**BIOME****The BIOlogy Education MEssenger**

(An ATBS eNewsletter)

*From The Editorial Team.....***CONTENTS OF
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A warm hello from team BIOME – the ATBS eNewsletter!! We are glad that we have finally managed to put together the 2022 issue of BIOME and as we may all agree it is always better late than never.

We are also happy to let you know that we have a young member to help us with the efforts that go into bringing out the BIOME. We would like to introduce to you Ms. Uzma Shaikh, colleague at the Biology Olympiad Cell of Homi Bhabha Centre for Science Education, Mumbai. She will assist the editorial office with copy-editing, illustrations, compilation and other publication-related matters.

As we have mentioned earlier, the intent of bringing out issues of the eNewsletter is to put forth thoughts and ideas of biology teachers across for others in the subject area to comment, deliberate and maybe practice them in regular biology classrooms. With this intent, we have in this issue the continuing article on ‘Amazing Xerocolles’ written by Prof. B. B. Nath, Emeritus Professor, Dept of Zoology, Pune University and Director MIE-SPPU Institute of Higher Education, Doha, Qatar as well as member of the Editorial Board, BIOME. We also have interesting snippets on some life forms in the form of a quiz and a lab under the ‘Biology can be fun’ section. Apart from an update on programmes organized by the ATBS, news from the IBO 2022 that was held in Yerevan, Armenia is also included in this issue.

Hope you have fun reading through this issue!!

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Amazing Xerocoles (Part 2 of 3)

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Xerocoles are generally referred to as animals found in deserts. These animals exhibit amazing adaptations that help them survive in harsh desert climates. In the previous issue of BIOME (Volume 9, Issue, 1, pp 2-5; <http://www.atbs.in/newsletter.html>), I have cited spectacular survival and adaptive strategies of two xerocoles, namely, kangaroo rat and horned lizard. In the second part of this article, I'll share striking adaptive features of three other xerocoles: sand cat, addax, and desert iguana.

Sand cat

Sand cats (*Felis margarita*) are mostly found in the Sahara Desert of Africa and the deserts of the Arabian Peninsula. These cats are also reported from different parts of the Middle East and arid zones of South-Western Asia. The sand cat is often called 'King of the desert' because of their ferocious nature as snake-hunters. Sand cats can fearlessly kill venomous snakes like the horned viper and the sand viper. Alian Dragesco-Joffé has captured photographs of snake-hunting by sand cats and documented them in his book '*La Vie Sauvage au Sahara*' (meaning 'Wildlife in the Sahara'). Sand cats possess wide ear canals and an extraordinary sense of hearing to detect low-frequency noises from insects and rodents roaming the Sahara Desert at night. Their low-set ears protect their inner ears from wind-blown fine particles during sandstorms and other calamities in the desert. During hunting, sand cats move close to the ground and use their sense of hearing to detect prey underneath the sand. Once detected, the sand cat rapidly starts digging to capture the prey.

Did you know?



- Sand cats dig and dwell inside burrows to avoid the intense heat or cold. They are nocturnal and crepuscular animals, being active in twilight.
- Sand cats do not occupy a burrow at the same time but rather take turns sharing shallow burrows.
- Sand cats often cover their kill with sand and return later to feed.
- The average lifespan of sand cats in human care can go up to 13 years.



A sand cat emerging from its burrow

(Images sourced from Wikimedia Commons)



Figure 1: Schematic sketch of a sand cat

The sand cat, in appearance, resembles any other domestic cat, except for its furry paws and large ears. These physical features are not just for show but are crucial for its survival in the harsh desert environment. The thick fur between its toes and the densely distributed fur on its paws act as insulation, protecting it from the near-burning desert sand on hot summer days. This thermal insulation also keeps it comfortable during chilly winter nights. The fur on the soles of its paws prevents it from sinking into the shifting sand dunes. Remarkably, sand cats can survive without water for many weeks at a time, obtaining moisture solely from their prey.

Addax

Addax is a nearly extinct antelope, rarely found in its native habitats. The addax (*Addax nasomaculatus*) is now found mostly in the Sahara Desert. Previously, they were abundant in North Africa, but unrestrained hunting led to a drastic reduction of addax in their natural habitat. Quite often, tourists in the vehicles are found chasing these antelopes to the point of exhaustion and forcing them to collapse and die. In 2000, the International Union for Conservation of Nature (IUCN) declared addax a critically endangered species. However, in recent times, efforts have been taken to reintroduce these desert antelopes to their ancestral natural habitats.

The most noticeable feature of addax is its long, spirally twisted horns. However, one cannot distinguish males and females simply by looking at their horns. Unlike other antelopes, addax males and females have horns of similar size and shape. Generally, antelopes are fast

Activities conducted by ATBS during 2021 - 2022!!

- The 16th Annual National Conference on “Wetlands Action for People and Nature” was organized by Paryavaran Dakshata Mandal in collaboration with ATBS on 2nd February 2022
- A webinar on “Ecotourism: A model of sustainable development” was organized by Ramniranjan Jhunjhunwala College of Arts, Science & Commerce (Autonomous) in collaboration with ATBS on 27-28 April 2022.
- A Resource Generation Camp (RGC) for generating a question bank for the first stage Olympiad examination, National Standard Examination in Biology (NSEB) was held in early 2022.

runners, but addax antelopes are ‘short leg’ runners. They cannot escape from faster predators, human poachers, and hunters.



Figure 2: Schematic sketch of an addax

Addax can survive in extremely arid habitats. Wide and outwardly turned hooves with flat soles facilitate traveling efficiently on desert sand without sinking in. One of the interesting features of desert adaptations of addax is nasal panting to cool down during hot summer days. Like other xerocoles, addax possesses efficient water conservation strategies. They will resort to feeding in the early morning when desert plants absorb enough atmospheric moisture.

Desert Iguana

Desert Iguanas (*Dipsosaurus dorsalis*) are lizards, mostly found in the bushy, dry, rocky areas of Mojave and Sonoran deserts (arid zones of California, Nevada, Arizona, and Mexico). They are easily located in and around the creosote bush (*Larrea tridentata*), which is the drought-tolerant ‘signature’ plant of North American deserts.

Desert Iguanas feed on buds and flowers of the creosote bush and hide underneath. These bushes can be sustained without any water for at least two years. This is an interesting example of an interspecific biotic interrelationship. Studies revealed that desert iguanas use their nasal passage for osmoregulation, which is crucial to survive under water

Did you know?

- Desert iguanas have tails that are longer than their bodies!
- Desert iguanas are considered to be one of the most heat-tolerant reptiles in North America. They are active even during the hottest times of the day when all other lizards retreat into their burrows.
- Desert iguanas hibernate inside burrows during the cold winter months.



A desert iguana camouflaged in a creosote bush (head visible)

(Images sourced from Wikimedia Commons)

scarcity and adapt to salt and water imbalances in their body fluid. Predominantly, the metabolic enzymes of iguana remain functional and active at a high ambient temperature. Like other desert-adapted reptiles, desert iguanas possess physiological control over their body temperature change rate.

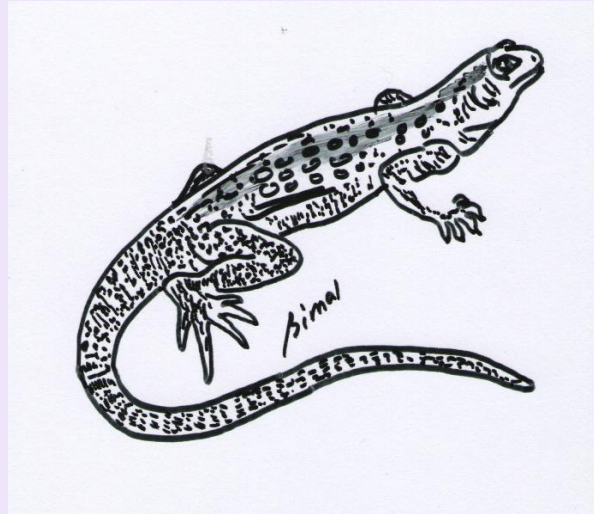


Figure 3: Schematic sketch of a desert iguana

A gray and tan coloration of scales with a background of brown colored skin helps desert iguanas to camouflage and elude predators like foxes, raptors, and snakes. In animals, body coloration plays multiple roles: mating signals, camouflaging, displaying offense and defense behavior, etc. Iguanas alter colour primarily for thermoregulation in the desert. Their body colour turns darker to absorb heat from sunlight whenever needed, while the body color is altered to pale and white for reflecting sunlight. When confronted by a predator, iguanas squeeze into a narrow space and gasp for air to expand their body size. This makes it impossible for the predator to capture them. Iguanas display the same defensive mechanism while hiding in burrows. They can inflate their body to twice their original size, and obviously, a predator cannot pull the inflated lizard out of burrows.

A few more interesting examples of desert adaptation of xerocoles will be shared in the third part of this article series.



Dr. Anupama Ronad
Biology Olympiad Cell,
Homi Bhabha Centre
for Science Education
(HBCSE).

Anupama joined HBCSE in the year 2000 with a background in Microbiology and has been actively involved in developing challenging academic content in biology for the major programmes of the Cell, namely the Biology Olympiad and the NIUS Programmes. Apart from these, Anupama regularly designs and conducts orientation and capacity building camps/workshops for high school and undergraduate teachers as well as students with an emphasis on hands-on biology leading to enhanced science process skills.

Biology can be fun.....

In this task you are going to observe various invertebrates under the microscope. Among them, *Paramecium* is a unicellular organism which can be identified by its slipper-shaped body covered with numerous cilia for movement. The transparent single-cell structure easily allows observation of physiological functions like feeding, digestion and osmoregulation.

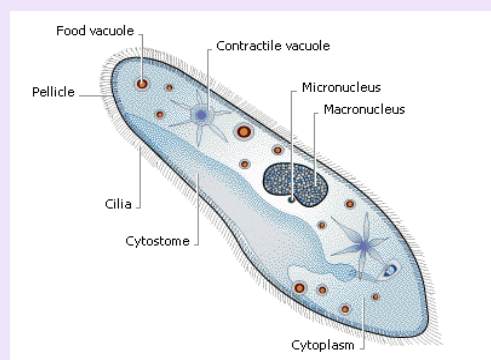


Fig. 1: Structure of a *Paramecium*

Observing the Feeding Mechanism in *Paramecium*

Materials & Specimen:

Paramecium from pond water, active dry yeast (yeast pellet powder), 1% Congo red staining solution, dropper, distilled water, glass slides, cotton, compound microscope

Staining of yeast cells:

Stained yeast cells are used for feeding *Paramecium*. Before starting the microscopic observations, carry out the staining procedure as follows:

1. Take a small pinch of yeast pellet powder in a test tube.
2. Now, add 2-3 ml of Congo red solution to the yeast powder in the test tube with a dropper. Disperse the powder well by gentle shaking.
3. Label the tube and keep it in a boiling water bath for 15 minutes.
4. Take a small drop of yeast suspension on a slide. Put coverslip and check under the microscope (10x objective) if cells are stained. Keep the suspension aside for later use.



**Mr. Vikrant
Ghanekar**

Biology Olympiad Cell,
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Vikrant Ghanekar holds a post-graduate degree in plant sciences from Mumbai University. Since 2009, he has served as a Scientific Officer at HBCSE's Biology Cell, actively contributing to prominent programs such as the Biology Olympiad and National Initiative on Undergraduate Science (NIUS). With a strong passion for plant anatomy, Vikrant regularly develops theoretical questions and experimental tasks for the Olympiad program. As a dedicated science communicator, he actively participates in numerous outreach programs for students and teachers.

Observation of *Paramecium* feeding and digestion

1. Collect a drop of pond water on a clean slide and observe it under 4X and then 10X. Try and identify *Paramecium* among the different invertebrates.
2. To slow down the movement of *Paramecium*, put a few strands of cotton fibres on another slide and take a drop of the pond water on this.
3. Place a coverslip on the drop without trapping any air bubbles. The paramecia get trapped in the cotton strands and hence can be observed easily. Carefully observe the various internal structures of the organism.
4. Add a drop of stained yeast suspension to the side of the coverslip so that the *Paramecium* can feed on them. Carefully observe the ingestion and digestion of yeast by *Paramecium*.
5. Observe the colour of the food vacuole initially and after 15-20 minutes.

What did you observe?

- Colour of food vacuole initially: _____
- Colour of food vacuole after 20 minutes: _____
- Why do you think this has occurred?

----- Anupama Ronad & Vikrant Ghanekar
Biology Olympiad Cell
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DO YOU KNOW?

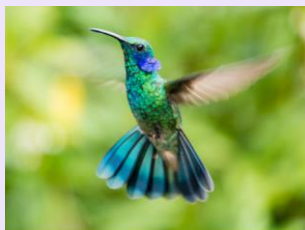
Fascinating facts of Plants & Animals!



The Burmese Bamboo (*Bambusa burmanica*) can grow upto 35 inches in a single day.



The common ostrich (*Struthio camelus*) has the largest eyes (diameter of approx. 5 cm), which are five times bigger than human eyes!!



The Humming bird (belonging to the *Trochilidae* family of birds) is the only bird that can fly backwards.



Humpback whales (*Megaptera novaeangliae*) can swim approximately 4000 to 8000 kilometres from a tropical breeding zones to relatively colder feeding zones.



The Australian ant, *Myrmecia pilosula* (often called as jumping jack bull ant) has only one pair of chromosomes. Males are haploid ($n = 1$), while the female worker ants are diploid ($2n = 2$).

1. Which bird can fly backwards?

M G H I N I D

	U		M				B		R	
--	---	--	---	--	--	--	---	--	---	--

2. In which insect is the lowest number of chromosomes found?

S U A L A N R T

A			T		A		I				N	
---	--	--	---	--	---	--	---	--	--	--	---	--

3. Which mammal can travel the longest distance during seasonal migration compared to other counterparts?

S U A E B C P W H

		M			A		K		H		L	
--	--	---	--	--	---	--	---	--	---	--	---	--

4. Which is the fastest growing woody plant in the world?

M B E M O U

B		R			S	E		A		B		O
---	--	---	--	--	---	---	--	---	--	---	--	---

5. Which bird has the biggest eyes?

O O C R M S C

	O		M		N			T		I		H
--	---	--	---	--	---	--	--	---	--	---	--	---

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**Team India at the 33rd International Biology Olympiad
10th - 18th July, 2022 at Yerevan, Armenia**

The 33rd International Biology Olympiad (IBO) 2022 was held in Yerevan, Armenia, from 10 to 18 July, 2022.



Team India at the 33rd International Biology Olympiad (IBO) 2022 held at Yerevan, Armenia. (L-R) Prof. Ujwala Bapat, Dr. Dharmendra Shah, Prachi Jindal, Mayank Pandhari, Amritansh Nigam, Rohit Panda, Prof. Sasikumar Menon, Dr. Selvaa Kumar.

All four Indian students bagged medals with the medal tally being 1 gold and 3 silver medals. The names of student participants are as follows:

Mayank Pandhari, Bengaluru (GOLD)

Amritansh Nigam, Uttar Pradesh (SILVER)

Prachi Jindal, New Delhi (SILVER)

Rohit Panda, Chattisgarh (SILVER)

The team was accompanied by two leaders: Prof. Ujwala Bapat (Retd. St. Xavier College, Mumbai), Prof. Sasikumar Menon (Therapeutic Drug Monitoring Lab, Mumbai) and two Scientific Observers: Dr. Dharmendra Shah (M. S. University, Baroda) and Dr. Selvaa Kumar (D.Y. Patil University, Navi Mumbai).

There were 62 participating and 3 observing countries at the IBO this year. There were two theoretical tests of three hours each as well as a total of six hours of experimental tests in four lab areas. The four lab areas at the IBO 2022 were (i) Animal Systematics & Anatomy; (ii) Plant Anatomy and Physiology; (iii) Biochemistry and (iv) Bioinformatics.
