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ZOO503 - Zoogeography and Paleontology

1. Biogeography of South America: 10

South America

The history of the biota of South America has been dominated by the effects of the great earth- engine of plate tectonics. Some of these effects were caused by the westward drift of the continent, which led to mountain building and consequent climatic changes, but most were the result of changes in its relationship with North America. As noted in the description of the origin of the Caribbean islands in the 'The West Indies' section, there had been islands in that region ever since the Americas started to move westward in the Early Cretaceous. This may have been the route by which some North American dinosaurs dispersed southward in the Mid-Cretaceous, accompanied by some early types of marsupial and placental mammal. But this connection has always been tenuous, sometimes permitting passage and sometimes becoming broken. This led to cycles of immigration, isolation and evolution, and final new immigration and extinction.

The Early Cenozoic:

The mammal fauna of South America today is characterized by a few marsupials (opossums) and a diversity of edentate placental mammals known as the Xenarthra (sloths, armadillos and South American anteaters) that are hardly known elsewhere. However, in the Late Cretaceous, South America had a mammal fauna of strange marsupials and of ungulate placentals quite unlike anything known elsewhere in the world. Alfred Wallace, one of the founders of zoogeography noted that the range boundaries of Amazonian birds seemed to coincide with the pattern of the rivers. It is fascinating that recent research shows that closely related taxa of some birds are to be found on either side of rivers throughout Amazonia.

2. What are three types of radiated amniotes 5

Amniotes radiated during the Late Carboniferous, giving rise to three main clades. These are distinguished by the pattern of openings in the side of the skull, especially the **temporal openings** behind the eye socket. These three skull patterns diagnose the key clades among amniotes which are

- i. **The anapsid** ("no arch") is the primitive state skull pattern, since there are no temporal openings. The Anapsida include various early forms such as *Hylonomus*, as well as some Permian and Triassic reptiles, and the turtles. The two other skull patterns seen in amniotes are
- ii. **The synapsid** ("same arch"), where there is a lower temporal opening. The Synapsida include the "mammal-like reptiles" and the mammals.
- iii. **The diapsid** ("two arch") pattern, where there are two temporal openings. The Diapsida includes a number of early groups, as well as the lizards and snakes and the crocodiles, pterosaurs, dinosaurs and birds. .

3. When modern birds appear?

Modern groups of birds appeared in the latest Cretaceous and Early Tertiary, including flightless ratites and ancestors of water birds, penguins and birds of prey. The perching birds or songbirds, consisting of 5000 species today, radiated in the Miocene

4. What is Kleptoparasitism with example? 5

Kleptoparasitism (literally, parasitism by theft) is a form of feeding in which one animal takes prey or other food from another that has caught, collected, or otherwise prepared the food, including stored food (as in the case of cuckoo bees, which lay their eggs on the pollen masses made by other bees; food resources could also be in the form of hosts of parasitic or parasitoid wasps). The term is also used to describe the stealing of nest material or other inanimate objects from one animal by another.

One very widespread duck in both continents is the gadwall. It feeds mainly on submerged vegetation, which is most abundant in nutrient- rich (eutrophic) waters. It cannot dive, so it feeds by upending, and this generally restricts it to the shallow parts of a lake, where it may encounter some competition from other water birds, such as the mallard. Coots (both Eurasian coot and the American coot dive for their food and bring vegetable matter to the surface from greater depths. The coots are messy eaters, and it is not difficult for gadwall to move in and collect some of the loot. This behavior is called **kleptoparasitism**, and it is an effective way of widening the niche of the gadwall.

5. Write a note on geographical history of New Caledonia

New Caledonia

Geological studies show that New Caledonia is the smallest (about 1600 km²) surviving fragment of Gondwana, having rifted away from Australia in the Late Cretaceous 80–65 mya and reaching its present position 1500 km east of it 50 mya. It is a hotspot for diversity: 77% of its flowering plant species are endemic to the island, as are 98% of the species of the flowering plant family Sapotaceae.

In view of the large amount of research that shows the frequency of long- distance dispersal in such scenarios, most biogeographers today believe that this was the mechanism of arrival of the ancestors of the **New Caledonian taxa**.

Geological studies show that the island was submerged for long periods in the **Paleocene– Eocene**, so that the island was not available for colonization until about 37 mya. The New Caledonian species must therefore have diverged from their ancestors after this date.

Panbiogeographers, however, **reject long- distance dispersal**. They therefore have to theorize that the Cretaceous ancestors of the present biota were widespread across the Pacific islands, including on supposedly formerly exposed large plateaux such as the Ontong Java plateau.

Biogeographers in Sweden and France have investigated the history of the New Caledonian species of the angiosperm family Sapotaceae. They found that these resulted from nine separate colonizations of the island between 33 and 4.2 mya, dates that are about 40 million years after the rifting of New Caledonia from Australia. New Guinea and Australia were the most important sources of the arrivals, those from Pacific islands arriving only more recently, 27–24 mya. These results are clearly totally incompatible with the panbiogeographers' theories.

6. History of old world tropical mammal fauna of Africa 5

Africa contains the best known and most distinctive of the Old World tropical mammal fauna. Molecular studies of the interrelationships of the different orders of placentals suggest that the common ancestor of a group of African placentals entered the continent in the Late Cretaceous. This group is made up of the elephants, hyracoids (conies), aquatic sirenians (sea cows), elephant shrews, aardvarks, Cape golden moles, insectivorous tenrecs and extinct embrithopods; they have been placed together in a super order, Afrotheria, that is endemic to Africa.

The early horse *Hipparion*, which had evolved in North America, appeared in both Eurasia and Africa, while rhinoceros, hyenas and sabre-toothed cats dispersed from Africa to Eurasia. The elephants originated in Africa in the Eocene, migrated into Eurasia in the Early Miocene and migrated back later in the Miocene. The ancestors of the mammoths and modern Asian elephant probably evolved in Africa 4 to 5 mya and migrated back into Eurasia 2 million years later.

7. Three amniotic layers in embryo and their functions.

- Enclose the embryo (the amnion)
- Collect waste (the allantois)
- line the eggshell (the chorion)
- Yolk, a yellow material rich in protein

8. difference between Sympatry AND Allopatry .

Sympatry

An initially interbreeding population that splits into two or more distinct species sharing a common range exemplifies sympatric speciation. Darwin's finches and their beak sizes

Allopatric speciation

Also referred to as geographic speciation, is a mode of speciation that occurs when biological populations of the same species become isolated from each other.

9. Redundant species hypothesis? 3

According to the *redundant species hypothesis*, the removal of certain species from an ecosystem would have little or no effect on the functioning of that ecosystem. Here, the function of an ecosystem could refer to its overall productivity, its rate of nutrient cycling or its general self-sustainability.

10. What is meant by Biogeography? 2

Biogeography is the study of the distribution of species and ecosystems in geographic space and through geological time.

11. What is meant by Niche? 3

The demands that an organism places on its environment in terms of physical and chemical conditions, space and food supply help to define what ecologists call its **niche**. But the concept of the niche goes beyond the basic physics and chemistry of its habitat and covers all aspects of how the organism makes a living. It includes the food an animal requires, but also encompasses the way in which it acquires that food. The kestrel is a bird that hunts small mammals by day, whereas an owl performs a similar

activity by night. Swallows catch aerial insects by day, and bats have the same feeding strategy at night.

12. Name the old amniotes and where it was found?

The oldest-known amniote, *Hylonomus* from the mid-Carboniferous of Canada is known only from its skeleton; no amniotic eggs are known from the Carboniferous.

13. What was the brain capacity of Homo habilis? 3

The first species, *H. habilis*, lived in Africa from 2.4 to 1.5 Ma, and had a brain capacity of 630–700 cm³ in a body only 1.3 m tall. *H. habilis* may have used tools.

14. Describe the Island biogeography of New Candolle 3

Another early contributor was Candolle, who pointed out that the age, climate and degree of isolation of an island, and whether or not it was volcanic, would also affect the diversity of its flora. Nevertheless, the sheer variety and volume of the works on island biogeography published by Alfred Wallace mark him as the real founder of studies on this subject.

15. Trace fossils excrement names, how they are different to other? 3

Fecal pellets and fecal strings: small pellets, usually less than 10 mm in length, or strings of excrement.

Coprolites: discrete fecal masses, usually more than 10 mm in length, and usually the product of vertebrates.

16. Describe the work of James Dana, and Edward Forbes in the Biogeography of Ocean 5

American scientist **James Dana**, who later became an eminent geologist. His brief paper, published in 1853, divided the surface waters of the globe into several different zones based on their mean minimum temperature.

Three years later 1856, the British zoologist **Edward Forbes** published the first comprehensive work, recognizing five depth zones and 25 faunal provinces along the coasts of the continents. He was the first to recognize the enormous Indo-Pacific faunal region.

17. Zoogeography 2

Developing from early 19th century onward with a different emphasis Birds and Mammals. Do not show a close correlation to local ecology. Early Zoogeographer: Prichard in 1826 and Swainson in 1835. Six regions. This was first formalized in 1858 by the British ornithologist *Philip Sclater*. He believed that all species had been created within the area in which they are found today.

18. Traces on bedding planes

- **Tracks:** sets of discrete footprints, usually formed by arthropods or vertebrates
- **Trails:** continuous traces, usually formed by the whole body, either trace

Excrement

- **Fecal pellets and fecal strings:** small pellets, usually <10 mm in length, or strings of excrement
- **Coprolites:** discrete fecal masses, usually >10 mm in length, and usually the product of vertebrates

Naming

- Given formal names, often based on Latin and Greek, just like living and fossil plants and animals
- Trace fossil genera: ichnogenera
- Trace fossil species: ichnospecies

19. Adaptive Radiations

One of the classic observations of large-scale evolution. A radiation is when a clade expands relatively rapidly. The adjective “adaptive”: happening because of some particular adaptation in the clade.

20: What are two key defining characters of Jawless fishes? 2

Two key defining characters: The head and neural crest tissues.

The neural crest appears in the early embryo as a strip of cells lying just below the outer skin, the ectoderm, of the embryo, above the line of where the backbone will develop.

21.What are characteristic features of Pterosaurs? 3

The pterosaurs were proficient flapping flyers, with a lightweight body, narrow hatchet-shaped skull and a long narrow wing supported on a spectacularly elongated fourth finger of the hand. Pterosaurs were covered with hair, and were almost certainly **endothermic**. Most pterosaurs fed on fishes caught in coastal seas, but others were insectivorous.

22. What is Study of trace fossil is called? 2

The study of trace fossils, often called ichnology (from the Greek ichnos, a trace).

23. Functions of Geographic Information System.

Modern biogeography often employs the use of Geographic Information Systems (GIS), to understand the factors affecting organism distribution, and to predict future trends in organism distribution. Often mathematical models and GIS are employed to solve ecological problems that have a spatial aspect to them.

24. Work of Leon Croizat in field of Biogeography.

He amassed a vast array of distributional data, representing each biogeographical pattern as a line, or track, connecting its known areas of distribution. Croizat studied the distribution patterns of many unrelated taxa, and for each he drew lines or ‘tracks’ on the map linking the areas in which they are found. In many cases, these lines were similar enough in position to be combined as ‘generalized tracks’, shown here. He found that the tracks of many taxa, belonging to a wide variety of organisms, could be combined to form a generalized track that connected different regions of the world

25. Oldest clear evidence for bipedalism

The oldest clear evidence for bipedalism was the find of some human tracks in volcanic ash from Tanzania, dated at 3.75 Ma. The oldest substantial skeletons, of *Praeanthropus afarensis*, come from rocks dated at about 3.2 Ma and also show clear anatomic evidence for advanced bipedalism, but still an ape-sized brain.

26. Name the most famous fossils. 3

One of the most famous fossils is *Archaeopteryx*, the oldest known bird. The first specimen was found in Upper Jurassic sediments in southern Germany in 1861, and was hailed as the ideal “missing link” or proof of evolution in action. Here was an animal with a beak, wings and feathers, so it was clearly a bird, but it still had a reptilian bony tail, claws on the hand, and teeth. Since 1861, nine more skeletons have come to light, the last two in 1992 and 2005.

27. What is the Biotic Replacement, give example?

Biotic Replacements are an obvious feature of the history of life. These are times when one group of plants or animals replaces another. The replacement of brachiopods by bivalves is a famous example. This had always been seen as a progressive process: the common view is that brachiopods are less adaptable than bivalves, and they clearly succumbed to long-term competition, perhaps lasting for tens or hundreds of millions of years.

28. The work of Albert Gunther, and Arbold Ortman in Biogeography 3

In 1880, the British zoologist **Albert Gunther** published a book on fishes in which he recognized 10 different regions in the distribution of shore fishes. The German **Arnold Ortmann** published a similar work based on the distribution of crustaceans such as crabs and lobsters.

29. Erythrosuchus

Small and large meat eaters such as *Erythrosuchus* appeared, one of the first of the archosaurs, a group that was later to include the dinosaurs, pterosaurs, crocodilians and birds.

MCQ's

1. The Spirallians are morphologically diversified clade of protostome animals including all of the following except.....**Cnidarians**
2. Early life was mainly affected by**predation**
3. Amphibians and reptiles evolved in**Triassic**
4. Lucy fossil old myb.... **3.2 million years**
5. Reptilian ancestors of mammals had... **synapsid skull**
6. The most advance mollusks are.....**Cephalopods**
7. Amniotes radiated in.....**Late carboniferous**
8. In early corocodilian were most diverse.....**Jurassic and Cretaceous**
9. Crocodile radiate in.....**jurassic**
10. First fossil evidence of bipedalism..... **Australopithecus afarensis**
11. Crocodile more diverse... **Jurassic and cretaceous**
12. Oldest known bird found in.....**Upper Jurassic sediments**

13. The oldest human was found is approximately lived ____ ago.....**6Mya**
14. German paleontologist ----- established a classification of trace fossil based on behavior**Adolf Seilacher**
15.are the observation of the appearance and disappearance of species.....**Patterns**
16. Which Scientist translated Cuvier's idea into English in 1813.....**Robert Jameson**
17.argues that all areas connected by one of these tracks had originally formed a single, continuous area that was inhabited by group concerned**Panbiogeography**
18. Briggs used pathogen of endemicity of coastal faunas to identify location where there appears to be a zone of unusually rapid faunal change and then used this to distinguish - -----**zoogeographical regions**
19. Brigg distinguish _____ zoogeographical regions.....**23**
20. The sum of all niche requirements under ideal conditions when the species is given unimpeded access to resources is called.....**Fundamental Niche**
21. ____ noted that the range boundaries of Amazonia birds seemed to coincide with the patterns of river.....**Alfred Wallace**
22. Geological study of New Caledonia show that the Island was submerged for long period in the Paleocene.....Eocene so that Island was not available for colonization until about.....**37 mya**
23. The ancestors of mammoths and modern Asian elephant probably evolved in.....**Africa**
24. During the early Devonian 380mya the fossil record suggest that all the early amphibians and reptile groups evolved in the continents called.....**Euramerica**
25. All of the following part of Gondwana Except.....**North America**
26. Many studies have demonstrated that the richness of the species particularly plant increases with -----**Altitude**
27. Evolution a process by which new species are generated it essentially involve.....**Genetic Variation and Subsequent selection**
28. The trade winds found in the both northern and southern hemisphere meet in the region of equators this is known as.....**Intertropical Convergence zone (ITCZ)**
29. _____ is a term sometimes used to describe waves of biological invasions that has occurred in the wake of human invasions by either accidental, transport or deliberate introduction**Ecological Imperialism**
30. When two species are attempting to tap a resource in the same way and when that resource in short supply the two are said to be in.....**Competition**
31. The theory of Island biogeography published in.....**1967**
32. All of the following are included in ecological biogeography except.....**Altitude**
33. In terms of diversification of life during the early Cambrian _____ was an important part of an ecosystem.....**Predation**
34. The focus of human evolution was in.....**Africa**
35. The reptile ancestors of the mammals are.....**synapsid**
36. Chondrichthyans is fish.....**Cartilaginous**
37. _____ is a term sometimes used to describe the wave of biological invasion that has occurred.....**Ecological imperialism**
38. Biogeography is an integrative field of inquiry that unites concept and information from solving branches of science except.....Any option except these (Ecology, Evolutionary Biology, Geology, Physical Geography).
39. Biology of ocean.....**marine biology**
40. ----- in on origin of species where devoted to geographical distributions.....**Two Chapters**
41. The oldest substantial skeleton of praeanthropus afarensis lived approximately ----- ago.....**3.2 Mya**
42. Early vertebrate skeleton..... **cartilage**
43. Certain species play key roles in the ecosystem, and when they are lost there is a sudden drop in the capacity of the ecosystem to function.....**River hypthesis**
44. Paleontology Originate from Greek word "Ontos" which means.....**Creature**
45. Today Extinction..... **6th**
46. Archaeopteryx is true missing link between.....**Dinosaurs and Birds**

47. Trilobites dominated assemblages in England and Wales area were described by.....**William Smith**
48. Fossils in Fold belts are, except.....**In Excellent Shape**
49. Where an organism live matters in which of the filters is preservation of the complete fossil record.....**Ecological Filters**
50. In Climate change in life history of earth has oscillated at least ----- between icehouse and greenhouse conditions.....**5 times**
51. Scala Naturae is -----**The Ladder of life**
52. When local ecological conditions affect the form of an organism during its life time and consequently fossil is called**Ecophenotypic Effects**
53. Rohde and Muller (2005) argued that there is ____ periodicity in mass extinctions**62 myr**
54. Modification of the Oparin____Haldane biochemical model is.....**Hydrothermal Model**
55. ____Biomarker indicates that eukaryotes were present around at least 2.7 Ga.....**Lipid**
56. Chromistans Includes all of the following, except.....**Protozoa**
57. The Parazoan body plan is seen in.....**Sponges**
58. Fossils Lagerstatten are assemblages of.....**inadequate Preserved soft bodied**
59. The Spirallians are morphologically diversified clade of protostome animals including all of the following except.....**Cinideria**
60. The most advanced mollusks are**Cephalopods**
61. The "Belly footed" Mollusks are.....**Gastropods**
62. The acme of the group Gastropoda with the radiation of the siphonal carnivorous neogastropods was in**Cenozoic**
63. Chelicerates are diversified and heterogeneous which includes....**All of the above (Mites, Scorpions, Spiders)**
64. Water Vascular system is present in.....**Echinoderms**

1. Which one of the following is second major diapsid clade

Ans: **Lepidosaurs**

2. The fossile may be classified according to the which of the following mode of behaviour represented

Ans: **All of given above**

3. The extraordinary diversity of tetrapode predators in the sea came to an end

Ans: **65Ma**

4. A network of collagen fiber on which needle like crystals of hydroxyapatite a form of (apatite CaPO_4) accumulate

Ans: **Bone**

5. Sphenodon the tuatara of

Ans: **New zeland**

6. Truly modern humans .H sapiens may have arisen as much as ----- and certainly by ----- in africa

Ans : **400,000 years ago ,150,000 years ago**

7. Lepidosaurus are

Ans: **Lizard**

8. Monotremes are restricted to

Ans : **Australasia**

9. Homo sapiens mean

Ans: **wise person**

10. Human arose ----- million years ago

Ans: **6-8**

11. Marsupials are included in ----- subclass of mammalia.

Ans: Metatheria

12. Apes arose from the -----

Ans: old world monkey

13. ----- live in Africa from 2.4 to 1.5 Ma

Ans: Homo habilis

14. Since 1861 ----- more skeletons have come to light

Ans: Nine(9)

15. Archaeopteryx is ----- fossils of ancient dinosaurs

Ans: Bird like

16. Proficient flyer diapsids were called

Ans: Pterosaurs

17. In the Cretaceous tertiary mass extinction which one of the following survived.

A. Monotremes b. Marsupials c. Placentals d. All of above

18. Synapsids radiated dramatically in the ----- as a new clade, the Therapsida.

Ans: Late Permian

19. Oldest known bird fossil was found in

Ans: Upper Jurassic

20. The basal vertebrate, lobe-finned fish, probably evolved during the-----

Ans: Ordovician

21. ----- more complex, with cones, bars and blades

Ans: Euconodonts

22. Ancestor of human and chimps separated about

Ans : 8-6 Ma

23. The membrane which encloses the embryo is called

Ans: Amnion

24. Early bony fishes almost certainly had **both lungs and gills**

25. After the Late Triassic extinction a new group of **herbivorous** dinosaurs, the sauropodomorphs, radiated dramatically, some like *Plateosaurus*.

26. Dinosaurs famously ruled the Earth for **160 Myr** of the Mesozoic. Replaced by the **mammals 65 Ma.**

27. The oldest substantial skeletons, of *Praeanthropus afarensis*, **3.2 Ma**

28. Trace fossils may be classified according to the mode of behavior represented:

Movement, Feeding, Farming, all of these

29. Plants moved onto land in the **Ordovician and Silurian,**

30. Gorillas seem to have diverged first, about **10 Ma**, and the ancestors of humans and chimps separated about **8–6 Ma.**