Studies on New Zealand Elasmobranchii. Part IV.
The Systematic Position of *Centroscymnus waitei* (Thompson, 1930), Selachii*

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**Abstract**

*Centroscymnus waitei* is a deep water squid known only from a single juvenile specimen taken in New Zealand waters. The species has rounded inner pectoral corners and hence its original designation to *Centrophorus* cannot be sustained. The dermal denticles on the trunk have tridentate, hollowed-out blades, which resemble those of juvenile specimens of *Centroscymnus nodakpus*. The species is referred to *Centroscymnus* as a distinct species, though it closely resembles *C. fimbria*.

*Centroscymnus waitei* is based on a single juvenile male specimen of spiny dogfish, 318 mm. in total length, taken on a long line in deep water off Kaikoura in August, 1928, by Mr. Nilson, and described by E. F. Thompson (1930, pp. 277–278, Pl. XLIV) as *Centrophorus waitei*. No further specimens have been recorded, and as Thompson’s description and illustrations of the holotype have proved inadequate for a complete comprehension of the species by both local and overseas workers, there have been divergent opinions on its generic status. Whitley (1934, p. 200) retains it in the g. *Centrophorus*, but in a later account of the sharks of Australia and New Zealand (1940, p. 143, fig. 156) it is listed as *Proscymnus waitei*, though no reasons are cited for the generic change. The descriptions and figures accompanying the latter account are both after Thompson. Fowler (1941, p 234) includes the species in the g. *Centrophorus* and gives a description modified from Thompson (Phillips, 1946, p 17) following Thompson, places the species in the g. *Centrophorus*. Bigelow and Schroeder (1948, p 451, footnote 8) consider that the species should be included in the g. *Scymnodon*, because the inner pectoral corners are rounded, and not angular and produced as they are in species of *Centrophorus*. Richardson and Garrick (1953, p 35, fig. 38) following Fowler, provisionally regard the species as belonging to the g. *Centrophorus*, but indicate that if the specimen should be established as a juvenile of the *Centrophorus plunketi* of Waite (1910, pp. 384–386, Pl. XXXVII)—a suggestion originally put forward by Thompson (1930, p 278) in his account of *C. waitei*—then it is a *Scymnodon*, as the inner pectoral corners of Waite’s species are rounded. Bigelow, Schroeder and Springer (1953, p 232) regard the species as a *Scymnodon*, though the lack of detailed information in the type description precludes them from being definite on this point.

*C. waitei* is characterised by having a broad, depressed head with obtusely rounded lateral margins continuing on to the short, blunt snout; a slender compressed trunk, a deep caudal fin with a very oblique terminal lobe and at best only an indistinct subterminal notch; lobate pectorals with broadly rounded

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corners; small, low dorsal fins, the 2nd much larger than the 1st, and each preceded by a short dorsal spine of which only the tip is exposed; the upper and lower teeth one-cusped and dissimilar, the upper lanceolate and sharply pointed, the lower rectangular with strongly oblique, laterally directed cusps; the dermal denticles loosely spaced, erect; the blades of the denticles of the trunk region very strongly tridentate, deeply hollowed-out and with narrow, flat-topped rims proximally, and a ventral keel.

The family Squalidae includes those small sharks or dogfishes in which there are two dorsal fins preceded by dorsal spines, and no anal fin. Within this family Bigelow and Schroeder (1948, pp. 450–499) recognise nine genera, these being Oxynotus, Centroscymnus, Etmopterus, Deania, Squalus, Cirrhigaleus, Centroscymnus, Scymnodon and Centrophorus. The genera are keyed out and distinguished as follows Oxynotus is at once distinct and bizarre in that it is very deep-bodied with high dorsal fins and prominent ventrolateral dermal ridges, so that in section the trunk is subtriangular. Moreover each of the dorsal fin spines arises from midway along the dorsal base and extends anterodorsally to emerge from the anterior margin of the fin. Of the remaining eight genera with slender trunks which are not markedly triangular in section, and with the dorsal fin spines lying along the anterior margins of the dorsal fins, Centroscymnus and Etmopterus differ from the rest chiefly in that their upper teeth have several cusps rather than one. Deania includes long snouted, attenuate squaloids in which the preoral length is greater than the length from the centre of the mouth to the origin of the pectorals, and is thus in contrast to the shorter snouted, less attenuate Squalus, Cirrhigaleus, Centroscymnus, Scymnodon and Centrophorus in which the preoral length is considerably shorter in the same ratio. Squalus and Cirrhigaleus have teeth which are similar in the two jaws, thus leaving three genera, Centroscymnus, Scymnodon and Centrophorus in which the teeth are dissimilar. It is within this latter group that the species described by Thompson as Centrophorus waitei falls.

Bigelow and Schroeder (1948, p. 451) distinguish Centrophorus from Centroscymnus and Scymnodon because it has the inner pectoral corner angular and more or less produced, a feature shown by Centrophorus granulosus (Bloch and Schneider, 1801), the type species of the genus. In a further paper, Bigelow, Schroeder and Springer (1953, p 223) emphasise the value of this character in subdividing "the considerable group of squaloids that agree in having one-cusped blade-like teeth in both jaws and simple dermal denticles"—in other words, the three genera Centrophorus, Centroscymnus and Scymnodon. These authors also indicate firstly the disadvantages of Garman’s (1913, pp. 189–233) classification in which the shape of the pectorals is abandoned as "a primary generic character", and secondly Fowler’s (1941, pp 222–263) distribution of those species with extended inner pectoral corners between two genera, Centrophorus and Entorhynchus, based on "the relative degrees to which the inner corners of the pectorals are produced and the shapes of the dermal denticles" (Bigelow and Schroeder, 1948, p. 451, footnote 8).

The specimen described by Thompson as Centrophorus waitei has the inner pectoral corners rounded and not at all produced. It is thus evident that this species cannot belong to the genus Centrophorus as recognised by Bigelow and Schroeder (1948, p 451) and Bigelow, Schroeder and Springer (1953, pp. 223–227) Its inclusion must then be within either Centroscymnus or Scymnodon.
which have rather similar facies and in which the inner pectoral corners are rounded. The distinctions between adult specimens of these two genera are small, and depend almost entirely on the nature of the dermal denticles. In *Centroscymnus* the "blades of the dermal denticles on trunk behind 1st dorsal smooth, with rounded margins, ridged or striate denticles confined to more anterior parts of the body" (Bigelow and Schroeder, 1948, p. 451), while in *Scymnodon* the "blades of dermal denticles with three to several ridges; with marginal teeth on posterior as well as on anterior parts of trunk" (Bigelow and Schroeder, 1948, p. 451). Although it is possible to separate adult specimens of the two genera on these denticle characters, the position has been complicated by the fact that juvenile specimens of *Centroscymnus coelolepis* have been found to have dentate denticles on the trunk instead of the evenly rounded denticles which occur in the adult (Bigelow and Schroeder, 1954, p. 47). This feature was first noted by Tortonese (1952, pp. 386-387, Fig. 1) who found strongly tridentate denticles on the sides of a juvenile male of 270 mm. total length, which was in all other respects, referable to *Centroscymnus coelolepis*. Bigelow and Schroeder corroborate Tortonese's findings and show that in a series of specimens ranging from embryos to an adult female of 1035 mm. total length, there is a gradual transition from dentate to smooth-edged denticles, the denticles which develop later being less and less dentate until the adult condition is reached. Accompanying this transition is an increase in the size of the denticles, and in addition, instead of being loosely spaced as they are in the juvenile, the denticles become more and more packed so as to overlap each other. Further evidence cited by Bigelow and Schroeder indicates the probability that a similar transition from tridentate to smooth-edged denticles accompanied by an increase in denticle size and closer packing occurs with growth in specimens of *Centroscymnus ousstoni* Garman, 1906.

The significance of these findings is that juvenile specimens of *Centroscymnus coelolepis* could be identified as specimens of *Scymnodon* because the dentate denticles on the sides of the trunk resemble those of *Scymnodon* and not *Centroscymnus*, and there are no other features yet recognised to adequately diagnose these two genera. Actually this has happened, and Bigelow and Schroeder (1954, p. 51) find that the juvenile specimens, 330–462 mm. in total length, on which they based their *Scymnodon melas* (1953, pp. 233–237, Fig. 5), are no other than juveniles of *Centroscymnus coelolepis*.

The generic status of the juvenile male on which Thompson (1930) based his *Centrophorus waitei* cannot therefore be determined readily. Not enough is known of the juveniles of *Centroscymnus* and *Scymnodon* to lay down any definite criteria, but the nature of the denticles of Thompson's species, together with the information given above on the changes with growth of the denticles of *Centroscymnus coelolepis* suggest very strongly that on these characters alone Thompson's species should be included in the g. *Centroscymnus*. The denticles of the head region of *C. waitei* are ridged as they are in *Centroscymnus coelolepis*, and differ from those of the trunk, which in *C. waitei* lack ridges, are smoothly hollowed-out and strongly tridentate. And although the denticles of the trunk of *C. waitei* vary considerably from their evenly rounded, slightly hollowed-out counterparts in adults of *Centroscymnus coelolepis*, they do show a close resemblance to those described from juvenile specimens of this species by Bigelow,
Schroeder and Springer (1953, pp. 233–237—under Scymnodon melas), and Bigelow and Schroeder (1954, pp. 47–52, Fig. 2).

It is worthwhile at this point to look for further affinities other than denticle characters, between Centrostycynus waitei and other species of Centrostycynus, and also for distinctions between the characters of this genus and those of Scymnodon. Only four other species of Centrostycynus are known these being C. coelocephis Bocage and Capello, 1864, C. owstoni Garman, 1906, C. fuscus Gilchrist and von Bonde, 1924, and C. cryptacanthus Regan, 1906. The former two are well known, and excellent descriptions and illustrations are available in Garman (1918—both species), Bigelow and Schroeder (1948—C. coelocephis) and other sources. C. fuscus is known only from the description of the type which was not illustrated. According to Smith (1950, p. 58) the type specimen is lost. C. cryptacanthus also is apparently inadequately known and not illustrated. However, the two well-known species have such uniform generic characterization which is evident also in the descriptions of C. fuscus and C. cryptacanthus that it is reasonable to use the former alone as a basis for comparing the facies of the genus with that of C. waitei.

The three species thus compared, C. coelocephis, C. owstoni and C. waitei, agree in the following: the trunk moderately slender, compressed and uniformly tapered; the head depressed, but obtusely margined, and with large eyes; the snout bluntly pointed and short; the dorsal fins small, with indistinct origins, and each preceded by a dorsal spine of which only the tip protrudes (concealed in C. cryptacanthus); the 1st dorsal smaller in area than the 2nd dorsal, and brush-shaped, while the 2nd is a little more triangular; the caudal well developed and deep, the distal margin truncate or oblique (very oblique in C. waitei, less so in C. owstoni and convexly truncate in C. coelocephis) and a distinct subterminal notch (not prominent in C. waitei); the pectoral fins with broadly rounded corners, and short so that when adpressed to the trunk they fail to reach the level of the 1st dorsal spine; the pelves just anterior to the second dorsal and similar in shape to it, the spiracles large, above and behind the level of the eyes, the gill-openings small, vertical and arranged in a horizontal series anterior to the pectoral base; the nostrils oblique, with their anteromedial margin expanded as small triangular lobes, the mouth broad, little arched, and bounded by long, deeply incised, upper labial furrows which reach ½ to ⅔ of the distance between the angles and the symphysis of the upper jaw, and short, shallow, lower furrows; the upper teeth erect, each with a sharply pointed lanceolate cusp arising from a bifid base, and the lower teeth rectangular, and each with a strongly oblique, laterally directed cusp.

The very close agreement which the species of Centrostycynus, including C. waitei, show in the above features, cannot be stressed too strongly at this stage.

The g. Scymnodon includes nine species as recognised by Bigelow, Schroeder and Springer (1953, pp. 230–233), other than C. waitei which they also provisionally regard as a Scymnodon. Most of these species are inadequately known, and only a few are well illustrated—viz., S. foliaceus (Gunther, 1877) and S. squammosus (Gunther, 1877) in Gunther (1887, Pl. II) and S. jonssooni (Saemundsson, 1922, Pl. V). They do not form as compact an assemblage as do the species of Centrostycynus, so that it is not possible to delineate the facies of the genus as concisely as can be done with Centrostycynus. But the following characters emerge and appear to be valid: the trunk is generally similar to that of Centro-
Scymnus, being moderately slender, compressed and uniformly tapered; the head depressed but varying in thickness at the margin, and in this respect generally thinner along the snout than it is in Centrosynus (as seen in S. squamulosus and S. jonssoni the head appears to have a thin well-defined margin anterior to the eye); the snout bluntly pointed, but narrower and more elongate than in Centrosynus; the dorsal fins either similar to those of Centrosynus with a small brush-shaped 1st dorsal and a larger triangular 2nd dorsal in which the base is constructed so that in lateral view the base is distinctly narrower than the distal portion of the web (S. squamulosus, S. jonssoni and S. planketi), or else with two large triangular dorsals resembling those of the g. Squalus (S. foliaceus); the dorsal spines small and just protruding (S. squamulosus), or with the 1st dorsal spine small and just protruding, the 2nd spine large and strongly projecting (S. foliaceus), or with both spines well developed and strongly projecting (S. macracanthus); the caudal fin similar to that of Centrosynus, but square truncated (even in the embryo of S. planketi figured by Waite (1914, Pl. III) the caudal is square truncate and thus fundamentally dissimilar to that of the juvenile C. waitei), and with a strong subterminal notch, the pectoral and pelvic fins as in Centrosynus, though Saemundsson (1922, Pl. V) illustrates S. jonssoni with the pelvic base almost opposite the base of the 2nd dorsal, the spiracles large and above and behind the eyes, the nostrils generally oblique, but almost transverse in S. foliaceus, and with their anteromedial margins expanded as short triangular lobes; the mouth little arched and with labial furrows as in Centrosynus (S. foliaceus, S. squamulosus), or highly arched and with very long upper labial furrows which reach almost to the symphyses (S. jonssoni); the upper teeth erect, each with a short wide, sharp, awl-shaped or triangular cusp (S. foliaceus, S. squamulosus), or with a long, narrow, sharply pointed, lanceolate cusp (S. planketi), the lower teeth rectangular, each with a broad, triangular cusp, either erect and symmetrical at the centre of the jaw and oblique and laterally directed at the angles (S. rugens, S. crepidator), or oblique and laterally directed along the whole width of the jaw (S. planketi).

In the absence of complete and detailed information on so many of the species of Scymnodon, the above account of the facies of the genus must necessarily be tentative, and cannot provide an adequate basis for comparison with Centrosynus. It can be seen, however, that there are characters of at least some of the species of Scymnodon which differ strongly from those of Centrosynus. Emphasising the principal ones of these, they are: the narrower, more elongate pointed head, with a definite thin margin anterior to the eyes, the strongly developed and projecting dorsal spines, accompanied by larger, triangular fins in some cases, the highly arched jaws with very long upper labial furrows reaching almost to the symphyses; the short, wide, awl-shaped or triangular cusps of the upper teeth; and the lower teeth with erect, symmetrical cusps at the centre of the mouth and oblique, laterally directed cusps towards the angles.

It is difficult to forecast what the significance of the above will be when a detailed survey of all the known species of Scymnodon is completed, but the indications are that in many diagnostic characters there is continuous gradation between Scymnodon and Centrosynus. In the meantime, reference to the characters selected above seems to promise possibilities for distinguishing species of Centrosynus from those species of Scymnodon in which they are most evident,
The specific distinctness of *C. waitai* from *C. coelolepis*, *C. owstoni* and *C. cryptacanthus* is clearcut. In *C. waitai* the tips of the pelvies fall short of the posterior end of the 2nd dorsal base by a distance subequal to the horizontal diameter of the eye. In *C. coelolepis* the tips of the pelvies extend to midway between the posterior insertion and the posterior free tip of the 2nd dorsal, as in Garman’s (1913) and Bigelow and Schroeder’s (1948) figures, or at least to the posterior insertion in juveniles as in Bigelow, Schroeder and Springer’s (1953) figure under *Scymnodon melas*. In *C. owstoni* the tips of the pelvies have the same relationship to the 2nd dorsal as in adult specimens of *C. coelolepis*, that is reaching behind the 2nd dorsal base as in Garman’s (1913) figure, while in *C. cryptacanthus* the tips of the pelvies reach further back to the level of the posterior free tip of the 2nd dorsal. Comparing the levels of the posterior insertion of the pelvies with the tip of the 2nd dorsal spine, *C. waitai* has the pelvic insertion well anterior to the tip of the spine, while in *C. coelolepis* and *C. owstoni* these reference points are at the same level. No data is available for comparison with *C. cryptacanthus*, but it seems likely that in this species the pelvic insertion would be posterior to the tip of the 2nd dorsal spine.

Using the key characters set out in Bigelow and Schroeder’s (1948, p. 494) separation of the species, *C. waitai* is allied with *C. fuscus* and distinct from *C. coelolepis*, *C. owstoni* and *C. cryptacanthus* in that the preoral length of *C. waitai* and *C. fuscus* is equal to the distance from the eye to the first gill-opening. In *C. coelolepis* the preoral length is less than, and in *C owstoni* and *C. cryptacanthus* the preoral length is greater than the distance from eye to 1st gill-opening. There appear to be no characters to separate *C. waitai* from *C. fuscus* other than the lengths of the dorsal bases compared with the interspace between the dorsals. But the lengths of the dorsal bases cannot be determined with precision in *C. waitai* because the dorsal fins arise smoothly from the dorsal profile without abrupt elevation. The point of origin selected in this study is the first evident elevation of the dorsal profile from the median dorsal longitudinal groove. Also the length of the dorsal bases and the interspaces between them are liable to variation with growth and size. *C. waitai* is based on a single juvenile of 318 mm total length, which still bears an umbilical scar. *C. fuscus* is based on an adult of 1,100 mm. total length and is thus not comparable with the specimen of *C. waitai*. Smith (1950, p 58) records the dental formula in *C. fuscus* as $\frac{5}{5}$, which is considerably greater than the $\frac{1}{1}$ for *C. waitai*. However, *C. coelolepis* has dental formulae ranging from $\frac{1}{1}$ (juvenile male, 339 mm. total length, under *Scymnodon melas* Bigelow, Schroeder and Springer, 1953, p. 234) to $\frac{6}{6}$ and $\frac{7}{7}$ (Bigelow and Schroeder, 1948, p 497), so that the discrepancies between *C. fuscus* and *C. waitai* are not adequate in themselves to indicate specific distinction. Moreover, Smith (1950, p 58) gives no indication of the source of his information on the dental formula of *C. fuscus*, which is not recorded in the type description, and notes that the type specimen has apparently been lost.

Although there are no grounds for distinguishing *C. waitai* from *C. fuscus*, the lack of detailed information on the latter species may hide distinctions, and until such time as further specimens of both species and particularly *C. fuscus* become available, it is desirable to regard them as separate species.

The identification of *C. waitai* as a *Centroscymnus* gives the first record of this genus for New Zealand or Australian waters, for hitherto it has been known
TEXT-Fig. 1.—Centroscymnus wairei. Holotype. Fig. A—Lateral view and inset of outline of transverse section through head just anterior to the eyes showing rounded lateral margins of head. Fig. B—Dorsal view of head. Fig. C—Ventral view. Fig. D—Outline of transverse section of caudal peduncle. Fig. E—Left nostril. Figs. F-J—Right upper teeth (row numbers indicated above). Fig. J—Right lower teeth. Figs. K-L—Lateral and external views of right upper tooth from 4th row, 3rd series. DG, dorsal groove; VG, ventral groove.
only from the North Atlantic, South Africa and Japan. Its occurrence in New Zealand, like that of *Trakis attenuata* Garrick, 1954, is a further indication of how imperfect our present knowledge is of the components and range of the deep-water shark fauna in this area.

*Centroscymnus* Boeage and Capello, 1864.

Squalidae with dorsal spines arising at origins of fins and lying along anterior margins of latter, their tips either exposed or concealed, without lateral longitudinal ridges or precaudal pits; snout in front of mouth much shorter than
from mouth to origin of pectorals; teeth unlike in the two jaws, the uppers with one slender, lanceolate cusp, the lowers approximately quadrate, their outer margins deeply notched and so oblique that the inner margins are nearly parallel to the jaw, forming a continuous cutting edge; dermal denticles of the adults scale-like, closely overlapping, with flat or concave blades, smooth or weakly ridged, their margins not toothed, on short, broad pedicles; eyes and spiracles moderate to large; anteromedial margin of nostrils expanded as a low triangular lobe only; a voluminous triangular pit at corner of mouth, labial furrow on each jaw; 1st dorsal considerably posterior to tips of pectorals; origin of 2nd dorsal over bases of pelvies; caudal with subterminal notch, its lower anterior corner expanded as a weakly defined lobe, its axis slightly raised; inner corner of pectoral broadly rounded, not at all produced; luminous organs lacking.

**Centroscymnus waitei** (Thompson, 1930). Text-fig. 1, Figs. A–L; Text-fig. 2, Figs. A–J.

**Study Material**

Holotype, juvenile male 318 mm total length, taken on a long line in deep water off Kaikoura in August, 1928, and presented to the Canterbury Museum by Mr. Nilson.

**Description**

**Proportional Measurements in per cent of Total Length**

- Trunk at pectoral origin: breadth 12.9, height, 8.2
- Snout length in front of mouth: 6.9
- Eye: horizontal diameter 5.0; vertical diameter 2.2
- Mouth: breadth 8.2
- Nostrils: breadth (between inner corners) 3.5
- Labial furrow lengths: upper 6.6; lower 2.2
- Gill-opening lengths: 1st 1.6, 5th, 1.3
- 1st dorsal fin: vertical height 2.5; length of base 8.8
- 2nd dorsal fin: vertical height 3.5, length of base 11.6
- Caudal fin: upper margin 23.8; lower anterior margin 11.6
- Pectoral fin: greatest length 12.9
- Pelvic fin: anterior margin 5.0; distal margin 4.7
- Distance from snout to eye: 41; 1st gill-opening 16.0; 5th gill-opening 19.3; 1st dorsal 28.8; 2nd dorsal 54.3; upper caudal 75.0; pectoral 20.1; pelvic 52.0.
- Interspace between 1st and 2nd dorsals 16.0; 2nd dorsal and caudal 8.5; pelvic and caudal 13.2.

Distance from origin to origin of pectoral and pelvic 31.7; pelvic and caudal 18.8.

Head very compact, depressed, large-eyed, trunk moderately slender, compressed, the degree of compression increasing from the pectorals posteriorly, so that the caudal peduncle is 1.5 times as high as broad. Along the dorsum of the trunk, between the first and second dorsal fins, there is a shallow median longitudinal groove, while similar but deeper grooves are present on the dorsal and ventral midlines of the caudal peduncle. An indistinct ventrolateral dermal ridge extends forward horizontally from the origin of the pelvies, where it is most prominent, to about the level of the base of the first dorsal. Height of trunk at origin of pectorals 1/9th of its length to origin of caudal. Length of body
measured to the cloaca, 56% of the total length. Caudal peduncle without lateral keels or precaudal pits.

Dermal denticles numerous, small, bristle-like to the touch, distributed loosely and uniformly, but not arranged in any pattern, and clothing the entire body with the exception of the distal margins of the fins, the axils of the fins, and the lower lip. Denticles from the trunk, the fins and the posterior parts of the head similar. Each has a stout 4-angled base, the angles arising as high ridges to the peduncle, which bears a generally slender, elongate, erect and curved, tridentate blade, the latter strongly hollowed out proximally, and laterally margined by a narrow, flat-topped rim. The distal portion of the blade trough-shaped, with a pronounced median ventral keel, and terminating in a long, sharp, median tooth which in lateral view is curved smoothly downwards so that it is below the level of the shorter lateral teeth and separated from them by deeply incised notches. The denticles of this type on the fins and caudal peduncle are more closely packed and have shorter blades than those on the rest of the trunk. Denticles from the top of the head in the interorbital region have stouter peduncles, and more erect, less curved and wider blades. These latter are hollowed out proximally, with a narrow flat marginal rim, and are tridentate distally, as are those from the trunk. However, the teeth are short and wide, and there is a median, longitudinal, steep-sided, dorsal ridge confluent proximally with the marginal rim, and arising from the concave floor of the blade and extending to the tip of the median tooth. Also the ventral keel is greatly produced in depth, and is notched distally so that it carries a short, pointed, ventral tooth. Denticles from the snout, both above and below, very closely packed and stouter than those from the interorbital region. They resemble the latter in having a median dorsal keel or ridge, and a toothed ventral keel, but the ventral tooth is less pronounced, and the blades are subovoid in outline and terminate in a single median tooth. The marginal rims are narrow proximally, but wide distally where they are slightly hollowed out and slope laterally before terminating abruptly, so that the distal margins lack a rim and become confluent to form the median tooth. Denticles from the upper lip, and those forming a band along the posterior edge of the naked lower lip, have very heavy bases and peduncles, and large, wide, leaf-shaped curved blades. The blades are hollowed proximally where they have wide, flat-topped margins and an incipient median dorsal keel. Distally the blades are smooth and without a dorsal keel. The ventral keel is lacking, or only a little developed basally, and there is no ventral tooth.

Head measured to 1st gill-opening 6 3 in the total length and 1 5 times the least fleshy interorbital distance. Head depressed, and broad, with obtusely rounded lateral margins. The dorsum of head flat, but with prominent supraorbital ridges elevating the profile. Contour of snout from above broad, and forming an obtuse angle interrupted by a rounded prominence at the snout tip. Snout short, the distance from snout tip to eye subequal to the horizontal diameter of the eye and 2 5 in the interorbital. Eye elongate, oval, twice as long as high. Spiracle sited dorsally, its lateral margin just above the level of the dorsal margin of the eye, and its anterior margin posterior to the eye by a distance subequal to the vertical diameter of the eye. Length of the spiracle 2 0 in the horizontal diameter of the eye. Gill-openings small, vertical, their anterior margins concave, and all of them anterior to and on the same horizontal level.
as the pectoral basis. Length of the gill-openings decreasing slightly from the 1st to the 5th, the latter 1 5 in the vertical diameter of the eye. Interspaces between the gill-openings greatest between the 1st and 2nd, where it is twice that between the 4th and 5th. Nostrils moderately oblique, close to the margin of the snout, their length 1 9 in the distance between their inner corners, and 1 2 in the vertical diameter of the eye. The nasal aperture is divided into a larger anterior and a smaller posterior aperture by the anterior and posterior nasal flaps, both of the latter being triangular. Mouth broad and very little arched. Width of mouth slightly greater than the preoral distance. The upper labial furrows long, deeply incised anteriorly but shallowing posteriorly where they extend well posterolateral to the angles of the jaws. The anterior extensions of the furrows reaching about 3 of the distance between the angle and the symphysys of the upper jaw, and the posterior extensions equal to the anterior. The lower labial furrows short and shallowly incised, extending along the lower lip for 3 of the distance between the angles and the symphysys of the lower jaw.

Teeth 24/24 - 17/17, dissimilar in the two jaws. The upper teeth erect, with a single, smooth-edged, elongate, lanceolate cusp borne on a bifid base, arranged in anteroposterior rows and with several series functional. The teeth in the middle third of each side of the jaw larger than those towards either the symphysys or the angle. The anterior series of teeth smaller and with less regularly shaped bases than the posterior and successional series. The rows of teeth towards the angles of the jaws with broader bases and cusps, and with the cusps slightly oblique, so that those right at the angle have a smoothly curved notch on their lateral margin. Three series of teeth functional at the centre of the mouth, two towards the angles. Lower teeth with a single, smooth-edged, sharp, triangular cusp borne on a rectangular base that is considerably higher than broad. The cusps are strongly reflexed laterally, so that the lateral margin is strongly and sharply notched, and the median margin forms the principal cutting edge. There is no median tooth, and the first tooth on the left side overlaps the first tooth on the right. A single series of teeth functional, with each tooth slightly overlapping its lateral neighbour, to form an almost continuous cutting edge.

First dorsal originates by a very shallow angle a little posterior to the level of the pectoral insertion. Base of the 1st dorsal, measured from the first evident elevation in the profile, equal to twice the horizontal diameter of the eye. Height of 1st dorsal 3 0 in its base. The upper profile almost continuously rounded, with only the apex breaking the outline. The distal margin frayed — as are the distal margins of all the other fins — and the posterior tip sharply pointed and free from the base for a distance equal to that between the insertion of the base and the level of the 1st dorsal spine. The 1st dorsal spine with only its tip protruding. The 2nd dorsal larger than the 1st, with the base 1 3ths as long as that of the 1st dorsal, and the upper profile flatter and more smoothly curved. The 2nd dorsal spine similar to the 1st. Origin of the 2nd dorsal above the middle of the pelvic base, with the posterior tip above the subcaudal origin. Caudal 3 6 in the total length. The epural lobe well developed, its height about 1 of its length, and its margin almost straight proximally but convex distally. The terminal lobe very obliquely truncate so as to be bluntly pointed with an indistinct subterminal notch. Origin of the hypural lobe anterior to that of the epural lobe by a distance equal to the height of the peduncle at the same level. Anterior hypural lobe subequal to the height of the epural lobe, and with a convex anterior margin.
which is half the length of the epiural margin. Apex bluntly pointed, and the posterior margin concave. Pectorals originating just posterior to the 5th gill-opening and a little more than half-way between the tip of the snout and the insertion of the 1st dorsal base. Length of pectoral base little more than the distance from snout tip to mouth. Pectorals lobate, the anterior and distal margins weakly convex, the corners broadly rounded and the posterior margin almost straight. Greatest length of pectorals equal to the distance from snout tip to posterior margin of spiracle. Pelvies originating well posterior to the 1st dorsal tip by a distance equal to the 1st dorsal base. The anterior and distal margins weakly convex, the posterior margin concave and the posterior tip sharply pointed. Length of base 1.5 in the 1st dorsal base. Claspers small, extending 3/4 of the distance along the posterior margin of the pelvies.

Colour (in formalin) uniform light tan, except for extremities of the fins, which are a darker tan.

Summary

(i) *Centroscymnus waitei* (Thompson, 1930) is known only from the holotype, a juvenile male of 318 mm. total length taken in deep water off the northern part of the East Coast of the South Island.

(ii) *C. waitei* has rounded inner pectoral corners, and hence its assignment by Thompson to the g. *Centrophorus* cannot be sustained.

(iii) The facies of *C. waitei* are those of the four currently recognised species of *Centroscymnus*—*C. coelelepis*, *C. owstoni*, *C. cryptacanthus* and *C. fuscus*.

(iv) The dermal denticles on the trunk of *C. waitei* have strongly tridentate, smoothly hollowed-out blades without dorsal ridges. They differ from the trunk denticles of adult specimens of other species of *Centroscymnus* in which the blades are evenly rounded and lack teeth.

(v) Bigelow and Schroeder (1954, p. 47) show that juveniles of *Centroscymnus coelelepis* have tridentate denticles on the trunk, and that with growth, the new denticles which appear are less and less dentate until the adult condition of evenly rounded denticles is reached.

(vi) The tridentate denticles on the trunk of *C. waitei* apparently represent a growth stage similar to that occurring in *C. coelelepis*, and hence are not indicative of the g. *Scymnodon*.

(vii) Most of the known species of *Scymnodon* are inadequately described, but at least some of them differ from *C. waitei* and the other species of *Centroscymnus* in the following characters: the head narrower, more elongate, and with a thin lateral margin anterior to the eyes, the dorsal spines stronger and more projecting; the dorsal fins larger, and triangular rather than brush-like; the jaws highly arched and with long upper and lower labial furrows reaching almost to the symphyses; the upper teeth with short, awl-shaped or triangular cusps, and the lower teeth with erect cusps in the middle of the jaw, and oblique cusps towards the angles. These differences lend weight to the inclusion of *C. waitei* in the g. *Centroscymnus*.

(viii) *C. waitei* is clearly distinct from *Centroscymnus coelelepis*, *C. owstoni* and *C. cryptacanthus*, but cannot be readily distinguished from the inadequately described *C. fuscus*.

(ix) The identification of *C. waitei* as a species of *Centroscymnus* gives the first record of this genus from New Zealand and Australian waters.
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LITERATURE CITED


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