Wonders of animal world part II

Bird migration

Birds migrate in response to seasonal changes in habitat and adversities of food availability. During migration many birds return to the same migratory stop-over sites, just as they may return to same breeding and wintering sites year after year. The longest migratory journey is performed by Arctic Tern (*Sterna macrura)* from Arctic to Antarctic summer & back, covering 11,000 miles along each path. In birds, the temptation for migration at suitable season is stimulated by both external factors and natural instincts.

According to L. Thomson (1926), bird migration may be described as **"changes of habitat periodically recurring and alternating in direction, which tend to secure optimum environmental conditions at all times"**.

Physiological preparation for migration & factors inducing migration-

Migration is a complex sequence of events integrating the physiology & behavior of birds. Fat is the principal source of energy store for migratory birds. Birds undergo a period of heavy feeding and pre-migratory fattening, in which fat deposits in the body cavity & subcutaneous tissue increase tenfold, ultimately reaching tenfold of body mass. Fat is metabolized rapidly when migration begins. Many birds migrate at night and eat during day time. Even diurnal migrants divide the day time into period of migratory flight and period of feeding. The internal stimulus seems to be, the state of reproductive organs like enlargement of the gonads, which is also determined by the end of the autumn season. These changes are brought about by photoperiodism. Glucagon level is elevated during the preparation for migration. This is because maximum glucose is utilized during flight as the source of energy. Birds acquire assisting skills that permit travel with least expense of energy.

In spring the adult males arrive first at their breeding ground, followed by females while young birds line up at the end of the season, while the order of departure is reversed in autumn. The young birds do not have any previous experience regarding the route and destination, they acquire the unmatching capability to overcome the distance of thousands of miles without trapping them in any difficulty. This ability according to researchers is due to an inborn instinct & racial customs inherited through countless generations years after year migrating between their breeding & wintering grounds. Many species of birds enter refractory period after breeding due to which they become unresponsive to photoperiodism, their gonads regress to the non-breeding condition and they moult. Decreasing photoperiods in autumn accelerates the southward migration of birds, thus responses of birds to changes in day length is an endogenous rhythm.

Surprisingly, birds return to same general locality for breeding and at same nesting site every year. It is believed that once birds return to their general locality, the former experiences of previous visits unerroneously dances in front of their vision. Interestingly evidence shows that Siberian cranes wintered in same locality in Keoladeo Ghana (Bharatpur) National Park in Rajasthan but also landed precisely in the same block for nesting purpose year after year covering distance of 6000 km till 2003.

Navigation in birds-

Migratory birds use a variety of cues for navigation like the position of sun, polarized light, earth's magnetic field & infrasound. Some birds detect U.V, light and sense low frequency sounds well below the frequencies human ears can hear. These sounds are generated by ocean waves & air masses, moving over mountains thus signaling a general direction over thousands of kilometers. Some birds navigate by recognizing air borne odours as they pass over the terrain.

Types of migration-

(i) Latitudinal migration:

The latitudinal migration usually means the movement from north to south, and vice versa. Most birds live in the land masses of the northern temperate and subarctic zones where they get facilities for nesting and feeding during summer. They move towards south during winter.

An opposite but lesser movement also occurs in the southern hemisphere when the seasons are changed. Cuckoo breeds in India and spends the summer at South-east Africa and thus covers a distance of about 7250 km.

Some tropical birds migrate during rainy season to the outer tropics to breed and return to the central tropics in dry season. Many marine birds also make considerable migration. Puffinus (Great shearwater) breeds on small islands and migrates as far as Greenland in May and returns after few months.

It covers a distance of 1300 km. Penguins migrate by swimming and cover a considerable distance of few hundred miles. Sterna paradisaea (Arctic tern) breeds in the northern temperate region and migrates to the Antarctic zone along the Atlantic. It was observed that Sterna covers a distance of 22 500 km during migration!

(ii) Longitudinal migration:

The longitudinal migration occurs when the birds migrate from east to west and vice- versa. Starlings (Sturnus vulgaris), a resident of east Europe and west Asia migrate towards the Atlantic coast. California gulls, a resident and breed in Utah, migrate westward to winter in the Pacific coast.

(iii) Altitudinal migration:

The altitudinal migration occurs in mountainous regions. Many birds inhabiting the mountain peaks migrate to low lands during winter. Golden plover (Pluvialis) starts from Arctic tundra and goes up to the plains of Argentina covering a distance of 11 250 km (Fig. 9.54).

Birds migrate either in flocks or in pairs. Swallows and storks migrate a distance of 9650 km from northern Europe to South Africa. Ruff breeds at Siberia and travels to Great Britain, Africa, India and Ceylon thus travelling a distance of 9650 kilometers.

(iv) Partial migration:
All the members of a group of birds do not take part in migration. Only several members of a group take part in migration. Blue Jays of Canada and northern part of United States travel southwards to blend with the sedentary populations of the Southern States of U.S.A. Coots and spoon bills (Platalea) of our country may be example of partial migration.

(v) Total migration:
When all the members of a species take part in the migration, it is called total migration.

(vi) Vagrant or irregular migration:
When some of the birds disperse to a short or long distance for safety and food, it is called vagrant or irregular migration. Herons may be the example of vagrant or irregular migration. Other examples are black stork (Ciconia nigra), Glossy ibis (Plegadis falcinellus), spotted eagle (Aquila clanga), and bee eater (Merops apiaster).

(vii) Daily migration:
Some birds make daily journey from their nests by the influence of environmental factors such as temperature, light, and humidity also. Examples are crows, herons and starlings.

(viii) Seasonal migration:
Some birds migrate at different seasons of the year for food or breeding, called seasonal migration, e.g., cuckoos, swifts, swallows etc. They migrate from the south to the north during summer. These birds are called summer visitors. Again there are some birds like snow bunting, red wing, shore lark, grey plover etc. which migrate from north to south during winter. They are called winter visitors.

Nocturnal and Diurnal Flight:

(i) Diurnal migration:
Many larger birds like crows, robins, swallows, hawks, jays, blue birds, pelicans, cranes, geese, etc. migrate during daytime for food. These birds are called diurnal birds and generally migrate in flocks.

(ii) Nocturnal migration:
Some small-sized birds of passerine groups like sparrows, warblers, etc. migrate in darkness, called nocturnal birds. The darkness of the night gives them protection from their enemies.

Desert adaptations in animals

Adaptations among animals may be morphological, anatomical, physiological or behavioural. The different genera of reptiles and mammals have adapted to a variety of environment and it's hazards. Lack of water creates a survival problem for all desert organisms, animals and plants alike. But animals have an additional problem - they are more susceptible to extremes of temperature than are plants. Animals receive heat directly by radiation from the sun and indirectly by conduction from the substrate (rocks and soil) and convection from the air.

The biological processes of animal tissue can function only within a relatively narrow temperature range. When this range is exceeded, the animal may die. For four or five months of the year, the daily temperatures in the desert may actually exceed this range, called the range of thermoneutrality. Combined with the scarcity of life-sustaining water, survival for desert animals can become extremely difficult. .Fortunately, most desert animals have evolved both behavioural and physiological mechanisms to solve the heat & water problems. Among thousands of desert animal species, there are remarkable behavioural and structural adaptations developed for avoiding excess heat. Various animal species have developed ingenious and diverse mechanisms to acquire, conserve, recycle, and actually manufacture water.

Avoiding Heat:

Behavioural techniques for avoiding excess heat are numerous among desert animals. Many animals (especially reptiles and mammals) are crepuscular, that is, they are active only at dusk and again at dawn. Many animals are completely nocturnal, restricting all their activities to the cooler temperatures of the night. Many snakes, bats, most rodents and some larger mammals like foxes and skunks, are nocturnal, sleeping in a cool den, cave or burrow by the day. Some smaller desert animals burrow below the surface of the soil or and to escape the high temperatures at the desert surface. Rodents may plug the entrances to their burrows to keep out heat & desiccating air. Certain desert lizards are active during the hottest seasons, but move rapidly over hot surfaces, stopping in cooler region of shade. Even their legs may be longer, so they absorb less surface heat while running The Round-tailed ground squirrel, a diurnal animal, enters a state of aestivation when the days become too hot and the vegetation too dry. They sleep away the hottest part of the summer. (They also hibernate in winter to avoid the cold season).

Dissipating Heat:

Some animals dissipate heat absorbed from their surroundings by various mechanisms. Many desert mammals have evolved long appendages to dissipate body heat into the environment. The enormous ears of jackrabbits, with many blood vessels, release heat when the animal is resting in a cool, shady location. Their relatives in cooler regions have much shorter ears Many desert animals are paler than their relatives elsewhere in more moderate environments. Fur, scales or skin are pale in colour, thus ensuring that the animal absorbs less heat from the environment & also helps to make it less conspicuous to predators in the bright, pallid surroundings.

Retaining Water:

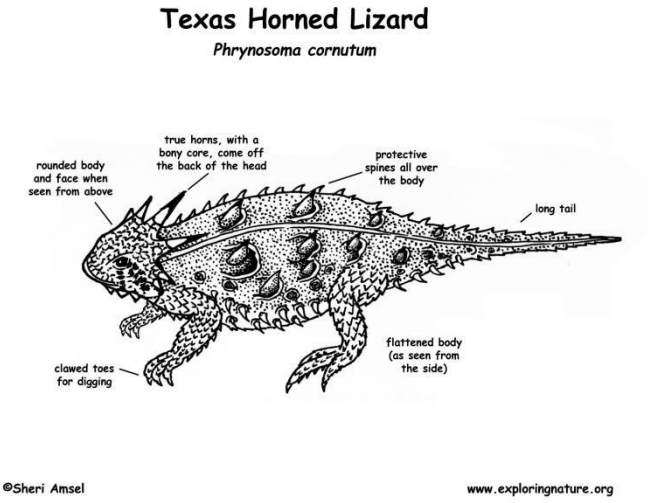
Some desert animals have evolved elaborate mechanisms to retain water. They range from simple to physiologically complex ones. Reptiles excrete metabolic wastes in the form of uric acid, an insoluble white compound, wasting very little water in the process.

Acquiring Water:

Desert creatures derive water directly from succulent plants, such as cacti or have hygroscopic skin which absorbs water from the atmosphere. The abundance of insect life permits insectivorous lizards, birds and bats to thrive in the desert. Some desert creatures utilize all of these physical and behavioural mechanisms to survive the extremes of heat and dryness. Certain desert mammals, such as Kangaroo rat, live in underground dens, which they seal off to block out midday heat and to recycle the moisture from their own breathing. These native rodents also have specialized kidneys with longer Henle's Loop, to extract most of the water from their urine and return it to the blood stream. And much of the moisture that would be exhaled in breathing is recaptured in the nasal cavities by specialized organs. Furthermore, kangaroo rat and some other desert rodents, actually manufacture their water metabolically by the digestion of oily dry seeds. These highly specialized desert animals do not drink water even when it is given to them in captivity. These are just a few examples of adaptations used by the animals to overcome the extremes of heat and paucity of water in the desert.

Desert reptile-Phrynosoma:

A horned toad is a typical desert animal. It has a broad, flat and spiny body. Spines help to prevent loss of water. Body colour generally matches with the surrounding sand colour, thus exhibiting camouflage. The large, flat body surface of the horned toad also works well as a solar collecting panel. At cooler temperatures, it orients its body to maximize the amount of exposure to the sun. When it gets too hot, it burrows into loose soil. The toad uses the scales on the front edge of its lower jaw to cut into the earth as it vibrates its head into the ground, then it shakes its body into the soil entirely. Skin is hygroscopic. Tongue is fleshy and non-protrusible. Eyelids are large and completely cover the eyes thus preventing the sand from entering in. Nostrils are provided with valves which prevent sand from entering inside. Ear aperture in absent.



Source:https://www.exploringnature.org/db/view/Lizard-Texas-Horned-Also-called-Horned-Toad

Camel:

Adaptations are special characteristics that an organism is born with and which enable it to survive in its natural habitat. There are two varieties of camels- the tropical variety is known as Dromedary found in the tropical warm deserts of the world and the Bactrian found in the temperate deserts. The following adaptations show that the camel is especially suited to live in the desert.

Desert adaptations:

1. Two rows of long eyelashes to protect it from blowing sand and the hot sun.
2. Nostrils can be closed. It helps to prevent the entry of blowing sand.
3. Fats stored in hump help to survive the desert life of long periods without food.
4. Thick leathery patches on knee help prevent from burns of hot sand when it kneels.
5. Broad, flat, leathery pads at the bottom of their hooves as their pads spread out when

Stepping on the ground forming a snowshoe effect. This helps the animal from sinking into the sand.

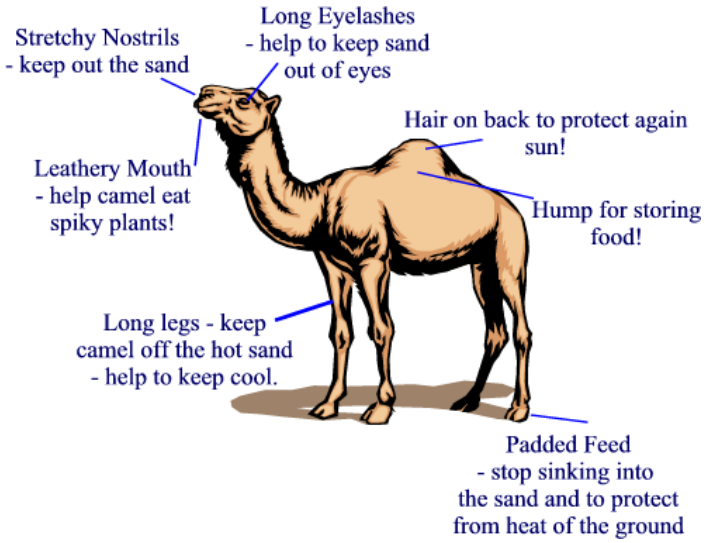
Long strong legs help elevate its body away from the hot sand.

Modification of Kidney in Camel:

Camel does have a special kidney and a special gastro-intestinal (GI) tract. As Camel's kidney can concentrate urine more saline than the sea water it can even afford to consume sea water A relative thickness of the medulla is a good measure of the length of the Henle's loop which is instrumental in urine concentration. The thickness reported in camel was less in comparison to that of kangaroo rat and much more than humans. Camel can survive without water for one week and all of a sudden if it gets water to drink, it can replace water within minutes of drinking, and some of this water is quickly absorbed in the blood stream. With

water in the blood stream, Anti-Diuretic hormone (ADHD) declines and the kidney return to normal renal function within 30 minutes of drinking of water. Not only does the camel adapt to scarce water, but the kidney can also adapt to rapid dehydration and it does not lead to demyelination of the brain.

Another interesting part of the camel physiology is that they have the stomach acting as storage (15 gallons per stomach) for the water and hence when water is not available, they can slowly replenish the system. An interesting physiological process is the capacity of the camel to store water in its blood stream. It is capable of losing forty percent of its body's weight before becoming distressed and is able to survive for five to seven days before having water to drink. When water is available, camel drinks about 21 gallons in 10 minutes Such an act would cause severe problems in most animals. The camel's mouth, stomach and teeth have all developed to allow it to eat plants that are not palatable to other desert animals. Contrary to popular myth, the camels do not store water in their humps; it is full of fat for food storage.



Source:https://www.pinterest.com.au/rafatsaghir/desert-animals-adaptations/

Parental care

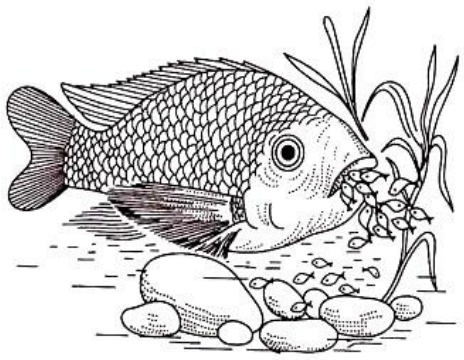
Breeding is a reproductive process that involves mating and production of offsprings by animals. Parental care is a unique phenomenon shown by many animals. Parental care is the care shown by one or both parents to protect eggs &/or young ones. Parental care is also extended for feeding the young ones, cleaning and moistening the terrestrial eggs, protecting the eggs from predators and eliminating the aborted and infected eggs.

A. Parental care in Pisces-

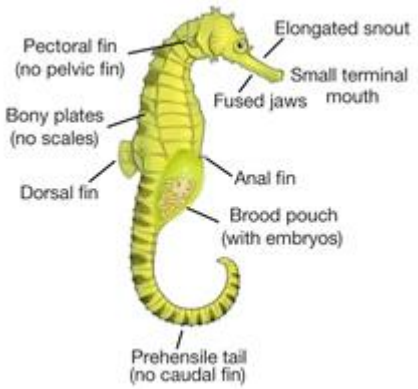
Most of the fishes are oviparous since they lay eggs and fertilization is external in them. Some fishes are live bearers because they are ovoviviparous, in these fishes, fertilization is internal. In ovoviviparous fishes, the female gives physical protection to developing embryos but they derive nourishment from the yolk deposited in the egg. Since there is no

implantation of the developing embryo and no nourishment provided to growing embryo by mother, it is called as ovoviviparity. E.g. Molly and Guppy. In these fishes the fecundity is low but the percentage of survival is comparatively high since the developing embryos are protected by the mother inside her body.

1. **Tilapia-** It is a fresh water fish and female shows parental care. It is a mouth brooder. The eggs are protected within the buccal cavity of the female fish. She stops feeding during this time until the last brood hatches. On hatching, the fry is released and the fry remain close to the mother and in case of any danger they sense, they jump into the buccal cavity of their mother and get protected.



2. **Sea horse (Hippocampus)-** It is a marine fish and parental care is shown by the male. Male takes care of eggs and the young ones. Male has a brood pouch on the ventral side close to the tail. During breeding season the pouch becomes thick and highly vascularized. The female deposits the fertilized eggs in the brood pouch of male using her cloaca as an intromittent organ. The eggs hatch and are nourished within the pouch. After completing the development miniature sea horses escape through the small aperture in the brood pouch.



https://en.wikipedia.org/wiki/Seahorse

B. Parental care in Amphibia-

1. **Midwife toad (*Alytes obstetricans*) –**
   It was discovered in France in the middle of eightnth century. In this toad, the males exhibit a peculiar type of parental care. The male massages the cloaca of the

female with its forelimbs. The female they lays the eggs which are carried by the male on his back & thigh. The eggs are immediately fertilized and are hidden in the burrow near the pond and are moistened occasionally. When the eggs are ready to hatch, the male emerges out of the burrow and carries the eggs to the pond and further development takes place in the water.

https://www.google.com/search?q=parental+care+in+midwife+toad+diagram&tbm=isch&ved=2ahUKEwjdo6CQ6oPyAhWGHnIKHfPdD64Q2cCegQIABAA&oq=parental+care+in+midwife+toad+diagram&gs_lcp=CgNpbWcQAzoGCAAQBxAeULyvAljw4QJg9YkDaABwAHgBgAGmA4gBkxSAQowLjE2LjIuMi4xmAEAoAEBqgELZ3dzLXdpei1pbWfAAQE&sclient=img&ei=iEkAYd2_Ioa9yAPzu7_wCg&bih=667&biw=1366#imgrc=vt2061El-7ihqM

2. **Darwin's frog (*Rhinoderma darwinii*)-**
   These frogs are found in the temperate forest of South Chile & Argentina. They are mouth brooders where the male exhibits parental care by carrying the eggs in their vocal sacs. The eggs are guarded until hatched and the tadpoles are then swallowed into the vocal sacs, till they develop into froglets. The froglets then hop out of the mouth about fifty days later.

https://animaldiversity.org/accounts/Rhinoderma_darwinii/

C. Parental care in Mammals-

1. Kangaroo –

Gestation period in kangaroo is only of 33 days. The young one called joey is born immature, naked and about 1 inch long. After birth, the young one reaches pouch present on the ventral side of mother within few mins. The young one uses forelimbs to pull along the mother's belly to reach the pouch. The pouch has true mammary glands with nipples. The young one

feeds on the milk and ventures out when they are four months old. The joey feeds on the milk for about 12 months.

https://pregnancybirthandparenting.com/labour-birth/kangaroo-care/

2.Platypus-

Platypus is an egg laying mammal belonging to order Monotremata. It breeds during September-October.Mating takes place. In two weeks after mating and before the eggs are laid, the female Platypus prepares for the arrival of her young one. Parental care is taken by female. She selects a suitable location for the nesting burrow in the roots of a tree with the opening just above the waterline. The nesting burrow is far more complicated than the resting burrow. The resting burrow is about 4-5m long while, the nesting burrow is upto 20m long with twists and turns. She uses her tail to collect leaves to make a nest at the end of the burrow. Before she lays eggs she seals herself into the burrow by blocking it at the intervals with earth. This provides a safe place for her to incubate her eggs and raise her young ones. Two weeks after mating two or three, grape sized yolky eggs are laid. The eggs have soft leathery shell like the reptilian eggs. The female incubates the eggs by holding them between her body and the tail. The eggs hatch after two weeks of incubation. The female platypus remains continuously with the eggs until hatched. A caruncle on the head and the egg-tooth help the young one in breaking the shell. The female produces milk from the specialized sweat glands present on the ventral abdominal wall and the ducts of these directly open on the patch of the skin. The young one licks the fur for its feed of milk since teats are lacking.

https://www.google.com/search?q=parental+care+in+platypus+images&tbm=isch&ved=2ahUKEwjzwpiJ7oPyAhVFHHIKHfArDvwQ2-cCegQIABAA&oq=parental+care+in+platypus+images&gs_lcp=CgNpbWcQAzIECCMQJzoGCAAQBxAeUN3UCljc_wpg_IgLaABwAHgAgAHY

AYgBlxGSAQYwLjEyLjKYAQCgAQGqAQtnd3Mtd2l6LWltZ8ABAQ&sclient=img&ei=q00AYbPBHsW4yAPw17jgDw&bih=667&biw=1366#imgrc=-4EydceX8_H8kM

Brood Parasitism in Cuckoo

It is generally species specific, but a very astonishing phenomenon. It is observed in some birds like cuckoo, cowbird, and is called brood parasitism. This phenomenon was first observed in common cuckoos by Aristotle in 4th century B.C. In brood parasitism the species loses its ability to care for the offspring. These are obligate brood parasites which do not build nest and thus they use host parents like Reed warbler, Wagtail, Magpie robin and Common crow, to raise their young ones. Cuckoo gets rid of all their parental duties, hence lays more eggs The adoption of parasitic lifestyle was associated in life history and ecological behaviour, like increase in migratory activities and a shift to a more open habitat. All parasite females lay their eggs into the host nest immediately after the host female starts laying her eggs. To avoid detection, the parasite female Cuckoo lays only one egg per host nest. The brood parasite lays mimetic eggs that nearly match host eggs. This phenomenon is called egg mimicry. After hatching, the parasite chick needs to out-compete host offspring's in the battle for parental care by destroying host eggs or killing the host nestlings. To elicit care from the host, the cuckoo chicks produce extremely loud buzzing calls, which mimic the entire brood of the host young ones. Avian brood parasites choose hosts that suit the diet requirements, incubation and nestling period of the parasitic chicks. This maximizes the survival probabilities of their offspring's.