Illustrated Keys to the chitons (Polyplacophora)
by Aaron Baldwin

The class Polyplacophora is one of the most primitive groups of mollusks. Chitons are unique in having eight shells called plates surrounded by a cartilaginous girdle. It is thought that the eight shells of chitons evolved from fused spicules such as those found in the tunic of Aplacophorans. While all species of chiton today have eight shells, the ancestral condition was probably seven. Evidence for this comes from the fact that the earliest known chiton fossils appear to have only seven "plates" and because the tail plate in chitons develops embryologically much later than the first seven.

Intertidal chitons tend to remain under rocks during the daytime but become active at night. This is especially true for those species that occur in warmer climes. Amazingly, chitons have "eyes" on the tops of their shells. Some chitons have as many as 11,000 tiny little light receptors! It is possible that they use these to tell day from night. It is also likely that they are used in a fashion similar to the eyes of sea stars for detecting shadows passing over them so that they can clamp tightly to the substrate.

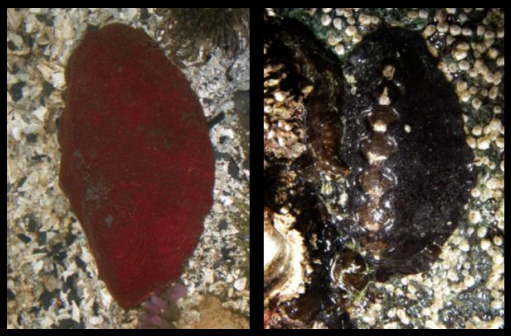
Most chitons are able to cling tightly to rocks. This bond is so tight that a chiton's shells may break before letting go. When collecting chitons, a thin, dull knife is usually slipped quickly between the chiton and the substrate. The blade is inserted under the posterior end of the chiton where the chiton often lifts the edge of its girdle. Another defense chitons use is the ability to roll into a tight ball when dislodged.

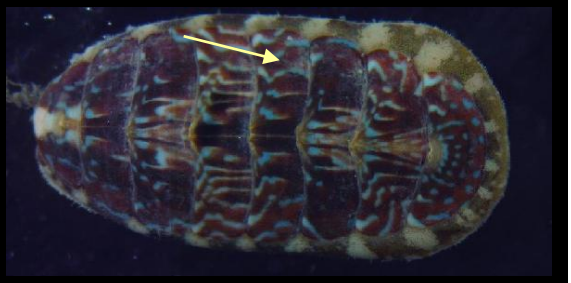
Identification of chitons from photographs can be tricky. This can be made easier by insuring you get good photos of key characters. I generally will try to get a picture of the entire animal in dorsal view, then get close ups of the head plate, sculpture (if any) on the central plates), and girdle. Most chitons will be on or near their preferred food source such as coralline algae or bryozoans. Photos of substrate can be useful for identification.

These keys are not comprehensive but include the more common species likely encountered in the Gulf of Alaska and south to the Oregonian Province. I included a few deepwater and uncommon species as well. These keys are free to use and distribute without charge, provided my name remains attached to them. If any other use is desired (as well as comments or reporting errors and suggestions) please contact me at uasbiology@gmail.com.

Key to the Class Polyplacophora

1





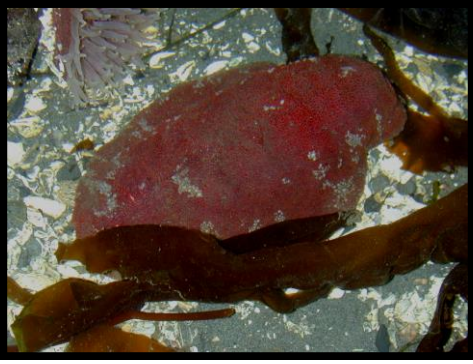
1a) Girdle completely covering plates or covering all but central portion of plates. Family Mopaliidae (in part)

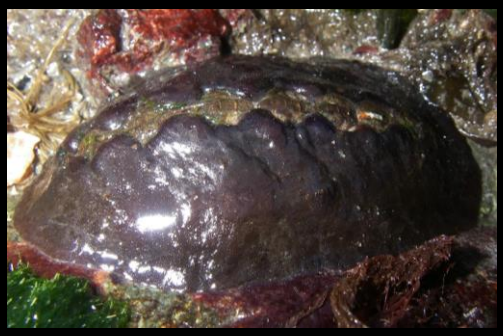
Go to 2

1b) Girdle not covering all or most of plates

Go to 4

2





2a) Girdle completely covering plates. Color often maroon. Often exceeding 15 cm (6”) in length.

Crypotochiton stelleri **(Middenforff, 1847)**

2b) Girdle covering lateral portions of plates but center portion exposed Less than 15 cm (6”) long.

Go to 3

3

3a) Girdle dark brown to black. Girdle smooth and slick. Very common upper intertidal species throughout range of these keys.

Katherina tunicata **(Wood, 1815)**

3b) Girdle light brown, orange, or pink. Girdle spiculose with scattered tufts of hairs. Cook Inlet and north to Arctic Ocean.

Amicula vestita **(Broderip & Sowerby, 1829)**

Key to the Class Polyplacophora (cont'd)

4

4a) Girdle appears nearly smooth due to granules being very small or microscopic.

Go to 5

4b) Girdle with hairs, scales or spicules such that it does not appear smooth. Spicules may be small (choice 13a) or hairs very fine and/or sparse (choices 22a, 27a &27b)

Go to 12

5

5a) Plates 2-7 Split down middle, may be difficult to see. Color often dull gray-green but sometimes flected with white or blue

***Schizoplax brandtii* (Middendorf, 1847)**

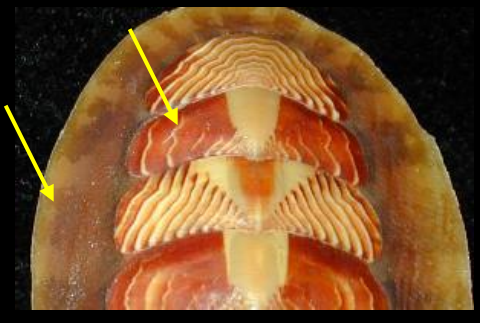
5b) Plates 2-7 entire. Color variable.

Go to 6

6

6a) Girdle with granules easily visible with low magnification. Coloration variable but not commonly with orange, pink and red dominant color of plates. Genus *Lepidochitona*.

Go to 7



6b) Girdle with granules very small, visible under higher magnification. Coloration variable but often with orange, pink and/or red on plates and often with pattern of closely-spaced lines.

Go to 8

Key to the Class Polyplacophora (cont'd)

7

8a) Lateral areas of plates with dense granules. Plates not typically eroded. Very common mid to upper intertidal species.

Lepidochitona dentiens **(Gould, 1846)**

7b) Lateral areas of plates with granules spaced apart. Plates often highly eroded. Plate coloration dark. Girdle may be spotted but lacking light and dark bands. High intertidal zone.

Lepidochitona fernaldi **Eernisse, 1986**

8

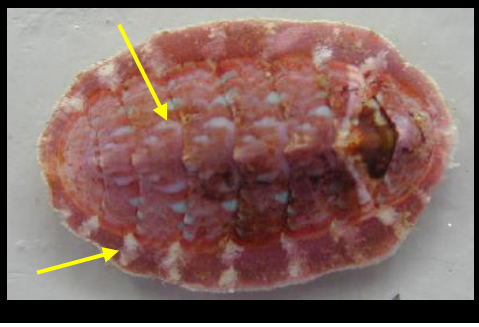
8a) Medial portions of plates with many rows of very fine, white or light yellow colored wavy lines, rest of plate nearly solid red-brown to black. Girdle commonly green with yellow or orange markings in the form of small dots

Tonicella insignis **(Reeve, 1847)**

8b) Medial portion of plates solid or without wavy white lines. Girdle variable in color.

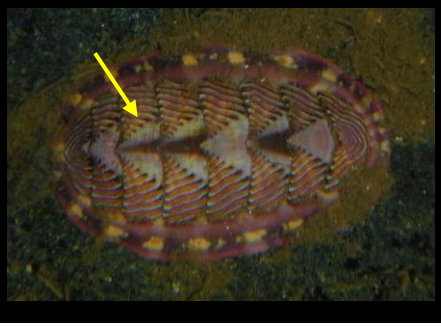
Go to 9

9



9a) Color pattern of lateral areas of plates typically consisting of white or off-white flecks, stripes, and/or chevron-shaped marks. Lacking any dark stripes. Girdle pink with radiating white stripes and/or tiny white dots. Rarely exceeding 1.5 cm.

Tonicella venusta **Clark, 1999**

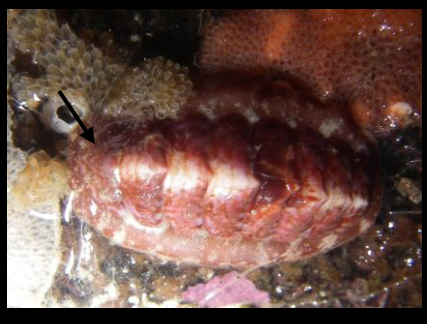


9b) Color pattern of lateral areas of plates typically with distinct stripes, these often dark colored. Girdle variable but usually not with radiating white stripes and tiny dots (but see choice 10a). Often exceeding 2 cm.

Go to 10

Key to the Class Polyplacophora (cont'd)

10



10a) Head plate without concentric pattern of lines. Rarely exceeding 2.5 cm. Girdle similar to choice 9a in having white stripes and tiny white dots but differs in having dark coloration on plates.

***Boreochiton berengensis* (Yakovleva, 1952**

10b) Head plate nearly always with concentric pattern of parallel lines which may be red, maroon, white, black, etc.

Go to 11

11

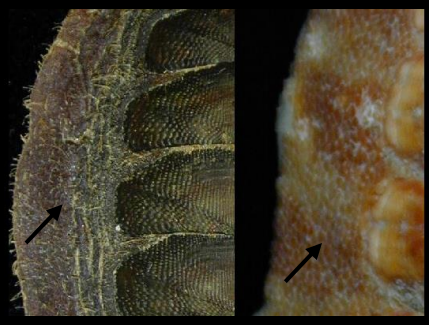
11a) Head plate with dark brown or red-brown lines bordering concentric lines. Usually without electric blue stripes on plates when alive. Abundant mid intertidal species

***Tonicella lineata* (Wood, 1815)**

11b) Head plate with zigzag blue or concentric lines without a dark border. Bright blue on plates. Common low intertidal and shallow subtidal species.

***Tonicella undocaerulea* Sirenko, 1973**

12



12a) Girdle with minute, transparent spicules. Color of plates and girdle white, usually stained yellow or rust. Found on undersides of rocks that are buried in somewhat anoxic environments. Rarely exceeding 1 cm. Genus Leptochiton.

Go to 13

12a) Girdle with distinct hairs (may be very fine or sparse) or distinct overlapping snake-like scales.

Go to 14

Key to the Class Polyplacophora (cont'd)

13

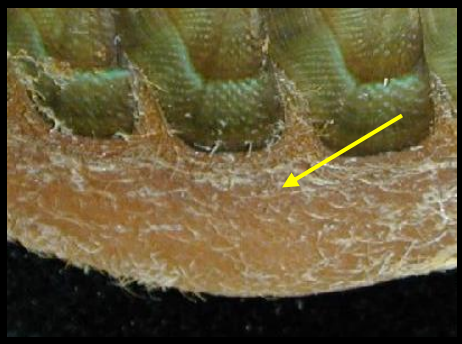
13a) Plates without obvious sculpture. Plates white but often stained rust. Common under low intertidal rocks buried in partially anoxic sediments.

***Leptochiton rugatus* (Carpenter, 1892)**

13b) Plates with fine but distinct sculpture. Plates white but often with black marl. Uncommon species usually found on rocks snagged by longline or trawl gear below 150 meters.

***Leptochiton alascensis* (Thiele, 1909)**

14



14a) Girdle with snake-like overlapping scales. Family Ischnochitonidae.

Go to 15

14b) Girdle with distinct hairs, although these may be fine (see choices 23a and 23b) and/or sparse (see choices 18a, 20a, and 21b). Family Mopaliidae (in part).

Go to 22

15

15a) Color of plates and girdle solid white or off-white (plates may be encrusted with black marl that can be picked off). Uncommon species only found deeper than 150 meters, and more often below 500 meters.

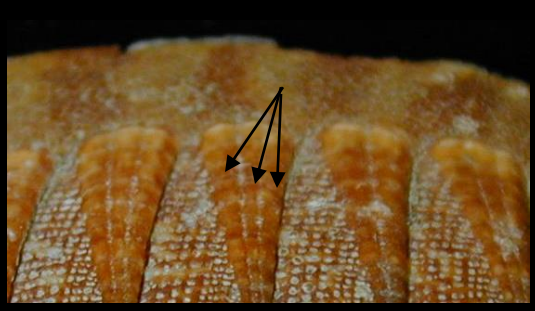
***Tripoplax abyssicola* (Smith & Cowan, 1966)**

15b) Color of plates variable, but not commonly white. In rare albinistic specimens that may be white, there are commonly stripes or bands of a different color present as well. Includes common intertidal and shallow subtidal species

Go to 16

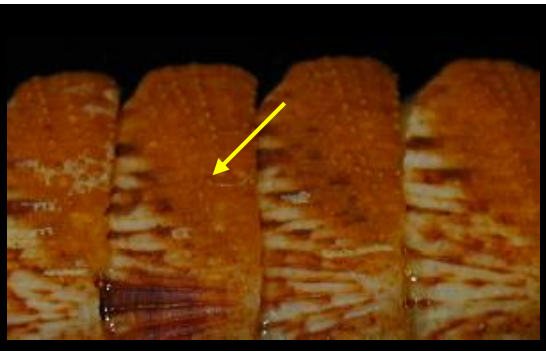
Key to the Class Polyplacophora (cont'd)

16



16a) Lateral area of plates 2-7 with three strong flattened ribs.

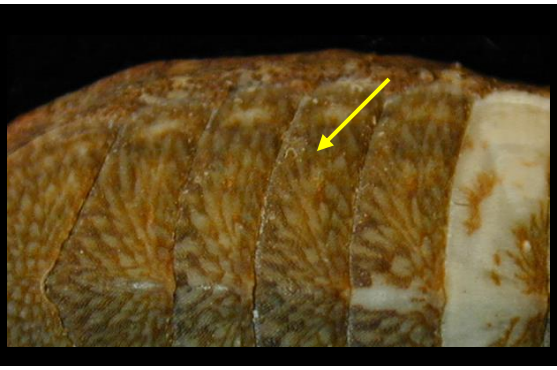
***Tripoplax trifida* (Carpenter, 1864)**



16b) Lateral area of plates 2-7 smooth or with rows of tubercles, pustulate or knobby ribs, or multiple (more than three) very fine ribs

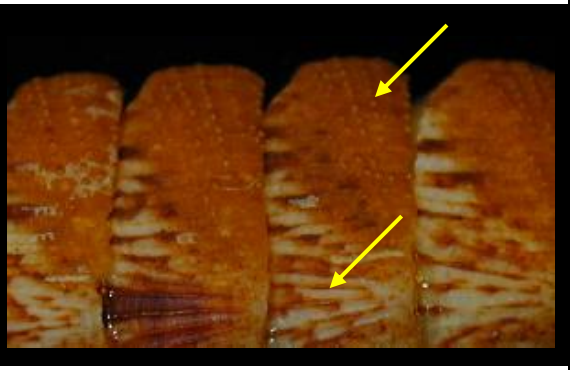
Go to 17

17



17a) Sculpture on plates 2-7 so minute as to be not readily visible to the naked eye. Microscopic examination reveals the presence of tiny pustules on central areas

***Lepidozona interstincta* (Gould, 1852)**



17b) Sculpture on plates 2-7 may be somewhat fine but readily visible to the naked eye. Sculpture of central areas consists of delicate pits or raised longitudinal ribs.

Go to 18

18

18a) Lateral area of plates 2-7 with 6 or more raised, tubercled ribs, these may be very fine. Central area with delicate pits. Uncommon subtidal species.

Go to 19

18b) Lateral area of plates 2-7 with rows of tubercles only (no raised ribs or 4-5 untubercled ribs, but check choice 21b). Central area either pitted or with longitudinal ridges. Includes common intertidal species.

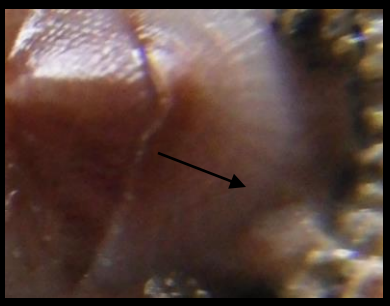
Go to 20

Key to the Class Polyplacophora (cont'd)

19

19a) Plate color reddish or red-brown. Head plate with usually less than 35 ribs. Uncommon shallow subtidal species.

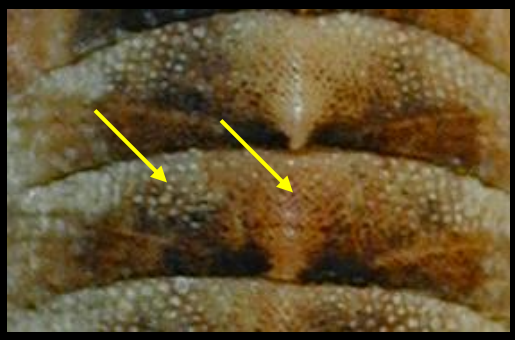
Lepidozona willeti **(Berry,1917)**



19b) Plate color cream, light pink, or light orange. Head plate usually with more than 35 ribs. Uncommon deep subtidal species.

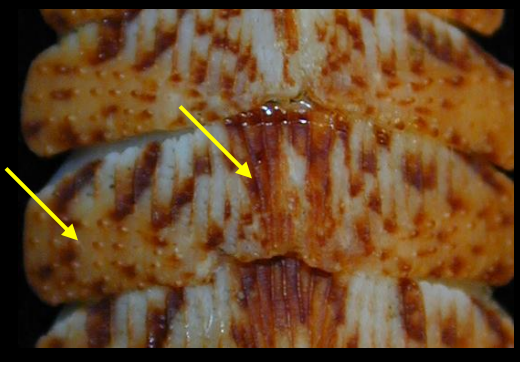
Lepidozona scabricostata **(Carpenter, 1864)**

20



20a) Central area of plates 2-7 with rows of delicate pits. Lateral area of plates 2-7 with rows of almost pointed granules. Uncommon low intertidal and subtidal species.

Lepidozona retiporosa **(Carpenter, 1864)**



20b) Central area of plates 2-7 with strong, longitudinal ridges. Lateral area of plates 2-7 with rows of fine hemispherical nodules. Includes common intertidal species

Go to 21

21

21a) Color generally brown, reddish, or violet (especially in SE Alaska). Valves low peaked. Most common *Lepidozona* in SE Alaska.

Lepidozona mertensii **(Middendorff, 1847)**

21b) Color generally grey or grey-green. Valves high peaked. Lateral areas with tubercles on slight ribs. Uncommon in SE Alaska, more common south.

Lepidozona cooperi **Pilsbry, 1892**

Key to the Class Polyplacophora (cont'd)

22	 	
	22a) Girdle extended in front of head so more than two times wider than rest of girdle. Girdle hairs usually sparse and mostly restricted to head end. Genus *Placiphorella.* **Go to 23**	**22b)** Girdle not extended in front of head. Girdle hairs present on all of girdle or only on posterior margin of girdle. **Go to 25**
23	 	
	23a) Plates a uniform white or off-white (may have dark staining that flakes off). Inhabiting very deep water, usually below 300 meters. ***Placiphorella pacifica* Berry, 1919**	**23b)** Plates with mottled color or solid orange, red, brown, etc. but not white. **Go to 24**
24	 	
	24a) Plates usually mottled with several colors, nearly always including olive green. Girdle tends to have abundant, thick hairs. Common intertidal species south of SE Alaska, rare in SE. ***Placiphorella velata* Dall, 1879**)	**24b)** Plates usually orange or red, with mottling limited to white or brown and not olive green. Girdle hairs very sparse and often limited to anterior margin of girdle. Common subtidal species. ***Placiphorella rufa* Berry, 1917**

Key to the Class Polyplacophora (cont'd)

25

25a) Girdle hairs mainly confined to a short row on posterior portion of body. Remainder of girdle bare with minute granules. Girdle sometimes solid orange.

Dendrochiton flectens **(Carpenter, 1864)**

25b) Girdle hairs may be fine or thick but present over entire surface. Genus *Mopalia*.

Go to 26

26

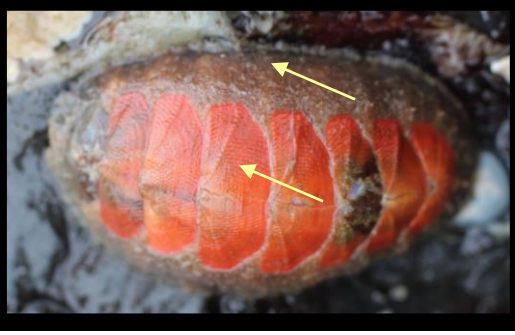
26a) Girdle sometimes appearing naked because of the small size of the hairs. Hairs are sparse and very fine. Length of hairs under 2 mm in length.

Go to 27

26b) Longest girdle hairs half the width of the entire chiton or longer. Includes uncommon intertidal species

Go to 28

27



27a) Girdle commonly flesh or tan colored, occasionally with alternating tan and brown stripes. Valves obviously sculptured. Girdle hairs usually about 0.5 mm in length. Color highly variable, but rarely forest green.

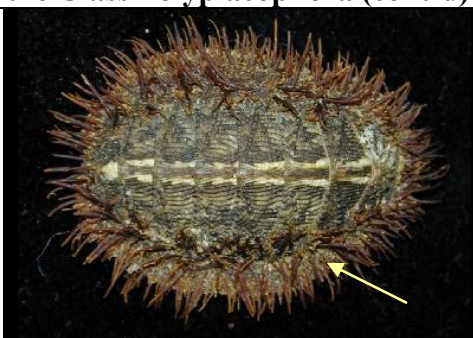
Mopalia swanii **Carpenter, 1864**

27b) Girdle variable in color. Valves very smooth, with faint sculpturing. Girdle hairs usually between 1-2 mm in length. Color of plates commonly mottled forest green with red or white patches.

Mopalia vespertina **(Gould, 1852)**

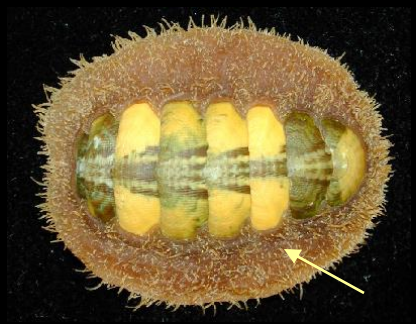
Key to the Class Polyplacophora (cont'd)

28



28a) Girdle hairs very dense, thick, and rubbery. Inside of valves nearly solid bright blue-green. Abundant in British Columbia and south, rare in SE Alaska.

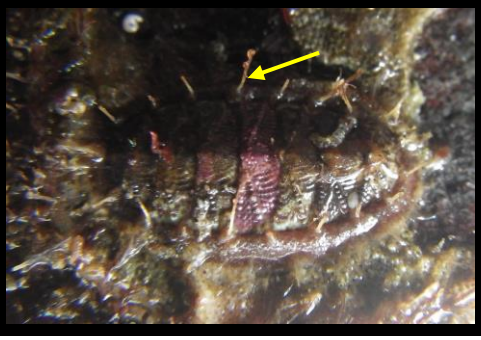
Go to 29



28b) Girdle hairs dense or not dense but never very thick, stiff or rubbery. Inside of valves variable but not usually bright blue-green (most often white). Includes species throughout the range of these keys.

Go to 30

29



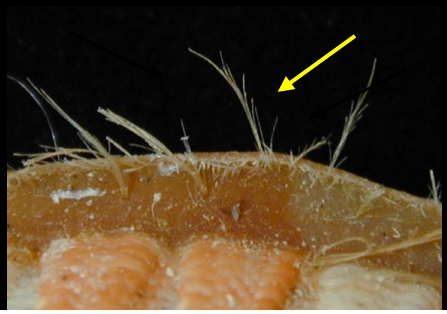
29a) At least some girdle hairs as long as girdle is wide. In some species the girdle hairs are as long as half of the width of the entire chiton (Caution: in dried specimens girdle may shrink, width refers to living or wet specimens).

Go to 30

29b) No girdle hairs as long as the girdle is wide.

Go to 32

30



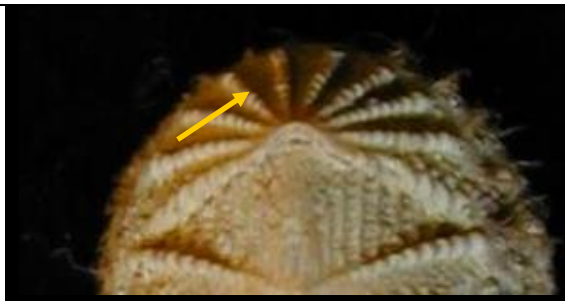
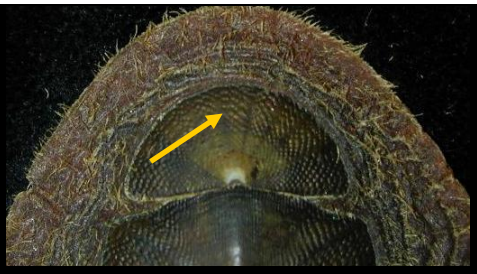
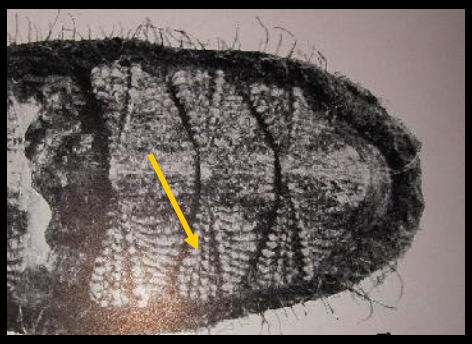
30a) Longest girdle hairs as wide as girdle or only slightly longer. Tufts of girdle hairs resemble egret feathers. Rare subtidal species

***Mopalia egretta* Berry, 1919**

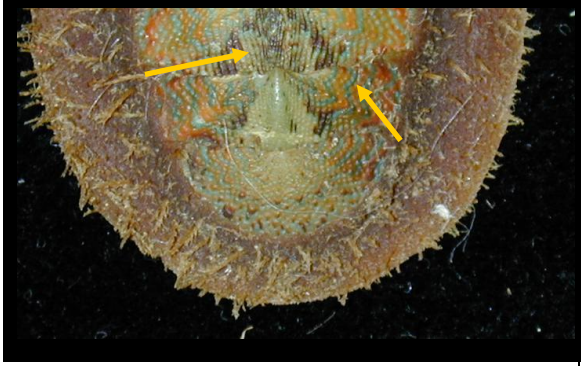
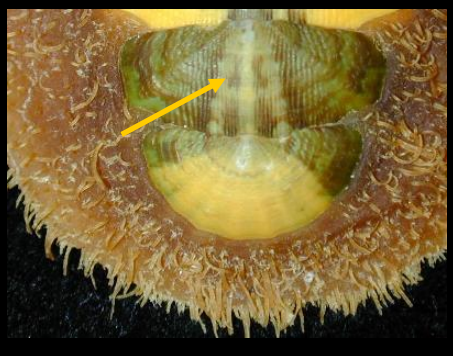
30b) Longest girdle twice as long as girdle width or longer. Includes uncommon intertidal species.

Go to 31

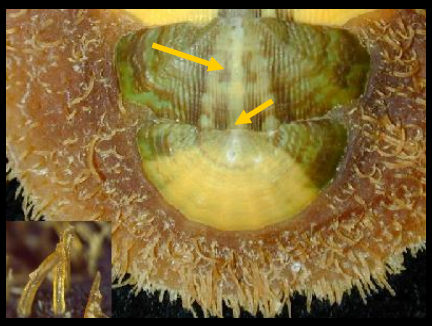
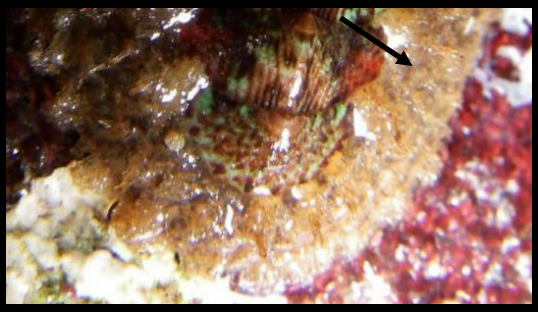
Key to the Class Polyplacophora (cont'd)

31	 	
	31a) Central areas of plates 2-7 with distinct longitudinal ribs. ***Mopalia cirrata* Berry, 1919**	**31b)** Central areas of plates 2-7 with delicate pits. ***Mopalia sinuata* Carpenter, 1864**
32	 	
	31a) Head valve with ten radiating ribs (or rows of pustules forming rib) that are almost as wide as the space in between them. Less than 3 cm total length. Includes uncommon species. **Go to 33**	31b) If ribs are present on head valve, they are much smaller than the spaces in between them. Often 5 cm or longer. Includes common intertidal species. **Go to 34**
33	 	
	33a) With 2-3 smaller ribs in between the large rib that defines the lateral area of plates 2-7 and the large rib that defines posterior margin of plates 2-7. Girdle hairs only sparsely branched. Rare, subtidal species. ***Mopalia phorminx* Berry, 1919**	**33b))** Without 2-3 smaller ribs in between the large rib that defines the lateral areas of plates 2-7 and the large rib that defines the posterior margin of plates 2-7. Girdle hairs short but heavily branched. Uncommon intertidal species ***Mopalia imporcata* Carpenter, 1864**

Key to the Class Polyplacophora (cont'd)

34		
	34a) Plates 2-7 with rows of longitudinal pits on central areas. Girdle often dark brown or gray with tiny yellow or tan dots. Plates typically dark green (rarely yellow or white) and covered with feather-like pattern of dark lines. ***Mopalia lignosa* (Gould, 1846)**	**34b)** Plates 2-7 with pustules, ridges, or both on central areas. Plates variable in color but not olive green with feather-like pattern of dark lines. **Go to 32**
35		
	35a) With a distinct crosshatched "basket-weave" pattern on plates 2-7. Girdle very wide, sometimes nearly as wide as width of plates. Plates often a solid dark green brown, gray, or nearly black. Plates sometimes bicolored with white. ***Mopalia hindsii* (Reeve, 1947)**	**35b)** Without crosshatched "basket-weave" pattern. Girdle not exceptionally wide. Color highly variable, but most often multi-colored and usually including green, white, yellow, brown, and often red and blue. **Go to 36**
36		
	36a) Central area of plates 2-7 pitted in longitudinal rows. Girdle commonly banded light orange and brown. Nearly always with bright turquoise zigzag markings ***Mopalia spectabilis* Cowan and Cowan, 1977**	**36b)** Central areas of plates 2-7 with longitudinal ridges. Girdle commonly light to dark brown, but may be banded. Rarely with turquoise zigzag markings. **Go to 37**

Key to the Class Polyplacophora (cont'd)

37		
	34a) Hairs on girdle short (about 3 mm) and strap-shaped (see inset), without abundant branches. Very common mid to upper intertidal species. ***Mopalia kennerleyi* Carpenter, 1864**	**34b)** Hairs on girdle long (over 3 mm) and heavily branched, giving a mossy appearance. Common low intertidal and shallow subtidal species. ***Mopalia ferreirai* Clark, 1991**

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