

## **Echinodermata**      Gr: spine skin

**6500 spp all marine except for few estuarine, none freshwater**

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1) pentamerous radial symmetry (adults)

\*larvae bilateral symmetrical

2) spines

3) endoskeleton

mesodermally-derived

ossicles

calcareous plates

up to 95%  $\text{CaCO}_3$ , up to 15%  $\text{MgCO}_3$ , salts,  
trace metals, small amount of organic materials

↙ 4) water vascular system (WVS)

→ 5) tube feet (podia)

## **Echinodermata**

Classes:

1) Asterozoidea (Gr: characterized by star-like)

1700 spp

2) Ophiurozoidea (Gr: snake-tail-like)

2100 spp

3) Echinozoidea (Gr: hedgehog-form)

1000 spp

4) Holothurozoidea (Gr: sea cucumber-like)

1200 spp

5) Crinozoidea (Gr: lily-like)

stalked – 100 spp

nonstalked, motile comatulid

(feather stars)- 600 spp

**Asteroidea** sea stars/starfish

arms not sharply marked off  
from central star shaped disc

spines fixed

pedicellariae

ambulacral groove open

tube feet with suckers on oral side

anus/madrepore aboral



Figure 22.01

**Pincushion star, *Calcita navaequeinae*,**  
preys on coral polyps,  
small organisms & detritus



A



**B *Choriaster granulatus*** scavenges  
dead animals on shallow Pacific reefs

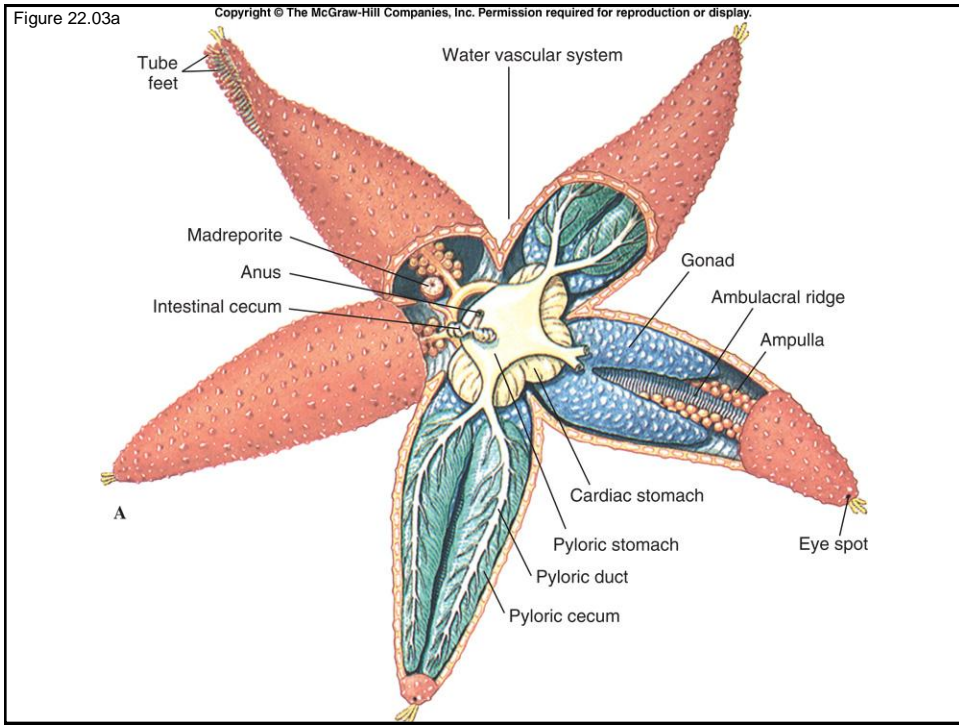
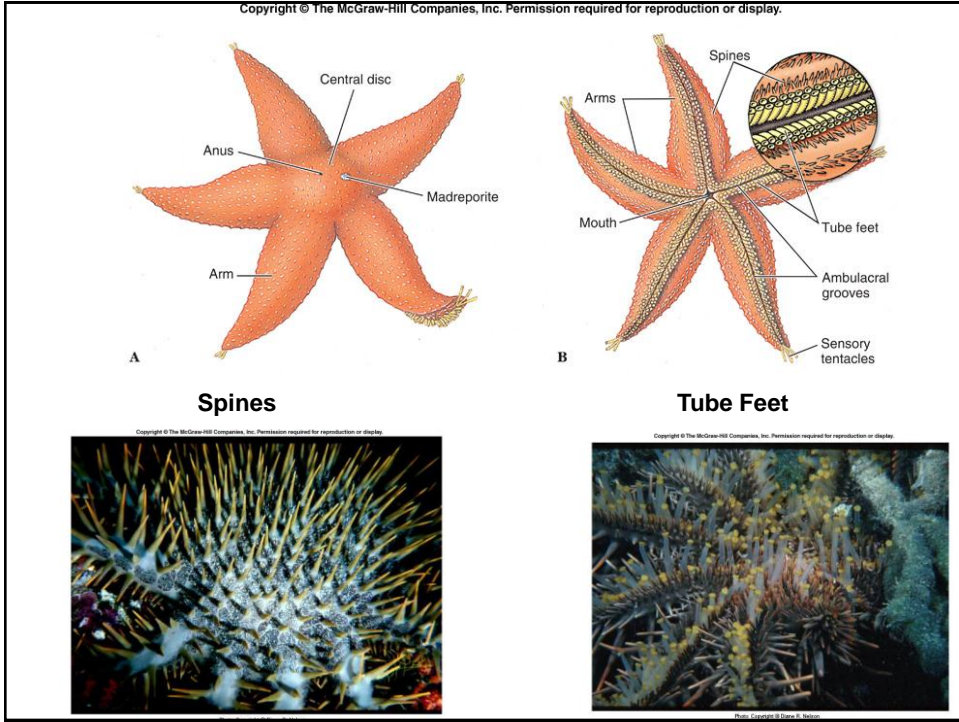


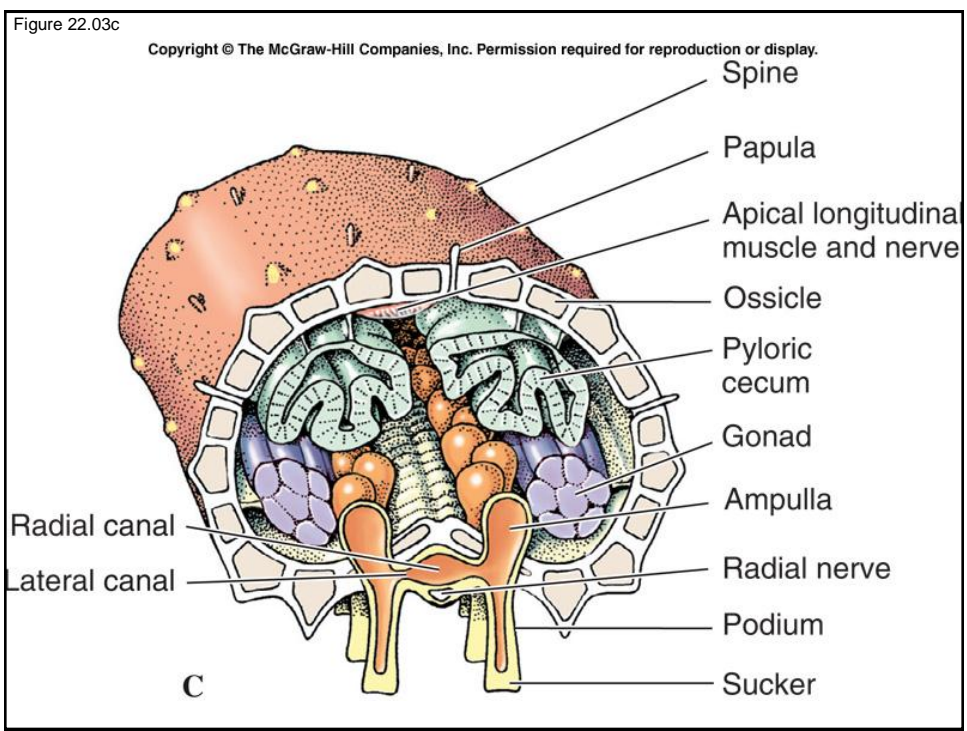
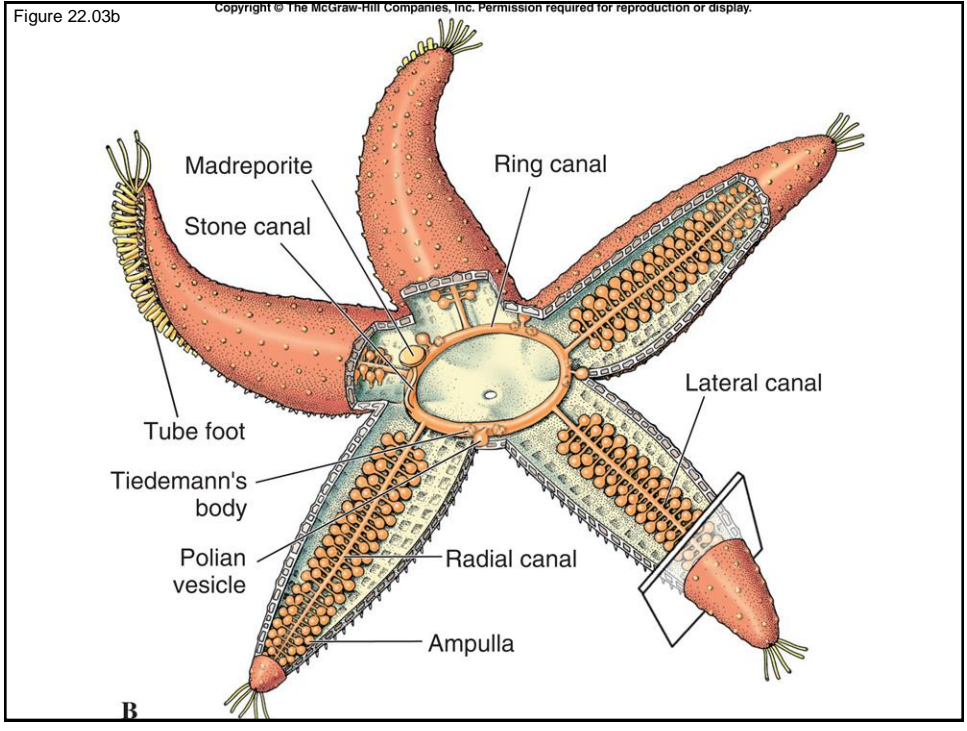
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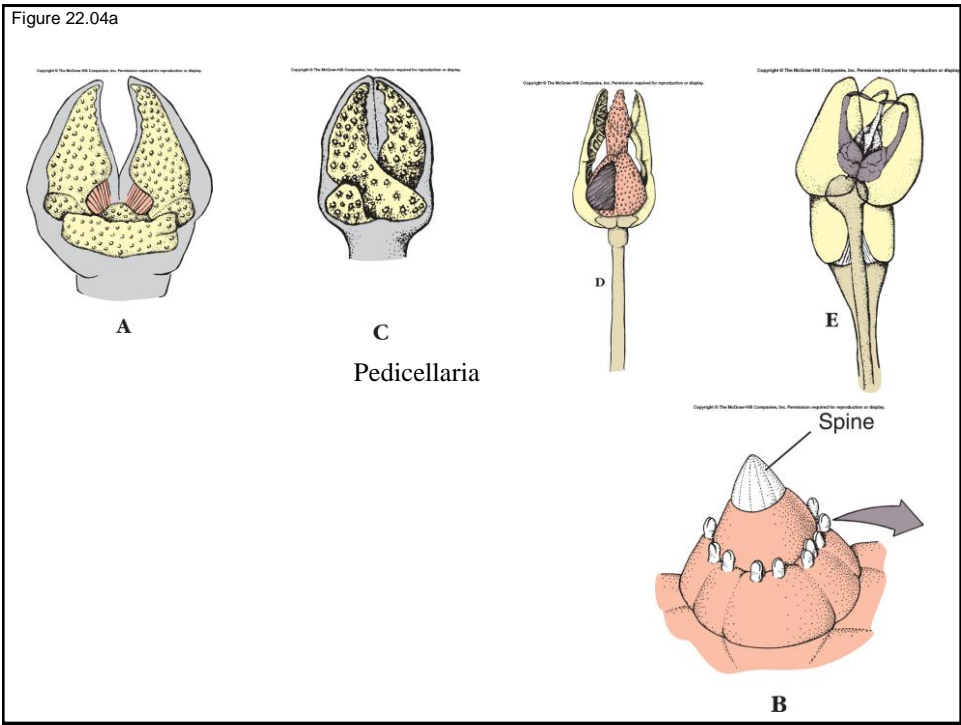
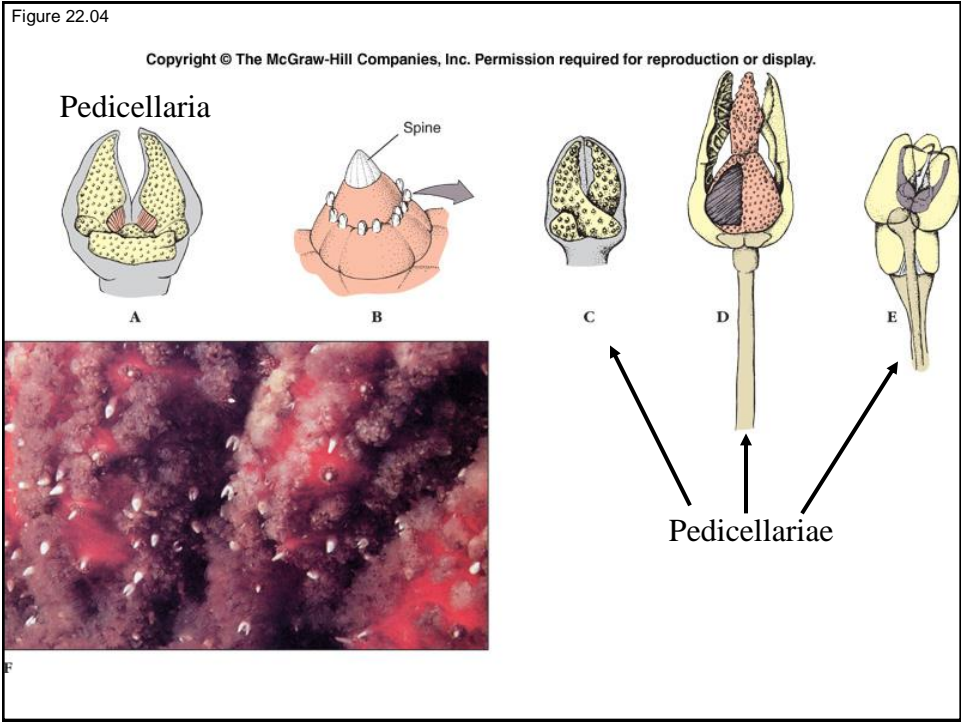
**On the Great Barrier Reef, *Tosia queenslandensis***  
browses encrusting organisms



**D Crown-of-thorns star, *Acanthaster planci***  
forages on corals







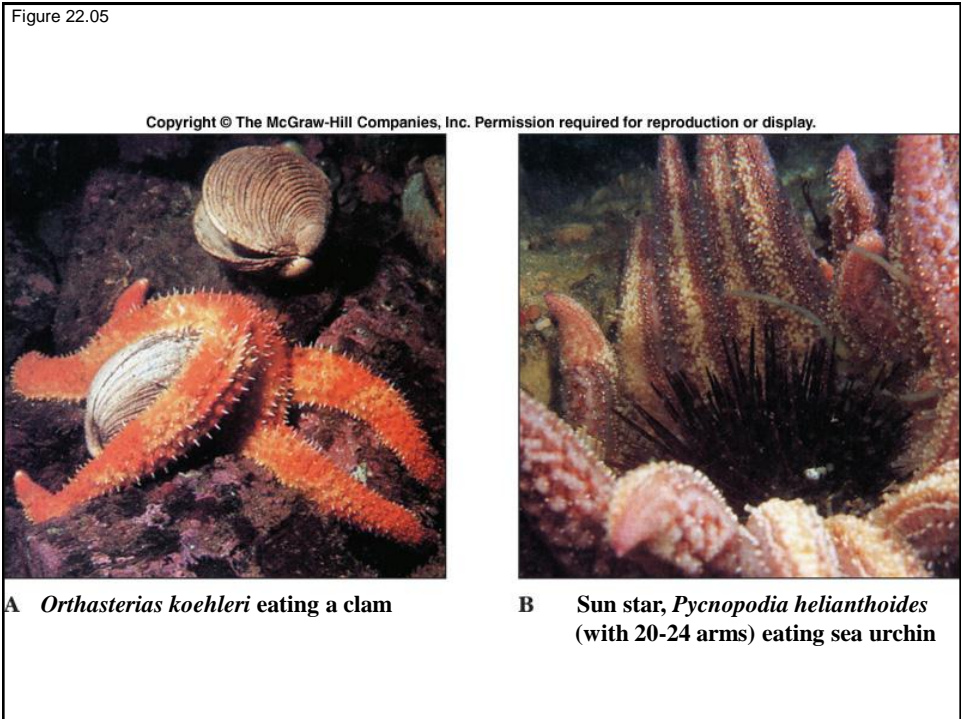
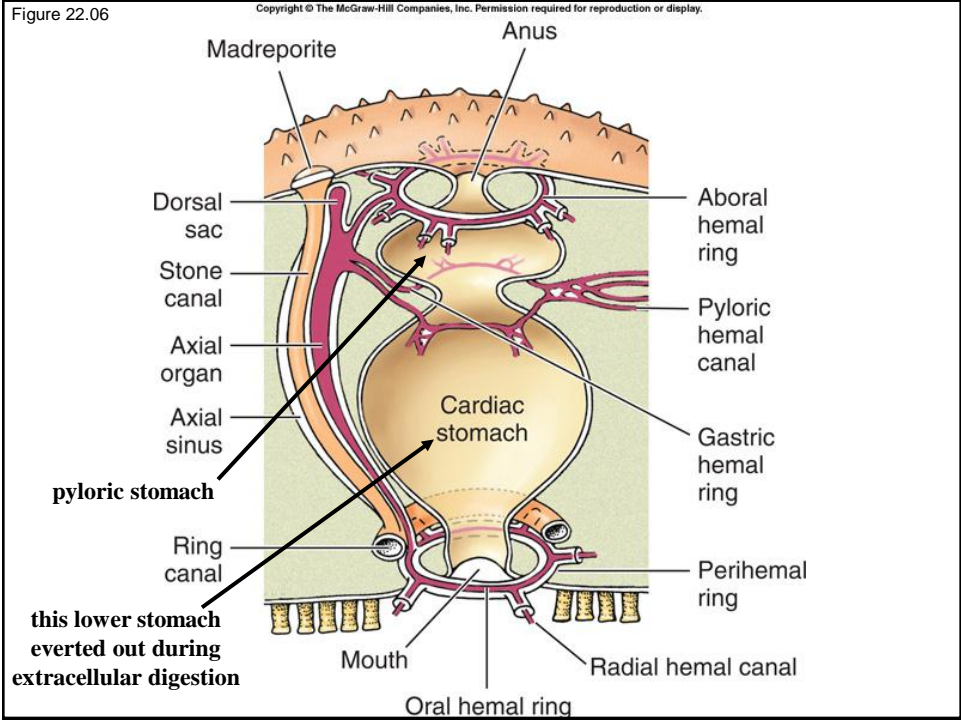
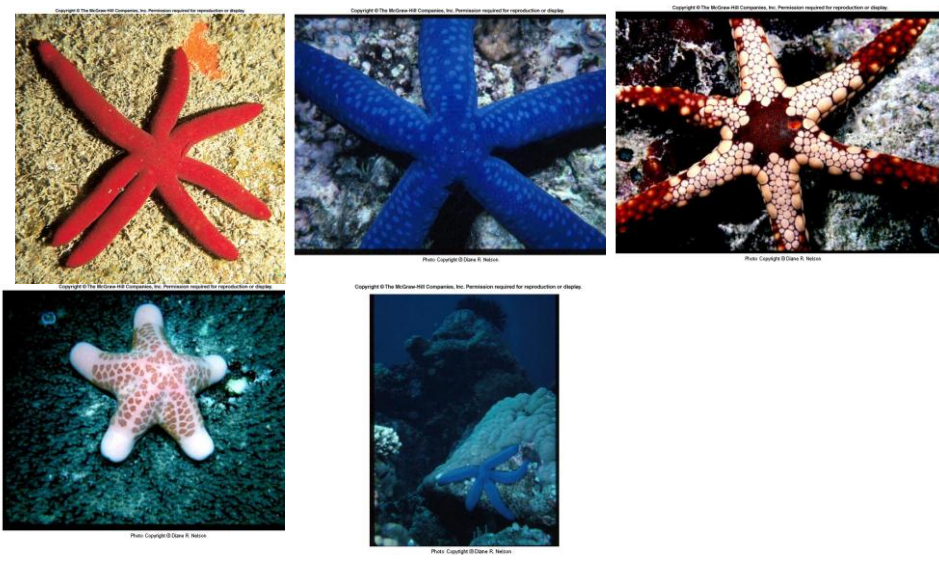


Figure 22.07



**Pacific sea star, *Echinaster luzonicus*: regeneration**

**Ophiuroidea      brittle star/basket star**

**arms separate from star shaped central disc**

**spines on arms**

**tube feet**

**without suckers**

**not used for locomotion**

**used for feeding**

**no pedicellariae**

**no anus**

**ambulacral groove closed & covered by ossicles**

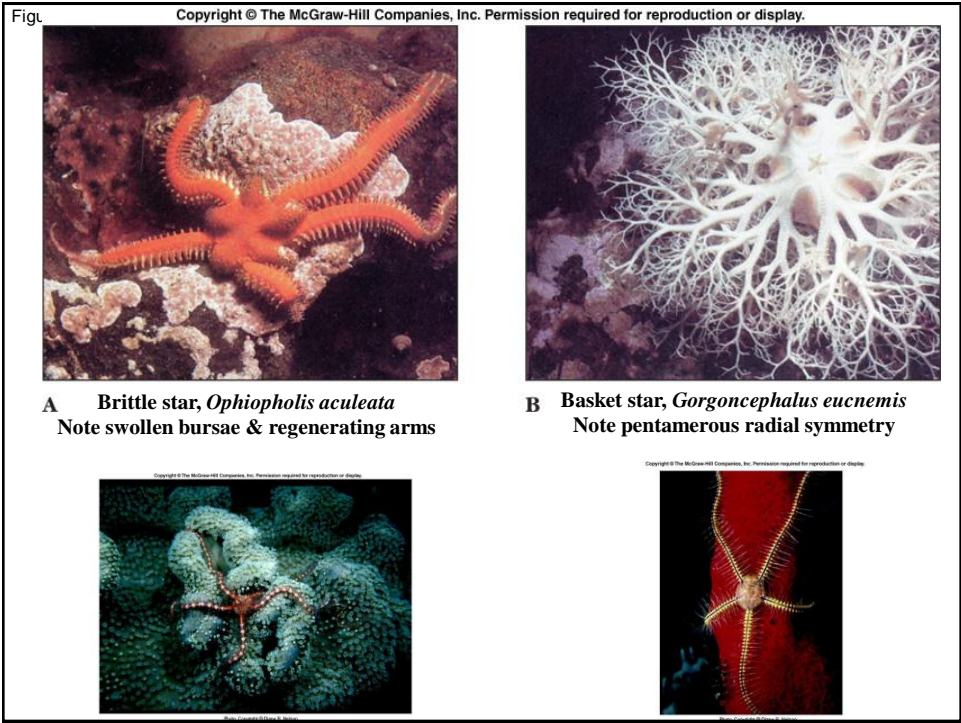
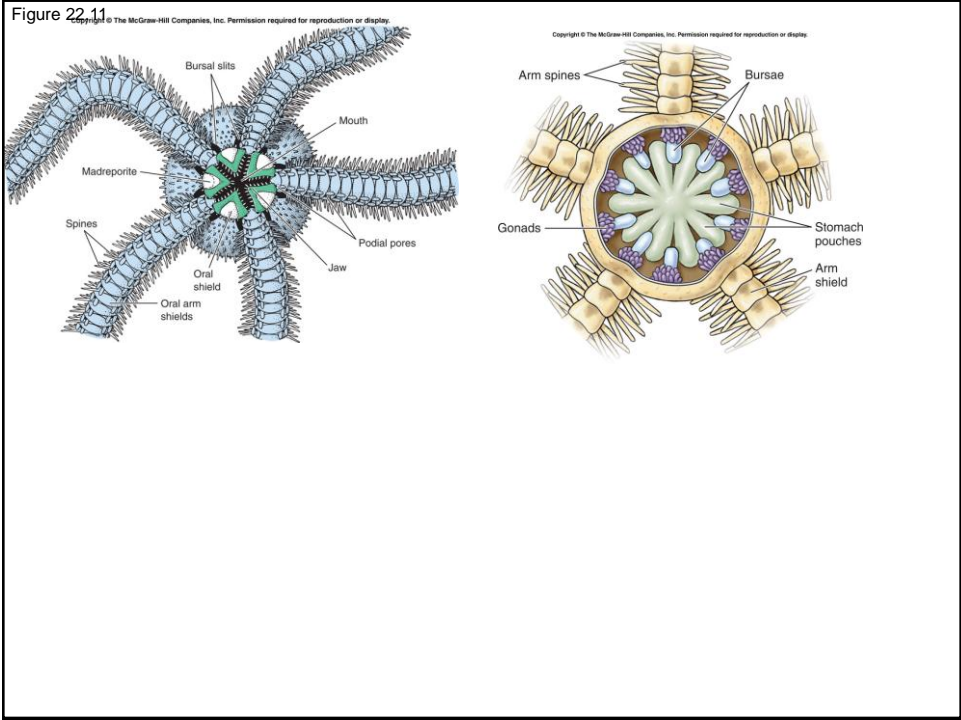
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**brittle star, *Ophiura lutkeni***



**basket star, *Astrophyton muricatum***





**Echinoidea** sea urchins, sea biscuits & sand dollars

globular/disc shape

endoskeletal ossicles fused

no arms

movable spines (ball & socket)

pedicellariae (3 jawed)

tube feet with suckers

ambulacral groove closed & covered by ossicles



Sea urchin, *Strongylocentrotus purpuratus*



B Sand dollar, *Encope micropora*

Figure 22.18

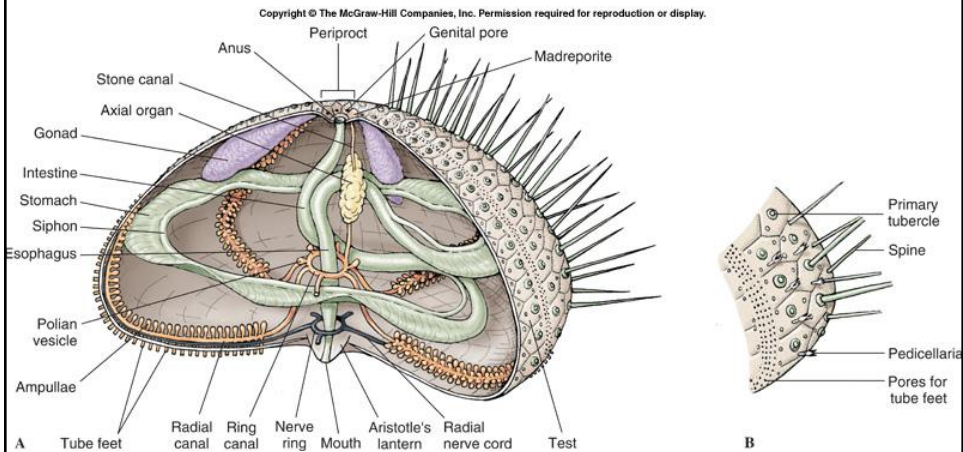
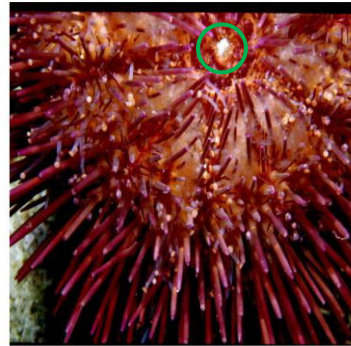
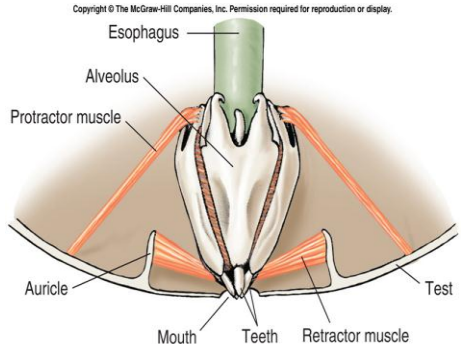


Figure 22.19



**Aristotle's Lantern –grazers herbivores**

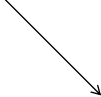
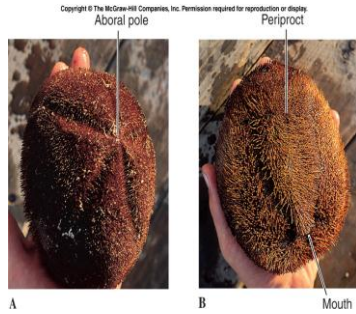


Figure 22.16a

**Heart urchin, *Meoma* (irregular)**



**Sand Dollars**



Figure 22.15

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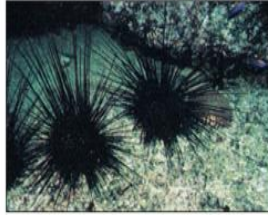
A Ten-lined pencil urchin, *Eucidaris metularia* from the Red Sea (retain ancestral characters from Paleozoic)



B Slate-pencil urchin, *Heterocentrotus mammilatus*



C *Colobocentrotus atraus*



D *Diadema antillarum* from West Indies & Florida



E *Astropyga magnifica*

**Holothuroidea** sea cucumbers



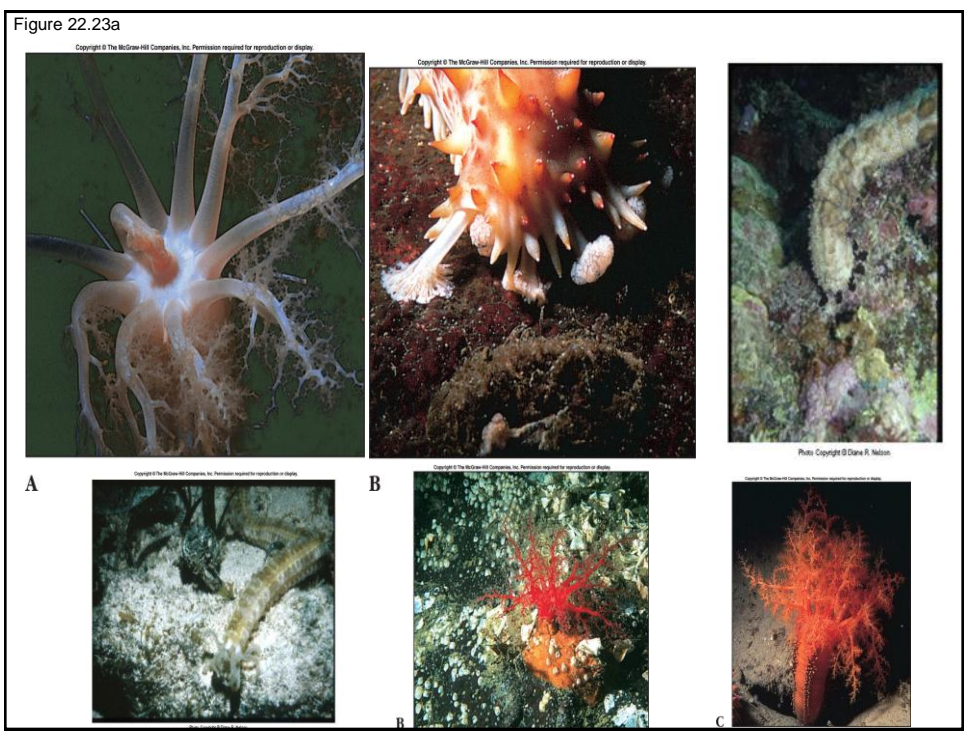
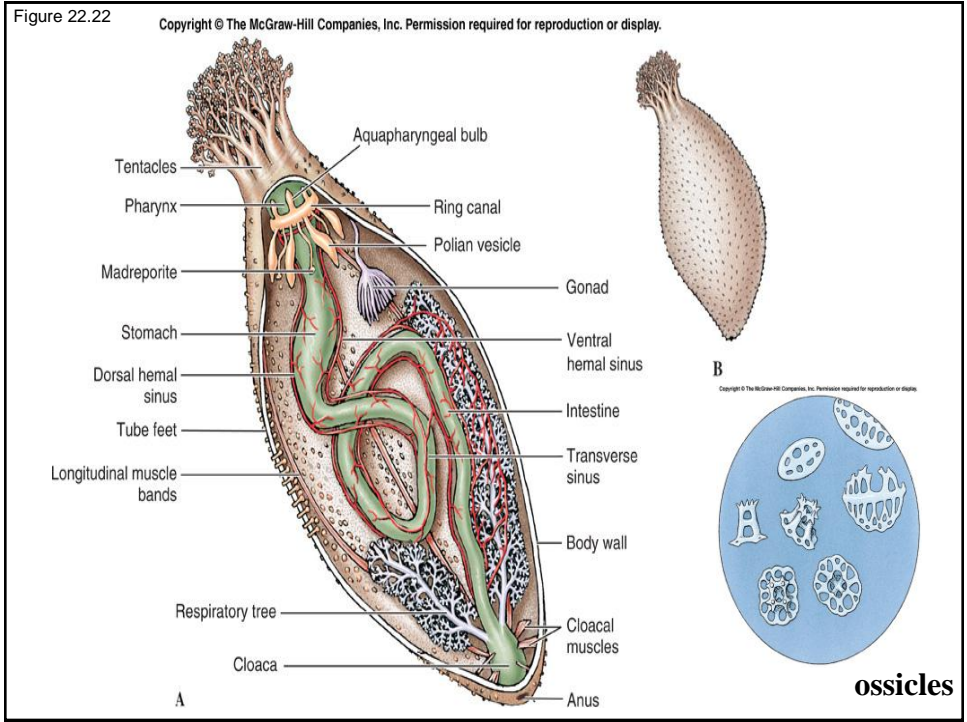
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- cucumber shaped (bilateral symmetrical)
- endoskeletal ossicles dispersed
- no arms
- no spines
- no pedicellariae
- tube feet with suckers
- ambulacral groove closed & covered by ossicles

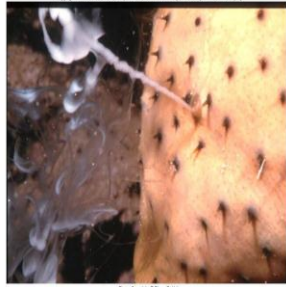
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*Parastichopus californicus*



A



0130.jpg



Cuvierian tubules everted

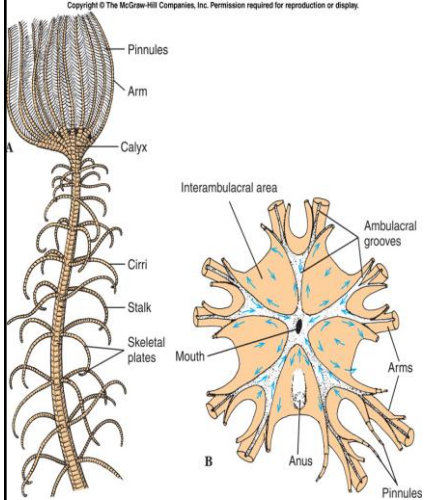
0133.jpg

### Cuvierian tubules everted



# Crinoidea

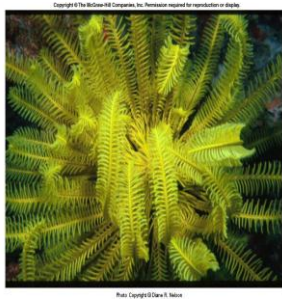
sea lilies/feather stars



- aboral attachment stalk of dermal ossicles
- no spines
- 5 branching arms w side branches (pinnules)
- no pedicellariae
- ciliated ambulacral groove on oral surface
- tube feet tentacle-like on oral surface for food collecting
- anus on oral surface

Figure 22.25

# Feather stars



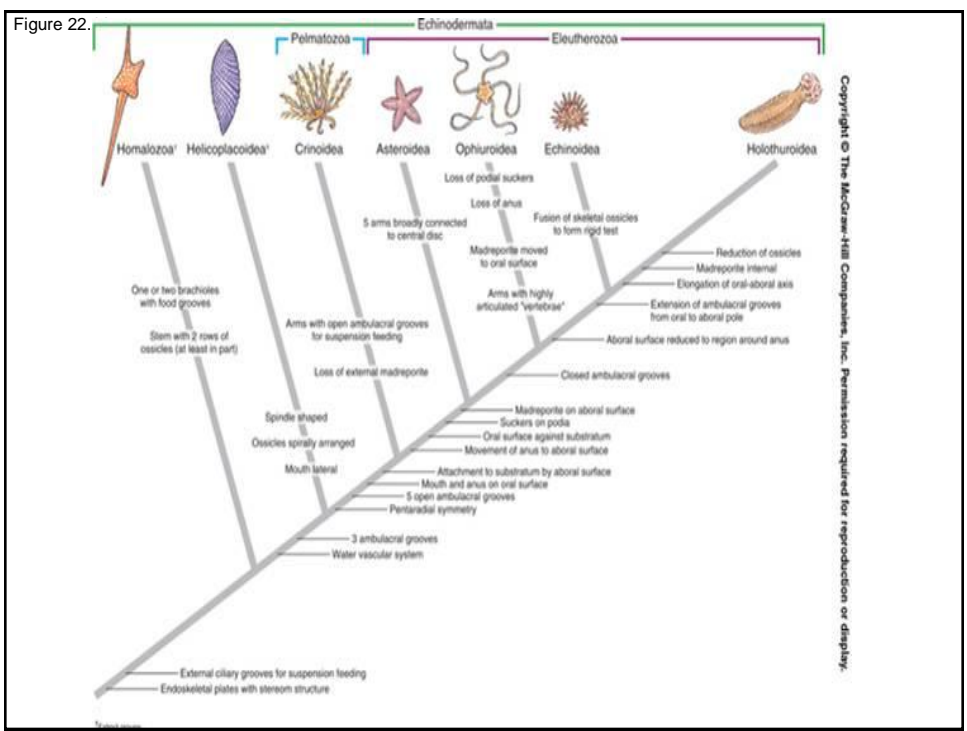
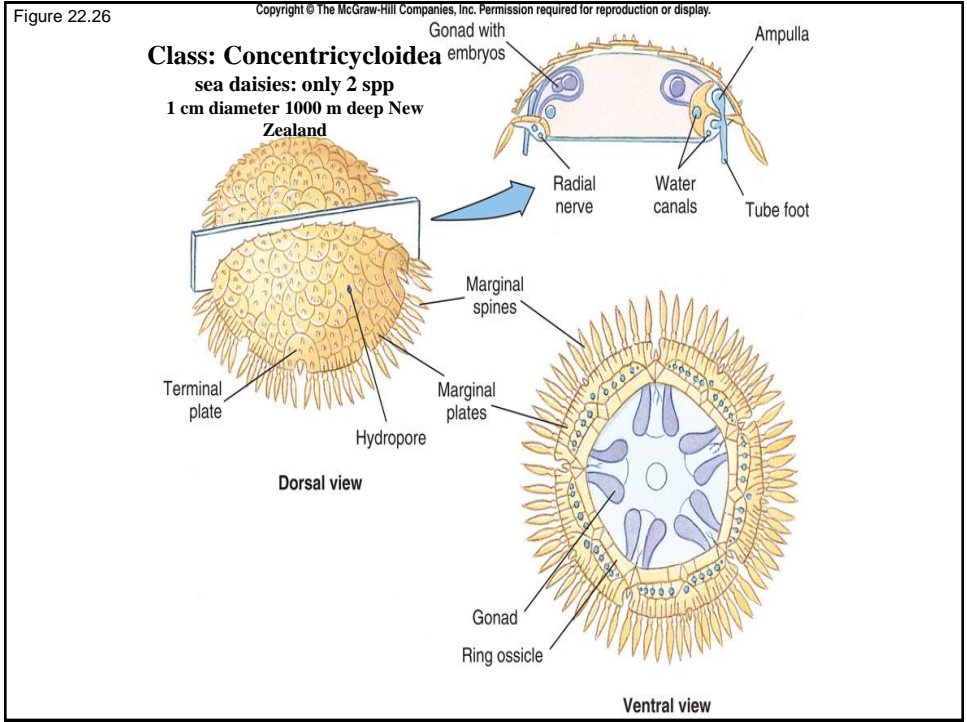


Figure 22.31

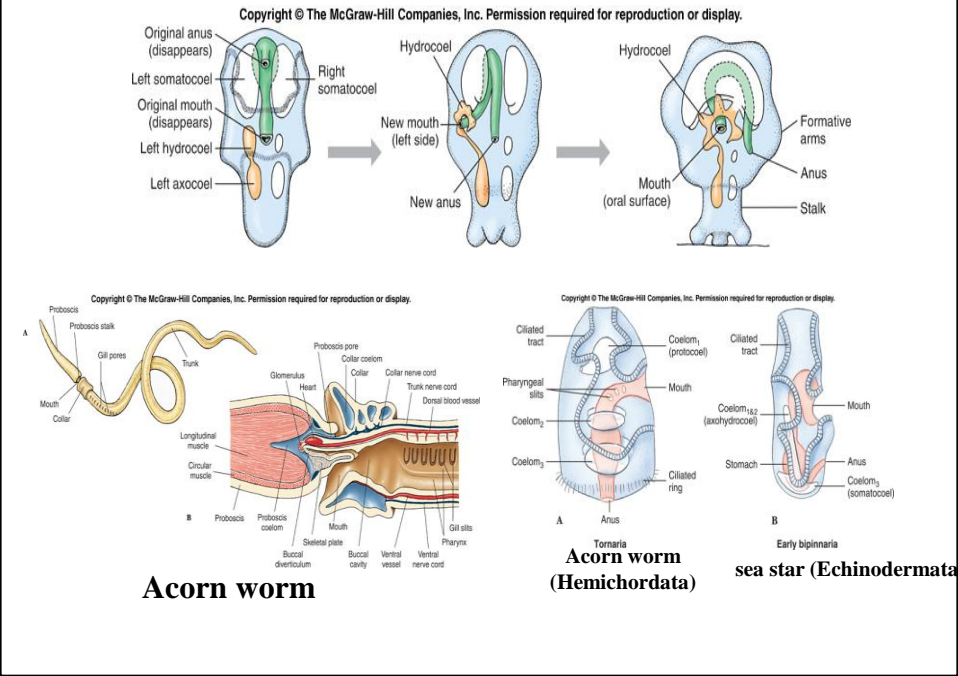
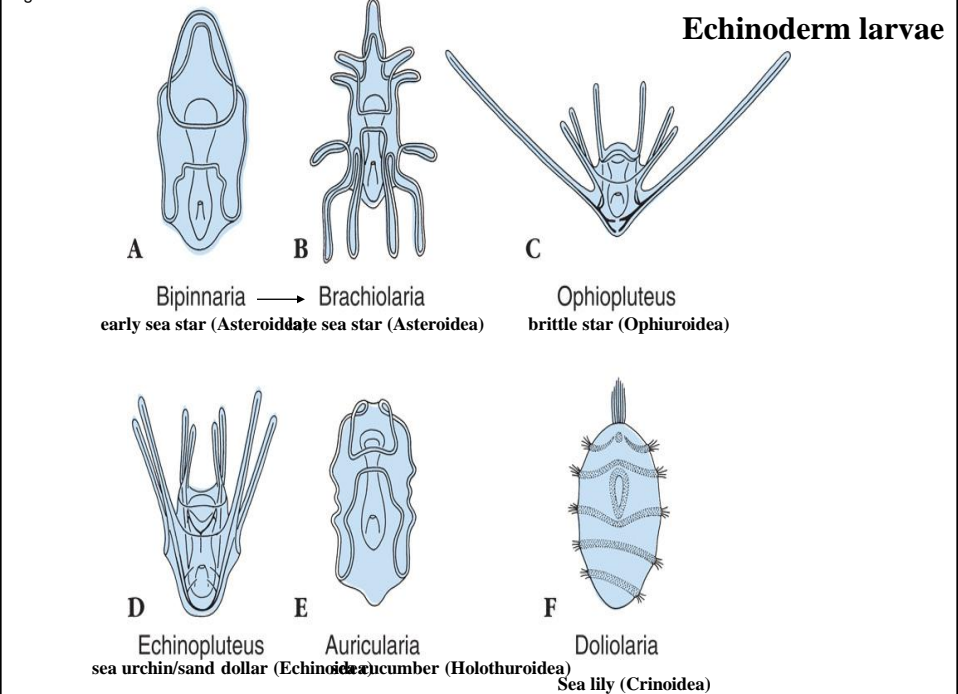


Figure 22.09





# Importance of Echinoderms

## Developmental biology

sea urchin egg/sperm → elucidate the jelly membrane surrounding a recently fertilized egg

## Ecology

keystone species sea stars/sea urchins

Intermediate Disturbance Hypothesis

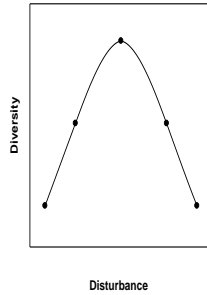


Figure 22.34

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