

THE GIANT SPECIES OF THE MOLLUSCAN GENUS *LIMA* OBTAINED IN PHILIPPINE AND ADJACENT WATERS.

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During the cruise of the United States Fisheries steamer *Albatross* in Philippine and adjacent waters a number of Giant Limas were obtained. Here, as elsewhere, they occurred only in deep water, the least depth at which they were found being 161 fathoms, the greatest 559, with an average of 313.6. They were by no means abundant or universally distributed, for of the 369 dredgings made in more than 100 fathoms, only 18 yielded these mollusks, and 205 of these stations were made in depths between the two extremes in which Giant Limas were obtained. To these 205, eleven stations might be added, which differ only a couple of fathoms in depth from the above. Some of the new species here described are remarkable for their great size, being of much greater dimensions than any Giant Lima heretofore known.

The three large species obtained in the Sulu Sea and its ramifications among the islands, differ from those heretofore known by having a shallow, broad, and oval resilium, which follows the outer border of the hinge for a much greater distance than in typical *Acesta*, characterized by *Lima excavata* Fabricius, the type of *Acesta*, in which we have the resilium assuming the form of a deep curved wedge. The characters of the two groups are well shown in our figures of *L. rathbuni* and *L. celebensis*. These characters, taken in conjunction with the much less strongly developed sculpture in the three large Philippine species, is deemed sufficient to merit at least a sectional recognition for which I propose the name *Callolima*, with *Lima* (*Callolima*) *rathbuni* as type.

In the adjoining table I quote measurements and data of previously described species from the papers by Mr. E. A. Smith¹ and Dr. W. H. Dall.² To these are added similar data from the present material to render the table complete.

¹ Ann. Mag. Nat. Hist., ser. 7, vol. 4, 1899, p. 251.

² The Nautilus, vol. 16, No. 2, June, 1902, pp. 15-17

Distribution and measurements of known species of Giant Limas.

Name.	Locality.	Depth in fathoms.	Measurements in mm.		
			Alt.	Lat.	Diam.
(<i>Acesta</i>) <i>excavata</i> Fabricius, 1779.....	Norway.....	150-300	170	125	55
(<i>Acesta</i>) <i>goliath</i> Sowerby, 1883.....	Japan.....	775	150	110	36
(<i>Acesta</i>) <i>indica</i> Smith, 1899.....	Arabian Sea.....	430	75	61	34
(<i>Acesta</i>) <i>patagonica</i> Dall, 1902.....	Patagonia.....	245-481	100	72	31
(<i>Acesta</i>) <i>agassizi</i> Dall, 1902.....	Panama.....	322	97	78	30
(<i>Acesta</i>) <i>verdensis</i>	Philippines.....	394	48	40. 4	21.5
(<i>Acesta</i>) <i>celebensis</i>	Buton Strait.....	519	159	(?)	(?)
(<i>Acesta</i>) <i>butonensis</i>.....	.....do.....	559	26.8	22	11
(<i>Callolima</i>) <i>smithi</i>	Philippines.....	281-508	175	118	48
(<i>Callolima</i>) <i>rathbuni</i>.....	.....do.....	161-226	208	156	59
(<i>Callolima</i>) <i>philippinensis</i>.....	.....do.....	190	177	111	37
(<i>Callolima</i>) <i>borneensis</i>	Borneo.....	305	39.2	33	16

The photographs of the accompanying illustration were made by the Photographer of the United States National Museum, and were retouched by Mrs. E. Bennett Decker.

LIMA (CALLOLIMA) SMITHI, new species.

Plates 12 and 13.

Shell large, slightly gaping for the greater part of both the anterior and posterior lateral margin. Pale lemon yellow, which is more intensified at the border than at the center of the disk, and also appears more emphasized on a series of rings which probably mark resting stages. Outline very oblique; the anterior lateral margin being much less curved than the posterior, which is very strongly arched. Hinge slightly curved, with a general upward slant posteriorly; scarcely produced beyond the beaks anteriorly. Lunule slight, outer surface marked with strongly impressed, quite regular and fairly evenly distributed somewhat zig-zag radiating lines which are less expressed on the early part of the shell and are almost obsolete on a narrow line radiating from the beak ventrally. The radiating lines are strongest on the lunule. Interior bluish white with the intensified yellow portion shining through the substance of the shell. Resilium large, with the posterior margin evenly curved and the ventral sigmoid.

The type, Cat. No. 256977, U.S.N.M., was dredged at station 5533, off Baliscasag Island, in 432 fathoms, on green mud and sand bottom, bottom temperature 53°.3. The type, which is the largest specimen, measures: alt. 175 mm., lat. 118 mm.; diameter 48 mm. The smallest specimen was obtained at station 5283. The ventral portion of this is broken, which prevents giving the height; but the breadth is 14.5 mm.

Lima (*Callolima*) *smithi* seems to prefer a finely sandy mud bottom. It was dredged at depths varying from 281 to 508, or at an average of 401 fathoms.

This species is named for Dr. Hugh M. Smith, Commissioner of Fish and Fisheries and director of the Philippine Expedition.

Specimens were obtained at the following stations:

Station 5124, north of Point Origen, Mindoro (lat. $12^{\circ} 52' N.$; long. $121^{\circ} 48' 30'' E.$), in 281 fathoms, on soft green mud bottom. Cat. No. 256978, U.S.N.M.

Station 5283, off Malavatuan Island (lat. $13^{\circ} 48' 30'' N.$; long. $120^{\circ} 28' 40'' E.$), in 280 fathoms, on dark gray sand bottom; bottom temperature, $46^{\circ}.8$; density of water at bottom, 1.02517. Cat. No. 237577, U.S.N.M.

Station 5423, south of Cagayan Island, Jolo Sea (lat. $9^{\circ} 38' 30'' N.$; long. $121^{\circ} 11' E.$), in 508 fathoms, on gray mud and coral sand bottom; bottom temperature, $49^{\circ}.8$. Cat. No. 255175, U.S.N.M.

Station 5513, off Camp Overton Light, Mindanao (lat. $8^{\circ} 16' 45'' N.$; long. $124^{\circ} 02' 48'' E.$), in 505 fathoms, on gray mud and fine sand bottom. Cat. No. 255177, U.S.N.M.

Station 5533, off Balicasag Island (lat. $9^{\circ} 27' 15'' N.$; long. $123^{\circ} 31' 48'' E.$), in 432 fathoms, on green mud and sand bottom; bottom temperature, $53^{\circ}.3$. Cat. No. 256977, U.S.N.M.

LIMA (CALLOLIMA) PHILIPPINENSIS, new species.

Plates 14 and 15.

Shell large, of spatulate outline, slightly gaping at the lunule and narrowly so for the entire length of the posterior lateral margin; yellowish white, with concentric bands of pale lemon yellow, which probably mark resting stages. Hinge slightly curved, bending slightly upward posteriorly; scarcely at all produced anteriorly beyond the beak. Outer surface marked with well-incised, fine, quite regular and fairly regularly spaced wavy radiating riblets excepting a narrow band that extends from the beak ventrally, spreading slightly to form a triangular area with the beak at the angle, which is free from these markings. The incised lines are a little stronger at the lunule than anywhere else. Interior bluish white, through which the yellow areas of the outside show. Dorsal boundary of the resilium evenly curved; the ventral sigmoid.

The type, Cat. No. 256976, U.S.N.M., was dredged at station 5373, off the outer Tayabas Light (lat. $13^{\circ} 40' N.$; long. $121^{\circ} 31' 10'' E.$), in 190 fathoms (sounding not made but taken from chart), on gray mud bottom. It measures: alt. 177 mm., lat. 111 mm.; diameter 37 mm.

LIMA (CALLOLIMA) RATHBUNI, new species.

Plates 16 and 17.

Shell very large, slightly gaping for about a third of the anterior lateral margin and for about half of the posterior lateral; lemon yellow, fading to yellowish white at the edges. Outlines irregularly oval; hinge slightly, obliquely, downward slanting posteriorly, scarcely produced anterior to the beak; lunule concavely, obliquely sloping; the remaining outline curving in a regular oval. Outer

surface marked with irregular wavy, faintly impressed, and irregularly distributed radiating lines, and fine concentric lines of growth. The radiating lines are decidedly stronger on the lunule than on any other part of the shell. Interior bluish white; within the umbones an iridescent intensified canary yellow callus patch occurs, which gradually becomes attenuated and diffused ventrally, extending weakly as far as the palial line. A rosy flush extends from a little within the ventral border dorsally, over about two-thirds of the inner surface of the shell. Resilium almost straight dorsally, with a sigmoid curve ventrally. Hinge with obsolete lateral teeth indicated, the anterior one of which is a little stronger than the posterior.

The type, Cat. No. 256975, U.S.N.M., was dredged at station 5173, off Jolo Light, in 186 fathoms, on shell and coral bottom. It measures: alt. 182 mm., lat. 135 mm.; diameter 52 mm. The smallest specimen obtained, Cat. No. 254979, U.S.N.M., comes from station 5519 and measures: alt. 63 mm., lat. 51 mm.; diameter 22.3 mm. The largest specimen, Cat. No. 254978, U.S.N.M., comes from station 5371 and measures: alt. 208 mm., lat. 156; diameter 59 mm.

This species was obtained at the following stations:

Station 5135, off Jolo Light (lat. $6^{\circ} 11' 50''$ N.; long. $21^{\circ} 08' 20''$ E.), in 161 fathoms, on fine coral sand bottom; bottom temperature, $57^{\circ}.4$. Cat. No. 254980, U.S.N.M.

Station 5173, off Jolo Light (lat. $6^{\circ} 02' 55''$ N.; long. $120^{\circ} 53' 00''$ E.), in 186 fathoms, on shell and coral bottom. Cat. No. 256975, U.S.N.M.

Station 5198, off Baliscasag Island (lat. $9^{\circ} 31' 50''$ N.; long. $123^{\circ} 39' 45''$ E.), in 220 fathoms, on green mud bottom; bottom temperature, $53^{\circ}.9$; density of water at bottom, 1.02500. Cat. No. 256975, U.S.N.M.

Station 5371, off outer Tayaba's Light (lat. $13^{\circ} 49' 40''$ N.; long. $121^{\circ} 40' 15''$ E.). Sounding not made, depth taken from chart which says 83 fathoms. (This is probably incorrect, for all the other Giant Limas were taken at much greater depth.) Bottom green mud. Cat. No. 254978, U.S.N.M.

Station 5387, off outer Bagatao Island Light (lat. $12^{\circ} 54' 40''$ N.; long. $123^{\circ} 20' 30''$ E.), in 209 fathoms, on soft green mud bottom; bottom temperature, $52^{\circ}.4$. Cat. No. 254976, U.S.N.M.

Station 5503, off Macubalan Point Light, Mindanao (lat. $8^{\circ} 36' 26''$ N.; long. $124^{\circ} 36' 08''$ E.), in 226 fathoms, on green mud bottom; bottom temperature, $53^{\circ}.3$. Cat. No. 254976, U.S.N.M.

Station 5516, off Point Tagolo Light, Mindanao (lat. $8^{\circ} 46' 00''$ N.; long. $123^{\circ} 32' 30''$ E.), in 175 fathoms, on globigerina bottom; bottom temperature, $54^{\circ}.3$. Cat. No. 254974, U.S.N.M.

Station 5519, off Point Tagolo Light, Mindanao (lat. $8^{\circ} 47' 00''$ N.; long. $123^{\circ} 31' 15''$ E.), in 182 fathoms, on globigerina and sand bottom; bottom temperature, $54^{\circ}.3$. Cat. No. 254979, U.S.N.M.

From the above one sees that *Lima* (*Callolima*) *rathbuni* seems to like a soft mud habitat, ranging in depth from 161 to 226, or an average of 194 fathoms.

This species is named for Dr. Richard Rathbun.

LIMA (CALLOLIMA?) BORNEENSIS, new species.

Plate 20, figs. 1, 2.

Shell apparently large, of suboval outline. Hinge slanting slightly upward, with the area occupied by the lunule concavely excavated. Pale canary yellow. Outer surface marked by numerous, somewhat wavy, almost equal and equally spaced radiating riblets, which are a little stronger at the lunule than on the rest of the shell. In addition to these riblets, the surface is marked by concentric lines of growth with stronger ridges at intervals indicating resting stages. The hinge area is slightly worn which makes it impossible to be positive about the type of resilium. Interior white, edged with a yellowish band.

This type, a young specimen, Cat. No. 229312, U.S.N.M., differs from the young shells of any of the species we know, and forces us to consider it distinct. It comes from station 5592, off Silungan Island, Borneo (lat. $4^{\circ} 12' 44''$ N.; long. $118^{\circ} 27' 44''$ E.), in 305 fathoms, on green mud bottom; bottom temperature $43^{\circ}.2$. The shell measures: alt. 39.2 mm., lat. 33 mm.; diameter of the single valve 8 mm.

LIMA (ACESTA) VERDENSIS, new species.

Plate 20, figs. 5, 6.

Shell moderately large, irregularly oval; bluish white; slightly gaping at the lunule. Outer surface marked by numerous, quite regular and regularly spaced radiating riblets which are stronger on and near the lunule than on the rest of the shell. The early central portion of the disk is almost smooth. In addition to the radial sculpture, the surface is marked with numerous lines of growth, some of which, marking resting stages, are much stronger than the rest. Hinge slightly curved, almost at right angles to the long diameter of the shell, extending very slightly anterior to the beaks. Resilium deeply impressed, wedge shaped. Lunule strongly developed and deeply impressed. Interior bluish white.

The young type, Cat. No. 249132, U.S.N.M., was dredged at station 5119, off Sombrero Island (lat. $13^{\circ} 45' 05''$ N.; long. $120^{\circ} 30' 30''$ E.), in 394 fathoms, on green mud and sand bottom; bottom temperature, $43^{\circ}.7$; density of water at bottom, 1.02468. It measures: alt. 48 mm., lat. 40.4 mm.; diameter, 21.5.

LIMA (ACESTA) CELEBENSIS, new species.

Plates 18 and 19.

Shell large, oval, with the hinge slightly curved, forming almost a right angle with the long diameter of the shell, and scarcely at all produced anterior to the beak. Outer surface marked by many coarse radiating ribs which are strongest on the lateral borders, particularly on the very strongly excavated lunule. In the depressed grooves between these ribs, finer threads frequently occur. Hinge broad. Resilium deeply impressed, wedge shaped, as in *Lima (Acesta) excavata*.

Two left valves and a lot of fragments probably belonging to these two valves, Cat. No. 249133, U.S.N.M., were dredged at station 5647, south of North Island, Buton Strait (lat. $5^{\circ} 34' 00''$ S.; long. $122^{\circ} 18' 15''$ E.), in 519 fathoms, on green mud bottom. One of these measures: alt. 159 mm.

A young specimen collected on the Philippine Expedition, Cat. No. 229395, U.S.N.M., without specific locality, undoubtedly belongs here. I have given a figure of this also.

LIMA (ACESTA) BUTONENSIS, new species.

Plate 20, figs. 3, 4.

Shell small, irregularly oval. Hinge very slightly curved, extending almost at a right angle to the long axis of the shell. Lunule excavated. Outer surface marked by very fine, regular, and regularly spaced radiating riblets which are a little stronger near the lunule than on the rest of the surface and weakest on the middle of the disk. In addition to the radiating sculpture, the surface is marked with fine concentric lines which are emphasized in the form of resting stages at irregular intervals. Ligament wedge shaped. Interior bluish white, edged with a yellowish border.

The single valve of this species, Cat. 239399, U.S.N.M., was dredged at station 5648, south of North Island, Buton Strait (lat. $5^{\circ} 35' 00''$ S.; long. $122^{\circ} 20' 00''$ E.), in 559 fathoms on green mud bottom. It measures: alt. 26.8 mm., lat. 22 mm.; diameter of single valve 5.5 mm.

EXPLANATION OF PLATES.

All figures natural size.

- Plate 12. *Lima (Callolima) smithi*, exterior. See page 236.
13. *Lima (Callolima) smithi*, interior. See page 236.
14. *Lima (Callolima) philippinensis*, exterior. See page 237.
15. *Lima (Callolima) philippinensis*, interior. See page 237.
16. *Lima (Callolima) rathbuni*, exterior. See page 237.
17. *Lima (Callolima) rathbuni*, interior. See page 237.
18. *Lima (Acesta) celebensis*, exterior. See page 240.
19. *Lima (Acesta) celebensis*, interior. See page 240.
20, fig. 1. *Lima (Callolima?) borneensis*, exterior. See page 239.
2. *Lima (Callolima?) borneensis*, interior. See page 239.
3. *Lima (Acesta) butonensis*, exterior. See page 240.
4. *Lima (Acesta) butonensis*, interior. See page 240.
5. *Lima (Acesta) verdensis*, exterior. See page 239.
6. *Lima (Acesta) verdensis*, interior. See page 239.



Bartsch, Paul. 1913. "[Scientific results of the Philippine cruise of the Fisheries steamer Albatross, 1907-1910..No. 26.] The giant species of the molluscan genus *Lima* obtained in Philippine and adjacent waters." *Proceedings of the United States National Museum* 45, 235–240.

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