



# ENVIS NEWSLETTER

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## HONEYBEES FOR SAFER ENVIRONMENT



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## From the Director's Desk...



Odisha ENVIS Centre is always trying to bring out environmental issues those are most vital in the State in newsletters. We have covered many issues of environment of the State in our previous publications. The objective is to disseminate information to the users and bring awareness among the society and policy makers.

This time we are covering an issue of **Honeybees for Safer Environment**. I hope the information contained in the issue will be useful to users.

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## Honeybees for Safer Environment

Honeybees are by far the most useful creatures of our green planet. They belong to the family Apidae of order Hymenoptera and from their ubiquitous association with angiosperms these bees are believed to have co-evolved with flowering plants during Miocene period of Cenozoic era. The greatest species diversity of genus *Apis* is seen in India and adjacent region . Of 20000 species of the bees spread all over the globe, the most important four species of honeybees viz., Rock bee, *Apis dorsata* F; Indian hive bee, *Apis cerana indica* F; Little bee, *Apis florea* F and the stingless bee, *Tetragonula* species are distributed widely in India and this Indian sub continent is the richest zone in housing the diversified species of the honeybees with supporting bee flora making Indian sub-continent suitable for beekeeping almost throughout the year. Status of bee keeping in the country has further transformed to a new dimension through introduction and successful establishment of the high yielding exotic honey bee, *Apis mellifera* Linnaeus in the country in erstwhile Punjab, at Nagrota -



Rock bee- *Apis dorsata* ( Changing habitat of *Apis dorsata*)

Bagwan (Now in HP) and PAU Ludhiana campus during early sixties through very strenuous and sustained efforts of Dr. A. S. Atwal and his associates .The species has been spread to other parts of the country during early eighties. Introduction of the exotic species brought about the amber/honey / sweet revolution in the country.

These honeybees not only provide honey, the only insect created complete natural food with therapeutic, medicinal, nutritional and cosmetic values and deeply associated with our cultural heritage rather beekeeping provides many other hive products like bee wax, royal jelly, propolis, apitoxin etc. and an



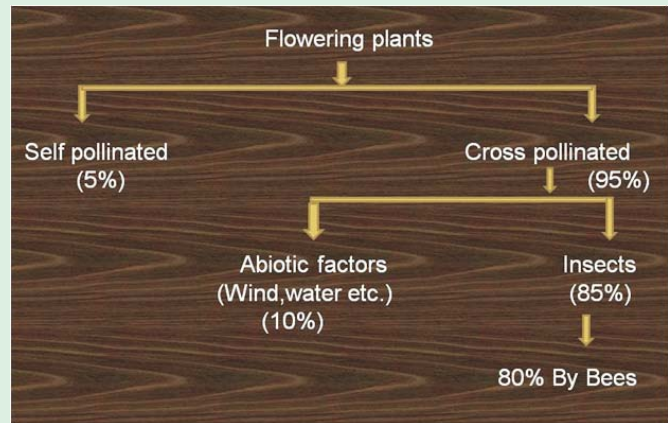
Indian hive bee- *Apis cerana indica*

array of employment generation options for improving livelihood. The real values of bees and bee keeping lies in providing free ecosystem services in the form of cross pollination, which not only boost the productivity of agricultural and horticultural crops but also help in conservation of biological diversity through propagation of wild flora.

Ecosystem services are the benefits that people obtain from nature. The services include provisioning services (such as food, air and water), regulating services (such as air quality, climate and water regulation), cultural services (including cultural identity, spiritual values and recreation and tourism) and supporting services (for example, soil formation and photosynthesis) (International Risk Governance Council, Geneva, 2009). In fact, the honey bees directly or indirectly contribute to all four types of ecosystem services. Urbanization, deforestation, climate change, non-native invasive species, unsustainable agricultural practices are modifying the structure of agro ecosystems and disrupting their proper functioning which an emerging concern in maintaining safe and healthy environment for the future generation.

Pollination is one important ecosystem service fundamental to the reproduction of flowering plants and this is one ecosystem services identified by the Millennium Ecosystem Assessment (MEA, 2005)

As such bees are considered to be the most important pollinators because they are the only insects whose immature stages are reared exclusively on pollen and nectar (Crane, 1990). The supporting facts that make the honey bees to be regarded as the best pollinators are



- ❖ The especially modified body parts to pick up pollen grains, e.g., pollen baskets in the hind legs i.e., Cubicula;
- ❖ Presence of body hairs;
- ❖ Exhibit flower constancy and fidelity;
- ❖ Potential for long working hours;
- ❖ Special communication system because of their social behavior;
- ❖ Thorough micro-manipulation of flowers;
- ❖ Ability to maintain high populations when and where necessary and
- ❖ Adaptability to different climates and niche

Bee pollination stimulates germination of pollen on stigmas of flowers and improves selectivity in fertilization, increases viability of seeds, embryos and plants, more nutritious



Little bee- *Apis florea*

and aromatic fruits are formed, increases the vegetative mass and stimulates faster growth of plants, increases number and size of seeds and yield of crops, enhances resistance to diseases and other adverse environmental conditions, increases nectar production in the nectarines of plants, increases fruit set and reduces fruit drop and increases oil content in oil-seed crops.

Mc Gregor (1976) an eminent pollination scientist in United States had estimated that "One third of man's diet is derived directly or indirectly from insect pollinated plants". Honeybees play vital role in the pollination of large number of cultivated crops, which is often under estimated in developing countries. However, it is an established fact that income



Stingless bee- *Tetragonula* sp.

from agriculture by the use of honeybees in crop pollination is many times higher than their value as honey and beeswax producers. Swaminathan (1986) in his forwarding note in FAO Service Bulletin on Apiculture stated "In spite of all global revolutions on food security, several hundred million children, women and men are going to bed hungry every day, particularly in the countries of the south. Since, prospects for global food security, system appears to be small at the present moment, it will be for the developing countries, characterized by poverty and under-nutrition, to build their own national food security system. In this task, apiculture can play a useful role. At a very little expenditure, honeybees will not only provide food and income, but will also enhance the productivity of horticultural and other field crops by their pollination activities". The per capita consumption of honey in India is only 9 g as against 1.8 Kg in Germany, the highest honey consumer. The country has over 50 million hectares area under crops that are benefited by bee pollination. Among the crops that give increased yields due to pollination services by bees are oilseeds, pulse crops, vegetables and fruits. Therefore, the role of beekeeping in providing nutritional, economic and ecological security to rural communities cannot be overlooked as it has always been linked with the cultural and natural heritage of rural communities (Verma, 2003).

By pollinating the flowers of intact native vegetation, honeybees can conserve such vegetation which otherwise might be considered of little value. A large proportion of flora in uncultivated terrestrial communities relies upon pollinators to produce foods and



Italian honeybee- *Apis mellifera*

seeds on which several wild species such as mammals and birds survive. One of the values of honey bees is that they provide "*biological insurance*" through their pollination services. Honeybees are therefore vital for life on earth. In this context the remark of the great scientist, Albert Einstein i.e "*If the bees disappeared off the surface of the globe, then man would have four years of life left. No more pollination, no more plants, no more animals, no more man*" appears to be very pertinent.

Though accurate statistical data is not available so far about the direct and indirect benefits of honeybees in terms of value of their hive products and cross pollination services but Asian hive bees and bee keeping has also been linked since ages with socio-economic, natural, cultural and religious heritage. Starting from honey hunting since time immemorial to traditional bee keeping and its present transformation to scientific bee keeping has been a continuous endeavor of human for harnessing both direct and indirect benefit from the activity.

Beekeeping provides sustainable livelihood option for economically vulnerable

communities because of its following attributes:

- ❖ Provide food and cash income without ownership of land
- ❖ Resilient when disaster happen
- ❖ Non extractive and sustainable
- ❖ Provide opportunity for small, medium and commercial farming
- ❖ Can be adopted as a spare time, part time, and full time occupation
- ❖ Require a little investment and infrastructure
- ❖ The technology is simple and low cost
- ❖ Help local craftsman to earn extra wages
- ❖ Hive product are low volume high value with good self life
- ❖ Earn foreign exchange
- ❖ Diversifies the economic base
- ❖ Enhance productivity levels of agricultural, horticultural and fodder crops through pollination services
- ❖ Helps in overcoming the problem of malnutrition and human health
- ❖ Bee pollination is vital for life on earth in terms of bio-diversity conservation
- ❖ Provide effective linkages to other farming system with positive ecological consequences

Despite of having immense potential for development of beekeeping, honey production in the country is abysmally low in comparison to the world production. So far, only about 20-25 per cent of the bee flora is being exploited. A shift from bee hunting to bee keeping although was noticed since nine decades, but bee hunting through some man



Scientific bee keeping  
with *Apis cerana indica*

made protections in the form of wall hives and pot hives are still in practice in the country. Moreover, the natural nests of the three bee species viz., *Apis dorsata*,

*A.florea* and *A.c.indica* and to some extent the local sting less species, *Tetragonula* are exposed to bee hunting as a professional pursuit of certain forest tribal communities. A major portion of our honey is obtained from the ferocious rock bee, *Apis dorsata*, which is a key species in the forest ecosystem and play vital role in sustaining forest flora. A well developed colony of this rock bee may yield over 20 kg honey and 2 kg of bees wax which the bee hunting tribal usually sell at the nearest rural markets. The squeezed honey sold by them is often found to be substandard and unhygienic due to the presence of wax/pollen particles, squeezed brood and body segments of bees. The methods of bee hunting followed by these tribal communities are highly destructive and have reduced our bee fauna. Further, lack of flora and deforestation has resulted in seasonal migration of rock bees to places of human dwellings. These bees pose nuisance to human beings and they are killed mercilessly by using fire or spraying of insecticides.

The rich diversity of bee species and of natural and cultivated vegetation in the country allows maximum utilization of bees and bee plants. The Indian forests could provide shelter and food to over 120 million bee colonies. Even if we consider reduction in the forest area in recent years, due to deforestation, etc., the country can still hold over 100 million bee colonies, providing self-employment to over 10 million rural and tribal families. In terms of production, these bee colonies can produce over 700,000 tons of honey and about 30,000 tons of beeswax. As it may take decades to fulfill our potential needs, conservation and management of native bees as well as that of related insect pollinators, are felt imperative for sustainable agriculture and rural development. The Millennium Ecosystem Assessment (MEA, 2005) has also identified Pollination as one of the 15 ecosystem services currently being under threat.



Honey hunting from *Apis dorsata*

## Conservation Strategies

In recent years there is growing concerns over the loss of pollinators in India and that can affect vegetable yields which concurrently limit people's access to a nutritional diet. In order to gain a clear insight into the scale of

the global problem, the FAO has established the International Pollinators Initiative, which includes a project involving seven nations including India with the aim of identifying practices and building capacity in the management of pollination services. The UN Environment Programme also observed: "*Any loss in biodiversity is a matter of public concern, but losses of pollinating insects may be particularly troublesome because of the potential effects on plant reproduction and hence on food supply security.*"

Of number of perspective strategies suggested for conservation of honey bees few that need prioritization are indicated below:

- ❑ Hunting of the natural nests of the three bee species viz., *Apis dorsata*, *A.florea* and *A.c.indica* and to some extent the local sting less species, *Tetragonula* bee by certain forest tribal communities must be discouraged.
  - ❑ Concerted research efforts on the nesting sites and strategies for their protection are also felt imperative.
  - ❑ Other insects like flower wasp, *Campsomeriella* spp (Fam: *Scolidae*) and syrphid flies (Fam. *Syrphidae*) which have dual role in ecosystem i.e they control crop pests as well as pollinate the crops need attention while planning insecticide applications and adequate monitoring of their population is required in context with the associated environment.
  - ❑ Since, monocultures reduce floral diversity limiting the variety of pollinators the natural vegetation whether these occur around the edges of agricultural lands are to be maintained to support the pollinators such as bees and butterflies.
- ❑ Despite harmful effects of insecticides on pollinators, use of pesticides cannot be averted. Under such situation pollinator friendly strategies such as use of granular formulations or application of insecticides just before flowering would save lots of native pollinators.
  - ❑ Besides, ecological approaches like raising barrier crops, crop refugia, adoption of validated ITKs' may also serve not only to check the harmful insects, but also to promote the pollinators and other beneficial insects.
  - ❑ There is a need of encouraging road side and other plantation with bee friendly plants like neem, pongamia, Baula, *Callophyllum*, Jamun, Acacia, Eucalyptus etc.
  - ❑ The most important need is to create awareness amongst policy makers, planners and aiding agencies about promoting bees and beekeeping as an important component of present day strategies for sustainable agriculture and rural development programmes .The beekeeping fraternity with lesson from bees i.e. "Live and let live" may contribute towards the general efforts for restoration of the environment that is being disturbed through human interference.

Over the past 200 million years, flowers and their pollinators have evolved in parallel (Maheshwari, 2003). Like co-evolution coextinction is also a natural phenomenon. Extinction of any plant species likely lead to extinction of the pollinator species associated intimately and the vice versa.

**Endangered pollinators - endangered plants-  
endangered animals - endangered man.**



Observation of Van Mahotsav Week on 10.07.2015 at Chandra Sekhar Pur High School, Bhubaneswar



Observation of International Coastal Clean-up Day on 21.09.2015 at Puri Sea Beach

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