Original Research Paper Zoology

REVIEW ON THE BEETLE WORLD AND HUMAN RELATIONSHIP

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ABSTRACT The present review deals with relationship of beetles with human being. The beetles has hard sheathed fore winged insects belongs to the Coleoptera order. It is largest order in animal kingdom, constitute about one per cent life forms. Beetles have different habitations except sea and Polar Regions. Besides the pests, most of beetle acts as beneficial insects e.g. they acts as predator (Lady bugs), improving soil fertility and protect livestock health (Dung beetle), used as human food (Meal worm), in art and jewelry (wings of genus- Ivie), in ancient culture (a scarab beetle of Karnak temple and Tomb etc) and many of them used in chemical warfare i.e. they defend themselves by discharging poison, foul testing fluids e.g. True beetle, Leaf beetle, Violin beetle, Bombardier beetle, Blister beetle and Stink beetle etc.

KEYWORDS : Beetle, Coleoptera, Predator, jewelry, Culture, Chemical warfare.

INTRODUCTION

Beetles are a group of insects that form the order Coleoptera. The word "coleoptera" is from the Greek 'koleos, meaning "sheath"; and pteron, meaning "wing", thus "sheathed wing". This name was given to the group by Aristotle for their elytra, hardened shield-like forewings. The order contains more species than any other order, constituting almost 25% of all known life-forms. About 40% of all described insect species are beetles. The diversity of beetles is very wide-ranging. They are found in almost all types of habitats, but are not known to occur in the sea or in the Polar Regions. They interact with their ecosystems in several ways. They often feed on plants and fungi, break down animal and plant debris, and eat other invertebrates. Some species are prey of various animals including birds and mammals. Certain species are agricultural pests, such as the Colorado potato beetle (Leptinotarsa decemlineata), the boll weevil (Anthonomus grandis,), the red flour beetle (Tribolium castaneum) and the mungbean or cowpea beetle (Callosobruchus maculatus) while other species of beetles are important controls of agricultural pests. For example, beetles in the family Coccinellidae ("ladybirds" or "ladybugs") consume aphids, scale insects, thrips, and other plant-sucking insects that damage crops.

Aims and objectives

- Aim is to initiate and encourage the conservation movement among teachers, farmers and society.
- To popularize importance of beetle for mankind as they play an important role as nutrient recyclers returning organic matter through multitrophic interactions, which contribute to soil fertility.
- The beetles are the important components of ecosystem. These are highly important from economical point of view. Today conservation of the species biodiversity is one of the most pressing environmental issues. Many factors threaten the world biological heritage. The change is far nations, government agencies, organizations and individuals to protect and enhance bio-diversity while continuing to meet people's need for natural resources. This challenge exists from local to global scale.

What is beetle?

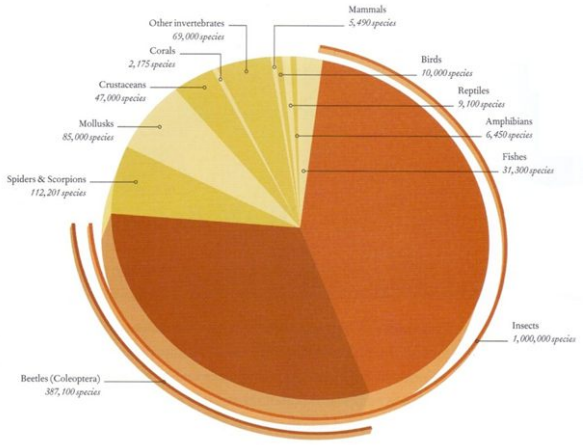
- Beetles are insects. Like all insects, they have a pair of antennae, six legs and three main body parts (fig. 1).
- More than 3, 50, 000 different kinds of beetle have been named. Thousands more are discovered every year. Altogether there are probably more than a million beetle species (Steve Jenkins, 1952).
- A beetle body is enclosed in a rigid shell called an exoskeleton. This hard casing provides support and protection
- Except for oceans and Polar Regions, beetles are found in almost every habitat; grasslands, forests, jungles, deserts, lakes and rivers.
- Beetle sense their surrounding with eyes, ears, and antennae. Tiny hairs on the legs and body of many beetles can also detect sound and odors.
- Beetles don't have a lung or gills. Instead they breathe through small openings on their body.
- Beetles evolved about 230 million years ago around the same time as the dinosaurs.

Taxonomy

The Coleopterans include more species than any other order, constituting almost 25% of all known types of animal life forms (Rosenzweig, 1995; Hunt et., 2007). About 3, 87,100 species of beetles occur – representing about 38.71 % of all known insects (Hammond, 1992). Overall, beetle species and their genera are currently placed in 1,663 tribes, within 541 subfamilies, nested in 211 families grouped into four suborders i. e. Adephaga, Archostemata, Myxophaga, and Polyphaga (Patrice, 2014). Polyphaga is the largest suborder, containing more than 300,000 described species in more than 170 families, including rove beetles (Staphylinidae), scarab beetles (Scarabaeidae), blister beetles (Meloidae), stag beetles (Lucanidae) and true weevils (Curculionidae). (Hunt et al., 2007). These beetles can be identified by the presence of cervical sclerites (hardened parts of the head used as points of attachment for muscles) absent in the other suborders (Atwal and Dhaliwal, 2003). The suborder Adephaga contains about 10 families of largely predatory beetles, includes ground beetles (Carabidae), Dytiscidae and whirligig beetles (Gyrinidae). Archostemata contains four families of mainly wood-eating beetles, including reticulated beetles (Cupedidae) and the telephone-pole beetle. Myxophaga contains about 100 described species in four families, mostly very small, including Hydroscaphidae and the genus Sphaerius.

Table-1. Animal diversity in relation to insects (Beetle)

Sr. No.	Animal group	Total Species	% Contribution
01	Fishes	31,300	2.27
02	Amphibian	6,450	0.47
03	Reptiles	9,100	0.66
04	Birds	10,000	0.72
05	Mammals	5,490	0.40
I	Chordates	62,340	4.52
06	Corals	2,175	0.16
07	Mollusks	85,000	6.17
08	Other invertebrates	69,000	5.0
II	Invertebrates other than Arthropods	79,675	11.3
09	Spider and Scorpion	1,12,201	8.14
10	Crustaceans	47,000	3.4
11	Insects	10,00,000	72.58
III	Arthropods	11,59,201	84.12
IV	Non-Chordates	13,15,376	95.48
	Total	13,77,716	100



Animal diversity

Relationship to human

a) As beneficial resources

Beetles are not only pests, but can also be beneficial, usually by controlling the populations of pests. One of the best, and widely known, examples is;

i) The ladybugs or ladybirds (family Coccinellidae, Fig. 2). Both the larvae and adults are found feeding on aphid colonies. Other ladybugs feed on scale insects and mealybugs. If normal food sources are scarce, they may feed on small caterpillars, young plant bugs, or honeydew and nectar. Ground beetles (family Carabidae) are common predators of many different insects and other arthropods, including fly eggs, caterpillars, wireworms, and others (Kromp, 1999).

ii) Dung beetles (Scarabidae, Fig. 3) have been successfully used to reduce the populations of pestilent flies and parasitic worms that breed in cattle dung. The beetles make the dung unavailable to breeding pests by quickly rolling and burying it in the soil, with the added effect of improving soil fertility, tilth, and nutrient cycling (Brown et al., 2010).

iii) They also protect livestock, such as cattle, by removing dung, which, if left, could provide habitat for pests such as flies. In developing countries, the beetle is especially important as an adjunct for improving standards of hygiene. **The American Institute of Biological Sciences** reports that dung beetles save the United States cattle industry an estimated US$380 million annually through burying above-ground livestock feces (John and Mace, 2006).

iv) Some beetles' help in a professional setting, doing things that people cannot; those of the family Dermestidae are often used in taxidermy and preparation of scientific specimens to clean bones of remaining soft tissue. Using the beetle larvae means that all cartilage is removed along with the flesh, leaving the bones spotless (Tomberlin and Sanford, 2012).

b) As food

Insects are used as human food in 80% of the world's nations (Carrington, 2010). Beetles are the most widely eaten insects. About 344 species are known to be used as food, usually eaten in the larval stage (Ramos and Menzel, 1998). The mealworm (fig. 4) is the most commonly eaten beetle species. The larvae of the darkling beetle and the rhinoceros beetle are also commonly eaten.

c) In art

Many beetles have beautiful and durable elytra that have been used as material in arts, with beetlewing the best example. Sometimes, they are also incorporated into ritual objects for their religious significance. Whole beetles, either as-is or encased in clear plastic, are also made into objects varying from cheap souvenirs such as key chains to expensive fine-art jewelry. In parts of Mexico, beetles of the genus Zopherus (fig. 5) are made into living brooches by attaching costume jewelry and golden chains, which is made possible by the incredibly hard elytra and sedentary habits of the genus (Ivie, 2002).

d) In ancient cultures

Some beetles were prominent in ancient cultures, the most prominent being the dung beetle in Ancient Egypt. Several species of dung beetle, especially the "sacred scarab" Scarabaeus sacer, were revered by the ancient Egyptians (Zabludoff, 2008). The hieroglyphic image of the beetle may have had existential, fictional, or ontologic significance. Images of the scarab in bone, ivory, stone, Egyptian faience, and precious metals are known from the Sixth Dynasty and up to the period of Roman rule. The scarab was of prime significance in the funerary cult of ancient Egypt. Example A Scarab Statue of Karnak temple (fig. 6) and a Scarab on wall of Tomb (fig.7).

e) In modern cultures

Beetles still play roles in culture e.g. the insect fighting for entertainment and gambling. This sport exploits the territorial behavior and mating competition of certain species of large beetles. In the Chiang Mai district of northern Thailand, male Xylotrupes rhinoceros beetles are caught in the wild and trained for fighting. Females are held inside a log to stimulate the fighting males with their pheromones.

f) Beetle as chemical warfare

Beetles have developed quite an arsenal of chemical weapons. They defend themselves with poison, foul tasting fluids, or jets of boiling hot liquid. The bright colors of many of these beetles warn predators that they are not good to it.

i. **True weevil:** The brilliant color of this true weevil is saying ' **I taste terrible'**(fig. 8).
ii. **Leaf beetle:** The body of this beetle is poisonous. But it has another trick up its sleeve. It produces a substance that is extremely sticky. If an ant tries to eat one these beetle, it will discover that its jaws are glued together (fig.9).
iii. **Violin beetle:** It repels predators by squirting acid from a gland in its abdomen. Those who handle this insect risk getting a painful burn on their fingers (fig.10).
iv. **Bombardier beetle:** The beetle has one of the most impressive beetle defenses. It squirts a blinding, boiling hot liquid into the face of an attacker. The chemical explosion powering this spray makes a loud popping sound (fig.11).
v. **Iron cross blister beetle**: The toxin from this beetle produce painful blisters on human skin. These beetles are dangerous – a horse can die from accidentally swallowing a few with its feed (fig.12).
vi. **Stink beetle:** It defends itself with a discharge of foul smelling liquid (fig.13) .

Acknowledgement

I am grateful to Director, BCUD, North Maharashtra University, Jalgaon for sanctioning and providing me an opportunity to serve under VCRMS scheme. I am also thankful our Principal for providing necessary laboratory facilities during the research work.

Fig. 1. The Beetle

Fig. 2. Coccinella septempunctata (A beneficial beetle).

Fig. 3. A dung beetle rolling dung.

Fig. 4. Mealworms presented in a Bowl for Human consumption.

Fig. 5. Zopheridae examples of jewelry temple.taken at the Texas (A&M University Insect Collection in College Station, Texas).

Fig. 6. A Scarab statue in the Karnak.

Fig. 7. . A scarab on a wall of Tomb KV6 in the Valley of the Kings.

Fig. 8. True weevil

Fig. 9. Leaf beetle

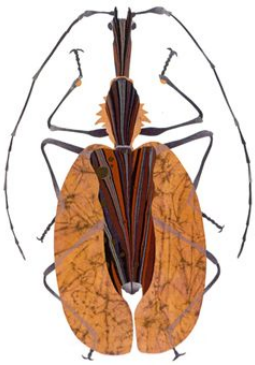


Fig. 10. Violin beetle

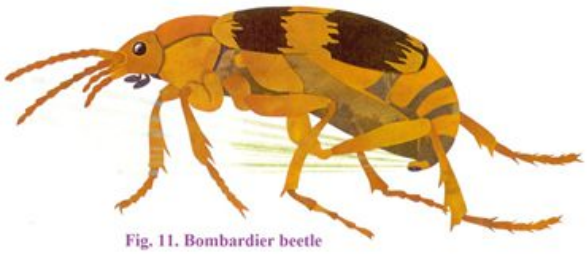


Fig. 11. Bombardier beetle

Fig. 12. Iron cross blister beetle

Fig. 13. Stink beetle

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