BIOS-385 Parasitology Scott Gardner

SOME IMPORTANT DEFINITIONS

PARASITISM --an intimate, symbiotic association between organisms of two or more species, in which the parasite obtains benefit from the host(s) which it usually injures.

SYMBIOSIS --*"living together" of two organisms of different species. Broadly defined,* includes parasitism, predation, commensalism, etc.

PREDATION --a short-term example of symbiosis in which the predator kills the prey outright.

PHORESIS --symbiosis in which one organism, the phoront, is carried about by its host. No physiological dependence exists.

MUTUALISM --symbiosis in which both partners derive a definite benefit from the association.

COMMENSALISM --symbiosis where the commensal is benefited while the host is neither harmed nor helped.

ECTOPARASITE --a parasite that lives on the outer surface of its host (is said to infest the host).

ENDOPARASITE --a parasite that lives inside its host (is said to infect the host).

OBLIGATORY PARASITE --a parasite that must spend all or a part of its life cycle on or in its host(s).

FACULTATIVE PARASITE --an organism which is not normally parasitic, but can become so, if accidentally ingested or exposed to wounds.

ACCIDENTAL (INCIDENTAL) PARASITE -- a parasite found in (or on) other than its normal host.

TEMPORARY PARASITE (MICROPREDATOR) -- a parasite that contacts its host briefly to feed and then leaves.

PERMANENT PARASITE --a parasite that spends its entire adult life within or on a host.

HYPERPARASITE -- a parasite that utilizes another parasite as a host.

PARASITOID -- an organism intermediate between a parasite and a predator. The term generally refers to an arthropod (esp. O. Hymenoptera) that is a parasite as a developing larvae, but ultimately kills and ingests its host. Only one host is

consumed during the lifetime of the parasitoid.

DEFINITIVE HOST -- the host in which the parasite achieves sexual maturity.

INTERMEDIATE HOST -- a host in which a parasite develops to some extent but not to sexual maturity.

PARATENIC (TRANSPORT) HOST -- a host in which the parasite survives without undergoing further development.

RESERVOIR HOST --an animal other than a human or domestic or species of interest which serves as a host for a parasite that can also infect domestic animals or humans or other species of interest.

ZOONOSIS -- a disease of animals that is transmissible to humans.

EPIDEMIOLOGY -- the study of the distribution, dynamics, and determinants of disease in human and/or animal populations.

VECTOR -- the means of transmission of a disease organism from one host to another. Mechanical: wind, water, sputum, etc.
Biological: fleas, mosquitoes, etc.

Direct (Monoxenous) Life Cycle --living within or on a single host during the parasite's life-cycle.

Indirect (Heteroxenous) Life Cycle living within or on more than one host during the parasite's life-cycle.

Sylvatic cycle – one that occurs in nature.

Domestic cycle - - one that occurs in human oriented

Parasitology is the study of parasites and of parasitism.

This field encompasses – phylogentics, genomics, ecology, entomology, helminthology, mammalogy, biochemistry, vector biology, ornithology, molecular biology, cell biology, protistology-protozoology, mathematics, statistics, ecological niche-modeling, and much more.

The first part of parasitology probably was home-remedies, or at least cave remedies or, in the case of primates at the earliest evolutionary stages in Africa, an understanding that if you ate a dead warthog, raw, you might kick off or at least get really-really sick. Thus, parasites may have been important in the development of cooked meat and harnessing fire by evolving species of *Homo*.

It may have gone something like this: A group of *Homo sapiens* that was running around on the plains of Africa may have seen that one of the group, we can call him "Jared," ate some meat of a wart-hog that had been in a bush-fire and he did not die or get a sore diaphram or tongue (of course we know this to be the symptom of *Trichinella spiralis* infection - more on that later.. remember this name, not Jared, *Trichinella!*) while his buddy, Biddler, ate some of the hog that had not been so cooked. Biddler died, and since Jared ate cooked meat and the rest of the group ate this too, they figured out how to keep fire because of this, and the group formed the basal clade of the rest of humanity.

A deeper pre-history of parasitology, at least from the paleontological perspective was the first identification of a pinworm nematode from the fecal pellet of a cynodont from Brazil that lived when the continents were still in the form known as Pangea (see my CV). We found what we identified as an egg of an Oxyurid nematode.

Taxonomy, which came later in the history of development of biological thought is "The science of the naming of organisms." George Gaylord Simpson wrote a book on the subject and we will look at this in class.

Names of plants and animals are officially rooted in the date of January 1, 1758. This was the date that systematists and taxonomists have decided on to use for the work of Carolus Linnaeus "Systema Naturae" developed the system of binomial nomenclature that we use today to name the diversity on the earth.

From page 22. Brooks and McLennan:

4 Guiding principles to studies of parasite diversity.

1) Phylogenetic trees are necessary but rarely sufficient for explaining evolutionary origins and diversification.

2) We (as scientists) must always be responsible for well-formulated questions.

3) We (as scientists) must always be responsible for the quality of the data used in any level of our analyses, from generating phylogenetic hypotheses to testing general theories.

4) Everything we learn implies more cycles of discovery and evaluation.

When did parasitology first begin to come into the area of human thought?

1) Study of Local Faunas. Naturalists exist in all human societies, especially where the natives must use the plants and animals for their daily existence. This was evident to me where I grew up in on a farm in western Oregon. We also encountered true naturalists when we first went to the field in Bolivia in 1984 – 2000 and in Mongolia from 2009-2012.
2) Non-Formal Explanations of Diversity. Usually developed from the Description of Local Faunas.
3) In New Guinea – One tribe had 137 specific names for 138 of the birds in the area in which they lived.
4) Nunamiut Eskimos in the Brooks Range of Alaska – All had names for each of the specific mammals, birds, insects, and plants that lived in the area where the Eskimos of Anaktuvik Pass lived. These were the last nomadic eskimos in the US territory and they quit moving their camps in the 1940's.

Period of Enlightenment and the Description of Local Faunas.

Hippocrates (460-377 B.C.) - Enumerated types of animals but no useful classification Aristotle (384-322 B.C.) Brought together the initial material and stated “animals may be characterized according to their way of living, their actions, their habits, and their bodily parts.”

He is the father of classification. His surviving works show that he recognized: birds, fishes, whales, insects (several subdivisions of the insects, including beetles). However, no orderly consistent classification was produced. - His thinking dominated animal classification for the next 2000 years, and kept biology in the dark for that long, too. He stated that spontaneous generation was a fact and nobody disputed this.

The Chinese were much more enlightened: Around 4700 B.C.E. -- Nematodes were first mentioned in the surviving literature in the Huang Ti Nei Ching or “The Yellow Emperor’s Classic of Internal Medicine” – also included were foods to avoid.

-Symptomatology.
-Treatment.

Year 217. Chang Chi noted: During ordinary abdominal pains, the pulse becomes feeble and thready. If on the contrary it is full and bounding, it indicates the sure presence of *Ascaris* in the abdomen.

Year 1174. “The three causes and one effect of disease” Some people become parasitized through eating fruits and vegetables or animals viscera, which contains their progenies.”

–>They knew that eggs and parasites were transmitted via microbial infection. –>

In the west, it was not until 1864 that the experiments of Louis Pasteur showed that spontaneous generation was false.

Classification.

Classifications in general.

Ecological Classification (defines sets such as): Forest insects, grassland insects, fresh water fishes, cave salamanders, prairie species, etc.

Organisms involved in this broad classification are identified and named according to other classifications before they are put into an ecological context.

Teleological classifications define sets (not taxa): according to their usefulness or lack of it with respect to humans. Examples: 1. Edible, non edible 2. Domesticated animals, draft animals, meat animals, pets.

Classifications are creations by us for our use.

There can be natural classifications - those that after designation, the phylogeny can be reconstructed from the classification.

-There are arguments for and against using this kind of classification. We will talk about these.

Linnaeus was the founder of modern bionomial nomenclature, from which the classification system has been developed.

Classification: Linnaeus used only 5 of these categories in 1758.

Linnaeus used Empire for the world of Phenomena. ----------

Kingdom

Phylum

Class

Order

Family

Genus

Species

Of course we can add other sections of these such as super and sub and other sections - like tribes