

# BIOLOGICAL CLASSIFICATION OF MARINE ORGANISMS

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# TOPIC 3 :

# ESTABLISHING

# IDENTITY

An illustration of an underwater scene with various marine life. In the foreground, there are dark silhouettes of coral and seaweed. In the middle ground, there are colorful elements like a large white starfish, a school of blue fish, a green seaweed plant, and a pink coral. In the background, there are more schools of blue fish and a large blue wave. The overall color palette is shades of blue and green.

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## OBJECTIVES



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- Establishing Identity:
  - ▣ Literature Search
  - ▣ Using Museum Collections

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## MISTAKES & BAD EXAMPLES

- Taxonomist discourage description from non-taxonomist/non-specialist
- Mistakes are easy to make when using incomplete material:
  - Fossils
  - Smashed and fragmented specimens from dredge or trawl hauls
  - Not recognizing that some item doesn't belong in a sample at all.
  - Poor understanding of the species itself and its ecology/biology

# ESTABLISHING IDENTITY

## Genetic

- genetic variant or mutant

## Variant produced by under unfavorable conditions

- plant subjected to heavy grazing
- animal stunted by an inadequate food supply

## Recent description

- not in book or article used for identification.

## Known species elsewhere but not worldwide

- introduced species,
- rare or inconspicuous and overlooked by earlier workers.

## NEW SPECIES

- must be named and described.

## SO WHAT TO DO?



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Track down descriptions of closely related species in literature

Learn to read or ask an expert

Locate and examine actual specimens

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# WHERE TO FIND TAXONOMIC LITERATURE



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University Library

Museum and Research  
Institutes

Taxonomic  
Literature

Online: Biodiversity  
Heritage Library

Online: Taxonomic  
Journals

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# TYPES OF TAXONOMIC LITERATURE



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## General Guides

General & quick guide to the biological literature

## Books and Text Books

More detailed biology

Generalization on higher taxa

## Field Guides

Helps with field sampling

May come with keys

## Abstracts and Indexes

Zoological Record

Biological Abstracts

## Taxonomic Journals

*TRUE*  
taxonomic literature

# TAXONOMIC JOURNALS



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## Species Descriptions

- A **description of a single new species** can be published by itself
- Physiology, morphology, reproduction, ecology.

## Re-descriptions

- Involves **examination of existing material and information in order to make a more complete description of a species or other group.**
- It is often carried out when a new species has been found and its generic placement must be evaluated

## Descriptions of Higher Taxa

- **New taxa at the family level and above** are even scarcer.
- Working on invertebrates, you could find yourself working on something completely baffling
  - organism that might turn out to represent a new family, order or phylum

# TAXONOMIC JOURNALS

## Synopses

- Synopses means a general view, summarize current knowledge of morphology, ecology, terminology, and classification of a group of organisms.
- Compiled largely for the purpose of species identification, they give descriptions and illustrations of species known (or species known from a particular geographic area).
- They may contain practical information on collection and preservation, as well as keys to species.

## Reviews

- A review is a publication in which an author critically examines previous work and material on a group.
- It brings together current information on the group, but does not include the detailed examination of relationships that is involved in a revision or monograph.
- It is often carried out in conjunction with description of new species.

## Catalogs/Catalogue

- Complete list of items arranged in an organized way
- A taxonomic catalog usually describes the specimens or species of a group of organisms that are found in the collection of particular museum or herbarium.
- It may just list the species present; it may include annotations on the taxonomy of those species, or the condition of the specimens
- it may even include descriptions for each species covered.
- may also be used for a taxonomic publication discussing all the species reported from a region, cruise, or expedition.



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# TAXONOMIC JOURNALS

## Revisions

- A revision involves restudy of a group to correct or improve its **diagnosis, description, or phylogeny**.
- One of the most important types of **scientific publication** for groups in which many new species are still being described.
- Taxonomic revisions include many papers in which new arrangements, shifts in the rank **or position of some of the included taxa**, are proposed.
- In a generic or family revision, **complete descriptions are usually given for every species, whether or not they have been described before**.

## Monographs

- Monographs treat the **systematics of a group in the most complete detail possible, usually with full descriptions, biology, ecology, and distribution of a group**.
- A monograph on a genus, with introductory chapters, plus a **detailed descriptions of all species included**, might represent a lifetime's worth of **research by an author**.
- Often, but not always, they are worldwide in geographic coverage.



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## Surveys, Field Guides and Checklists

- Surveys stresses the the characteristics of local populations and by limiting discussion of distributions to a particular geographic region.
- Field guides and identification handbooks are similar to floras and faunal surveys in that they cover a **limited geographic area, but because they are designed for field or amateur use, they emphasize illustrations and keys and often use simplified descriptions stressing coloration, behavior, vocalizations, or other aspects of biology that can be observed in life**.
- Checklists may merely list the species found, or they may **contain discussion, synonymy, distribution, or brief descriptive information**



## Synonyms

- Different names that have been used for a taxon over time
- Objective synonym: based on the same type material as another (earlier) named form
  - = homotypic synonyms, obligate synonyms, and absolute synonyms.

## Objective synonym example

The name *Alogostreptus nattereri* (Diplopoda: Spirostreptidae) was proposed by Attems in 1950 from a single specimen in the Vienna Museum, a specimen that was already labeled "*Spirostreptus cultratus* Humber & Saussure," a species described in 1870, from that same specimen. Either Attems overlooked the original label or ignored it because the word type was not written on it; whatever his reasoning, the type of *nattereri* is unquestionably the type of *cultratus*, so these two names are automatically objective synonyms.

# ETYMOLOGY

- This section occurs when a species is first described
- It gives the derivation of the name
- A new species for the respective paper is written as
  - new species
  - sp. nov.
  - nov. sp.
  - nov. n.

# DIAGNOSIS



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- Brief comparative description of the organism
- How does it differ from close relative

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# TAXONOMIC DISCUSSION



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- problems with or changes in the placement of the species being described, there will often be a section for explanation or discussion of that fact

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- ecological information
- habitat preferences
- community association
- species biology
  - such as reproductive season
  - seasonal changes in growth form, or pelage.



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- Lets “play around” with the platform on Biodiversity Heritage Library

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# CSI: "DIARY" & "AUTOPSY"

## SAMPLING

Do you think you found a new species

## LITERATURE

**NO**

Nothing in ALL literature & Database

**YES**

## COLLECTIONS

**HOORAY, NEW SPECIES!**

Go Register!

Is it similar to your type/non-type specimen?

## REGISTRATION

**NO**

**HOORAY, NEW SPECIES!**

**YES**

**Review/Redescribe/ID**

- Collections, Museum and Herbaria
  - Local Collections
  - Botanical Gardens
  - Museums and Herbaria

- Collections, Museum and Herbaria
  - Local Collections
    - Field Station
    - Agricultural Research Station
    - State Geological Survey
    - Marine Laboratory
  - Issues
    - Not always well maintained
      - RA
      - Investigators

# USING MUSEUM COLLECTIONS

- Collections, Museum and Herbaria
  - Botanical Gardens
    - Plant species
    - Scientist: reproduction, phenetic variation, hybridization



## • Collections, Museum and Herbaria

### • Museums

- a building in which objects of historical, scientific, artistic, or cultural interest are stored and exhibited.

### • Herbaria

- Research collection of dried plants

### • Objectives

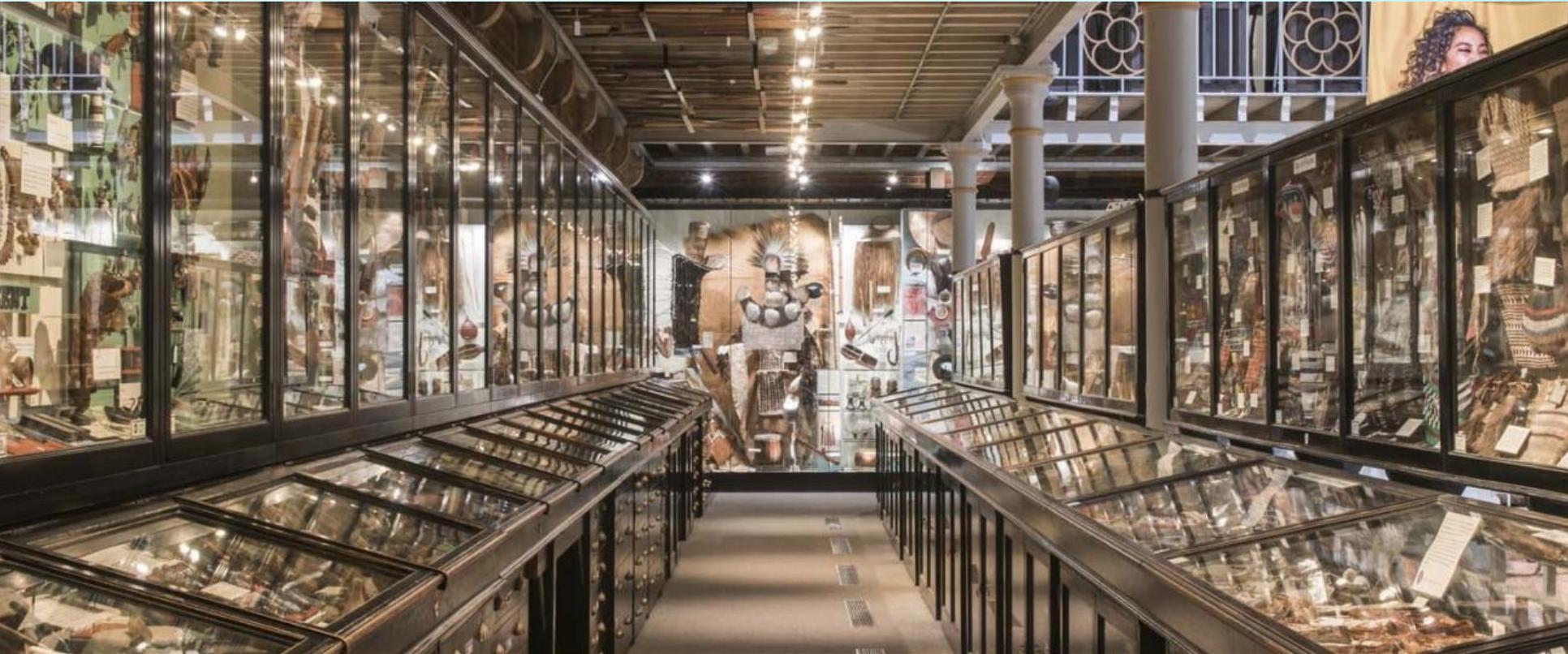
- providing preservation & conservation
- providing systematic research
- University, state, national, private non-profit
- Housing > 60 phyla
- Electric cataloguing



# MUSEUM EXHIBITS FOR EDUCATION



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# WHAT YOU ARE MOST FAMILIAR WITH



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# Back of House



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## LOCATING MATERIAL



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- Google, email and ask or meet an expert
- Deal with curators
- Modern descriptions from journals
  - List institutions types and non-types are deposited
  - Accession/catalog number, locality, collector, holding institution
- Older papers MAY not all provide this information
  - Specimens no longer exist
  - Incorporated into museum collection and can be located through directories
  - ☹️ museum are insufficiently funded to make all collections available

## BORROWING MATERIAL



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- Written request, shipped or during a visit
  - Museum loan policies vary (very easy → very “*songeh*”)
  - Must be stored and shipped under conditions that meet or exceed the home institute
  - ANY INTENTIONS OF DISSECTING REQUIRES APPROVAL

- Biologist  $\neq$  taxonomist
  - Biology, ecology, paleontology: Biological Species Concept, dealing with “species” as “ideal” or “type”
  - Taxonomy: a specimen(s) serving as a reference standard for taxon, and used in reference for hypothesis
  - **Name bearing type:**
    - the name-bearing type is the biological type that determines the application of a name under the **International Code of Zoological Nomenclature (Code)**

### • **Holotype:**

- The holotype is a **single specimen used by an author, either the only specimen he found or one of several found**, but the only one designated as a type.
- When people talk about the type, they are referring to this single specimen.

### • **Neotype:**

- This is a specimen selected (and designated in a paper in the literature) to serve as a type when the original material has been **lost or destroyed**

### • Paratypes:

- specimens that the person making the original description examined while carrying out the work.
- **They may be from the same or a different locality, but they clearly (at least in the mind of the describer) are members of the new species.**
- Although they are **not types in the nomenclatural sense**, they are often distributed to other museums as vouchers for the new species.
- like holotypes and syntypes they are often cataloged and stored separately from the rest of the collection.

- **Syntypes:**

- These are **two or more specimens selected** from the available material to serve as types.

- **Lectotype:**

- One specimen of the syntype set (or one specimen known to have been used by the author if no type was identified) may be selected as the lectotype by the author or a later worker.
- It should be the **specimen illustrated in the original description**, if not all were depicted.
- **Paralectotype:** Any additional specimen from among a set of syntypes, after a lectotype has been designated from among them.

### • Topotype

- These are **specimens collected from the same locality as the type material** (although not necessarily at the same time).
- they have **no official standing**, but if a museum has such material it is usually well worth seeing.
- Winston (1999) vouches for the fact that with marine invertebrates, topotypical material of the species one seeks is much more likely to belong to that species than material labeled with the same name but from thousands of miles away.

## VISITING COLLECTIONS: WHAT TO EXPECT



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- Look at ALL registered specimens
  - Especially changes with taxon/ not stored under current names
- Checked for catalogued or possible misidentified specimens
  - May be filled with half a dozen names
  - Some given accession numbers but never catalogued



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**MUSÉUM**  
NATIONAL D'HISTOIRE NATURELLE

TU ES... ▾

WEB TV

MUSEUM UNIVERSE

### GREAT GALLERY OF EVOLUTION

GALLERY OF EVOLUTION VISIT

A mythical place renovated in 1994, where modernity stands alongside history and science to tell us the great adventure of biodiversity.

VISIT EXPLORE PARTICIPATE COLLECTIONS RESEARCH & EXPERTISE

Recherchez sur mnhn.fr

SKIP TO CONTENT

- Lets locate type specimens from the platform on Museum of Natural History, Paris



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The screenshot shows the Australian Museum website. At the top, there is a navigation bar with 'ABOUT', 'DISCOVER & LEARN', and 'GET INVOLVED'. A search icon, a 'Subscribe' button, and a 'Join & Give' button are also present. The main content area features a dark background with a 'DISCOVER & LEARN' menu on the left and a large image of a butterfly on the right. The text next to the butterfly reads: 'In this section, there's a wealth of information about our collections of scientific specimens and cultural objects. Come and explore what our researchers, curators and education programs have to offer!'

**Tutankhamun: Treasures of the Golden Pharaoh**

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Accept and close

**Museum news**

Read about our latest discoveries, research expeditions and collection objects on display.

- Lets locate type specimens from the platform on Australian Museum, Sydney

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## NEXT CLASS



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- Each group is to bring a hard copy of a taxonomic paper from the journal Zootaxa
  - Please verify with me on Tuesday's class if the paper is acceptable
- Find a title representing your organism of interest
- Identify the different parts of a taxonomic paper based on today's handouts
- Each group will summarize on how to read their taxonomic paper