



FIRST REPORT OF *CISTOPUS TAIWANICUS* LIAO AND LU, 2009 (CEPHALOPODA: OCTOPODIDAE) FROM THE INDIAN COAST

Sreeja, V.,¹ Biju Kumar, A.^{1*} and M.D. Norman²

¹Department of Aquatic Biology & Fisheries, University of Kerala, Thiruvananthapuram, Kerala, India

²Sciences, Museum Victoria, GPO Box 666, Melbourne, Victoria 3001, Australia

*E-mail: bijupuzhayoram@gmail.com

Abstract: Octopuses of the genus *Cistopus* Gray, 1849 are commercially valuable catches in the cephalopod fisheries of India. The primary and unique diagnostic character of this genus is the possession of eight small mucous pouches embedded in the oral faces of the webs between the bases of each arm. These glands are proposed to be used in the formation of subsurface burrows in soft sediments. The Indian records of this genus have been assigned to two species, *C. indicus*, a species described from off the Philippine Islands and *C. platinoidus*, described from off Kerala coast of India. Recent studies have demonstrated a complex of species within this genus and described three additional species, *C. taiwanicus* Liao and Lu, 2009 from Taiwan, *C. chinensis* Zheng *et al.* 2012 from the South China Sea and *C. platinoidus* Sreeja, Norman and Kumar 2015. In reviewing the octopod fauna off the Kerala coast, we have detected one more species of *Cistopus* and report here the first record of *Cistopus taiwanicus* from the Indian coast. This record greatly expands the known distribution of *C. taiwanicus* to include the western Indian Ocean and highlights the need to review all members of this important genus in Indian waters.

Key words: *Cistopus*, octopus, taxonomy, mucous pouches, range extension, Indian Ocean.

INTRODUCTION

The octopuses of the genus *Cistopus* Gray, 1849 are widely distributed in the coastal waters of India and form an economically valuable component of export markets (Sundram, 2011). This genus of benthic octopuses is characterised by the possession of eight small mucous pouches embedded in the oral webs at the base of the arms (atypically inflated in the preserved specimen shown in Fig. 1A). The functions of these glands has not been demonstrated but are proposed to produce mucous that aids in the formation of subsurface burrows in soft sediments by binding loose sediments in burrow walls (Norman *et al.* 2014). The lack of taxonomic clarity associated with this genus is primarily due to the difficulty in finding the openings of these glands in distorted dead and poorly fixed or preserved specimens (Pickford, 1974; Nesis, 1982, see Fig. 1B as example). This genus contains four shallow-water species that occur across central and south-east Asia, from the coastal waters of India east to the Indo-Malayan Archipelago, south to northern Australia: *Cistopus indicus* (Rapp, 1835), *Cistopus chinensis* Zheng *et*

al., 2012, *Cistopus taiwanicus* Liao and Lu, 2009, and *Cistopus platinoidus* Sreeja *et al.*, 2015 (Norman *et al.*, 2014, Sreeja *et al.*, 2015).

To date, two *Cistopus* species, *C. indicus* and *C. platinoidus* have been reported from the Indian coast (Silas, 1985; Sreeja *et al.*, 2015). Species-specific landing data are not available across India for octopuses, however a fishery of a *Cistopus* species identified as *C. indicus* is well established in Maharashtra state, where the catch varied from 2 tonnes in the year 2002 to 324 tonnes in 2006 (Sundaram and Deshmukh, 2011). Prior to 2009, the genus *Cistopus* was considered as being monotypic. As such all records of *Cistopus* throughout the known range of the genus had been assigned the species name *C. indicus*, with a purported distribution of tropical and subtropical coastal waters of southern China, Taiwan, Philippines and northern Indonesia, south to Malaysia and west to India (Roper *et al.*, 1984; Norman and Hochberg, 1994; Norman and Sweeney, 1997; Norman, 1998; Norman and Lu, 2000). Recent

description of new species from Taiwan (Liao and Lu, 2009), China (Zheng *et al.* 2012) and India (Sreeja *et al.*, 2015), have challenged the purported wide distribution of *C. indicus*.

During an extensive survey of the cephalopods along the southwest coast of India, we collected and identified *C. taiwanicus* from the Ponnani, Neendakara and Sakthikulangara fishing harbours in Kerala, India, having been caught by the trawlers operating off the Kerala coast. This paper provides the first record of *C. taiwanicus* from Indian waters.

MATERIALS AND METHODS

Specimens were collected from commercial trawlers operating out of the Ponnani, Neendakara and Sakthikulangara fishing harbours of Kerala, India. Morphological counts and measurements presented here follow Roper and Voss (1983) and Norman and Sweeney (1997). The following counts and measurements were recorded: TL - total length; ML - mantle length; MW - mantle width; VML - ventral mantle length; HL - head length; HW - head width; AL - arm length; AW - arm width; WD - web depth; LL - ligula length; FuL - funnel length; Ffu - free funnel length; HcA - hectocotylised arm length; ASC - arm sucker counts by arm 1 to 4 respectively; HcASC - hectocotylised arm sucker count.

Indices were calculated by expressing each measure as a percentage of mantle length, length of longest arm and/or length of hectocotylised arm. The following indices were calculated: MWI - mantle width index (MW/ML); HWI - head width index (HW/ML); MAI - mantle arm index (ML/longest AL); ALI - arm length index [AL/ML: by arm 1 (dorsal), 2 (dorso-lateral), 3 (ventro-lateral), 4 (ventral)]; AWI - arm width index (AW/AL); WDI - web depth index (deepest WL/longest AL); HcAI - hectocotylised arm index (HcA/ML); LLI - ligula length index (LL/HcA); FuLI - funnel length index (FuL/ML); FfuI - free funnel index (FFu/FL); ELI - egg length index (EL/ML).

Voucher specimens are deposited at the Western Ghats Regional Centre of the Zoological Survey of India at Kozhikode (Calicut), India (ZSI/ WGRC) and at Department of Aquatic Biology and Fisheries, University of Kerala, Thiruvananthapuram, India (DABFUK).

RESULTS

Taxonomy

Class: Cephalopoda

Order: Octopoda

Family: Octopodidae

Genus: *Cistopus*

Species: *Cistopus taiwanicus* Liao and Lu, 2009 (Figs. 2 A-H, 3)

Common name: Taiwan pouched octopus.

Material examined

Kerala, India, collected from commercial trawlers operating in a depth range of 50-100 metres. Collected by V. Sreeja and A. Bijukumar. Ponnani fishing harbour, 10°46'N, 75°54'E: 1M, 97.0 mm ML, 467.0 mm TL, 16 March 2011 (DABFUK/MOL/CEPH/21); 1M, 112.0 mm ML, 553.0 mm TL, 16 March 2011 (DABFUK/MOL/CEPH/22); 1M, 101.0 mm ML, 570.0 mm TL, 16 March 2011 (DABFUK/MOL/CEPH/23); 1F, 99.0 mm ML, 422.0mm TL, 16 March 2011 (DABFUK/MOL/CEPH/24). Neendakara fishing harbour, 8°56'N, 76°32'E: 1M, 106.0 mm ML, 570.0mm TL, 5 June 2009 (DABFUK/MOL/CEPH/25); 1M, 130.0 mm ML, 645.0 mm TL, 05 June 2009 (DABFUK/MOL/CEPH/26); 1M, 135.0 mm ML, 720.0 mm TL, 18 December 2009 (DABFUK/MOL/CEPH/27); 1F, 120.0 mm ML, 445.0 mm TL, 05 June 2009 (DABFUK/MOL/CEPH/28). Sakthikulangara fishing harbour, 8°55'N, 76°32'E: 1M, 88.0 mm ML, 580.0 mm TL, 19 September 2009 (DABFUK/MOL/CEPH/29); 1M, 135.0 mm ML, 645.0 mm TL, 19 September 2009 (DABFUK/MOL/CEPH/30); 1M, 123.0 mm ML, 590.0 mm TL, 25 April 2010 (DABFUK/MOL/CEPH/31); 1M, 125.0 mm ML, 470.0 mm TL, 21 October 2011 (DABFUK/MOL/CEPH/32).

Description

Live specimens dull grey on dorsal mantle and light greenish blue on lateral and ventral mantle. Specimens preserved in formalin appear light reddish brown. Skin smooth, with few scattered low papillae on dorsal mantle (Fig. 2A). Medium to large-sized species with elongate and ovoid mantle (ML 88.0-135mm in males, 99.0-120 mm in females). Mantle width moderate (MWI 36.7-63.8 in males; 47.5-49.1 in females). Head narrow (HWI 23.9-42.2 in males; 29.3-31.7 in females), distinct

neck region present, separating the head from the mantle. Eyes small (6.4-12.9% ML). Funnel length moderate (FuLI 17.8-29.6 in males, 20.0-22.2 in females), funnel organ W-shaped, limbs of approximately equal length (Fig. 2B). Webs of moderate depth, deepest on dorsal arms (WDI 15.0-22.0 in males, 20.6-26.4 in females) and shallowest on ventral arms. Web formula typically A>B>C>D>E or B>A>C>D>E.

Arms long, 3-5 times mantle length, dorsal arm pair longest. Arm formula 1>2>3>4. Arm width moderate (AWI 8.0-10.9 in males, 6.7-9.1 in females). Right third arm of male hectocotylized (Fig. 2D), around 70-75% length of opposite arm (HcAI 183.5-301.5). Suckers biserial. Suckers moderate-sized to large (SD 7.5-16.0 mm in males, 5.0-6.0 mm in females), distinctly enlarged suckers present in mature males, 2 to 4 on arms 1 and 2 at level of 18th to 21st proximal suckers (Figs. 2C, 3). Mean sucker counts 82 to 167 on normal arms (maximum of 190 in males, 155 in females). Hectocotylized arm with 106 to 116 suckers (80 in one potentially regenerating male). Ligula small (LLI 0.3-0.6) and calamus absent (Fig. 2D). Mature

female with large numbers of eggs, egg length 4.0 mm (ELI 3.83).

Eight mucous pouches present in oral surface of webs close to mouth (Fig. 1B, pouch length 17.0-30.0 mm in males), mucous pouches difficult to find and measure in females. Mucous pores small (pore diameter 1.0-1.3 mm in males, 0.5 mm in females), located at level of 3rd to 4th proximal sucker. Gills with 9-10 lamellae per demibranch (Fig. 2E). Upper beak with narrow hood and short hooked rostrum (Fig. 2F). Lower beak with narrow hood and moderately broad wings, the lateral wall separated in posterior region (Fig. 2G). Radula with nine elements, seven transverse rows of teeth and two rows of marginal plates (Fig. 2H). Rachidian tooth with one to two lateral cusps on each side of medial cone. Lateral cusps in asymmetrical seriation, migrating from lateral to medial position over three transverse rows. First lateral teeth small with one large medial cusp; second lateral teeth with wide heel, one dagger-like medial cusp. Marginal teeth long with sabre-like cusp, short base. Marginal plates oblong. Distinct crop present as side branch off oesophagus. Ink sac and anal flaps present.

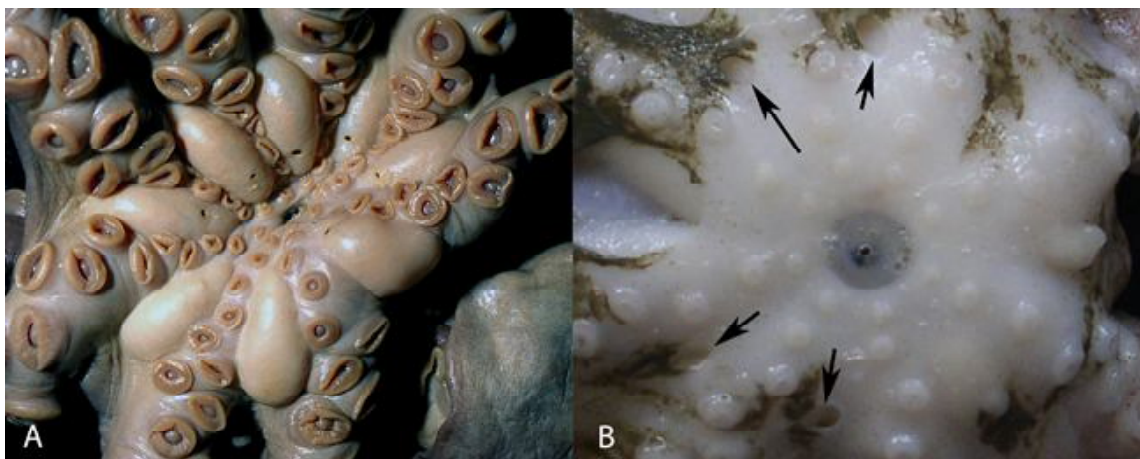


Fig. 1. Oral view of *Cistopus* species showing the mucus web pouches and pores characteristic of the genus. A. Preserved individual of unidentified *Cistopus* sp. from Singapore showing inflated pouches with pores; B. Fresh individual of *C. taiwanicus* from Kerala showing position of pores (arrows).

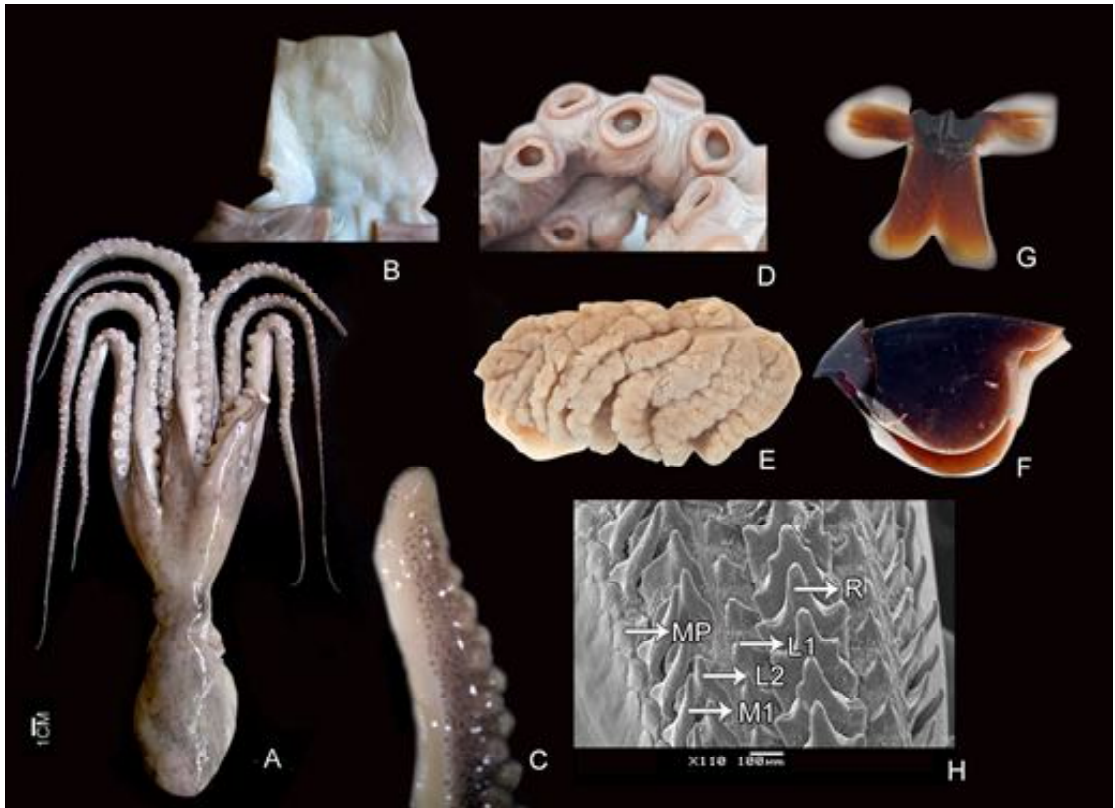


Fig. 2. *Cistopus taiwanicus* Liao and Lu, 2009 from Kerala, India. A. Dorsal view of whole animal (male); B. Funnel organ; C. Enlarged suckers on first and second right arms of mature male; D. Distal end of hectocotylyzed arm, lateral view; E. Gill, lateral view; F. Upper beak, lateral view; G. Lower beak, ventral view; H. Scanning electron micrograph of radula; L1: first lateral tooth, L2: second lateral tooth, M1: marginal tooth, MP: marginal plate, R: rachidian tooth.



Fig. 3. *Cistopus taiwanicus*. Pattern of arm suckers in formalin-fixed specimen, showing enlarged suckers on first and second right arms.

Table 1. Measurements (mm), counts and morphometric indices of *C. taiwanicus* (India) and *C. taiwanicus* (Taiwan; Liao and Lu, 2009). (* range and mean for Indian hectocotylised arm sucker counts for males excludes one potentially regenerating male with count of 80).

Index	Males		Females	
	Range and mean in <i>C. taiwanicus</i> (India) n = 10	Range and mean in <i>C. taiwanicus</i> (Taiwan) n = 7	Range and mean in <i>C. taiwanicus</i> (India) n = 2	Range and mean in <i>C. taiwanicus</i> (Taiwan) n = 7
TL(mm)	467.0 - 582.2 - 720.0	406.0 - 543.3- 740.0	422.0 - 433.5- 445.0	396.0- 649.4- 942.0
DML(mm)	88.0 - 116.2 - 135.0	73.0- 91.8- 117.0	99.0 - 109.5 - 120.0	72.0 - 112.1- 141.0
VML(mm)	62.0 - 86.7 - 103.0	51.0- 64.8- 79.0	62.0 - 71.0 - 80.0	54.0- 80.9- 103.0
MW(mm)	32.0 - 62.9 - 83.0	44.0- 61.5- 90.0	47.0 - 53.0 - 59.0	50.0- 79.1- 104.0
MWI (%ML)	36.7 - 53.6 - 63.8	52.4- 66.5- 73.0	47.5 - 48.3 - 49.1	63.8- 70.6- 77.3
HL(mm)	23.0 - 31.6 - 40.0	19.0- 26.2- 36.0	22.0 - 26.0 - 30.0	17.0- 29.9- 42.0
HLI (%ML)	21.5 - 27.2 - 32.5	23.9- 28.3-34.8	22.2 - 23.6 - 25.0	21.8- 26.3- 28.8
HW(mm)	21.0 - 38.8 - 57.0	29.0- 37.5- 52.0	29.0 - 33.5 - 38.0	27.0- 38.4- 46.0
HWI(%ML)	23.9 - 33.2 - 42.2	30.2- 40.7- 54.3	29.3 - 30.5 - 31.7	27.9- 34.9- 40.2
MAI	20.9 - 26.6 - 34.0	14.5- 23.0- 28.0	32.7 - 35.7 - 38.7	16.6- 21.4- 26.1
(%Longest Arm)				
AL1(mm)	322.0 - 437.2 - 585.0	551.0- 591.0- 631.0	310.0 - 321.5- 333.0	348.0- 525.5- 819.0
AL1I(%ML)	280.0 - 379.3 - 477.3	470.9- 578.4- 685.9	258.3 - 297.4- 336.4	383.0- 487.6- 602.2
AL2(mm)	260.0 - 383.1 - 455.0	274.0- 361.8- 549.0	262.0- 279.0 - 296.0	332.0- 530.0- 730.0
AL2I(%ML)	268.0 - 301.4 - 409.1	315.7- 387.8- 469.2	218.3- 258.6- 298.9	375.9- 443.7- 536.8
AL3(mm)	178.0 - 287.3 - 407.0	191.0- 276.2- 336.0	245.0 - 253.5- 262.0	288.0- 473.4- 634.0
AL3I(%ML)	183.5 - 244.7 - 301.5	227.4- 304.1- 383.6	218.3 - 232.9- 247.5	351.2- 390.2- 466.2
AL4 (mm)	223.0 - 304.9 - 357.0	288.0- 349.0- 470.0	227.0 - 231.0- 235.0	260.0- 322.3- 398.0
AL4I(%ML)	203.2 - 266.0 - 364.8	328.1- 399.1- 510.9	189.2 - 213.3- 237.4	259.7- 286.4- 317.1
AW(mm)	7.0 - 11.0 - 15.0	-	8.0 - 8.5 - 9.0	-
AWI(%ML)	8.0 - 9.4 - 10.9	-	6.7 - 7.9 - 9.1	-
WD(mm)	63.0 - 85.7 - 115.0	56.0- 77.8- 124.0	64.0 - 72.0 - 80.0	72.0- 90.6- 147.0
WDI	15.0 - 19.4 - 22.0	13.9- 18.5- 22.5	20.6 - 23.5 - 26.4	15.5 - 19.1 - 23.6
(%Longest Arm)				
ASc 1	62 - 154 - 190	-	86 - 120 - 155	-
ASc 2	70 - 143 - 182	-	140 - 147- 155	-
ASc 3	80 - 105 - 116	-	138 - 145 - 152	-
ASc 4	116 - 143 - 180	-	130 - 131 -132	-
SNN	82 - 136 - 167	134 - 148 - 162	113 - 132- 144	131 - 148-162
HcASc	100 - 108 - 116*	106 - 110 - 117	-	-
HcAI(%ML)	183.5 - 244.7 - 301.5	227.4 - 304.1 - 383.6	-	-
LL(mm)	1.0 - 1.5 - 2.0	1.0- 1.4- 1.6	-	-
LLI (%HcAL)	0.3 - 0.5 - 0.6	0.4 - 0.5	-	-
EL (mm)	-	-	4	5.0- 5.5 - 7.0
ELI (%ML)	-	-	3.8	3.7 - 5.0
FuL (mm)	35.0 - 50.2 - 65.0	25.0 - 34.7 - 46.0	44.0 - 47.0 - 50.0	26.0- 36.7- 49.0
FuLI(%ML)	33.3 - 43.1 - 50.4	26.0 - 37.9 - 45.7	41.7 - 43.1 - 44.4	27.7 - 32.9 - 36.1
FFuL (mm)	18.0 - 26.2 - 40.0	-	22.0 - 23.0 - 24.0	-
FFuI(%ML)	17.8 - 23.3 - 29.6	-	20.0 - 21.1 - 22.2	-
GLC	9-10	9	9	09-Oct
SD (mm)	12.0 - 14.8 - 17.0	10.5- 13.8- 18.2	5.0 - 5.5 - 6.0	8.7- 11.7- 15.3
SDI (%ML)	11.4 - 12.8 - 14.2	11.6 - 14.4 - 19.8	4.2 - 5.2 - 6.1	9.6 - 10.6 - 12.1
Penis L (mm)	10.5 - 17.8 - 25.0	10.4 - 14.5 - 20.9	-	-
Pouch L (mm)	17.0 - 21.1 - 30.0	15.3 - 20.5 - 26.4	-	-
Pore D (mm)	1.0 - 1.1 - 1.3	1.0 - 1.1 - 1.8	0.5	0.3- 0.4- 0.5
Weight (g)	225.0 - 467.0 - 800.0	197.0 - 426.7 - 882.0	145.0 - 180.0- 215.0	209.0- 664.1- 1226.0

DISCUSSION

In reviewing the described members of the genus *Cistopus*, the morphology of our material matched that of *C. taiwanicus* Liao and Lu, 2009, a shallow-water species described from soft sediment substrates in Taiwan. Key shared characters include hectocotylus morphology (the lack of a calamus, the small flap present at the base of the ligula in most octopuses), hectocotylied arm sucker counts (106–117 for Taiwan versus 100–116 for India), gill lamellae counts (9–10), enlarged suckers in mature males (2 to 4 on arms 1 and 2 at level of 18th to 21st suckers), and small egg size (around 4–7 mm, 3.7–5.0% of mantle length). Variations observed in other morphological characters such as arm lengths and head and body dimensions are more plastic characters, highly prone to fixation and preservation artefacts and state of maturity.

Cistopus taiwanicus was originally described from the coastal waters of Hsinchu County, Miaoli County and Tung Kang (Pingtung County), Taiwan and was distinguished from the closely related *C. indicus* by the presence of enlarged suckers in mature males and lower sucker counts on normal arms and hectocotylied arm (Liao and Lu, 2009). Zheng *et al.* (2012) described *Cistopus chinensis* from the East and South China seas. *Cistopus taiwanicus* differs from *C. chinensis* by the position of enlarged suckers in mature males and the hectocotylied arm structure. In *C. taiwanicus*, 2 to 4 enlarged suckers are present in mature males on arms 1 and 2 at level of 18th to 21st proximal suckers versus 10th and 11th on arms 1, 2, 4 in *C. chinensis*. *Cistopus taiwanicus* lacks a calamus on the hectocotylus compared with a distinct calamus present in *C. chinensis*. The hectocotylied arm sucker count in *C. taiwanicus* is 100–116 (80 in one potentially regenerating specimen) versus 57–67 in *C. chinensis*. *Cistopus indicus* remains distinct from both species in lacking both a calamus and enlarged suckers.

More recently, Sreeja *et al.* (2015) described *C. platinoidus* from the southwest coast of India. *C. taiwanicus* specimens (Figs. 5a–c) differs from *C. platinoidus* in hectocotylied arm sucker count (106–116 versus 60–65 versus), enlarged suckers in males (2 at level of 18–21st proximal suckers versus 2 at level of 10–12th proximal versus in *C. platinoidus*),

ligula length (0.3–0.6 versus 0.6–1.8) and absence of calamus.

In reviewing octopod egg sizes and resulting hatchling morphology and behaviour, Boletzky (1974) proposed that species with eggs less than 10% of mantle length produced planktonic hatchlings with high capacity for planktonic dispersal (see review in Villanueva and Norman, 2008). The egg length index (egg length as a percentage of mantle length) of around 4–5% in *C. taiwanicus* from both Taiwan and India supports the proposal that planktonic dispersal and potential gene flow exists between these distant sites. In describing their new species from the west coast of Taiwan, Liao and Lu (2009) opined that “it is possible that *C. taiwanicus* of Taiwanese waters has a much broader distribution (potentially as far as India)”. Our research supports the distribution of this species extending to the western Indian Ocean. We predict that with time the species will be recorded from coastal waters in additional locations between these two distant regions.

The total landings of octopods in India during 2013 were reported as 6,448 tonnes, representing 5% of molluscan landings in the country (CMFRI, 2014); the landing decreased to 5,909 tonnes in 2014 (CMFRI, 2015). However, no species-specific data is available on octopus catch, except for scattered reports from some harbours.

As demonstrated in our study, the genus *Cistopus* represents a species complex in India. However, the limited available landings data for *Cistopus* species in India are treated under the single species name *Cistopus indicus*. For example, trawl catches reported as *C. indicus* from New Ferry Wharf from 2000 to 2009 in Mumbai waters ranged from 2 tonnes (2002) to 324 tonnes (2006), with the catch rate rising from 0.002 kg/hr (2002) to 0.181 kg/hr (2006) (Sundaram and Deshmukh, 2011). In Kerala state of India, the octopus fishery was reported as consisting of *Amphioctopus neglectus* (51.4%), *A. marginatus* (25.4%), *Cistopus* “*indicus*” (18.6%) and other species (18.6%) (CMFRI, 2013). However, our study and ongoing surveys indicate that there are at least three species represented in the catch: *C. indicus*, *C. taiwanicus* and another recently described new species, *C. platinoidus*.

ACKNOWLEDGEMENTS

Sreeja wishes to thank the Kerala State Council for Science, Technology and Environment for a taxonomy fellowship and Bijukumar gratefully acknowledges the Department of Biotechnology, Government of India for the financial support of this project. Mark would like to recognise the support of the Australian Biological Resources Study and the UN Food and Agriculture Organisation for support of octopod taxonomic research.

REFERENCES

- Boletzky, S.V. 1974. The larvae of Cephalopoda: a review. *Thalassia Jugoslavica*, 10: 45–76.
- CMFRI 2013. Annual Report 2012-13. Central Marine Fisheries Research Institute, Cochin, India, 200 pp.
- CMFRI 2014. Annual Report 2013-14. Central Marine Fisheries Research Institute, Cochin, 274 pp.
- CMFRI 2015. Annual Report 2014-15. Central Marine Fisheries Research Institute, Cochin, 279 pp.
- Jereb, P., C.F.E. Roper, M.D. Norman and J.K. Finn (eds). 2014. *Cephalopods of the world. An annotated and illustrated catalogue of cephalopod species known to date*. Volume 3. Octopods and Vampire Squids. FAO Species Catalogue for Fishery Purposes 4, Vol. 3. Rome, FAO, 370 pp.
- Liao, J.X. and C.C. Lu. 2009. A new species of *Cistopus* (Cephalopoda: Octopodidae) from Taiwan and morphology of mucous pouches. *Journal of Molluscan Studies*, 75: 269–278.
- Nesis, K.N. 1982. *Cephalopods of the World: Squid, cuttlefishes, octopuses, and allies*. T.F.H. Publications Inc. Ltd, Neptune City.
- Norman, M.D. 1998. Family Octopodidae, benthic octopuses. In: K.E. Carpenter and V.H. Niem, Eds, *The Living Marine resources of the Western Central Pacific*. Volume 2. *Cephalopods, Crustaceans, Holothurians and Sharks*. FAO Species Identification Guide for Fishery Purposes, Rome: FAO, 800–826 pp.
- Norman, M.D. and F.G. Hochberg. 1994. Shallow-water octopuses (Cephalopoda: Octopodidae) of Hong Kong territorial waters. In: B. Morton, Ed. *The Malacofauna of Hong Kong and Southern China III*. Proceedings of the Third International Workshop on the Malacofauna of Hong Kong and Southern China. Hong Kong University Press, Hong Kong, pp.141–160
- Norman, M.D. and C.C. Lu. 2000. Preliminary checklist of the cephalopods of the South China Sea. *The Raffles Bulletin of Zoology*, Suppl., 8: 539–567.
- Norman, M.D. and M.J. Sweeney. 1997. The shallow-water octopuses (Cephalopoda: Octopodidae) of the Philippines Islands. *Invertebrate Taxonomy*, 11: 89–140.
- Pickford, G.E. 1974. *Cistopus indicus* (Orbigny): A common Indo-Malayan species of octopus. *J. Mar. Biol. Ass. India*, 16: 43–48.
- Roper C.F.E. and G.L. Voss. 1983. Guidelines for taxonomy descriptions of cephalopod species. *Memoirs of the National Museum of Victoria*, 44: 49–63.
- Roper C.F.E., M.J. Sweeney and C.E. Nauen. 1984. FAO Species Catalogue. Volume, 3. *Cephalopods of the world: An Annotated and Illustrated Catalogue of species of Interest to Fisheries*. FAO Fisheries synopsis, 125, 1–277.
- Sreeja, V., Norman, M.D. and Biju Kumar, A. (2015). A new species of pouched octopus, *Cistopus* Gray, 1849 (Cephalopoda: Octopodidae) from the southwest coast of India. *Zootaxa*, 4058 (2): 244–256.
- Silas E.G. R. Sarvesan and K.S. Rao. 1985. Octopod resources. In: C.G. Silas. Ed. *Cephalopod bionomics, fisheries and resources of the exclusive economic zone of India*. *Central Marine Fisheries Research Institute Bulletin*, 37: 137–139
- Sundaram S. 2011. Rising trend in the fishery of the octopus *Cistopus indicus* (Orbigny, 1840) by trawlers at Mumbai. *Marine Fisheries Information Service T&E Ser.*, no. 207, 28–29.
- Sundaram S. and V.D. Deshmukh. 2011. Fishery and biology of the octopus, *Cistopus indicus* (Orbigny, 1840) from Mumbai waters. *J. Mar. Biol. Ass. India*, 53(1): 145–148.
- Villanueva R. and M.D. Norman. 2008. Biology of the planktonic stages of benthic octopuses. *Oceanography and Marine Biology (An Annual Review)*, 46: 105–202.
- Zheng X., X. Lin, C.C. Lu and R. Ma. 2012. A new species of *Cistopus* Gray, 1849 (Cephalopoda: Octopodidae) from the East and South China Seas and phylogenetic analysis based on the mitochondrial COI gene, *Journal of Natural History*, 46(5-6): 355–368.

