

INSTRUCTIONAL PRACTICE

Field Based Learning about Butterfly Diversity in School Garden-A Case Study From Puducherry, India

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Abstract

Butterflies are essential components for well functioning of ecosystems due to their key roles as pollinators and as indicators of ecosystem health. Butterflies are also beloved by public as well as young students and children, who are largely unaware that many species are threatened or endangered. The main objectives of field based education for butterfly conservation were to create knowledge, interest and necessary skills to investigate and, identify the butterfly species and conserve its diversity in school gardens. For butterfly survey the census technique method was taught to the students to investigate the diversity of butterflies during the field trips. During the field trip a total of 34 butterfly species, belonging to 4 families, were recorded with standard literature and colour photographs. The Nymphalidae family was the dominant species found in school gardens. The study concluded that the young students must be given the chance to investigate, engage with and experience nature in order to appreciate and be motivated to conserve and protect these fascinating insects at local level. The conservation of our natural biological resources will be dependent upon future generations. This field based learning program inspired to identify and conserve the butterfly diversity within the school gardens.

Keywords: Field based education, butterfly conservation, Census technique, biodiversity

Introduction

India is known for its rich biodiversity. India is one of the 17 mega-diverse countries in the world. With only 2.4% of the world's geographical area, its contribution to the world's

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biodiversity ranges from 7-8% of the total world's recorded floral diversity (about 45,000) and faunal diversity (about 91, 000). India has ten bio geographic zones that possess an exemplary diversity of ecosystems, like alpine forests, grasslands, wetlands, deserts and coastal and marine habitats. India has four out of thirty four global biodiversity hotspots, amongst which the eastern Himalaya, which has rich butterfly diversity of about 300 species. Also, the Western Ghats endow highly endemic flora and fauna, being an indicator of high degree of endemism in India. About 5,150 plant species and 1,837 animal species are endemic to India. India's biodiversity includes wild relatives of agricultural crops and domesticated animals. India has 16 major types' and 251 subtypes of forests. The large mosaic of distinct agro-ecosystems has contributed to diverse cropping pattern and systems across the country (India & CBD cop 10 Nagoya Japan 2010).

In the world there are about 17000 butterfly species, and in India the number of species recorded equals circa 1225, of which Hesperids 321, Palionids 107, pierids 109, Lycanids 443, Nymphalids 521 (Issack Kehimer 2008). They are one of the most amazing and magnificent elements of biodiversity, spread through diverse habitats from cooler regions to tropical forests. In the Neo tropical region, 31.4 % of species were described, representing the highest diversity in global biomes (Heppner, 1991). It is estimated that the richness of this order could reach up to 500.000 species, and just 7.784 species of butterflies are known (<http://diversityindia.org/butterfly.php> downloaded on 9-10-2010).

Students show very positive attitudes and a lot of enthusiasm towards field trips. Field trips are an important teaching tool. Students learn about the local natural environment in a less formal setting than the classroom and this encourages interactions between teachers and students. Principles that are merely black and white concepts of the two dimensional black board become illustrated in full, three dimensional colours. Field trips are effective instrument in teaching ecology (Lisowski & Disinger 1992) but can be appropriate for almost all biology classes.

Teaching about biological diversity by means of field trips brings students out of classrooms into nature, where they are given the opportunity to understand the interaction between plants and animals within their larger natural environment (Thomashow, 2001; Burkholder, 2003). They gain understanding about natural systems using their existing knowledge with their mind setup (Orr, 1992), while deepening their fascination, feelings and connection with nature (Cuthbertson, Dymont, Curthoys, Potter & O'Connell, 2003). This way of active teaching provides students with theoretical knowledge and practical personal experience with nature (Orr, 1992; Wilson, 1998). Moreover, this kind of experiential learning moves students towards self perception about nature, and theory and are integrated. (Burkholder, 2003). It encourages students to see nature as a primary source of information and inspiration, as a motivator and classroom, and, above all, as a home and place that provides comfort, protection and gives meaning to life, all of which supports the process of learning and creates a meaningful and memorable learning experience (Cuthbertson, Dymont, Curthoys, Potter, & O'Connell, 2003). When the learning about nature occurred in the field the students are completely immersed with the natural world the learning and ecological communities the experience is more meaning full and development in student's attitudes and knowledge (Dittrick, 2003)

Objectives of butterfly study

The main objective of the field based butterfly educational program was to promote, protect and restore native butterflies and their habitats and enhance students' knowledge and skills of butterfly ecology, by means of identification and conservation through field based education, investigation of varieties of butterfly biodiversity within the school

campus and giving them opportunities to contribute to butterfly protection and habitat restoration.

Methods

Classroom sessions

The students with middle school level VIII and IX standard in the age group between 13-15 years were selected from Chewalier Sellane Higher Secondary School (CSS) and Jawahar Navodaya Vidyalaya School (JNV) from the Puducherry region, based on their interest and motivation. First, the students were familiarized with butterflies; the definition and etymological background of butterfly biology, identification of the stages of butterfly lifecycle, habitat requirements for butterflies, threats to butterfly diversity, names of several different species, their role in ecosystems as pollinators and conservation needs and methods. A variety of active learning classroom interactive sessions was carried out during January 10th to May 30th, 2010, including lectures, power point presentations, documentary films, puppetry shows, dramas, debates, group discussions and drawing competitions.

Census Route Design

During the field days the students were trained to investigate the butterfly census in the month of March 2010 within the JNV and CSS school campuses. The census route design and field methodology, which were previously used for a butterfly investigation program with school students, were adapted from Jaret C. Daniels and Emily Heffernan Florida Butterfly Monitoring Network. Students crossed a variety of different vegetative areas such as the flower garden, natural vegetation and trees in the school gardens. The Census routes additionally encompassed several plant communities such grass lands, the medicinal garden and ornamental plants. The plant communities traversed by the census route were delineated and prominent features marked. In small groups, the students moved from one habitat to the next totally butterflies in the appropriate column on their data sheets.

Census Procedure

Census methods as suggested by Jarret 2000 C. Daniels Florida Butterfly Monitoring Centre (FBMN) were used for butterfly survey; in every group, one student acted as observer and others accompanied him, helping with record/spot keeping and identification. Only the observer was spotting butterflies, while the recorder was pointing them out. During the observation the observer always preceded at a uniform pace. The butterfly census was carried out between 10 AM noon or 2-4PM with less than 50% cloud cover and moderate light, as the butterflies are very active during this time. Directional radiuses of roughly 6 meters (20 feet) to each side of the route were maintained for survey. Census routes were conceptualized as corridors, 12 meters (40 feet) in width. Each butterfly was tallied on a data sheet and also the most preferred plant community was recorded for each section of the census route. During the butterfly survey students were instructed not to remove/harm any butterfly from the site. Butterflies were identified with standard references and colour photographs.

Butterfly Diversity

The result of the student butterfly survey in the school gardens was a total of 34 species (Table 2) falling within 4 families. The dominant family is Nymphalidae with 15 species, followed by Lycaenidae 8 species, Pieridae 6 species, and Papilionidae 5 species. The diversity and abundance of species is highly correlated with the availability of food plants in the surroundings (Kunte 2000, Raut & Pendharkar 2010). Occurrence of maximum number of species in the family Nymphalidae is due to the attraction to nectar producing plants in

the flower gardens and other natural vegetations that occurred on the school campus (Table 1).

Table 1.

Nectar Plant species that attract butterflies on the school campus

No	Common name	Scientific	Family	Habitat
1	Blue port weed	<i>Stachytarpheta jamaicensis</i>	Verbenaceae	low, sprawling shrub
2	Dronapushpi	<i>Leucas aspera</i>	Labiatae	Sub shrub
3	Spanish Flag	<i>Lantana camara</i>	Verbanaceae	Herb
4	Shaggy buttenweed	Spermacoce hispida	Rubiaceae	Herb
5	Burr Bush	<i>Triumfetta rhomboidea</i>	Tiliaceae	woody herb or shrub
6	Jungle Geranium	<i>Ixora coccinea</i>	Rubiaceae	common flowering shrub
7	coat buttons	<i>Tridax procumbens</i>	Asteraceae	Sub shrub weed
8	Sleepy Morning	<i>Waltheria indica</i>	Malvaceae	Shrub
9	Little ironweed	<i>Vernonia cinerea</i>	Asteraceae	Shrub
10	Ornamental Plant	<i>Desmodium triflorum</i>	Fabaceae	Herb
11	horsenettles	<i>Solanum trilobatum</i> L	Solanaceae	Shrub
12	Sessile joy weed	<i>Alternanthera sessilis</i>	Amaranthaceae	Shrub

Table 2.

Butterflies and moths of Javagar Navodya Vidyalaya School campus (JNV), Puducherry, India

FAMILY	COMMON NAME	SCIENTIFIC NAME
Papilionidae	Crimson Rose	<i>Pachliopta hector</i> (Linnaeus, 1758)
	Common Rose	<i>Pachliopta aristolochiae</i> (Fabricius, 1775)
	Helen, Red	<i>Papilio helenus</i> (Linnaeus, 1758)
	Lime Butterfly	<i>Papilio demoleus</i> (Linnaeus, 1758)
	Mormon, Common	<i>Papilio polytes</i> (Linnaeus, 1758)
Pieridae	Emigrant, Mottled	<i>Catopsilia pyranthe</i> (Linnaeus, 1758)
	Emigrant, Common	<i>Catopsilia pomona</i> (Fabricius, 1775)
	Jezebel, Common	<i>Delias eucharis</i> (Drury, 1773)
	Cabbage, White	<i>Pieris brassicae</i> (Linnaeus, 1758)
	Green-veined, White	<i>Pieris napi</i> (Linnaeus, 1758)
	Grassyellow, Common	<i>Eurema hecabe</i> (Linnaeus, 1758)
Lycaenidae	Pierrot, Common	<i>Castalius rosimon</i> (Fabricius, 1775)
	Tiny grass, Blue	<i>Zizula gaika</i> (Trimen, 1862)
	Dark grass, Blue	<i>Zizeeria lysimon</i> (Hübner 1798-1803)
	Zebra, Blue	<i>Tarucus plinius</i> (Fabricius, 1793)
	Pea, Blue	<i>Lampides boeticus</i> (Linnaeus, 1767)
	Cerulean, Common	<i>Jamides celeno</i> (Cramer, 1775)
	Gram, Blue	<i>Euchrysops cnejus</i> (Fabricius 1798)
	Jewel, Grass	<i>Chilades trochylus</i> (Freyer 1845)
Nymphalidae	Castor, Common	<i>Ariadne merione</i> (Cramer, 1779)
	Eggfly, Great/Common	<i>Hypolimnas bolina</i> (Linnaeus, 1758)
	Grass Blue, Tiny	<i>Zizula gaika</i> (Trimen, 1862)
	Pansy, Chocolate	<i>Precis iphita</i> (Cramer 1779)
	Pansy, Grey	<i>Junonia atlites</i> (Linnaeus, 1763)
	Pansy, Lemon	<i>Junonia hierta</i> (Fabricius, 1798)

Table 2. (Cont.)

Pansy, Peacock	<i>Junonia almanac</i> (Linnaeus, 1758)
Pansy, Blue	<i>Junonia orithya</i> (Linnaeus, 1764)
Tiger, Blue	<i>Tirumala limniace</i> (Cramer, 1775)
Tiger, Plain	<i>Danaus chrysippus</i> (Linnaeus, 1758)
Tiger, Striped	<i>Danaus genutia</i> (Cramer, 1779)
Crow, Common	<i>Euploea core</i> (Cramer, 1780)
Five ring, Common	<i>Ypthima baldus</i> (Fabricius, 1775)
Four ring, Common	<i>Ypthima huebneri</i> (Kirby, 1871)
Leopard, Common	<i>Phalanta phalantha</i> (Drury, 1773)

Discussion

Butterflies are threatened in many ways, but predominantly by anthropogenic and climate change, severely affecting butterfly diversity. Butterflies are used in biogeography, plant-insect interactions research, as important pollinators and environmental bio indicators, since they can indirectly assess environmental variations due to their sensitivity to climatic conditions, light and proportion of vegetation cover. Worldwide, the importance of butterfly conservation is given little concern. However, they are unique beautiful creatures with high ecological importance and thus need to be conserved. Exploration and experiential study allow young students to love and conserve nature. The type of activity and field based biodiversity education used in Puducherry created wonder, sympathy, creativity and willingness among students to conserve these beautiful insects. Continuous field trip exposure is important for children to acquire a deep sensitive understanding of the natural world and forms the foundation of biodiversity conservation. Children need to be given the chance to investigate, engage with, and experience nature in order to appreciate and love their environment. The results of the field based butterfly education program reflect the students' experience and enthusiasm in protection and conservation of butterfly species and its associated plants. Finally, it was decided to increase the number of nectar plants on the school campus in order to attract more butterfly species.

Recommendations for butterfly conservation in school campuses

Conservation of butterfly diversity in school campuses is dependent on the variety of native herbs, shrubs and trees which foliage, nectar, pollen and seeds. Protecting and conserving these kinds of plant species within the school gardens is needed in order to provide a suitable habitat for conservation of butterfly diversities.

Design of actions for butterfly conservation with student participation within the school campuses is required. Furthermore, the knowledge of butterfly species diversity and its ecological sustenance need to be popularized among school children. Establishment of Butterfly gardens within school campuses and promotion of conservation education to students as well as the local community is essential for butterfly conservation.



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