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# Mollusks of Alacran Reef, Campeche Bank, Mexico<sup>1</sup>

WINNIE H. RICE AND LOUIS S. KORNICKER<sup>2</sup>

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## Abstract

Photographic plates and descriptions are given for a collection of 90 species of gastropods and 40 species of pelecypods from Alacran Reef, Yucatan, Mexico, to aid in further study of the Campeche Bank.

## Introduction

Alacran Reef, a shelf atoll situated about 70 miles north of Yucatan, Mexico, is the largest reef on the Campeche Bank, which is a carbonate shelf extending about 125 miles into the Gulf of Mexico.

The present paper describes mollusks collected on and in the immediate vicinity of Alacran Reef. The text is designed to facilitate identification of mollusks by investigators working on the Campeche Bank, where because of the similarity of the bank to carbonate deposits in the geologic column, and because of the relatively few carbonate areas in today's seas, we can expect many geological and biological investigations during the ensuing years.

In general the mollusks of Alacran Reef are similar to those of the West Indies and the Florida Keys. A similar molluscan assemblage was reported from Blanquilla Reef, which is in the Gulf of Mexico about 60 miles from Tampico, Mexico (Moore, 1958). The Alacran Reef molluscan assemblage differs considerably from that living along the coast of Texas. The present paper includes descriptions of 90 species of Gastropods and 40 species of Pelecypods.

The classification used in this paper is based principally on that of R. Tucker Abbott (*American Seashells*, 1955). In describing a shell, morphological characteristics of the shell considered taxonomically important by Abbott were stressed. Descriptions were based on shells from Alacran Reef in the mollusk collection at the Institute of Marine Science. Previous papers concerning the Campeche Bank include those of Agassiz (1878, 1879), Rehder and Abbott (1951), Springer and Bullis (1956), and Kornicker, Bonet, Cann, and Hoskin (1959).

## Systematic Descriptions

GASTROPODA

FISSURELLIDAE

Genus *Emarginula* Lamarek 1801

*Emarginula plurivodes* Dall. 6 mm in length. Translucent white. Narrow slit on anterior margin. Base oval. Finely cancellate sculpture of concentric cords, 20 to 20 radial ribs. Two specimens.

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Genus *Diodora* Gray 1821

*Diodora minuta* Lamarck. Plate 1, Fig. 3A, 3B. 7 to 9 mm. Thin, depressed. Base elliptical, raised slightly at center. Short front slope concave, back slope convex. Orifice narrow, trilobated. Exterior shiny; numerous finely beaded radial ribs. Color: white, many ribs entirely or partly black; internal callus bounded by black line. Six specimens.

*Diodora listeri* Orbigny. Plate 1, Fig. 1A, 1B. 19 to 38 mm. Shell large, heavy, conical, elevated. Base ovate. Orifice key-hole shaped. 38 to 40 strong, rounded radial ribs, alternately larger and smaller, crossed by 9 to 12 concentric threads to form small squares. Large scales or nodules produced where concentric threads and radial ribs cross. Color: dull white. Orifice blue-black. Nine specimens.

Genus *Lucapina* Sowerby 1835

*Lucapina suffusa* Reeve. Plate 1, Fig. 4A, 4B. 10 to 20 mm. Outline oblong. About 60 alternately large and small, radiating ribs, 9 to 13 raised concentric threads. Color: delicate mauve to pink. Orifice blue-black. Four specimens.

*Lucapina philippiana* Finlay. Plate 1, Fig. 2A, 2B. 10 to 18 mm. Very depressed, narrow. Base oblong, sides subparallel, front slope straight, about half the length of convex posterior slope. Orifice large, oblong. Finely sculptured; about 33 close, radiating, alternately large and small ribs starting at orifice; ribs beaded by 8 or 9 raised concentric threads. Color: dull white. Four specimens.

Genus *Hemitoma* Swainson 1840

*Hemitoma emarginata* de Blainville. Plate 1, Fig. 7A, 7B. 10 to 18 mm. Apex sub-central, recurved posteriorly. Strong reticulate sculpture; nodules formed where radial ribs and concentric ridges cross. Primary ribs 8 to 10. Anterior rib single, prominent, ending in small notch at margin. 1 to 3 secondary ribs between primary ribs. Anal groove extends from near apex to margin, ending in small notch. Color: white. Ten specimens.

## ACMAEIDAE

Genus *Acmaea* Eschscholtz 1830

*Acmaea jamaicensis* Gmelin. Plate 1, Fig. 6A, 6B. 10 to 15 mm. Moderately high, thick; sides slightly convex. 15 to 20 rounded, white radial ribs on tan background. Interior white, with tan, thickened central callus. Five specimens.

*Acmaea pustulata pulcherrima* Guilding. Plate 1, Fig. 5A, 5B. 10 to 12 mm. Outline oval. Moderately flat, apex sharp. Shell thin, light pink in color, flecked with red. Six specimens.

## TROCHIDAE

Genus *Calliostoma* Swainson 1840

*Calliostoma zonamestum* A. Adams. Plate 2, Fig. 7. 23 mm in diameter, 15 mm high. Sides of whorls flat. Periphery sharp, base flat. Dark brown line between each of 10 beaded, spiral threads. Umbilicus white, deep, smooth-sided. One specimen.

*Calliostoma jujubinum* Gmelin. Plate 2, Fig. 6. 24 mm in diameter. Distinguished by swollen, rounded periphery of each whorl which in spire is located just above suture. Color: light tan with splotches of brown. Umbilicus white, deep, narrow, smooth-sided, bordered by beaded spiral thread. Two specimens.

*Calliostoma* sp. Plate 4, Fig. 18. 11 mm in length, not quite so high. Imperforate. Sculpture of numerous spiral, beaded threads. Cream color, apical whorls with dark spiral cord below suture. Three specimens.

#### Genus *Tegula* Lesson 1832

*Tegula fasciata* Born. 4 to 8 mm in diameter. 4 to 6 flat whorls. Color: white or cream; top of whorls splotched with deep pink to brown. Numerous fine, spiral threads. Umbilicus deep, round, smooth. Two teeth at base of columella. Twelve specimens.

#### TURBINIDAE

#### Genus *Cyclostrema* Marryat 1818

*Cyclostrema cancellatum* Marryat. Plate 3, Fig. 21. 3 to 6 mm in diameter. 2 to 3 flat-topped whorls. Color: frosted white. Sculpture of 14 rounded axial ribs which encircle entire whorl. Nodules formed at intersection of axial ribs and smaller spiral cords. Fourth, fifth and sixth spiral cords situated respectively at top, middle and bottom of periphery of whorl. Umbilicus wide, deep. Aperture circular and thickened. Sixteen specimens collected from beach sand.

#### Genus *Arene* H. and A. Adams 1854

*Arene* cf. *cruentata* Mühlfeld. Plate 4, Fig. 15. 6 to 8 mm in diameter, half as high. Color: white with small red dots on top of 4 to 5 angular whorls. Top of periphery bearing series of horizontal, open, triangular spines; minor row of smaller spines at middle of periphery, every third spine pink to red. Strong, beaded, spiral cord at base of periphery. Aperture circular. Umbilicus round, deep; bordered by 3 spiral, beaded cords. Ten specimens collected from beach sand.

#### Genus *Turbo* Linnaeus 1758

*Turbo cailletii* Fischer and Bernard. Plate 2, Fig. 11, 12. Slightly more than 25 mm. Color: cream with dark brown, flame-like patches. Sculpture of irregular spiral cords; coarse on upper half of body whorl, finer and more numerous on base of shell. Lower lip projects downward. Aperture white. Callus on columella, heavy. Two specimens.

#### Genus *Astraea* Röding 1798

*Astraea longispina* Lamarek. Plate 5, Fig. 18. 44 to 63 mm in diameter; low spire, base almost flat. Periphery of whorls with strong, flat, triangular spines. Aperture lustrous. Operculum calcareous. Six specimens.

*Astraea americana* Gmelin. Plate 2, Fig. 14. 25 to 38 mm in length, not quite so wide. Color: cream. Spire elevated, sides flat. Sculpture of oblique radial folds; 5 to 8 fine spiral cords on base of shell. Operculum calcareous, thick, convex. Eight specimens.

*Astraea caelata* Gmelin. Plate 5, Fig. 17. 25 to 50 mm in diameter, not quite so high. Color: cream with splotches of pinkish-brown. 3 to 5 uneven spiral rows of hollow, scale-like spines on upper body whorl; base with 4 to 6 strong spiral cords. Entire body whorl with numerous oblique, finely fimbriated, radial lamellae. Operculum thick, convex, papillose. Seven specimens.

## PHASIANELLIDAE

Genus *Tricolia* Risso 1826

*Tricolia* cf. *thalassicola* Robertson. Plate 3, Fig. 19. About 4 mm. 6 rounded whorls. White with minute dots of greenish yellow; 7 patches of bright pink dots spirally arranged below suture and at periphery. Numerous beach specimens.

## NERITIDAE

Genus *Nerita* Linnaeus 1758

*Nerita peloronta* Linnaeus. Plate 2, Fig. 8. 16 to 18 mm. Color: grayish-yellow with streaks and patches of purple or black. Distinguished by red stain on parietal area which bears 1 to 2 white teeth. Sculpture of flat spiral ridges which become obscure on last half of body whorl. Operculum pink on underside; outside smooth, orange colored on lower half, gray green, papillose on upper half. Four specimens.

*Nerita versicolor* Gmelin. Plate 2, Fig. 10. 12 to 21 mm. Color: grayish-white with irregular zigzag rows of black and purplish-pink spots. Sculpture of strong, rounded, spiral ridges which extend to edge of outer lip. Parietal area yellowish-white with 4 teeth; middle 2 larger than outer ones. Operculum grayish-brown, concave, papillose on lower half. Ten specimens.

*Nerita tessellata* Gmelin. Plate 2, Fig. 9. 10 to 18 mm. Color: chalky white with squarish black spots which form irregular checkered pattern. Apex pale yellow. Outer lip blue-white with black spots. Columellar lip with 2 weak teeth in middle; teeth inconspicuous in immature specimens. This species characterized by black operculum which is papillose, slightly convex. Ten specimens.

Genus *Neritina* Lamarek 1816

*Neritina virginea* Linnaeus. Pl. 3, Fig. 7. 8 to 12 mm. Smooth, glossy. Color: olive green with varied patterns of grayish-white; some spirally banded, others spotted or mottled. Columellar area smooth, white, convex with 6 to 12 small, irregular teeth. Operculum black. Ten specimens.

Genus *Smaragdia* Issel 1869

*Smaragdia viridis* Linnaeus. Pl. 4, Fig. 13. 3 to 7 mm. Pale green in color with short, white, radial streaks. Columellar lip white with several small, irregular teeth. Twenty-four specimens collected from beach sand.

## LITTORINIDAE

Genus *Littorina* Ferussac 1821

*Littorina ziczac* Gmelin. Plate 3, Fig. 6. 8. 8 to 18 mm. Shell bluish-white with numerous zigzag, oblique lines of dark brown. Aperture purplish-brown. Well defined keel near

base of body whorl. Operculum dark brown. Six specimens. (Abbott gives the length of females of this species about 1 inch, higher than wide, smoothish; male shells about  $\frac{1}{2}$  inch, as high as wide with strong spiral grooves.)

Genus *Nodilittorina* Martens 1897

*Nodilittorina tuberculata* Menke. Plate 3, Fig. 4. 10 to 15 mm. 7 to 8 whorls. Shell rounded at base. Nuclear whorls have fine, spiral threads. Succeeding whorls bear 2 or 3 spiral rows of small, pointed nodules. Largest nodules on second and third row. 7 rows of nodules on body whorl. Columella flattened and dished out. Outer lip projects below columella. Color: brownish-gray, nodules whitish; columella and aperture dark brown. Operculum paucispiral, dark brown, chitinous. Seven specimens.

RISSOIDAE

Genus *Rissoina* Orbigny 1840

*Rissoina chesneli* Michaud. Plate 3, Fig. 16. 3 mm. 5 glossy white whorls with 12 radial ribs.

*Rissoina multicostata* C. B. Adams. Plate 3, Fig. 14. 4 to 5 mm. Shell white with 5 to 7 whorls. 21 axial ribs, weaker spiral cords. Ribs disappear on base; spiral threads strongest on base.

*Rissoina cancellata* Philippi. Plate 3, Fig. 13. 5 to 7 mm. White, 6 to 8 whorls. Sculpture strongly cancellate. Depressed interspaces large, square.

*Rissoina browniana* Orbigny. 4 to 5 mm. Smooth, glossy white.

VERMETIDAE

Genus *Petalococonchus* H. C. Lea 1843

*Petalococonchus* cf. *nigricans* Dall. Plate 2, Fig. 18. Closely packed, irregular mass, each tube about 2 mm in diameter. Color: dirty gray. Longitudinal sculpture of finely beaded cords.

SILICULARIDAE

Genus *Vermicularia* Lamarek 1799

*Vermicularia knorri* Deshayes. Plate 2, Fig. 16. 17. 19 to 50 mm. Evenly coiled portions translucent white, subsequent whorls brown. Six specimens.

CAECIDAE

Genus *Caecum* Fleming 1817

*Caecum cooperi* S. Smith. Plate 3, Fig. 22. 3.5 mm. Cream to tan in color, glossy. Sculpture of about 15 longitudinal ribs; strong, raised axial rings near aperture form cancellated sculpture on anterior end. Pointed prong on apical plug.

*Caecum floridanum* Stimpson. Plate 3, Fig. 23. 2 to 4 mm. Dull white. 20 to 30 strong axial rings, the last 3 or 4 much enlarged. Slightly recessed apical plug with pointed prong.

*Caecum nebulosum* Rehder. Plate 3, Fig. 24. Slightly more than 2 mm. Translucent white with opaque mottling. Not swollen at center. Aperture oblique. Apical plug with weak projection on highest side.

MODULIDAE

Genus *Modulus* Gray 1842

*Modulus modulus* Linnaeus. Plate 4, Fig. 16. 5 to 7 mm in diameter. Shell umbilicate. Periphery of body whorl angulate. Sculpture variable; top of whorls with axial ribs or only spiral threads. Base with 4 to 6 spiral cords. Tooth at base of columella. Color: white with brown spots on spiral cords. Twenty-four specimens.

POTAMIDIDAE

Genus *Batillaria* Benson 1842

*Batillaria minima* Gmelin. Plate 4, Fig. 14. 3 to 9 mm. Color: rusty to blackish-brown. Apex crooked, chalky. Irregular spiral cords, finely nodulose. Aperture dark brown. Short siphonal canal twisted to left. Operculum multispiral. Twenty-four specimens.

CERITHIIDAE

Genus *Cerithium* Bruguiere 1789

*Cerithium literatum* Born. Plate 2, Fig. 2. 10 to 30 mm in length, half as wide. Color: white with spiral rows of dark brown dashes. Spiral row of 8 to 12 sharp nodules just below suture. Eight specimens.

*Cerithium variabile* C. B. Adams. Plate 4, Fig. 3. 12 to 15 mm. Color: white with brown mottlings. Sculpture of 3 irregularly beaded, spiral cords. 1 to 2 former varices on each whorl. Three specimens.

*Cerithium algicola* C. B. Adams. Plate 3, Fig. 10. 20 to 22 mm. Color: white with brown mottlings. Each whorl has middle spiral row of 9 to 12 beads, large, sharply pointed. Three specimens.

*Cerithium eburneum* Bruguiere. Plate 4, Fig. 20. 20 to 24 mm. Color: white with tan splotches. 4 to 5 spiral rows of 18 to 22 beads on each whorl, center row only slightly larger; beads rounded, not sharp or pointed. Former varices on each whorl. Two specimens.

Genus *Seila* A. Adams 1861

*Seila adamsi* H. C. Lea. Plate 3, Fig. 12. I beachworn specimen 8 mm. Color: yellow. Slender, flat-sided whorls. Sculpture of close, smooth, squarish, spiral cords.

Genus *Alaba* H. and A. Adams 1853

*Alaba* sp. Plate 3, Fig. 11. 7 mm. 9 convex whorls; nuclear whorls broken. Sculpture of spiral grooves, strongest on lower half of each whorl. Several former varices. Shell translucent white.



## TRIPHORIDAE

Genus *Triphora* Blainville 1823

*Triphora decorata* C. B. Adams. Plate 4, Figure 4. 2 beachworn specimens 10, 12 mm. Sinistral, elongated, flat-sided, 3 evenly beaded, spiral cords on each whorl. White with irregular, radial streaks of brown.

## EPITONIIDAE

Genus *Epitonium* Röding 1793

*Epitonium* sp. Plate 4, Fig. 19. 12 mm. Glossy white. Axial costae 12, high, thin, sharp.

## EULINIDAE

Genus *Balcis* Leach 1847

*Balcis* sp. Plate 3, Fig. 17. 6 mm. Glossy white. Conic, body whorl rounded. Outer lip thin, sharp.

## HIPPONICIDAE

Genus *Cheilea* Modeer 1793

*Cheilea equestris* Linnaeus. Plate 1, Fig. 8A, 8B. 5 to 12 mm. Cap-shaped; frosted white. Fragile, internal, tube-like structure, anterior third cut away, attached slightly off center. Exterior with sculpture of delicate, concentric, fimbriated lamellae. Four specimens.

Genus *Hipponix* DeFrance 1819

*Hipponix antiquatus* Linnaeus. Plate 1, Fig. 9A, 9B. 5 to 12 mm in diameter. Cap-shaped. Spire deflected back and downward. Exterior appears concentrically lamellated. Muscle scar horse-shoe shaped. Color: dull white. Ten specimens.

## CALYPTRAEIDAE

Genus *Crepidula* Lamarck 1799

*Crepidula plana* Say. 20 mm. Oblong, thin, very flat. Upper side dull white, under-side glossy. Two specimens.

## STROMBIDAE

Genus *Strombus* Linnaeus 1758

*Strombus gigas* Linnaeus. Pl. 5, Fig. 1, 2. 63 to 173 mm. Color: dark cream or tan externally, smaller specimens mottled with brown; aperture pink. Large, fairly sharp spines on shoulder of whorls. Outer lip thin; shell relatively light in weight. The flaring lip, characteristic of this species, is undeveloped. Fourteen immature specimens.

*Strombus costatus* Gmelin. Plate 5, Fig. 6, 9. 100 to 150 mm. Shell heavy, with low, blunt spines; the last 3 or 4 on body whorl much enlarged. Color varies from cream to

burnt orange externally; aperture china-white. Parietal wall and thick outer lip highly glazed with greenish-silver enamel. Six specimens.

*Strombus raninus* Gmelin, Plate 5, Fig. 5, 10. 88 mm. Grayish-white in color with chocolate brown mottling. Aperture salmon pink. Parietal wall and outer lip covered with an aluminium-like glaze. Blunt spines on shoulder of body whorl, last 2 conspicuously larger. Numerous spiral lines on last two-thirds of body whorl. Thick outer lip extends above shoulder of body whorl into a short blunt wing which is not as high as spire of shell. Two specimens.

#### ERATOIDAE

##### Genus *Trivia* Broderip 1837

*Trivia suffusa* Gray, Plate 4, Fig. 17. 6 to 12 mm. Elongate-globular. Color: pale pink with 3 brown splotches on each side of dorsal groove. 12 to 20 finely beaded riblets cross pink outer lip. Eight specimens.

*Trivia quadripunctata* Gray. 6 to 8 mm. Elongate-globular. Color: bright pink with 2 to 3 small brown spots along short dorsal groove. 19 to 21 smooth ribs cross outer lip.

#### OVULIDAE

##### Genus *Cyphoma* Röding 1798

*Cyphoma gibbosum* Linnaeus, Plate 2, Fig. 5A, 5B. 30 and 35 mm. Porcellaneous. Color: pinkish-buff except for whitish rectangle on back; aperture white. Two specimens.

#### NATICIDAE

##### Genus *Polinices* Montfort 1810

*Polinices lacteus* Guilding, 8 to 20 mm in height. Six specimens, all beach worn. Ovate. Glossy, milk-white. Umbilicus partially closed by heavy parietal callus.

##### Genus *Sinum* Röding 1798

*Sinum perspectivum* Say, Plate 3, Fig. 20. One specimen, 27 mm in diameter. Auriform; aperture widely flared. Color: white, interior glossy. Sculpture of wavy spiral threads crossed by fine growth lines.

##### Genus *Natica* Scopoli 1777

*Natica canrena* Linnaeus, Plate 5, Fig. 15. One specimen, 38 mm. Color: ivory with brown, wavy, axial lines. 4 spiral rows of brown, arrow-shaped marks. Shell smooth except for weak wrinkles near suture. White callus partially fills deep umbilicus.

*Natica livida* Pfeiffer, 12 mm. Shell moderately thin; glossy smooth. Color: light gray with 2 weak spiral bands of tan. Umbilicus partially closed by light brown callus. One specimen.

#### CASSIDIDAE

##### Genus *Cassis* Scopoli 1777

*Cassis madagascariensis spinella* Clench. One beach worn specimen, 213 mm. Color: cream. 3 spiral rows of small, rounded nodules on body whorl; top row largest.

Parietal area blackish-brown between ridge-like teeth. Light brown inside aperture. Outer lip color of body whorl, brown between teeth.

## CYMATIDAE

Genus *Cymatium* Röding 1798

- Cymatium pileare* Linnaeus. Plate 5, Fig. 19. One beachworn specimen, 50 mm. Sculpture of irregular, squarish, weakly beaded, spiral cords. Color: white with bands of light brown; outer lip tan between lighter colored teeth which are grouped in pairs. Parietal wall brown between numerous, irregular, white folds.
- Cymatium caribbaeum* Clench and Turner. Plate 2, Fig. 15. One worn specimen, 44 mm. Body whorl globular, shoulders angulate; previous whorls flat-sided. Apical whorls cancellate; strongly beaded spiral cords on body whorl. 1 former varix. Thick outer lip with 7 large, single, white teeth. Color: light tan.
- Cymatium gemmatum* Reeve. Plate 2, Fig. 1. One specimen, 31 mm. Shell white or cream, covered with thin straw colored periostracum, smooth over most of shell but producing fringed blades on axial ribs. Whorls squarish at shoulders. Spiral sculpture of finely beaded cords. Body whorl with 6 brown nodules at periphery. 1 varix. Aperture elongate-oval, pale apricot within; large columellar tooth at upper edge. Thickened outer lip with 12 teeth grouped in pairs.
- Cymatium nicobaricum* Röding, 60 mm; nucleus broken. Spire extended, whorls shouldered. Coarse sculpture of 6 irregular, nodulose, spiral ribs interspaced with 2 smaller cords. Variable axial folds between varices. Color: ashen gray; aperture bright orange, with 7, single, ridge-like, white teeth. One specimen.

## TONNIDAE

Genus *Tonna* Brunnich 1772

- Tonna maculosa* Dillwyn. Plate 5, Fig. 13. One specimen 69 mm. Shell thin. Color: cream mottled with light brown. Nuclear whorls golden brown, smooth. Numerous broad, flat, spiral cords. This species is longer than wide.
- Tonna galea* Linnaeus. Plate 5, Fig. 11, 16. 50 to 75 mm. Globular, fairly thin. Nuclear whorls smooth, dark brown, 18 to 21 broad, flat, spiral ribs; fine spiral cord between each rib on upper half of body whorl. Fresh specimens cream to tan in color, some slightly mottled with brown; older shells bleached white. Eighteen specimens.

## MURICIDAE

Genus *Murex* Linnaeus 1758

- Murex pomum* Gmelin. 63 mm. One beach worn specimen. Shell thick, dirty white. 2 short axial folds between each of 3 varices. Dark brown spot at upper edge of parietal area. Outer lip crenulate, with 3 evenly spaced brown spots.

Genus *Drupa* Röding 1798

- Drupa nodulosa* C. B. Adams. Plate 3, Fig. 5. 10 to 18 mm. Elongate. Sculpture of round, black nodules, axially aligned. Aperture dark purple. Thick outer lip with 4 white teeth. Twelve specimens.

Genus *Thais* Röding 1798

*Thais deltoidea* Lamarck. Plate 2, Fig. 13. 31 to 44 mm. Shells grayish-white. Spiral row of large, blunt spines at shoulder of body whorl. Some specimens show second row of much smaller spines below first. Aperture china-white; parietal area tinted lavender. Nine specimens.

## COLUMBELLIDAE

Genus *Columbella* Lamarck 1799

*Columbella mercatoria* Linnaeus. Pl. 4, Fig. 5. 8 to 15 mm. Color: white, with broken, spiral streaks of brown. Sculpture of numerous spiral grooves. Aperture long, narrow. 10 to 12 white teeth on outer lip which is thickened, particularly in the middle. Fifty specimens.

Genus *Nitidella* Swainson 1810

*Nitidella nitidula* Sowerby. Plate 4, Fig. 7. One specimen. 10 mm. Color: cream with orange splotches. 7 sloping whorls, no shoulders. Spire sharply pointed. Surface of shell smoothish, faint spiral threads on lower one-fourth of last whorl. Outer lip only slightly thickened.

Genus *Anachis* H. and A. Adams 1853

*Anachis pulchella* Sowerby. Plate 4, Fig. 6. 8 to 10 mm. Translucent, lightly mottled with yellow. Numerous low, axial ribs crossed by spiral striae. Ribs strongest on upper whorls. Only beach specimens collected.

## BUCCINIDAE

Genus *Bailya* M. Smith 1944

*Bailya intricata* Dall. Plate 4, Fig. 1. One beach specimen. 12 mm. Frosted white, with 2 faint brownish, spiral bands on body whorl. 6 shouldered whorls; nuclear whorls broken. Surface cancellate; body whorl with 12 axial riblets crossed by 8 spiral cords with smaller threads between; beaded at intersection. Outer lip with rounded varix.

Genus *Cantharus* Röding 1798

*Cantharus tinctus* Conrad. 23 to 25 mm. Sloping whorls. Small posterior canal. Outer lip thickened. Sculpture of 10 axial folds crossed by numerous spiral threads. Color: grayish-brown with dark blue splotches on glazed parietal wall. Two specimens.

## MELONGENIDAE

Genus *Cantharus* Röding 1798

*Busycon contrarium* Conrad. Plate 5, Fig. 12. 106 to 193 mm. Sinistral. Shell relatively heavy. Spire low, whorls shouldered. Spiral row of spines on shoulder, largest on body whorl. Surface covered with wavy, spiral threads. Color: cream to dark tan

with white spiral band at center of body whorl. Color inside aperture varies from deep cream to orange. Eight specimens.

*Busycosa spiratum* Lamarck. Plate 5, Fig. 7. 31 to 113 mm. Shell thin, spire flattened. Shoulders slightly keeled. Suture marked by deep, narrow channel. Sculpture of very fine, spiral threads. White with 2 to 3 spiral rows of brown splotches. Fifteen specimens.

#### NASSARIIDAE

##### Genus *Nassarius* Dumeril 1806

*Nassarius unbiguus* Pultney. Plate 4, Fig. 2. 6 to 12 mm. Color: white with 2 narrow bands of light brown, obscure in these beach specimens. Relatively light shelled. Whorls shouldered. 10 to 12 axial ribs on each whorl; numerous small, spiral threads. Eight specimens.

#### FASCIOLARIIDAE

##### Genus *Leucozonia* Gray 1847

*Leucozonia nassa* Gmelin. Plate 5, Fig. 1A. 31 to 44 mm. Shell thick; shoulders well-rounded, marked by obscure nodules which are more prominent on penultimate whorl. 4 columellar folds. Color: dark brown; aperture dark cream within. Six specimens.

##### Genus *Fasciolaria* Lamarck 1799

*Fasciolaria tulipa* Linnacus. Plate 5, Fig. 4. 8. 56 to 131 mm. Characterized by 2 or 3 spiral grooves just below suture. Gray with broken spiral lines, blotches of blackish-brown. Inside aperture glossy cream color. Six specimens.

##### Genus *Pleuroploca* P. Fischer 1884

*Pleuroploca gigantea* Kiener. Two beach worn specimens, each about 250 mm. Nuclear whorls broken. Yellowish-white. Shouldered whorls with 8 large nodules on shoulder of body whorl. Coarse, irregular, spiral ribs.

#### XANCIDAE

##### Genus *Xancus* Röding 1798

*Xancus angulatus* Solander. Plate 5, Fig. 3. One specimen, 113 mm. Shell thick, heavy, cream colored, interior tinged with pale pink. 3 strong, widely spaced columellar folds. Spiral ridge inside aperture about middle of outer lip.

#### OLIVIDAE

##### Genus *Olivella* Swainson 1831

*Olivella uivea* Gmelin. Plate 4, Fig. 9. 5 to 14 mm. Elongate. 5 to 6 whorls. Apex pointed. Shell glossy white; nucleus tan in fresh specimens. Numerous columella folds

## MITRIDAE

Genus *Pusia* Swainson 1840

*Pusia gemmata* Sowerby. Plate 3, Fig. 15. 5 to 6 mm in length. Beach specimens. Tan, with white spiral band bearing 11 to 13 nodules on each whorl.

## MARGINELLIDAE

Genus *Prunum* Herrmannsen 1852

*Prunum labiatum* Valenciennes. Plate 2, Fig. 4. Porcelaneous. Outer lip thickened, dull orange, tiny teeth on inner edge. Body whorl grayish-white with 3 cloudy, spiral bands of dull lavender. 25 to 30 mm. Five specimens.

*Prunum guttatum* Dillwyn. Plate 3, Fig. 1. One specimen, 15 mm. Body whorl grayish-white, irregularly spotted with opaque white dots. Stout outer lip smooth. Color: white, with three brown spots on lower half. 4 strong, columellar folds.

Genus *Hyalina* Schumacher 1817

*Hyalina avena* Valenciennes. Plate 4, Fig. 8. 9 to 11 mm. Ivory colored with several obscure bands of light tan. Shell slender, spire short. Outer lip rolled in, smooth. Aperture narrow above, wide below. Four slanting columellar folds. Four specimens collected from beach sand.

Genus *Persicula* Schumacher 1817

*Persicula* sp. Plate 4, Fig. 11. 5 to 6 mm. Apical area slightly concave, sealed over by thin callus. 20 to 25 tiny teeth inside outer lip. 5 to 6 columellar folds; first 2 folds very weak. Shell glossy white with several spiral rows of brown arrow-shaped marks. Four specimens.

## CONIDAE

Genus *Conus* Linnaeus 1758

*Conus spurius atlanticus* Clench. One specimen, 59 mm. Spire slightly elevated in the center. Shell smooth, white with spiral rows of squarish orange spots and blotches. Aperture white.

*Conus mus* Hwass. Plate 2, Fig. 3. One specimen, 31 mm. Spire moderately elevated. Color: mottled grayish-brown. Low, irregular, white knobs on shoulder. 2 wide, spiral, brown bands inside aperture. Periostracum thick, velvety, dull brown.

## TURRIDAE

Genus *Glyphoturris* Woodring 1928

*Glyphoturris quadrata rugirima* Dall. About 6 mm. Frosted white. Sculpture of high axial ribs, 8 on body whorl. Ribs sharply angulated at center of each whorl and crossed by faintly beaded, spiral threads. One specimen.

## BULLIDAE

Genus *Bulla* Linnaeus 1758

*Bulla* sp. Plate 3, Fig. 2. 8 to 14 mm. Color: white to tan with brown mottling. Callus white. Spiral grooves well-marked toward base of shell and within apical perforation. Fifteen specimens.

## ATYIDAE

Genus *Haminoea* Turton and Kingston 1830

*Haminoea succinea* Conrad. Plate 4, Fig. 12. One specimen, 7 mm. Translucent white. Apertural lip rises on right side of perforation, not angled. Sides of whorls flattish. Numerous spiral grooves.

Genus *Alys* Montfort 1810

*Alys caribaea* Orbigny. Plate 3, Fig. 3. 5 to 6 mm. Elongate-oval. Translucent milk-white. Central part of shell smooth; about 12 very fine, incised spiral lines at both ends. Spire concealed. Aperture long, narrow with outer lip rising well above top of shell and projecting below columella. Six specimens collected from beach.

*Alys sandersoni* Dall. Plate 4, Fig. 10. 5 to 8 mm. Similar to *A. caribaea* but with flatter sides, more numerous, finer, spiral lines at each end. Ten specimens.

## RETUSIDAE

Genus *Retusa* Brown 1827

*Retusa caudiculata* Say. 4 to 5 mm. Oblong, flat-sided, smooth, glossy white. Tiny pimple-like nucleus. Aperture narrow at posterior end, wider anteriorly. Outer lip thin. Six specimens.

## PYRAMIDELLIDAE

Genus *Odostomia* Fleming 1817

*Odostomia* sp. Plate 3, Fig. 18. 2 mm. Frosted white. Sculpture of strong, squarish, faintly beaded spiral cords. Two specimens.

## PELECYPODA

## ARCIDAE

Genus *Arca* Linnaeus 1758

*Arca zebra* Swainson. Plate 6, Fig. 8A, 8B. 44 to 62 mm in length, about half as high. Color: light brown with zebra-stripes of dark brown. Radial ribs only. Relatively small bysial gap. Beaks widely separated, with broad, flat area between. Two specimens.

*Arca umbonata* Lamarck. Plate 6, Fig. 7A, 7B. 37 to 53 mm, box-like, elongate. Shell tan to brown mottled with darker brown. Interior lighter in color. Beaks widely

separated with concave area between. Numerous irregular, beaded radial ribs. Large byssal gap. Periostracum very heavy on live specimens. Seven specimens.

Genus *Barbatia* Gray 1847

*Barbatia domingensis* Lamarck. Plate 9, Fig. 7A, 7B. 20 mm. Color: grayish-white. Shell moderately inflated. Reticulated sculpture. Inner margins denticulate. One specimen.

*Barbatia cancellaria* Lamarck. Plate 8, Fig. 12A, 12B. 15 to 35 mm. Flattish, fairly thin. Sculpture of numerous, well beaded, axial cords. Dark purplish-brown in color. Ten specimens.

Genus *Arcopsis* von Koenen 1885

*Arcopsis adamsi* E. A. Smith. Plate 9, Fig. 8. One specimen, 6 mm. Oblong, inflated. Color: white. Cancellate sculpture. Small brown diamond-shaped ligament between umbones.

GLYCYMERIDAE

Genus *Glycymeris* Da Costa 1778

*Glycymeris pectinata* Gmelin. Plate 9, Fig. 6A, 6B. One beach worn specimen, 20 mm. Sculpture of 22 smooth, radial ribs. Color: gray-white with concentric line of brown midway of valves; flecks of brown scattered over shell.

MYTILIDAE

Genus *Modiolus* Lamarck 1799

*Modiolus americanus* Leach. Plate 7, Fig. 7A, 7B. 2½ to 3½ inches. Smooth, except for growth lines. Shell white, flushed with rose or purple. Interior iridescent with external color visible. Fresh specimens covered with dark brown periostracum, glossy on anterior area, beard-like at posterior margin. Ten specimens.

Genus *Brachidontes* Swainson 1840

*Brachidontes citrinus* Röding. Plate 8, Fig. 13. 31 mm, narrow. Color white with yellow periostracum. Sculpture of numerous, fine, radial, riblets: 1 specimen.

Genus *Lithophaga* Röding 1798

*Lithophaga nigra* Orbigny. Plate 7, Fig. 8A, 8B. 40 to 53 mm, cylindrical. Brownish-black outside, iridescent blue-white inside. Weak vertical lines on lower anterior third of each valve, remainder of shell smooth. Four specimens.

ISOGNOMONIDAE

Genus *Isognomon* Solander 1786

*Isognomon alatus* Gmelin. Plate 9, Fig. 11A, 11B. 13 to 32 mm. Roughly oval in outline. Right valve flat or slightly concave, left valve convex. Hinge with 4 to 6 oblong



sockets. Exterior color varies from dull white to purple; interior nacreous. Six specimens.

*Isognomon radiatus* Anton. 82 mm. Elongate. Exterior coarsely lamellated; interior nacreous except on ventral margins. Right valve concave, left valve convex. Hinge short, 5 small oblong sockets. Color: yellowish-gray with purplish radial streaks on convex valve. One specimen.

*Isognomon* cf. *bicolor* C. B. Adams. Plate 9, Fig. 10A, 10B. 15 mm in height, 10 mm wide. Valves slightly inflated. Exterior smooth except for irregular growth lines. Color: dull gray. Hinge has 7 oblong sockets. Interior of both valves with squarish, saucer-like depression, located in upper half; outlined by raised, fairly sharp rim. Depressed area and rim opalescent; wide ventral margin dark purple. One specimen.

#### PTERIIDAE

##### Genus *Pinctada* Röding 1798

*Pinctada radiata* Leach. Plate 6, Fig. 6A, 6B, 9. 37 to 56 mm. Thin shelled, slightly inflated. Narrow ligament, center third of hinge line. Exterior rough with weak, flaky lamellations; interior nacreous. Color varies from dull white to pale brown, mottled or rayed with purple. Ten specimens.

#### PINNIDAE

##### Genus *Pinna* Linnaeus 1758

*Pinna carnea* Gmelin. 88 to 288 mm. Color: flesh pink to deep burnt orange. Shell thin, inflated. Posterior end rounded, gaping. About 10 radial ridges with and without large open spines. Six specimens.

#### PECTINIDAE

##### Genus *Lyropecten* Conrad 1862

*Lyropecten antillarum* Recluz. Plate 8, Fig. 7A, 7B. 20 mm in length, about as wide. Color: white. Shell thin, flat, with 10 smooth, rounded, radial ribs. Two specimens.

##### Genus *Chlamys* Röding 1798

*Chlamys imbricata* Gmelin. Plate 8, Fig. 2, 5. 21 to 40 mm in height, not as wide. Upper valve nearly flat, lower valve convex. 9 to 10 radial ribs, each with evenly spaced, hollow knobs; where broken, these knobs appear as cup-shaped scales. Color: white or pinkish with small red spots; interior yellowish, some specimens white. Ten specimens.

#### SPONDYLIDAE

##### Genus *Spondylus* Linnaeus 1758

*Spondylus americanus* Hermann. Plate 8, Fig. 9A, 9B. 1 upper valve, 25 mm in diameter; thin. Exterior purplish-red, interior iridescent. Numerous closely set spines, nearly erect, varying from flat to needle-like in shape.

## LIMIDAE

Genus *Lima* Bruguiere 1797

*Lima scabra* Born. Plate 7, Fig. 4A, 4B. 50 to 75 mm in height. Elongate-oval in outline. Color: white or yellowish. Sculpture of radial ribs bearing short, irregularly spaced, shingle-like scales. Long bysial gap. Three specimens.

*Lima lima* Linnaeus. Plate 8, Fig. 8A, 8B. 10 to 34 mm in height. Color: pure white. Anterior ear much larger than posterior one, giving apex slightly pointed appearance. Sculpture of about 28, even, radial ribs bearing numerous sharp, erect scales. Twelve specimens.

*Lima pellucida* C. B. Adams. 25 mm. Shell fragile; translucent white. Gaping anteriorly and posteriorly. Sculpture of numerous, fine, radial threads. Beaks smooth, centrally located. One specimen.

## OSTREIDAE

Genus *Ostrea* Linnaeus 1758

*Ostrea frons* Linnaeus. Plate 6, Fig. 4A, 4B, 4C. One articulated specimen, about 50 mm in length, half as wide; attached to twig by finger-like processes. Upper valve with broad, longitudinal mid-rib. Margins sharply plicate. Minute pimples on inner margin of upper valve. Exterior purple, interior iridescent.

## CARDITIDAE

Genus *Venericardia* Conrad 1867

*Venericardia* sp. Plate 9, Fig. 9A, 9B. 3 mm in length, about as high. Shell thick with 17 to 18 strong, evenly beaded, radial ribs. Beaks close together and turned forward. Color varies from white to pink with faint mottling. Six specimens.

## LUCINIDAE

Genus *Lucina* Bruguiere 1797

*Lucina pensylvanica* Linnaeus. Plate 8, Fig. 6A, 6B. 18 to 37 mm. Color: glossy white. Thin, straw-colored periostracum. Shell relatively thick, ovate, well inflated. Fresh specimens show numerous fine, concentric ridges. Strong posterior groove from beaks to ventral margin. Five specimens.

Genus *Codakia* Scopoli 1777

*Codakia* cf. *orbiculata* Montagu. Plate 9, Fig. 1A, 1B, 3A, 3B. 8 to 11 mm. White. Obliquely rounded in outline. Large, elongate lunule. Numerous radial ribs extend to beaks; crossed by fine, concentric threads and coarser growth lines. Ten specimens.

*Codakia orbicularis* Linnaeus. Plate 6, Fig. 2A, 2B. 25 to 75 mm. Orbicular in outline. Mature specimens moderately thick, heavy. Coarse, divaricate ribs are crossed by fine, concentric threads giving ribs beaded appearance. Beaks smooth, except for microscopic radial lines, yellowish. Lunule small, heart-shaped, nearly all in right

valve. Exterior white, interior white to pale yellow; rose tinted interior margins on some specimens. Fifteen specimens.

Genus *Divaricella* von Martens 1880

*Divaricella quadrisulcata* Orbigny. Plate 8, Fig. 3A, 3B. Slightly less than 25 mm. Orbicular, well inflated. Cream colored, glossy. Sculpture of fine, criss-cross grooves. One specimen.

*Divaricella dentata* Wood. Plate 8, Fig. 1A, 1B. 25 to 37 mm. Orbicular, inflated. Color: cream. Sculpture of fine, criss-cross threads which extend beyond margins to form serrated edge; serration prominent on dorsal margin. 4 to 6 deeply impressed, concentric growth lines. Six specimens.

CHAMIDAE

Genus *Chama* Linnaeus 1758

*Chama mucerophylla* Gmelin. Plate 6, Fig. 5A, 5B. 31 to 69 mm in height. Heavy, roughly oval in outline. Concentric sculpture of irregular, fimbriated or foliated lamellae. Inner valve margins crenulated. Colors: yellow, pale pink, lavender. Eight specimens.

CARDIIDAE

Genus *Trachycardium* Morch 1853

*Trachycardium isocardia* Linnaeus. 53 mm in height, 44 mm wide. One beach specimen, dull white with flecks of pale yellow. 32 rounded, radial ribs.

Genus *Trigoniocardia* Dall 1900

*Trigoniocardia media* Linnaeus. Plate 8, Fig. 10A, 10B. One specimen 31 mm high. Shell thick, inflated. Posterior slope descends sharply. 34 strong, radial ribs, bearing chevron-shaped scales. Margins serrated. Escutcheon and lunule not defined. White spotted with light purple.

Genus *Laevicardium* Swainson 1840

*Laevicardium laevigatum* Linnaeus. Plate 6, Fig. 1A, 1B. 31 to 40 mm in height, not as wide. Shell thin, well inflated, slightly oblique. Surface smooth except for microscopic sculpture. Glossy white with pink tinge near ligament; interior of some specimens flushed with pale yellow. Inner margins finely serrated. Six specimens.

VENERIDAE

Genus *Antigona* Schumacher 1817

*Antigona listeri* Gray. Plate 7, Fig. 6A, 6B. Slightly more than 75 mm. Thick, heavy, oblong-oval. Sculpture of numerous, low, radial riblets crossed by blade-like, serrated, concentric ridges. Gray-white with light brown splotches. Interior white, stained purplish-black on posterior third. Two specimens.

*Antigona rigida* Dillwyn. Plate 6, Fig. 3A, B. 62 mm, sub-circular in outline, inflated. White with long, chevron-shaped streaks of purplish brown. Sculpture of prominent, sharp, lamellate, concentric ridges; 1 to 4 concentric threads between ridges on upper half of valves. One specimen.

Genus *Chione* Mühlfeld 1811

*Chione cancellata* Linnaeus. Plate 8, Fig. 4. 25 mm in width, three-fourths as high. Low radial riblets crossed by sharp, blade-like, concentric ridges. Long, smooth escutcheon. Lunule heart-shaped with fine, vertical lines. Color: flat white, few irregular markings of dark brown and pink. Umbones pink. One specimen.

PETRICOLIDAE

Genus *Petricola* Lamarck 1801

*Petricola lapicida* Gmelin. Plate 9, Fig. 5A, 5B. 15 mm in height. Ovate, well inflated, grayish-white. Sculpture of minute, criss-cross threads. 5 to 7 irregular, wavy ribs on posterior end. Interior glossy white with pale green tinge. Three specimens.

TELLINIDAE

Genus *Tellina* Linnaeus 1758

*Tellina interrupta* Wood. Plate 7, Fig. 1A, 1B. 56 to 100 mm. Elongate, flattened, unpolished. Posterior end twisted. Sculpture of numerous, rough, evenly spaced, concentric threads. Color: white with zigzag markings of light brown. Five specimens.

*Tellina radiata* Linnaeus. Plate 7, Fig. 2A, 2B. 68 to 93 mm. Elongate. Porcelaneous. Shell creamy-white with broad rays of pinks and/or lavender. Interior all white or flushed with yellow. Beaks bright red. Three specimens.

*Tellina candeana* Orbigny. Plate 9, Fig. 4A, 4B. 12 to 15 mm. Moderately elongate, thin, fragile, translucent white. Sculpture of growth lines and numerous wavy, concentric threads which cross the shell at oblique angle. Twelve specimens.

Genus *Arcopagia* Brown 1827

*Arcopagia fausta* Pultney. Plate 7, Fig. 5A, 5B. 68 to 88 mm. Oval in outline, relatively heavy. Smooth, except for lines of growth. Color: white with faint sheen. Interior glazed, flushed with pale yellow. Two specimens.

Genus *Strigilla* Turton 1822

*Strigilla mirabilis* Philippi. Plate 9, Fig. 2A, 2B. 10 to 15 mm. Oval, moderately inflated, translucent white. Sculpture of fine, impressed, criss-crossed lines. Pallial line does not reach anterior muscle scar. Inner margins smooth. Six specimens.

Genus *Apolymetis* Salisbury 1929

*Apolymetis intastriata* Say. Plate 7, Fig. 3A, 3B. 63 mm. Oblong in outline. Dull white. Thin but strong. Posterior end twisted to the right. Strong radial ridge at posterior end of right valve, corresponding groove on left valve. Large pallial sinus. One specimen.

## SCAPHIPODA

## SIPHONODENTALIIDAE

Genus *Cadulus* Philippi 1844

*Cadulus* sp. Plate 3, Fig. 25. 19 mm, smooth. Apex with 4 well-defined notches. One specimen.

## DENTALIIDAE

Genus *Dentalium* Linnaeus 1758

*Dentalium* sp. Plate 3, Fig. 2B. 23 mm, apex missing. White with opaque dots. Sculpture of numerous, low, flat ribs of varying widths. One specimen.

## AMPHINEURA

## ISCHNOCHITONIDAE

Genus *Ischnochiton* Gray 1847

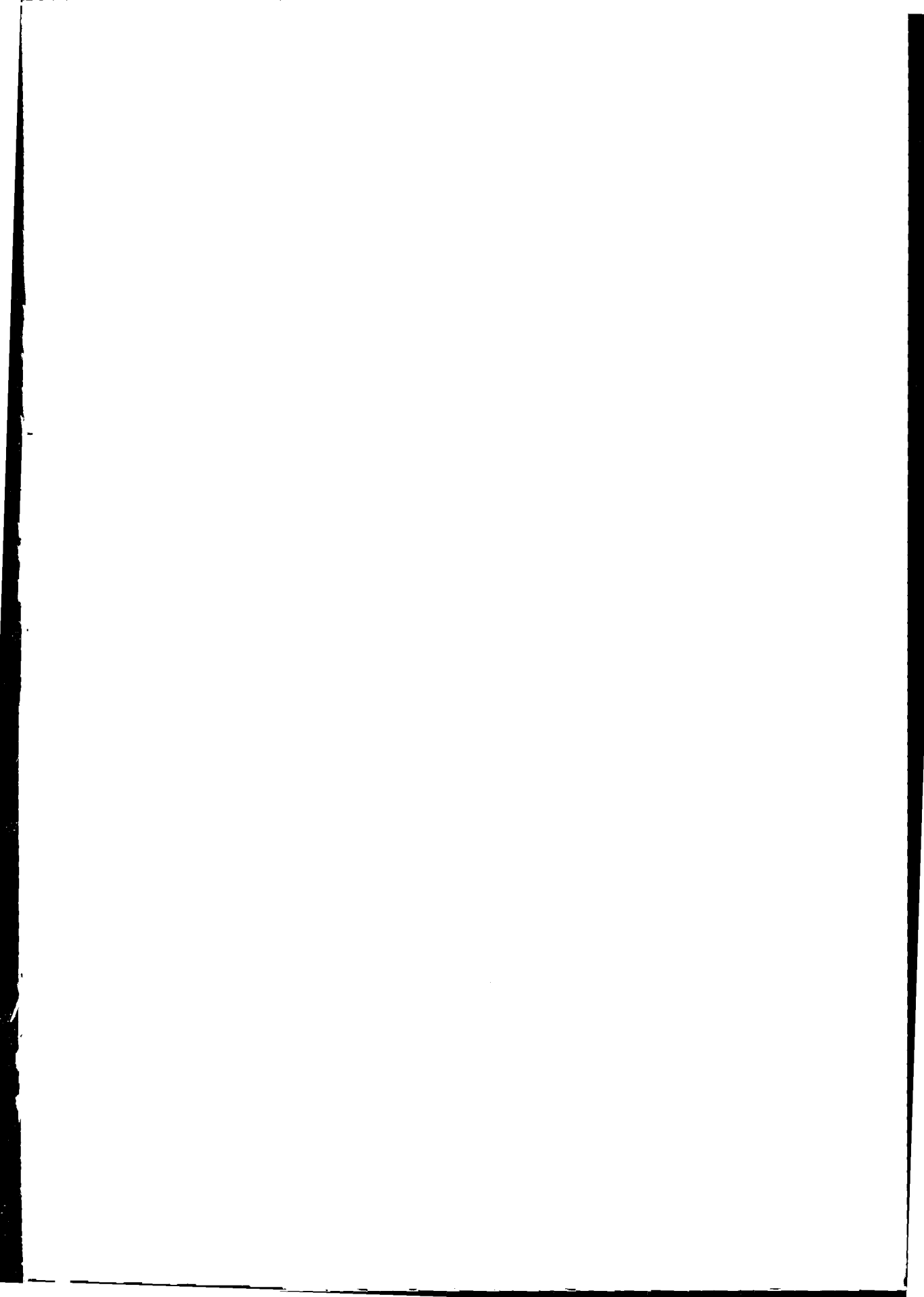
*Ischnochiton* sp. Plate 9, Fig. 12A, B. Slightly less than 25 mm, elongate, narrow. Color: grayish-green, speckled with dark green and black. Girdle covered with minute scales. Lateral areas raised, with wavy, beaded, longitudinal riblets. Central areas similarly sculptured. End valves concentrically headed. Four specimens.

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## Literature Cited

- Abbott, Tucker R. 1955. American Seashells. D. Van Nostrand Company, Inc., New York. 541 p.
- Agassiz, Alexander. 1878-1879. Letter No. 1 to C. P. Patterson, Superintendent Coast Guard Survey, Washington, D. C. Harv. Mus. Comp. Zool. 5(6): 1-19.
- . 1888. Three Cruises of the United States Coast and Geodetic Steamer "Blake." Harv. Mus. Comp. Zool. 1(1): 70-73.
- Kornicker, Louis S., F. Bonet, Ross Cann, and Charles M. Hoskin. 1959. Alacran Reef, Campeche Bank, Mexico. Publ. Inst. Mar. Sci. Univ. Tex. 6: 1-22.
- Moore, Donald R. 1958. Notes on Blanquilla Reef. Publ. Inst. Mar. Sci. Univ. Tex. 5: 151-155.
- Rehder, H. A., and R. T. Abbott. 1951. Some new and interesting mollusks from the deeper waters of the Gulf of Mexico. Rev. Soc. Malac. "Carlos de la Torre" 8(2): 53-66.
- Springer, Stewart, and Harvey R. Bullis, Jr. 1956. Collections by the Oregon in the Gulf of Mexico. Special scientific report: Fisheries No. 196, United States Department of the Interior, Fish and Wildlife Service. 134 p.



## PLATE I

## ALACRAN REEF GASTROPODS

2 to 3 times life size

|   | Text reference |
|---|----------------|
| 1A,B. <i>Diodora listeri</i> Orbiguy              | 367            |
| 2A,B. <i>Lucapina philippiana</i> Finlay          | 367            |
| 3A,B. <i>Diodora minute</i> Lamarck               | 367            |
| 4A,B. <i>Lucapina suffusa</i> Reeve               | 367            |
| 5A,B. <i>Acmaea pusulata pulcherrima</i> Guilding | 367            |
| 6A,B. <i>Acmaea jamaicensis</i> Gmelin            | 367            |
| 7A,B. <i>Henitoma emarginata</i> de Blainville    | 367            |
| 8A,B. <i>Cheilea equestris</i> Linnaeus           | 372            |
| 9A,B. <i>Hippoxix antiquatus</i> Linnaeus         | 372            |

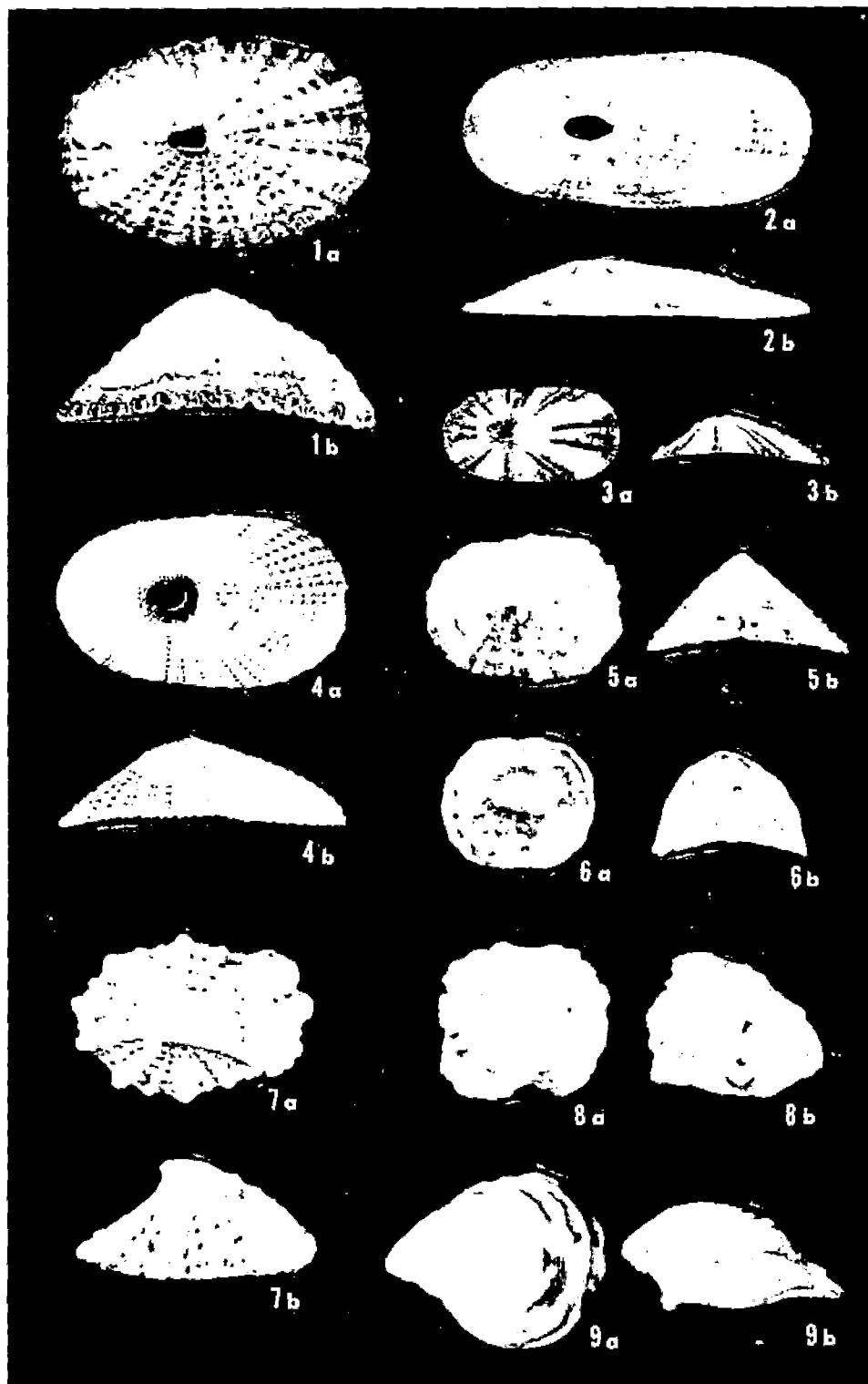


PLATE 1



## PLATE 2

## ALACRAN REEF GASTROPODS

life size

|   | Text reference |
|---|----------------|
| 1. <i>Cymatium gemmatum</i> Reeve                         | 371            |
| 2. <i>Cerithium literatum</i> Born                        | 371            |
| 3. <i>Conus mus</i> Hwass                                 | 377            |
| 4. <i>Prunum labintum</i> Valenciennes                    | 377            |
| 5. <i>Cyphoma gibbosum</i> Linnaeus, two views, A, B.     | 373            |
| 6. <i>Calliostoma injubinum</i> Gmelin                    | 368            |
| 7. <i>Calliostoma zonamestum</i> A. Adams                 | 367            |
| 8. <i>Nerita peloronta</i> Linnaeus                       | 369            |
| 9. <i>Nerita tessellata</i> Gmelin                        | 369            |
| 10. <i>Nerita versicolor</i> Gmelin                       | 369            |
| 11, 12. <i>Turbo cailletii</i> Fischer and Bernard        | 368            |
| 13. <i>Thois deltoidea</i> Lamarek                        | 375            |
| 14. <i>Astraea americana</i> Gmelin                       | 369            |
| 15. <i>Cymatium caribbaeum</i> Cleitch and Turner         | 374            |
| 16, 17. <i>Vermicularia knorri</i> Deshayes               | 370            |
| 18. <i>Petalocochnus</i> cf. <i>nigricaus</i> Dall, (x 2) | 370            |

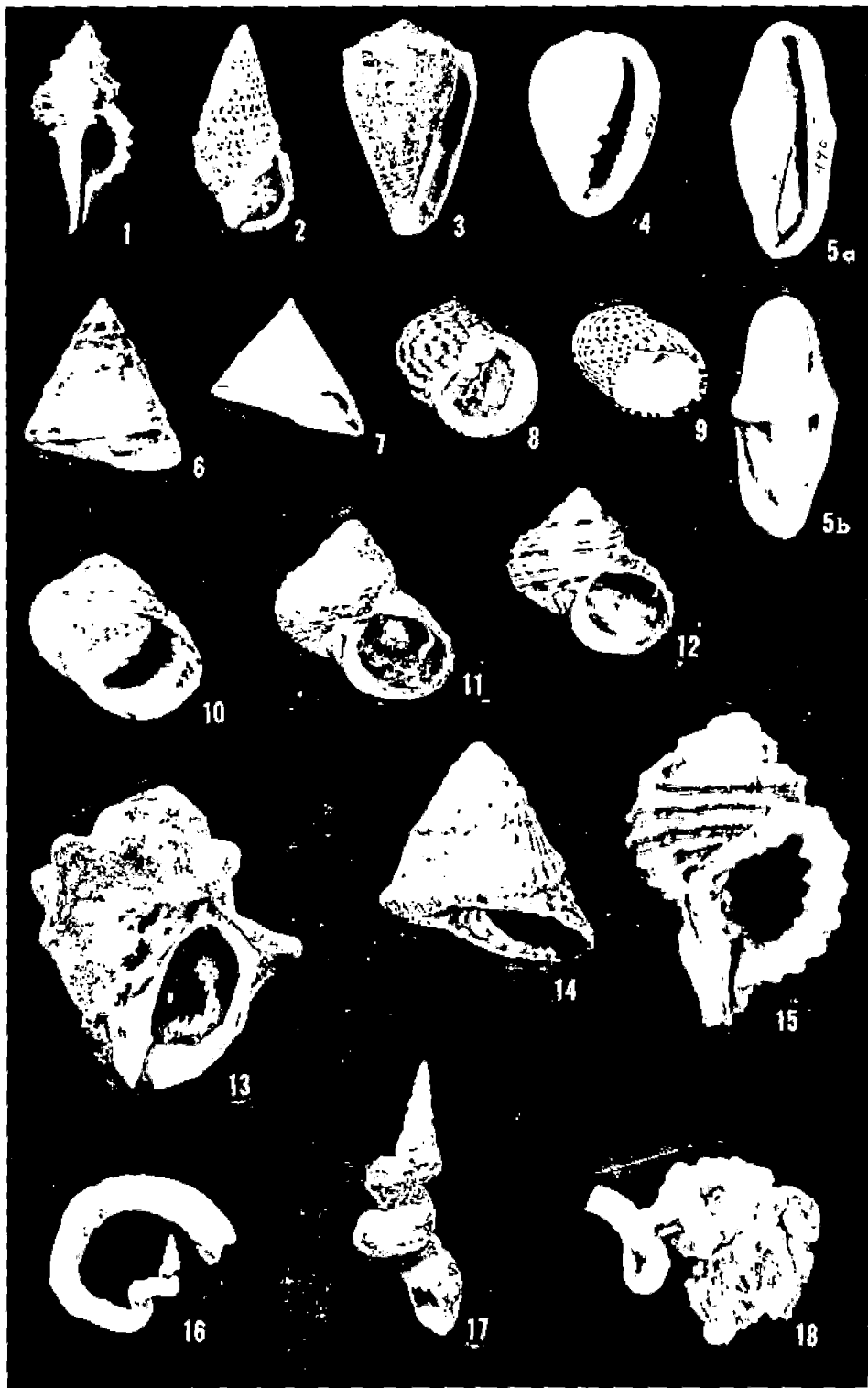


PLATE 2

## PLATE 3

## ALACRAN REEF GASTROPODS AND SCAPHOPODS

|   | Text reference |
|---|----------------|
| 1. <i>Prunum gattaium</i> Dillwyn (x 2)                     | 377            |
| 2. <i>Bulla</i> sp. (x 2)                                   | 378            |
| 3. <i>Atys caribaea</i> Orbigny (x 2)                       | 378            |
| 4. <i>Nodilittorina tuberculata</i> Menke (x 2)             | 370            |
| 5. <i>Drupa nodulosa</i> C. B. Adams (x 2)                  | 374            |
| 6, and 8. <i>Littorina ziczac</i> Gmelin (x 2)              | 369            |
| 7. <i>Neritina virginea</i> Linnaeus (x 5)                  | 369            |
| 9. <i>Batillaria minima</i> Gmelin (x 5)                    | 371            |
| 10. <i>Cerithium algicola</i> C. B. Adams (x 2)             | 371            |
| 11. <i>Alaba</i> sp. (x 5)                                  | 371            |
| 12. <i>Seila adamsi</i> H. C. Lea (x 5)                     | 371            |
| 13. <i>Rissoina cancellata</i> Philippi (x 5)               | 370            |
| 14. <i>Rissoina multivostata</i> C. B. Adams (x 5)          | 370            |
| 15. <i>Pusia gemmata</i> Sowerby (x 5)                      | 377            |
| 16. <i>Rissoina chesneli</i> Michaud (x 10)                 | 370            |
| 17. <i>Balcis</i> sp. (x 10)                                | 372            |
| 18. <i>Olostomia</i> sp. (x 10)                             | 378            |
| 19. <i>Tricolia</i> cf. <i>thalassicola</i> Robertson (x 5) | 369            |
| 20. <i>Sinuus perspectivus</i> Say (x 2)                    | 373            |
| 21. <i>Cyclostrema cancellatum</i> Marrayat (x 10)          | 368            |
| 22. <i>Caecum cooperi</i> S. Smith (x 10)                   | 370            |
| 23. <i>Caecum floridanum</i> Stimpson (x 10)                | 370            |
| 24. <i>Caecum nebulosum</i> Rehder (x 10)                   | 371            |
| 25. <i>Cudulus</i> sp. (x 10)                               | 384            |
| 26. <i>Dentalium</i> sp. (x 10)                             | 384            |

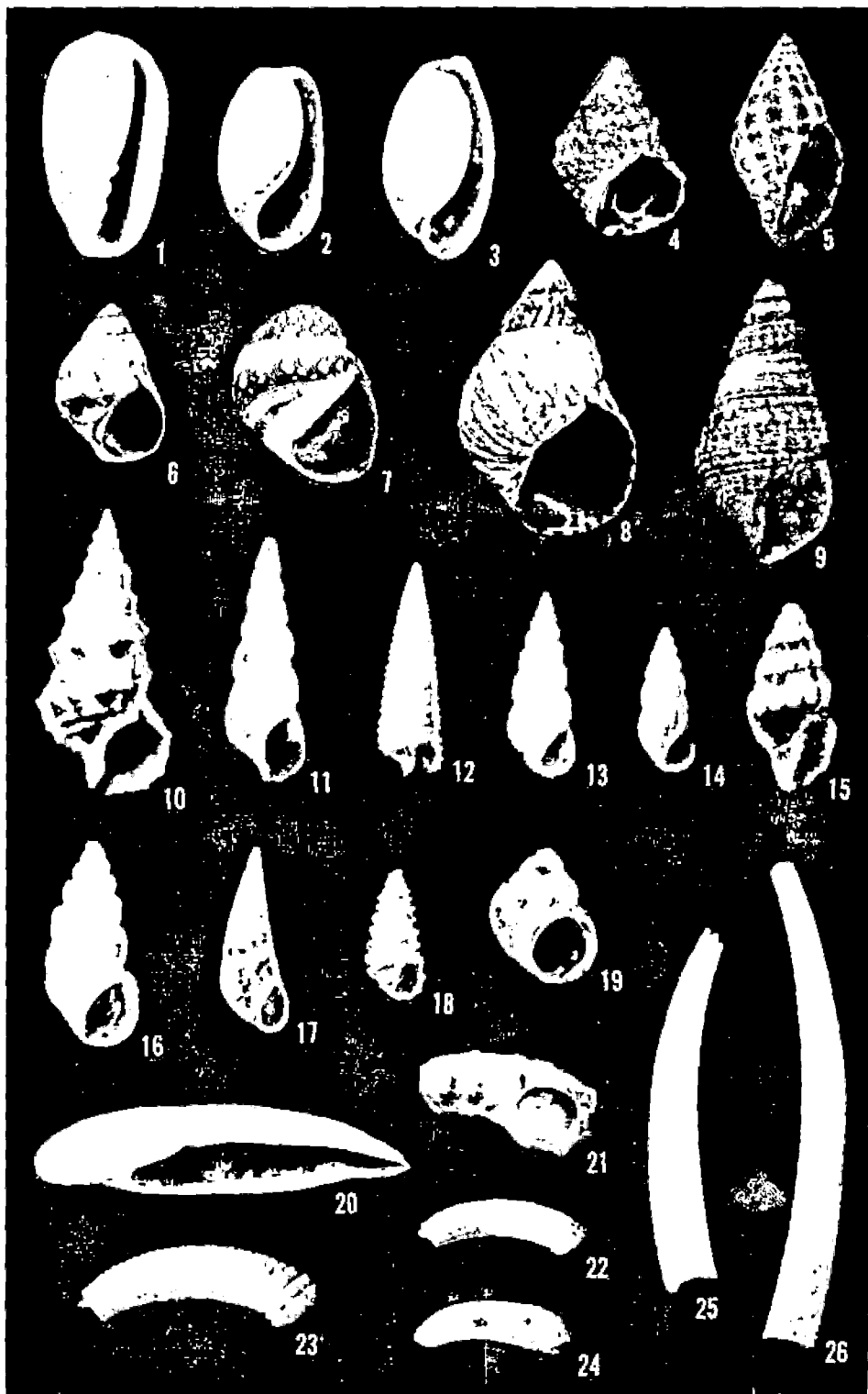


PLATE 3

## PLATE 4

## ALACRAN REEF GASTROPODS

3 times life size

|  | Text reference |
|--|----------------|
| 1. <i>Bailya intricata</i> Dall                | 375            |
| 2. <i>Nassarius ambiguus</i> Pulteney          | 376            |
| 3. <i>Cerithium variabile</i> C. B. Adams      | 371            |
| 4. <i>Triphora decorata</i> C. B. Adams        | 372            |
| 5. <i>Columbella mercatoria</i> Linnaeus       | 375            |
| 6. <i>Anachis pulchella</i> Sowerby            | 375            |
| 7. <i>Nitidella nitidula</i> Sowerby           | 375            |
| 8. <i>Hyalina avena</i> Valenciennes           | 375            |
| 9. <i>Olivella nivea</i> Gmelin                | 376            |
| 10. <i>Alys sandersoni</i> Dall                | 378            |
| 11. <i>Persicula</i> sp.                       | 377            |
| 12. <i>Hominoca succinea</i> Conrad            | 378            |
| 13. <i>Smaragdia viridis</i> Linnaeus          | 369            |
| 14. <i>Batillaria minima</i> Gmelin            | 371            |
| 15. <i>Arene</i> cf. <i>cruentata</i> Muhlfeld | 368            |
| 16. <i>Modulus modulus</i> Linnaeus            | 371            |
| 17. <i>Trivio suffusa</i> Gray                 | 373            |
| 18. <i>Calliostoma</i> sp.                     | 368            |
| 19. <i>Epitonium</i> sp.                       | 372            |
| 20. <i>Cerithium eburneum</i> Bruguiere        | 371            |

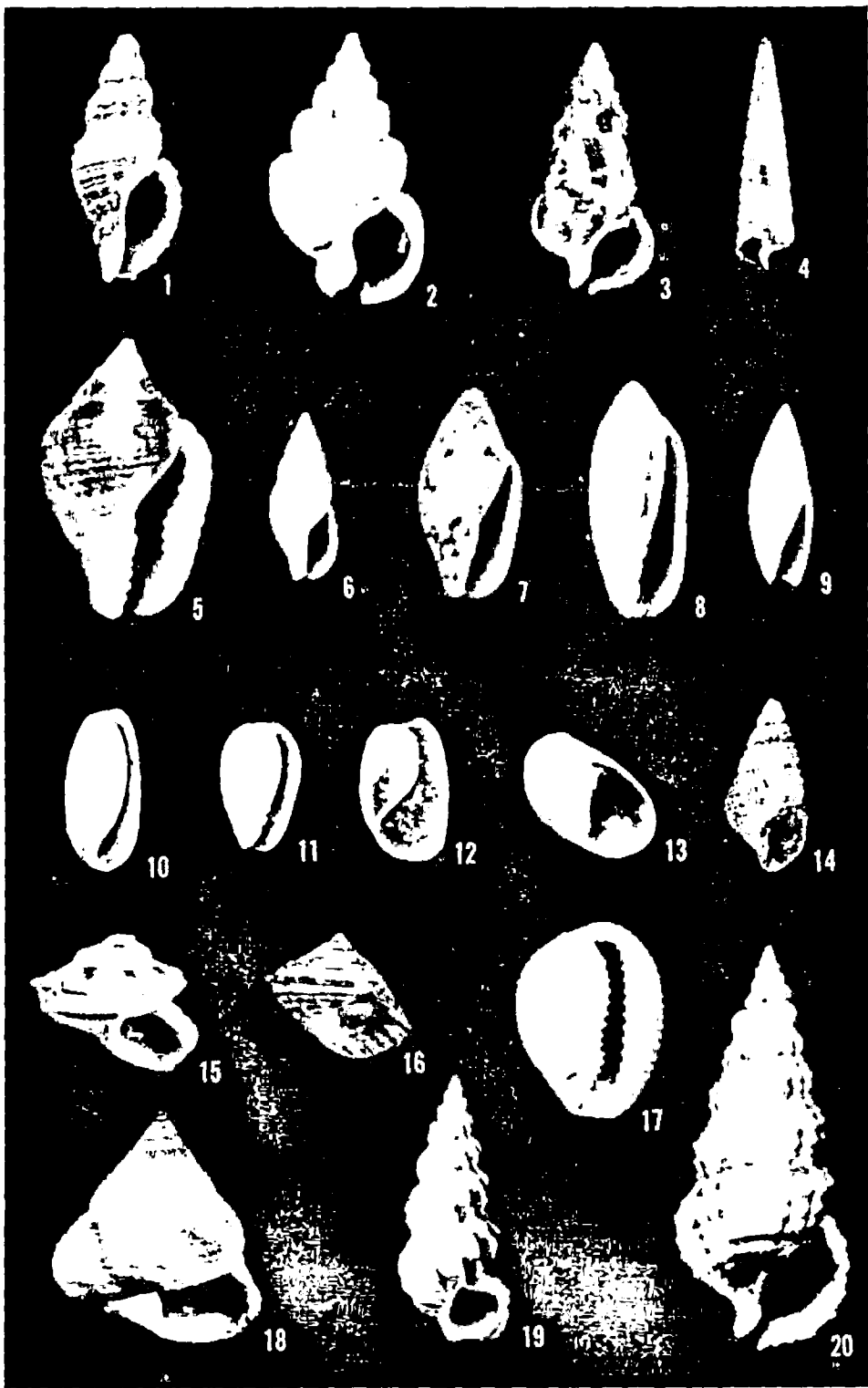


PLATE 4

## PLATE 5

## ALACRAN REEF GASTROPODS

 $\frac{1}{2}$  to  $\frac{2}{3}$  life size

|   | Text reference |
|---|----------------|
| 1, 2. <i>Strombus gigas</i> Linne (x $\frac{1}{2}$ )        | 372            |
| 3. <i>Xancus angulatus</i> Solander (x $\frac{1}{2}$ )      | 376            |
| 4, 8. <i>Fasciolaria tulipu</i> Linnaeus (x $\frac{1}{2}$ ) | 376            |
| 5, 10. <i>Strombus raninus</i> Gmelin (x $\frac{1}{2}$ )    | 373            |
| 6, 9. <i>Strombus costatus</i> Gmelin (x $\frac{1}{2}$ )    | 372            |
| 7. <i>Busycon spiratum</i> Lamarek (x $\frac{1}{2}$ )       | 376            |
| 11, 16. <i>Tonna gulea</i> Linnaeus (x $\frac{1}{3}$ )      | 374            |
| 12. <i>Busycon contrarium</i> Conrad (x $\frac{1}{2}$ )     | 375            |
| 13. <i>Tonna maculosa</i> Dillwyn (x $\frac{1}{2}$ )        | 374            |
| 14. <i>Leucozonia nassa</i> Gmelin (x $\frac{2}{3}$ )       | 376            |
| 15. <i>Natica caurena</i> Linnaeus (x $\frac{2}{3}$ )       | 373            |
| 17. <i>Astraea caelata</i> Gmelin (x $\frac{2}{3}$ )        | 369            |
| 18. <i>Astraea longispina</i> Lamarek (x $\frac{2}{3}$ )    | 368            |
| 19. <i>Cypratum pileare</i> Linnaeus (x $\frac{2}{3}$ )     | 374            |



PLATE 5



## PLATE 6

## ALACRAN REEF PELECYPODS

 $\frac{1}{2}$  to  $\frac{2}{3}$  life size

|  | Text reference |
|--|----------------|
| 1A,B. <i>Laevicardium laevigatum</i> Linnaeus (x $\frac{2}{3}$ ) | 382            |
| 2A,B. <i>Codakia orbicularis</i> Linnaeus (x $\frac{2}{3}$ )     | 381            |
| 3A,B. <i>Antigona rigida</i> Dillwyn (x $\frac{1}{2}$ )          | 382            |
| 4A,B,C. <i>Ostrea frons</i> Linnaeus (x $\frac{2}{3}$ )          | 381            |
| 5A,B. <i>Chama macerophylla</i> Gmelin (x $\frac{2}{3}$ )        | 382            |
| 6A,B. <i>Pinctada radiata</i> Leach (x $\frac{2}{3}$ )           | 380            |
| 7A,B. <i>Arca umbonata</i> Lamarek (x $\frac{2}{3}$ )            | 378            |
| 8A,B. <i>Arca zebra</i> Swainson (x $\frac{2}{3}$ )              | 378            |
| 9. <i>Pinctada radiata</i> Leach (x $\frac{2}{3}$ )              | 380            |

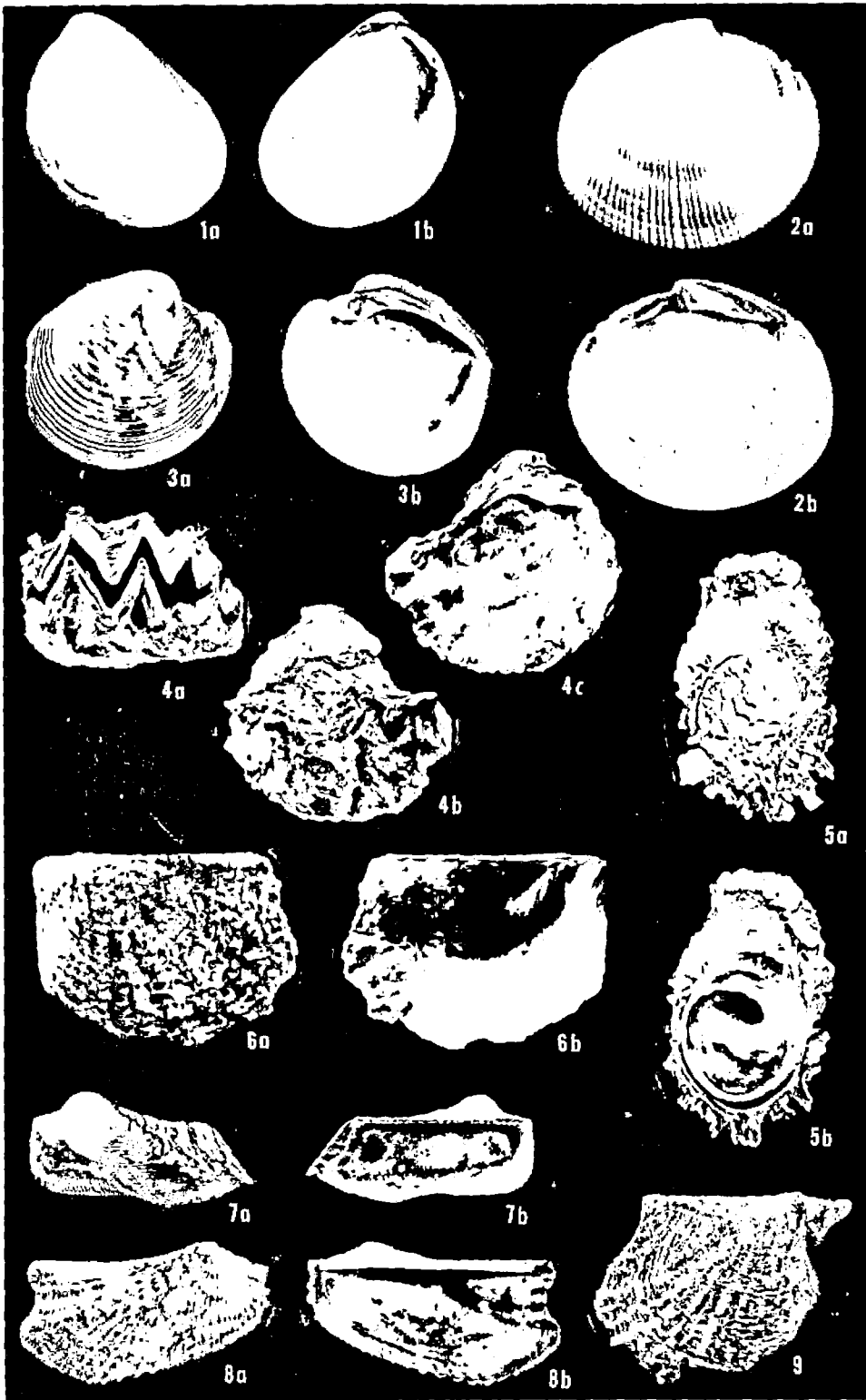


PLATE 6

## PLATE 7

## ALACRAN REEF PELECYPODS

 $\frac{1}{2}$  to  $\frac{2}{3}$  life size

|  | Text reference |
|--|----------------|
| 1A,B. <i>Tellina interrupta</i> Wood (x $\frac{2}{3}$ )    | 383            |
| 2A,B. <i>Tellina radiata</i> Linnaeus (x $\frac{1}{2}$ )   | 383            |
| 3A,B. <i>Apolymetis intastriata</i> Say (x $\frac{2}{3}$ ) | 383            |
| 4A,B. <i>Lima scabra</i> Born (x $\frac{1}{2}$ )           | 381            |
| 5A,B. <i>Arcopagia fausta</i> Pulteney (x $\frac{1}{2}$ )  | 383            |
| 6A,B. <i>Antigona listeri</i> Gray (x $\frac{1}{2}$ )      | 382            |
| 7A,B. <i>Modiolus americanus</i> Leach (x $\frac{2}{3}$ )  | 379            |
| 8A,B. <i>Lithophaga nigra</i> Orbigny (x $\frac{2}{3}$ )   | 379            |

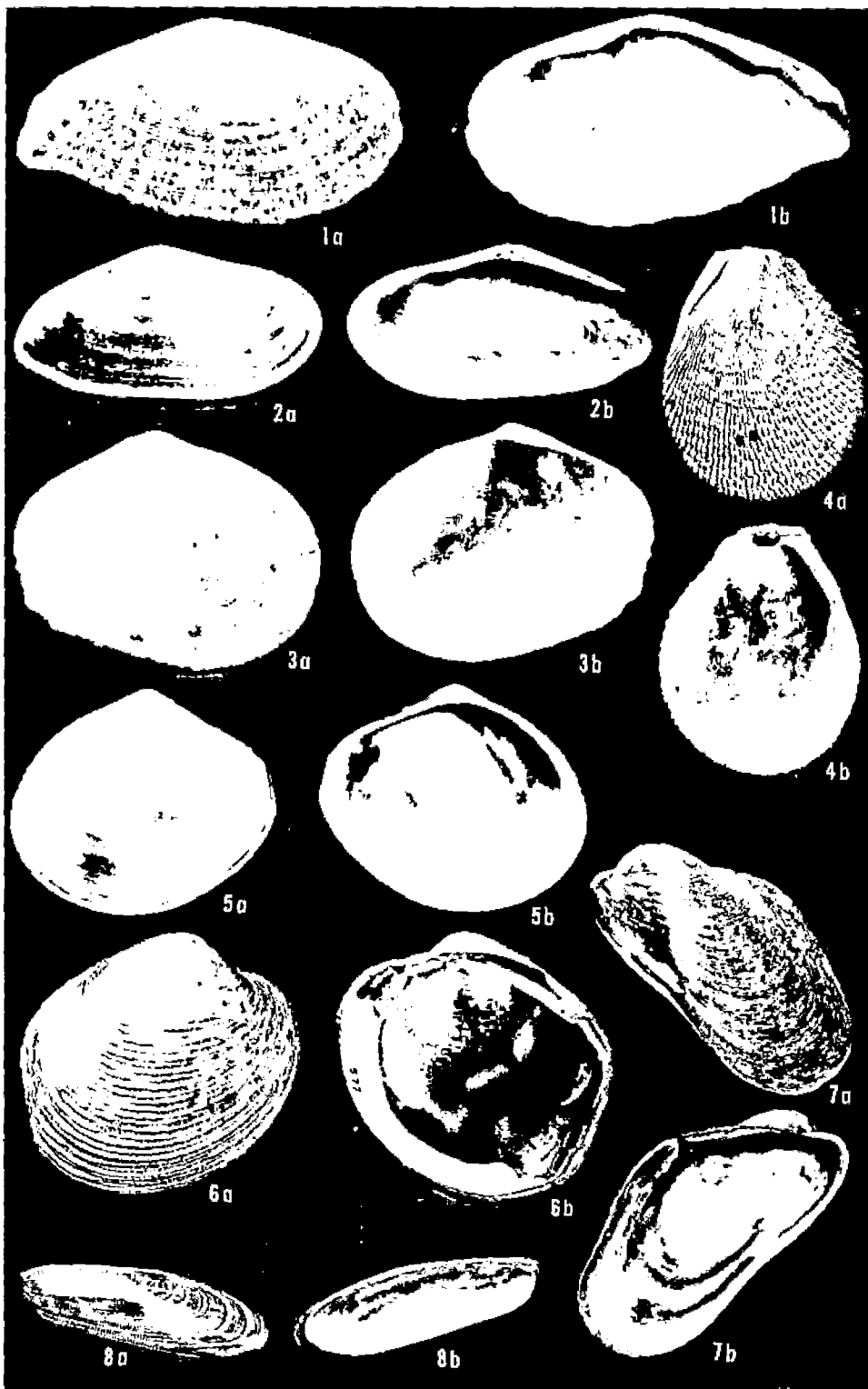


PLATE 7

## PLATE 8

## ALACRAN REEF PELECYPODS

life size

|  | Text reference |
|--|----------------|
| 1A,B. <i>Divaricella dentata</i> Wood                                      | 382            |
| 2. <i>Chlamys imbricata</i> Gmelin, upper valve                            | 380            |
| 3A,B. <i>Divaricella quadrisulcata</i> Orbiguy                             | 382            |
| 4. <i>Chione cancellata</i> Linnaeus                                       | 383            |
| 5. <i>Chlamys imbricata</i> Gmelin, (½ life size) interior, lower valve    | 380            |
| 6A,B. <i>Lucina pensylvanica</i> Linnaeus                                  | 381            |
| 7A,B. <i>Lyropecten utillarum</i> Recluz                                   | 380            |
| 8A,B. <i>Lima lima</i> Linnaeus  | 381            |
| 9A,B. <i>Spondylus americanus</i> Hermann, upper valve, exterior, interior | 380            |
| 10A,B. <i>Trigoniocardia media</i> Linnaeus                                | 382            |
| 11. <i>Ostrea frous</i> Linnaeus, interior, attached valve                 | 381            |
| 12A,B. <i>Barbatia cancellaria</i> Lamarek                                 | 379            |
| 13. <i>Brachidontes citrinus</i> Röding                                    | 379            |

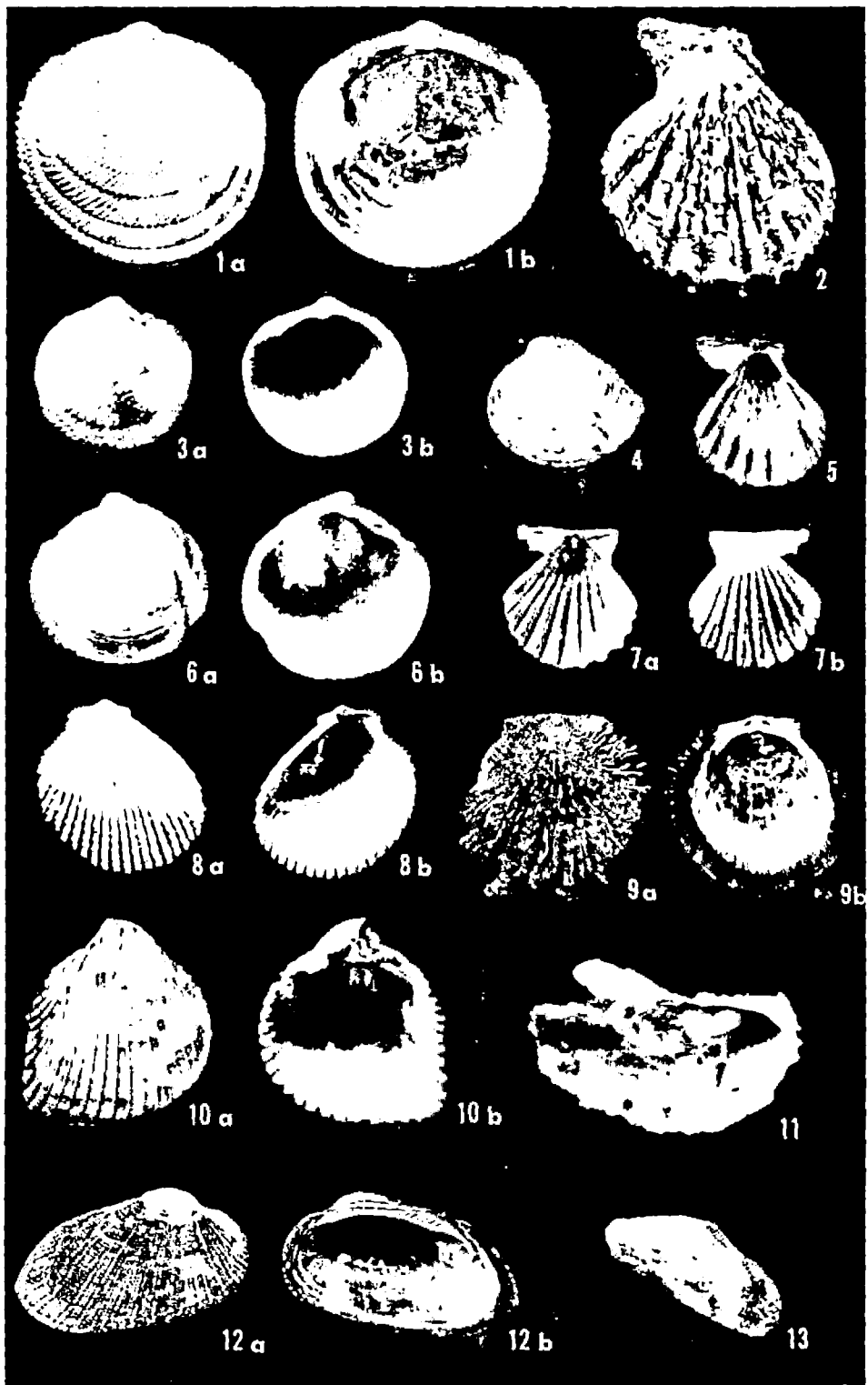


PLATE 8

## PLATE 9

## ALACRAN REEF PELECYPODS

|   | Text reference |
|---|----------------|
| 1A,B. <i>Codakia</i> cf. <i>orbiculata</i> Montagu (x 2)                | 381            |
| 2A,B. <i>Strigilla mirabilis</i> Philippi (x 2)                         | 383            |
| 3A,B. <i>Codakia</i> cf. <i>orbiculata</i> Montagu (x 2), (variation ?) | 381            |
| 4A,B. <i>Tellina candeana</i> Orbiguy (x 2)                             | 383            |
| 5A,B. <i>Petricola lapicida</i> Gmelin (x 2)                            | 383            |
| 6A,B. <i>Glycymeris pectinata</i> Gmelin (x 2)                          | 379            |
| 7A,B. <i>Barbatia domingensis</i> Lamarek (x 2)                         | 379            |
| 8. <i>Arcopsis alansi</i> E. A. Smith (x 5)                             | 379            |
| 9A,B. <i>Venericardia</i> sp. (x 5)                                     | 381            |
| 10A,B. <i>Isognomon</i> cf. <i>bicolor</i> C. B. Adams (x 2)            | 380            |
| 11A,B. <i>Isognomon alatus</i> Gmelin (life size)                       | 379            |
| 12A,B. <i>Ischnochiton</i> sp. (x 3)                                    | 384            |