

How TDSB expeditions changed concepts of diversity and evolution of chemosymbiotic bivalves in family Lucinidae

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Lucinidae ca 450 living species



... sur les épaules des géants

Major French contributions to systematics of Lucinidae



Alcide d'Orbigny
1802-1857



Gérard Deshayes
1795-1875



Maurice Cossmann
1850-1924



Edouard Lamy
1866-1942

André Chavan



prior to molecular era Chavan (1969)
was standard classification



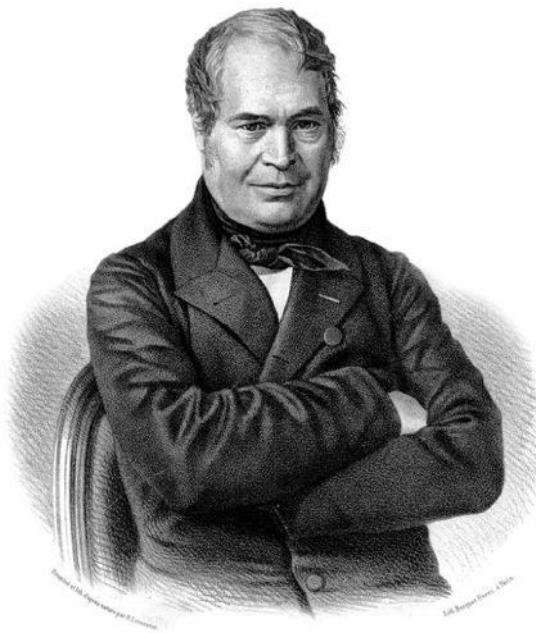
Rudo von Cosel & Philippe Bouchet

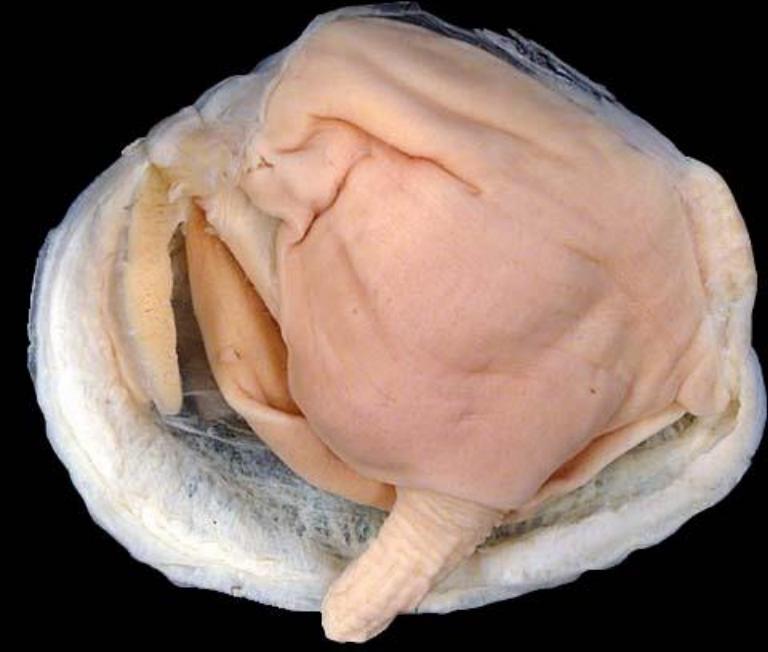
Remarkable prescience

Gérard Paul Deshayes, 1857

A mesure que se multiplient les recherches des naturalistes, le genre Lucine acquiert une plus grande importance; le nombre des espèces, tant vivantes que fossiles, s'accroît chaque jour; on le voit se répandre dans toutes les mers, parcourir toute l'échelle des terrains de sédiment.]

Ce n'est pas seulement par le nombre des espèces que le genre Lucine doit intéresser le naturaliste, c'est aussi par la diversité des formes et des caractères qu'il présente.

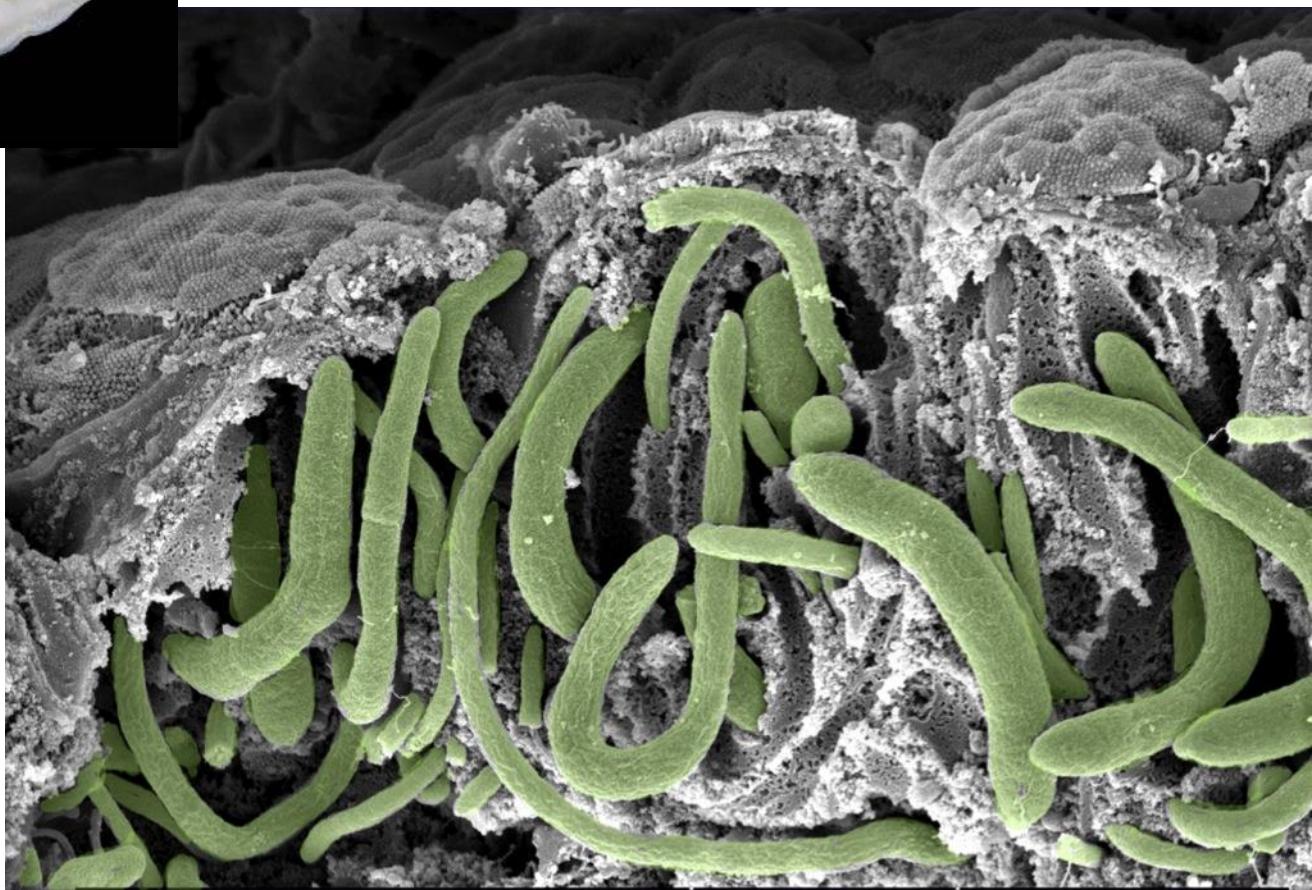


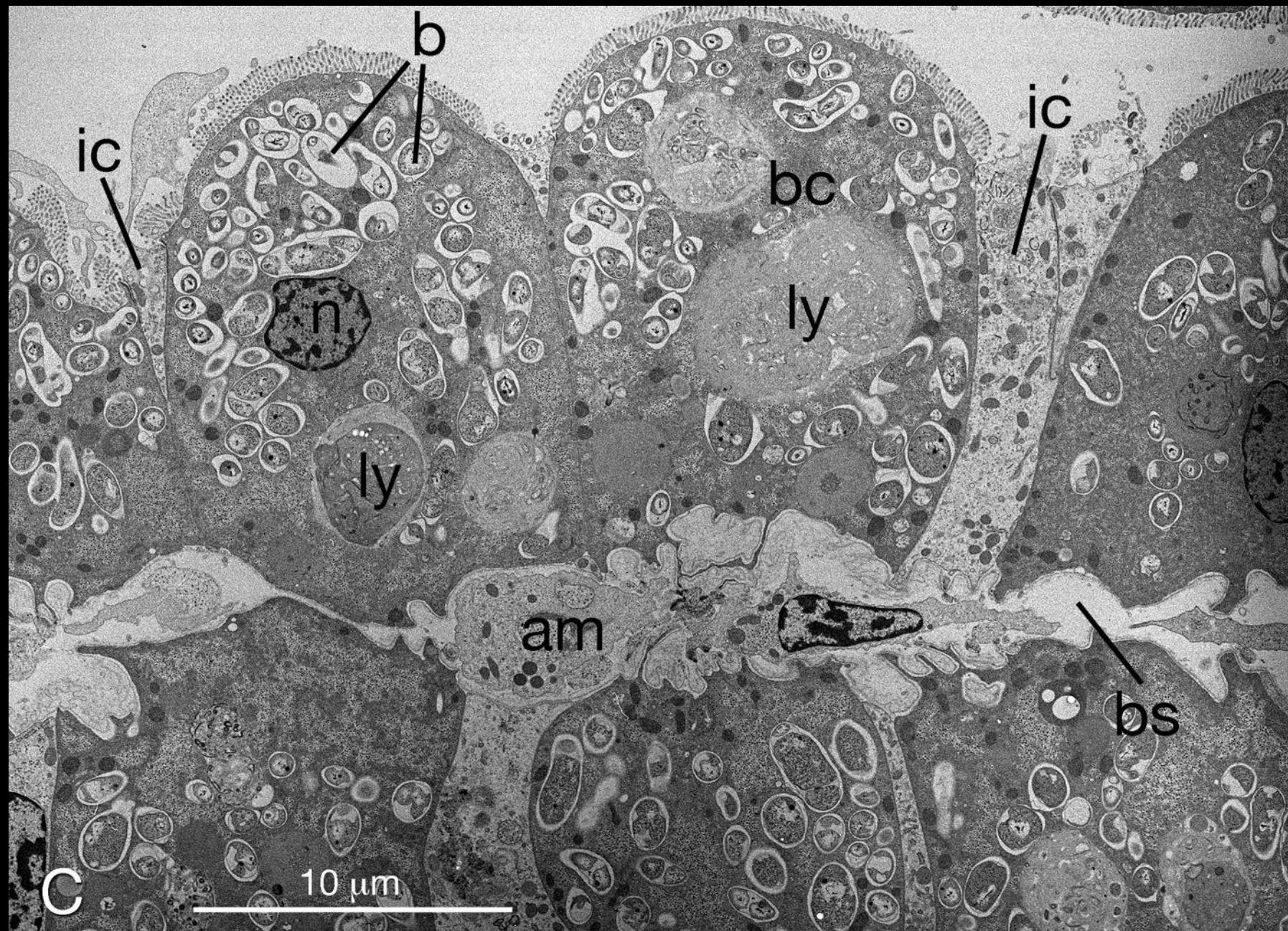


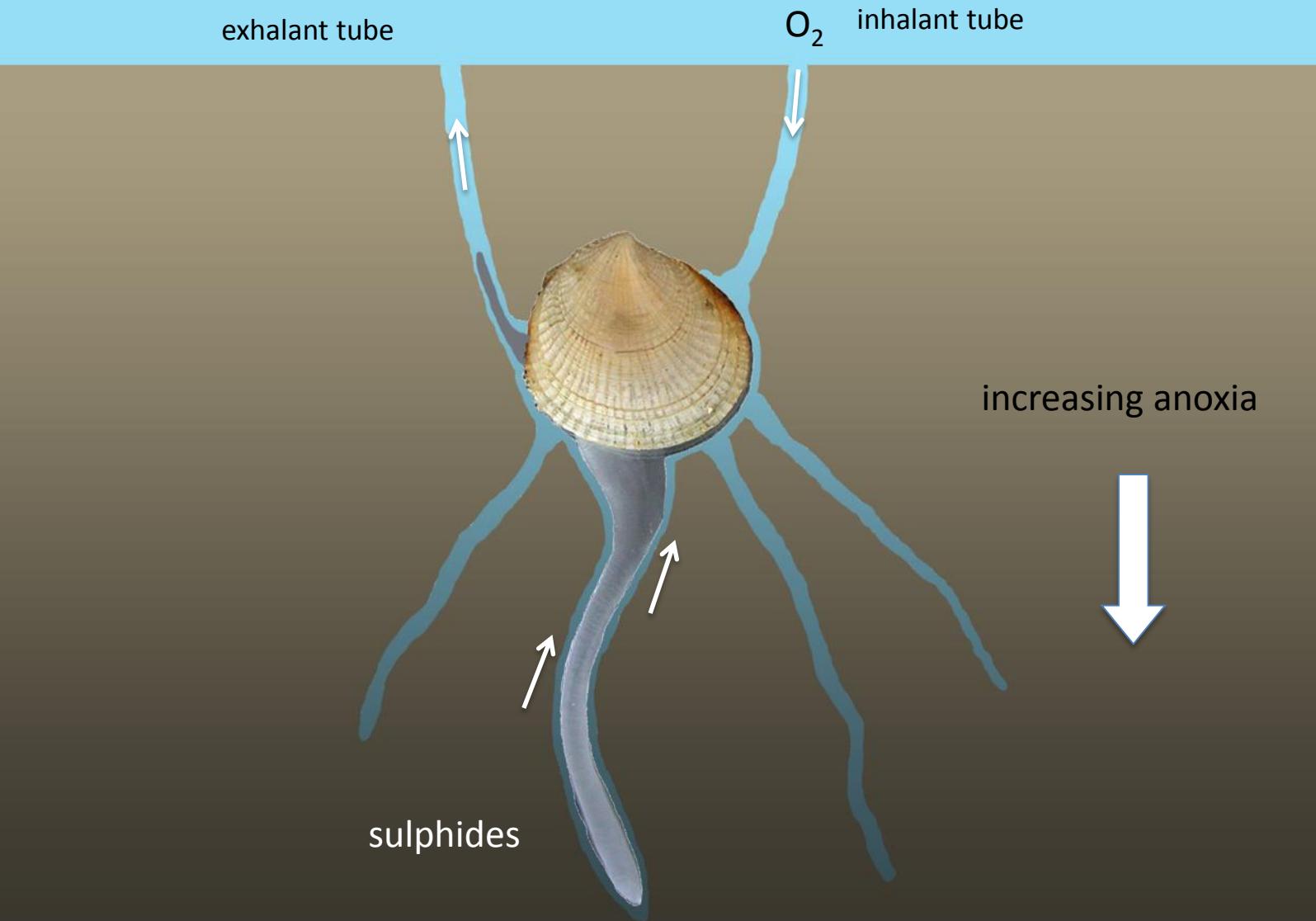
Obligate chemosymbiosis with
sulphide-oxidising bacteria
housed in gills

discovered 1983-6

420 myr
co-evolution







mangroves

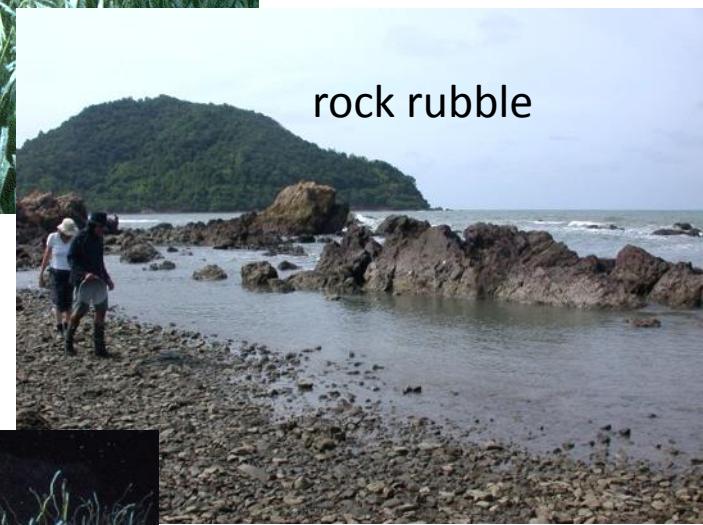


mud

seagrass beds



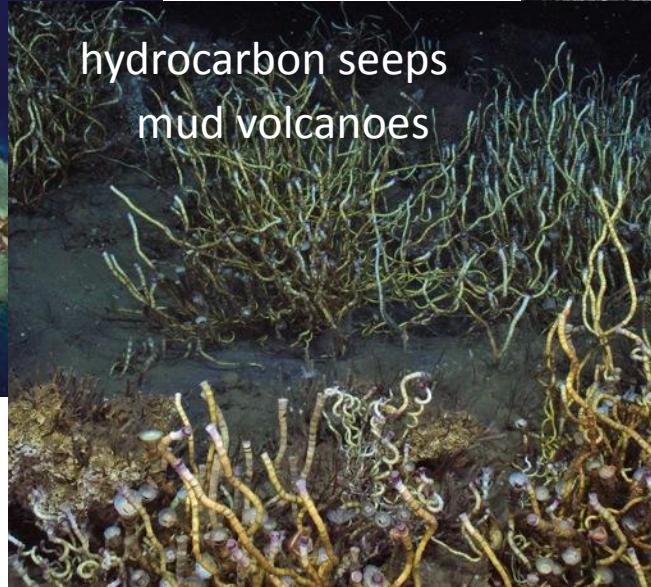
rock rubble



reefs and lagoons



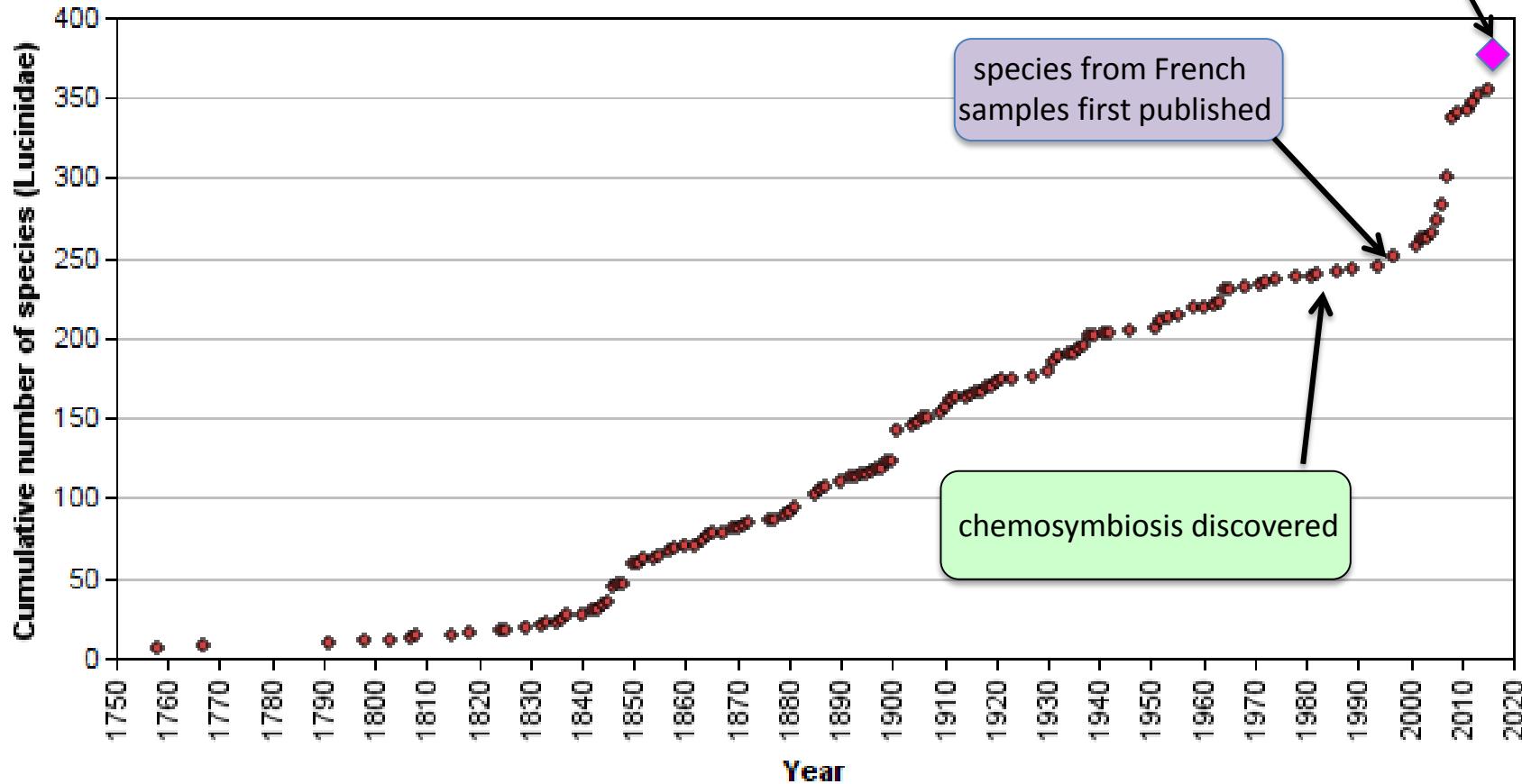
hydrocarbon seeps
mud volcanoes



sunken wood



Cumulative Lucinidae species 1750 to present

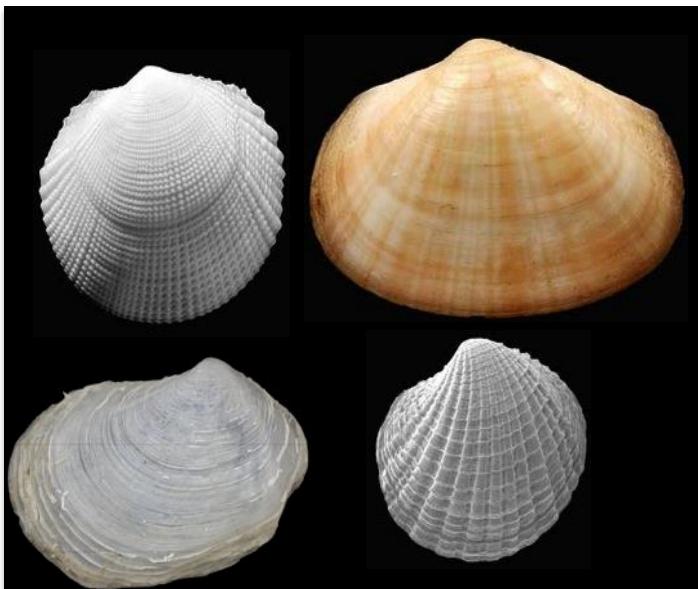


Intensive sampling: New Caledonia

less than 200 m

6220 shells

34 species of which
18 new
9 new genera



Diversity of chemosymbiotic bivalves on coral reefs: Lucinidae (Mollusca, Bivalvia) of New Caledonia and Lifou

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Glover E. A. & Taylor J. D. 2007. — Diversity of chemosymbiotic bivalves on coral reefs: Lucinidae (Mollusca, Bivalvia) of New Caledonia and Lifou. *Zoosystema* 29 (1): 1-••.

ABSTRACT

KEY WORDS
Mollusca,
Bivalvia,
Lucinidae,
high diversity,
coral reefs,
chemosymbiosis,
New Caledonia,
new genera,
new species.

Thirty-four species of marine bivalve molluscs of the family Lucinidae are described and illustrated from water depths less than 200 m around New Caledonia, the Loyalty Islands and Chesterfield Bank. Most of the bivalves came from three intensively sampled sites: Koumac and Touho on New Caledonia and Lifou in the Loyalty Islands. Eighteen new species are described. Nine new genera (*Myrtina* n. gen., *Poumea* n. gen., *Solelucina* n. gen., *Disculicina* n. gen., *Lepidolucina* n. gen., *Ferrocina* n. gen., *Liralucina* n. gen., *Parvidontia* n. gen. and *Bretskya* n. gen.) include both new and previously described species. Additionally, new descriptions and illustrations of type species are provided for two previously misunderstood genera – *Epicodakia* Iredale, 1930 and *Gonimyrtea* Marwick, 1929. The fauna described in this study is the most diverse assemblage of chemosymbiotic bivalves yet recorded.

Game changer

Deep water revelations based on French deep-sea expeditions in Indo-West Pacific - intensive sampling



La Recherche



RV Alis



MV DA-BFAR

Tropical Deep-Sea Benthos

volume 25

Rudo von Cosel & Philippe Bouchet 2008

Tropical deep-water lucinids (Mollusca: Bivalvia) from the Indo-Pacific: essentially unknown, but diverse and occasionally gigantic.

Tropical Deep Sea Benthos 25. Mémoires du Muséum national d'Histoire naturelle, 196, 115–213.

Major Expeditions
MUSORSTOM 2, 3, KARUBAR 1991,
SALOMON 1



New deep water genera from Indonesia and Philippines

9 new genera 32 new species



Elliptiolucina



Gloverina



Rostrilucina



Epidulcina



Taylorina



Dulcina



Troendleina



Minilucina



Semelilucina

Zoological Studies 43(4): 704-711 (2004)

The World's Largest Lucinid is an Undescribed Species from Taiwan
(Mollusca: Bivalvia)

Philippe Bouchet* and Rudo von Cosel



Meganodontia acetabulum Bouchet & Cosel, 2004

250-580 m hydrocarbon seeps, Taiwan Exped. 2001



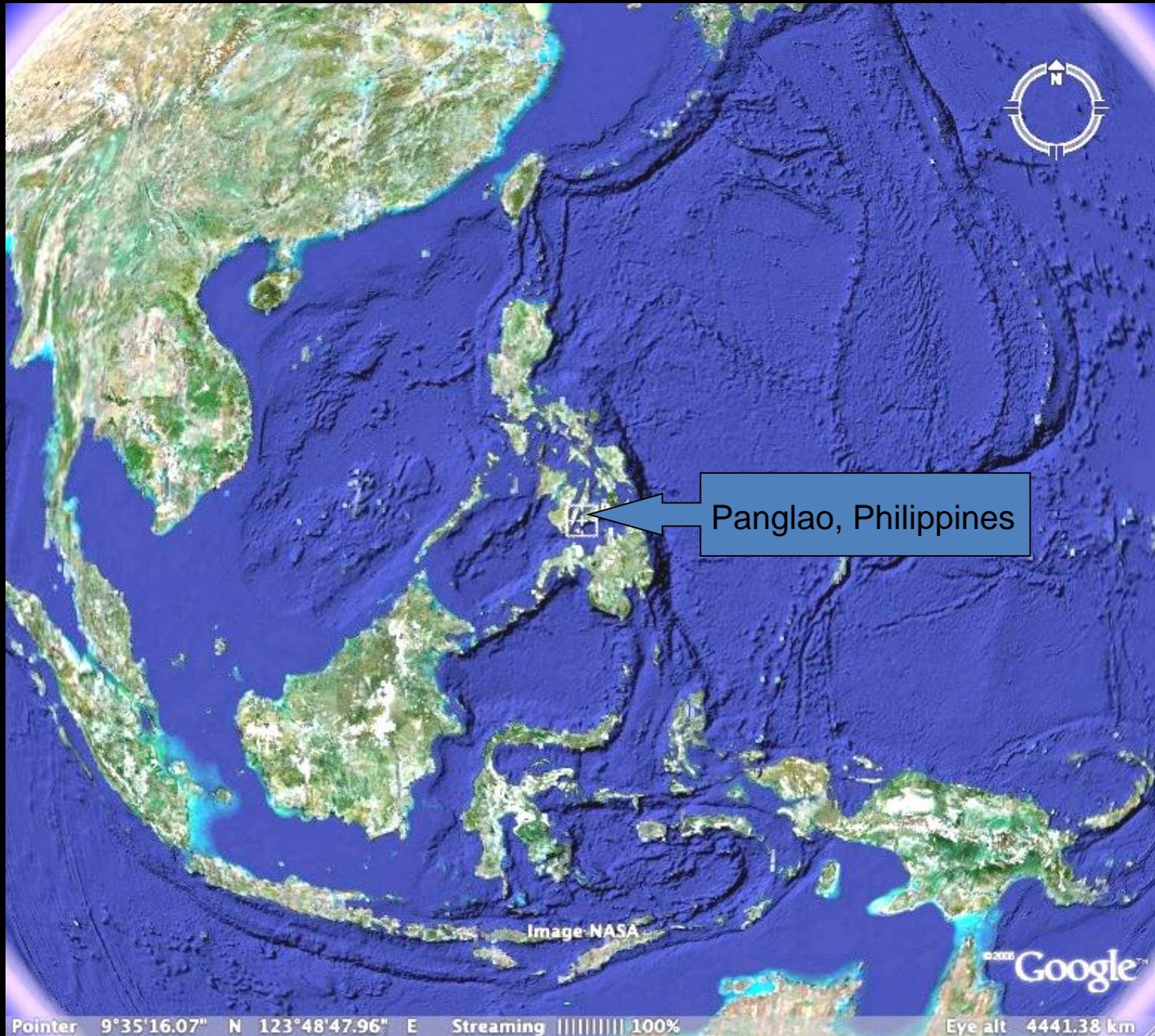
Meganodontia in fossil record

Fossil hydrocarbon seep sites from late Miocene rocks of northern Italy



Also now known from late Miocene and Pliocene seeps of central Indo-West Pacific





Philippine Lucinidae

Intensive sampling:

PANGLAO 2004 - 306 stations - hand, suction, brush,
dredge, trawl

PANGLAO 2005 - 74 stations trawl & dredge

Other expeditions:

AURORA 2007

MUSORSTOM 3 - 1985

MUSORSTOM 2 - 1980

ESTASE 2 - 1990

samples from depths 0 - 2570 m



How many lucinids in Philippines?

PANGLAO 2004/2005

- 14,670 lucinid specimens from 213 stations
- 57 lucinid species (23 new sp. 3 new genera)

ADDITIONAL PHILIPPINES - 14 species

MUSORSTOM, AURORA etc

Total Philippines - 71 species

estimate - 75

Tropical West Africa - 31

New Caledonia - 34

Tropical East Pacific - 33

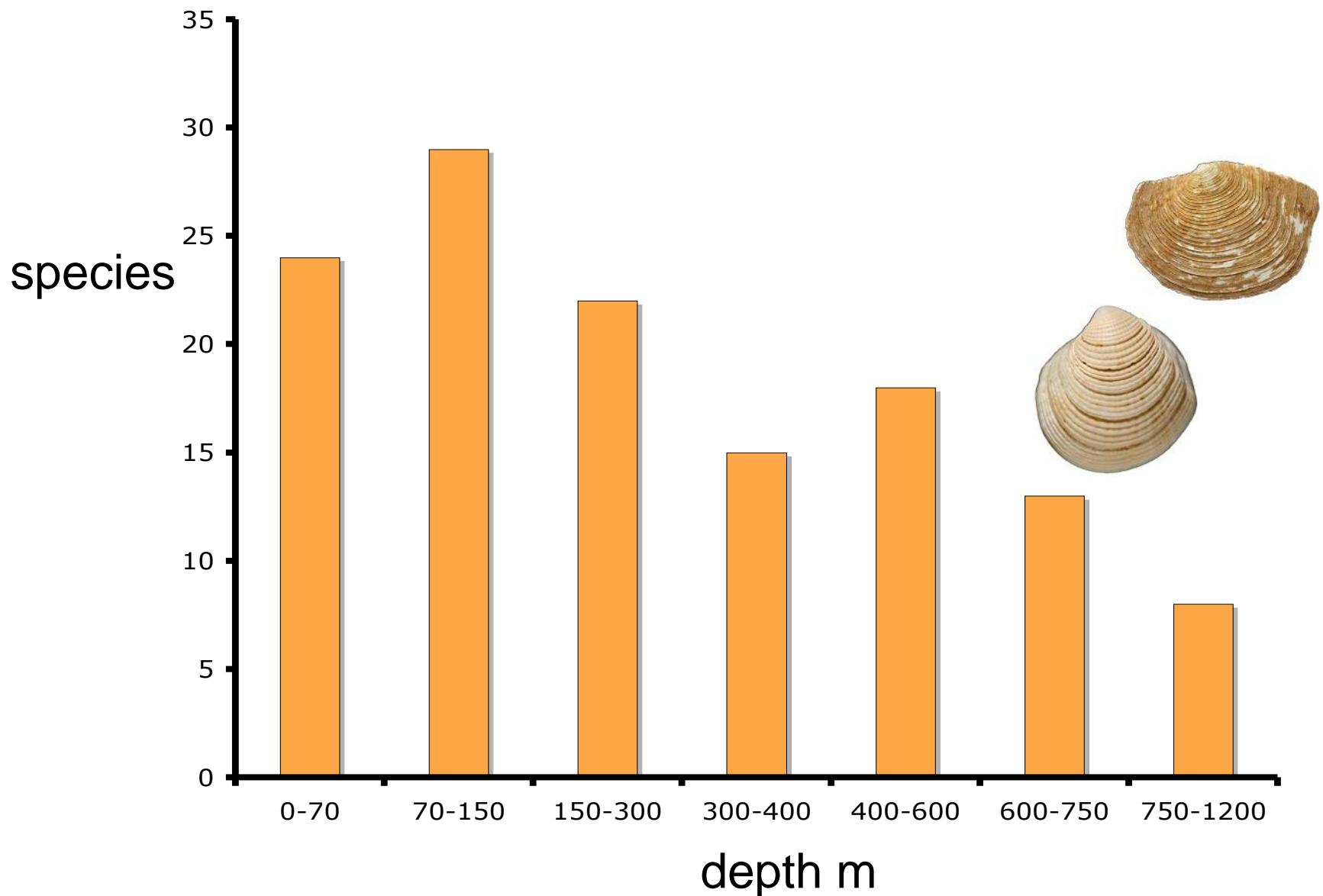
Tropical West Atlantic - 42

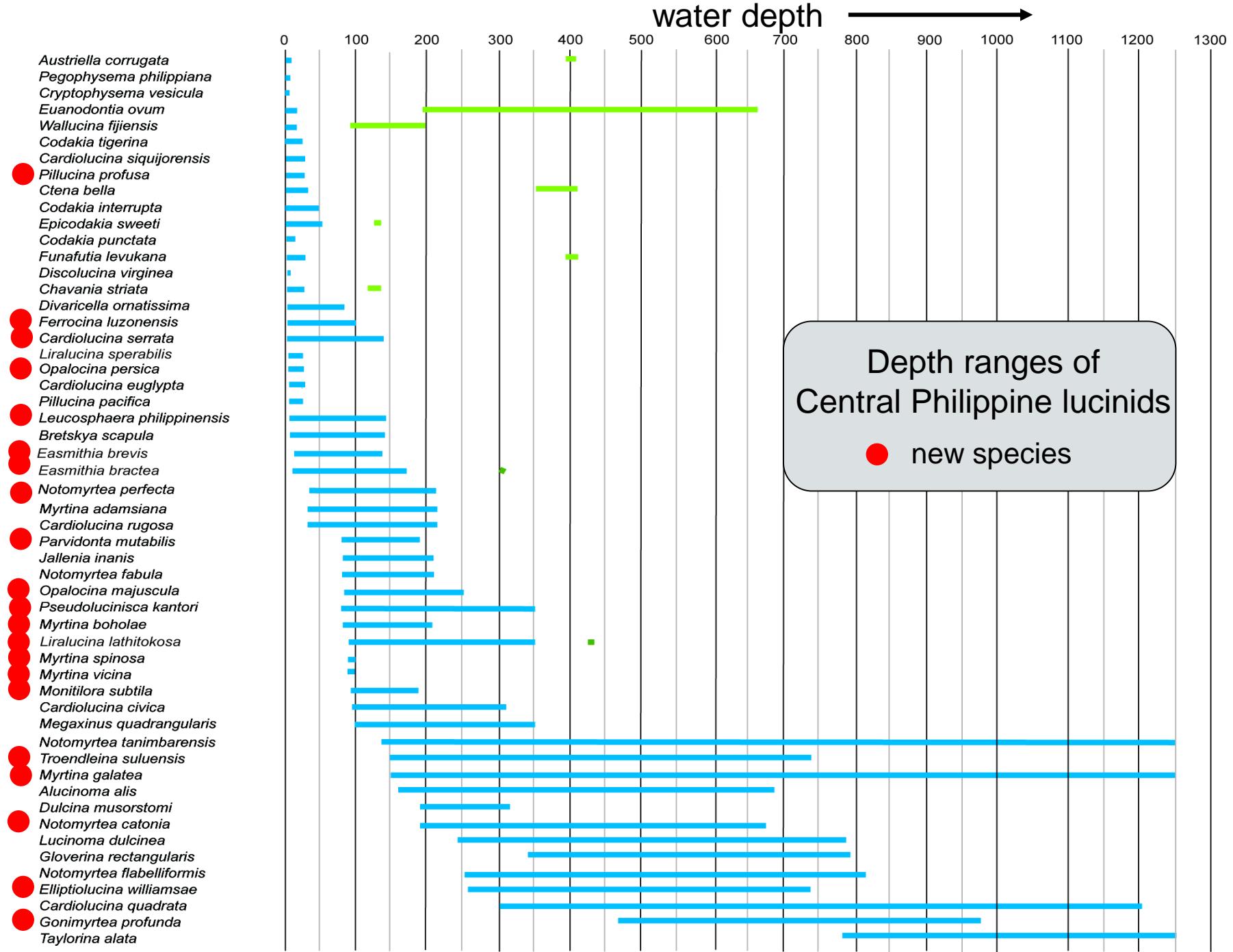


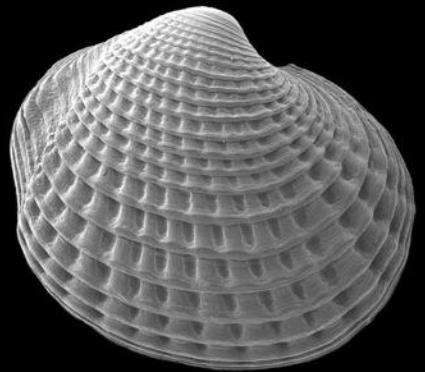
Some new species from Panglao

PANGLAO 2004 - 2005

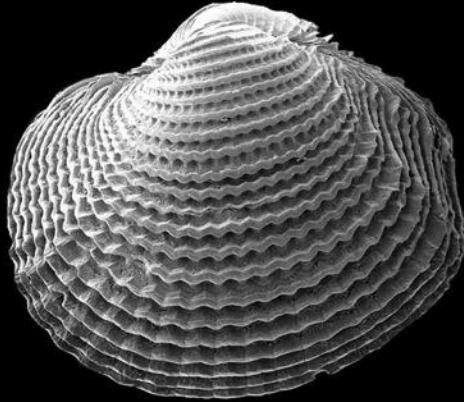
species number with depth







siquijorensis
0-20m



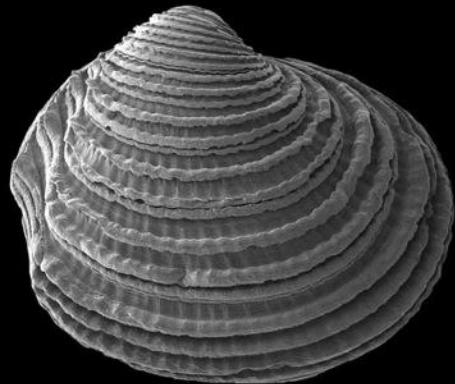
serrata
5-30m



macassari
20m



euglypta
5-20m



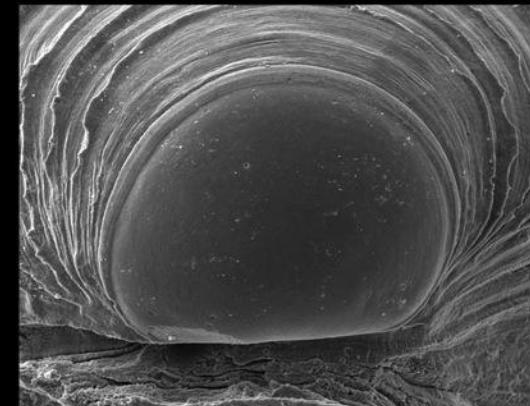
rugosa
60-150m



civica
150-350m



quadrata
400-900m



Cardiolucina species

5 mm

Bretskya scapula



coconut husks



Takuma Haga

Molecular era

- Overturned previous classifications based on shell characters
- Revealed species complexes and cryptic species
- New framework for testable evolutionary and biogeographic hypotheses
- Examine co-evolution with bacterial symbionts

Zoological Journal of the Linnean Society, 2011, 163, 15–49. With 7 figures

Molecular phylogeny and classification of the chemosymbiotic bivalve family Lucinidae (Mollusca: Bivalvia)

JOHN D. TAYLOR*, EMILY A. GLOVER, LISA SMITH, PATRICIA DYAL and SUZANNE T. WILLIAMS

Department of Zoology, The Natural History Museum, London SW7 5BD, UK

J. Moll. Stud. (2004) 70: 187–202

MOLECULAR PHYLOGENY OF THE LUCINOIDEA (BIVALVIA): NON-MONOPHYLY AND SEPARATE ACQUISITION OF BACTERIAL CHEMOSYMBIOSIS

SUZANNE T. WILLIAMS, JOHN D. TAYLOR AND EMILY A. GLOVER

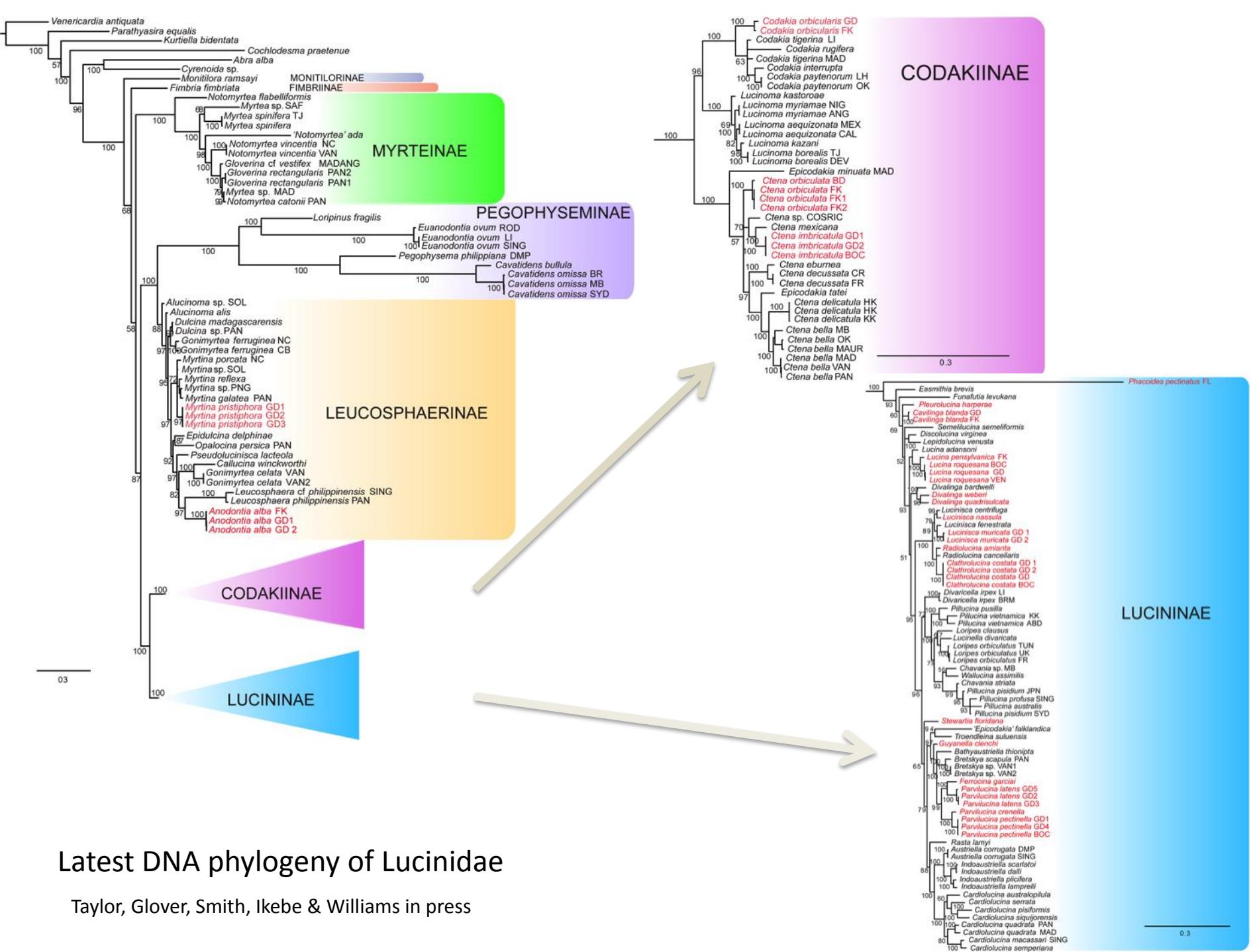


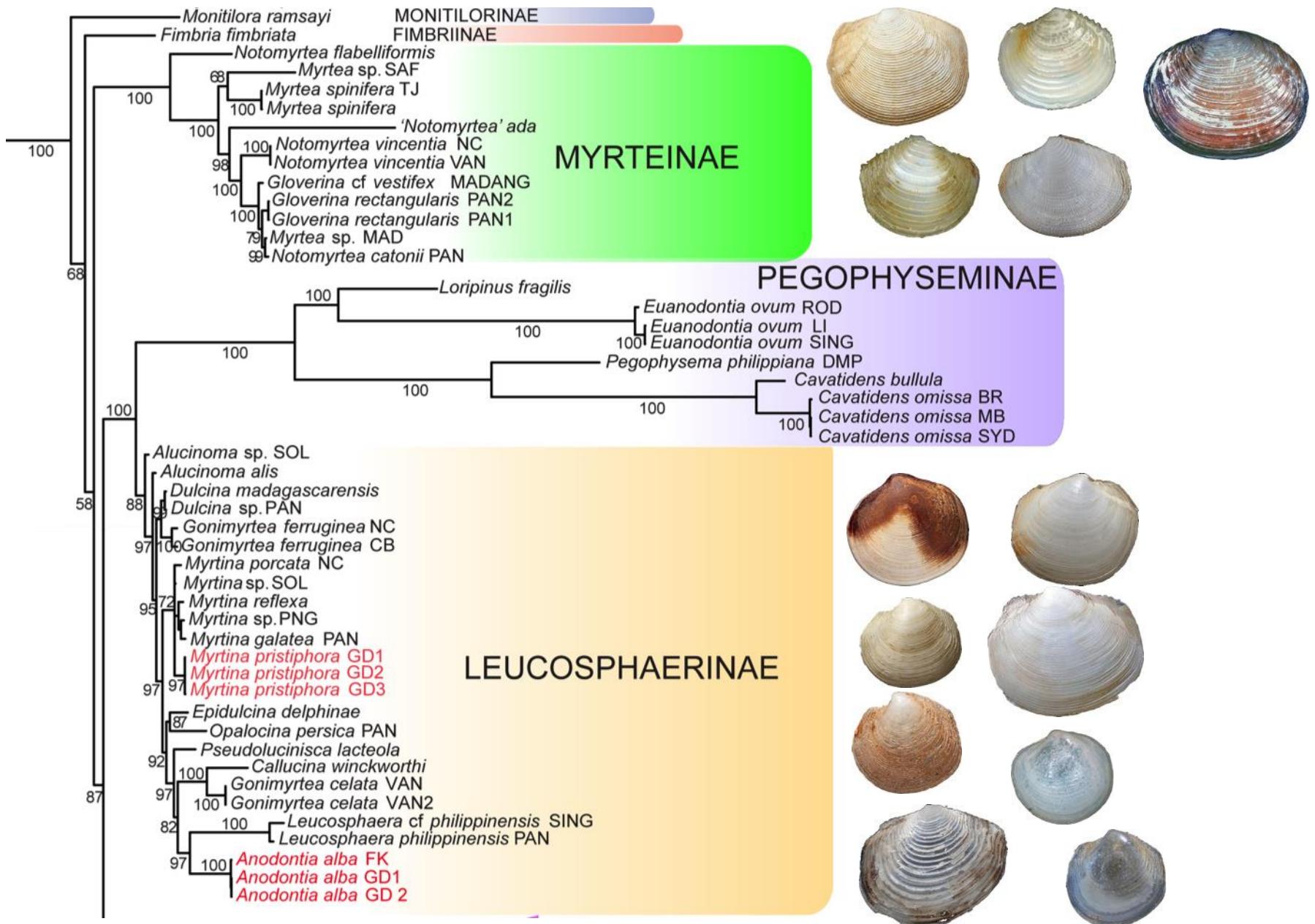
Biological Journal of the Linnean Society, 2014, 111, 401–420. With 5 figures

Diversification of chemosymbiotic bivalves: origins and relationships of deeper water Lucinidae

JOHN D. TAYLOR*, EMILY A. GLOVER and SUZANNE T. WILLIAMS

Samples from: ATIMO VATAE, SANTO 06, MIRIKY, SALOMON 2, TERRASSES, PANGLAO, INHACA, EBISCO, EXBODI, MADEEP, BIOPAPUA, KARUBENTHOS, MADANG

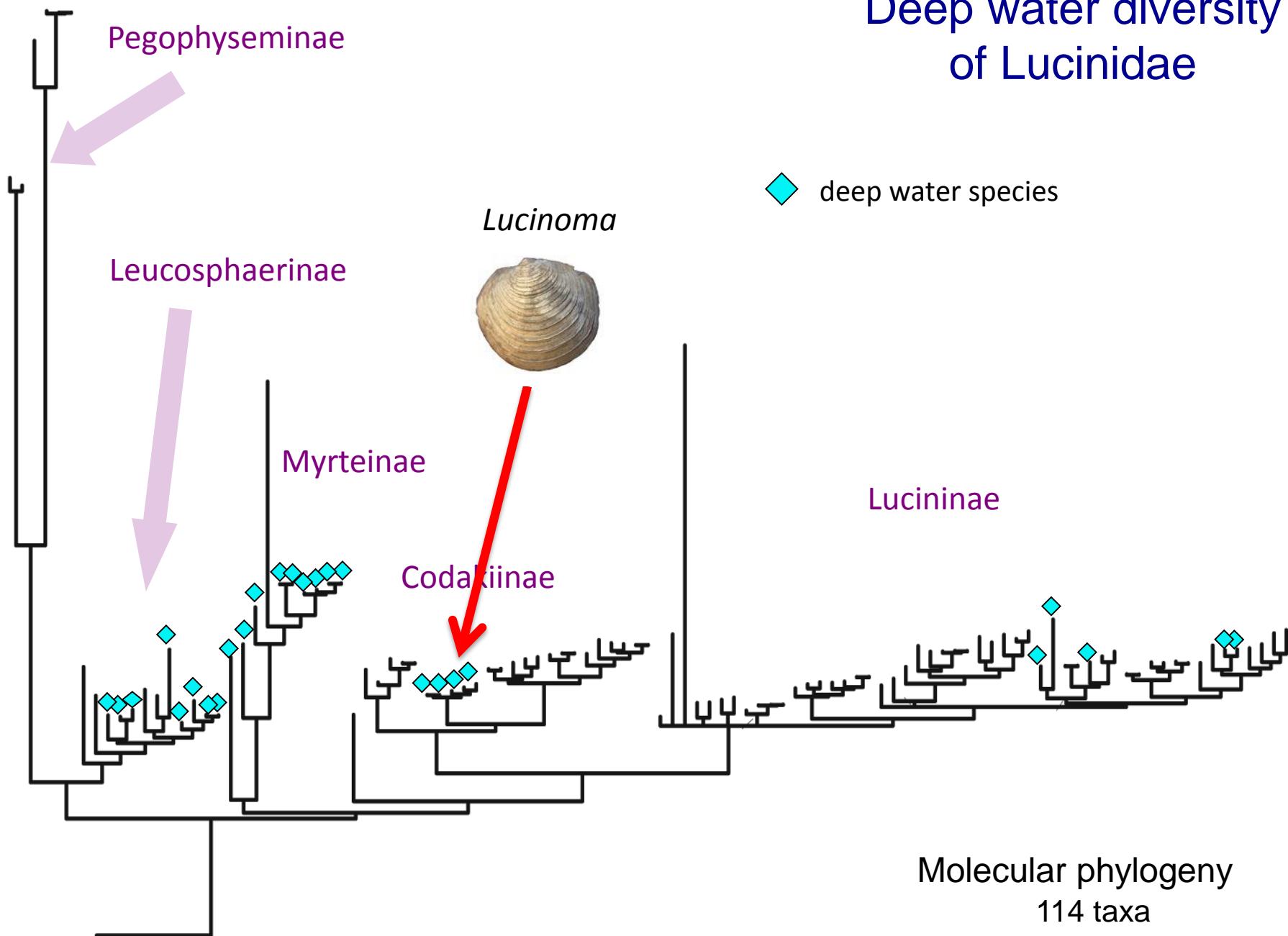




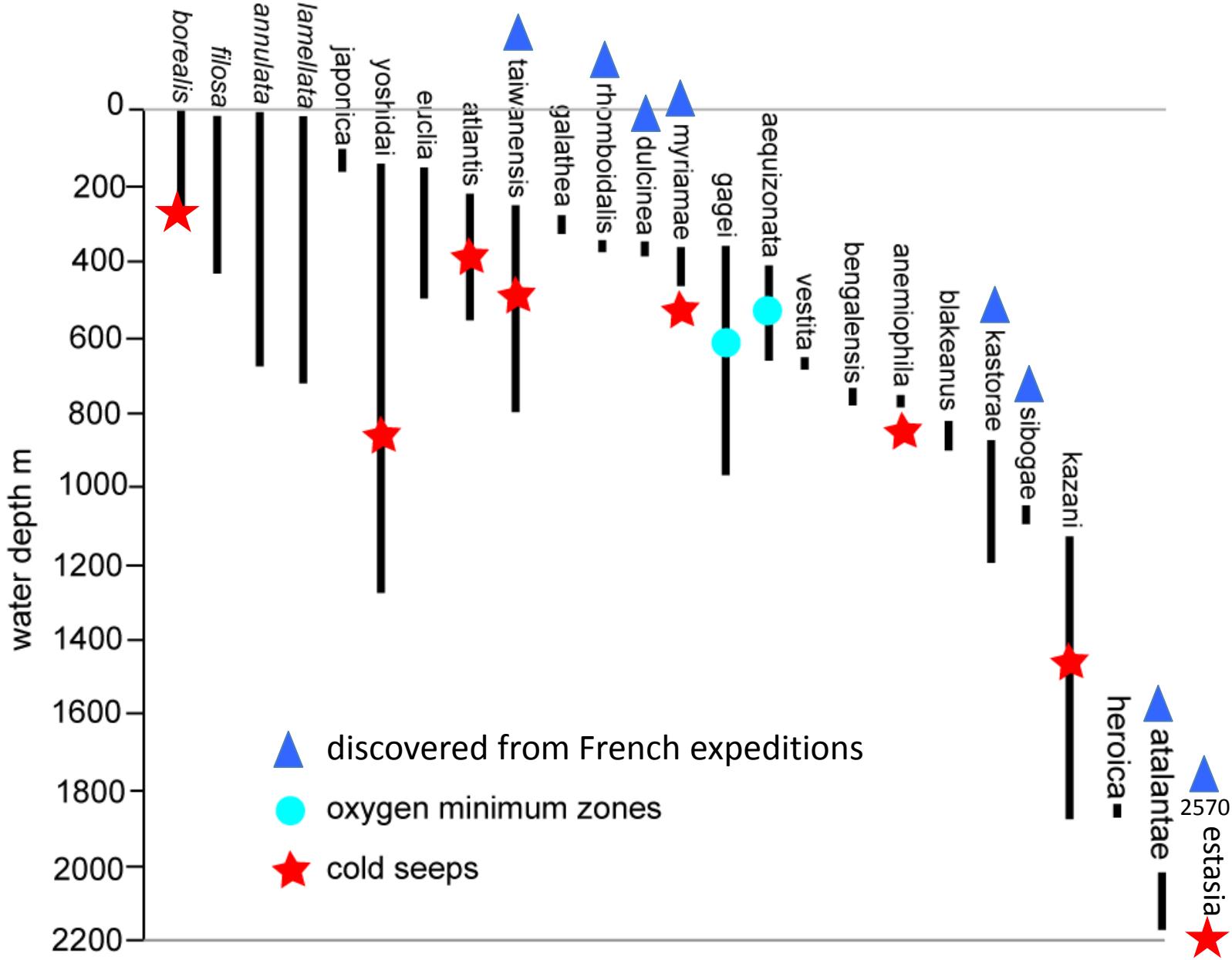
Leucosphaerinae recognised in 2011 from molecular data



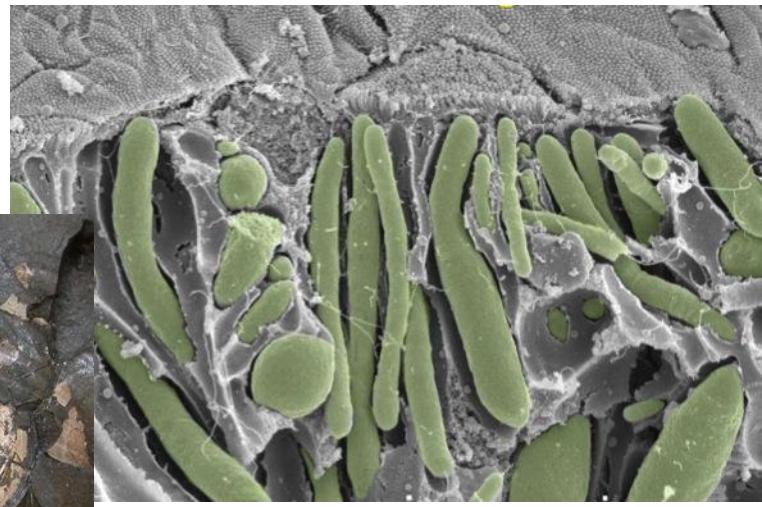
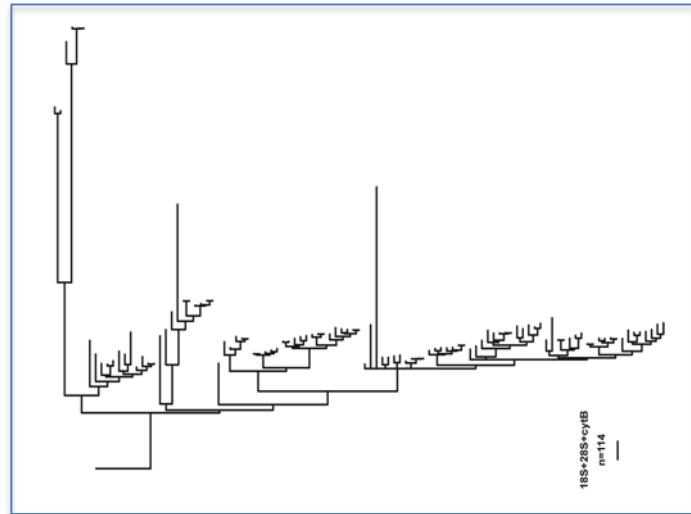
Deep water diversity of Lucinidae



Lucinoma depth distribution



Looking ahead



In summary

- Lucinidae by far the most diverse group of chemosymbiotic molluscs
 - Range from the intertidal to 2500 m
 - Globally distributed
 - Long and rich fossil history

Finally,

we acknowledge the remarkable contribution
of French collections for understanding
diversity and evolution of the family

Acknowledgements

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- Many friends and colleagues who have collected samples or helped us find them
- Curators of living and fossil collections in many museums
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BivAToL & ABRS

