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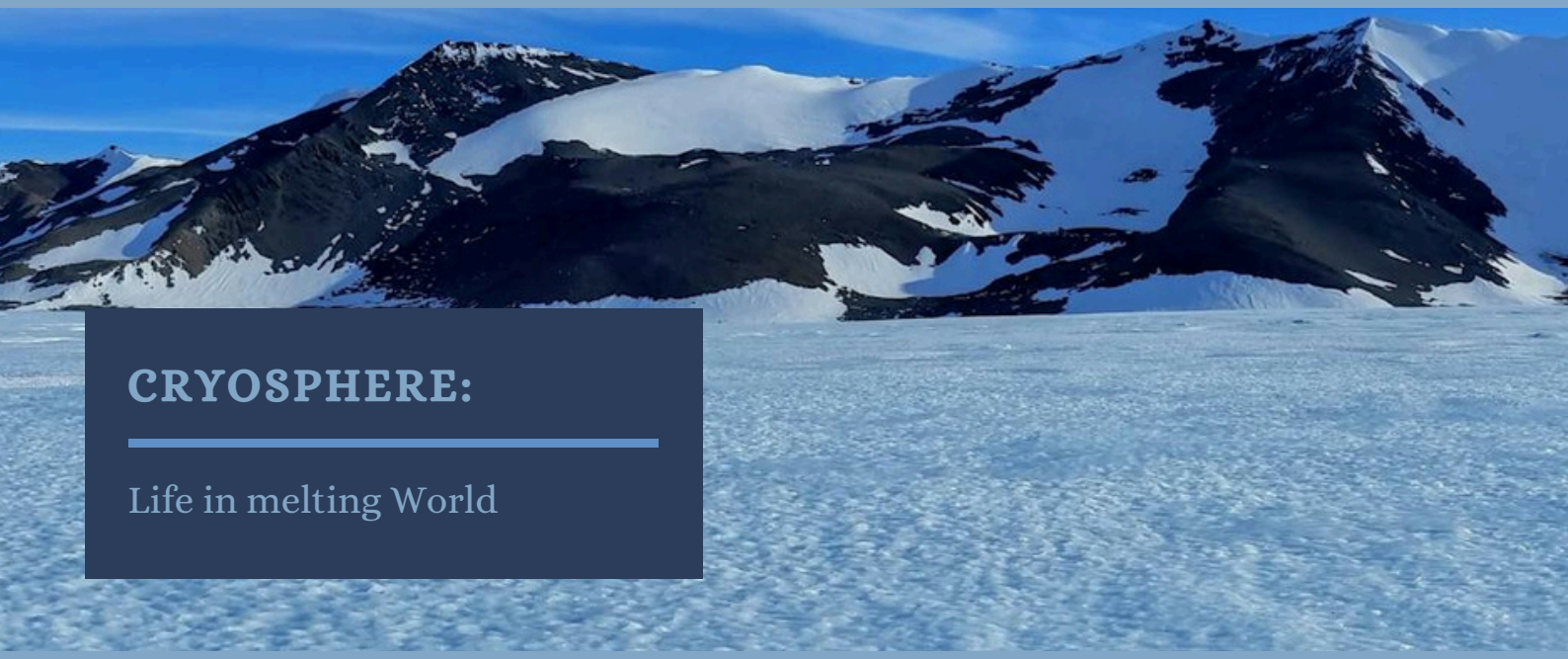
LIFE E-NEWSLETTER



CRYOSPHERE:

Life in melting World

WELCOME TO CRYOSPHERE!

As we step into another year of curiosity and discovery, the Zoology Department is delighted to present the 15th edition of our eNewsletter. LIFE continues to be a space where we share knowledge, experiences, and perspectives that celebrate the marvels of the natural world.

This issue embraces the theme **Cryosphere – Life Beneath the Glaciers**, highlighting the extraordinary biodiversity of glacial and cold ecosystems. From the majestic snow leopard to the microscopic extremophiles dwelling in ancient ice, we explore the remarkable adaptations that allow life to flourish in some of the planet's harshest environments. In line with the **United Nations' declaration of 2025** as the **International Year for Glaciers' Preservation,** this edition also reflects on the urgent need to protect these frozen frontiers and the life they sustain in the face of climate change.

We invite you to journey with us through these pages — to learn, reflect, and be inspired by the resilience of life in the cold.

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Survival Mechanisms: How Animals Adapt To Cold Extremes.

By Arshiya (SYBSc)

The fascination with cold-endurance in animals spans centuries. Indigenous Arctic communities, early explorers, and naturalists observed thick coats, migrations, and huddling long before science explained them. Polar expeditions in the 19th–20th centuries linked body shape and insulation to survival. Fossil records and evolutionary biology later revealed that many cold-climate traits emerged during Ice Age cycles. Today, tools like satellite tracking and genetic analysis continue to uncover how animals thrive in Earth's most frigid environments.

Animals have evolved a suite of adaptations—physical, behavioral, and physiological—to survive extreme cold.

- **Physical Adaptations**

Animals in cold environments rely on physical adaptations like insulation and blubber to survive. Thick fur or feathers trap warm air, helping species like Arctic foxes, which grow white winter coats for both warmth and camouflage. Musk oxen use shaggy guard hairs and a dense undercoat called qiviut for insulation. Penguins combine double-layered feathers with a thick layer of blubber to stay warm. Blubber also plays a key role in energy storage and buoyancy. Bowhead whales have up to 20 inches of blubber, while seals, walruses, and polar bears use it for insulation and to stay afloat in icy waters. These adaptations are essential for maintaining body heat and surviving in extreme cold.

- **Behavioral adaptations**

Behavioral adaptations help animals survive cold and food scarcity. Dormancy slows metabolism and activity during winter. It includes hibernation, a prolonged state seen in groundhogs, bears, and European hedgehogs. Bears enter a lighter form called torpor, which is also used short-term by hummingbirds, black-capped chickadees, bats, skunks, chipmunks, and raccoons. Brumation occurs in cold-blooded animals like garter snakes, corn snakes, box turtles, red-eared sliders, bearded dragons, and alligators, who slow down but may emerge to drink. Migration allows animals like Arctic terns, humpback whales, monarch butterflies, caribou, and blue wildebeest to escape harsh conditions and find food. Shelter seeking involves finding dens, burrows, or snow cover, as seen in bears, arctic foxes, willow ptarmigan, squirrels, and rabbits. Huddling helps animals like emperor penguins conserve heat by sharing body warmth.

- **Physiological adaptations**

Physiological adaptations help animals survive extreme cold. Freeze tolerance allows some to survive internal ice formation, like the wood frog, which releases glucose as antifreeze to protect cells. Increased metabolism helps small mammals and birds generate heat; voles and shrews have high metabolism to offset heat loss, birds fluff feathers and shiver, while whales and sea lions increase metabolism when diving into colder waters. Brown Adipose Tissue (BAT) is specialized fat that produces heat without shivering; bears use BAT to rewarm after torpor, ground squirrels build BAT in autumn for intermittent arousals, human infants rely on BAT for temperature regulation, and cold-adapted humans like reindeer herders show increased BAT activity in response to cold. The Antarctic icefish, a scaleless, pale-skinned species with translucent blood, is the only vertebrate group lacking hemoglobin and red blood cells. Adapted to freezing waters, it absorbs oxygen through its skin, aided by large gills, an oversized heart, and expanded capillaries. Its genome reveals abundant antifreeze and egg-protective protein genes, helping it survive in icy, oxygen-poor conditions.

Animals surviving extreme cold rely on a mix of clever adaptations—thick fur, blubber, and compact body shapes help retain heat, while behaviors like hibernation, migration, and huddling conserve energy. Some even tolerate freezing, like wood frogs that let ice form inside their bodies. These strategies, shaped by evolution and observed across centuries, reveal nature's remarkable ability to thrive in the harshest conditions.

Symbiotic Struggles: Mutualism And Competition In Extreme Conditions

By Riya Jadhav(FYBSc)

Life in extreme environments is never easy, and nowhere is this more evident than in India's cold deserts such as Ladakh and Spiti. These regions, perched above 3,000 meters, endure long winters, temperatures that can drop well below –30°C, thin air, and very little vegetation. Yet, despite such harshness, a surprising range of plants and animals manage to survive here, their existence hinging on a delicate balance between competition and mutualism.

Competition is intense among predators. Snow leopards, Himalayan wolves, and red foxes all rely on a limited prey base—bharal, ibex, pikas, and other small mammals—and this overlap often forces them to adapt different strategies. Snow leopards specialise on rocky cliffs, wolves patrol open valleys in packs, while red foxes scavenge or hunt smaller prey. These pressures push species to carve out distinct niches, sharpening their hunting tactics and behaviour.

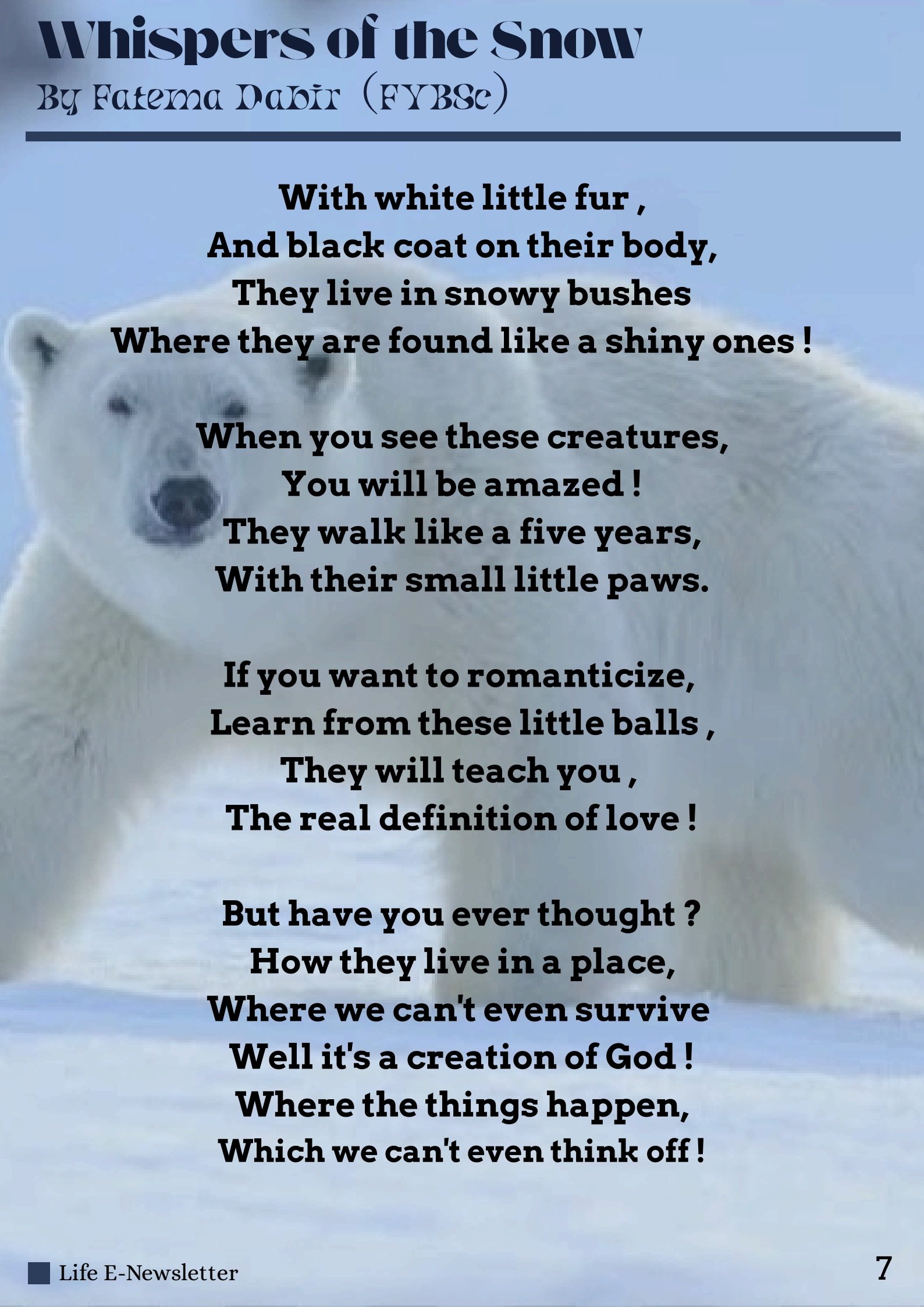
Yet cooperation quietly supports life in these frozen landscapes. Himalayan marmots dig burrows that offer refuge to other small animals; alpine plants partner with soil fungi to extract scarce nutrients; choughs and snow pigeons feed on insects stirred up by grazing herds; and scavengers depend on the leftovers of larger predators. In the cold deserts, survival is shaped by this interplay of rivalry and alliance—where competition drives specialization and mutualism provides the hidden lifelines that keep ecosystems functioning.

Glacier In Danger: What Conservation Biology Tells us

Glaciers, vital reservoirs of fresh water, are shrinking under the combined pressures of climate change and human activity. This loss disrupts fragile ecosystems, threatening wildlife like snow leopards, Himalayan ibex, and unique alpine plants that depend on icy habitats. Melting glaciers alter river flows, impacting both biodiversity and human livelihoods downstream. Conservation biology highlights the urgency of protecting these regions through strict safeguards, sustainable tourism, and expanding protected areas such as national parks. Ongoing research—tracking species, mapping glacial retreat, and restoring habitats—offers hope. Preserving glaciers is not just about saving ice, but sustaining life and balance in high altitude ecosystems.

Whispers of the Snow

By Fatema Dabir (FYBSc)



With white little fur ,
And black coat on their body,
They live in snowy bushes
Where they are found like a shiny ones !

When you see these creatures,
You will be amazed !
They walk like a five years,
With their small little paws.

If you want to romanticize,
Learn from these little balls ,
They will teach you ,
The real definition of love !

But have you ever thought ?
How they live in a place,
Where we can't even survive
Well it's a creation of God !
Where the things happen,
Which we can't even think off !

PHOTO GALLERY

Bombay Night Frog
Nyctibatrachus humayuni
By Rabia (SyBSc)

Malabar pit viper
Trimeresurus malabaricus
By Aarati (SyBSc)

Southern Oak Bush-cricket
Meconema meridionale
By Shrivasugi (SyBSc)

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