

GEO130 Oceanography
FILM STUDY GUIDE

Title: *Blue Planet, Seas of Life Episode I: Ocean Planet*, BBC/Discovery Channel

Synopsis: Earth is a blue planet. When seen from space water dominates, and 70% of Earth's surface is water. Oceans play a controlling role in almost every aspect of our dynamic planet from weather and climate to biological productivity. Just like on land there is primary productivity in the oceans. Phytoplankton, microscopic floating green plants harness the sun's energy and create biomass through photosynthesis. Primary consumers eat the phytoplankton. An example of a primary consumer is the crustacean krill. Other consumers eat the krill and in the ocean just like on land there are predators - example Killer Whales. There are daily, monthly and seasonal cycles in the oceans and with each there is a migration.

Geography: Scenes in this film occur in the open ocean, near seamounts (submerged islands) in the east Pacific, southeastern South Africa, the Falkland Islands, Costa Rica, tropical Pacific off Mexico, coastal Alaska, the deep ocean sea floor.

Major concepts and related information:

1. The Blue Whale is the most massive animal to every have lived on earth it can be 30 meters long and weigh 200 tons. Its tongue can weigh as much as an average elephant.
2. **Whales are mammals** and like humans breathe air and therefore must surface to do so. Whales are of two types **toothed whales** (examples Sperm Whale, Killer Whale) and **baleen whales** (Blue Whale, Gray Whale, Humpback Whale). Baleen is material like a bull's horn and arranged as filter plates. Great gulps of water are expelled through the plates, plankton is trapped and the whale's tongue cleans it from the baleen.
3. The largest of all animals feeds on one of the smallest - krill, a small crustacean that feeds on microscopic floating green plants called **phytoplankton** - they are **primary producers**. The blue whale can consume up to 40 million krill per day.
4. We know little of the Blue whale's migration routes and the breeding grounds of the blue whale - good news for the Blue Whale.
5. Earth is a blue planet with **more than 70% of the surface covered in water**.
6. **Within the volume of the ocean is 97% of Earth's habitable space**, and the oceans contain far more life than found in terrestrial ecosystems.
7. Life in the oceans is regulated by the **transport of nutrients and gasses** by currents and the variable strength of the sun. These dictate where primary producers will be plentiful or sparse. If primary producers are sparse so too are all other life forms.

8. The oceans are a force that dominates all of Earth.
9. Water vapor evaporated from the oceans becomes clouds that are transported by global winds so precipitation can fall far from where the water evaporated. Long term oceans play a controlling role in global climate.
10. Waves can be huge swells over the open ocean and barely be noticeable. They roll over and break on shore because of friction with the bottom.
11. The oceans never rest.
12. Open ocean areas are the oceanic equivalent of deserts. Biologically speaking they are nutrient poor. Those beautiful blue tropical waters are most nutrient poor of all.
NOT IN THE FILM BUT IMPLIED: Open ocean waters are far from sources of nutrients, i.e. minerals from erosion of continents. Warm waters hold less dissolved oxygen (O₂) and carbon dioxide (CO₂) than cool waters so are less productive.
 Therefore open ocean, warm tropical waters have little **primary productivity**. Seamounts are oases - in the open ocean they force cool (rich in CO₂ - good for phytoplankton, rich in O₂, good for fish) and nutrient rich waters to rise - this is one form of **upwelling**.
13. Seamounts - permanent residents are plankton and fish that feed on them.
14. Seamounts - visitors from the open ocean - tuna->sharks.
15. El Niño - changes weather and the distribution of life in the sea.
16. **Coastal upwelling** - brings nutrients to the surface. (**Not mentioned in the film - open ocean upwelling and downwelling**)
17. Southern Africa - feeding frenzy (sardine run) thanks to upwelling near the Natal Coast with the warm Agulhas Current just off shore.
18. Polar area monster storms can stir the water and bring up nutrients.
19. Life needs more than nutrients and thanks to green plants and photosynthesis the energy of the sun is harvested and food is available. (In the ocean floating organisms (plants and animals) that drift with the currents and do not propel themselves are called **plankton**. Floating plants are **phytoplankton**, Floating animals are **zooplankton**. Organisms that propel themselves are **nekton**)
20. The greatest migration of life on Earth (in terms of numbers of individuals and total biomass - 1 billion tons move daily that is 2 trillion - 2,000,000,000,000 pounds) is the migration of animals from the depths under the cover of night to get nearer the surface for food. They return to the dark depths at dawn.
21. The moon creates ocean tides.
22. Moon phases are closely linked to animal migrations. The 1st or Last Quarters - are the times of minimal tides and therefore the time of the smallest chance of rough waters. In Costa Rica - Ridley's Sea Turtles, come to shore during the quarter phases, mostly last quarter to lay eggs.
23. The annual cycle of the sun has the greatest effect on ocean life example the Alaska phytoplankton bloom.

24. Grey Whale migration is a 12,000 mile annual odyssey from the tropical Pacific off Mexico to the shores of Alaska to take part in the springtime phytoplankton bloom.
25. In the oceans decaying biological materials continuously sink towards the seafloor. This is sometimes called "marine snow" and link the animals of the deep to the sun far above. Again primary producers create the biomass and eventually some is eaten on the sea floor. Recall the creepy hack fish feeding on the whale carcass.
26. Deep-sea dwellers have strategies for survival. Sleeper Sharks are large and move slowly to conserve resources.
27. Herring go to Alaska for breeding. Different animals have different strategies for survival of the species. Herring produce billions of eggs, their strategy is producing great numbers of eggs which increases the probability many will survive. At the other extreme is the Grey Whale. Few offspring, the gestation period is about 12 months, that receive intensive care until the young whale can be on its own.