Subclass Protobranchia  
Order Nuculida  
Family Nuculidae

1. Taxodont dentition  
2. Umbos opisthogyrate, beak pointing posteriorly  
3. Ligament amphidetic, internal  
4. Hinge teeth V-shaped, on both sides of beaks; separated by deep resilifer  
5. Inner ventral margin with or without crenulations
Acila

1. Shell ovate to quadrate, equivale
2. Posterior end truncate
3. Sculpture of divaricate radial riblets
4. Resilifer large, projecting anteriorly
5. Ventral shell margin crenulate
Acila castrensis (Hinds 1843)
Acila castrensis (Hinds 1843)

Specimens courtesy of Carol Paquette MBC
Acila castrensis (Hinds 1843)

left valve
right valve

MMS Hard Bottom 017A/B 190m 1984

Specimen courtesy of Carol Paquette MBC
Ennucula

1. Shell subovate to subtrigonal
2. Posterior end not quadrate
3. Sculpture of commarginal striae
4. Resilifer large, projecting anteriorly
5. Ventral shell margin not crenulate
Ennucula linki (Dall 1916)

Cascadia Slope EB5-64 950m 5 July 1975
Specimen courtesy of Kelvin Barwick via Don Cadien
Ennucula linki (Dall 1916)
Ennucula linki (Dall 1916)

Cascadia Slope EB5-64 950m 5 July 1975
Specimen courtesy of Kelvin Barwick via Don Cadien
Ennucula tenuis (Montagu 1808)

City of San Diego E9 114m 2019
Specimens courtesy of Wendy Enright City of San Diego
Ennucula tenuis (Montagu 1808)

City of San Diego B9 101m 2019
Specimen courtesy of Wendy Enright City of San Diego

City of San Diego E9 114m 2019
Ennucula tenuis (Montagu 1808)

B’18 10246 East Santa Barbara Channel 44m

left valve  
right valve
Nucula

1. Shell subovate to subtrigonal
2. Posterior end not truncate
3. Sculpture usually cancellate or only with commarginal riblets
4. Small resilifer, not projecting
5. Ventral shell margin crenulate
Nucula carlottensis Dall 1897

Specimens courtesy of Kelvin Barwick via Don Cadien
Nucula carlottensis Dall 1897

Specimens courtesy of Kelvin Barwich via Don Cadien

Cascadia Slope EB5-64 950m 5 Jul 1975
Nucula carlottensis Dall 1897

Cascadia Slope EB5-64 950m 5 Jul 1975
Specimen courtesy of Kelvin Barwick via Don Cadien
Nucula exigua G.B. Sowerby I 1833

Chevron B8N (3) 7m 2017

left hinge  right hinge
Nuculidae juveniles

Upper – *Ennucula linki*
Lower – *Nucula carlottensis*

Upper – *Ennucula tenuis*
Lower – *Acila castrensis*
Order Solemyida
Family Solemyidae

1. Hinge edentate; ligament external or internal
2. Chondrophore present or absent
3. Posterior end rounded or subquadrate
4. Periostracum light brown to black, silky to shiny, with projections
Acharax

1. Ligament external, projecting, attached to nymph
2. Chondrophore absent
Acharax johnsoni (Dall 1891)

DB13, 18OCT05, 542 m

Photo courtesy of Kelvin Barwick
Petrasma

1. Ligament internal, with ovate lateral extension
2. Chondrophore present, anterior to internal ligament
Petrasma pervernicosa (Kuroda 1948)

Upper – Santa Monica Bay E6 153m 1976
Lower – B’94 Santa Monica Bay 1052 220m

Upper – Santa Monica Bay E6 153m 1976
Lower – B’13 San Pedro Shelf 31m
Acharax johnsoni/Petrasma pervernicaosa

DB13, 18OCT05, 542 m

Santa Monica Bay E6 153m 1976
Acharax johnsoni/Petrasma pervernicosa

Notice the difference in the hinges and the placement of the ligament

PDF courtesy of Megan Lilly
Family Nucinellididae

1. Ligament internal
2. Hinge teeth 6 or fewer, mostly on one side of beak
Huxleyia munita (Dall 1898)

B’13 Station 9357 75m Northern Channel Islands

External (upper) and Internal (lower) valves
Order Nuculanida  
Family Bathyspinululidae  

1. Taxodont dentition, separated by small resilifer  
2. Ligament external, amphidetic, small internal resilium  
3. Hinge teeth V-shaped, on both sides of beaks, unequal
“Tindariopsis” grasslei (J.A Allen 1993)

Left valve

Right valve

Holotype USNM 859482
Photos courtesy of Dr. Paul Valentich Scott
“Tindariopsis” grasslei (J.A Allen 1993)

Left valve

Paratype USNM 859481
Photos courtesy of Dr. Paul Valentich Scott SBMNH
Family Nuculanidae

1. Taxodont dentition, separated by small resilifer
2. Ligament amphidetic, mainly internal
3. Hinge teeth V-shaped in most, on both sides of beaks, unequal
4. Inner ventral margin without crenulations
5. Pallial sinus absent, shallow or moderate
Ledella

1. Posterior end produced, set of by shallow radial fold
2. Umbos prominent
3. Sculpture of commarginal ribs or striae
4. Ligament internal, within minute resilifer
5. All teeth V-shaped, anterior and posterior nearly equal in length
**Nuculana**

1. Posterior end strongly rostrate
2. Umbone small, opisthogyrate
3. Strong to weak commarginal ribbing
4. Escutcheon well-defined, lunule smooth
5. Ligament internal, with small resilifer
6. All teeth V-shaped
Nuculana hamata (Carpenter 1864)

B’13 9360 Northern Channel Islands  88m
**Nuculana hamata** (Carpenter 1864)

Santa Monica Bay NB5 57m 2014

BNOYOA Central R-21 93m 1982

Specimen courtesy of Carol Paquette MBC
Nuculana hamata (Carpenter 1864)

B’13 9274 Northern Channel Islands 72m
B’18 10244 Oxnard 81m
Nuculana hamata juv/Nuculana sp juv

B’18 10244 East Santa Barbara Channel 81m
B’13 9376 Northern Channel Islands 110m
Nuculana leonina (Dall 1896)

Farallon Islands 370m 1977
Specimen courtesy of Carol Paquette MBC
Nuculana leonina (Dall 1896)

Cascadia Slope Oregon 950m
Photo courtesy of Kelvin Barwick
Nuculana minuta (Muller 1776)

Willapa Bay, Puget Sound 25m NCCA15 TetraTech 2015
Nuculana minuta (Muller 1776)

escutcheon

lunule
Nuculana minuta (Muller 1776)

Puget Sound 10m NCCA20 TetraTech 2020
posterior                     anterior
1. Shell “club shaped”
2. Rostrum long
3. Prodissoconch with net-like sculpture
4. Escutcheon well defined by ridge, lunule poorly defined
5. Sculpture of commarginal ribs or striae
6. Lamellar teeth, few in number, on both sides of umbos; all other teeth V-shaped
7. Long internal ridge running from umbo to posterior margin
Propeleda conceptionis (Dall 1896)

MMS Phase I 025-B2R-01-TX 433 m 1984
Specimens courtesy of Carol Paquette MBC
Propeleda conceptionis (Dall 1896)

Orange County Deep G-6 trawl 1983
Specimen courtesy of Carol Paquette MBC
Propeleda conceptionis (Dall 1896)

Orange County Deep G-6 trawl 1983
photo courtesy of Kelvin Barwick
Propeleda conceptionis (Dall 1896)

Orange County Deep G-12 trawl 1983
Propeleda sp B (SCAMIT 2013)

B’13 9281 Santa Monica Canyon 448m
Propeleda sp B (SCAMIT 2013)

B’03 5034 394m (photo courtesy of Kelvin Barwick)

B’08 7428 Santa Monica Bay 400m
Propeleda sp B (SCAMIT 2013)

Photos courtesy Kelvin Barwick
Propeleda sp B (SCAMIT 2013)

Photos courtesy of Kelvin Barwick
1. Shell subovate-elongate to subtrigonal, moderately inflated
2. Rostrum rounded to bluntly pointed
3. Escutcheon sunken with medial ridge, lunule weakly defined
4. Sculpture usually of strong commarginal ribs
5. Teeth all V-shaped
6. Prodissoconch with net-like sculpture
Saccella taphria (Dall 1896)

Long Beach Harbor Anchor GWMA LB12 10m 2018
Saccella taphria (Dall 1896)
Saccella taphria (Dall 1896)

San Francisco PUC Stn 63 29m  Photo courtesy of Kelvin Barwick

San Pedro Bay 15m 2015
Sacculina sp A SCAMIT 2006

Santa Monica Bay 89m 2016
Saccula sp A SCAMIT 2006

Photos courtesy of Kelvin Barwick
Saccella sp A SCAMIT 2006

Photos courtesy of Kelvin Barwick
Saccella taphria/Saccella sp A (juvenile)

OCSD Station 9 61m July 17, 2019
Saccella sp OC1 Barwick 2015

Photos courtesy of Kelvin Barwick
Saccella sp OC1 Barwick 2015

Santa Monica Bay E10 151m 2015
Saccella sp A/Saccella sp OC1
Saccella sp A/Saccella sp OC1
*Saccella* sp A/*Saccella* sp OC1
Saccella sp A/Saccella sp OC1
Saccella cf penderi (Dall & Bartsch 1910)

AGSS off San Gabriel River 13m 1991
Specimen courtesy of Carol Paquette MBC
Saccella cf penderi (Dall & Bartsch 1910)

CSD Voucher M292 A12 50m 1990
Saccella cf penderi (Dall & Bartsch 1910)
Saccella cf penderi (Dall & Bartsch 1910)

Santa Monica Bay C7 60m 2014
Santa Monica Bay C7 59m 2015
Saccula cf penderi (Dall & Bartsch 1910)

Santa Monica Bay C7 60m 2014

adult escutcheon/lunule juvenile
**Saccella penderi** (Dall & Bartsch 1910)

Photos courtesy of Kelvin Barwick

**Paratype (CAIZ0644424)**

**Ledea penderi** Dall & Bartsch, 1910

**Syntype USNM 211606**

Syntype (USNM 211606)
Saccula penderi (Dall & Bartsch 1910)/
Saccula cf penderi (Dall & Bartsch 1910)

Paratype (CAIZ0464424)

AGSS offshore San Gabriel River 13m 1991
Saccella penderi (Dall & Bartsch 1910)/
Saccella cf penderi (Dall & Bartsch 1910)

Paratype (CAIZ0644424)

CSD Voucher M292 A12 50m 1990
Family Malletiidae

1. Taxodont dentition, resilifer absent
2. Ligament opisthodetic, external in groove
3. Hinge teeth V-shaped, on both sides of beaks, uneven
4. Inner ventral margin without crenulations
5. Shell irregular in outline, very thin
Malletia faba Dall 1897

City of San Diego DB07 401m 2005
Specimen courtesy of Wendy Enright City of San Diego
Malletia faba Dall 1897

Specimens courtesy of Kelvin Barwick via Don Cadien

Cascadia Slope EB5-64 950m 5 Jul 1975
Malletia pacifica Dall 1897

B’08 7479 Santa Monica Bay 397m
Malletia pacifica Dall 1897

CSD Voucher M361 DB07 401m 2005
Specimen courtesy of Wendy Enright City of San Diego
Malletia pacifica Dall 1897

CSD Voucher M361 DB07 401m 2005
Specimen courtesy of Wendy Enright City of San Diego
Family Neilonellidae

1. Taxodont dentition, gap between teeth, resilifer absent
2. Ligament opisthodetic, external in groove
3. Hinge teeth V-shaped, on both sides of beaks, uneven
4. Pallial line obscure, pallial sinus unclear
5. Inner ventral margin without crenulations
Neilonella ritteri (Dall 1916)

Specimens courtesy of Carol Paquette MBC
Neilonella ritteri (Dall 1916)

Specimens courtesy of Carol Paquette MBC
Family Yoldiidae

1. Taxodont dentition in two unequal series, separated by large resilifer
2. Ligament amphidetic, partly internal, in resilifer
3. Hinge teeth V-shaped, on both sides of beaks
4. Inner ventral margin without crenulations
5. Pallial line with sinus
Megayoldia

1. Shell inequilateral
2. Posterior end expanded, rostrate to truncate
3. Posterior margin produced, with inflected dorsal edge
4. Sculpture absent, or incremental striae
5. Escutcheon delimited, lunule absent
Megayoldia thraciaeformis (Storer 1838)

MMS CARP T7 SB28 600m 11/24/87
Specimen courtesy of John Ljubenkov voucher collection
Megayoldia thraciaeformis (Storer 1838)

MMS CARP T7 SB28 600m 11/24/87
Specimen courtesy of John Ljubekov voucher collection
Megayoldia thraciaeformis (Storer 1838)

MMS CARP T7 SB28 600m 11/24/87
Specimen courtesy of John Ljubenkov voucher collection
Megayoldia thraciaeformis (Storer 1838)

MMS CARP T7 SB28 600m 11/24/87
Specimen courtesy of John Ljubenkov voucher collection
Yoldia

1. Shell inequilateral
2. Posterior end expanded, rostrate to truncate
3. Posterior margin produced, with inflected dorsal edge
4. Sculpture absent, or concentric ribbing
5. Escutcheon delimited, lunule absent
Yoldia cooperi Gabb 1865
Yoldia cooperi Gabb 1865

ISS Point Reyes 0223QX13 9/9/04
Yoldia cooperi Gabb 1865

Avila Beach 10m 2012
Yoldia seminuda Dall 1871

B’18 10322 West Santa Barbara Channel 288m
Yoldia seminuda Dall 1871

LACSD 5A 305m 2015 (above)

MMS CARP T3 198m 1987 (upper right)

LACSD Z4D 30m 1984(right)

LACSD specimens courtesy of Don Cadien
MMS specimen courtesy of Carol Paquette MBC
Yoldiella

1. Shell inequilateral to subequisilateral
2. Periostracum polished
3. Sculpture absent, or with weak commarginal striae
4. Escutcheon and lunule weak
5. Teeth separated by elongate resilifer
6. Ligament amphidetic
Yoldiella nana (M. Sars 1865)

B13 9309 Hueneme to Dume 499m
Family Tindariidae

1. Taxodont dentition, continuous with no gap, resilifer absent
2. Ligament opisthodetic, external, partly sunken in groove
3. Hinge teeth V-shaped, on both sides of beaks
4. Inner ventral margin without crenulations
Tindaria kennerlyi (Dall 1897)

Specimens courtesy of Carol Paquette MBC
Nuculanida (juvenile)

Yoldiidae Yoldiella

CSD Sta.DS1, 25APR03, 500m
0.5 mm fraction

Neilonellidae Neilonella

Yoldiidae Megayoldia
Nuculanida (juvenile)

Nuculana taphria vs Yoldia cooperi

K. Barwick, 2008 (revised 13SEP2021)

Yoldia cooperi Gabb, 1865 - A. Juvenile growth series (scale bar = 1 mm), B. Detail of smallest specimens in series. (CCSF voucher BSSW, C091, Sept. 1987)

Nuculana taphria (Dall, 1896) - C. Juvenile growth series (scale bar = 1 mm), D. Detail of smallest specimens in series. (CCSF voucher SWOO A134, St. 63 (0.5-1.0mm), 9-23-99)

PDF courtesy of Kelvin Barwick