

Zoogeography

Lesson 14



20th-21st November
2023

ID paper	Title and references	Student
1	New developments in the field of genomic technologies and their relevance to conservation management. doi.org/10.1007/s10592-021-01415-5	Lucrezia
2	Life history, climate and biogeography interactively affect worldwide genetic diversity of plant and animal populations. https://www.nature.com/articles/s41467-021-20958-2	Davide
3	Animal invaders threaten protected areas worldwide. doi.org/10.1038/s41467-020-16719-2	Luca
4	Urbanization and agricultural intensification destabilize animal communities differently than diversity loss. doi.org/10.1038/s41467-020-16240-6	Federica
5	Low level of anthropization linked to harsh vertebrate biodiversity declines in Amazonia. doi.org/10.1038/s41467-022-30842-2	Natalie
6	Factors shaping the abundance and diversity of the gut archaeome across the animal kingdom. doi.org/10.1038/s41467-022-31038-4	Lucia
7	A 2-million-year-old ecosystem in Greenland uncovered by environmental DNA. doi.org/10.1038/s41586-022-05453-y	Maddalena
8	High-resolution maps show that rubber causes substantial deforestation. https://doi.org/10.1038/s41586-023-06642-z	Gaia
9	Extensive global wetland loss over the past three centuries. https://doi.org/10.1038/s41586-022-05572-6	Guido

The potential **efficacy of larval dispersal** is shown by the fact that species of benthic invertebrate along the western coasts of the Atlantic are **more widely distributed** if they have **planktonic larvae** than if they do not

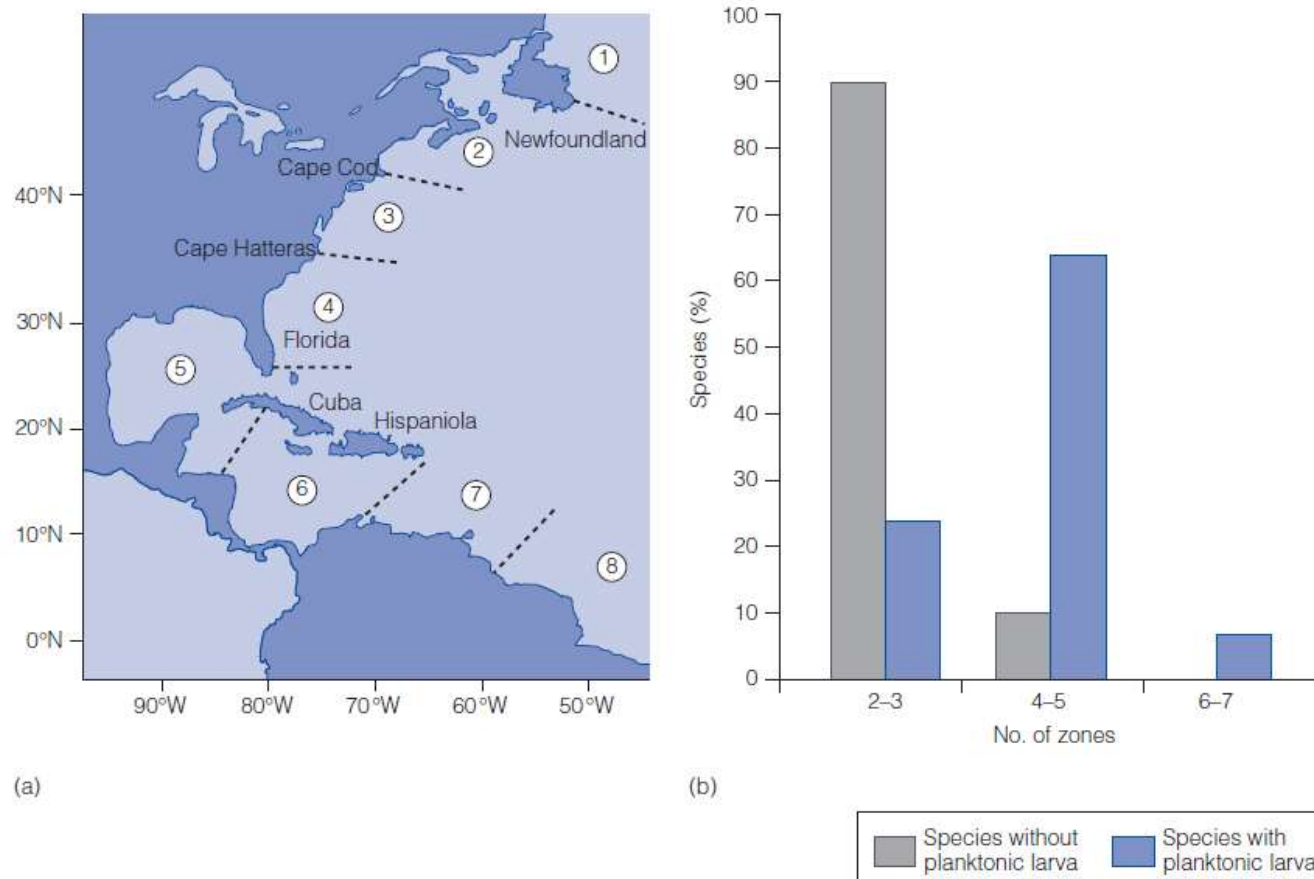


Figure 9.8 (a) Biogeographical zones down the western coasts of the Atlantic. (b) The number of invertebrate benthic species that occupy these zones, with or without planktonic larvae. Adapted from Scheltema [63].

long-lived larvae will need to feed during the days of dispersal, so it is not surprising to find that such larvae are more common in **low latitudes**, where the **phytoplankton season is long**, than in high latitudes, in which it is shorter

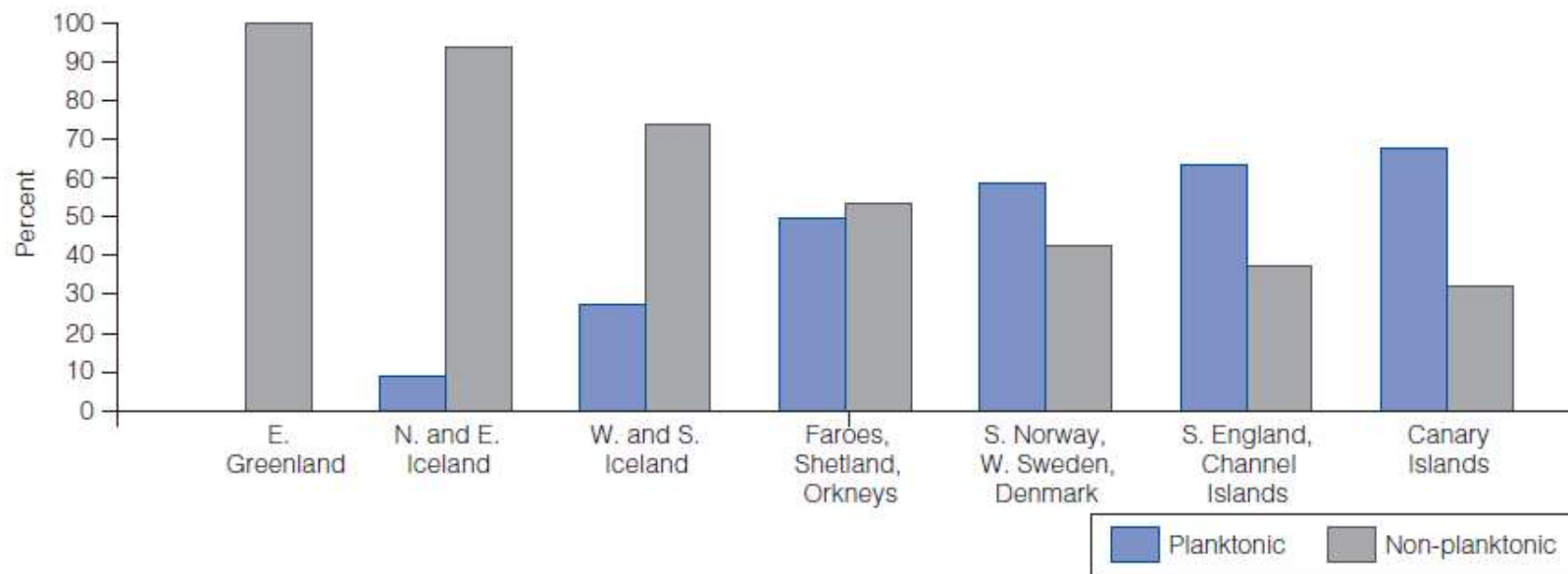


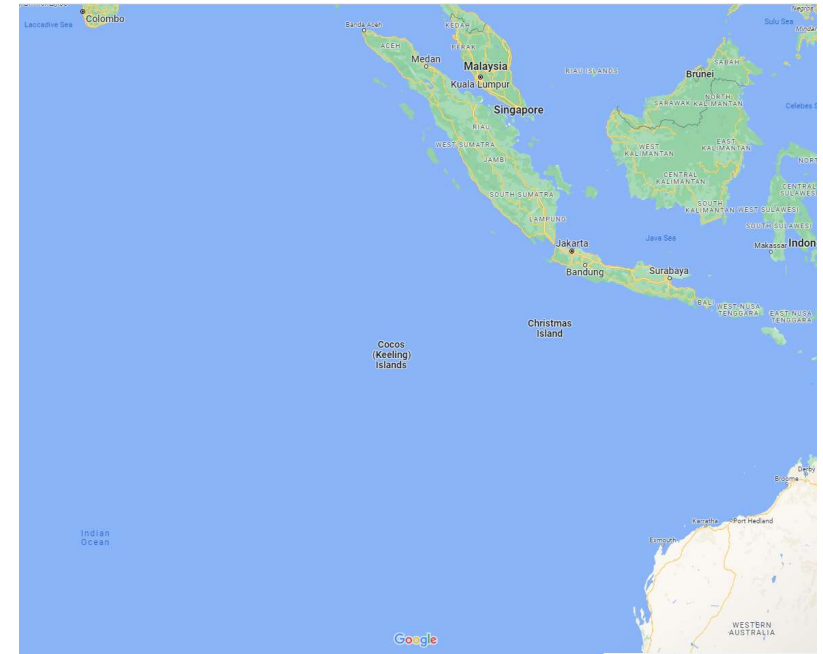
Figure 9.9 The percentage of gastropod species that either have, or do not have, planktonic larvae, at different latitudes. Adapted from Thorson [64].

Coral reefs

Coral reefs provide a complex, three-dimensional environment that is home for an immense diversity of marine organisms, including 25% of the diversity of life in the oceans, and comprise the greatest diversity of species of vertebrate per square metre known on Earth.

To date, 35k-60k different species of reef-dwelling organisms have been described, and this is probably only a fraction of the total number.

Between '50s and 1994 the number of fish, mollusks, echinoderms and corals known from the Coco Islands tripled (**genetic analysis!**)



Coral reefs

Min seasurface 16°C and
max 30-34°C

Hermatypic corals
cannot flourish where
there is high
sedimentation rate

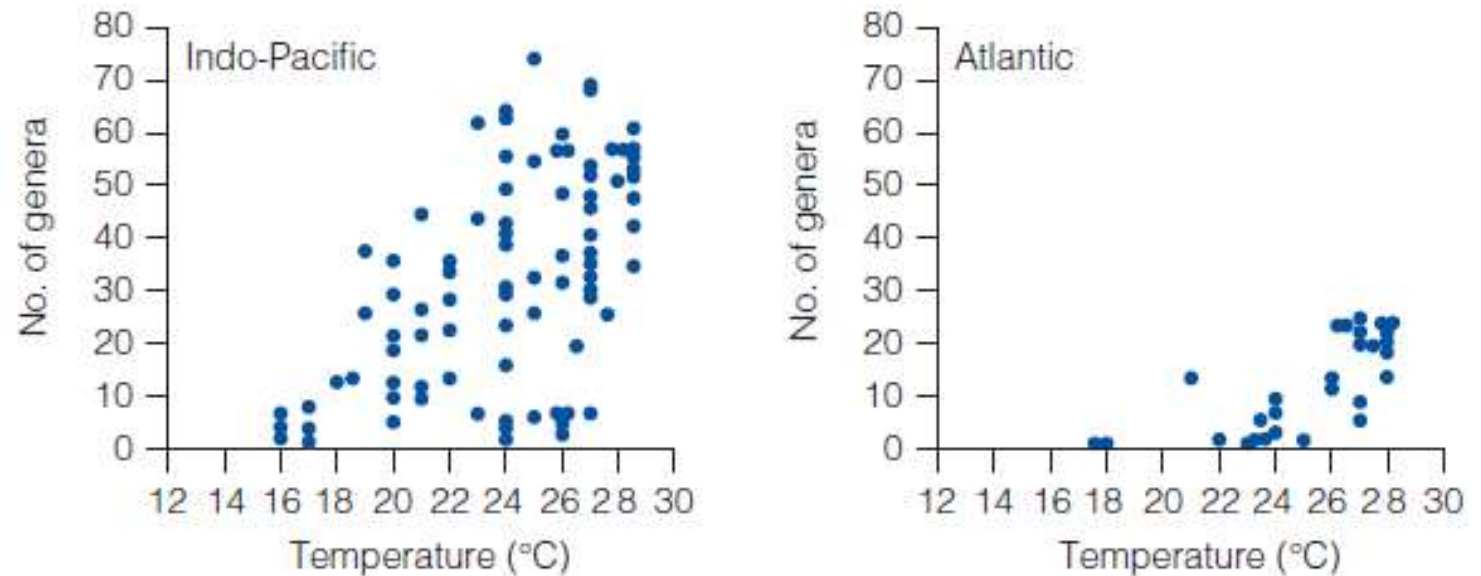
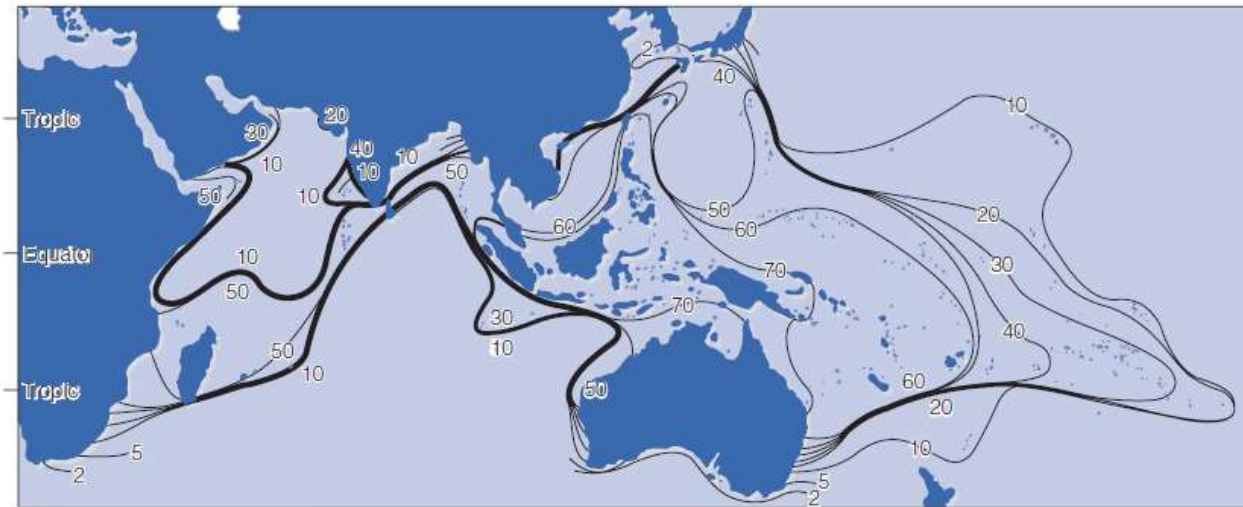


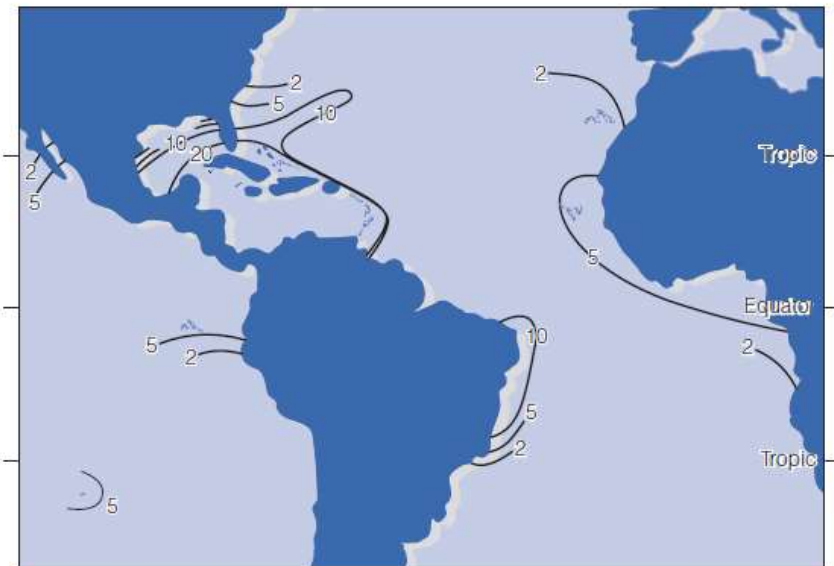
Figure 9.10 The number of genera of coral at different mean annual sea-surface temperatures in the Indo-Pacific and Atlantic oceans. From Rosen [65].



(a)

The westerly winds of the equatorial Atlantic bring heavy rains to the low-lying river basins of tropical South America, which drain back to the sea via the great rivers

- Seawater dilution
- Sediments



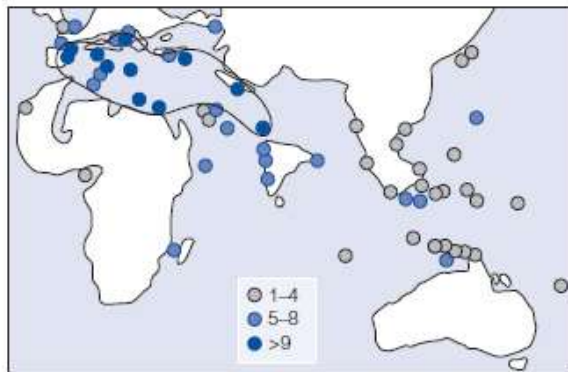
(b)

The impact of this phenomenon has been increased by the deforestation of the Amazon Basin

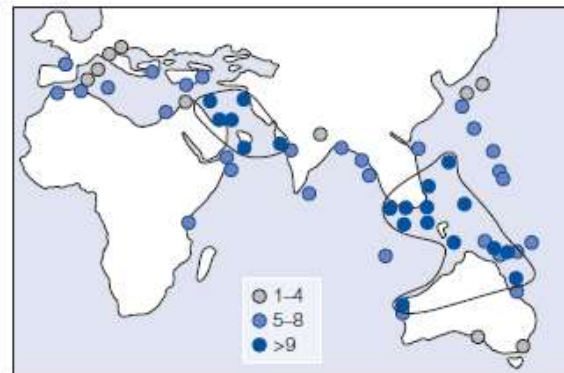
- the waters of the great rivers bearing even more sediment and also
- having an increased concentration of nutrients (while fires in Central America have had a similar effect on corals in the neighbouring part of the Caribbean).

Figure 9.11 Contours of generic diversity in corals, combining the distribution ranges of all the genera. (a) The Indian Ocean and West Pacific regions. (b) The East Pacific and Atlantic oceans. Adapted from Veron [46].

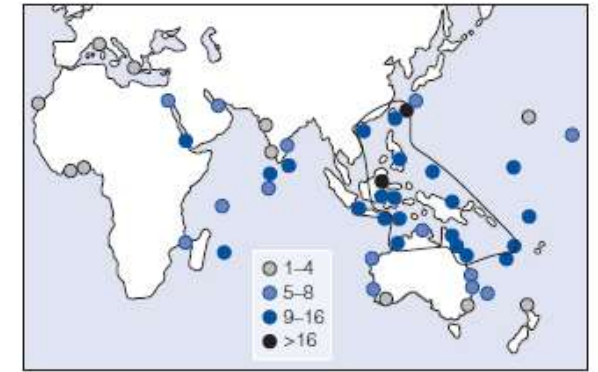
Reef hotspots location during time



Late Middle Eocene



Early Miocene



Recent

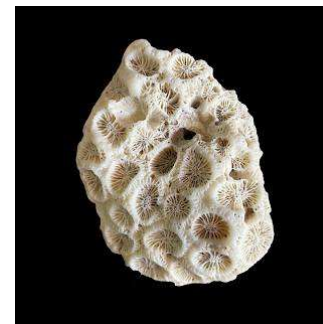
Figure 9.15 The locations of reef hotspots at three different periods of time. From Bellwood *et al.* [57]. (Reproduced with permission of Cambridge University Press.)

Paleontology: coral reefs and their faun changed around 65 mya

Herbivorous fishes did an intense grazing on algae



Open areas for fast-growing corals



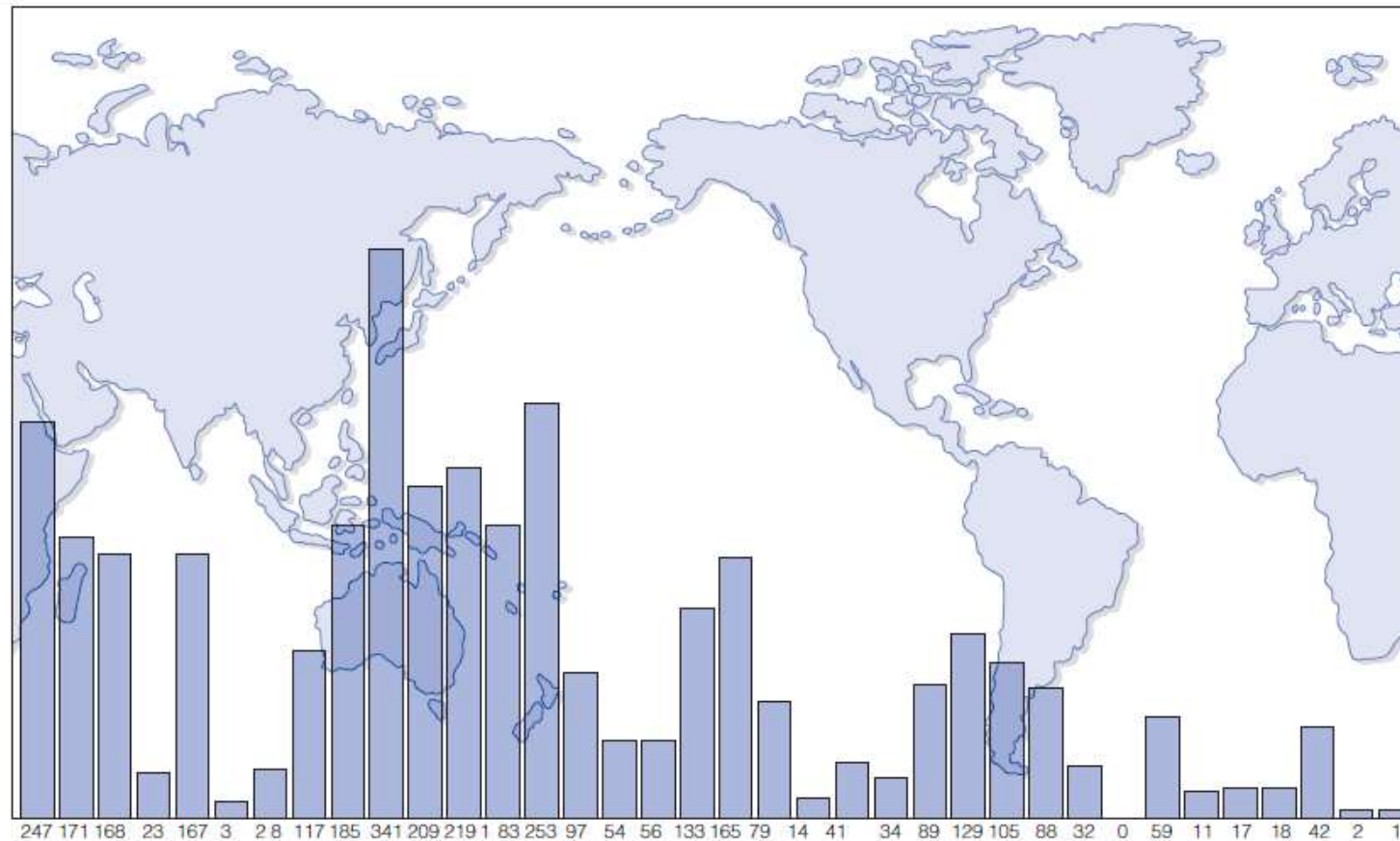
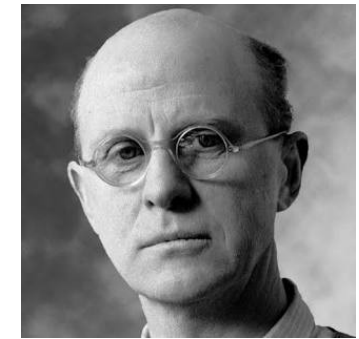
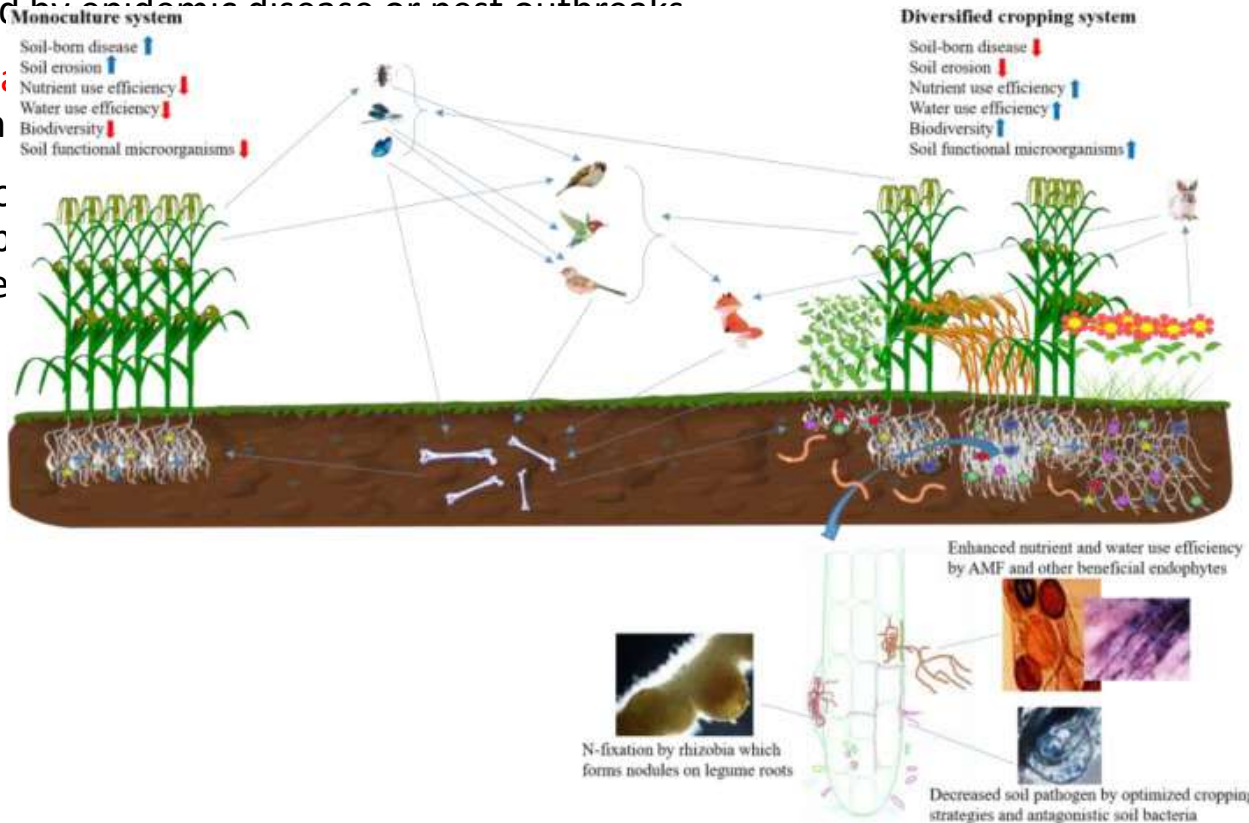


Figure 9.13 Longitudinal gradients in fish species richness. The columns represent the total number of fish species (from a sample of 799 species) that occur in each 10°-wide band of longitude. Note how the diversity increases in the latitudes that include the West Indies and Caribbean, where there are many coral reefs. Adapted from McAllister *et al.*

Has the diversity an influence on the stability of an ecosystem?

- Charles Elton who first proposed (in the 1950s) that a **more complex and rich ecosystem** should also be **more stable**, meaning that it was less prone to violent fluctuations such as those caused by epidemic disease or pest outbreaks

- a species in : events, such
- i.e. the use c in terms of b marginal are



te

Ivantages
in

Some confusion can arise because of the different ways in which the term *diversity* is used

often, it is simply used as an alternative to the number of species present within an ecosystem: **species richness**

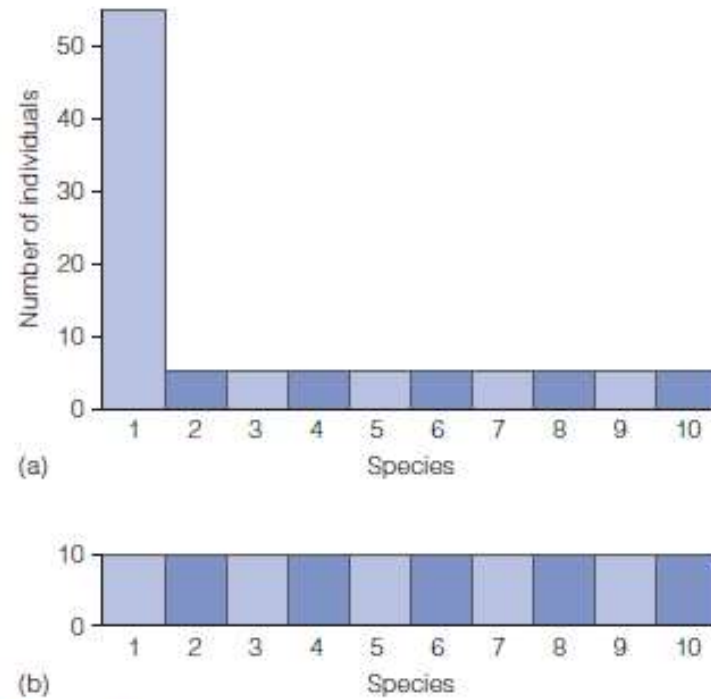


Figure 3.5 Hypothetical community of 10 species and 100 individuals. In (a), one species dominates; and in (b), all species have equal representation. It can be argued that (b) represents the more diverse of the two communities despite their having identical species richness.