BIO 367 Antarctic Ecology
Exam II study guide
Fall 2021

Terms and Concepts: know definitions, significance specifically to Antarctic research and how to explain concepts if asked to do so in an essay question.

Lecture VII: Marine ecosystems and ice fish

Continental shelf, slope and abyssal plain
Photic zone
Benthic biodiversity in Antarctica and endemism
Sea ice and nutrients
Pycnogonids
Bull kelp characteristics and kelp community in Antarctic Peninsula
Biological pump in benthic zone
King crab invasion—potential impact
Sea ice algae and productivity
Heavy versus light ice years
Why more ice with warmer temperatures?
Sea ice microhabitats and community
Primary production and timing in new versus multiyear sea ice, marginal ice zone
Antarctic krill (*Euphausia superba*) life cycle, vertical migration, distribution
Crystal krill (*E. crystallorophias*) and how it differs in life cycle from Antarctic krill
Krill swarms
Salp and patterns in abundance
Ice fish—Notothenioidei, characteristics, glycoproteins
Silverfish (*Pleurogramma antarcticum*) life cycle, vertical migration, and importance
Channichthyidae fish and characteristics, blood and oxygen flow
Otoliths, structure and study
Deep sea benthos composition, origin, biodiversity
ANDEEP program
Biodiversity pump from Ross and Weddell Seas
Forams
Gigantism and why it occurs with marine invertebrates

Lecture VIII: Terrestrial ecosystems

Biodiversity in east versus west Antarctica
Cold-active bacteria
Soil characteristics and five processes for development
Soil horizons
Parent material, importance and physical/chemical breakdown
Exfoliation
Gelisols
Ornithogenic soils
Microfauna in Antarctic soils: tardigrades, nematodes, mites, bacteria, fungi, protozoa
Cryoturbation and polygons

Soil patterns from freeze-thaw
Cryptogamic soils
Dry valley soil characteristics
Antarctic Peninsula soil characteristics
Three types of lichen and mutualism of fungi and algae
Lichen characteristics, biodiversity, growth rates and reproduction
Endolithic lichens and why only in sandstone
Moss and algae biodiversity and characteristics
Moss pigments and photosynthetic physiology
Snow algae characteristics, mucilage
Vegetation zonation at active and abandoned penguin colonies
Antarctic grass and pearlwort distribution and characteristics
Biodiversity trends for plants and invertebrates, sub-Antarctic to the continent

Lecture IX: Ornithogenic soils

Formation and lithology
Biological contents and preservation
Types of analyses possible
Microbiota compared to other soils
Algae associated with penguin colonies
Ornithogenic soils versus ornithogenic sediments
Bio-elements in ornithogenic soils
Estimating past penguin populations and movements from bio-elements
Paleodietary information

Lecture X: Antarctic lakes

Important factors for lake mixing and productivity
Dimictic, monomictic, and meromictic lakes
Oligotrophic versus eutrophic lakes
Allochthonous versus autochthonous inputs in lakes
Lake types in Antarctica (five) and their characteristics
Percent salinity for freshwater versus saline lakes
Effect of ice cover on lakes
Lakes at penguin colonies
Dry Valley lakes and variations
Don Juan Pond, Lake Vanda
Lakes Bonney, Hoare, and Fryxell
Ross Ice Shelf, Lake Washburn and evolution of Dry Valley lakes
Biota in freshwater lakes
Cyanobacterial mats
Rotifers, cladocerans, and copepods
Fairy shrimp only in the Antarctic Peninsula and why
Saline lakes and their different origins
Don Juan Pond significance and source of $CaCl_2$ salts
Stratification in saline lakes—mixolimnion versus monimolimnion
Pony Lake characteristics

Epishelf lakes and their origin, rarity, and associated freshwater and marine species
Beaver Lake
Supraglacial lakes and characteristics
Cryoconite holes and formation
Subglacial lakes, how discovered and mapped and why they exist
Lake Vostok research, recent results from Russian core
Blood Falls in Taylor Valley and origin

Lecture XI: Subantarctic islands

How defined and locations
Scotia arc and island chains
Biodiversity and climate
Isla de los Estados, South Georgia Island
Antarctic maritime islands
Tussock community function and distribution
Bird guano and volatilization of nitrogenous compounds
Floral diversity and endemism
Megaherbs on Campbell Island
Introduced species and impacts: South Georgia, Marion, and Macquarie Islands
Impacts of reindeer, cats, rats to seabirds and vegetation
Eradication efforts and recovery
Graph of cost/effort with total eradication
South Georgia Pipit, Royal and Snares Crested Penguins
Eradication program and methods on Macquarie and South Georgia Islands
Cushion plants and impact of climate change
Marine Protected Areas and effectiveness
Five features of successful MPAs

Lecture XII: Marine mammals

Diversity and biomass in southern ocean
Endemic species of pinnipeds (four seals) plus two other subantarctic to Antarctic species
Otariidae vs. Phocidae differences
Antarctic fur seal distribution and breeding cycle
Elephant seal distribution and breeding cycle
Ecological differences in pinniped diets and habitat
Four endemic seals and sea ice habitat, characteristics, and breeding cycle
Weddell seal and why more is known about it than other Antarctic seals
Leopard seal diet and specializations on penguins
Krill as a keystone species in the southern ocean
Antarctic silverfish
Odontoceti vs. Mysticeti differences
Major cetacean species in the southern ocean
Orca types, dietary differences, hunting strategies
Spy hopping and wave washing
Weddell seal ‘butchering’ by orcas
Humpback whales feeding strategy, baleen

Humpback migration and feeding zones
Minke whales and foraging habitat
Trophic interactions whales, penguins, krill