

What we will cover today

Physiology, Nutrition and Birth

- 1. Animal Physiology**
 - 2. Nutrition, Indices and Analysis**
 - 3. Stress, its Hormones and Mechanism**
 - 4. Pregnancy and Birth in Animals**
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What is Animal Physiology

Deals with animal metabolism and body functioning, e.g.

-nutrition

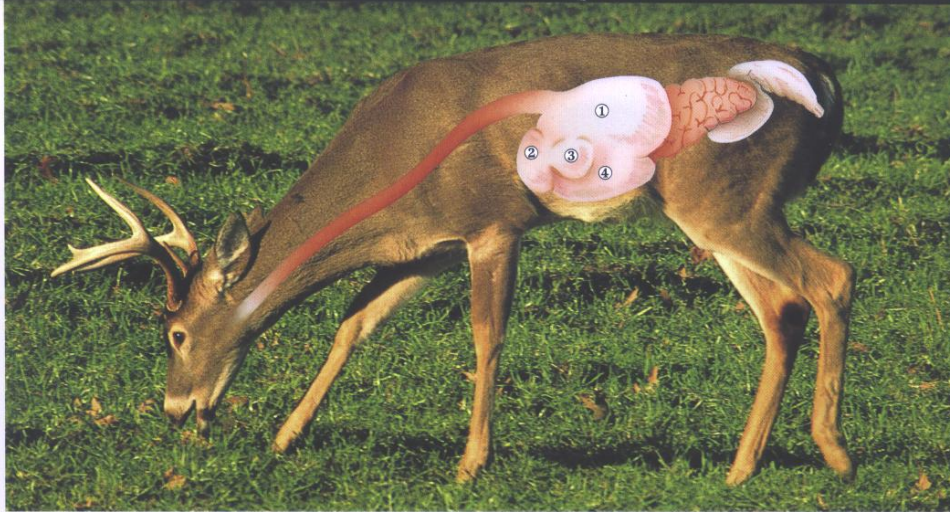
-reproductive capacity

-stress

"Physiology can describe the well-being of an animal".

It provides crucial information for complementing habitat and impact studies towards a 'complete biological picture' !

First: The Animal's Interior...



THE STOMACH consists of four chambers. The largest and the second chamber (?) the reticulum. Then it nas.

Lung
Heart
Liver
Kidney
Fat
Bones
Glands
Blood
Vessels...

Nutritional Analysis

Chemical and Energetic Analysis of Food

Nutrition: Rate of ingestion of assimilable energy and nutrients

Nutritional Condition: State of body components controlled by nutrition and which, in turn, influence an animal's fitness.

Nutritional status is usually a measure of fat or energy stores in the body (protein and calcium were also suggested).

Storing energy/fat carries advantages and disadvantages.

Nutritional Analysis

Food Digestibility Measurements

In vitro: Rumen fluid, buffer solution, pepsin and mild acid
(Tilley and Terry 1963)

vs.

In vivo: Difference of food input vs. output (consider energy loss)
(Total Collection Method)

Nutritional Analysis

Nutritional and Energetical Techniques for Wild Populations

Combining Food habits and Diet quality Data:

- Analyses of Stomach and Crop Contents
 - Indicator Techniques e.g. lignin, ash, indigestible cell-walls
 - Indices of Diet Quality, e.g. fecal nitrogen, DAPA concentration
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Selected Indices of Nutritional Condition

Mammals:

Body Fat

Skeletal Measurements

Weight

Marrow Fat Index

Kidney Fat Index (KFI)

Blood and Urine Characteristics

Others: Visceral Fat, Mesogastric Fat, Carcass Density

Selected Indices of Nutritional Condition

Birds:

Body weight and structural measurements

Discrete Fat Deposits

Bone Marrow's Fat Index

Percent Water

Electrical Conductivity and Ultrasound

Ptilochoronology

Protein Index

Blood Characteristics

Food and Wildlife: An example

Habitat choice is affected by food quality...

Assessment of Reproductive Patterns and Performance

Male Birds:

Testis Size

Sperm Counts

Testicular Biopsy

Female Birds:

Ovarian Activity

Postovulatory Follicles

Laparotomy

Clutch Size

Egg Quality

Crop Gland

Assessment of Reproductive Patterns and Performance

Female Mammals:

Detection of Estrus (Estradiol level)

Ovulation and Ovarian Analysis

Ovarian Function

Laparotomy, Laparoscopy and Ultrasonography

Analysis of Follicles

Corpora Lutea

Uterine Analysis and Fetal counts

Lactation

Reproductive Endocrinology

Hormone Profiles (each stage of reproductive cycle from courtship and fertilization to egg incubation or lactation is controlled by a sequence of hormonal signals)

Male Birds and Mammals: FSH and LH, testosterone and androgens

Female Mammals: FSH and LH, estrogens, progesterone

Female Birds: LH, prolactin

Hormone Metabolites in Urine and Feces

Method: Radioimmunassay (RIA)

Highly specific and sensitive for reliable estimates of hormone concentrations from (tiny) plasma samples

Applied since 1970s

Importance of Reproductive History: An Example

How does El Nino affect Reproduction in a Seabird Colony ...

Stress and Stressors

Any stimulus that elicits stress, e.g. pain, fear, cold, blood loss, environmental contaminants, pathogenic microbes, social tensions
(Selye 1936, 1976)

Stress in Animals

Mechanisms and physiological basics:

HPA (Hypothalamic-pituitary-adrenal axis)

CRF (Corticotropin-releasing factor)

ACTH (Adreno-corticotrophic hormone)

Steroids and Glucose Metabolism

Affect reproductive functions

Dispersal appears to avoid pathogenic effects of stress

Stress in Animals

Measurements:

-ACTH

-corticosteroid secretion (Cortisol)

-Adrenal weight (chromaffin tissue)

Stress in Animals: An Application

Elevated CORT levels interfere with hormonal control of reproduction and induce mortality in high density populations

= > population cycles, density-dependent effects, predator-prey

Stress in Animals

Applications of measurements:

Habitat Evaluation Studies

Disturbance Studies

Endangered Species

Zoo and Cage Studies

Telemetry Studies

Predator-Prey Studies

Dispersal Studies

Birth and Pregnancy in Animals

Mammals: estrus cycle or breeding season
copulation
pregnancy (egg dormancy possible)
birth
dispersal or care-of-the-young

Birds: breeding season
copulation
egg development
egg laying
incubation
hatching
post breeding dispersal (multi-broods possible)

End of Session

Any Questions ?

