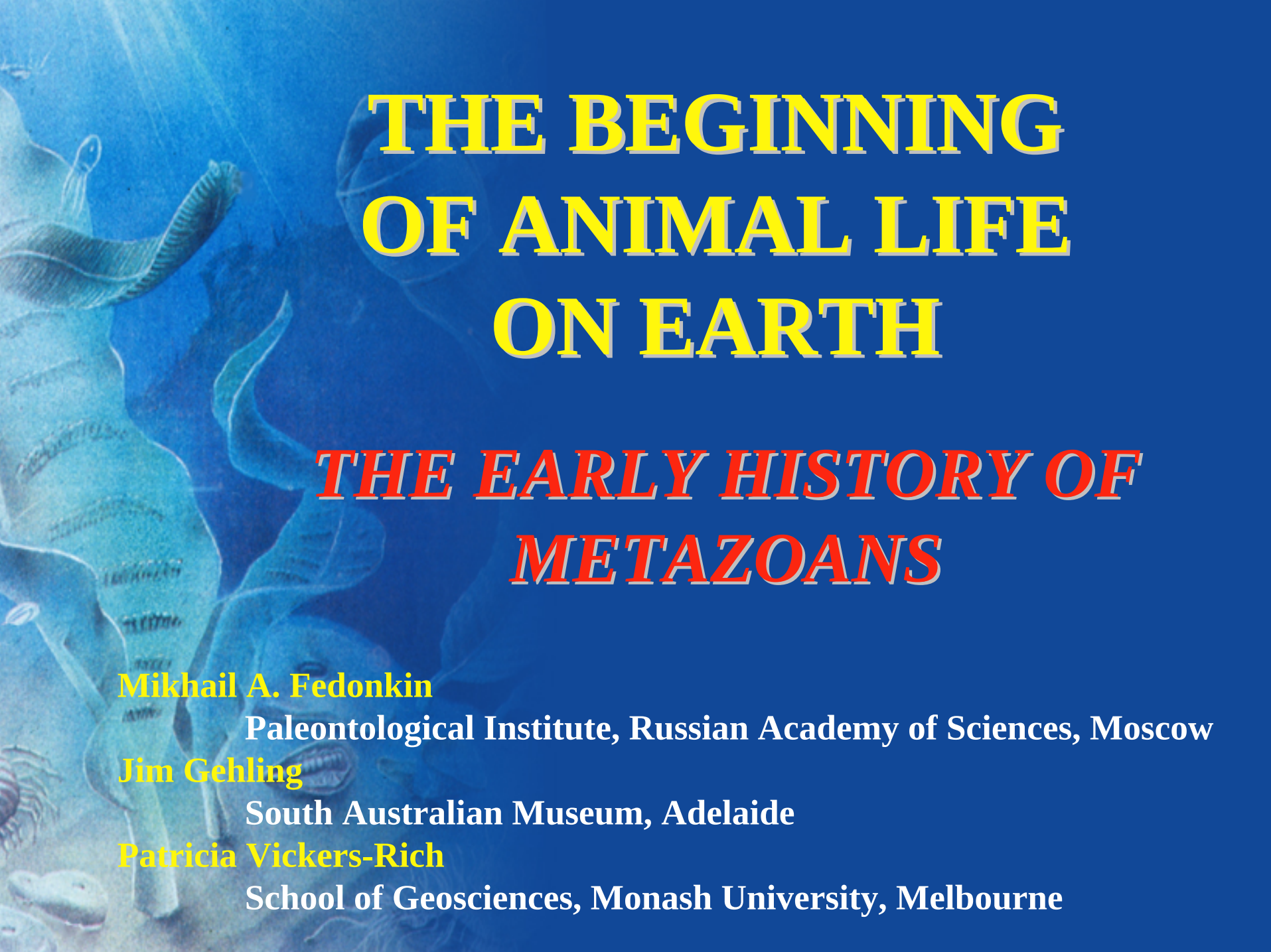


# THE BEGINNING OF ANIMAL LIFE ON EARTH

## *THE EARLY HISTORY OF METAZOANS*

**Mikhail A. Fedonkin**
Paleontological Institute, Russian Academy of Sciences, Moscow
**Jim Gehling**
South Australian Museum, Adelaide
**Patricia Vickers-Rich**
School of Geosciences, Monash University, Melbourne

# WHAT IS A METAZOAN?

Patricia Vickers-Rich

- **COMMONLY REFERRED TO AS ANIMALS**

- **MULTICELLULAR**

  **so single celled animals (Protozoa) do *not* qualify**

- **MOBILE**

  **at some stage in the life cycle of a metazoan, they move**

# WHAT IS A METAZOAN?

- **HETEROTROPHIC**

  **metazoans are consumers at different levels in the food chain**

  **-none are capable of generating their own food directly from inorganics**

  **-some have, however, liased with other species in symbiotic associations with autotrophs (which can generate food from inorganics), such as coral polyps with dinoflagellates**

# WHAT IS A METAZOAN?

- **DIPLOID ORGANISMS** with embryonic development that goes through a **blastula** stage

diploid = having two sets of chromosomes (leading to much greater biodiversity with each generation)

blastula = early embryonic stage, a hollow, fluid-filled ball of cells one layer thick

# WHAT IS A METAZOAN?

- **MANY, BUT NOT ALL, ARE TRIPLOBLASTIC**

  during development three embryonic layers (endoderm, mesoderm, ectoderm) produce all later structures

# WHAT IS THE BIODATABASE FOR THE LATE PROTEROZOIC, WHEN ANIMALS FIRST APPEARED (1400-550 million years ago)?

- **A Brief Overview of Important Fossil Locales that Have Produced an Early Record of Animal Life**

- **Flinders Ranges, South Australia**
- **?Bangemall Basin, Western Australia**
- **?Glacier National Park, Montana, USA**
- **White Sea Region, Russia**
- **Ural Mountains, Russia**
- **Siberia**
- **Ukraine**
- **Newfoundland**
- **Namibia**

- **Today's Keynote Will Cover Two of These Important Areas that Have Yielded Fundamental Information on the Origin of Animals, Metazoans.**

- **J. Gehling – Flinders Range of South Australia**
- **M. Fedonkin – White Sea Region of Russia**

# THE VENDIAN FAUNAS OF THE WHITE SEA REGION, NORTHERN RUSSIA

**Mikhail A. Fedonkin**

- LOCATION
- FIELD CONDITIONS
- ROCKS
- AGE
- THE VENDIAN FAUNA

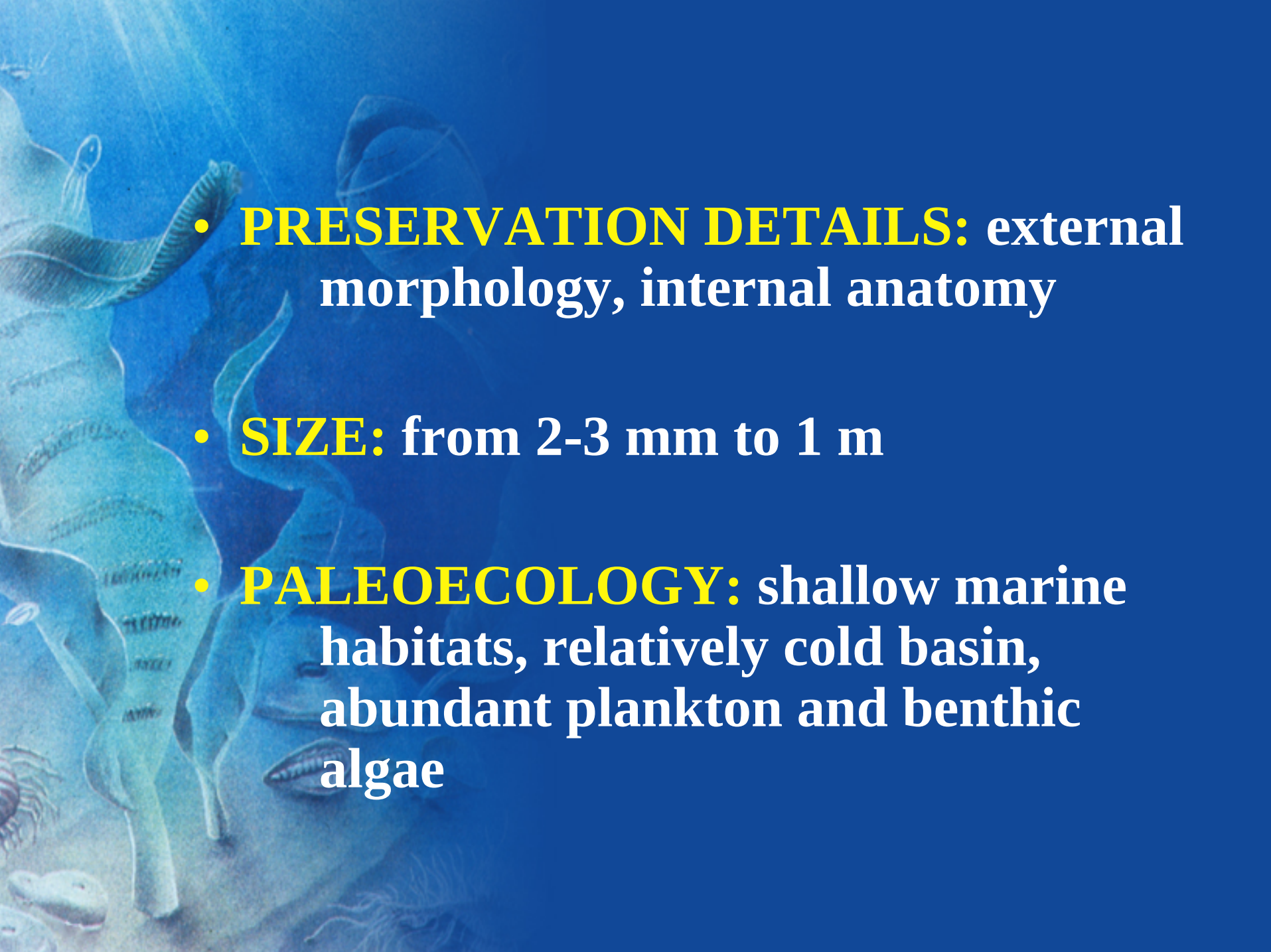
- **THE VENDIAN FAUNA**
  - **POPULATION DENSITY**
  - **BODY SIZE**
  - **VARIOUS EXTERNAL MORPHOLOGY**
  - **COMPLEX INTERNAL ANATOMY**
  - **SHALLOW MARINE HABITATS**
  - **NO FRESH WATER ANIMALS**
  - **LOCOMOTION STYLES**
  - **FEEDING HABITS**
  - **REPRODUCTION**
  - **COLONIZATION OF THE SEDIMENTS**
  - **ORIGIN AND EXTINCTION**

# THE VENDIAN FAUNAS OF THE WHITE SEA REGION, NORTHERN RUSSIA

- **AGE: over 555 million years, U-Pb radiometric dating of zircon crystals from volcanic ash beds**
- **LOCATION: about 1000 km north from Moscow, S-SE coast of the White Sea**
- **GETTING THERE (TRANSPORTATION): 22 hours by train from Moscow, then sea vessel, boat, helicopter, feet**

- **FOSSIL SITES: within 400 km from Onega River to the Winter Coast of the White Sea**
- **FIELD CONDITIONS: swamps and taiga, short and cold summer, mosquitoes, midges, bears**
- **ACCOMODATION: tents**
- **ROCKS: sandstone, siltstone and clay**

- **FOSSILIFEROUS BEDS:** clay/sand interface, storm beds
- **FOSSIL TYPES:** body fossils and trace fossils (trails, tracks and burrows)
- **PRESERVATION MODE:** imprints, 3d casts and molds, pyrite crust, organic material



- **PRESERVATION DETAILS:** external morphology, internal anatomy
- **SIZE:** from 2-3 mm to 1 m
- **PALEOECOLOGY:** shallow marine habitats, relatively cold basin, abundant plankton and benthic algae

# THE VENDIAN FAUNAS OF THE WHITE SEA REGION, NORTHERN RUSSIA

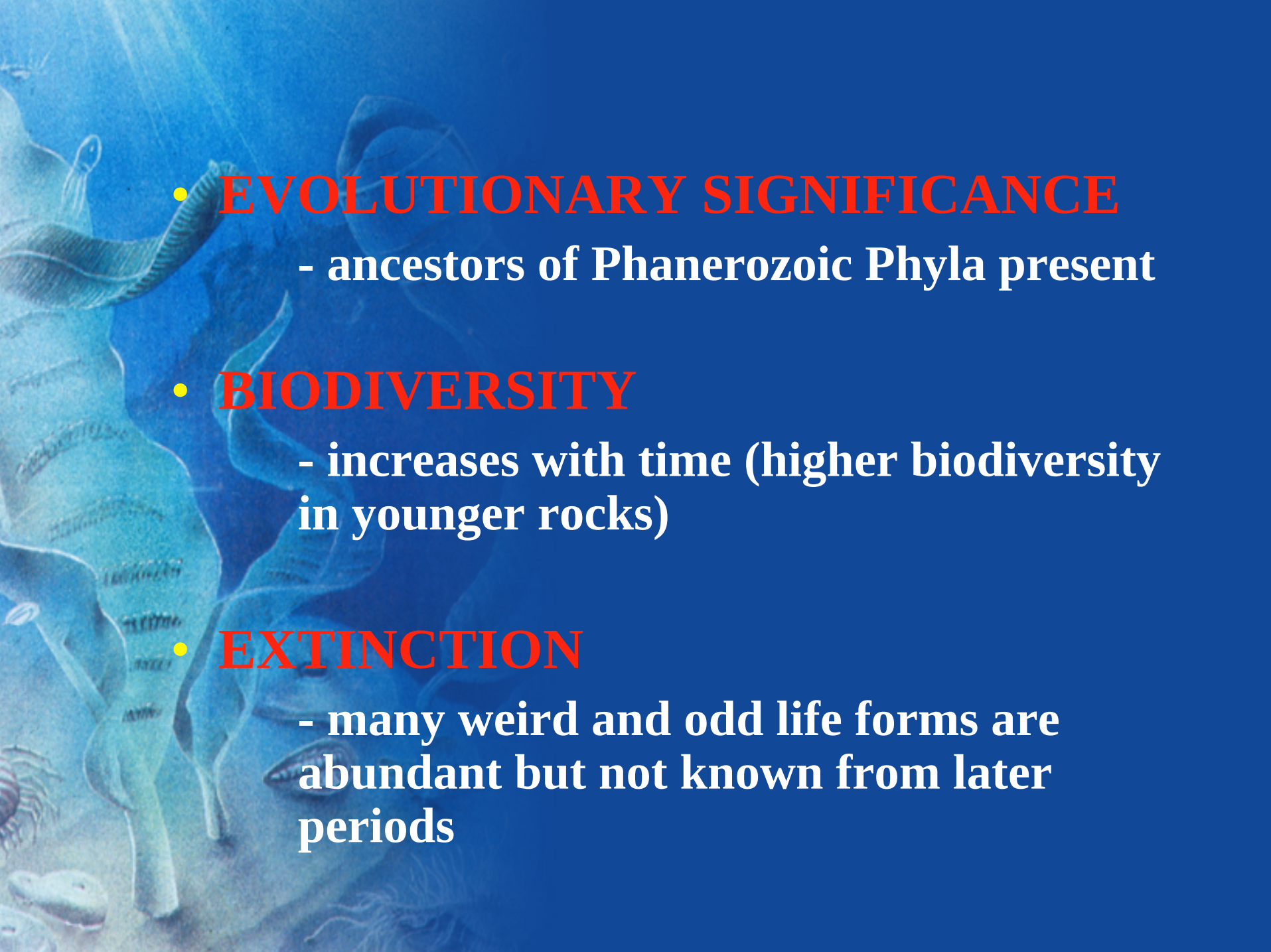
- **NATURE OF ANIMALS**

  - soft-bodied forms dominate
  - bottom dwellers: attached and mobile

- **COMPOSITION**

  - a few, well established groups of both diploblastic and triploblastic invertebrates

- **LOCOMOTION STYLE**
  - peristaltic creeping
- **FEEDING HABITS**
  - dominantly micropredators
- **REPRODUCTION**
  - sexual and asexual, larval forms assumed (because of global distribution), seasonal
- **COLONIZATION OF THE SEDIMENTS**
  - low bioturbation



- **EVOLUTIONARY SIGNIFICANCE**
  - **- ancestors of Phanerozoic Phyla present**
- **BIODIVERSITY**
  - **- increases with time (higher biodiversity in younger rocks)**
- **EXTINCTION**
  - **- many weird and odd life forms are abundant but not known from later periods**