GLOSSARY FOR THE ECHINODERMATA

OVERVIEW

The echinoderms are a globally distributed and morphologically diverse group of invertebrates whose history dates back 500 million years (Lambert 1997; Lambert 2000; Lambert and Austin 2007; Pearse et al. 2007). The group includes the sea stars (Asteroidea), sea cucumbers (Holothuroidea), sea lilies and feather stars (Crinoidea), the sea urchins, heart urchins and sand dollars (Echinoidea) and the brittle stars (Ophiuroidea). In some areas the group comprises up to 95% of the megafaunal biomass (Miller and Pawson 1990). Today some 13,000 species occur around the world (Pearse et al. 2007). Of those 13,000 species 194 are known to occur in British Columbia (Lambert and Boutillier, in press).

The echinoderms are a group of almost exclusively marine organisms with the few exceptions living in brackish water (Brusca and Brusca 1990). Almost all of the echinoderms are benthic, meaning that they live on or in the substrate. There are a few exceptions to this rule. For example several holothuroids (sea cucumbers) are capable of swimming, sometimes hundreds of meters above the sea floor (Miller and Pawson 1990). One species of holothuroid, Rynkatorpa pawsoni, lives as a commensal with a deep-sea angler fish (Gigantactis macronema) (Martin 1969).

While the echinoderms are a diverse group, they do share four unique features that define the group. These are pentaradial symmetry, an endoskeleton made up of ossicles, a water vascular system and mutable collagenous tissue. While larval echinoderms are bilaterally symmetrical the adults are pentaradially symmetrical (Brusca and Brusca 1990).

All echinoderms have an endoskeleton made of calcareous ossicles (figure 1). The density of the ossicles within the mesoderm varies among groups and species. In the Echinoidea (urchins and sand dollars) the ossicles are fused together to form a rigid test (Lambert and Austin 2007). Similarly in the Crinoidea and Ophiuroidea many of the ossicles have fused together to form hard skeletal elements (e.g. the brachials of crinoid arms) (Lambert and Austin 2007). In comparison the ossicles of the holothuroids (sea cucumbers) are widely spaced (Lambert 1997).

The water vascular system is a complex network of canals and reservoirs. It uses hydraulic pressure and the action of muscles to operate the various podia (Brusca and Brusca 1990). Podia include both tube feet (used in locomotion and attachment) and tentacles (used in feeding). The podia also function in gas exchange and sensory reception. The water vascular system is usually open at one end to the surrounding environment. This opening, called the madreporite, is where sea water enters the system. While most asteroids and echinoids have relatively obvious madreporites, the holothuroids have an internal madreporite that can only be seen upon dissection (Lambert 1997). The madreporite is absent in the crinoids.

Figure 1. Scanning electron micrograph (SEM) of ossicles from a holothuroid.
Mutable collagenous tissue is also unique to the echinoderms and is, perhaps, their most fascinating trait. This tissue can change rapidly, in less than a second to several minutes, from a rigid to a flaccid state. The change in physical state, from hard to soft or vice versa, is not the result of muscle activation, but rather the result of changes to the passive mechanical properties of the tissue itself. The current consensus is that mutable collagenous tissue is made up of discrete collagen fibrils that are organized into bundles (Wilkie 2002). Substances released by juxtaligamental cells change the cohesion between the collagen bundles causing the tissue to either harden or soften (Wilkie 2002). These changes are under the control of the nervous system.

Sea urchins and some sea stars have pedicellariae on the aboral side: these are jaw-like structures often mounted on flexible stalks (figure 2). The shape of the three-part jaw varies, and any given species might have two or more types of pedicellariae (Brusca and Brusca 1990). The pedicellariae are used to keep debris off the organism, to hold and capture small prey and in defense.

The echinoderms, like some other groups of animals, have the ability to regenerate lost body parts (Brusca and Brusca 1990). The crinoids are particularly adept at regenerating body parts and can regenerate both their arms and visceral mass, assuming that a sufficient amount of the main body remains undamaged (Kondo and Akasaka, 2010). The crinoids also use regeneration to grow additional arms (i.e. they autotomize one arm and re-grow two arms) (Kondo and Akasaka, 2010). A few ophiuroids, though none in BC, rely on regeneration to reproduce asexually. In such species the brittle star splits across its central disc and each half regenerates into a new individual (Crawford and Crawford 2007).
Figure 4. Morphology of a generalized feather star (Crinoidea) (a), sand dollar (Echinoidea) (b), sea urchin (Echinoidea) (c), and sea cucumber (Holothuroidea) (d).
The following checklist lists all of the species known to occur in British Columbia and adjacent regions. Species that are not known to occur in BC but do occur either immediately north or south of the province are indicated by an asterisk. The list is from Lambert and Boutillier (in press).

Depth ranges are given for each species if known. The species authorities (authors and dates) are also provided. The species authority is the person or persons who first publish a description about a new species. Many echinoderms do not have common names and due to space constraints none are included here. Further information on many of these species can be found in Lambert (1997; 2000) and Lambert and Austin (2007).

### Echinodermata

Crinoidea – sea lilies, feather stars (five species)

- **Gephyrocrinus** n. sp. Roux and Lambert, in prep. 1859 – 1903 m
- **Ptilocrinus** n. sp. Roux and Lambert, in prep. 1164 – 2105 m
- **Ptilocrinus pinnatus** A.H. Clark, 1907 2904 m

Bourgueticrinida

- **Bathycrinus pacificus** A.H. Clark, 1907 1655 m

Comatulida

- **Pentametrocrinus** paucispinulus Messing, 2008 1768 m
- **Pentametrocrinus varians** (Carpenter, 1882) 457 – 2727 m

Zenometridae

- **Florometra serratissima** (A.H. Clark, 1907) 11 – 1252 m
- **Retiometra alascana** A.H. Clark, 1936 291 – 1270 m

Zenometridae

- **Psathyrometra fragilis** (A.H. Clark, 1907) 439 – 2903 m

### CRINOIDEA (Sea Lilies and Feather Stars – five species in BC)

Hyocrinida

- **Hyocrinidae**
  - **Gephyrocrinus** n. sp. Roux and Lambert, in prep. 1859 – 1903 m
  - **Ptilocrinus** n. sp. Roux and Lambert, in prep. 1164 – 2105 m
  - **Ptilocrinus pinnatus** A.H. Clark, 1907 2904 m

Bourgueticrinida

- **Bathycrinus pacificus** A.H. Clark, 1907 1655 m

Comatulida

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Zenometridae

- **Psathyrometra fragilis** (A.H. Clark, 1907) 439 – 2903 m

### ECHINOIDEA (Sea Urchins and Sand Dollars - eight species in BC)

Cidaridae

- **Aporocidaris fragilis** Agassiz and Clark, 1907 3000 – 4000 m
- **Aporocidaris milleri** Agassiz, 1898 850 – 4300 m

Echinothurioida

- **Sperosoma biseriatum** Doderlein, 1901 1019 – 3500 m
- **Sperosoma giganteum** Agassiz and Clark, 1907 1211 m
Echinoida

Strongylocentrotidae

*Strongylocentrotus droebachiensis* (Müller, 1776) 0 – 300 m
*Strongylocentrotus fragilis* Jackson, 1912 50 – 1200 m
*Strongylocentrotus franciscanus* (Agassiz, 1863) 0 – 125 m
*Strongylocentrotus pallidus* (Sars, 1871) 5 – 1600 m
*Strongylocentrotus purpuratus* (Stimpson, 1857) 0 – 161 m

Clypeasteroida

Dendrasteridae

*Dendraster excentricus* (Eschscholtz, 1831) 0 – 232 m

Holasteroida

Urechinidae

*Cystechinus loveni* Agassiz, 1898 2600 – 4080 m

Pourtalesoidae (Deep-sea Urchins)

*Ceratophyza ceratopyga valvaecristata* Mironov, 1976 4200 – 6320 m
*Cystocrepis setigera* (Agassiz, 1898) 2876 – 4072 m
*Echinocrepis rostrata* Mironov, 1973 3315 – 5020 m
*Pourtalesia tanneri* Agassiz, 1898 1450 – 3954 m
*Pourtalesia thomsoni* Mironov, 1976 3315 – 4321 m

Spatangoida

Schizasteridae

*Brisaster latifrons* (Agassiz, 1898) 20 – 1900 m

Aeropsidae

*Aeropsis fulva* (Agassiz, 1898) 1463 – 5390 m

**OPHIUROIDEA (Basket Stars and Brittle Stars - 45 species in BC)**

Euryalida

Asteronychidae

*Asteronyx loveni* Müller and Troschel, 1842 115 – 2963 m

Gorgonocephalidae (Basket Stars)

*Gorgonocephalus eucnemis* Müller and Troschel, 1842 10 – 2000 m

Asteroschematidae

*Asteroschema sublaeve* Lütken and Mortensen, 1899 605 – 1909 m

Ophiurida (Brittle Stars)

Ophiomyxidae

*Ophiocolea corynetes* (H.L. Clark, 1911) 538 – 1253 m

Ophiacanthidae

*Ophiacantha bathybia* H.L. Clark, 1911 1587 – 6450 m
*Ophiacantha cataleimmoida* H.L. Clark, 1911 130 – 1940 m
*Ophiacantha diplasia* H.L. Clark, 1911 71 – 1330 m
*Ophiacantha eurypoma* H.L. Clark, 1911 1394 – 2869 m
*Ophiacantha normani* Lyman, 1879 37 – 2600 m
*Ophiacantha rhachophora* H.L. Clark, 1911 50 – 1700 m
*Ophiacantha trachybeta* H.L. Clark, 1911 406 – 2014 m
*Ophiolinna bairdi* (Lyman, 1883) 521 – 2600 m

Chilophiurina

Ophiuridae

*Amphiophiura bullata pacifica* Litvinova, 1971 2507 – 6380 m
*Stegophiura ponderosa* (Lyman, 1878) 137 – 1436 m
**Amphiophiura superba** (Lütken and Mortensen, 1899) 825 – 1867 m

**Ophiocen hastatum** Lyman, 1878 916 – 2877 m

**Ophiophalma jolliense** (McClenndon, 1909) 155 – 2105 m

**Ophiura bathybia** H.L. Clark, 1911 2869 – 4872 m

**Ophiura cryptolepis** H.L. Clark, 1911 420 – 1280 m

**Ophiura flagellata** (Lyman, 1878) 128 – 2014 m

**Ophiura leptoctenia** H.L. Clark, 1911 27 – 3239 m

**Ophiura lueticenii** (Lyman, 1860) 0 – 1097 m

**Ophiura sarsii** Lütken, 1855 0 – 1898 m

**Stegophiura carinata** D’Yakonov, 1954 950 – 2300 m

**Gnathophiurina**

**Amphiuridae**

**Amphiodia occidentalis** (Lyman, 1860) 0 – 367 m

**Amphiodia periercta** H.L. Clark, 1911 9 – 315 m

**Amphiodia urtica** (Lyman, 1860) 0 – 1624 m

**Amphiplus euryaspsi** (H.L Clark, 1911) 124 – 582 m

**Amphiplus macraspis** (H.L. Clark, 1911) 7 – 1400 m

**Amphiplus strongylopis** (H.L. Clark, 1911) 4 – 1408 m

**Amphipholis pugetana** (Lyman, 1860) 4 – 1620 m

**Amphipholis squamata** (Delle Chiage, 1829) 0 – 823 m

**Amphiura diomedeae** Lütken and Mortensen, 1899 71 – 3030 m

**Amphilepis patens** Lyman, 1879 1790 – 3608 m

**Ophiotrichidae**

**Ophiothrix spiculata** Le Conte, 1851 0 – 2059 m

**Ophiactidae**

**Ophiopholis aculeata** Linnaeus, 1767 0 – 366 m

**Ophiopholis bakeri** McClendon, 1909 9 – 1006 m

**Ophiopholis japonica** Lyman, 1879 15 – 1884 m

**Ophiopholis kennerlyi** Lyman, 1860 0 – 732 m

**Ophiopholis longispina** H.L.Clark, 1911 51 – 1746 m

**Ophiocomidae**

**Ophiopetris papillosa** Lyman, 1875 0 – 170 m

**Ophiolepida**

**Ophiomusium glabrum** Lütken and Mortensen, 1899 878 – 4082 m

**Ophiomusium lymani** Wyville Thompson, 1873 130 – 3435 m

**Ophiomusium multispinum** H.L. Clark, 1911 878 – 3219 m

**Ophioplocus esmarki** Lyman, 1874 0 – 74 m

**HOLOTHUROIDEA** (**Sea Cucumbers – 47 species in BC**)  

**Aspidochirotida**

**Stichopodidae**

**Parastichopus californicus** (Stimpson, 1857) 0 – 249 m

**Parastichopus leukothelae** Lambert, 1986 24 – 285 m

**Synallactidae**

**Capheira mollis** Ohshima, 1915 1353 – 2200 m

**Capheira sulcata** Ludwig, 706 – 3400 m

**Mesothuria murrayi** (Théel, 1886) 483 – 2515 m

**Paelopatides confundens** Théel, 1886 1986 – 4069 m
Elasipoda (Deep-sea Cucumbers)

Pseudostichopus mollis Théel, 1886
$179 – 2200 \text{ m}$

Pseudostichopus tuberosus O'Loughlin and Ahearn, 2005
$1859 – 2105 \text{ m}$

Synallaxtes cf. challengeri (Théel, 1886)
$20 – 366 \text{ m}$

Laetmogonidae

Pannychia moseleyi Théel, 1881
$212 – 2598 \text{ m}$

Elpidiidae

Amperima naresi (Théel, 1882)
$1889 – 7130 \text{ m}$

Scotoplanes globosa (Théel, 1879)
$2100 – 5630 \text{ m}$

Scotoplanes theeli Ohshima, 1915
$545 – 2500 \text{ m}$

Pentagone japonica Ohshima, 1915
$1135 – 1669 \text{ m}$

Dactylochirotida

Ypsilothuriidae

Ypsilothuria bitentaculata Ludwig, 1893
$1318 – 4000 \text{ m}$

Dendrochirotida

Psolidae

Psolidium bidiscum Lambert, 1996
$0 – 220 \text{ m}$

Psolus chitonoides Clark, 1901
$0 – 247 \text{ m}$

Psolus squamatus (Koren, 1844)
$37 – 1061 \text{ m}$

Cucumariidae

Cucumaria frondosa japonica (Gunnerus, 1767)
$25 – 130 \text{ m}$

Cucumaria miniata (Brandt, 1835)
$0 – 225 \text{ m}$

Cucumaria pallida Kirkendale and Lambert, 1995
$0 – 91 \text{ m}$

Cucumaria piperata (Stimpson, 1864)
$0 – 137 \text{ m}$

Cucumaria pseudocurata Deichmann, 1938
intertidal

Cucumaria vegae Théel, 1886
intertidal

Pseudothyone levini Lambert and Oliver, 2001
$0 – 70 \text{ m}$

Phyllophoridae

Pentamera lissoplaca (H.L. Clark, 1924)
$0 – 90 \text{ m}$

Pentamera pediparva Lambert, 1998
$7 – 150 \text{ m}$

Pentamera populifera (Stimpson, 1864)
$0 – 256 \text{ m}$

Pentamera pseudocalcigera Deichmann, 1938
$22 – 300 \text{ m}$

Pentamera rigida Lambert, 1998
$18 – 421 \text{ m}$

Pentamera trachyplaca (H.L. Clark, 1924)
$0 – 27 \text{ m}$

Thyone benthi Deichmann, 1937
$0 – 135 \text{ m}$

Sclerodactylidae

Eupentacta pseudoquinquesemita Deichmann, 1938
$0 – 200 \text{ m}$

Eupentacta quinquesemita (Selenka, 1867)
$0 – 55 \text{ m}$

Pseudothyone levini Lambert and Oliver, 2001
$0 – 70 \text{ m}$

Molpadiida

Molpadiidae

Molpadia musculus Risso 1826
$800 – 3000 \text{ m}$

Molpadia intermedia (Ludwig, 1894)
$7 – 2925 \text{ m}$

Caudinidae

Hedingia californica (Ludwig, 1894)
$595 – 2850 \text{ m}$

Paracaudina chilensis (Müller, 1850)
$0 – 100 \text{ m}$
Apopida

Synaptidae

- *Leptosynapta clarki* Heding, 1928: 0 – 73 m
- *Leptosynapta transgressor* Heding, 1928: 6 – 40 m

Chiridotidae

- *Chiridota albatrossii* Edwards, 1907: 46 – 732 m
- *Chiridota discolor* Eschscholtz, 1829: intertidal SE Alaska
- *Chiridota nanaimensis* Heding, 1928: 46 m

**ASTEROIDEA (Sea Stars - 89 species in BC)**

**Paxillosida**

Luidiidae

- *Luidia foliolata* Grube, 1866: 4 – 613 m

Astropectinidae

- *Dipsacaster anoplus* Fisher, 1910: 146 – 2200 m
- *Dipsacaster borealis* Fisher, 1910: 201 – 1195 m
- *Dipsacaster laetmophilus* Fisher, 1910: 1271 – 1903 m
- *Leptychaster anomalous* Fisher, 1906: 59 – 1258 m
- *Leptychaster arcticus* (Sars, 1851): 40 – 1261 m
- *Leptychaster inermis* (Ludwig, 1905): 1180 – 2000 m
- *Leptychaster pacificus* Fisher, 1906: 10 – 435 m
- *Psilaster pectinatus* (Fisher, 1905): 1500 – 3000 m
- *Thrissacanthias penicillatus* (Fisher, 1905): 507 – 1503 m

Porcellanasteridae (Deep-sea Mud Stars)

- *Eremericaster pacificus* (Ludwig, 1905): 1570 – 4090 m
- *Eremericaster crassus* (Sladen, 1883): 1570 – 6330 m

Ctenodiscidae

- *Ctenodiscus crispatus* (Retzius, 1805): 10 – 1890 m

**Notomyotida**

Benthopectinidae

- *Benthopecten acanthonotus* Fisher, 1905: 1800 – 2125 m
- *Benthopecten claviger claviger* Fisher, 1910: 1100 – 2400 m
- *Benthopecten mutabilis* Fisher, 1910: 2870 m
- *Cheiraster dawsoni* (Verrill, 1880): 73 – 384 m
- *Nearcaster aciculosus* (Fisher, 1910): 84 – 1492 m
- *Nearcaster variabilis variabilis* (Fisher, 1910): 198 – 1061 m
- *Pectinaster agassizi evoplus* (Fisher, 1910): 1100 – 2200 m

**Valvatida**

Asterinidae

- *Patiria miniata* (Brandt, 1835): 0 – 302 m

Poraniidae

- *Poraniopsis inflatus inflatus*: 11 – 366 m

Goniasteridae

- *Ceramaster arcticus* (Verrill, 1909): 0 – 186 m
- *Ceramaster clarki* Fisher, 1910: 611 – 1098 m
- *Ceramaster japonicus* (Sladen, 1889): 195 – 1438 m
- *Ceramaster patagonicus* (Sladen, 1889): 10 – 245 m
- *Cladaster validus* Fisher, 1910: 116 – 621 m
- *Cryptopeltaster lepidonotus* Fisher, 1905: 486 – 1244 m
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<tr>
<th>Genus</th>
<th>Species</th>
<th>Depth range</th>
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<td><strong>Gephyreaster</strong></td>
<td>swifti (Fisher, 1905)</td>
<td>11 – 344 m</td>
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<td><strong>Hippasteria</strong></td>
<td>californica Fisher, 1905</td>
<td>300 – 2200 m</td>
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<td>spinosa Verrill, 1909</td>
<td>10 – 512 m</td>
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<td><strong>Mediaster</strong></td>
<td>aequalis Stimpson, 1857</td>
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<td>tenellus Fisher, 1905</td>
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<td>dissonus Fisher, 1910</td>
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<td>parelii (Duben and Koren, 1846)</td>
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<td>alascensis Fisher, 1905</td>
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<td><strong>Asteropseidae</strong></td>
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<td><strong>Dermasterias</strong></td>
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<td><strong>Solasteridae</strong></td>
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<td><strong>Crossaster</strong></td>
<td>papposus (Linnaeus, 1767)</td>
<td>0 – 1200 m</td>
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<td><strong>Heterozonia</strong></td>
<td>alternatus (Fisher, 1906)</td>
<td>302 – 1594 m</td>
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<td>furcilliger Fisher, 1905</td>
<td>229 – 2125 m</td>
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<td>furcilliger vexator Fisher, 1910</td>
<td>21 – 670 m</td>
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<td>dawsoni Verrill, 1880</td>
<td>0 – 420 m</td>
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<td>endeca (Linnaeus, 1771)</td>
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<td>paxillatus Sladen, 1889</td>
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<td>stimpsoni Verrill, 1880</td>
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<td>sp. B</td>
<td>571 – 621 m</td>
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<td><strong>Pterasteridae</strong></td>
<td>(Cushion Stars)</td>
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<td><strong>Diplopteraster</strong></td>
<td>multipes (Sars, 1865)</td>
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<td>koehleri Fisher, 1910</td>
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<td>perissonotus Fisher, 1910</td>
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<td>quadrispinosus Fisher, 1905</td>
<td>1097 – 3610 m</td>
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<td>coscinopeplus Fisher, 1910</td>
<td>857 – 1942 m</td>
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<td>jordani Fisher, 1905</td>
<td>457 – 1903 m</td>
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<td>marsippus Fisher, 1910</td>
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<td>militaris (Müller, 1776)</td>
<td>10 – 1100 m</td>
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<td>tesselatus Ives, 1888</td>
<td>6 – 436 m</td>
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<td>trigonodon Fisher, 1910</td>
<td>706 – 1259</td>
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<td><strong>Myxasteridae</strong></td>
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<td>fisheri Alton, 1966</td>
<td>1152 – 1922 m</td>
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<td><strong>Korethrasteridae</strong></td>
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<td><strong>Spinulosida</strong></td>
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<td><strong>Echinasteridae</strong></td>
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<td><strong>Henricia</strong></td>
<td>aspera aspera Fisher, 1906</td>
<td>6 – 904 m</td>
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<td>asthenactis Fisher 1910</td>
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<td>clarki Fisher, 1910</td>
<td>227 – 1955 m</td>
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<td>leviscula leviscula (Stimpson, 1857)</td>
<td>0 – 400 m</td>
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<td><strong>Henricia</strong></td>
<td>leviscula annectens Fisher, 1910</td>
<td>10 – 228 m</td>
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<td>leviscula spicularia Clark, 1901</td>
<td>9 – 680 m</td>
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<td>longispina longispina Fisher, 1910</td>
<td>28 – 512 m</td>
</tr>
<tr>
<td><strong>Henricia</strong></td>
<td>polyacantha Fisher, 1906</td>
<td>227 – 1171 m</td>
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</tbody>
</table>
Henricia sanguinolenta (Müller, 1776)  15 – 518 m

Forcipulatida (Sea Stars with pedicellariae)

Zoroasteridae

Myxodera sacculatum (Fisher, 1905)  329 – 2012 m
Sagenaster evermanni (Fisher, 1905)  100 – 2710 m
Zoroaster ophiurus Fisher, 1905  696 – 2300 m

Asteriidae

Evasterias troschelii (Stimpson, 1862)  0 – 75
Leptasterias aequalis sp. complex  intertidal/shallow
Leptasterias alaskensis sp. complex  intertidal/shallow
Leptasterias hexactis sp. complex  intertidal/shallow
*Leptasterias coei Verrill, 1914  18 – 187 m
Leptasterias polaris katherinae (Grey, 1840)  intertidal to 10 m
*Leptasterias nanimensis (Verrill, 1914)  0 – 224 m
Orthasterias koehleri (de Loriol, 1897)  0 – 230 m
Pisaster brevispinus (Stimpson, 1857)  0 – 128 m
Pisaster ochraceus (Brandt, 1835)  0 – 97 m
Pycnopodia helianthoides (Brandt, 1835)  0 – 120 m
Styasterias forreri (de Loriol, 1887)  6 – 532 m

Pedicellasteridae

Ampheraster marianus (Ludwig, 1905)  507 – 1240 m
Anteliaster coscinactis Fisher, 1923  817 – 950 m
Pedicellaster magister Fisher, 1923  77 – 1776 m
Tarsaster alaskanus Fisher, 1928  198 – 2100 m

Labidiasteridae

Rathbunaster californicus Fisher, 1906  134 – 675 m

Brisingididae

Brisingidae (Deep-sea Suspension feeders)

Brisinga synaptoma (Fisher, 1917)  1353 – 3176 m

Freyellidae

Astrocles actinodetus Fisher, 1917  2870 – 4200 m
Freyella microplax (Fisher, 1917)  1722 – 3176 m
Freyellaster fecundus (Fisher, 1905)  880 – 2124 m

Hymenodiscididae (after Mah, 1997)

Astrolirus panamensis (Ludwig, 1905)  1353 – 2418 m
Hymenodiscus pannychia (Fisher, 1928)  1410 – 2300 m
Hymenodiscus pusilla (Fisher, 1917)  602 – 2118 m
GLOSSARY OF TERMS

**Aboral surface** – The side opposite to the mouth. In most echinoderms this refers to the dorsal side of the body.

**Ambulacral furrow** – Furrow (groove) on the oral side of each arm that houses the tube feet. This is formed by pairs of ambulacral plates.

**Ambulacral plate** – In the echinoids these plates are found in between the interambulacral plates. The ambulacral plates are associated with the water vascular system and have pores to allow the tube feet to penetrate the test.

**Ampulla** – The ampulla is a bulb-like reservoir at the base of a tube foot. The contraction of the ampulla causes the tube foot to extend; much like squeezing one end of a balloon causes the other end to swell.

**Aristotle’s Lantern** – The five-sided jaw apparatus found only in the Echinoidea. It is made up of five plate-like teeth and numerous ligaments, muscles and levers.

**Arm** – An appendage radiating out laterally from the disc. Found in the asteroids, crinoids and ophiuroids.

**Asexual** – A form of reproduction that does not involve the gametes of two separate individuals. Asexual reproduction results in offspring that are clones of the parent.

**Benthic** – Pertaining to the benthos or bottom of a body of water. Benthic organisms live on or in the substrate.

**Brachial** – In the crinoids this is a calcareous segment. The brachials, connected by ligaments, muscles and fibers, form the arms. In the ophiuroids brachial refers to structures attached to the arm.

**Cilia** – Cilia are hair-like structures, found in many groups of invertebrates, which move to create small water currents.

**Circular muscles** – The circular muscles encircle the body. They are found in the Holothuroidea and they run perpendicular to the longitudinal muscles.

**Cirri** – Appendages at the base of a feather star (Crinoidea) that are used to grasp the substrate.

**Coelom** – A fluid filled cavity inside the mesoderm.

**Commensal** – An organism that lives in close association with another species but does not provide benefits to the other organism or cause it harm.
**Conspecific** – The term conspecific refers to other members of the same species. For example in a congregation of sea urchins the members of species “A” would all be conspecific to one another. The members of species ‘A’ would be heterospecific to members of species ‘B’.

**Dendritic tentacles** – A type of feeding tentacle found in suspension feeding holothuroids (sea cucumbers). This type of tentacle is highly branched and is feathery or fern-like in appearance.

**Deposit feeding** – Deposit feeders obtain nutrients by consuming detritus located in the substrate.

**Digitate tentacles** – A type of feeding tentacle found in some holothuroids that ingest sediment while they burrow into the substrate. This type of tentacle resembles a cross or four-pointed star on a short stalk.

**Disc** – The central part of the sea star body to which the arms attach.

**Distal** – The portion of an organism located away from the central axis or disc of an organism.

**Dorsal** – The back or top side of an animal. In the asteroids and ophiuroids this is the same side as the aboral side.

**Endoskeleton** – An internal skeleton covered by skin and muscles. Vertebrates and some invertebrates have endoskeletons.

**Epidermis** – This is the outermost layer of tissue (i.e. the skin) and forms a barrier between the organism and the outside environment.

**Evert** – To turn a body part inside out. Some sea stars feed by everting their stomach. That is they push their stomach through their mouth so that it is outside of their body.

**Gonads** – The sex organs.

**Gonopore** – In echinoderms, the opening in the body wall through which eggs and sperm are released.

**Hermaphrodite** – An organism that has both male and female sex organs. Hermaphrodites can have both male and female sex organs at the same time (simultaneous hermaphrodite). Alternatively they can change from being a male to a female, or vice versa, over the course of their life (sequential hermaphrodite).

**Heterospecific** – Members of different species. For example in a congregation of sea urchins the members of species “A” would be heterospecific to members of species “B”.

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Phil Lambert
**Interambulacral plate** – In the echinoids these plates are found between the ambulacral plates. There are no pores for tube feet in the interambulacral plates.

**Juxtaligamental cells** – These are special cells in echinoderms that are associated with, and control, through their secretions, mutable collagenous tissue.

**Longitudinal muscles** – These are muscles the run the length of an organism. For example in the sea cucumbers (Holothuroidea) bands of longitudinal muscles run along the long axis from end to end.

**Mamelon** – A knob-like tubercle to which moveable spines attach. These are found only in the Echinoidea (urchins, sand dollars).

**Madreporite** – A perforated ossicle through which water enters the water vascular system.

**Mesoderm** – Mesoderm is the middle of the three basic tissue layers in an organism. Some invertebrates (i.e. sponges and jelly fish) do not have mesoderm.

**Morphology** – The overall shape of an organism and the structure of its parts.

**Mutable collagenous tissue** – This type of tissue is found only in the echinoderms and can rapidly change from a soft to a rigid state. The change in state is due to changes in the physical nature of the tissue, mediated by the juxtaligamental cells. The nervous system controls the mutable collagenous tissue.

**Oral surface** – The side of an organism that contains the mouth.

**Ossicle** – A single calcified element of an echinoderm endoskeleton.

**Papulae** – Functionally, these are the gills of a sea star and serve in respiration and waste removal. They are thin walled, small and found on the aboral surface of asteroids.

**Pedicellariae** – These are small pincher-like structures that occur on the outside of many echinoderms. They consist of a muscular stem with a jaw-like head (usually three jaws).

**Pelagic** – Relating to or living in the middle layers of the water column (i.e. not on the bottom and not at the surface).

**Peltate tentacles** – A type of feeding tentacle found in surface deposit feeding holothuroids. This type of tentacles somewhat resembles a head of broccoli.

**Pentaradial symmetry** - A type of radial symmetry, characteristic of echinoderms, in which body parts are arranged along five rays of symmetry.
**Pinnate tentacles** – A type of feeding tentacle found in some holothuroids that ingest sediment while they burrow.

**Pinnule** – A side branch of a brachial in crinoids (sea lilies and feather stars).

**Podia** – Another name for tube feet.

**Proximal** – Close to center of the disc or central axis of an organism.

**Radial canal** – The radial canals are part of the water vascular system and branch off the ring canal. The radial canal occurs internally and adjacent to the ambulacral furrow or plate.

**Ring canal** – The ring canal is part of the water vascular system and surrounds the mouth.

**Sedentary** – Organisms that lead a sedentary lifestyle have the ability to move, though often only very slowly, but normally do not move. For example, suspension feeding sea cucumbers are usually sedentary, only moving to reach areas with better water currents or to evade predators.

**Sessile** – Sessile organisms are permanently attached or fixed to the substrate and are unable to move. Some crinoids (e.g. sea lilies) are often considered sessile.

**Suspension feeding** – Suspension feeding is often called filter feeding. Animals that suspension feed strain food particles out of the water using specialized structures and/or a mucus coating.

**Syzygy joints** – In the crinoids, a non-muscular rigid joint between two brachials. The joint resembles a perforated line.

**Tube feet** – In the echinoderms these are hollow cylindrically shaped extensions of the water vascular system that function in respiration, locomotion and food collection.

**Test** – The hard spherical or semi-spherical skeleton of a sea urchin. The test is made up of many small plates made of fused ossicles.

**Ventral** – Usually the lower part of an invertebrate animal closest to the substrate. In the asteroids and ophiuroids this is the same side as the oral side.

**Water vascular system** – A system of water filled canals and chambers that uses hydraulic pressure and muscle contractions to operate the tube feet.
REFERENCES


