, 238 mm SL (MNHN 1995-534) (photograph of this specimen in Fig. 24).

New Caledonia. BERYX 11: stn CP 25, 24°43.52'S, 168°08.52'E, 230-235 m depth, beam trawl, R. V. "Alis", 17 October 1992: 1 specimen, 249 mm SL (NMNZ-P.29240). — Stn C41, 23°39.20'S, 168°00.50'E, 230-360 m depth, otter trawl, 20 October 1992: 1 specimen, 213 mm SL (NMNZ-P.29243).

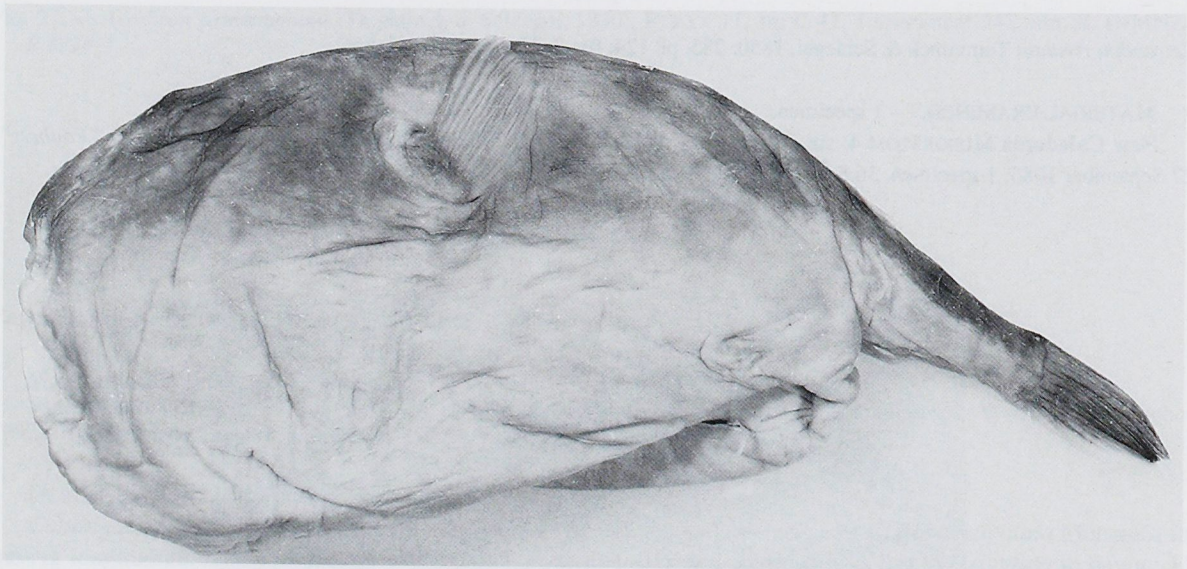


FIG. 24. — *Sphoeroides pachygaster* (Müller & Troschel, 1848), CHALCAL 1, stn CH 2, 1 specimen: 238 mm SL (MNHN 1995-534).

DESCRIPTION. — Meristics. Dorsal 9; anal 9; pectoral 15 (16).

DISTRIBUTION. — Although SHIPP (1974) recorded *Sphoeroides pachygaster* in the Pacific only from the Philippines and Hawaii, it is frequently taken by trawl in deep waters around Japan (MATSUURA, 1988) and has been recorded from New Zealand and Australia (HARDY, 1981). This species differs from other species of *Sphoeroides* by having no spinules or spines on the body. It is distributed in temperate and tropical waters worldwide. The deepest record of this species is 480 m (SHIPP, 1974).

Genus *TORQUIGENER* Whitley, 1930

Torquigener brevipinnis (Regan, 1902)

Figs 25-26

Tetrodon brevipinnis Regan, 1902: 300 (Indonesia).

MATERIAL EXAMINED. — 7 specimens.

New Caledonia MUSORSTOM 4: stn CC 146, 19°53.40'S, 163°47.10'E, 34 m depth, otter trawl, R. V. "Vauban", 13 September 1985: 3 specimens, 75.9-81.3 mm SL (NSMT-P.46812). — Stn CC 147, 19°35.00'S, 163°39.60'E, 46 m depth, otter 13 October 1985: 4 specimens, 67.3-84.4 mm SL (MNHN 1995-526) (photographs of 67.3 and 75.9 mm SL specimens in Figs. 25-26).

DESCRIPTION. — Meristics. Dorsal 9 (8); anal 8; pectoral 15 (14-16). Because HARDY (1984) redescribed this species in detail on the basis of 12 specimens, no detailed description is needed here.

DISTRIBUTION. — This species has primarily been recorded from Indonesia and Papua New Guinea (HARDY, 1984), but it occurs also in southern Japan (MATSUURA, 1988). HARDY (1984) showed that this species has been captured in moderately deep waters (34-100 m).



FIG. 25. — *Torquigener brevipinnis* (Regan, 1902), MUSORSTOM 4, stn CC 147, lateral view, 2 of 4 specimens. **A, B**: 75.9 mm and 67.3 mm SL (MNHN 1995-526).

Genus *TYLERIUS* Hardy, 1984*Tylerius spinosissimus* (Regan, 1908)

Fig. 27

Spheroides spinosissima Regan, 1908: 253, pl. 31, fig. 5 (Saya de Malha Bank).

MATERIAL EXAMINED. — 5 specimens.

New Caledonia. MUSORSTOM 4: stn CC 173, 19°02.50'S, 163°18.80'E, 250-290 m depth, otter trawl, R. V. "Vauban", 17 September 1985: 1 specimen, 69.5 mm SL (MNHN 1995-536). — Stn CC 245, 22°07.00'S, 167°11.00'E, 415-435 m depth, otter trawl, 3 October 1985: 2 specimens, 108-110 mm SL (NSMT-P.46813) (photograph of 110 mm SL specimen in Fig. 27). — Stn CC 246, 22°08.50'S, 167°11.50'E, 410-420 m depth, otter trawl, 3 October 1985: 1 specimen, 76.3 mm SL (MNHN 1995-535). — Stn CC 248, 22°09.50'S, 167°10.00'E, 380-385 m depth, otter trawl, 4 October 1985: 1 specimen, 70.9 mm SL (MNHN 1995-537).

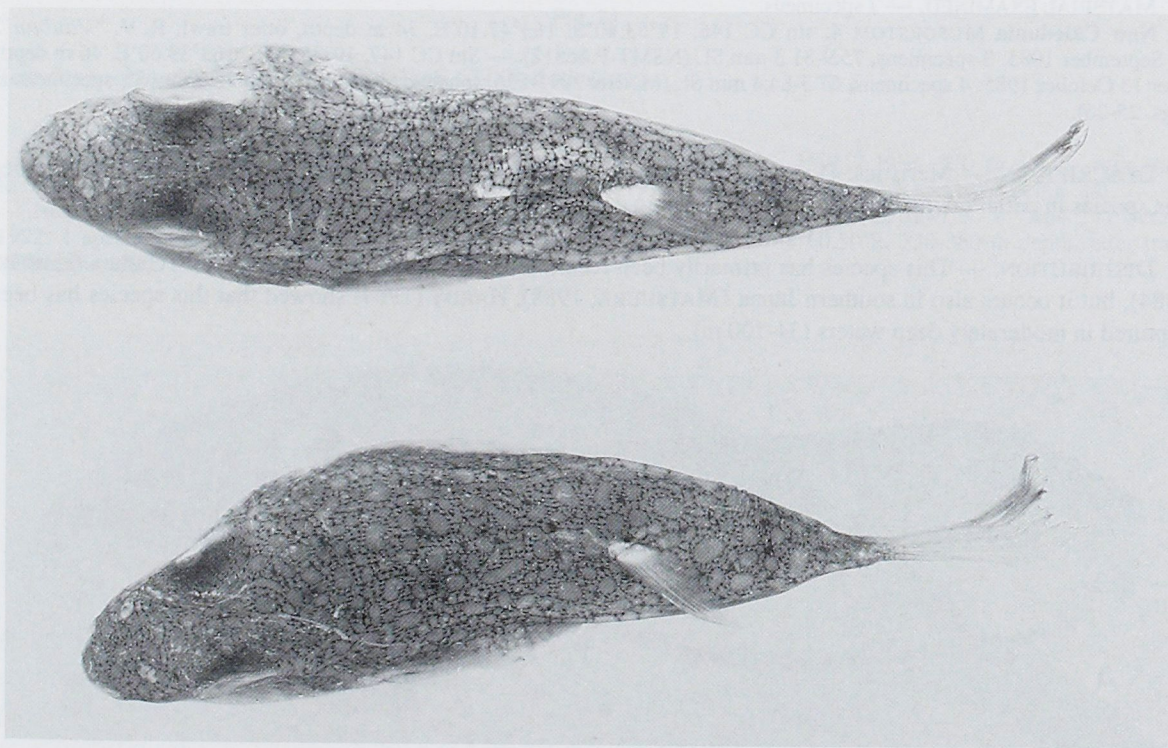


FIG. 26. — *Torquigener brevipinnis*, MUSORSTOM 4, stn CC 147, dorsal view of the specimens shown in Fig. 25 (MNHN 1995-526).

DESCRIPTION. — Meristics. Dorsal 8 (7); anal 7; pectoral 16 (15-17).

This species was described in great detail by HARDY (1981) and the present specimens from New Caledonia do not require comment.

DISTRIBUTION. — This species is widely distributed in the Indo-west Pacific from South Africa to north-western Australia and northward to the South China Sea (HARDY, 1984).

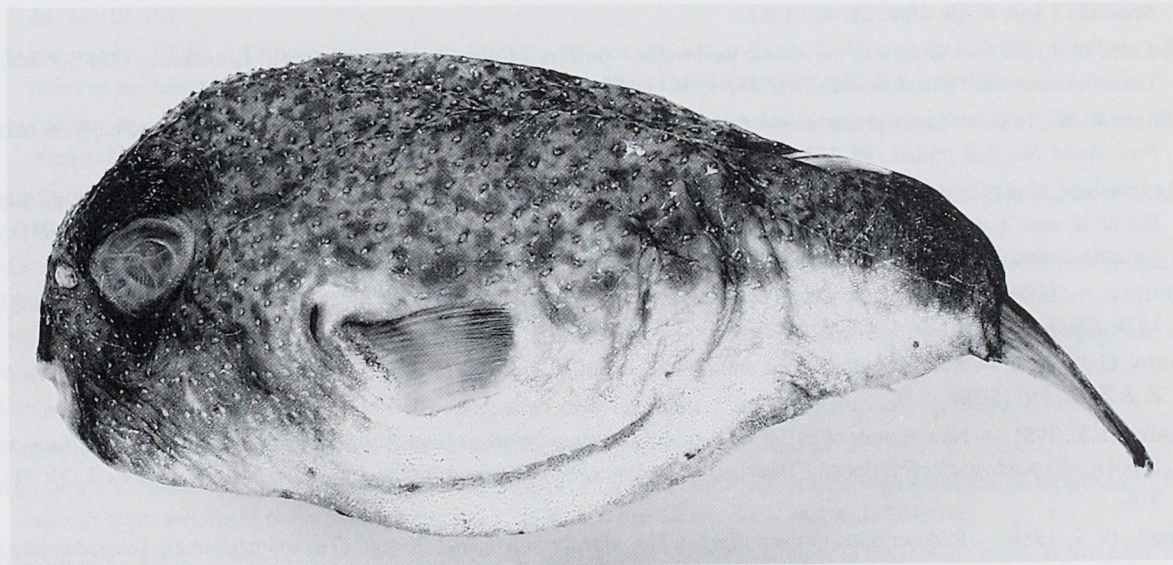


FIG. 27. — *Tylerius spinosissimus* (Regan, 1908), MUSORSTOM 4, stn CC 245, 1 of 2 specimens: 110 mm SL (NSMT-P.46813).

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