

II. IDENTITY

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2.1 TAXONOMY

The family Scombridae (under the order Perciformes of sub-class Actinopterygii) comprises four subfamilies viz., Gasterochismatinae, Thunninae, Scomberomorinae and Scombrinae. The first subfamily includes just one member, *Gasterochisma melampus* Richardson, popularly known as the butterfly mackerel which has a southern and disjunct distribution, occurring on coast of South Africa, New Zealand, Australia and Argentina. Thunninae includes a large assemblage of species, called tunnies coming under the genera *Auxis* Cuvier, *Cybiosarda* Whitley, *Sarda* Cuvier, *Gymnosarda* Gill, *Thunnus* South, *Allothunnus* Serventy, *Orcynopsis* Gill, *Katsuwonus* Kishinouye and *Euthynnus* Jordan and Gilbert. The genus *Thunnus* comprises several subgenera, viz., *Thunnus* S.Str., *Parathunnus* Kishinouye, *Kishinoella* Jordan and Hubbs and *Neothunnus* Kishinouye. Scomberomorinae has the seer fishes under the genus *Scomberomorus* Lacepede and the Wahoo under *Acanthocybium* Gill. The subfamily Scombrinae includes the chub mackerels or the true mackerels and the double-lined mackerel under the genera *Scomber* Linnaeus, *Rastrelliger* Jordan and Starks and *Grammatorcynus* Gill. Most members of these four subfamilies are well distributed in the Indo-Pacific region. Some, however, are restricted in their distribution to temperate regions only as *Scomber scombrus*, *Orcynopsis unicolor* and *Allothunnus fallai* Serventy. The genus *Rastrelliger* has two valid species i.e. *R. kanagurta* (Cuvier) and *R. brachysoma* (Bleeker) occurring in the seas around India, the former being by far the commonest and most abundant mackerel species in this region.

2. 1. 1 Definition

Phylum VERTEBRATA

Subphylum Craniata

Superclass Gnathostomata

Series Pisces

Class Teleostomi

Subclass Actinopterygii

Order Perciformes

Suborder Scombroidei

Superfamily Scombroidea

Family Scombridae

Genus *Rastrelliger* Jordan and Starks 1908

Species *R. kanagurta* (Cuvier) 1817; and

R. brachysoma (Bleeker) 1851

2. 1. 2 Description

Genus *Rastrelliger* Jordan and Starks 1908

The following is the description of the genus *Rastrelliger* as given by Jones and Silas (1964a): “Body compressed from side to side; body and cheek covered with small scales, eyes with well developed adipose eye-lid, mouth large, maxillary reaching nearly vertical below posterior edge of eye; teeth small, present in jaws; vomer and palatine edentulous; gill rakers long, numerous and feather-like and visible when mouth is opened. Spinous first dorsal and soft rayed second dorsal separated by distance equalling length of base of former; anal devoid of spines; five or six dorsal and anal finlets; pectorals short with broad base; pelvics with a spine and five rays; caudal deeply forked.”

The nominal species under the genus are known to occur in the tropical belt of the Indian Ocean, extending in range from the east coast of South Africa to North Australia and as far as the Micronesian and Polynesian Islands.

Scomber being very similar to *Rastrelliger* in external appearance it is considered necessary to point out the salient characters of similarity and distinction between the two genera. In both there is an adipose eye-lid, the corselet is poorly developed, the inter-pelvic process is single and small and the caudal peduncle has only two small keels on each

side. In *Scomber* the teeth are present on the vomer and the palatine, the gill rakers are fewer (generally less than 35 on the lower limb of the first branchial arch) not very long and not visible in the gape of the mouth, body is stout and circular in cross section, its depth less than the length of the head and an osseous stiff anal spine present where as in *Rastrelliger* the vomer and palatines are edentulous, gill rakers larger in number (generally more than 35 on the lower limb of the first branchial arch) protruding into the buccal cavity and clearly visible when the mouth is open, body is laterally compressed and anal spine is wanting (Fraser-Brunner, 1950; Jones and Silas, 1964a; Collette and Gibbs, 1963).

For a time, the generic name *Scomber* was used for including the species now referable under *Rastrelliger* also (Cuvier, 1817; Ruppell, 1835; Bleeker, 1856; Day, 1870). The separation of *Rastrelliger* brings the recognisable species of *Scomber* occurring in the Indo-Australian Archipelago to just two, they being *S. australasicus* Cuv. & Val. And *S. japonicus* Houttuyn. De Beaufort (1951) recognised two species viz. *S. australasicus* and *S. janesaba* Bleeker, but the latter is now known to be synonymous with *S. japonicus*. The validity of the generic name *Pneumatophorus* for those members of *Scomber* having the air-bladder, as distinct from *Scomber* proper without that structure is doubted (Jones and Silas, 1964a). There is a great deal of confusion regarding the number of valid species under *Scomber*. Fraser-Brunner (*loc. cit*) has recognised only two distinct world species under *Scomber* viz., *S. scombrus* Linnaeus and *S. japonicus* Houttuyn, the former occurring in the Atlantic Ocean and the Mediterranean Sea (including the adjoining Black Sea) and the latter having a much wider distribution in the Atlantic, Indian and Pacific Oceans. Matsui (1967), reviewing the mackerel genera under *Scomber* and *Rastrelliger* has come to the conclusion that three valid species under *Scomber* are recognisable, they being *S. scomber*, *S. australasicus* and *S. japonicus* and that the many similarities between them warrant their being placed in the same genus and that there is no reason to recognise *Pneumatophorus* for the two latter species. He, however finds that one of the Philippine mackerels previously regarded as *S. australasicus* (Syn. *P. australasicus*) by de Beaufort (1951) and Manacop (1956) is a new species of *Rastrelliger* which he has named *R. faughni*. In this species

the vomer and the palatine are edentulous as in other members of *Rastrelliger*, but the gill rakers are short as in *Scomber*. In a few osteological characters also like the rudimentary anal spine and in the characteristic shape of interhaemal bones and the hyoid, *R. faughni* shows close resemblance to other members of *Rastrelliger*.

2. 1. 3 Key to the identification of mackerel species

There is much of overlapping in the characters of *R. kanagurta* and *R. brachysoma*, but the prominent distinction between the two lies in respect of relation between head length and the greatest depth of the body. The following is the key to the identification of the mackerel and mackerel-like fishes, occurring in the Indian coastal waters including the Andaman Sea (Abridged, after Jones and Silas, 1964 b):

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|------|--|-------|--|
| 1 a. | Side of body with two lateral lines; gill rakers on lower limb of outer gill arch generally not exceeding 16 | | <i>Grammatorcynus bicarinatus</i> (Quoy & Gaim.) |
| 1 b. | Side of body with a single lateral line; gill rakers on lower limb of outer gill arch exceeding 20 | | 2 |
| 2 a. | Vomer and palatine toothed; osseous and moderately stiff and spine present | ... | <i>Scomber japonicus</i> Houttuyn |
| 2 b. | Vomer and palatine edentulous; osseous stiff anal spine absent | | 3 |
| 3 a. | Greatest height of body 23-27% of fork length; length of head about equal to or more than the greatest depth of body; snout pointed; anterior margin of spinous dorsal dusky; dark longitudinal stripes often clear on upper half of body | ... | <i>Rastrelliger Kanagurta</i> (Cuvier) |
| 3 b. | Greatest and height of body 28 to 34% of fork length; length of head distinctly smaller than the greatest depth of body; snout short, bluntly rounded; posterior margin of spinous dorsal conspicuously black; body without longitudinal stripes | | <i>R. brachysoma</i> (Bleeker) |

2. 2 NOMENCLATURE

2. 2. 1 Valid scientific names

A. Rastrelliger kanagurta (Cuvier)

Russell (1803) in his account on the fishes of Visakhapatnam figured and described the Indian mackerel as “*kanagurta*” after its vernacular local name (Telugu). He did not follow the conventional binomial nomenclature, but there is no ambiguity about the description and the figure having been well drawn, doubt does arise about its identity. Cuvier in 1817 (*Regene animal*, 2: 313) adapted this name and described the form as *Scomber kanagurta*. Subsequently Cuvier himself has used the name as *S. canagurta* in 1829 (*Regene Amimal* 2nd Edn. 2: 197) and *S. kanagurta* in 1831 (*Histoire Naturelle des Poissons*, 8: 49). Since the generic name *Rastrelliger* of Jordan and Starks in Jordan and Dickerson (1908) has come to be adopted for some of the forms originally referred to under *Scomber*, the species is now recognized under the name *R. kanagurta*.

B. Rastrelliger brachysoma (Bleeker)

De Beaufort (loc. cit.) has recognized three species of *Rastrelliger* occurring in the Indo-Australian Archipelago, they being *R. kanagurta* (Cuvier), *R. brachysoma* (Bleeker) and *R. neglectus* (Van Kampen). In the first the head is longer than high and the body is slender whereas in the other two which are considered synonymous, the head is as long as high and the body distinctly deep. The specific name *brachysoma* of Bleeker (1851) has priority over *neglectus* of Van Kampen (1907) and hence the former is the valid name.

The following are the descriptions of adults of two species of *Rastrelliger kanagurta* and *R. brachysoma*:

Rastrelliger kanagurta (Cuvier 1817) (Fig. 1 A&B)

D¹. 8-10, D². 1/11 + V-VI, A. 1/11 + V-VI, P¹. 19-22, P². 1/5, C. 24, L.1. 128-150, L.tr. 10/28, Vert. 13/16.

Length of head $3\frac{3}{4}$ to $4\frac{1}{4}$, caudal $4\frac{3}{4}$ to 5, height of body 4 to $4\frac{2}{3}$ in total length. Length of head about equal to height of body. Head length longer than its height. Eye with thick adipose eye lid, its diameter 4 to $4\frac{1}{2}$ times in length of head and 1.53 in snout. Snout pointed and a little less than the interorbital space. Mouth oblique, lower jaw a little larger than the upper, cleft of mouth deep, maxilla reaches to below the hind edge of the eye. Teeth minute and pointed in single series in both jaws, often disappearing with age. Vomer and palatine edentulous..Gull-rakers moderately long feathery and with pointed tips, 17 to 24 on the upper and 33 to 45 on the lower branch of the first gill arch. Dorsal spines weak. First dorsal spine shorter than the second and last spine small and feeble. Finlets arise behind the second dorsal and the anal fins, the upper and the lower ones similar and opposite, arranged in pairs. Anal insertion a little behind origin of second dorsal. Pectoral triangular and pointed, less half the length of head. Scales ctenoid, broader than long, those around pectoral base the largest, scale spines prominent and about 30. Caudal deeply forked, lobes pointed. Air vessel present.

Coloration:- Body greenish blue above and silvery yellow on belly and at the sides. About three grayish longitudinal stripes above the lateral line present. A row of about 16 irregular blotches below the dorsal fin on the back. A dark blotch on the body behind the pectoral base visible externally through the translucent pectoral fin. Two or three black spots along the base of the spinous dorsal. Dorsal fins yellow, with tips and outer margin grayish. Pectoral yellow. Ventral and anal fins hyaline and faintly dotted when fresh. Caudal yellow, dusky along the margin and extremities.

Colour and markings variable with age. In large specimens several dark longitudinal bands on the upper half of the body prominent and the uppermost of them broken up into blotches. A few golden yellow bands along and below the lateral line. Small juveniles have prominent, small roundish dots along the upper half of the back.

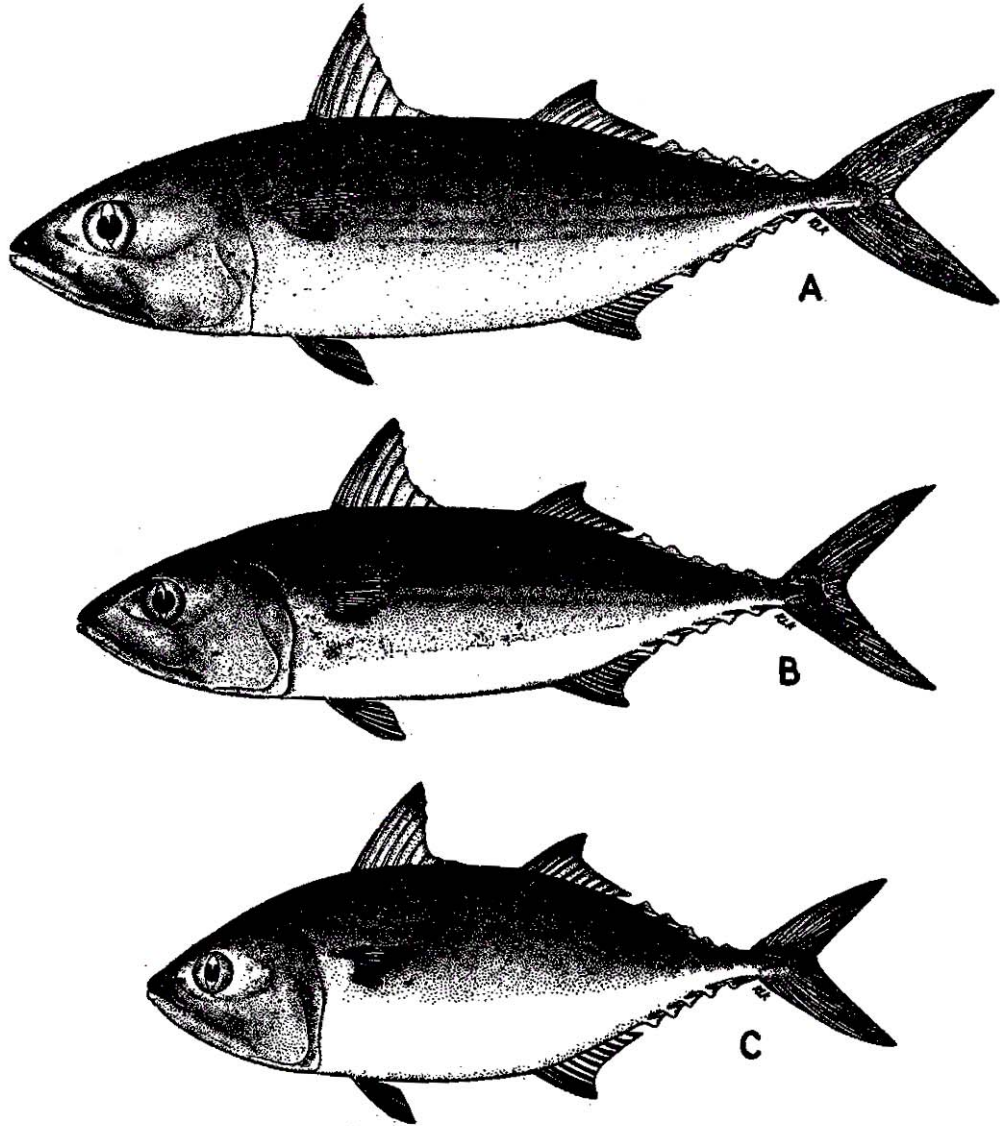


Fig. 1. A. *Rastrelliger kanagurta* (Cuvier) from Andamans; B. *R. kanagurta* (Cuvier) from Calicut; C. *R. brachysoma* (Bleeker) from Andamans.

Rastrelliger brachysoma (Bleeker 1851) (Fig. 1 C)

D¹. 8-10, D². 1/11 + V-VI, A. 1/11 + V-VI, P.22, V. 1/5, C. 21, L.1. 135, Vert. 31-32.

Head $3\frac{3}{4}$, caudal $5\frac{1}{4}$ and height of body $3\frac{2}{3}$ in total length. Eye diameter $4\frac{1}{3}$ in head length, 1.1 to 1.4 in snout and equal to interorbital space. Preorbital $\frac{4}{7}$ of the head. Head as long as high. Length of head much less than the greatest depth of body. Mouth oblique, lower jaw little longer. Maxilla reaches a little beyond the hind border of the eye. Teeth in a single series minute and pointed in both the jaws, but absent on vomer and palatine. Gill rakers longer and more numerous than in *R. kanagurta*, 16 to 24 in upper limb and 34 to 45 on the lower limb of the first branchial arch. Dorsal spines weak. Arrangement of finlets as in *R. kanagurta*. Pectoral half as long as head, caudal deeply forked. Scales ctenoid, squarish.

Coloration.- Bluish green above and silvery with yellowish tinge below. Distinct dark longitudinal bands are absent. Often one or two rows of black spots along the back present. Distal border of spinous dorsal conspicuously black. A faint dark blotch behind the pectoral base. When fresh two glistening whitish spots visible on the head above and behind each eye.

2. 2. 2 Synonyms

A. *Rastrelliger kanagurta* (Cuvier) 1817

Scomber kanagurta Cuvier, *Regene Animal*, II, 1817, p. 313 (footnote); Ruppell, *Atlas Reise N.Afrika. Fische des rothen Meeres*, 1828, p. 93; Cuvier and Valenciennes, *Hist. Nat. Poissons*, VIII, 1831, p. 49; Gunther, *Fische der Sudsee* II, 1876, p. 140; Macleay, *Proc. Linn. Soc. New S. Wales*, IX, 1884; Jordan and Evermann, *Proc. U.S. Nat. Mus.* XXV, 1902, p. 336; Fowler, *Proc. Acad. Nat. Sc. Philadelphia*, LVI (1904), 1905, p. 757; Fowler & Bean, *Proc. U.S. Nat. Mus.*, LXII, 1922, p. 18.

Scomber canagurta Cuvier, *Regene Animal*, ed 2, II; 1829, P. 197 (footnote).

- Scomber chrysosoma* Ruppell, *Neue Wirbelthiere, Fische des Rothen Meeres*, 1835, p. 37.
- Scomber loo* Cuvier and Valenciennes, *Hist. Nat. Poissons*, VIII, 1831, p. 52; Bleeker, *Verh. Bat. Gen.* XXIV, Bidjir Kennis Mackerel, 1852, p. 35; Kner. *Novara Exp. Fische* I, 1865-67, p. 142;
- Scomber microlepidotus* Ruppell, *Neue Wirbelthiers Fische des Rothen Meeres*, 1835, p. 38; Day, *Fishes of India*, pt. I, reprinted 1958, p. 250; Jordan and Seale, *Bull. Bur. Fish.*, XXVI (1906) 1907, p. 12; Evermann and Seale, *ibid.*, p. 61; Blegvad, *Danish Sc. Inv.* Iran, pt. III, 1944, p. 159.
- Scomber moluccensis* Bleeker, *Acta Soc. Indo-Neerl.*, 1, 1856, p.40; M. Weber, *Siboga Exp. Fische*, 1913, p. 400.
- Scomber reani* Day, *Proc. Zool. Soc. London*, 1870, p. 690.
- Scomber lepturus* Agassiz, *Pisces celebes*, 1874, Tab.2,
- Rastrelliger brachysoma* (nec. Bleeker) Jordan and Dickerson, *Proc. U.S.Nat. Mus.* XXXIV, 1908, P. 190.
- Rastrelliger chrysozonus* Kishinouye, *J. Coll. Agric.* Tokyo, VIII, No.3, 1923, p. 406; Manacop, *Philippine J. Fish.*, 1958, 4(2):92.
- Rastrelliger serventyi* Whitley, *Austr. Zool.*, X. 1944, 252-273.
- Rastrelliger microlepidotus* Barnard, *Ann. S. Afric. Mus.* XXI, pt. 2, 1927, p. 796.
- Rastrelliger kanagurta* Jordan and Starks, *Ann. Carnegie Mus.*, XI, No.3-4, 1917, p. 440; Fowler, *Proc. Acad. Nat. Sci. Philadelphia*, LXXXVII, 1935, p. 138; Jones and Silas, *Proc. Symposium on Scombroid Fishes*, Marine Biological Association of India, 1962, Pt. I. p. 15; Jones and Rosa Jr., *Ibid.*, Pt. III, 1961, p. 1191; Jones and Rosa Jr., *FAO Fisheries Synopsis*, 1965, No.29. A.

B. *Rastrelliger brachysoma* (Bleeker) 1851

- Scomber brachysoma* Bleeker, *Nat. Tijdschr. Ned. Indie*, I, 1851, p. 356; Day, *Fishes of India*, vol, I, reprinted 1958, p. 251.
- Scomber neglectus* Van Kampen, *Bull. Dept. de l'Agric. Indes Neerl.* VIII (Zool.ii) 1907, p.7.
- Rastrelliger brachysomus* Barnard, *Ann. S. African Mus.*, XXI, Pt.2, 1927, p. 796.

Rastrelliger brachysoma Manacop, Philippine J. Fish., 1956, 4(2), p. 87; Jones and Silas, *Proc. Symposium on Scombroid Fishes*, Marine Biological Assn. India, Pt.I, 1962, p. 15; Jones and Rosa Jr., *Ibid.*, Pt. III, 1967, p. 1192; Jones and Rosa Jr., *FAO Fisheries Synopsis*, 1965, 29.

2. 2. 3 Common names

A. For *R. kanagurta*:

Country	Language	Name
India	English	Indian mackerel
	Canarese	Bangda
	Hindi	Bangdi
	Marathi	Kaulagedar or Bangda
	Malayalam	Ayila or Ayla
	Sindhi	Oibiagedar
	Tamil	Kumla or Kanangeluthi
	Telugu	Kanagurta or Kannangadatha
	Oriya	Karan-kita
Ceylon	Sinhalese	Kumbalaya or Maha kara bolla
	Tamil	Ailai, Kumbala or Karungkuluttan
Indo-China	Local Language or dialect	Cabacma or Treykamong
Indonesia	Do.	Kembung, Banjar
Malaya Federation	Do.	Kuala muda, Kembong
Japan	Do.	Naha or Gurukun-muhji
Pakistan West	Do.	Surmai
Philippines	Do.	Alumahan, Lumahan, Burau, Salimburaw, Bunatan, Buyaw, Hasa-hasa, Mataan
Singapore	Do.	Kembong
Thailand	Do.	Plathu
Saudi Arabia and Somalia	Do.	Bagha

B. For *R. brachysoma*:

Country	Language	Name
India	Hindi	Chappata Bangdi
Indo-China	Local language	Cabaoma, Plathu

Indonesia	Local Language	Kembung
Malaysia	Do.	Kembung
Philippines	English	Short-bodied or chub mackerel
	Local language	Kabalyas, Aguma-a Kabalyas, Luman, Asa-asa, Hasa-hasa, Linchay, Masangi

2. 3 GENERAL VARIABILITY

Morphometric measurements and meristic counts of a large number of specimens of *R. kanagurta* and *R. brachysoma* have been examined in detail by Jones and Silas (1964b). The body proportions of 9 characters in the two species showed differences statistically significant at 5% level. In respect of second predorsal distance, length of pectoral fin, anterior height of first dorsal fin and the length of the maxilla the divergence was to the extent of 75% or even more. In the greatest depth of body there has been no overlap, with 100% divergence.

Regarding the frequency of the number of dorsal and anal finlets in the two species the typical arrangement is 5/5 but 6/5 and 6/6 are also met with as exceptions. Jones and Silas (*loc. cit*) have observed in *R. kanagurta* 5/5 in 96.77% and 6/5 in 3.23% in *R. brachysoma* 5/5 in 91.66% 6/5 in 5.5% and 6/6 in 2.77% Manacop's (1958) observations show that in *R. brachysoma* finlet frequency was 5/5 in 92.4%, 5/6 in 5.6%, 6/5 in 0.67%, 6/6 in 0.23%, 5/4 in 0.1% and 4/5 in 0.99% in *R. chrysozonus* (= *R. kanagurta*) 5/5 in 93.50%, 5/6 in 3.90% and 6/6 in 2.60%.

Considerable amount of variation was also met with in gill raker numbers in the upper and lower limits of the outermost right and the left gill arches in both the species examined from Andaman region. There has been a good deal of overlapping. It appears that gill rakers count alone is not sufficient to separate the two species. The range of gill rakers observed in *R. kanagurta* was 17 to 21 (upper limb) + 33 to 42 (lower limb) and in *R. brachysoma* 17 to 22 (upper limb) + 35 to 42 (lower limb).

The total number of gill rakers on the right arch of the upper and the lower limbs combined has been found to vary from 51 to 61 in

R. kanagurta and 54 to 61 in *R. branchysoma*. Manacop's (1958) observations on Philippine specimens show the gill raker numbers to be 16 to 24 (upper limb) + 34 to 45 (lower limb) in *R. chrysozonus* (Syn. *R. kanagurta*) and 19 to 23 (upper limb) + 34 to 39 (lower limb) in *R. brachysoma*.

In the specimens from Andamans, variability in a few other characters was also noticed. The length of the longest gill raker in *R. kanagurta* ranged from 8.2% to 10.4% in fork length and in *R. brachysoma* from 9.5% to 12.5% in fork length. The length of the longest gill filament in *R. kanagurta* ranged from 6.3% to 7.5% and in *R. brachysoma* from 5.3% to 7.5% but mostly 5.3% to 6.6% fork length. These results show that the length of the gill raker is relatively longer, but the length of the longest gill filament is relatively shorter in *R. kanagurta* than the corresponding variable in *R. brachysoma*.

In regard to racial difference in *R. kanagurta* no information is available from the published accounts.

Balakrishnan (1969) has examined in detail the dorsal and anal fins of *R. kanagurta*, obtained from different regions on the Indian coasts and noted the number of rays varying with the size of the fish, the larger fish showing a reduced number of them. He is of the opinion that the dorsal and anal finlets should be regarded as 6 each instead of 5 each, since the last finlet is always double, the two components being close to each other. The increase or decrease in the dorsal or ventral finlet number is accompanied by a corresponding decrease or increase in the dorsal or ventral fin rays. It has also been observed that the endoskeletal supports are constant in number, being 29 in association with the dorsal fin and 18 with ventral fin.