A new species of cuttlefish *Sepia ramani* sp. nov. (Class : Cephalopoda) from Tuticorin Bay, southeast coast of India

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A new cuttlefish *Sepia ramani* sp.nov. collected from Tuticorin Bay (8°48′ N, 78°11′ E), India, is described based on 50 specimens covering both-sexes with a comparison of the closely related species of the same genus, *Sepia pharaonis*. *Sepia ramani* sp.nov resembles *S. pharaonis* in morphological characters such as fins, funnel, head, buccal membrane and colour and in most of the morphometric characters. However, in *S. ramani* sp.nov, the tentacular club is long with 15-24 enlarged suckers and enlarged suckers are almost sub equal in size, in contrast to 6 enlarged medial suckers of which 3 to 4 suckers are greatly enlarged in *S. pharaonis*. Further, the left ventral arm in males of *S. ramani* sp.nov is hectocotylised, with 14-16 basal series of quadrirserially arranged normal suckers instead of 10-12 in *S. pharaonis*. Both the newly erected species and *S. pharaonis* belonging to *Sepia sensu stricto* species complex as the inner cone of both the species are with plate like callosity and without any cavity.

The genus *Sepia* Linnaeus, (Class: Cephalopoda, family Sepiidae) is widely distributed in the tropical and sub-tropical waters. Eighty four species under the genus *Sepia* have been reviewed by Khromov et al.1. Lu² reported 26 species of this genus from Australian waters. Adam & Rees³ have reviewed 62 species of cuttlefishes of the genus *Sepia* collected during John Murrey Expedition (1933 – 1934) from Indian Ocean. *Sepia thurstoni* Adam & Rees, erected by these authors from south east coast of India was also included in their review. Six species of the genus *Sepia* namely *Sepia aculeata* Orbigny, *S. arabica* Massy, *S. brevimana* Steenstrup, *S. latimanus* Quoy & Gaimard, *S. pharaonis* Ehrenberg, *S. prashadi* Winckworth have been reported in Indian waters by Roper et al⁴. In addition to this, Jothinayagam⁵ has reported *Sepia kobiensis* Hoyle, from Madras coast. Further, Silas et al.⁶ have reported two more species under the genus *Sepia* namely *Sepia trygonia* Rochebrune and *S. elliptica* Hoyle from Indian waters. Khromov et al.⁷ while studying the taxonomy of cuttlefishes separated the species under genus *Sepia* into 6 species complexes based on the shape and structure of the cuttlebone⁸.

Dr.V.K.Venkataramani, is a Professor of Fisheries Biology in Fisheries College and Research Institute, Tamil Nadu Veterinary and Animal Sciences University, Tuticorin, India. The species being erected was recorded for the first time during the course of Ph.D. dissertation work under the guidance of Dr.V.K.Venkataramani. As a token of respect to his guidance and outstanding contribution to the field of Fisheries Biology, the newly described species is named after him.

While studying the taxonomy of the cuttlefishes of Tuticorin (8°47′N, 78°9′E) and its environ, a new species of the genus *Sepia* hitherto wrongly treated as *Sepia pharaonis* Ehrenberg was encountered. This species morphologically differed from other species already reported in Indian seas, and other world waters. *Sepia ramani* sp.nov. which form commercial fishery along Tuticorin coast is fully described in the present study with comparison of the closely related species, *Sepia pharaonis*. Fifty specimens in fresh condition covering 25 males and 25 females were collected covering wide range of length for the newly erected species and for *S. pharaonis*. For each specimen, twenty morphometric measurements were taken to the nearest millimeter. Since there was no notable sexual dimorphism with respect to morphometry in *Sepia ramani* sp.nov and *Sepia pharaonis*, the studied morphometric characters were pooled for each species without separately treating the sexes.

**Type location** —Tuticorin SE coast of India

**Holotype** — LA 3 and LA 4(DML 250 mm male; DML 300 mm female) in Fisheries College and Research Institute, Reference Museum (FCRIRM)

Paratypes—(i) 48 specimens DML 107 to 375 mm with same details as above. (ii) 2 specimens DML 200 to 300 mm deposited in Marine Biological Station Reference Museum (MBSRM) at Parangipettai (PortoNovo), Annamalai University, India.

Phylum: Mollusca

Class: Cephalopoda

Sub class: Coleoidea

Order: Sepioida

Family: Sepiidae

Genus: Sepia

Species: Sepia ramani sp. nov.

*Sepia ramani* sp. nov.—(Fig. 1)—Mantle elongate, transverse tiger-stripe pattern on dorsal side of mantle, head and arms prominent in fresh condition and fades after death; tentacles long, tentacular club long with 15-24 enlarged medial suckers almost sub equal in size (Fig. 2); left ventral arm in males hectocotylised, basal 14-16 transverse series of suckers normal in size, hectocotylised part with 7-10 series of minute suckers in two dorsal rows and normal suckers in two ventral rows, dorsal and ventral

Fig. 1—*Sepia ramani* sp. nov., A) male (dorsal view), B) female (dorsal view)

Fig. 2—Tentacular club of *Sepia ramani* sp. nov. male

Fig. 3—Hectocotylised arm of *Sepia ramani* sp. nov. male
rows of suckers in hectocotylised portion separated by fleshy transverse ridge (Fig. 3); inner cone of the shell relatively short (Fig. 4).

**Mantle**—Mantle robust, oval in outline and elongate, broadest in upper half, maximum width 49.85% (40.38 – 71.43%) of DML, mid dorsal part of mantle in anterior end produced into a triangular lobe.

**Fins**—Fin muscular, anterior tip of fin produced as a broad, triangular projection; fins extend along entire margin and wide near the posterior end, a narrow white line along the base of the fins demarcating mantle and fin, fin starts from anterior margin of mantle or slightly below (about 1.8%) anterior margin of mantle, fin width 14.40% (8.16 – 23.81%) of DML.

**Funnel**—Funnel large, stout and thick walled, reaches almost base of ventral arm, funnel locking apparatus consists of a short curved groove, rounded anteriorly and pointed posteriorly, a short ridge on mantle highest in the middle, funnel valve large, rounded and triangular, funnel length 32.20% (26.91-40.95%) of DML.

**Head**—Head prominent, short and about as long as inter orbital width, Inter orbital width 27.38% (20.00 – 35.33%) of DML; eye prominent and its diameter 11.47% (8.16 – 14.56%) of DML.

**Arms**—Arms sub equal decrease in length in the order of 4, 3, 2 and 1, and stout at base, I and II arm rounded, III arm slightly flattened and ventral arms (IV) long with well developed keels and tapering ends, suckers in four rows throughout and have horny rings with vertical sides, suckers in basal rows larger and gets gradually reduced in size towards distal end, those at tips very minute, left dorsal arm (I) 54.80% (35.65 – 82.19%) of DML, left dorso lateral arm (II) 61.64% (40.00 – 77.08%) of DML; left ventro lateral arm (III) 60.84% (42.55 – 82.19%) of DML and left ventral arm (IV) 64.08% (42.55 – 80.00%) of DML, arms relatively soft in female.

**Hectocotylus**—Left ventral arm hectocotylised, middle portion modified, 14-16 transverse series of suckers at the base of hectocotylised arm, normal in size, next 7-10 series have two ventral rows of normal suckers and two dorsal rows of reduced suckers, ventral row of suckers separated from dorsal row of suckers by a transversely grooved ridge.

**Tentacles**—Tentacles very long, longer than body 207.93% (150-279.05%) of DML, tentacular stem thick and triangular in cross section, tentacular clubs slender and elongate 32.66% (22.66%-47.62%) of DML, swimming membrane at anterior end not remarkably broad and it gradually tapers towards posterior end, protective membranes on either side narrow, extend slightly beyond carpus and not united at base, club elongate with 100-140 suckers of unequal size. suckers of carpus and dactylus portions small, 15-24 suckers enlarged, enlarged suckers almost sub equal, sucker rings with wavy end without denticulation.

**Buccal membrane**—Buccal membrane thick and lappets bear minute suckers at tip, rostrum of horny beak dark coloured, embedded in buccal mass seen in middle.

**Colour**—Conspicuous transverse tiger-stripes on dorsal side of mantle, head and arms, much prominent in male than female, body brown with distinct stripes in live condition, colouration gets faded after death and on preservation in ice, colour turns greenish yellow, colour pattern variable.

**Cuttlebone**—Cuttlebone elongate, slenderly elliptical in shape, dorsal surface convex, rugose in texture having three longitudinal faint ribs, chitinous outer edges on dorsal side broad and pale yellowish brown in fresh condition and becomes dark brown on drying, margin of chitinous part with narrow transparent rim, ventral surface of cuttlebone has a wide, deep, longitudinal groove in middle, running along entire length of striated zone, striae of growth lines distinctly inverted ‘V’ shaped with undulations,
Fig. 5—*Sepia pharaonis*, A) male (dorsal view), B) female (dorsal view)

Fig. 6—Tentacular club of *Sepia pharaonis* male

Fig. 7—Hectocotylised arm of *Sepia pharaonis* male

Fig. 8—Cuttlebone of *Sepia pharaonis*, A) male (ventral view), B) female (ventral view)
inner cone relatively short, inner cone with plate-like callosity without any cavity, spine short stout and without any keel, shell of female slightly broader than that of male, width 30.78%(28-35%) of cuttlebone length, length of loculus 31.37%(20.52-44.47%) of cuttlebone length, striated zone length 57.71%(45.02-66.33%) of cuttlebone length, inner cone length about 10.14%(7.25-11.83%) of cuttlebone length.

Affinity—This species is closely related to *S. pharaonis*, which is also recorded from Tuticorin Bay\(^5\). In morphological characters such as fins, funnel, head, buccal membrane and colour, *S. ramani* sp.nov resembled *S. pharaonis*. In male specimens of both the species, the hectocotylised portion of left ventral arm has two ventral rows of normal suckers and two dorsal rows of reduced suckers separated by a thick ridge. Further, the inner cone of the cuttlebone of both the species is with plate like callosity without any cavity, hence both of them belong to *Sepia* sensu strico species complex\(^1\). However, *Sepia ramani* sp.nov could be distinguished from *Sepia pharaonis* in the following characters.

*Sepia ramani* sp.nov—Mantle elongate, transverse tiger-stripe pattern on dorsal side of mantle, head and arms, stripes not much prominent after death;

### Table 1—Morphometric measurements of *Sepia ramani* sp. nov and *Sepia pharaonis* (measurements in cm)

<table>
<thead>
<tr>
<th>Parameters</th>
<th><em>Sepia ramani</em></th>
<th><em>Sepia pharaonis</em></th>
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</thead>
<tbody>
<tr>
<td>Dorsal mantle length</td>
<td>24.6460</td>
<td>21.8160</td>
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<tr>
<td>Maximum width of mantle</td>
<td>12.1580</td>
<td>10.7220</td>
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<tr>
<td>Fin width</td>
<td>3.5760</td>
<td>3.1700</td>
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<tr>
<td>Fin length</td>
<td>24.2060</td>
<td>21.7640</td>
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<td>Maximum width including fin</td>
<td>17.4200</td>
<td>15.2840</td>
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<tr>
<td>Eye diameter</td>
<td>2.7920</td>
<td>2.3960</td>
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<tr>
<td>Inter orbital width</td>
<td>6.6400</td>
<td>5.8260</td>
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<tr>
<td>Free height</td>
<td>0.4400</td>
<td>0.0520</td>
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<tr>
<td>Length of funnel</td>
<td>7.8380</td>
<td>7.1760</td>
</tr>
<tr>
<td>Tentacle length</td>
<td>50.7160</td>
<td>38.7720</td>
</tr>
<tr>
<td>Tentacular club length</td>
<td>7.9340</td>
<td>5.9580</td>
</tr>
<tr>
<td>Left first arm length</td>
<td>13.5960</td>
<td>13.5640</td>
</tr>
<tr>
<td>Left second arm length</td>
<td>14.4840</td>
<td>13.1540</td>
</tr>
<tr>
<td>Left third arm length</td>
<td>15.2300</td>
<td>13.4720</td>
</tr>
<tr>
<td>Left fourth arm length</td>
<td>15.7720</td>
<td>15.4720</td>
</tr>
<tr>
<td>Cuttlebone length</td>
<td>24.5430</td>
<td>21.8010</td>
</tr>
<tr>
<td>Cuttlebone width</td>
<td>7.3632</td>
<td>7.2800</td>
</tr>
<tr>
<td>Length of loculus</td>
<td>7.4316</td>
<td>6.6320</td>
</tr>
<tr>
<td>Striated zone length</td>
<td>13.9211</td>
<td>13.2060</td>
</tr>
<tr>
<td>Inner cone length</td>
<td>2.4237</td>
<td>2.7220</td>
</tr>
</tbody>
</table>

### Table 2—Percentage of overlapping of body proportions of *Sepia ramani* sp. nov with that of *Sepia pharaonis*

<table>
<thead>
<tr>
<th>Character</th>
<th>Range of overlapping ratio</th>
<th>Percentage of overlapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum width of mantle</td>
<td>42.55-58.62</td>
<td>51.76</td>
</tr>
<tr>
<td>Fin width</td>
<td>8.16-23.81</td>
<td>87.14</td>
</tr>
<tr>
<td>Fin length</td>
<td>94.35-100.00</td>
<td>84.71</td>
</tr>
<tr>
<td>Maximum width including fin</td>
<td>54.92-87.19</td>
<td>87.29</td>
</tr>
<tr>
<td>Eye diameter</td>
<td>8.16-14.56</td>
<td>66.74</td>
</tr>
<tr>
<td>Inter orbital width</td>
<td>20.00-33.10</td>
<td>81.88</td>
</tr>
<tr>
<td>Free height</td>
<td>0-5.65</td>
<td>84.71</td>
</tr>
<tr>
<td>Length of funnel</td>
<td>26.91-40.52</td>
<td>94.84</td>
</tr>
<tr>
<td>Tentacle length</td>
<td>150.00-223.68</td>
<td>49.98</td>
</tr>
<tr>
<td>Tentacular club length</td>
<td>22.66-34.48</td>
<td>34.86</td>
</tr>
<tr>
<td>Left first arm length</td>
<td>39.97-82.19</td>
<td>72.75</td>
</tr>
<tr>
<td>Left second arm length</td>
<td>40.00-77.08</td>
<td>77.54</td>
</tr>
<tr>
<td>Left third arm length</td>
<td>42.55 - 82.19</td>
<td>77.68</td>
</tr>
<tr>
<td>Left fourth arm length</td>
<td>47.98 - 80.00</td>
<td>48.80</td>
</tr>
<tr>
<td>Cuttlebone width</td>
<td>28.00 - 35.00</td>
<td>18.79</td>
</tr>
<tr>
<td>Length of loculus</td>
<td>20.52 - 44.47</td>
<td>44.37</td>
</tr>
<tr>
<td>Striated zone length</td>
<td>45.56 - 66.33</td>
<td>42.72</td>
</tr>
<tr>
<td>Inner cone length</td>
<td>7.25 - 11.83</td>
<td>25.95</td>
</tr>
</tbody>
</table>
tentacles long; tentacular club long with 15-24
enlarged suckers, enlarged suckers almost sub equal
in size; left ventral arm in male hectocotylised, basal
14-16 series of quadriserial suckers normal,
hectocotylised part with 7-10 series of suckers; inner
cone of cuttle bone relatively short.

*Sepia pharaonis* Ehrenberg (Fig.5)—Mantle
broad, vivid transverse tiger- stripes on dorsal side of
mantle, head and arms which persists even after
death; tentacles short, tentacular club short with about
6 medial suckers in two median series much enlarged
(Fig.6), enlarged suckers unequal in size, among the
enlarged suckers 3 to 4 suckers greatly enlarged; left
ventral arm in male hectocotylised; basal 10-12
transverse series of suckers normal, and
hectocotylised part with 7 series of suckers (Fig. 7);
inner cone of the cuttle bone relatively long (Fig. 8).

Twenty morphometric characters taken from 50
specimens of each species ranging in size from 10.7
to 37.5 cm DML and 14.0-30.0 cm DML for *S.
ramani* and *S. pharaonis* are given in Table 1. The
percentage of overlapping of body proportions of *S.
ramani* sp.nov and *S. pharaonis* are given in Table 2.
All the studied morphometric characters were found
to overlap between the two closely related species
inferring the closer resemblance of the two species
with respect to morphometry. However, cuttlebone
width, innercone length and the tentacular club length
showed less overlapping of 18.79, 25.95 and 34.86%
respectively for the two species. Therefore these three
characters could be taken as supporting characters in
addition to the diagnostic characters for distinguishing
the two closely related species.

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