



Reef biodiversity research at the Florida Museum of Natural History

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ABSTRACT

Reef biodiversity is a major focus at FLMNH-IZ, the largest invertebrate collection in the SE US, especially through collaborative, large-scale biodiversity surveys. Typical surveys voucher, photo-document, and genetically characterize 1000+/- species. An effort to genetically barcode 25,000 specimens of marine invertebrates from the collection just started. Curation, databasing, and identification is pursued with students, staff, and a large network of specialists. 440,000 records are now searchable online, with large photo-library soon to follow. Our goal is to make reef invertebrate diversity as well documented and accessible to all as possible. All are invited to visit, pursue research, and collaborate with these efforts.

INTRODUCTION

FLMNH is Florida's state museum and part of the University of Florida, located in Gainesville, north-central Florida. FLMNH and adjacent FSCA (Florida State Collection of Arthropods) hold ~33 million specimens, about the same as the American Museum of Natural History. FLMNH is young (1891), with the bulk of the collection acquired in the past 50 years. FLMNH-IZ (Malacology and Marine Invertebrates) expanded from mollusks to all invertebrates in 2000, and holds ~440,000 databased specimen lots of >3 million specimens, in ~20 phyla. Mollusks comprise 90%, with other reef invertebrates most of the remainder. Rapid growth resulted from incorporation of relinquished collections (e.g., Miami University, Tulane University & University of Alabama mollusk collections, Forbush, Keeler & McGinty private collections), and active field programs.

CURATION

Curation and databasing make information from biodiversity surveys useful and accessible, and are central to the operation of FLMNH-IZ. We curate and database incoming collections from biodiversity surveys within 12 months. FLMNH-IZ serves the second largest number of invertebrate records in the world online. A dedicated tissue collection and photo-database are underway. Informatics efforts to link these and survey databases are under development.



Curation of incoming collection (above); search interface for FLMNH-IZ (below)



TRAINING

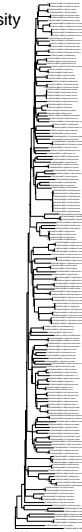
As a university affiliated museum, FLMNH offers excellent opportunities for training. Undergraduates, graduate students, postdocs and visitors are involved in field work, curation, and pursue specimen-based research (left).

BIODIVERSITY SURVEYS

Marine research at FLMNH-IZ is focused on large-scale reef biodiversity surveys and on the biogeography and evolution of invertebrates. Major recent surveys are outlined below; most geared toward documenting as many species as possible with voucher specimens (with data accessible on the web), photos, and genetic samples.

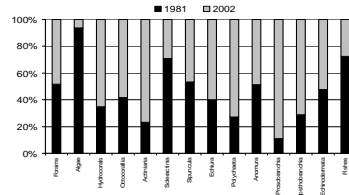


Field and lab work during surveys (left); COI phylogeny of a sample of species collected at Fort Pierce FL (right)



Marine Biodiversity Survey of Guam and the Marianas

Brought together records of 5640 marine species (see attached volume – available here or from slapcin@flmnh.ufl.edu), about a third were photo-documented (see URL in title).



Increasing knowledge through large-scale surveys: proportion of species known from Guam in 1981 checklist vs. after surveys

Census of Coral Reefs - Hawaii

CRReefs is a collaborative survey to characterize (voucher, database, photo-document, barcode) reef biodiversity, with first effort focused on French Frigate Shoals, NW Hawaiian Islands National Monument, where over 1000 species were documented. See Moffitt et al's talk and abstract.



Putative new species of hermit crab and anemone (left one) from CRReefs

BioCode – French Polynesia

BioCode's objective is to document and genetically characterize "all" species on Moorea. The marine invertebrate component aims to voucher, database, photo-document, and sequence ~5000 species of invertebrates. Preliminary field work in 2006 netted ~1000 species (<http://biocode.berkeley.edu/>); current surveys start this fall.

Photos above courtesy of the Northwestern Hawaiian Islands Marine National Monument, Hawaiian Islands National Wildlife Refuge, the Northwestern Hawaiian Islands State Marine Refuge, NOAA's Pacific Islands Fisheries Science Center and CRReefs, in accordance with permit numbers NWHNMMN-2006-015, 2006-01, 2006-017, and DLNR/NWHIDGR021 and associated amendments.

BIOTAS – SW Indian Ocean

Collaborative surveys aimed at documenting patterns of connectivity and speciation in SW Indian Ocean at the scale of biotas. We are collecting, photographing, and sequencing ~1000 species per locality (see Bruggemann et al talk and abstract).

Marine Biodiversity Survey of Oman

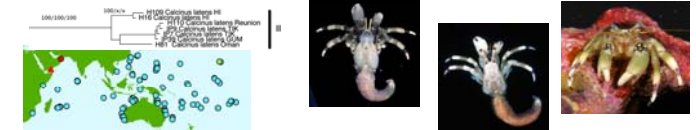
Collaborative effort to document and create guide to marine macrobiota of the Sultanate of Oman. Past efforts have been on vouchering and photo-documentation, with sequencing now beginning as well.

Florida Invertebrate Survey

A yet informal, collaborative survey to voucher, photo-document, and genetically barcode marine invertebrates in Florida. Following years of unfocused collecting, the effort was kicked off in a 3 day workshop at SMS Ft. Pierce in 2008 that netted 250 species and tested databasing and extraction methods (tree on left)

PHYLOGENETICS, PHYLOGEOGRAPHY, BARCODING

Much research is focused on marine speciation, connectivity, coevolution, and invertebrate phylogenetics, using sequence data. Recent biodiversity surveys include efforts to sequence most species collected, while Sloan Foundation funding is allowing sequencing of 25,000 specimens from past efforts.



Work on speciation usually includes comprehensive geographic and phylogenetic sampling. *Calcinus latens* species complex: Arabian form (left), widespread form (middle), Hawaiian form (right).

REVISIONARY SYSTEMATICS

Biodiversity information hinges on quality of underlying taxonomy. Systematic revisions using integrative techniques are essential for reliable taxonomy and a major focus at FLMNH-IZ.



NSF-PEET effort is focused at revising reef-associated sea cucumbers, see Michonneau et al talk & abstract

Use

The information content of collections is extracted through use. Engage in this public resource online, through loans, or come and visit us!

Acknowledgements

Curation has been supported by many students and technicians over the years and funding from NSF, State of Florida, and the McGinty Foundation. Biodiversity and sequencing surveys have benefited greatly from participation and identification efforts of many, and funding by the Moore Foundation, Sloan Foundation, NSF, NCI, NOAA, DOI, DOD, SeaGrant, ANR-France, Florida Institute of Oceanography, University of Florida, and Sultan Qaboos University.