

# Supporting research pipelines through the creation of stratigraphic and taxonomic concordances



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# Collaborator Map



**UCMP PIs:** Charles Marshall (Lead PI, UCMP Director), Seth Finnegan, Pat Holroyd, Lisa White

**Collaborating PIs:** Pat Druckenmiller (UAM), Liz Nesbitt (Burke), Edward Davis (UO), Peter Roopnarine (CAS), Jann Vendetti (LACM), Greg Dietl (PRI)

**Unfunded collaborators:** Cooper Center (Nicole Bonuso), Smithsonian NMNH (Kathy Hollis)

# EPICC TCN

- Eastern Pacific Invertebrate Communities of the Cenozoic
- NSF funded initiative to catalog 1.6 million marine invertebrates over 66 million years of Earth's history
- Currently 665k digitized specimens, 21k photographed specimens, 14k georeferenced localities



A-7586

*Pecten coalingensis*

Arnold

+ *Balanus* (T.) *gargarius?*

Arnold - 1906 Pl. 4

Fig 4

San Joaquin Fm.



~~A-7586~~

University of California  
Museum of Paleontology

A-7586

*Balanus* (*Balanus*) cf. *improvisus*

Loc. A7586 / UCMP 127750

Sessilia: Balanidae

*Balanus amphitrite inexpectatus* cf. species

Elem: shell with barnacles

ID by

Pliocene

California

Fm: San Joaquin

Kings Co.

Collector:

FldNo:

UNIV. of CA MUSEUM of PALEONTOLOGY

*Balanus* cf. *amphitrite*  
*inexpectatus*

LOC. .... (CAS)

U.C.M.P. A-7586

HYPOTYPE

ZULLO

IDENTIFIED BY.....  
DEPARTMENT OF GEOLOGY  
CALIFORNIA ACADEMY OF SCIENCES

HYPOTYPE

# 32

UNIVERSITY OF CALIFORNIA  
MUSEUM OF PALEONTOLOGY

No. A-7586 1127750

B. cf. B. a. *inexpectatus*

# Existing taxonomic standards

- World Register of Marine Species focused on recent specimens
- Paleobiology Database incomplete





# EPICC Taxonomic concordance

- 5300+ entries to date
- Based on taxonomic authority papers
- Started with Recent and Quaternary mollusks (Austin Hendy, LACM); provides robust framework for introduction of taxonomic names from older fossil literature
- Collaboration with taxonomic experts to add additional groups (i.e., Decapoda, Echinodermata, Patellogastropoda) and reconcile outdated taxonomic concepts

Created by	Date Created	Category	Reference	Kingdom	Phylum	Class	Order	Family	Genus	Subgenus	Species
LACMIP	2/7/2017	C	McLean (2013)	Animalia	Mollusca	Gastropoda		Acmaeidae	<i>Acmaea</i>		<i>mitra</i>
LACMIP	2/7/2017	C	McLean (2013)	Animalia	Mollusca	Gastropoda	Cephalaspidea	Acteocinidae	<i>Tornastra</i>		<i>cerealis</i>
LACMIP	2/7/2017	C	McLean (2013)	Animalia	Mollusca	Gastropoda	Cephalaspidea	Acteocinidae	<i>Tornastra</i>		<i>culcitella</i>
LACMIP	2/7/2017	C	Hall (2002)	Animalia	Mollusca	Gastropoda	Cephalaspidea	Acteocinidae	<i>Acteocina</i>		<i>eximia</i>
LACMIP	2/7/2017	C	McLean (2013)	Animalia	Mollusca	Gastropoda	Cephalaspidea	Acteocinidae	<i>Acteocina</i>		<i>harpa</i>
LACMIP	2/7/2017	C	McLean (2013)	Animalia	Mollusca	Gastropoda	Cephalaspidea	Acteocinidae	<i>Acteocina</i>		<i>inculta</i>
LACMIP	2/7/2017	C	McLean (2013)	Animalia	Mollusca	Gastropoda	Cephalaspidea	Acteocinidae	<i>Tornastra</i>		<i>infrequens</i>
LACMIP	2/7/2017	C	McLean (2013)	Animalia	Mollusca	Gastropoda	Cephalaspidea	Acteocinidae	<i>Acteocina</i>		<i>oldroydi</i>
LACMIP	2/7/2017	C	Moore (1976)	Animalia	Mollusca	Gastropoda	Cephalaspidea	Acteonidae	<i>Acteon</i>		<i>chehalisensis</i>
LACMIP	2/7/2017	C	McLean (2013)	Animalia	Mollusca	Gastropoda	Cephalaspidea	Acteonidae	<i>Rictaxis</i>		<i>painei</i>
LACMIP	2/7/2017	C	Moore (1976)	Animalia	Mollusca	Gastropoda	Cephalaspidea	Acteonidae	<i>Acteon</i>		<i>parvuum</i>
Family	Genus	Subgenus	Species	Author	Original	Synonyms		Age Range	Fossil Distribution		
Acmaeidae	<i>Acmaea</i>		<i>mitra</i>	Rathke, 1833	<i>Acmaea mitra</i>	<i>Acmaea mitra</i>		IPI-R	California: Pico [various sources], San Diego [Powell et al. 1976]. Oregon: ?late Pleistocene [Addicott & Emerson, 1959].		
Acteocinidae	<i>Tornastra</i>		<i>cerealis</i>	(Gould, 1853)		<i>Tornastra cerealis</i>		R			
Acteocinidae	<i>Tornastra</i>		<i>culcitella</i>	(Gould, 1853)		<i>Acteocina culcitella</i> , <i>Tornatina culcitella</i>		ePI-R	California: Careaga Sandstone [Powell, unpubl. data], Pico [various sources].		
Acteocinidae	<i>Acteocina</i>		<i>eximia</i>	(Baird, 1863)		<i>Acteocina eximia</i>		IQ-R			
Acteocinidae	<i>Acteocina</i>		<i>harpa</i>	(Dall, 1871)		<i>Coleophysis harpa</i>		ePI-R	California: Fernando [Powell, unpubl. data].		
Acteocinidae	<i>Acteocina</i>		<i>inculta</i>	(Gould, 1855)		<i>Acteocina inculta</i>		R			
Acteocinidae	<i>Tornastra</i>		<i>infrequens</i>	(Adams, 1852)		<i>Acteocina anomala</i>		IQ-R			
Acteocinidae	<i>Acteocina</i>		<i>oldroydi</i>	Dall, 1925	<i>Acteocina oldroydi</i>	<i>Acteocina oldroydi</i>		R			
Acteonidae	<i>Acteon</i>		<i>chehalisensis</i>	(Weaver, 1916)	<i>Acteocina chehalisensis</i>	<i>Acteon chehalisensis</i>		E(p)-M(a)	Washinghton: †Lincoln Creek [Moore, 1976]. Oregon: Pico [Moore, 1976].		
Acteonidae	<i>Rictaxis</i>		<i>painei</i>	(Dall, 1903)		<i>Rictaxis painei</i> , <i>Rictaxis painei</i> sp. n.		IPI-R	California: Pico [various sources].		
Acteonidae	<i>Acteon</i>		<i>parvuum</i>	Dickerson, 1917	<i>Acteon parvuum</i>	<i>Acteon parvuum</i>		E(p)-O(r)	Washinghton: †Gries Ranch [Moore, 1976]. Oregon: Pico [Moore, 1976].		

# Marking occurrences by stratigraphy

- Stratigraphy is how paleontologists represent time and ecology of an animal's occurrence





NAME

DATE

Wheeler Ridge, Calif.  
Oct. 8, 1924.

Dear Dr. Clark:

Have recently collected some fossils from either San Lorenzo or Vaqueiros and so highly important that I know from which formation they came. I wonder if you would kindly look them over for me and send me a list of the species together with your opinion as to whether they belong to Vaqueiros or San Lorenzo. I shall be glad to make it right with you for your trouble.

Kindly keep the fossil until I call for them some time before Christmas.

The paper by Dr. Stock was received thanks very much.

With very best regards,

Sincerely

H. W. Hoots

9-181.

UNITED STATES GEOLOGICAL SURVEY.

SURVEY OF THE

No. F8-24

Name:

Field:

Determined:

San Emigdio foothills  
H. W. Hoots  
In charge.

18572

L. Vaqueiros (?)

Note Book:

Page:

6-1907

Hoots

may be San Lorenzo

UCMP Loc IP6518

Field No. F8-24

Other Loc No. USGS Cenozoic 18572

San Emigdio foothills

Oligocene, Miocene

Fm: Pleito

California

Kern Co.

Collector &amp; Date H.W. Hoots 1924/10/07

Fm: Pleito

GEOLOGICAL SURVEY

San Emigdio foothills

Loc No. 18572

Oligocene - Lower Miocene  
Pleito fm.

Coll. H.W. Hoots

San Lorenzo or Vaqueiros



# Stratigraphic concordances

- Updating outdated stratigraphic units
- Based on: USGS geologic lexicon, unpublished USGS geologic names committee archives, Macrostrat, with updates from recent literature
- Script-ready data tables uploaded to Data Dryad
- Written descriptions of problematic formations

# Stratigraphic concordances

- California (250+ stratigraphic units; Peter Kloess, UC Berkeley/UCMP)

Name_(in_Geolex)	Lithostratigraphic_Unit	Ages_(in_Geolex)	Formal Name? Yes_No	Non-marine? (per M
Gualala Fm	Formation	Late Cretaceous	Formal	Marine
Hambre Sst of Monterey Grp* (recognized locally in San Francisco region)	Formation	Miocene*	Formal	Marine
Hookton Fm	Formation	Pleistocene	Formal	non-marine: fluvial
Howard Canyon= no record			Informal	Not in Macrostrat
Hungry Valley Fm; Hungry Valley Fm of Ridge Basin Grp	Formation	Miocene, late; Pliocene, early	Formal	non-marine: lacustr
Hurricane Deck Fm	Formation	Tertiary; Miocene	Formal	Not given
Imperial Fm*	Formation	Miocene, late* to Pliocene, late(?)*	Formal	Marine
Ione Fm*	Formation	early Tertiary (Eocene)*	Formal	Marine
Irvington Grv	Formation	Pleistocene	Formal	Not given
Jacalitos Fm	Formation	Miocene; Pliocene	Formal	Marine
Jewett Sd*; /Freeman-Jewett Sh	Formation	Tertiary; Miocene, early*	Formal	Marine
Juncal Fm*	Formation	Eocene*	Formal	Not given
Kellogg Mbr of Nortonville Sh; Kellogg Sh Mbr of Markley Fm; Kellogg Sh	Member	Eocene	Formal	Not given
Kinton Point= no record			Informal	Not in Macrostrat
Kirker Tuff*	Formation	Oligocene*	Formal	Marine

# Stratigraphic concordances

- OR, WA, British Columbia (66 units; Liz Nesbitt, Burke Museum)

	Geolex Name	State	Other names used in literature	First published description & redefinitions	Geolex recognized Members and/or Group names	Epoch	ICS Age*
57	Lookingglass Formation	OR		Baldwin (1974)	Umpqua Group. Bushnell Rock, Olalla Creek and Tenmile members.	Early Eocene	<i>Yprisian-Bartonian</i>
58	Roseburg Formation	OR	Umpqua Formation	Baldwin (1974)	Umpqua Group	Early-Middle Eocene	<i>Yprisian</i>
59							
60	Siletz River Volcanics	OR	Metchosin Volcanics	Snively and Baldwin (1948)	Kings Valley Siltstone Member	Eocene	<i>Yprisian</i>
61	Fraser lowland glacial-marine deposits	WA			No official name	Pleistocene	
62	Sooke Formation	BC		Richardson (1876-1877); Clapp and Cook (1917)	Carmanah	Late Oligocene	<i>Chattian</i>
63	Formation	BC		Clapp and Cook (1917)		Oligocene - Miocene	<i>Rupelian-Chattian</i>
64	Hesquiate Formation	BC		Jeletsky (1975)	Carmanah	Oligocene	<i>Rupelian-Chattian</i>
65	Escalente Formation	BC		Bancroft (1837)	Carmanah	Eocene/Oligocene boundary	<i>Bartonian-Priabonian</i>
66	Metchosin Volcanics	BC	Metchosin Igneous Complex	Clapp (1910)		Paleocene-Eocene	



# Research uses of data

- TCN data served via individual IPT or VertNet IPT to iDigBio, GBIF, etc.
- Ecological and evolutionary response of marine species and communities to major environmental changes such as:
  - Paleocene-Eocene Thermal Maximum
  - Greenhouse-icehouse transitions
  - Opening of Bering Strait, closing of Panama Seaway
  - Contraction of the tropics

# Already available

- Have feedback on our approach or methods?
- Interested in using our data?
- Let me know:  
[eclites@berkeley.edu](mailto:eclites@berkeley.edu)
- Or visit us @  
<https://epicctcn.org>
- TCN products available
  - [Setting up GeoLocate collaborative portal](#)
  - [Guide to labeling marine invertebrates](#)
  - [Standard views of marine invertebrates for photography](#)



# Acknowledgements

- PIs, students, staff and volunteers of EPICC
- iDigBio staff and trainings
- Chuck Powell (USGS, retired) for access to Geographic Names Committee archives and contributions to CA stratigraphic units.
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