

Americardia lindamaesae spec. nov., a new cardiid from Ascension Island (Bivalvia, Cardiidae)

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Americardia lindamaesae spec. nov. (Cardiidae) is described from Ascension Island, based on new collections. It is compared with the related *Americardia media* (Linnaeus, 1758), *A. lightbourni* Lee & Huber, 2012, *A. columbella* Lee & Huber, 2012 and *A. speciosa* (A. Adams & Reeve, 1850).

Key words: Bivalvia, Cardiidae, *Americardia*, new species, tropical South Atlantic Ocean, Ascension.

INTRODUCTION

Ascension Island is a small (88 km²) and remote island in the central South Atlantic Ocean (7°56'S, 14°22'W), located just west of the Mid-Atlantic Ridge. St. Helena Island is the nearest island, circa 1290 km to the southeast. Ascension is the summit of a massive strato-volcano that rises 3000 m above the oceanic crust of the South American Plate (<http://volcano.si.edu/volcano.cfm?vn=385050>).

The 'Beagle' visited Ascension Island in 1836 and the 'Challenger' expedition in 1876 (Smith, 1885). The malacofauna of the island is poorly studied: the most well-known publication is an annotated list of the marine molluscs (Rosewater, 1975). Recently Brown et al. (2016) have dealt with some molluscs and Padula et al. (2014) have treated the heterobranch sea slugs. Only two Cardiidae species have been reported from Ascension Island, viz. *Americardia media* (Linnaeus, 1758) and *Papyridea soleniformis* (Bruguière, 1789). Thanks to recent intensified collection efforts, a large number of samples of both species have recently

become available. Close examination of this material has led to the conclusion that the Ascension population of *A. media* is specifically different. It is herein described as *A. lindamaesae* spec. nov.

MATERIAL AND METHODS

The material for this study almost exclusively originates from the collection efforts made by Judith Brown (JB), Sarah Browning-Lee (SBL) and Peter Wirtz (PW) during various expeditions to Ascension Island between 2015 and 2018. Besides limited beach collecting, numerous SCUBA dives down to 35 m depth were performed at multiple sites. With the prevailing southeast winds, diving largely focussed at sites located north and west of the island. In addition to handpicking, shell grit samples were taken from various depths.

Unless stated otherwise, the used morphological terminology follows Lee & Huber (2012). The height is measured along an axis perpendicular to the hinge, and the length is the greatest distance between the anterior and posterior ends, parallel to the hinge line. In the captions only the largest size is given, either length or height. Geographic coordinates of many of the sample localities are given in Brown et al. (2016: table 1).

Acronyms of institutions and repositories: FMNH, Field Museum of Natural History, Chicago, U.S.A.; MNHN, Muséum national d'Histoire naturelle, Paris, France; NHMUK, The Natural History Museum, London, U.K.; RBINS, Royal Belgian Institute of Natural Sciences, Brussels, Belgium; RMNH, Naturalis Biodiversity Center, Leiden, The Netherlands; UF, Florida Museum of Natural History, Gainesville, U.S.A.; FS, colln F. Swinnen, Lommel, Belgium; JJTP, colln J.J. ter Poorten, Hilversum, The Netherlands; RDP, colln Roland De Prins, Mechelen, Belgium.

Abbreviations: H, height; L, length; LV, left valve(s); PV, paired valves; RV, right valve(s); V, valve(s); W, width.

SYSTEMATIC PART

Class Bivalvia Linnaeus, 1758

Order Cardiida Ferussac, 1822

Family Cardiidae Lamarck, 1809

Subfamily Fraginae Keen, 1951

Genus *Americardia* Stewart, 1930

Americardia Stewart, 1930: 267-269 (as a subgenus of *Trigoniocardia*). Type species by original designation: *Cardium medium* Linnaeus, 1758; Recent, “O. Indico” (Caribbean, restricted to Havana, Cuba by Lee & Huber, 2012).

Diagnosis. — Shell small (15 mm) to medium (60 mm), generally rather thick shelled, oblique quadrate-trigonal, inequilateral with umbonal radial keel and posterior slope strongly truncate. Radial ribs well developed, with low arched scales; interspaces with fine commarginal striae. Anterior and posterior lateral teeth about equidistant from cardinal teeth in rv; anterior laterals only slightly closer to cardinals in lv. Animal with very short, separate siphons.

Distribution. — Oligocene, Chattian to Recent (Herrera et al., 2015: table 1), Caribbean, Patagonian, Panamic, Californian, Peruvian; littoral-sublittoral on sand and mud bottoms, often in association with seagrass or coral rubble.

Remarks. — Phylogenetic research of Kirkendale (2009) and Herrera et al. (2015) support inclusion of *Americardia* in a clade sister to the Eastern Pacific / Atlantic *Apiocardia* and *Trigoniocardia*. The related Indo-Pacific genera *Ctenocardia* and *Microfragum* form a separate clade. Increased taxon sampling and more elaborate sequence data sets are needed to clarify relationships within and between genera, for instance with the Eastern Pacific *A. biangulata* (Brodrip & G.B. Sowerby I, 1829) and *A. planicostata* (G.B. Sowerby I, 1833) as well as with the Caribbean *A. guppyi* (Thiele, 1910).

Americardia lindamaesae spec. nov.

(Figs 1-7, 15-16, Tables 1-2)

Cardium (Fragum) medium Linné — E.A. Smith, 1890: 322.
Trigoniocardia (Americardia) medium (Linné) — Packer, 1968: 59.

Trigoniocardia (Americardia) medium (Linné, 1758) — Rosewater, 1975: 33.

Corculum (Trigoniocardia) medium Linné — Fischer-Piette, 1977: 121 (pars, Ascension).

Trigoniocardia medium (Linné) — Packer, 1983: 42.

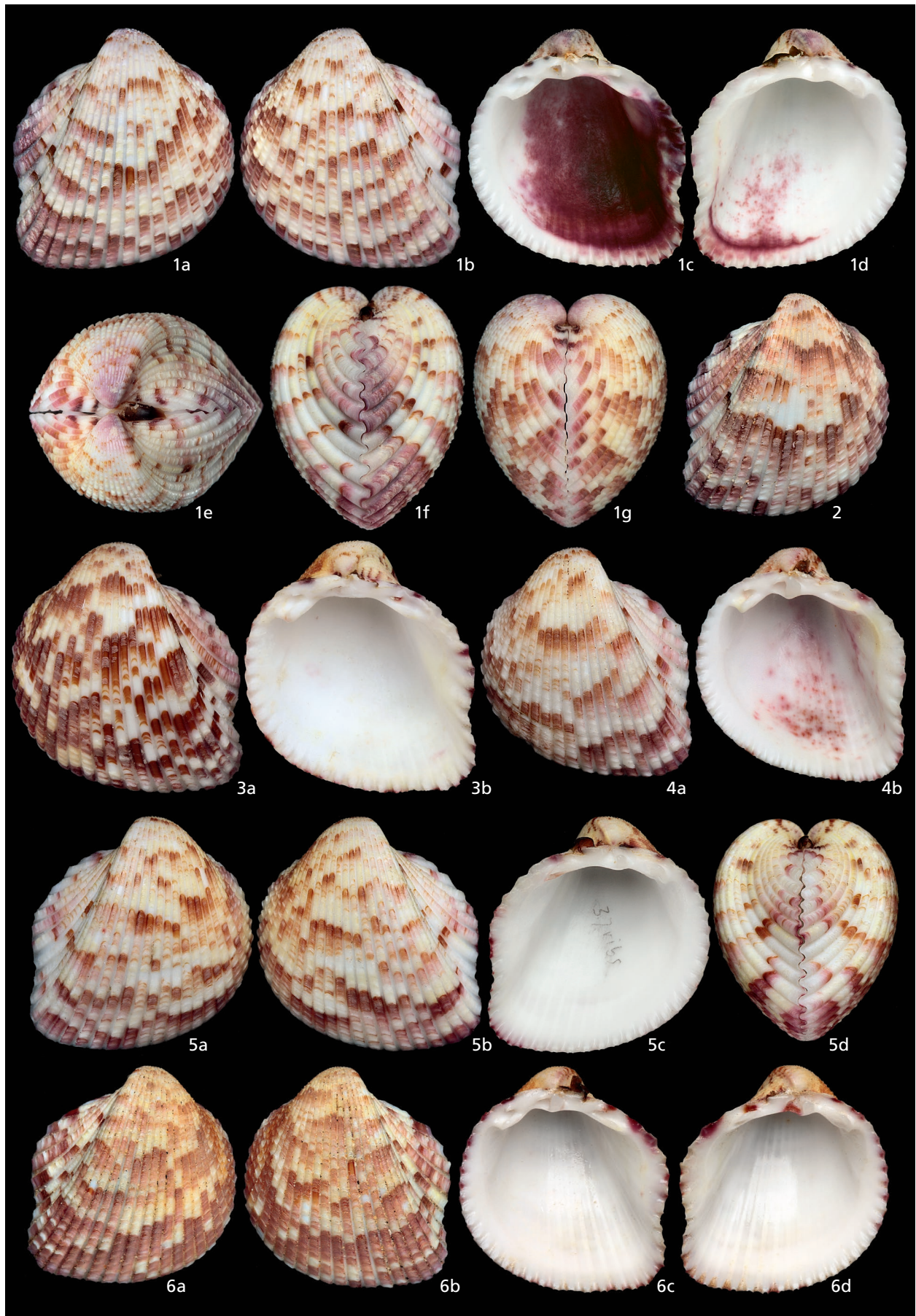
Americardia media (Linnaeus, 1758) — Lee & Huber, 2012: 19, table 1 (pars, Ascension).

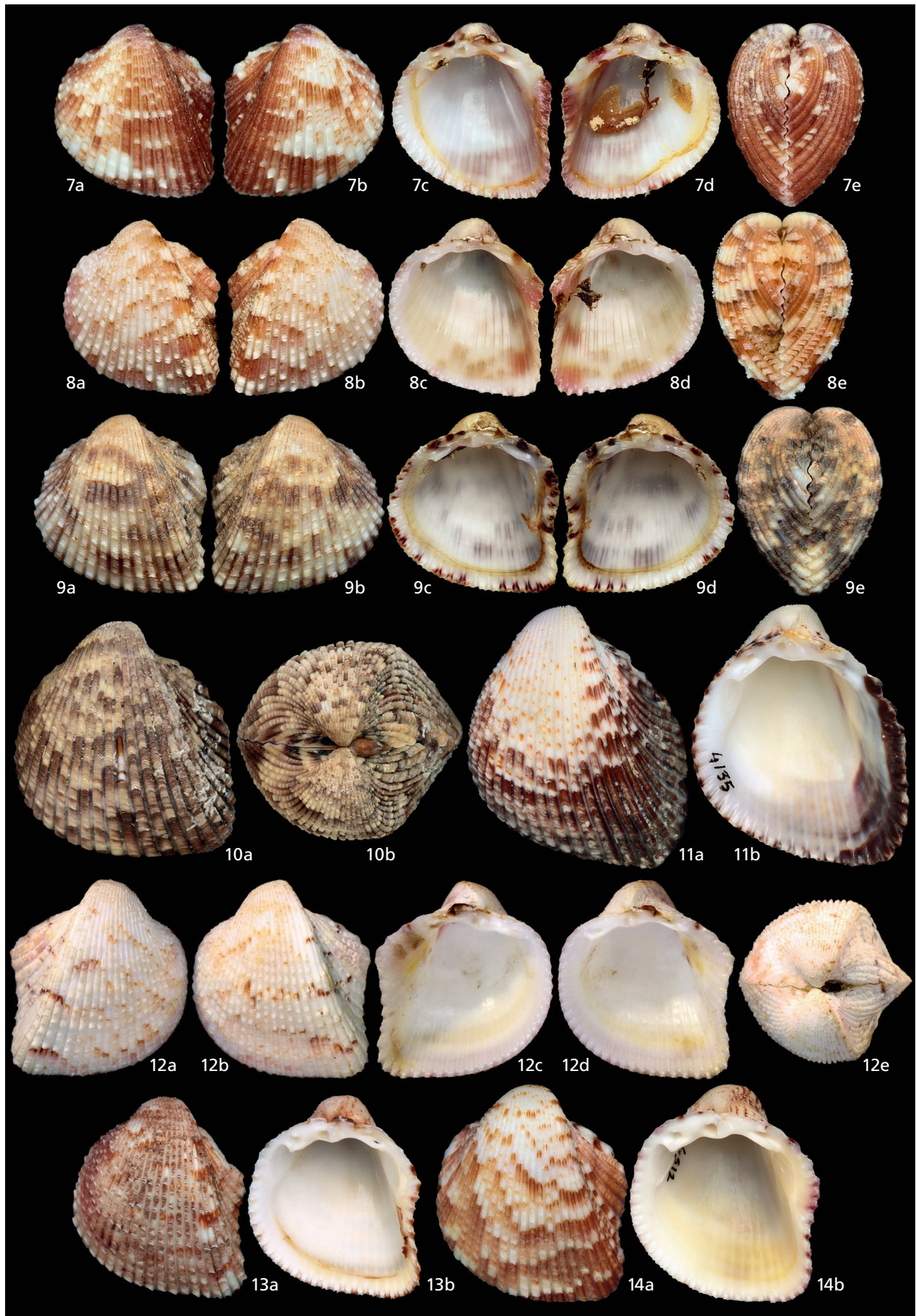
Type series (indicated in bold-italic type) and other material examined. — Ascension Isl., beached. (FS, **paratypes**, 1 PV, 2 V); Bird Breeding Isl., Small Isl., White Isl., on sandy seabed near rocky reef, depth 27 m. Leg. SBL & JB, 10.12.2016 (NHMUK 20190451, **paratypes**, 1 PV, 2 V, juv.; RMNH.MOL.338701, **paratype**, 1 PV); Boatswain Bird Island, depth 27 m. Leg. SBL & JB, 06.11.2016 (FS, 2 V, adult, juv.); Boatswain Bird Island, on rocky reef, depth 23 m. Leg. SBL & JB, 07.02.2016 (FS, 9 V, juv.); Boatswain Bird Island, rock ledge, directly below bird colony, in green algae, 07°53.092'S, 14°18.500'W, depth 25 m. Leg. SBL & JB, 20.08.2016 (FS, 1 V, juv.); Boatswain Bird Island, rocky reef beneath seabird colony, depth 10 m. Leg. SBL & JB, 16.04.2017 (JJTP 5104, **paratypes**, 2 PV, of which 1 juv.); Boatswain Bird Island, rocky reef, 07°53.092'S, 14°18.500'W, depth 20 m. Leg. SBL & JB, 20.08.2016 (FS, 2 V, juv.); Boatswain Bird Island, rocky reef, depth 28 m. Leg. SBL & JB, 25.03.2016 (FS, 4 V, juv.); Boatswain Bird Island, seabed close to reef below bird colony, depth 33 m. Leg. SBL & JB, 22.01.2017 (FS, 2 V, juv.); Boatswain Bird Island, seabed close to the edge of rocky reef below seabird colony island, in detritus, depth 34 m. Leg. SBL & JB, 26.02.2017 (JJTP 5107, **paratype**, 1 PV); Boatswain Bird Island, seabed near rocky reef beneath bird colony, depth 35 m. Leg. SBL & JB, 16.04.2017 (FS, **paratypes**, 3 PV, juv., alive; 6 V, partly juv.); Boatswain Bird Island, seabed next to reef, depth 27 m. Leg. SBL & JB, 30.04.2017 (FS, 1 PV: juv., 13 V, juv.); Boatswain Bird Island, seabed next to rock reef, underneath bird colony, depth 33 m. Leg. SBL & JB, 12.02.2017 (FS, 2 V, juv.); Boatswain Bird Island, seabed next to rocky reef, depth 27 m. Leg. SBL & JB, 26.11.2016 (FS, **paratypes**, 1 PV, 4 V partly juv.); Boys Tower, depth 18 m. Leg. SBL & JB, 01.05.2016 (FS, 3 V, juv.); Clarence Bay Arch, sandy reef, depth 24 m. Leg. SBL & JB, 16.10.2016 (FS, **paratypes**, 1 PV, 1 V); Clarence Bay Arch, sandy seabed next to rocky reef, depth 24 m. Leg. SBL & JB, 16.10.2016 (FS, 7 V, juv.); Clarence Bay Arches, Georgetown, sand floor, in shell grit, depth 29 m. Leg. SBL & JB, 06.02.2016 (FS, 10 V, juv.); Clarence Bay, Georgetown, Arches, Catherine Point, under rocks, depth 23 m. Leg. SBL & JB, 27.03.2016 (FS, **paratypes**, 2 PV, of which 1 juv., 8 V, partly juv.); Clarence Bay, Georgetown, Arches, seabed next to Rock Reef Isl., surrounded by sand, collected under big arch, depth 23 m. Leg. SBL & JB, 12.03.2017 (RDP, **paratype**, 1 PV); Clarence Bay, Long Beach, in sandy seabed wave battered, rocky outcrops, depth 5.5 m. Leg. SBL & JB, 21.01.2018 (FS, 2 V, juv.); Clarence Bay, Long Beach, rock reef under rocks, depth 7.7 m. Leg. SBL & JB, 06.12.2015 (FS, 3 V, juv.); Comfortless Cove, on rocky reef, in shell grit, depth 6 m. Leg. SBL & JB, 01.01.2016 (FS, 1 V, juv.); English Bay, -7.893967, -14.383500, in shell grit, depth 9 m. Leg. PW, 16.07.2015 (FS, 1 PV, juv., alive, 2 V, juv.); English Bay, below big arches, 7°53'25.42"S, 14°22'50.24"W, depth 9 m. Leg. PW, 11.11.2015 (FS, 1 PV, juv.,

alive); English Bay, Derby Wreck, rocky reef, depth 7 m. Leg. SBL & JB, 04.06.2016 (FS, 2 v, juv.); English Bay, Eddie's Gullies, under ledge, depth 18.5 m. Leg. SBL & JB, 07.11.2015 (FS, 2 v, juv.); English Bay, in Lava tunnel, in shell grit, depth 9 m. Leg. PW, 08.02.2014 (FS, 1 v, juv.); English Bay, in shell grit, depth 12 m. Leg. PW, 05.02.2014 (FS, 1 PV, juv., 11 v, juv.); English Bay, One Hook, in detritus, depth 17 m. Leg. PW, 25.04.2015 (FS, 1 v, juv.); English Bay, One Hook, in shell grit, depth 10 m. Leg. PW, 25.04.2015 (FS, 6 v, juv.); English Bay, One Hook, 1 m. off rock reef on broken coral/sandy seabed, depth 20 m. Leg. SBL & JB, 05.06.2016 (FS, **paratypes**, 12 v, partly juv.); English Bay, One Hook, seabed, rock reef, bottom of large rock face, depth 18.4 m. Leg. SBL & JB, 04.10.2015 (FS, 1 v, juv.); English Bay, One Hook, seabed, rocky reef under rock ledge, depth 20 m. Leg. SBL & JB, 04.10.2015 (FS, 2 v, juv.); English Bay, One Hook Bay, rocky reef, underneath rock ledge, seabed, in shell grit, depth 20 m. Leg. SBL & JB, 04.11.2015 (FS, 3 v, juv.); English Bay, sandy seabed occasional rocky patches, depth 10 m. Leg. SBL & JB, 19.06.2016 (FS, 1 v, juv.); English Bay, under stones, depth 10 m. Leg. SBL & JB, 19.06.2016 (FS, 2 PV: juv., 6 v, partly juv.); English Bay, Wigan Pier, in sand, depth 15 m. Leg. SBL & JB, 03.02.2018 (FS, **paratypes**, 2 PV, of which 1 juv.); English Bay, Wigan Pier, in sandy shallow reef between sand /reef, depth 7 m. Leg. SBL & JB, 14.01.2017 (FMNH 344768, **paratype**, 1 PV); English Bay, Wigan Pier, 12.07.2015 (FS, 1 PV, juv., alive); Georgetown, Dead Man's Beach, sandy beach. Leg. SBL, 2015 (JJTP 4578, 1 v); Georgetown, in tidal pool, 7°55'56.70"S, 14°25'12.15"W. Leg. PW, 02.2014 (FS, 2 v, juv.); Georgetown, offshore, China Wreck, sandy floor next to wreck, 07°53'675"S, 14°25'470"W, depth 27 m. Leg. SBL & JB, 25.06.2016 (FS, 2 v, juv.); Horseshoe Reef, depth 23 m. Leg. SBL & JB, 23.10.2016 (FS, 1 PV, juv., 2 v, juv.); Jimmy's Reef, in sand under rocks, depth 22 m. Leg. SBL & JB, 22.11.2015 (FS, 2 v, juv.); Lion's Mane Reef, 7°54'23.6"S, 14°24'26.1"W, depth 23 m, seabed next to reef. Leg. SBL & JB, 25.12.2016 (FS, 2 PV, **paratypes**); Lion's Mane Reef, seabed next to rocky Reef, depth 29 m. Leg. SBL & JB, 17.04.2017 (MNHN-IM-2014-6041, **paratype**, 1 PV; FS **paratypes**, 3 PV, of which 1 juv.); N. side, Ladies Loo, in shell grit, depth 17 m. Leg. SBL & JB, 24.01.2016 (FS, 1 PV, juv., 10 v juv.); N. side, Ladies Loo, reef ledges, depth 18 m. Leg. SBL & JB, 12.06.2016 (FS, 1 PV, juv., 12 v, juv.); North Point Reef, 7°54'23.6"S, 14°24'20.1"W, depth 25 m, seabed, bottom of reef wall. Leg. SBL & JB, 21.08.2016 (RBINS I.G. 33959/MT.3754, **holotype**, 1 PV; FS, **paratypes**, 1 PV, 1 v, juv.; JJTP 4832, **paratype**, 1 PV); North Point Reef, Rock Gully, high density of green algae, 07°54.236'S, 14°14.261'W, depth 7 m. Leg. SBL & JB, 21.08.2016 (FS, 1 v, juv.); North Point, sandy seabed next to steep rock reef face, depth 23 m. Leg. SBL & JB, 11.03.2017 (FS, 15 v, partly juv.); North Point, Sudan Wreck, rocky reef close to wreck, 07°53.266'S, 14°22.599'W, depth 14 m. Leg. SBL & JB, 06.08.2016 (FS, 1 v,

juv.); North Point, Triangles, in small cave/overhang, depth 15 m. Leg. PW, 19.07.2015 (FS, 3 v, juv.); Pan-Am, in shell grit, near black coral, depth 20 m. Leg. PW, 18.07.2015 (FS, 11 v, juv.); Pan-Am Beach, in corner, under rocks on black lava seabed, depth 8 m. Leg. SBL & JB, 16.07.2016 (FS, **paratypes**, 1 PV, juv., 3 v); Pan-Am Ladders, rocky reef, in sand, depth 15 m. Leg. SBL & JB, 10.09.2016 (FS, 1 PV, juv., 2 v, juv.); Pan-Am Ladders, under black coral, depth 26 m. Leg. SBL & JB, 10.09.2016 (FS, 4 v, partly juv.); Pyramid Point, below boulder, depth 20 m. Leg. PW, 22.07.2015 (FS, 6 v, juv.); Red Rock, in detritus, depth 30 m. Leg. PW, 20.07.2015 (FS, 9 v, juv.); Red Rock, in detritus, depth 14 m. Leg. PW, 09.02.2014 (FS, 3 v, juv.); Red Rock, rocky reef, depth 15 m. Leg. SBL & JB, 17.12.2016 (FS, 2 v, juv.); Red Rock, rocky reef, depth 22 m. Leg. SBL & JB, 08.10.2016 (FS, 1 v, juv.); Red Rock, sandy seabed next to rocky reef, depth 30 m. Leg. SBL & JB, 22.10.2016 (FS, 1 PV, 1 v, juv.); Red Rock, sandy seafloor next to rocky reef, depth 27 m. Leg. SBL & JB, 17.12.2016 (FS, 1 v, juv.); Red Rock Reef, 7°53.726'S, 14°23.725'W, sandy seabed next to reef, depth 30 m. Leg. SBL & JB, 28.08.2016 (FS, 8 v, partly juv.); Red Rock, -7.894233, -14.3946, in sand. Leg. PW, 23.07.2015 (FS, 1 PV, 1 v); Reef next to Lion's Mane, rocky reef, depth 14 m. Leg. SBL & JB, 18.12.2016 (JJTP 5105, **paratype**, 1 PV); Rocket Pad, sandy seabed next to reef, depth 26 m. Leg. SBL & JB, 06.01.2017 (JJTP 5106, **paratypes**, 4 v, partly juv.); Two Hooks, in seabed next to reef, black sand, depth 18 m. Leg. SBL & JB, 27.11.2016 (FS, 1 v, juv.); White [Rock] Isl., rock reef, under boulders and in sand pockets on reef, depth 18 m. Leg. SBL & JB, 06.02.2017 (FS, 1 PV, 2 v, juv.); White Rock Isl., sandy ledge on rocky reef, depth 14 m. Leg. SBL & JB, 10.12.2016 (FS, 3 v, juv.); Yorkshire Chariots, under rocks, rocky reef, depth 17 m. Leg. SBL & JB, 09.07.2016 (FS, 2 v, of which 1 juv.).

> **Figs 1-6.** *Americardia lindamaesae* spec. nov. **1.** Ascension, North Point Reef, 7°54'23.6"S, 14°24'20.1"W, 25 m. Leg. S. Browning-Lee & J. Brown, 21.08.2016, RBINS, I.G. 33959/MT.3754, holotype, H 28.6 mm (a: RV exterior, b: LV exterior, c: RV interior, d: LV interior, e: dorsal, f: posterior, g: anterior). **2.** Ascension, English Bay, Wigan Pier, 7 m. Leg. S. Browning-Lee & J. Brown, 14.01.2017, FMNH 344768, paratype, H 25.6 mm (RV exterior). **3.** Ascension, Bird Breeding Isl., Small Isl., White Isl., 27 m. Leg. S. Browning-Lee & J. Brown, 10.12.2016, NHMUK 20190451, paratype, H 30.1 mm (a: LV exterior, b: RV interior). **4.** Ascension, Lion's Mane Reef, 29 m. Leg. S. Browning-Lee & J. Brown, 17.04.2017, MNHN-IM-2014-6041, paratype, H 26.7 mm (a: LV exterior, b: RV interior). **5.** Ascension, North Point Reef, 07°54'23.6"S, 14°24'20.1"W, 25 m. Leg. S. Browning-Lee & J. Brown, 21.08.2016, JJTP 4832, paratype, H 26.0 mm (a: RV exterior, b: LV exterior, c: LV interior, d: posterior). **6.** Ascension, beached. FS, no reg. no., paratype, H 25.4 mm (a: RV exterior, b: LV exterior, c: RV interior, d: LV interior).





Type locality. — Ascension Island, North Point Reef, 7°54'23.6"S, 14°24'20.1"W, depth 25 m.

Description. — Shell height up to 34.5 mm, H slightly exceeds L (L/H 0.85–0.97, mean 0.91, $n = 21$, Table 1), solid, inflated (W/(L+H/2) 0.79–0.88, mean 0.82, $n = 21$, Table 1); oblique-quadrangle, with a well expressed posterior sulcus and a moderately marked carina. Anterior margin evenly rounded, ventral margin weakly rounded, postero-ventral margin angulate and posterior margin slightly concave. Shell equivalve and subequilateral, with rounded, orthogyrous umbones placed just in front of the midline and clearly protruding. Shell with 33–37 radial ribs (mean 35.0, $n = 21$, Table 1), of which 22–26 on the anterior and median part up to the carina (mean 24.7, $n = 21$, Table 1). Interspaces on the anterior slope circa one-fourth of the rib width (Fig. 15a). Ribs subtrigonal in cross-section, with flattened top and highest elevation posteriorly. Rib sculpture consisting of dehiscent intritacalx, composed of a thin calcareous layer and easily wearing off. Ribs beneath intritacalx glossy and smooth. Rib sculpture on anterior part consisting of dense, crescent-shaped commarginal threads, every eighth to twelfth forming a thickened, elevated thread (Fig. 15a); sculpture on median part (Fig. 15b) similar, slightly overhanging posteriorly and with less thickened threads; sculpture on posterior part similar but not overhanging and with more irregular placed elevated threads.

External ligament small, lunule broad and hollowed, unsculptured and slightly larger in RV. Hinge plate strong and rather thick with two cardinal teeth and two anterior and posterior lateral teeth in RV; LV with two cardinal teeth, one posterior lateral and two anterior lateral teeth. Cardinals separated by a deep pit and largely joined dorsally in RV.

External colouration whitish with radially arranged yellow-brownish to pinkish-purple blotches and streaks, slightly staggering from rib to rib. Internal colouration white, with purple patches along the dorsal and posterior margin, occasionally extending to a large part of the internal shell. Internal colouration of LV and RV sometimes strongly unequally extending. Animal not observed.

Distribution and ecology. — *Americardia lindamaesae* spec. nov. appears to be endemic to Ascension Island (Fig. 16). Numerous *Americardia* samples from St. Helena invariably belong to *A. speciosa* (A. Adams & Reeve, 1850) (Figs 21–22). Bathymetric data of the examined material point at a preference for shallow water with a sandy bottom. Depth range of the present material 0–35 m (dead), 9–35 m (alive). As collecting efforts are limited to SCUBA dives down to 35 m depth, the true bathymetric range will probably be wider.

Etymology. — Named after Mrs. Linda Maes, spouse of the second author, for providing continuous support with sampling and studying shells from Europe and West Africa.

Remarks. — *Americardia* samples from Ascension Island have invariably been identified as *Americardia media* (E.A. Smith, 1890; Parker, 1968; Rosewater, 1975; Fischer-Piette, 1977; Lee & Huber, 2012). This would imply a disjunct distribution as verified records of *A. media* from North Brazil could not be traced. H.G. Lee informed us (e-mail 24.01.2019) that he is unaware of *A. media* reaching any part of Brazil. Very few samples from North Brazil can be examined in data aggregators, such as GBIF (gbif.org) and iDigBio (idigbio.org), either with poor data or from deep water and thus likely relating to *A. lightbourni*. Massemin et al. (2009) mention *A. media* from French Guiana. However, their figured specimen is from Martinique and they report a bathymetric range of 50–70 m, again fitting *A. lightbourni*. Likewise, van Regteren Altena (1971: 49) reports *A. media* from Surinam stating that ‘the specimens are a little narrower in relation to their height than nearly all the specimens I saw from other countries’. This morphological character, in combination with the dredged depth of 24 fms (44 m) points at *A. lightbourni*. *Americardia media* has also not been found by the French GUYANE 2014 expedition (MNHN, cardinals identified by the first author). Based on the current evidence, the eastern end of the distribution of *A. media* is Surinam (Fig. 18), leaving a gap of some 4,500 km to Ascension Island. In the tropical Atlantic, the broad, westward flowing South Equatorial Current appears to represent a massive barrier for transportation of pelagic lar-

< **Fig. 7.** *Americardia lindamaesae* spec. nov. Ascension, Boatswain Bird Island, 35 m, alive. Leg. S. Browning-Lee & J. Brown, 21.08.2016, FS, no reg. no., paratype, H 9.0 mm (a: LV exterior, b: RV exterior, c: RV interior, d: LV interior, e: dorsal). **Fig. 8.** *Americardia lightbourni* Lee & Huber, 2012. Martinique, southwest of Vétiver, 14°37.6'N, 61°08.3'W, dredged 60 m, alive, 30.09.2016. MADIBENTHOS, stn AD280, MNHN-IM-2014-6038, H 9.5 mm (a: LV exterior, b: RV exterior, c: RV interior, d: LV interior, e: dorsal). **Figs 9–11.** *Americardia media* (Linnaeus, 1758). **9.** Martinique, Cap Saint Martin, 14°51.6'N, 61°12.6'W, 6–18 m, alive, 02.10.2016. MADIBENTHOS, stn AR380, MNHN-IM-2014-6040, H 9.6 mm (a: LV exterior, b: RV exterior, c: RV interior, d: LV interior, e: dorsal). **10.** Martinique, Baie de Fort-de-France, south of Ilet à Ramier, 14°32.6'N, 61°04.8'W, night dive 5 m, alive, 08.09.2016. MADIBENTHOS, stn ARO55, MNHN-IM-2013-72204 (genotyped specimen), H 31.8 mm (a: LV exterior, b: dorsal). **11.** Bahamas, Chub Cay, Club Beach, 1.5 m. Leg. P. Williams, 15.05.2007, JJTP 4135, H 36.5 mm (a: LV exterior, b: RV interior). **Figs 12–14.** *Americardia lightbourni* Lee & Huber, 2012. **12.** Bermuda, south of Castle Roads, dredged 82 m. Leg. J.R.H. Lightbourn & A.T. Guest, 31.08.1976, UF 447279, holotype, H 18.9 mm (a: RV exterior, b: LV exterior, c: LV interior, d: RV interior, e: dorsal). **13.** Brazil, Bahia, 13°18'S, 38°42'W, dredged 45–48 m, alive. Leg. Métivier, 26.11.1961. CALYPSO 1961–62, stn DR64, MNHN-IM-2014-6039, H 19.4 mm (a: LV exterior, b: RV interior). **14.** Brazil, Bahia, off Alcobaça City, dived, 25–35 m. Leg. F. Soares, JJTP 4912, H 23.0 mm (a: LV exterior, b: RV interior).

Collection, registration number	L (mm)	H (mm)	W (mm)	Ribs (ant.)	Ribs (post.)	Ribs (total)	L/H	(L+H)/2	Inflation	
RBINS I.G. 33959/MT.3754, holotype •	25.8	28.6	22.5	23	10	33	0.90	27.20	0.83	PV
NHMUK 20190451, paratype •	27.6	30.1	25.3	25	11	36	0.92	28.85	0.88	PV
RMNH.MOL.338701, paratype	16.0	17.6	13.4	26	10	36	0.91	16.80	0.80	PV
FS, no reg. no., paratype •	23.6	25.4	20.3	25	10	35	0.93	24.50	0.83	PV
MNHN IM-2014-6041, paratype •	23.6	26.7	21.4	25	10	35	0.88	25.15	0.85	PV
FS, no reg. no., paratype	21.5	23.7	18.2	24	11	35	0.91	22.60	0.81	PV
FMNH 344768, paratype •	23.0	25.6	19.7	25	9	34	0.90	24.30	0.81	PV
FS, no reg. no., paratype	30.1	34.5	(28.0)	24	11	35	0.87	32.30	0.87	RV
FS, no reg. no., paratype	19.4	21.3	16.9	26	9	35	0.91	20.35	0.83	PV
JJTP 5104, paratype	16.2	17.1	13.1	25	10	35	0.95	16.65	0.79	PV
FS, no reg. no., paratype	30.0	34.5	28.4	26	11	37	0.87	32.25	0.88	PV
RDP, no reg. no., paratype	22.5	26.5	19.5	24	10	34	0.85	24.50	0.80	PV
JJTP 5105, paratype	22.3	23.9	18.6	22	11	33	0.93	23.10	0.81	PV
FS, no reg. no., paratype	30.5	32.9	(26.4)	24	11	35	0.93	31.70	0.83	LV
FS, no reg. no., paratype	30.5	32.6	(25.6)	26	10	36	0.94	31.55	0.81	LV
JJTP 5106, paratype	21.9	22.9	(17.9)	24	9	33	0.96	22.40	0.80	LV
FS, no reg. no., paratype	17.8	19.7	15.7	25	10	35	0.90	18.75	0.84	PV
JJTP 5107, paratype	16.0	16.8	13.1	24	10	34	0.95	16.40	0.80	PV
FS, no reg. no., paratype	18.1	18.6	15.2	25	10	35	0.97	18.35	0.83	PV
FS, no reg. no., paratype	21.3	23.6	18.3	25	11	36	0.90	22.45	0.82	PV
JJTP 4832, paratype •	24.3	26.0	21.3	25	12	37	0.93	25.15	0.85	PV
Mean values (n = 21)				24.7	10.3	35.0	0.91		0.83	

Table 1. Shell measurements of *Americardia lindamaesae* spec. nov. Sizes in brackets refer to extrapolated values. Only (sub)adult shells are included, defined as all those individuals with $L \geq 16$ mm. Material with a black circle (•) is figured herein.

vae bridging this distance. Unfortunately nothing is known regarding the duration of the planktonic larval stage in *Americardia*.

Americardia media (Figs 9-11, 17-18) differs by a more heterogeneous oblique-quadrate shell shape, a larger maximum size (H up to 61.5 mm), a slightly higher rib number (34-39), wider interspaces on the anterior slope related to the rib width (circa one-third), more coarse commarginal threads on the anterior and median slope (Figs 17a-b) and irregular placed thickened threads (often in pairs), and by a colouration that is more of a yellow-chocolate brown nature.

Americardia lightbourni (Figs 12-14, 19-20) differs by a more inflated elongate-quadrate shell with a sharper carina, a thinner shell, a posterior outline with more angular pos-

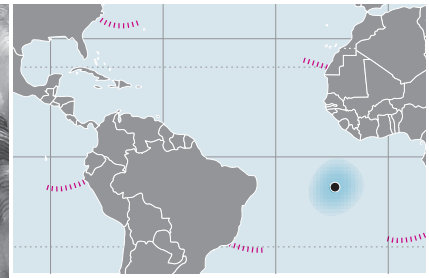
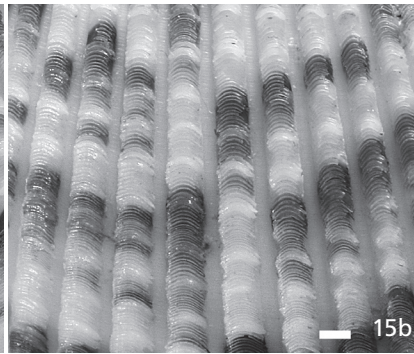
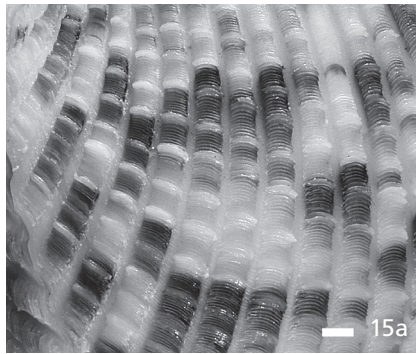
tero-dorsal and postero-ventral margins, a slightly higher rib number (35-41), a larger number of thickened scales on the shell (often in pairs or a small series) (Figs 19a-b), and by a more variable and vivid colouration with orange, rose and brown, internally often white suffused with yellow.

Americardia speciosa (Figs 21-22; Hylleberg, 2011: 904, unnumbered figs; <http://data.nhm.ac.uk/object/5f51022b-cdc4-464f-aco5-d777e722758a>) differs by a much more inflated, elongate and strongly oblique shell with a well-marked carina, a stronger concave posterior margin, a slightly lower rib number (28-36), smaller interspaces on the anterior slope related to the rib width (circa one-fifth, Fig. 21a), and by a colouration that contains orange, reddish or pinkish blotches, internally white, yellowish or deep yellow.

	<i>Americardia lindamaesae</i>	<i>Americardia media</i>	<i>Americardia lightbourni</i>	<i>Americardia speciosa</i>	<i>Americardia columbella</i>
Shell shape and carina	Moderately higher than long, broadly oblique-quadrated; moderately inflated; carina moderately marked	Variable: usually moderately higher than long to clearly higher than long, weakly oblique; moderately inflated; carina weakly expressed	Clearly higher than long, narrow to broadly oblique; well inflated; carina sharply expressed	Clearly higher than long, narrow and strongly oblique; well inflated; carina well marked to broadly rounded	Clearly higher than long, quadrate, upright; well inflated; carina sharply expressed
Posterior sulcus	Weakly expressed sulcus; flat adjacent area	Weakly expressed sulcus; flat adjacent area	Marked sulcus; flat adjacent area	Marked sulcus; flat adjacent area	Strongly marked sulcus, hollowed (sunk-en) adjacent area
Number of radial ribs	33-37 ribs in total, 22-26 anterior ribs	34-39 ribs in total, 22-27 anterior ribs	35-41 ribs in total, 26-31 anterior ribs	28-36 ribs in total, 21-24 anterior ribs	34-37 ribs in total, 23-25 anterior ribs
Rib sculpture and interspaces on anterior slope	Subtrigonal, very fine and dense, regularly altering with one thickened thread; interspaces about ¼ rib width (Fig. 15a)	Rather flat and broad, coarse and dense, of irregular thickness; interspaces about ½ rib width (Fig. 17a)	Low and narrow, rather flat, of irregular thickness and often in pairs or small series; interspaces less than ¼ rib width (Fig. 19a)	Subtrigonal, higher posteriorly, very fine and dense, irregularly altering with one or two thickened threads; interspaces less than ½ rib width (Fig. 21a)	Elevated, subtrigonal, higher posteriorly, small knobs on rib tops, covered with very fine and dense threads; adjacent and no interspaces (Fig. 23a)
Size	H 25-34.5 mm	H 30-61.5 mm	H 20-32.5 mm	H 30-36 mm	H 30-44.5 mm
Colouration	Externally white with yellow-brownish to pinkish-purple blotches and streaks; internally white with purple patches or largely deep purple	Externally white or yellowish with chocolate brown blotches; internally white or yellow, often with brownish blotches or streaks	Externally variable and vivid, whitish with orange, rose, and brown streaks; internally white, nearly always suffused with yellow	Externally rather uniform, white with numerous orange, reddish or rose blotches; internally yellowish-white, rose-red on the posterior margin	Externally rather uniform, predominantly orange-brown; internally white or pale yellow with purple-pink on the posterior margin

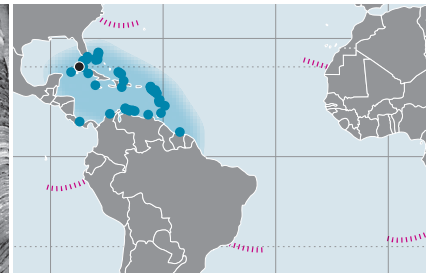
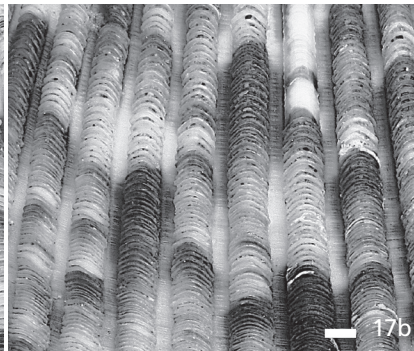
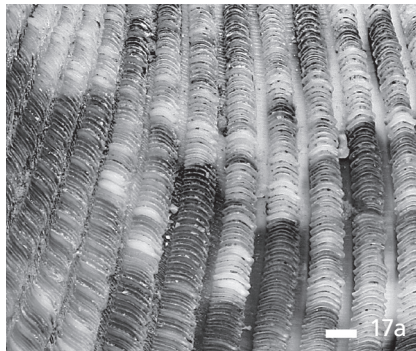
Table 2. Comparative summary of shell characters of five Atlantic *Americardia* species (based on adult material). Modified and extended after Lee & Huber (2012).

> **Figs 15, 17, 19, 21, 23.** Radial rib sculpture of *Americardia* species (a: LV anterior slope, b: LV median slope), scale bars: 1 mm. **Figs 16, 18, 20, 22, 24.** Distributions of *Americardia* species as currently known. Borders of fauna provinces with red striped lines. Black circle representing the type locality, blue circles representing verified samples (number (n) of samples given, including number of live samples and depth range based on live samples). Material mainly originating from FMNH, MNHN, RMNH (ex ZMA), UF, FS and JTP. **Figs 15-16.** *Americardia lindamaesae* spec. nov. **15.** Ascension, North Point Reef, 7°54'23.6"S, 14°24'20.1"W, 25 m. Leg. S. Browning-Lee & J. Brown, 21.08.2016, RBINS, I.G. 33959/MT.3754, holotype. **16.** Distribution map. **Figs 17-18.** *Americardia media* (Linnaeus, 1758). **17.** Martinique, Baie de Fort-de-France, S. of Ilet à Ramier, 14°32.6'N, 61°04.8'W, night dive 5 m, alive, 08.09.2016. MADIBENTHOS, stn ARO55, MNHN-IM-2013-72204. **18.** Distribution map. **Figs 19-20.** *Americardia lightbourni* Lee & Huber, 2012. **19.** Brazil, Bahia, off Alcobaça City, dived, 25-35 m. Leg. F. Soares, JTP 4912. **20.** Distribution map. **Figs 21-22.** *Americardia speciosa* (A. Adams & Reeve, 1850). **21.** St. Helena, Red Island, 15°56'24"S, 5°44'31.2"W, 12 m in shell grit. Leg. J. Brown, 10.07.2014, FS, no reg. no. **22.** Distribution map. **Figs 23-24.** *Americardia columbella* Lee & Huber, 2012. **23.** U.S.A., Florida, Broward Co., Pompano Beach, dredged at night in sand, 30-35 m. JTP 4782. **24.** Distribution map.



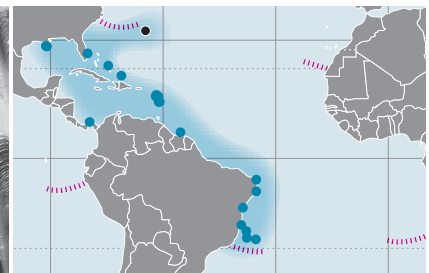
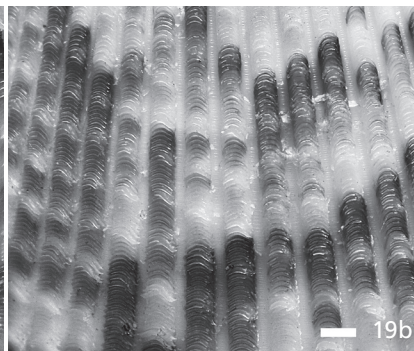
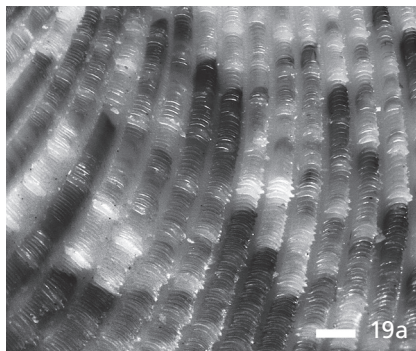
Americardia lindamaesae spec. nov.
n = 77 samples, of which 4 alive (9–35 m)

16



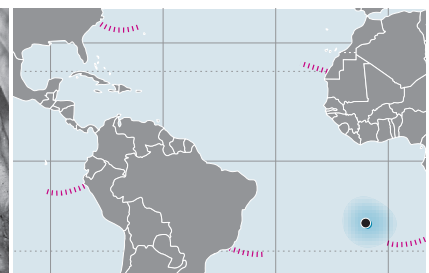
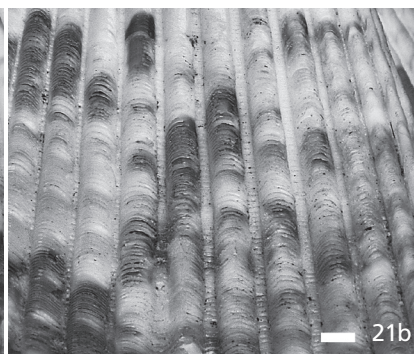
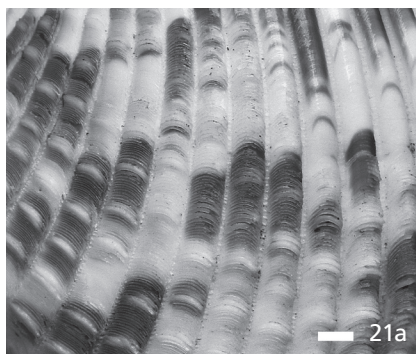
Americardia media (Linnaeus, 1758)
n = 129 samples, of which 30 alive (0–20 m)

18



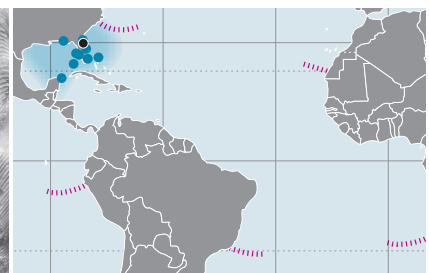
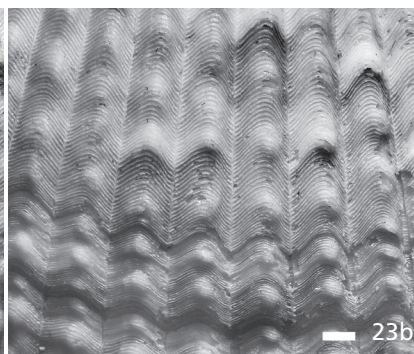
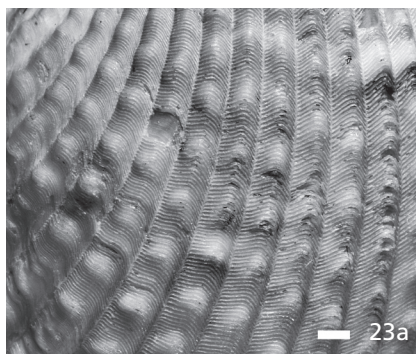
Americardia lightbourni Lee & Huber, 2012
n = 57 samples, of which 14 alive (11–80 m)

20



Americardia speciosa (A. Adams & Reeve, 1850)
n = 20 samples, no live data

22



Americardia columbella Lee & Huber, 2012
n = 14 samples, of which 3 alive (31–33 m)

24

Americardia columbella (Figs 23-24; Lee & Huber, 2012: figs 12-16) differs by a much more inflated, elongate oblique shell with a well expressed sulcus and a more prominent carina, a stronger concave posterior margin and a partly concave ventral margin just anterior of the carina, more triangular ribs, interspaces that are absent on the anterior and median slope (Figs 23a-b), the presence of small knobs on the rib tops, and by a colouration that is predominantly orange-brown, internally white or pale yellow.

See Table 2 for a comparison of the shell characters of the five *Americardia* species.

DISCUSSION

The biogeographic position of Ascension Island is controversial. Huber (2010) considers the West African influence slightly stronger than the Caribbean and includes St. Helena and Ascension Islands in the West African fauna province. In Spalding et al. (2007) both islands together form a separate marine province. Based on fish distribution, Briggs & Bowen (2012), assign Ascension a higher affiliation with the Brazilian Province (29% shared species) than with the Tropical Eastern Atlantic (6% shared species), while St. Helena has nearly equal affiliations (16% Brazilian, 15% Tropical Eastern Atlantic). Considering that each island demonstrates significant evolutionary innovation, Briggs & Bowen (2012) call for the recognition of a separate St. Helena and Ascension province. Kulbicki et al. (2013) associate Ascension and St. Helena with the West Atlantic, based on biogeographic analyses of reef fish fauna and in terms of similarity of species composition. Together, Ascension and St. Helena form a separate 'Atlantic islands province'.

With the introduction of *Americardia lindamaesae* spec. nov. both islands host their own endemic *Americardia* species (Figs 16, 22), constituting West Atlantic faunal elements. Additional genetic research is needed to start unravelling the genetic connectivity among Atlantic Ocean *Americardia* taxa. Additional research on the malacofauna of both islands is needed to improve our knowledge of their faunistic affinities with other provinces.

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ples and shells of their dives in Ascension Isl. Diana Baum (Director of Conservation and Fisheries Ascension), Andy Richardson (Chief Scientist Conservation Dept. Ascension) and Yves Samyn (RBINS) are acknowledged for help with literature. Jørgen Hylleberg (Aarhus University, Denmark) is acknowledged for reviewing the manuscript and giving some constructive remarks. Cardiid travel costs of the first author to UF were supported by the U.S. National Science Foundation Grant 1633535 (to David Jablonski).

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