First record of Veneridae clam *Protapes ziczac* (Linnaeus, 1758) from east coast of India, Andhra Pradesh

S S Rout\textsuperscript{a,b}, B Dash\textsuperscript{a,b}, N V Subba Rao\textsuperscript{c}, K V Surya Rao\textsuperscript{c}, A V Raman\textsuperscript{a} & D Raut\textsuperscript{b}

\textsuperscript{a}Marine Biology Laboratory, Andhra University, Visakhapatnam, AP – 530 003, India
\textsuperscript{b}Centre of Excellence in Environment and Public Health, Environmental Science Laboratory, Department of Zoology, Ravenshaw University, Cuttack, Odisha – 753 003, India
\textsuperscript{c}Molluscan Section, Zoological Survey of India, New Alipore, Kolkata – 700 053, India

\textsuperscript{*}[E-mail: raut.dipti2@gmail.com]

Received 05 September 2019; revised 15 July 2020

A venerid bivalve *Protapes ziczac* (Linnaeus, 1758) from benthic collections is reported for the first time from the coastal waters of Andhra Pradesh, east coast of India. The findings of this study indicate the extended distributional range of the species, until now documented from the west coast of India.

**Keywords**: Benthos, East coast of India, Mollusca, New Record, *Protapes ziczac*, Veneridae

**Introduction**

Representatives of the family Veneridae commonly referred to as Venus clams are cosmopolitan and ubiquitous in distribution, occurring world-wide in littoral environments. Of the 800 extant species known globally\textsuperscript{1} under the family, many are often subjected to wide-ranging commercial exploitation owing to their numerical dominance in benthic communities\textsuperscript{2}. Veneridae, is one amongst the ten identified families popular with shell collectors\textsuperscript{3}. Besides, most species are not only recognized as foods with high nutritional value, for example *Meretrix meretrix* rich in proteins, enzymes, polysaccharides, minerals, essential vitamins and essential amino acids\textsuperscript{4} but also as poultry feed, and in extraction of lime by local fisher communities, thus contributing to livelihood economies. Majority of the venerid species reported from India are common to both west and east coasts. About ten species are restricted in their distribution to west coast, with two species known only from the Andaman Islands. From the coast of Andhra Pradesh, in all, 29 venerid species have been reported\textsuperscript{5} with the present species now as an addition to the existing bivalve fauna of the coast.

The genus *Protapes* Dall, 1902 is represented by three species in India: *Protapes cor* (G. B. Sowerby I, 1853), and *P. ziczac* (Linnaeus, 1758) from west coast\textsuperscript{5,6} in addition to *P. gallus* (Gmelin, 1791) from both west and east coasts in extensive beds in estuaries in the proximity of the sea where marine conditions prevail\textsuperscript{9}. Amongst the species documented, *P. ziczac* (Linnaeus, 1758) was recorded earlier from the Arabian sea\textsuperscript{7} as *P. sinuosa* (Lamarck, 1818)\textsuperscript{8}. Additionally, reports of the species off Kerala\textsuperscript{9} corroborate the existence of the species from the south west coast of India. The objective of the present study is to further document the occurrence and range extension of *P. ziczac* (Linnaeus, 1758), previously unreported, from the east coast of India.

**Materials and Methods**

Two specimens were obtained with a Naturalist’s dredge (20 x 50 cm; mesh size ~ 0.6 cm\textsuperscript{2}) operated from a fishing trawler at a depth of about 10-30 m from Singarayakonda in the coastal corridor (15°20.120’ N, 80°08.218’ E) off Andhra Pradesh, India (Fig. 1). After collection, the specimens were washed with seawater and sorted on board. The specimens were carefully preserved in 10 % neutralized formaldehyde. Morphometric measurements were recorded using a dial Caliper. Identification was carried out based on key taxonomic features with appropriate literature\textsuperscript{10}. The specimens were photographed with a digital (Nikon) camera, vouchered (Reg. No. MBLDZAU-239; dated 01.03.2017) and deposited in the collections of the Marine Biology Laboratory, Department of Zoology, Andhra University, Visakhapatnam, India. The samples for hydrography were analyzed according to Standard methods for the estimation of water quality\textsuperscript{11,12}.

**Material examined**

Two live specimens, Voucher no. MBLDZAU-239; dated 01.03.2017; collected from Singarayakonda (15°20.120’ N, 80°08.218’ E) of Andhra Pradesh, India, at depth of 10 m.
Results

Identification

Systematic account

Phylum: Mollusca
Class: Bivalvia
Subclass: Heterodonta
Infraclass: Euheterodonta
Superorder: Imparidentia
Order: Venerida
Superfamily: Veneroidea
Family: Veneridae Rafinesque, 1815
Genus: Protapes Dall, 1902
Protapes ziczac (Linnaeus, 1758)

Synonyms
Tapes inflata Römer, 1870
Venus ziczac Linnaeus, 1758 (Figs. 1a – d; Table 1)

Diagnosis
Shell color pale off-white tan with four prominent reddish-brown axial bands and zigzag streaks radiating from umbo to ventral margin. Externally shell sculptured with growth curves separated by more or less identical sized furrows; hard, compact, thick, fairly distended, rotund, projecting into inflexed umbones towards the anterior margin; equivalve, oviform, trigonal of moderate dimensions (Table 1). Posterior margin curving upwards, ventral margin smooth, undulating. Lunule spindle shaped. Escutcheon slender, even. Interior shell color white; hinge with three cardinal teeth each; pallial sinus discernible with rounded apex; pallial line connects roughly trigonal anterior and elliptical posterior muscle scars.

Remarks: In comparison with the other two species of Protapes reported from India, P. ziczac has a much distended, swollen and bulky shell with well-defined strong external sculpture.

Ecology
The specimens were recorded from a depth of 10 m with a salinity of 34.20 psu; sediment organic matter

<table>
<thead>
<tr>
<th>Table 1 — Morphometric measurements in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shell morphometrics Protapes ziczac</td>
</tr>
<tr>
<td>Specimen 1 Specimen 2</td>
</tr>
<tr>
<td>Shell height</td>
</tr>
<tr>
<td>24.52 24.50</td>
</tr>
<tr>
<td>Shell length</td>
</tr>
<tr>
<td>35.82 35.79</td>
</tr>
<tr>
<td>Shell thickness</td>
</tr>
<tr>
<td>15.32 15.32</td>
</tr>
</tbody>
</table>
was 1.21 % with silt loam texture (29.16 % sand, silt 70.78 % and clay 0.06 %). Two other venerids Pelecyora excisa (Röding, 1798) and Placacent lamellatum (Röding, 1798) were also observed from the same site.

**Conclusion**

Extensive investigations as attempted in this study remain crucial in the exploration and documentation of benthic life. *P. ziczac* (Linnaeus, 1758) though described as a wide-ranging species of the western Indian Ocean, the possibility of a broader distribution across the Indo-Pacific was speculative⁶. The present finding of the species off Andhra Pradesh coastal waters, confirms an eastward extension into the Bay of Bengal.

**Acknowledgements**

We acknowledge financial support (MoES/36/00SI/Extra/11/2012) from the Ministry of Earth Sciences, Government of India for a research project on Benthic Communities of Coastal Andhra Pradesh. This work was carried out at the Marine Biology Laboratory, Department of Zoology, Andhra University. We thank all those who assisted in the fieldwork. S S Rout and B Dash are thankful to the CSIR, New Delhi for the award of a Senior Research Fellowship.

**Conflict of Interest**

There is no competing or conflict of interest.

**Author Contributions**

Specimen acquisition: AR; Laboratory analysis and figure: SSR & BD; Preparation of map: SSR & BD; Taxonomic identification: NVS and KVS; Writing: DR & SSR. Editing and review: AR and NVS; and funding acquisition: AR.

**References**