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ZOO510 - Economic Zoology

1. Mode of action of pesticide and pest resistance. 10 marks

Mode of action: how they work to control the pest

- Systemic pesticides are absorbed through tissues and transported elsewhere where the pest encounters it through feeding
 - Used on plants or livestock
- **Contact** pesticides must come in direct contact with the target pest

Pesticides vary in how they work to actually control the pest. We call this the mode of action – how they kill or control the pest.

Some pesticides are systemic and actually move through animal or plant tissues and the pest encounters it when feeding on the animal or plant.

Other pesticides work by contact action like battery acid on your pants. You must make sure that you apply the material so that it comes into direct contact with the pest.

Selectivity: what range of pests they affect

- **Non-selective** – kills all related pests – for example some herbicides kill all green plant that gets a sufficient dose
- **Selective** – kills only certain weeds, insects, plant pathogens – for example other herbicides only kill broadleaf weeds not grasses

Pesticides also vary in their selectivity or how many different pest species they target.

Some affect all related organisms equally and are called non-selective. A good example is glyphosate, the active ingredient in Roundup Original. Glyphosate is non-selective when applied to green plants. ANY green plant that gets a sufficient dose will die whether it's a broadleaf or a grass plant.

In contrast, a selective pesticide only kills a small group of related organisms and does not harm others. The herbicide 2,4-D is a good example. It only kills broadleaf plants and does not harm grass plants when applied according to label directions.

Persistence: how long they remain active in the environment

- **Residual pesticides** – remain active for weeks, months, years – for example herbicides used around road guard rails
- **Non-residual** – inactivated immediately or within a few days – for example – some herbicides do not remain active in the soil once applied

Persistence is the term used for how long a pesticide remains present in the environment. DDT, which is no longer used, was a very persistent insecticide that's still found in the environment today. Many of the new products break down in a matter of hours or a few weeks. There are some persistent materials on the market today; we call them residual insecticides and herbicides and use them where we want long-term control.

Applications of residual herbicides are made to rights-of-ways so repeated applications are not required throughout the year.

Non-residual materials are also available, they break down very quickly.

2. Source of protein. 3 marks

Sources of Protein

6 common sources

1. Soybean Meal
2. Cotton Seed Meal
3. Fish Meal
4. Tankage
5. Skim Milk
6. Alfalfa

3. Difference between hygiene quality and milk. 3 marks

Hygiene and Milk Quality

- Dirty milk (containing dirt, bacteria or antibiotics) can cause serious problems when processing.
- Dirty milk is caused by unhygienic milking machines or poor milk filters.
- Antibiotics are found in milk as residues from treatments to cows for mastitis.
- When milk is found to be not up to standard, it may be rejected by the creamery or bought at a lower price.

4. Milk composition .5 marks

Milk used for bottling or drinking must by law contain 3.6% fat and 8.5% SNF.
Creameries buy milk in many different ways – sometimes at a flat rate per kg.
Sometimes, however, it may be by percentage butterfat or protein.
Milk composition varies also amongst different breeds.
The milk of the Jersey cow has the highest butterfat and SNF content of any cow.
Also the composition of milk varies during milking.
The milk at the start may only contain 1% fat, while the milk at the end (“The Stripping”) may contain 10% fat.

5. Bubonic plague . 5 marks

14th Century Europe: mysterious scourge kills millions
Centuries later it was found that rat fleas became infected with disease-causing bacteria
Fleas sought other warm-blooded hosts (humans) when rat numbers declined
Plague is currently managed monitoring for plague and reducing the number of rodent-hosts for fleas

Do you remember anything from your history lessons about Black Plague in Europe?
During the
14th Century there were Plague outbreaks, millions of people died, and at the time it wasn't understood why. Centuries later, it was discovered that Plague was a bacterial disease and it was spread by fleas found in rodent populations. Besides biting rats, infected fleas would bite humans and other mammals. Bubonic plague is still present in some rodent populations today, even here in the United States. But with rodent management and plague monitoring, only a few people a year are infected with plague.

6. Bio accumulation .2 marks

Bioaccumulation: when a chemical accumulates in animal fat (historical fact)

Bioaccumulation is the gradual accumulation of substances, such as pesticides, or other chemicals in an organism.

Bioaccumulation occurs when an organism absorbs a substance at a rate faster than that at which the substance is lost by catabolism and excretion.

7. Monogastric and polygastric .2 marks

A monogastric organism has a simple single-chambered stomach, compared with a ruminant organism, like a cow, goat, or sheep, which has a four-chambered complex stomach.

Monogastric (simple stomach)
Pig, Dog, Human

Polygastric (ruminants)

Ruminants are mammals that are able to acquire nutrients from plant-based food by fermenting it in a specialized stomach prior to digestion, principally through microbial actions. The process, which takes place in the front part of the digestive system and therefore is called foregut fermentation, typically requires the fermented ingesta (known as cud) to be regurgitated and chewed again. The process of rechewing the cud to further break down plant matter and stimulate digestion is called **rumination**

Polygastric (ruminants)

- Cow, Sheep, Goat

8. Common pest control factors.

Natural Pest Controls

1. Wind
2. Temperature
3. Humidity, rain
4. Rivers, lakes, mountains
5. Pathogens, predators
6. Food supply of the pest
7. Cultural control
8. Control by natural enemies
9. Genetic control
10. Natural chemical control

Natural controls are out of man's control – Mother nature dishes these out. They are without a doubt the leading factors that manage pest populations. Natural controls include wind, temperature extremes, humidity levels, and rainfall. A cold snap in the spring or a wet spring can largely reduce insect pest numbers for that season.

Rivers, lakes, and mountains provide significant barriers to pest movement and expansion. Naturally-occurring predators and pathogens hold down pest populations. The natural food supply of the pest also affects population density.

9. 1st, 2nd, 3rd and 4th generation pesticides.

First-generation pesticides (inorganic)

1. First attempt at chemical technology
2. Included heavy metals such as arsenic, copper and lead.
3. Toxic to humans and agricultural plants.
4. Pests developed resistance.

- **Second-generation pesticides**

1. Organic chemical (organochlorines).
2. Used after WWII (presently in developing countries)
3. Synthesis begins with petroleum ("oil") ✓ Mechanism of actions often unknown.
4. Bioaccumulation & Biomagnification.
5. Toxic to animals (humans) and agricultural plants.
6. Pests developed resistance.

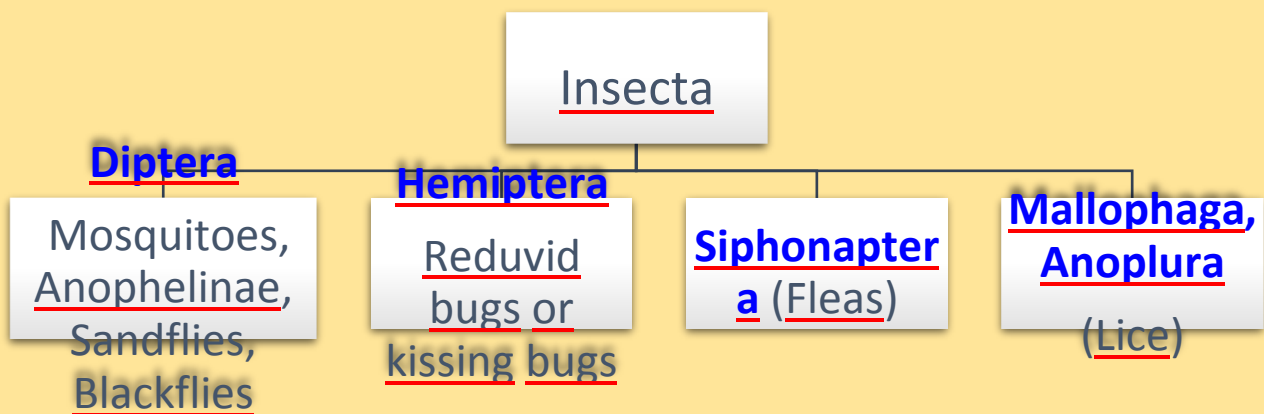
- **Third-generation Pesticides**

1. Organophosphates and carbamates
2. Less persistent in environment (good deal)
3. Acutely potent nerve toxins
4. More lethal in low dose than organochlorines

Fourth-generation Pesticides

1. Endocrine disruptors (hormonal chaos) ✓ Target a critical life cycle stage of insects.
2. Not direct killers per say.
3. Reduce reproduction (fertility) of population.

10. Order of class insecta . 5 marks



CLASS	ORDER	EXAMPLE
Insecta	Thysanura	Silverfish
	Odonta	Damselfly
	Orthoptera	Grasshopper/Cricket
	Coleoptera	Beetle
	Lepidoptera	Butterfly
	Diptera	Fly

11. Pest resistance.

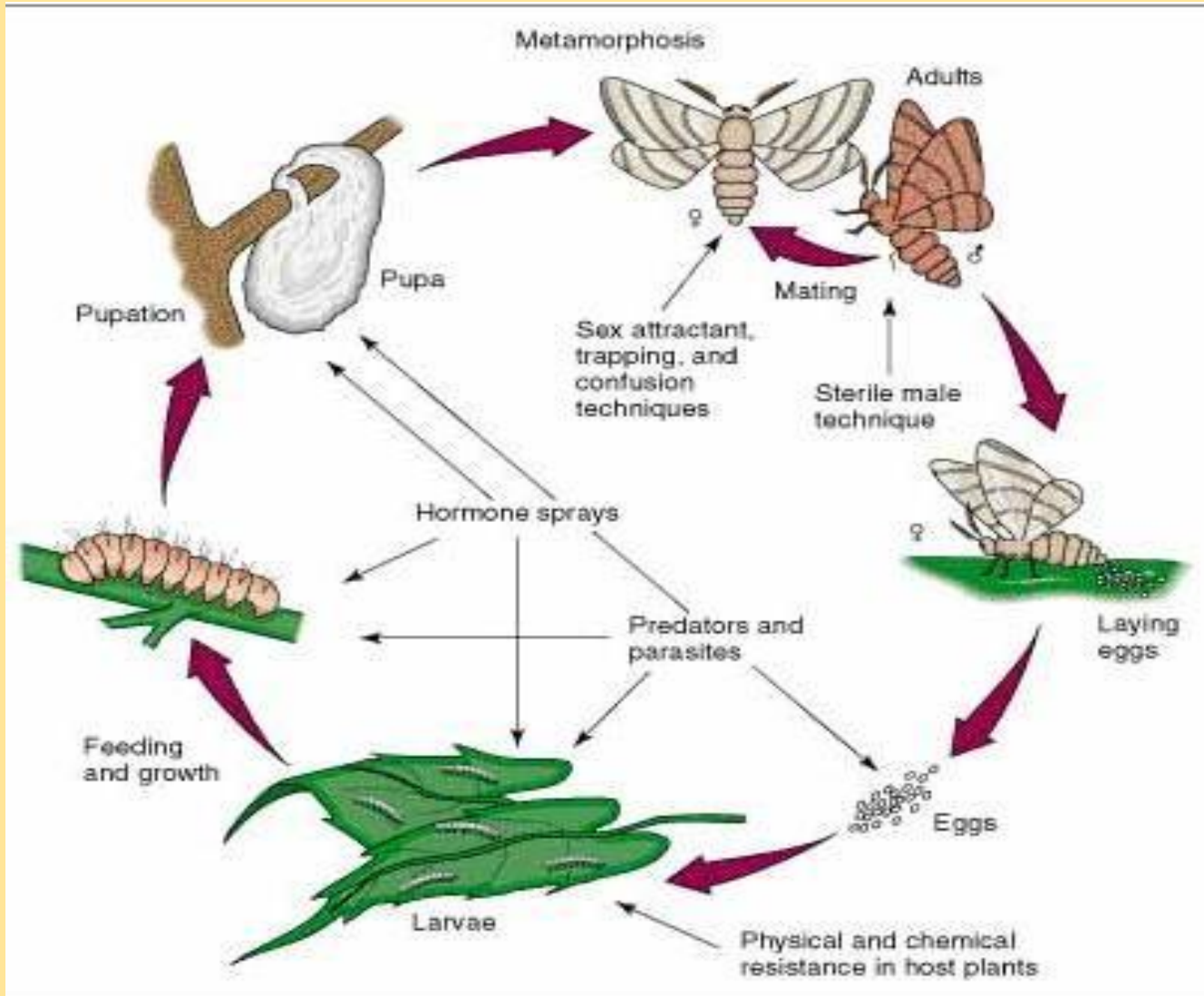
The Insecticide **Resistance** Action Committee (IRAC) defines **pest resistance** as “a heritable change in the sensitivity of a **pest** population that is reflected in the repeated failure of a product to achieve the expected level of control when used according to the label recommendation for that **pest** species.

12. Ecological pest management. 3 marks

Ecological Pest Management (EPM) is an approach to increasing the strengths of natural systems to reinforce the natural processes of pest regulation and improve agricultural production.

1. Control based on pest life cycle and ecology
2. Control agent may be an organism or chemical
3. Specific to pest and/or manipulate a part of the ecosystem
4. Emphasizes protection from pest

13. Life cycle of insects.



1.Egg

You can find insect eggs everywhere, if you know where to look. Most insects lay their eggs near the food they like to eat. Moths and butterflies lay eggs underneath leaves. Dung beetles lay eggs in balls of animal poop. Many flies lay eggs on meat. Some insects even lay eggs on other animals.

Many insects make special cases to protect their eggs. One insect puts foam around its eggs. You may have seen this “cuckoo spit” in tall grass. Many insects lay eggs in pools, ponds, or streams. Others lay their eggs underground. Rarely, a female insect keeps the eggs inside her body. The eggs hatch, and the young are born alive.

2. Larva .

Most eggs hatch into a worm-like stage called a larva. Caterpillars, grubs, and maggots are larvae (LAR-vee). They have long bodies and many legs. Almost all larvae are eating machines. A larva can eat more than its own body weight in one day.

Many larvae can destroy crops. Some larvae suck sap from crop roots. Others devour the leaves. Others eat fruits or vegetables. Beetle larvae can weaken and kill trees. Some moth larvae eat wool clothing. On the other hand, the silkworm, a moth larva, makes silk thread.

3. Pupa

Once the larva has grown, it must totally change its shape. And it must protect itself while it does so. Many larvae spin cocoons out of silk or grow hard shells. The pupa does not eat and does not move much. But inside, the insect is very busy changing shape. This change is called metamorphosis (MET-ahMORF-oh-sis).

4. Adult

After the metamorphosis is complete, the pupa hatches as an adult. The adult insect has wings, six legs, and three body parts. Many larvae that lived in water will hatch into adults that live on land. Larvae that lived underground will hatch above the soil.

Adult insects will find mates, and the females will lay eggs.

Sometimes, this is all the adults do. Mayfly adults live for only one day. Most other insects have longer adult lives. They eat, fly, hunt, and work.

5. Nymph

In the three-stage life cycle, eggs do not hatch as larvae. They hatch as nymphs, which look like small adults. Some nymphs do not have full wings. Others, such as the dragonfly nymph, may live underwater.

Nymphs do not turn into pupae. Instead, they shed their skin as they grow. Each time they shed their skin, they look more like an adult. Slowly, the nymph transforms into an adult.

14. Natural pest control factors. 2 marks

15. Treatment of mumbal foot. 5 marks

- a) Soak foot in warm water and Epsom salts.
- b) disinfect with alcohol.
- c) If skin is open, drain pus from abscess.

- d) Flush abscess cavity with hydrogen peroxide to cleanout pus and debris.
- e) Pack the cavity with antibiotic ointment .
- f) wrap the foot with gauze and elastic bandage.

16. Explain lac of insects.

Lac culture is the scientific management of lac insects to obtain a high amount of quality lac. This involves selection and maintenance of host plants, inoculation of host plants with healthy lac insects, collection and processing of lac and protection against enemies.

Lac is the resinous secretion of lac insects. Two species of lac insects *Tachardia lacca* and *T. chinensis* are common, of which the former one is predominant in India. India is the highest lac-producing country. Thailand is next in order.

Host plants:

Kusum, Ranjeeni (Khair) and Ber (Plum) trees. The insects live upon plant juice.

Inoculation:

20 to 30 cm long twigs of host plant with old lac crusts are cut and tied with branches of new plants for propagation. The crust contains eggs laid by female insects.

Types of Lac:

1. Kusmi lac:

It grows on Kusum trees. Inoculation is done in January-February and harvested in June-July.

2. Ranjeeni lac:

It grows on trees other than Kusum. Inoculated in October-November and harvested in next May-June.

17. What is biomagnification.

Bio-magnification: when an organism accumulates residues at higher concentrations than the organisms they consume

Some organisms accumulate chemical residues in higher concentrations than those found in their food source. This process is called **biomagnification**. For example, invertebrates with pesticides in their tissues are eaten by fish, which are then eaten by birds. The birds

at the top of the food chain accumulate the highest concentration of pesticide residues. Pesticides that bioaccumulate and biomagnify have been removed from the marketplace.

Biomagnification, also known as bioamplification or biological magnification, is the increasing concentration of a substance, such as a toxic chemical, in the tissues of tolerant organisms at successively higher levels in a food chain.

18. Water soluble minerals and vitamins.

19. What is "Biosecurity"?

Protecting your birds from disease .Preventing or controlling disease transmission by vectors

- procedures or measures designed to protect the population against harmful biological or biochemical substances.

20. What is a vector?

- Something that may transmit a disease
- Rodents, birds, insects, shoes, car tires, shared equipment, best friend, pet, feed, water, dust, air....

a **vector** is an organism that does not cause disease itself but which spreads infection by conveying pathogens from one host to another. Species of mosquito, for example, serve as **vectors** for the deadly disease Malaria.

21. How many exposures does it take to make your population resistant?

Expose a population to a pesticide several times with mating in between exposures and see how many exposures it takes for resistant bugs to become the majority.

• Rules of the Game:

1. Toss your population (pennies) on the ground, and consider all with painted sides showing as exposed to pesticide
2. All exposed yellow (RR = susceptible) die so remove these pennies.
3. All exposed red (rr = resistant) survive and double; add a red penny for each exposed red penny.
4. For every three exposed blue (mild resistance) add one of each color. (Keep track of any remaining blues (<3) to add to those on the next throw)
5. Keep track of the exposure count and repeat until most pennies are red.

Mcqs (midterm)

- 1- **Aquaculture** is farming of aquatic organisms in natural or controlled marine or Fresh water environment.
- 3- RAS stands for. **Recirculating aquaculture system**
- 4- Induction air into water is called .. **Aeration**
- 5- Transformation from soft, dusty mixture to compact form is. **Pelleting**
- 6- fungi are. **multicellular**
- 7- Most common feeding method for fishes is. **Hand feeding**
- 8- Bombyx mori produces. **Silk**
- 9- bombyx mori produces ... **90%**. percent of the worlds raw silk
- 10- In. **india**... Lac insect is known to have two distinct strains: kusumi and rangeeni.
- 11- The life cycle of lac insect takes about.... **6**..... Months
- 12- Mature male chicken is called. **Roaster**
- 13- The lac which grows on non-kusum plants is called as.. **Ranjeem lac**
- 14- India alone accounts for about ... **70%**..... percent of global lac production.
- 15- QMP stands for.. **Queen mandibular pheromone**.
- 16- **poultry** is a farming of chicken, turkey, duck and goose.
- 17- Raceways are considered.. **Flow through systems**
- 18- is a silkworm disease **Pebrine**
- 19- Aghani and baisakhi strain are the main crops contributing about..... **90%**..... Percent of lac production.
- 20- Lac cultivation is introduced into.... **Thailand**..... From India.

21. a group of chicken is called **flock**

22. Trained staff called ' **catchers** ' catch the birds and put them in special containers called **modules**.

23. life of worker bee is **28 to 35 days**.

24. Carnivorous fish consume foods with **~50%** of protein .

25. The place where a beekeeper keeps his bees is called an **apiary or a bee yard**.

26. Typically **6 inch** pipe is sufficient for ponds less than 10 acres .

28. Whirling disease Caused by **protozoan . Myxobolus cerebralis**

29. Mulberry culture spread in India by 140BC from **China**

30. The common parasites of lac insect are known as "**Chalcid**."

31. A virus is a **microscopic organism**
32. **American Cancer Association** Regular fish consumption decreases chances of colon cancer **50%** .
34. Unsaturated FA = **double bonds** .
35. James I introduced sericulture to **England** He also took sericulture to **America**.
36. Female lac insect is **larger** than male.
37. **Septicemia** (blood poisoning due to bacteria.
38. a parasite which lives inside the host is an **endo parasite**.
39. **Spring Viremia of Carp** A **viral infection** caused by *Rhabdovirus carpio*.
40. To produce 1 kg of lac resin, around **300,000** insects lose their life.
- 41 **Aeromonas hydrophila** caused by fish disease.
42. Feeds should be stored in a **dry, cool and well-ventilated** area .
43. Male Lac-insect: The body is typically divided into head, **thorax** and abdomen.
46. **Ponds** were used as one of the first forms of aquaculture.

1. Male Lac-insect The body is typically divided into head, **thorax** and abdomen.
2. Feeds should be stored in a **dry, cool** and well-ventilated area.
3. **Hand feeding** Is a common methods of feeding fish.
4. *Bombyx mori* Produces over **90%** of the world's raw silk .
5. Blood poisoning due to bacteria is called **Septicemia**.
6. **Aeromonas hydrophila** Causes disease in fish.
7. **Pebrine** Causes disease in silkworm.
8. To produce 1 kg of lac resin, around **300,000** insects lose their life
9. . Spring Viremia of Carp is a **viral** infection.

10. Bombyx mori is an economically important insects being a primary producer of **silk**.
11. Whirling diseased by **Myxobolus cerebralis**
12. Aghani and baisakhi strain are the main corps contributing about **90%** of lac production.
13. James I introduced sericulture to **England America**

1. **Enlargement of hock joints Cause:** def. Of niacin, biotin, vit.E & zinc.
2. **Maganese** is needed of egg production & hatchability.
3. **Methionine** is first limiting AAs for egg production.
4. When **miks** is found to be not up to standard, it may be rejected by the creamery.
5. Mesogenic strain (R2B) for the treatment of ranikhet disease useful at the age of **6-8 weeks of age**.
6. Which one is the Lab Animals – **Mice**.
7. Good Biosecurity Practices should Reduce exposure form. **All the above**.
8. Staphylococcus bacteria causes. **BUMBLE FOOT**
9. The milk of the **Jersey cow** has the highest butterfat and SNF content of any cow
10. Fat Soluble Vitamin **A**,

mcq..

1. Making good Silage **50-70%** moisture range target .
2. The color of egg yolk depend upon the presence of carotenoid pigment (**xanthophylls**) in the ration
3. Fowl pox vaccine at **4-6 weeks** of age ➤ Second dose at **12-14 weeks** of age.
4. Evaluating Hay Quality involved **Odor and Condition**
5. rape, turnips, or summer grasses example of **Strip Grazing**
6. Ticks sense **CO₂**, warmth and movement from animals
7. Intensive pesticide use kills susceptible **pests** in a population, leaving some resistant ones to reproduce
8. **6** aphids per wheat plant = no problem - no action
9. Biological control is.....
10. **Four** Major Pest Categories .
11. Complex learning (intelligence) **genetics**.
12. **Extrusion Pelleting** Heat and pressure forcing feed through a small spiral hole
 - Produces a flaked feed
 - Similar to pelleting

13. **Corn Stover (Stalklage)** Should be fairly fine-chopped to ensure packing

14. **Corn byproducts include.**

- **Corn Gluten Meal**
- **Corn Gluten Feed**

15. Performance of livestock is based on efficiency of production which is the ability to utilize feed efficiently, **in producing meat, milk, wool or power. Bases of Selection**

• **Selection based on**

1. **Type and individuality**
2. **Pedigree**
3. **Show-ring winnings**
4. **Production testing**

16. Commercial feeds in **mash, pelleted or crumbles** form available for ducks & geese