New record of *Scapharca cornea* (Bivalvia: Pteriomorpha: Arcidae) from Minicoy Lagoon, Lakshadweep, India

The members of the family Arcidae are the most abundantly occurring species in tropical and subtropical regions and have very high economic value in the Indo-Pacific Region[1–4]. Some species such as *Scapharca subcrenata*, *S. broughtonii* and *Tegillarca granosa* have been cultured in China, Japan and Vietnam and others will certainly be cultured in the future. Hence, species identification and knowledge about distribution of this family will become important for choosing suitable species[5]. They are also ecologically important in recycling of organic matter[6]. Most species of Arcidae are intertidal or marginally sub-tidal in their distribution and settle on muddy shores between mean high water of neap tides (MHWN) and mean low water of neap tides (MLWN). They do not generally extend into the area above mean high tide level, which is usually dominated by mangrove swamp forests. Peak densities are usually encountered around mid-tide level[1]. Mass occurrence of the genera of the family Arcidae, such as *Scapharca*, *Anadara* and *Arca*, was reported from the South East Asian countries[7–13] and their key role in the development of ecological processes has also been pointed out[14,15]. The results of the present study on the occurrence of *Scapharca cornea* are informative both for the Lakshadweep Islands and for other Indian coastal waters.

The study was conducted in the Minicoy Island (8°17′N and 73°04′E) of the Lakshadweep group of islands (Figure 1) in the eastern Arabian Sea (Exclusive Economic Zone of India). It has two distinct habitats – the coral shoals which occupy about 75% of the area and the sand flats in the southern parts of the atoll. The atoll has a rich vegetation of seagrasses and seaweeds, which extend to an area of 2.2 sq. km in the intertidal zone[16]. The sampling site of *S. cornea* is located at 8°16′31″N and 73°02′25″E in the southwestern part of the lagoon having patches of the seagrass, *Halophila ovalis* and *Cymodocea serrulata.*

The study was carried out during the southwest monsoon period (June 2011). Distribution of *S. cornea* was assessed using visual census method and the density by quadrat method and expressed as individuals/m^2. Samples were collected by hand-picking and preserved in 10% formalin and later identified up to species level[4]. The hydrographic parameters such as water temperature, pH, salinity and dissolved oxygen[17] were analysed and presented. The nature of the substratum was also noted. The settlement area was measured using GPS (Magellan Triton 300) coordinates.

On the mangrove ecosystem of Minicoy Atoll, Lakshadweep in June 2011, extensive beds (approx 0.7 sq. km) of juvenile *S. cornea* were observed in the intertidal zone of the lagoon, which is bordered by mangroves in the southwestern part of the Minicoy Island. The Lakshadweep Islands consist of 10 inhabited islands, all of which are atolls. Minicoy Island is the southernmost in the group, with the largest lagoon having an area of 25 sq. km and an average depth of 4 m. It is located 215 nautical miles southwest off the Indian mainland and is connected to sea by the Saleh Magu Channel in the northeast. So far, there have been no reports on the occurrence of *S. cornea* from Lakshadweep Islands.

S. cornea (Reeve, 1844) is a new record from the Lakshadweep Archipelago (Figure 2). The specimens were obtained

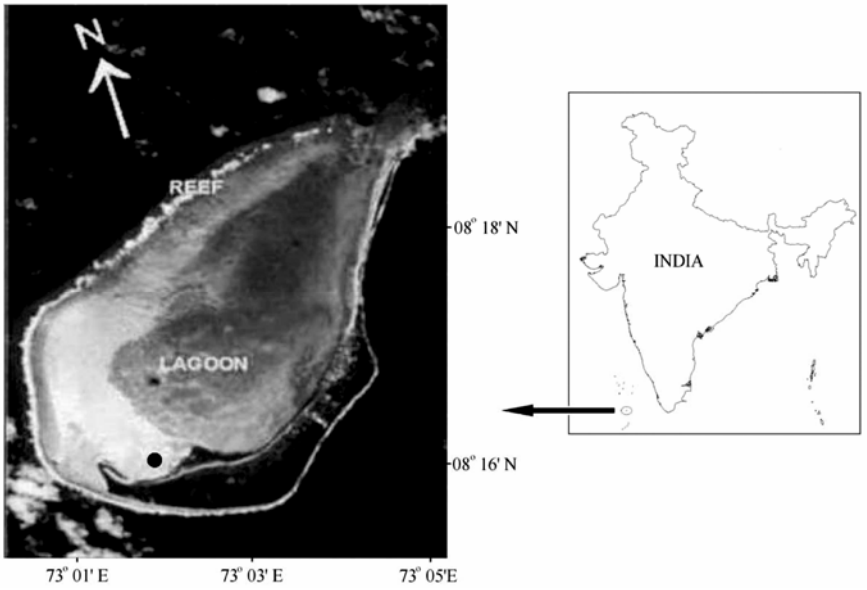

Figure 1. Sampling location (•) at Minicoy Lagoon, Lakshadweep Islands, India.

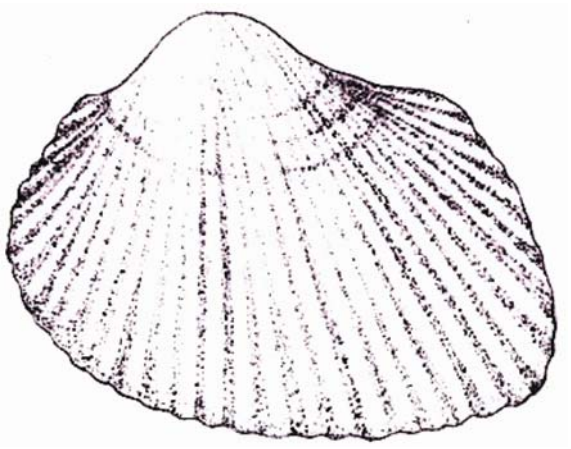

Figure 2. Dorsal view of *Scapharca cornea* (1 cm) obtained from Minicoy Lagoon.

from Minicoy Lagoon, which is located in the southwest region of Indian EEZ. The study area was characterized by sandy bottom (Figure 3) having patches of macroalga (*Chaetomorpha* sp.) and the gastropod (*Cerithium* sp.). The bed of *S. cornea* extended to an area of approximately 0.7 sq. km and was found to be perpendicular to the coast at a depth of 0.5 m (Figure 4). The average density of *S. cornea* in the study area was 3940 individuals/m^2.

Figure 3. Juveniles of *S. cornea* along with the gastropod *Cerithium* sp. and macroalga *Chaetomorpha* sp. in Minicoy Lagoon.

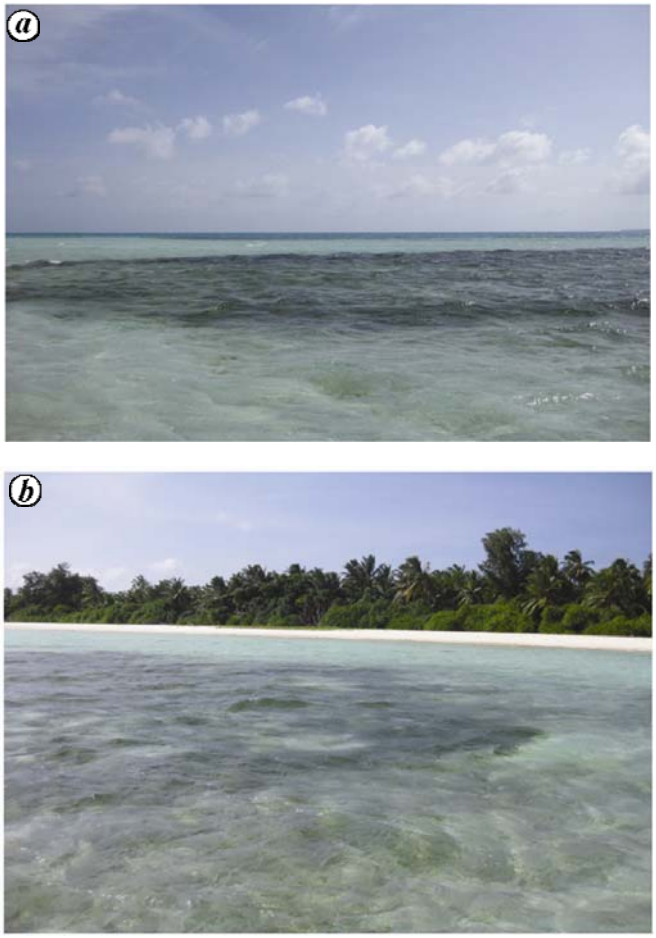

Figure 4. Large beds of juvenile *S. cornea* in Minicoy Lagoon towards the seaside (***a***) and the coast (***b***).

The taxonomical description of *S. cornea* is as follows.

Phylum:	Mollusca (Linnaeus, 1758)
Class:	Bivalvia (Linnaeus, 1758)
Sub class:	Metabranchia
Super order:	Filibranchia
Order:	Pteriomorpha
Super family:	Arcoidea
Family:	Arcidae (Lamarck, 1809)
Genus:	*Scapharca* (Reeve, 1844)
Species:	*Scapharca cornea* (Reeve, 1844)

The shell of the species is thick and solid, inflated, inequilateral, somewhat transversally elongate in shape and with height greater than inflation, roughly quadrate to trapezoidal in outline; slightly inequivalve, left valve slightly overlapping right valve along postero-ventral margin. Anterior margin rounded, ventral margin widely convex and meeting the oblique posterior margin at a blunt angle. Umbones moderately prominent and prosogyrate, on top of a wide cardinal area, ligament external, often with V-shaped grooves. Postero-dorsal slope flattened to slightly concave toward posterior end of dorsal margin, set off by a broad, rounded ridge radiating from the umbones to postero-ventral end of the shell. Cardinal area rather narrow and elongated. About 28 radial ribs (26–30) at each valve, as wide as the interstices, mainly granulated on left valve. Periostracum well developed, concentrically striated, scaly to spiky in the interstices of the ribs. Internal margins with strong crenulations corresponding with the external radial ribbing. Outside of shell white, frequently tinged deep bluish-green posteriorly; periostracum dark grayish-brown. Umbonal area smooth and velvety, brownish-green in juvenile specimens. Interior whitish. The average size of juveniles obtained from the Minicoy Lagoon was 1.02 ± 0.15 cm.

The study area is characterized by tropical oceanic lagoon conditions. The substratum is characterized by coral sand and organic debris from adjacent mangroves. Water temperature in the settlement area was 29°C and pH was alkaline in nature (8.2). Salinity was 30 ppt and dissolved oxygen 4.8 ml/l.

There are 27 species in the genus *Scapharca* worldwide. *S. cornea* from Minicoy Lagoon inhabited the sand bot-

toms in the littoral and sub-littoral zone. The members of the family Arcidae can be found on sandy-mud, but the highest population densities are seen on the soft intertidal muddy area bordering mangrove swamp forests[18]. The population of *Anadara granosa*, which is a member of the family Arcidae at Phuket, Thailand, inhabited substrates with 70–80% sand[19]. *S. inaequivalvis* was found in intertidal sandy areas[20] and *S. cornea* in sandy substrates in Fijian coastal waters[21]. In Minicoy Lagoon, the substratum is dominated by sand (70–80%). The proximity to mangroves offers some organic matter to the substratum where *S. cornea* settled. It grows to a length of 2.5–8 cm and up to 6 cm in height[22]. The average size of the juvenile specimens collected was 1.02 ± 0.15 cm. They formed extensive beds in the lagoon in an area of 0.7 sq. km.

Although bivalves are an ecologically and economically important group of organisms, relatively little is known about their distribution and community structure in Lakshadweep waters. The biodiversity of bivalves is not well documented in Lakshadweep Islands, except for some survey reports[23,24] and a recent work related to seagrass ecosystems[25]. From Indian waters, the occurrence of *S. cornea* was recorded in the Andaman and Nicobar Islands[26] and east coast of India[27]. The occurrence of *Scapharca* sp. in Mumbai harbour area[28] was reported in 2010. However so far the species has not been reported from Lakshadweep Islands. Distribution and abundance of the family Arcidae are well documented in SE Asian nations. *S. cornea* is an Indo-Pacific bivalve reported from China[29], Brunei Darsm, Cambodia, Indonesia, Japan, Philippines, Singapore, Taiwan, Thailand, Malaysia and Vietnam[22], Hong Kong and the Republic of Korea[30]. Its invasive ability was recorded in the Mediterranean Sea[31]. Most arcoid species can be readily recognized by their shell form, radial ribs, taxodont hinge and duplivincular ligament[32]. There are many species with considerable commercial value in this order.

S. cornea, which seems well adapted to the prevailing environmental conditions, can dominate the oceanic coral lagoons of Lakshadweep, thus highlighting the potential of invasive species. Such biological invasions deserve attention and emphasize the need for an integrated evaluation of the resources of Lakshadweep Islands.

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