

## A new *Vasticardium* (Bivalvia: Cardiidae) from Vietnam

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**Abstract:** A new species of genus *Vasticardium* Iredale, 1927 is described from Phan Thiết, Central Vietnam and compared to three other species of this genus: *Vasticardium fidele* (Vidal, 1992), *Vasticardium elongatum cipangense* (Vidal, 1999) and *Vasticardium elongatum wilsoni* (Voskuil & Onverwagt, 1991).

### INTRODUCTION

The genus *Vasticardium* Iredale, 1927, is a principal genus of the cardiid subfamily Trachycardiinae with many species collected in Vietnam. During the summer of 2012, an unknown cockle was found that was not listed in the works by Hylleberg & Kilburn (2003). It belongs to *Vasticardium* and is a newly described species.

### ABBREVIATIONS

ANSP = Academy of Natural Sciences of Drexel University, Philadelphia, USA

PMBC = Phuket Marine Biological Center, Thailand

MNHN= Muséum national d'Histoire naturelle Paris, France

NBC = Naturalis Biodiversity Center Leiden, The Netherlands

ZSM = Zoologische Staatssammlung München, Germany

KBIN = Royal Belgian Institute of Natural Sciences, Belgium

NNT = Private collection N.N.Thach

CJH = Private collection Jorgen Hylleberg

SH = Shell height

SL = Shell length

SW = Shell width

Ral 2 = Right anterior lateral tooth No 2

### SYSTEMATICS

**Class Bivalvia Linnaeus, 1758**

**Family Cardiidae Lamarck, 1809**

**Subfamily Trachycardiinae Stewart, 1930**

**Genus *Vasticardium* Iredale, 1927 [Type species: *Vasticardium nebulosum* Iredale, 1927]**

*Vasticardium hyllebergi* n. sp.

Figures 1-9

**Synonymy:**

*Vasticardium fidele* (Vidal, 1992). Thach, 2005, Plate 84, Figure 2.

### DESCRIPTION

Shell large for the family (70-80 mm in average adult height, reaching 97 mm) and elongately ovate in outline with short anterior part and broader, truncate posterior part. Dorsal margin strongly curved, ventral margin regularly convex and highly crenulated. Shell length less than height (mean SL/SH 70.8%, Table 1). Valves rather inflated (mean SW/SH 63.3%, Table 1). Sculpture consisting of 30-32 ribs, each with inverted U-shaped cross section with slightly rounded top and crenulated vertical

sides, formed by intersection of strong radial ribs and concentric ribs. Interstices as wide as ribs or wider than ribs (especially posteriorly). Each rib wider on top than at base. Radial ribs gradually curving posteriorly when approaching ventral margin. Posteriormost six or seven ribs bearing sharp spines. Hinge teeth strong,

ligament exterior and well visible. The laterals consist of an upper and a lower lamella with a small tooth sandwiched in between. Hylleberg (2013) referred to this small tooth as Ral 2. Color exteriorly yellow to orange with darker commarginal bands and interiorly white with orange crenulated margins.

**Table 1.** Mean SL/SH, SW/SH and number of ribs of *Vasticardium hyllebergi* n. sp.

Specimen	SH (mm)	SL (mm)	SL/SH	Mean SL/SH	SW mm	SW/SL	Mean SW/SH	Number of ribs (RV)	Mean Number of ribs (RV)
1 (Holotype)	84.0	59.0	0.702	0.708 70.8%	54.9	0.654	0.633 63.3%	32	31
2 (Paratype 1)	82.2	59.3	0.721		52.5	0.639		31	
3 (Paratype 2)	97.0	64.2	0.662		59.6	0.614		30	
4 (Paratype 3)	81.8	57.0	0.697		50.5	0.617		31	
5 (Paratype 4)	81.0	56.9	0.702		49.7	0.614		31	
6 (Paratype 5)	66.0	48.7	0.738		42.6	0.645		32	
7 (Paratype 6)	72.5	51.7	0.713		46.1	0.636		31	
8 (Paratype 7)	71.8	52.7	0.734		45.2	0.630		31	
9 (Paratype 8)	79.0	54.3	0.687		51.7	0.654		32	
10 (Paratype 9)	80.4	56.5	0.703		50.7	0.631		31	
11 (Paratype 10)	85.1	59.1	0.694		53.0	0.623		30	
12 (Paratype 11)	78.5	56.4	0.718		50.8	0.647		31	
13 (Paratype 12)	83.6	61.3	0.733		52.4	0.627		30	

**Type material:**

Holotype 84.0mm PMBC (Figs. 1-2). Paratypes: all from type locality, Paratype 1: 82.2mm high in ANSP (Fig.3). Paratype 2: 97.0mm high in NNT (Fig.4). Paratype 3: 81.8mm high in MHNH (Fig.5). Paratype 4: 81.0mm high in NBS (not illustrated). Paratype 5: 66.0mm high in ZSM (not illustrated). Paratype 6: 72.5mm high in KBIN (not illustrated). Paratype 7: 71.8mm high in CJH (not illustrated). Paratype 11: 78.5mm high in NNT (Fig.9). Paratype 12: 83.6mm high in NNT (Fig.8).

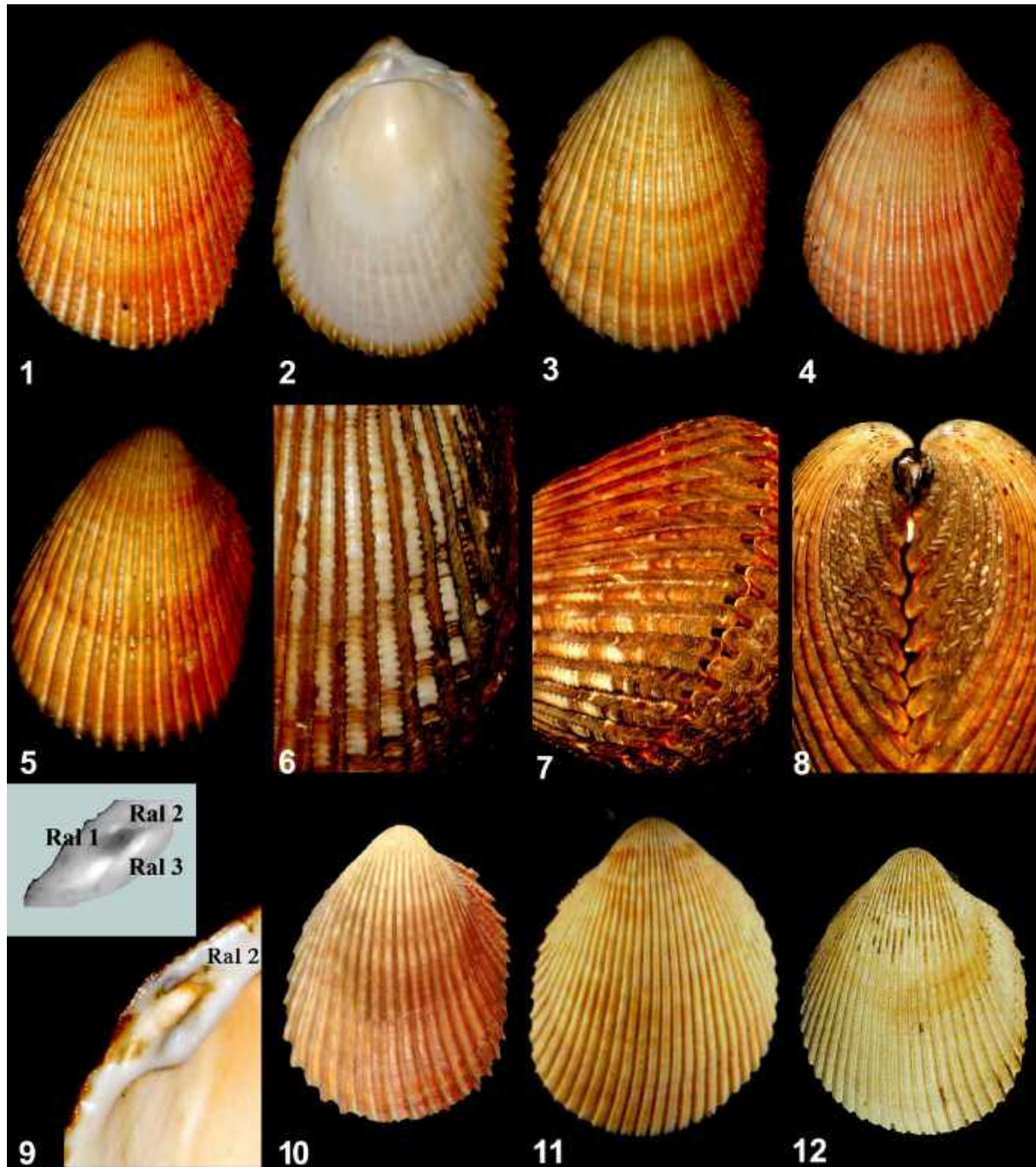
**Type locality:** Phan Thiết, Bình Thuận Province, Central Vietnam.

**Range and habitat:** along Central Vietnam, from Bình Thuận Province to Khánh Hòa Province. The specimens are living on sand at 1-20m. The type specimens were collected at 15m depth.

**Etymology:** This new species is named in honor of Prof. Jorgen Hylleberg of Denmark in recognition of organizing many Malacological Congresses in Vietnam.

**Table 2.** Comparison of *Vasticardium hyllebergi* n. sp. and *V. fidele*

	<i>V. hyllebergi</i> n. sp.	<i>V. fidele</i>
<b>Size</b>	Larger adult size (up to 97 mm SH)	Medium adult size (up to 75.3 mm SH)
<b>Shape</b>	Elongately ovate (SL = 70.8% SH)	Ovate (SL = 77% SH)
<b>Convexity</b>	Slightly more inflated (Shell Width = 89.4% SL)	Inflated (Shell Width = 84% SL)
<b>Concentric ribs</b>	Strong (fig. 6)	Weak
<b>Radial ribs</b>	U-shaped with top slightly rounded, wider than width of rib at base (fig. 7)	Rectangular with top flat, as wide as width of rib at base
<b>Interstices</b>	Deeper, very narrow	Moderately deep
<b>Right Anterior lateral tooth No 2 (Ral 2)</b>	Present, solid (Fig. 9)	Obscure (in holotype) or weak



1-9: *Vasticardium hyllebergi* n.sp., Phan Thiét, Vietnam- 1&2: Holotype 84.0mm high with exterior and interior views, PMBC- 3: Paratype 1: 82.2mm high, ANSP- 4: Paratype 2, 97.0mm, NNT- 5: Paratype 3: 81.8mm high, MNHN- 6: Front view of radial ribs (Paratype 2)- 7: U-shaped radial ribs (Paratype 2)- 8: Spiny ribs at posterior part (Paratype 12)- 9: Ral 2 of Paratype 11 (bottom) compared to that of *Vasticardium fidele* (top, Photo from J. Hylleberg)- 10: *Vasticardium fidele* Holotype (Photo by Arnou le Goff.)- 11: *Vasticardium elongatum cipangense* Holotype (Photo by A.le G.)- 12: *Vasticardium elongatum wilsoni* Paratype (Photo by Jacques Vidal.)

## DISCUSSION

*Vasticardium hyllebergi* n. sp. differs from *V. fidele* (holotype, Fig. 10) in many stable characters as summarized in Table 2.

Hylleberg (pers. comm. 2014) has examined populations of *Vasticardium fidele* from the Bay of Bengal (India), the Andaman Sea (North Sumatra and Phuket), the Gulf of Thailand (Pattani) and the South China Sea (Nha Trang, Vietnam) and compared with literature information from the Sulu Sea and the Pacific type locality Okinawa. Morphological analyses showed great overlap of characters but significant differences were found with respect to the Vietnamese population. Compared to other populations, the Vietnamese specimens displayed the smallest relative distance from the ventral edge of the shell to a vertical line passing through umbo. Hylleberg analyzed 54 specimens (7 from Vietnam) by a novel approach referred to the horizontal pivot axis analysis to standardized shells.

Ter Poorten (2005) suggested that *Vasticardium kenyanum* (Cox, 1930) from the Pleistocene is identical with recent *Vasticardium fidele* (Vidal, 1992). According to existing rules the fossil *V. kenyanum* has priority and should replace *V. fidele* if they are indeed identical. However, as discussed by Hylleberg (2013), living and extinct species should not carry the same name even if they look alike. Similarity does not make them identical. Many details cannot be examined on impressions of fossil specimens, and molecular techniques cannot be applied. Therefore, it remains unknown if the fossil species has remained unchanged for up to 1.6 million years where dramatic changes in climatic and environmental factors have occurred.

· *Vasticardium hyllebergi* n.sp. is close to *Vasticardium elongatum cipangense* (Vidal, 1999) (holotype, Fig.11) but differs in smaller adult size and less numerous radial ribs

· *Vasticardium hyllebergi* n.sp. is close to *Vasticardium elongatum wilsoni* (Voskuil & Onverwagt, 1991) (holotype, Fig. 12) but differs in smaller adult size, less obese shape and more widely-spaced radial ribs.

· *Vasticardium hyllebergi* n.sp. is close to *Vasticardium elongatum elongatum* (Bruguère, 1789) but differs in more subrectangular outline and in radial ribs that are more widely-spaced and concentrically grooved.

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