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An overview on Butterflies significance

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Abstract
Butterflies are the most valuable creatures of the biosphere. They are one of the important pollinators, food chain member and climate indicator. They are part of human emotion, culture and art.

Keywords: butterflies, biodiversity, ecology, bio indicators

Introduction
After bees, butterflies are the category of insects which are very specific to their food plants (Ghazoul, 2002) [21]. Butterflies are the most attractive than most other insects. They have been referred to as 'Flagship' and 'honorary birds'. They are valuable pollinators, important food chain components of birds, reptiles, spiders, and predatory insects; they are also the good indicators of environmental quality. Butterflies are one of the most amazing and magnificent elements of biodiversity (Ghazoul, 2002) [21]. They are valuable pollinators in the local environment and help in pollinating more than 50 economically important crops (Borges *et al.,* 2003) [3]. They are one of the important food chain components of birds, reptiles, spiders and predatory insects (Thomas, *et al.,* 1998) [64]. The larvae, which feed on foliage, are primary herbivores in the ecosystem and are important in the transfer of energy fixed by plants, making them available to the other organisms in the ecosystem. Adult butterflies are dependent on nectar and pollen as their food while the caterpillars are dependent on specific host plant for foliage. Butterflies bear a history of long-term coevolution with plants. The faunistic survey of butterflies their occurrence and characteristics provide crucial information on the ecology of a particular region (Ghazoul, 2002) [21]. Butterflies are taxonomically well studied group, which have received reasonable amount of attention throughout the world. 19,238 species have been documented from all over the world (Ghazoul, 2002) [21], among them 1501 species of butterflies are recorded from India (Kunte *et al.*,1999) [34] out of which 962 species have been reported from North eastern part (Evans, 1932) [15], 332 species from the Western Ghats and 150 from Eastern Ghats (Ashish *et al.,* 2009) [1]. Out of 332 species of Western Ghats 37 species are endemic (Kunte, 2000; Prajapati, 2010) [35, 50]. Being good indicators of climatic conditions as well as seasonal and ecological changes, they can serve in formulating strategies for conservation. However, they have largely been ignored by conservation biologist and policy makers as well. It is hence encouraging that butterflies are now being included in biodiversity studies and biodiversity conservation prioritization programme (Gadgil, 1996) [18].

Discussion
Ecological importance of butterfies
With well over a million identified species of insects only a few hundred species are listed as serious pests of humans and their crops, animals and structure. Thousand more species can be directly or indirectly beneficial to humans. The insects themselves are responsible for destroying a thousand times more pest insects than we are able do with our feeble "advanced technologies". As a result governments, universities and private concern are expanding their funding for research and implementation of cultural and biological control techniques that as successful managing insect and other pest populations. Without insects and other arthropods killing other insects and pollinating plants, the human species probably would have died out, either through disease or lack of food, even before leaving the trees (Thomas, 2008) [65].

Apart from its intrinsic value butterflies plays an very important role in the ecosystem balance, Butterfly Conservation Europe, (www.bc-europe-eu/index.php?id=489) explained in detail the importance of butterflies under following headings - aesthetic value, ecosystem value, educational value, health value, economic value, intrinsic value, scientific value. Ghazanfar (2016) [20] *et al*., explained in detail the ecosystem value of butterflies in their paper, "Butterflies and their contribution in ecosystem: a review". Numerous Lepidopterists disused the importance of butterflies on the ecosystem service render by them.

1. Among insects butterflies occupy a vital position in ecosystems and their occurrence and diversity are considered as good indicators of the health of terrestrial biota (Kunte, 2000b) [36].
2. Butterflies are valuable pollinators in the local environment and help in pollinating more than 50 economically important crops (Borges *et al*., 2003) [4].
3. Butterflies are an excellent choice for monitoring the habitat quality (Kunte *et al*., 1999) [37].
4. Butterflies as a group eat a wide array of Angiosperms and occasionally other plants or animals (Ehrlich and Raven, 1964; Singer *et al*., 1971; Coltrell, 1984; Singer and Mallet, 1986) [13, 58, 11].
5. Butterflies are one of the best insect studied groups and are highly sensitive to habitat disturbances; they are commonly used as indicator of environmental quality (Varshney, 1993; Kremen, 1994; Kocher and Williams, 2000; Koh and Sodhi, 2004) [71, 31, 28].
6. The use of butterflies been as indicators in conservation

planning has been the focus of authors for several years (Ehrlich and Murphy, 1987; Brown, 1991; Kremen *et al*., 1993; Nelson and Anderson, 1994; De Vrise *et al*., 1997) [14, 7, 33, 43]. They are considered as good bio indicators because -

- Due to short (typically annual) life cycles they are more sensitive than other groups to changes in their habitats (Thomas, 1994; Thomas *et al.*, 2004; Swaay and Warren, 1999) [66, 67].
- Breeding even in small habitat patches they are likely to reflect changes occurring at a fine scale (Van Swaay *et al*., 2006).
- They may be expected to be representative for a wide range of terrestrial habitats (Van Swaay *et al*., 2006) and more importantly to be adequate indicators for many groups of terrestrial insects (Thomas and Clarke, 2004; Thomas, 2005) [64, 66].
- Which themselves constitute the predominant fraction of biodiversity (Nowicki *et al*., 2008) [44].
- Consequently, butterfly monitoring have been suggested as a potential tool for assessing large-scale biodiversity trends (Thomas, 2005; Van Swaay *et al*., 2006) [67].
- The butterfly fulfills most of the important criteria for choosing a practical indicator taxon. Their diversity and distributions are well-described, they are relatively easy to sample, accessible field guides exist for identification, their taxonomy is relatively stable, and they are abundant and diverse in many ecosystems (Scott, 1986; Scoble, 1992; Caro and O'Dogerty, 1999) [55, 54].
- Butterflies and moths offer good opportunities for studies on population and community ecology (Pollard, 19991) [2].
- Butterflies are flagship taxa on biodiversity inventories (Lawton *et al*., 1998) [39].
- In addition, lepidopteron species are relatively host-specific (Janzen, 1988), so they may serve as biodiversity indicators of plants and thus other phytophagous insect taxa (Luff and Woiwod, 1995) [40].
- Butterflies are sensitive to biota, which get severely affected by environmental variations and changes in forest structure (Pollard, 1991) [2].
- Many species are strictly seasonal, preferring only a particular set of habitats in spite of this, butterflies have been generally neglected by community ecologists and there are very few studied available on their community structure, population dynamics and the ecoclimatic factors which affect them. Butterflies widely appreciated for their aesthetic value are important as ecological indicators (Chakravarthy, *et al*., 1997) [10].
- Butterflies therefore have been a popular choice as an indicator taxon and are often included in biodiversity assessments as the lone representative as the lone representative of the class Insecta (Scott *et al*., 1993b; Sisk *et al*., 1994) [56].

7. Butterflies provide food for number of animals such as birds, reptiles, amphibians, etc. and caterpillars provide an occasional meal for scorpion and ants. Eggs of some flies and wasps live as parasite inside caterpillars body and feed on it. If population of butterfly diminishes, then population of birds, mice and other animals that rely on them as food source will also reduce. This loss will collapse the entire ecosystem (Brower and Brower, 1964). "Birds plan their whole breeding season around when caterpillars will be most abundant. If butterflies and caterpillars are depleted then there will be less food for developing chicks" – Stephen Dickie (Ghazanfar *et al*., 2016 [20]. And http://carbon-based-ghg.blogspot.com/2012/09/butterflies-act as-wildlife-indicators.html).
8. Even though butterflies are the one of the most admired insects group of the most admired insects group to humans, is not well known that they are sensitive to climate and chemical changes. It is important to test the variation in butterfly family and habitat dynamics to establish diversity patterns (Gilbert and Singer, 1975) [58].
9. They form an important part of the food chain of birds, reptiles, amphibians, spiders and predatory insects, they also respond to disturbances and changes in the quality of habitat, and are thus a good indicator species to evaluate changes in habitat and landscape structure variations (Kremen, 1992; Kocher and Williams, 2000) [32, 28].
10. Most of them are strictly seasonal and prefer only particular set of habitats (Kunte, 1997) [36].
11. Other than their aesthetic value, butterflies have important roles in the functioning of forest ecosystems. Because of their diversity, wide distribution, specificity to vegetation type, rapid response to perturbation, taxonomic tractability, statistically significant abundance and ease of sampling, they have been considered useful organisms to monitor environmental changes (Raghavendra *et al*., 2011) [51].
12. Butterflies are the most beautiful and colorful creatures on the earth and have a great aesthetic value. Butterflies are lovely and graceful insects provide economic and ecological benefits to the human society (Bubesh *et al*., 2012).
13. Butterflies have most ecological significance among all insects. Butterflies play an immense role in pollination, which helps to increase heterozygosity in flora or brings variations through kinds of pollen dispersion from one place to another place (Mahendra *et al*., 2013a) [41].
14. Butterflies are the potential umbrella group of biodiversity conservation. They are good subjects for dispersal studies and have enormous ecological importance. They serve as food for predators at various levels. The larvae, which feed on foliage, are primary herbivores in the ecosystem and are important in the transfer of energy fixed by plants, making them available to other organisms in the ecosystem. After bees, butterflies are the second category of insects which are very specific to their food plants. The faunistic survey of butterflies, their occurrence and characteristic provide crucial information on the ecology of a particular region. By knowing the flora of an area, one can easily predict the existing butterfly fauna of that region (Ghazoul, 2002) [21].
15. Butterflies are commonly referred as "insects of the sun" with their catching color and delicate Charisma. They have been admired for centuries for their physical beauty and behavioral display (NRCSB, 2000).
16. Butterflies are an extremely important group of "model" organisms used, for centuries, to investigate many areas of biological research, including such

diverse fields as navigation, pest control, embryology, mimicry, evolution, genetics, population dynamics and biodiversity conservation (Butterfly Conservation Europe, www.bc-europe-eu/index.php?id=489 Accessed on- 29/3/2019 at 2.4pm.)

17. The long history and popularity of butterfly study have provided a unique data recourse on an insect group unmatched in geographical scale and timescale anywhere in the world. This has proved extremely important for scientific research on climate change (Butterfly Conservation Europe, www.bc-europe-eu/index.php?id=489 Accessed on- 29/3/2019 at 2.4pm.)
18. Thousands of people travel abroad each year looking for butterflies and moths. Eco-tours bring income to many European countries and developing countries around the world (Butterfly Conservation Europe, www.bc-europe-eu/index.php?id=489. Accessed on- 29/3/2019 at 2.4pm. Accessed on- 29/3/2019 at 2.4pm.)

Why butterflies matters?

Before starting the discussion on Why Butterflies matters? we would like to put a brief note on why biodiversity loss matters? Very well explained by Flynn and Furney (2010), "biodiversity loss matters, it matters for ethical, emotional, environmental and economic reasons. Ethically, we have a responsibility to future generations to maintain the diversity of life on earth; emotionally, we derive from nature pleasure, fulfillment, inspiration and solace; nature is fundamental to our culture, language, psychological and spiritual wellbeing. Environmentally, biodiversity provides a wide range of essential services – including carbon-cycle and storage, clean water, climate mitigation, mitigation of natural hazards, and pollination. Economically, the financial value of the goods and services provided by ecosystems and species – by life on earth- has been estimated at Euro 26 trillion per year-nearly twice the value of what human produce each year. The conservation and sustainable use of biodiversity is essential to poverty eradication in developing countries, and to sustainable livelihood and sustained economic growth in Europe and worldwide. Biodiversity is part of the daily lives of every one of us and, indeed, we are part of biodiversity. Climate change will increasingly drive biodiversity loss, affecting both individual species and their ecosystems. An ecosystem can be defined as a community of plant and animal species and the physical environment that they occupy, which includes the climate regime. When climate conditions change, unexpected results may follow. Each species will respond in an individual fashion, according to its climate tolerances and its ability to disperse into a new location, alter its phenology or adapt to shifting food sources. It is difficult to predict the overall results of changes in the abundance of herbivores and food plants, predators and prey. Many studies have attempted to project the rate and extent of terrestrial ecosystem response to climate change, some using simple models assuming that entire ecosystems will shift to follow the changing climate, and others using 'plant functional type' models featuring the responses of different types of herbs, bushes and trees. Vegetation zones are typically expected to move towards higher latitudes or higher altitudes following shifts in average temperatures"

Entire animal kingdom is classified into invertebrates and vertebrates. The phylum invertebrates comprise 95%of the total animal known, named and classified, remaining 5% are vertebrates. Arthropoda is one of the largest phylum of invertebrates contains about 80% of the all known species. Insects belonging to the class Insecta, one of the largest class in the phylum Arthropoda, they are the most diverse groups of animals on the earth at present (Imms, 1964). Approximately 0.9 million species of insects have been described throughout the world and 59,353 species in India belonging to 27 orders (Varshney, 1998) [72]. Butterflies are belonging to the order Lepidoptera, which is the second largest order in the class insect. There are different views regarding total number of butterflies in the world as well as in India, few are- i) According to Heppner (1998), Evnas (1932), Kunte (2000) [34] - 19,238 species of butterflies from the world and 1501 species are from India. ii) In view of Gaonkar (1996), there are 16,823 species recorded from all over the world and among them 1501 species of butterflies are recorded from India. iii) According to Kehimkar (2008) around 18,000 species of butterflies are estimated to be there in the world and India has recorded 1501 species. iv) Kunte (2009) [35], India has total 1,504 species of butterflies. v) The recent estimates according to Varshney and Smetacek (2015) [73] there are about 18,000 plus species of butterflies in the world, vi) Although several estimates have been made from to time ranging from a low of 13,000 (Owen, 1971) to the maximum of 20,000 (Vane Wright, 1978) but the total number of butterflies is in the state of flux and it remains so. Though the tropical region contains very rich and diverse butterfly fauna, the information on species found in different habitats is very poor particularly for the Indian region (Rajagopal *et al.*, 2011). From the numerical data it is evident that butterflies are the integral part of not only insect diversity but the entire biodiversity.

Entomologist	World	India
Heppner, (1998), Evnas (1932), Kunte (2000) [34]	19,238	1,501
Gaonkar (1996)	16,823	1,501
Kehimkar (2008)	18,000	1,501
Kunte (2009) [38]	-	1,504
Varshney and Smetacek (2015) [73]	18,000+	1,318

Human beings are the greediest, self-centered among all the organisms living on the earth, we humans always raise the question why it matters? specially for invertebrates, when compared to the total number of species of insects human beings are negligible but they never asked such questions, because they are not "educated" like us, it is fortunate otherwise we would have been extinct many years before

not here to "conserve" the animals and dare to ask such questions. Human see the nature whether it is abiotic or biotic factors from light, temperature, soil, wind, microorganisms, plant or any animal only from the perspective of how to get benefits from this, because of this basic core selfishness we analyze, calculate before studying biotic or abiotic factors in detail, if a animal "fits" into his economic/medicinal or any other beneficial category he starts studying it or try to conserve it, this is the reason why all the conservation programme are focused on higher vertebrates not any other category of animals because they are analyzed for their economic and ecological value and they properly "fits" into the criteria that human counts, insects are too economically, ecologically very very important and there loss is the loss of part of biodiversity, the study of butterflies and their ecological studies are overlooked and underappreciated aspect, if we study and prove the use of it may be the survival chances of butterflies may increase. From the numerical data it is evident that butterflies are very much important part of biodiversity, in this short communication an attempt was made to provide the answer for why butterfly matters, unfortunately we know very less about the services rendered by them.

According to Albert Einstein, "Not everything that can be counted counts and not everything that counts can be counted". I wish there were conclusive way to prove it.

Butterflies in Art and Culture

Paul Smart Fres in his Book "The illustrated Encyclopedia of the Butterfly World", explained how our culture and our routine life connected with butterfly, few are listed below (1-5)

1. From earliest times, the butterfly form has been celebrated in the art and poetry of many different cultures.
2. Butterfly legends and beliefs have become incorporated into the folklore of many countries, for example the Brazilian dance to honor the dead once, described by the anthropologist Sir James Frazer, in which the dancer assumes the character of a giant Morpho butterfly.
3. It is equally curious that the ancient writers on natural history, including Aristotle and later Pliny, mention few butterflies in their books and essays; yet butterflies were certainly not ignored by the Greeks. They believed the emergence of the adult butterfly from its pupa represented a personification of the human soul. In later Christian art the Metamorphosis of the butterfly became a symbol of the Resurrection.
4. Butterflies figure in a lighter vein on illuminated manuscripts dating from the 9th century, where they often appear as a decorative border to the text. It is sometimes possible to recognize the actual species depicted, though usually these illustrations are very stylized and often rather crudely executed.
5. Insects, including butterflies, also appear frequently in the work of early oriental artists and the paintaining of 16th and 17th century Flemish artists, especially Jan Van Kessel (1626-1679).

We often see that artificial butterfly made form plastic or paper mounted on walls for ornamentation purposes in the home, office to feel good by seeing them. Most of the poets, writers use the butterfly in their creative work, for example, Amy LV wrote a poem on Monarch butterfly, "To a Butterfly" by William Wordsworth, "Patergitti Pakka" by D.R. Bendre (Famous Kannada Poet), Sir John Tenniel in his story used butterfly caterpillar as a character. Butterflies were considered as the reincarnations of the soul of dead warriors in many civilizations, whenever they enter the garden or into the homes they feel their old once visited them. Ancient Egyptian tombs clearly indicate that they have deep knowledge of butterfly.

- There were several famous painters used butterflies in their paintings, for example, Salvador Dali painted two butterflies resembles the butterflies of desert region.

Butterflies recurrently appear in Japanese mythology, they considered the butterflies are the souls of good women and men; they are often played a role in their folklores.

- Japanese also believe that entering of a butterfly in the guestroom indicates visit of close friend soon.

Butterflies are the most recognized group of insects in the world. They have influenced art, literature, and religious and mythical traditions. Both butterflies and moths have been represented in art from Egyptian temples, in Chinese amulets, and Aztec ceramics, as well as in drawings, gem carvings, glass, paintings, sculptures, and textiles. Lepidoptera have had a symbolic connection to the soul. Pre –Columbian cultures of Central America respected butterflies and moths in religious and mythical traditions in which they represented souls of the dead, new plant growth, the heat of fire, sunlight, and various other transformations of nature (www.answers.com/topic/lepidoptera-1).

Peterson (1995) reported that, Morpho butterfly have been collected for jewelry because of its striking iridescent blue wing scales, the specimens collected in such an extent that they are now in the category of extinction (Scudder, 1976).

These indicate that we emotionally connected to environment and we inspired from all the creatures that surround us. Butterflies are the symbol of activity, beauty, hard work, challenge taker, nature lover; above all it is the good example for, continuous attempt to reach positive goal will always end up with new fresh colorful life. Come let us inspire by butterflies and desire to live a positive active life.

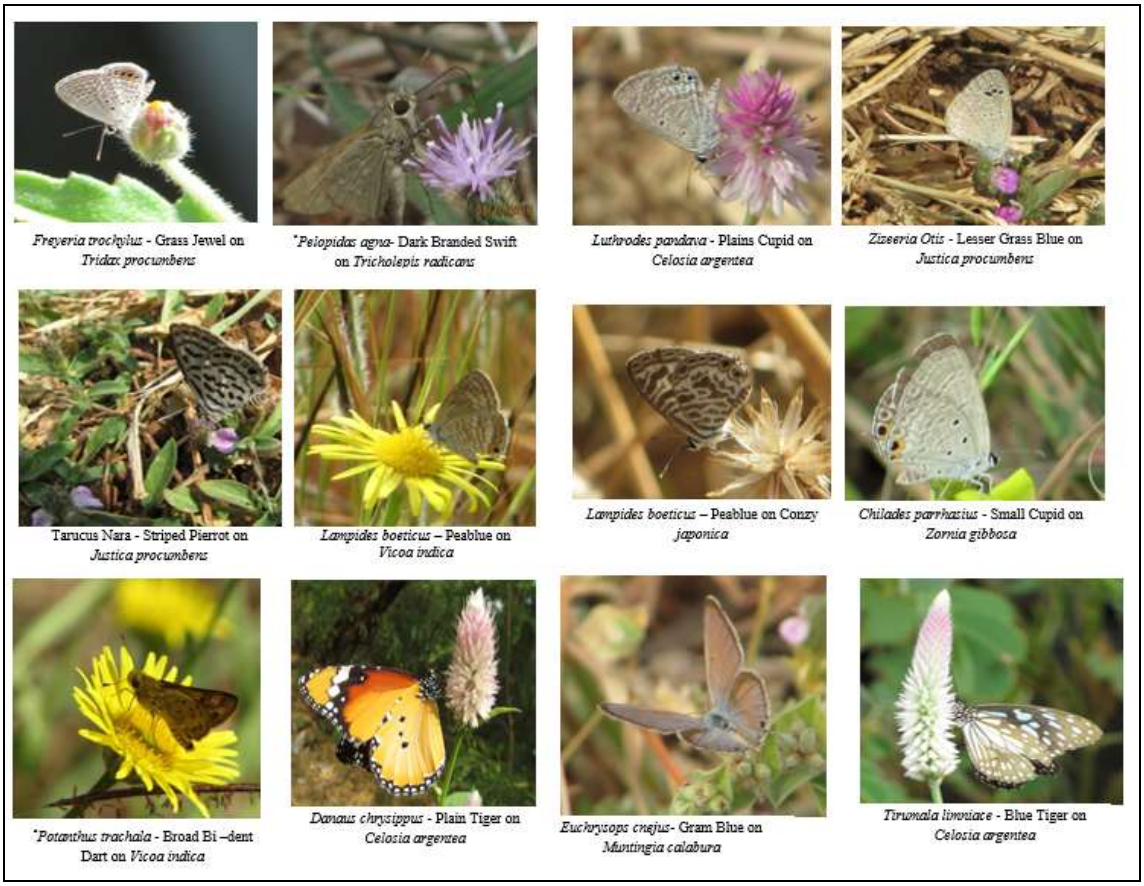

Plate 1: Butterflies sipping nectar from the flowers and they are important pollinators

Conclusion

Human beings are the most self-centered and selfish, greedy animal in the entire animal kingdom. We always look forward the use or outcome of all the things that are there in the nature from water to invisible microorganisms, we human think that the entire nature is there to serve the endless desire of ours we always forget that we are here because all factors biotic and abiotic including "small" invertebrates working with harmony, taking the things within the limited range from the nature, never ever think about their " growth" at the cost of destroying the other wildlife's, environment and ecosystem. Whatever the subject we study in the basic Biology or any branch (specially insects) either it may be Biodiversity, Ecology, wildlife, Population dynamics, Population assemblages, Community ecology, Bioecology of animals specially invertebrates, biotic interaction of (specially once again) invertebrates, check listing the biodiversity of invertebrates etc., the primary question we asked is why it matters? What is the outcome of the study? How it help to overcome the diseases? Is there genome related to human being; if it yes at what percentage? Is it worth investing money? But we never think is our "study" disturbing somebody's lives? They are living with harmony even with us too. Few so called intellectual people think about how we can replace the "loss"? How we can compensate to that disturbance? What are all the prioritization that can be possible to start? Next stars Conservation. Forming the conservation committee, finalizing the experts in it from various disciplines of the subjects, studying the harm, formulating laws and making the guidelines to follow to bring back the worst situation back (?) After few months or years committee presents report with "positive" outcome. First disturbing the nature greed fully then starting slowly in fact very very slowly conservation programmes and again ready to ask another question on any other focused fauna that come with "convinced", "scientific" answers for list of questions like "why it matters? How it can be useful for our community? is it help to overcome any diseases specially cancer, AIDS, genetic disorders? If such questions are answered logically, statistically the cycles starts once again and end with new conservation programmes. We can prove that how these conservation programmes help to improve the particular habitat to bring the situation back by counting the plants and animals, putting the data in the table, draw the positive progress correlation graph, proving the hypothesis, but we never understand what's going on in their genes in the new habitat, what is the consequences of the new situation that animals are forced to adapt and still there are many more aspects that are invisible and impossible to understand, count, calculate and prove.

So the first thing we must and should stop raising the question why it is matters? What is its important? For any wildlife form from Protozoa to Mammals. Nature treats all the life equally with all respect; it is our duty to treat with same. It is inevitable that we have to use nature our survival but it should be in the limits. As we become "Civilized", we also become more "intellectual" and starts proving our conservation programme and its long lasting "positive' effect by theories, hypothesis with statistical data and graph with modern technology and softwares but nature has its own way to behave with these "conservation Programmes" it does not understand neither our "Mathematics" nor our "Statistics". Whenever we tried to balance the nature we have lost ours and put over self in still bigger ecological problems, the first thing we have to do is stop our over intellectual study, conservation programme, beings to lead a natural, less greedy life, nature has the tremendous capacity

to balance itself and our lives too, it does not need anybody's help. This is the prime time to salute the all the lives of nature make the decision to live with harmony with all the members including smallest insects, because they matter too. Finally, I would like to end with the note of Romain Grey, "there is nothing in nature to prove that it cares more for human species than for daffodils. We may one day vanish as quickly and as radically as thousands of others breeds before us… Mother Nature has no mama's darlings… when the balance of nature is threatened, it always finds a way to restore that balance, at whatever cost. If endangered by us, nature will strike back and show no more concern for Michaelangelo, Shakespeare or Mozart than for daffodils. We are dealing here with an overwhelming force, that of life itself and we know next to nothing about it. The only thing we know is – nature has no favorite among the species".

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