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Diversity, Morphology and Ecological Significance of Metallic Beetles (Family: Buprestidae) - A Research Study

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ABSTRACT
Metallic beetles, commonly known as jewel beetles, are one of the most beautiful and colourful groups of insects in the world. They belong to family *Buprestidae* of order Coleoptera. Their body shows brilliant metallic colours like green, blue, copper, gold and purple due to structural coloration, not due to pigments. This research paper studies the classification, morphology, life cycle, habitat, behaviour, ecological role and economic importance of metallic beetles. It also discusses the reasons for their metallic colour, their role as bioindicators and the threats to their survival. About 15,000 species of metallic beetles are found in the world and more than 800 species are reported from India.
KEYWORDS: Metallic Beetles; Jewel Beetles; *Buprestidae*; Coleoptera; Structural Colour; Bioindicator; Biodiversity

1. INTRODUCTION

Beetles are the largest group of insects on Earth. Order Coleoptera contains more than 4 lakh species, which is about 40% of all insects. Among them, metallic beetles are special because of their shining, jewel-like body. Metallic beetles are called Jewel Beetles because their elytra shine like precious stones.

In ancient times, their elytra were used to make jewellery, embroidery and decorative items in India, Japan and South America. In India, the famous *Buprestis* beetle elytra were used in traditional *zari* work.

Metallic beetles are mostly found in tropical forests, dry deciduous forests and woodlands. In India they are commonly seen in Madhya Pradesh, Chhattisgarh, Karnataka, Kerala, Uttarakhand and North-East states during rainy season.

The most famous metallic beetle in India is *Chrysochroa fulgidissima*, known as Jewel Beetle, and *Sternocera aequisignata*, known as the large metallic green beetle.

2. CLASSIFICATION

Kingdom: *Animalia*
Phylum: Arthropoda
Class: *Insecta*
Order: Coleoptera
Suborder: *Polyphaga*
Family: *Buprestidae*
Common Name: Metallic Beetles / Jewel Beetles / Metallic Wood-Boring Beetles Major Genera in India: *Chrysochroa, Sternocera, Julodis, Agrilus, Belionota, Chrysobothris, Sphenoptera*

3. MORPHOLOGY OF METALLIC BEETLES

A. Size and Shape Metallic beetles are 3 mm to 100 mm in size. Most Indian species are 15 mm to 40 mm. Body is elongated, oval and flattened from top. Head is small and partly hidden under *pronotum*.

B. Metallic Colour - Structural Colouration

This is the most interesting feature. Their colour is not due to pigment, but due to microscopic layers in the cuticle. Light reflects from these layers and produces interference, which creates metallic green, blue, copper and gold colours.

When the beetle moves, the colour changes with angle of light. This is called iridescence. This colour helps in:

1. Camouflage - In sunlight, shining body looks like leaf with water drops.
2. Warning to predators - Bright colour warns that beetle is hard and bad in taste.
3. Mate attraction - Male with brighter colour attracts female easily.

Scientists are now studying this structure to make colour-changing paints, mobile covers and anti-counterfeit notes.

C. Head

Head has a pair of compound eyes, short antennae with 11 segments and chewing mouthparts. Antennae are serrated in many species.

D. Thorax

Thorax has 3 pairs of legs and 2 pairs of wings. Forewings are modified into hard elytra, which protect the hind wings and abdomen. Elytra are highly metallic and have punctures and ridges.

E. Abdomen

Abdomen has 5 visible segments. In females, ovipositor is present for laying eggs in bark cracks.

F. Legs

Legs are short and strong, adapted for gripping bark and wood. Tarsi have 5 segments.

4. LIFE CYCLE AND BEHAVIOUR

Metallic beetles show complete metamorphosis - Egg - Larva - Pupa - Adult.

A. Egg Stage

Female lays 50 to 100 eggs in cracks of bark, on leaves or on dead wood. Eggs hatch in 10 to 20 days.

B. Larva Stage - Wood Borer

Larva is called flat-headed borer because its head is wide and flat. Larva is white, legless and lives inside wood for 1 to 3 years. It makes tunnels in wood and eats wood tissue. This is the longest stage of life. Larval tunnels are flat and filled with *frass*.

C. Pupa Stage

Larva makes a pupal chamber near bark and becomes pupa. Pupal stage lasts for 2 to 4 weeks.

D. Adult Stage

Adult emerges in summer or rainy season. Adults live for 2 to 6 weeks. They are diurnal, active in bright sunlight. They feed on leaves, flowers, pollen and nectar. They are good fliers and can fly long distances.

Mating takes place on tree trunks or flowers. Males are territorial and fight for females.

5. HABITAT AND DISTRIBUTION

Metallic beetles are found in all continents except Antarctica. Maximum diversity is in tropical regions - India, Brazil, Australia, Africa and South-East Asia.

In India, they are found in:

- Sal and Teak forests of Central India
- Western Ghats
- Himalayan foothills
- Dry forests of Rajasthan and Gujarat

They prefer dead, dying or fire-damaged trees for egg laying. Some species are found on specific host plants like Acacia, Mango, Teak, Sal, Eucalyptus and Bamboo.

6. ECOLOGICAL IMPORTANCE

A. Decomposers

Larvae decompose dead wood and return nutrients to soil. They are important for forest cleaning.

B. Pollinators

Adult beetles visit flowers for pollen and nectar and help in pollination of many wild plants.

C. Food for Other Animals

Birds, lizards, frogs and other insects eat metallic beetles. They are an important part of food chain.

D. Bioindicators

Metallic beetles are very sensitive to forest health. If number of metallic beetles decreases, it means forest is disturbed. Scientists use them as bioindicators to study climate change and deforestation.

E. Forest Fire Indicators

Some species like *Melanophila* can detect forest fire from 50 km distance through special infrared sensors. They lay eggs in burnt wood. This helps scientists to understand fire ecology.

7. ECONOMIC IMPORTANCE - BENEFITS AND HARM

A. Beneficial

1. Jewellery and Handicraft - Elytra used in traditional jewellery.
2. Scientific Research - Structural colour used in nanotechnology.
3. Forest Ecology - Help in nutrient cycling.

B. Harmful - As Pests

Some species are serious pests:

- *Agrilus planipennis* - Emerald Ash Borer - destroyed crores of Ash trees in America.
- *Agrilus biguttatus* - damages Oak trees in Europe.
- *Sphenoptera* - damages crops and fruit trees in India.

Larvae bore into living trees and block water supply, which causes death of tree. This causes loss of timber worth crores of rupees every year.

8. THREATS AND CONSERVATION

A. Deforestation - Cutting of forests destroys habitat.

B. Over-collection - Collection for jewellery and trade reduces population.

C. Pesticides - Chemical spray kills adults and larvae.

D. Climate Change - Change in temperature affects emergence time.
E. Forest Fire and Urbanisation - Loss of host trees.

Conservation Methods:

1. Protection of forests and old trees.
2. Ban on illegal collection and trade.
3. Plantation of host trees like Teak, Sal and Acacia.
4. Awareness among local people about importance of beetles.
5. Including metallic beetles in biodiversity studies.

9. RESULT AND DISCUSSION

From this study, it is clear that metallic beetles are not only beautiful insects, but also ecologically very important. Their metallic colour is a wonderful example of natural nanotechnology. Their presence indicates a healthy forest.

Although some species are pests, most species are beneficial for forest ecosystem. Their decline is a warning sign for biodiversity loss. More research is needed in India on their taxonomy, distribution and behaviour, because many species are still undiscovered.

10. CONCLUSION

Metallic beetles are jewels of nature. They show how beauty and function can exist together in nature. From pollination to decomposition, from bioindication to scientific inspiration, they play many roles.

It is our duty to protect these beautiful insects. If we save forests, we will automatically save metallic beetles. Conservation of metallic beetles means conservation of biodiversity.

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