

BI103 Marine Biology

Introduction

I. What is Marine Biology?

- ❖ Not a pure scientific discipline
- ❖ *marinus* = L., mare, or sea
- ❖ *bios* = Gr., life
- ❖ *logos* = Gr., study
- ❖ Therefore, marine biology is
 - ◆ *general science of biology applied to the sea, or*
 - ◆ *the scientific study of life in the oceans*

II. History of marine biology in the Pacific

❖ Pre-16th Century

- ◆ earliest settlers of Pacific islands possessed wealth of knowledge of marine environment
- ◆ unfortunately, this knowledge was not recorded, and it not considered scientific

❖ First recorded observations?

- ◆ Aristotle 384–322 BC
 - thought that accurate observation and description of nature, as well as **inductive reasoning** and interpretation, were the only ways to advance understanding of the natural world
 - considered the *Father of Marine Biology*



- his observations on the anatomy of octopus, cuttlefish, crustaceans, & many other marine invertebrates are remarkably accurate; could only have been made from first-hand experience with dissection
- however, his greatest contribution to science was his approach, which was the forerunner of the modern scientific method
- *"I found no basis prepared; no models to copy... Mine is the first step, and therefore a small one, though worked out with much thought and hard labor. It must be looked at as a first step and judged with indulgence."*



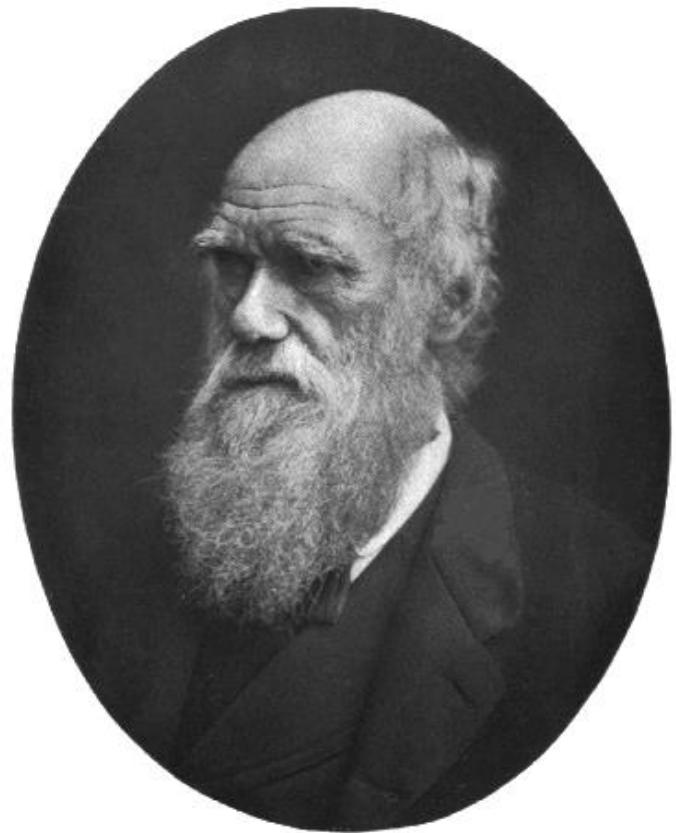
European age of exploration

- ◆ Columbus' crossing of the Atlantic, 1492
- ◆ Magellan's circumnavigation, 1519–1522
- ◆ sparked “voyages of discovery”



HMS Beagle

- ◆ circumnavigation
1831–1836
- ◆ Charles Darwin served
as naturalist
- ◆ made detailed
observations on
geology and biology
that led to the theory of
evolution



★ *HMS Bounty*

- ◆ 1787–1789
- ◆ sponsored by naturalist Joseph Banks
- ◆ voyage was intended to transplant breadfruit to the Caribbean islands





Freycinet Expedition, 1817–1820

- ◆ *Uranie* and *Physicienne*
- ◆ visited Guam
- ◆ reported first scientific observations of Guam and the Mariana Islands
- ◆ naturalists, Quoy and Gaimard (zoology) and Gaudichaud-Beaupré (botany)

★ Dumont D'Urville Expeditions

- ◆ two visits to Guam
 - *Astrolabe*, 1826–1829
 - *Astrolabe* and *Zélée*, 1837–1840
- ◆ continued scientific observations with naturalists





Scientists first began to accompany voyages in the mid-19th century

- ◆ Edward Forbes, in the 1840s & 1850s
 - carried out extensive dredging studies of seafloor around England
 - observed changes in community composition with increasing depth
 - although Forbes never dredged deeper than 364 m [1,200 ft], he hypothesized that nothing in the sea lived below 455 m [1,500 ft]

◆ *HMS Challenger*
Expedition, 1872–1876

- first major oceanographic voyage
- sailed around world gathering information systematically & carefully
- made observations @ 360 stations scattered over 360 million km² [140 million mi²] of ocean floor



H.M.S. CHALLENGER PREPARING TO SOUND, 1872.

General Outline of the *Challenger* Expedition (modified from Bailey, 1953)



- ◆ meticulous records of all measures & specimens were kept; at each station, recorded
 - total depth of water
 - temperature @ various depths
 - atmospheric conditions
 - current direction & speed
 - currents @ different depths
 - dredged sediment & biological specimens
- ◆ *Challenger* passed through Mariana Islands in vicinity of Pagan; discovered Mariana Trench on 23 March 1875—hit their deepest sounding = 8,136 m [26,850 ft]; greatest depth then known

- ◆ volume of data collected is enormous; after the voyage ended, it took 19 yrs to publish the results, which filled 50 large volumes, including two volumes summarizing the scientific results, two narrative volumes, and 46 monographs written by the leading scientists of the time
- ◆ expedition scientists discovered 715 new genera of marine organisms & 4,417 new species
- ◆ *Challenger* Expedition produced more information about the oceans than had been published throughout history to that time; most importantly, it laid the foundations of modern marine biology



Today

- ◆ technology continues to enable scientists to make major advances in marine biology
 - SONAR, detailed bathymetry
 - SCUBA, first-hand observations of marine life
 - space technology, large-scale observations and measurements
 - submersibles, deep-sea studies
 - desktop and mainframe computers, analysis of large volumes of data in short periods