Ecosystem Services of Insects

Goutam Roy Chowdhury¹, Upasana Datta², Sufia Zaman² and Abhijit Mitra³*

¹Chancellor, Techno India University, India
²Department of Oceanography, Techno India University, India
³Department of Marine Science, University of Calcutta, India

Received: July 15, 2017; Published: July 31, 2017

*Corresponding author: Abhijit Mitra, Department of Marine Science, University of Calcutta, 35 B.C. Road, Kolkata 700019, India, Tel: 9831269550; Email: abhijit_mitra@hotmail.com

Introduction

Insects comprise the most diverse group of multicellular organisms in the planet Earth, which provide several ecosystem services like pollination, pest control (bio-control), decomposition, transference of energy through food chain etc. In addition, insects are widely used today as human edible items and ingredients of fish-feed, turtle-feed, livestock, etc. In this paper we focus on the vital ecosystem services provided by insects with special reference to their services in the domain of human food. Our research stands on the high nutritional value of insects preferably protein which ranges between 13% - 77%. Our paper has two-fold goals namely documentation of selective ecosystem services of insects and highlighting the edible value of insects. In this paper we have intentionally excluded the value of commercially produced insect-derived products like honey, wax, silk, shellac, etc. rather our main focus is to highlight the nutritional value of insects which is the most demanding subject to feed the rapidly rising population in the present world.

Pollination

Insects play an important role in the reproduction of plant species. About one lakh pollinator species have been identified out of which 98% are insects [1]. Over 90% of two lakh fifty thousand flowering plant species depend on pollinators. This is applicable for 75% of the hundred crop species that generate most of the worlds’ food grain.

Decomposition/ Biodegradation

The process of waste biodegradation is regulated and controlled by the insect community. Beetle larvae, flies, ants and termites clean up dead plant matter and break them into finer particles for further decomposition by microbial community. Dung beetles (about 4000 species documented) also play a significant role in decomposing manure. If the dung remains on the soil surface about 80% of the nitrogen (N2) is lost to the atmosphere which is one of the prime causes of global warming.

Biological Control of Pest

Pest control is a vital aspect in the domain of agriculture and in most of the cases it is done by using chemicals. This not only harms the environment, but also decreases the productivity of the soil. Today there is an inclination of biological control of harmful insects. The number of insects that feed or prey on other insects is vast. 10% of all insects are parasitoids [2]. Entire orders of insects - such as Odonata (dragon flies) and Neuroptera (net-winged insects such as lacewings and ant lions) - are predators. A large percentage of true bugs (Hemiptera), beetle (Coleoptera), flies (Diptera) and wasps, bees and ants (Hymenoptera) are also predators. The number of beneficial insect species in the average agro-ecosystem typically far outweighs the number of harmful insect species.

Edible Value of Insects

Table 1: Comparison of average protein content among insects, reptiles, fish and mammals.

<table>
<thead>
<tr>
<th>Animal group</th>
<th>Species and common name</th>
<th>Edible product</th>
<th>Protein content (g/100 g fresh weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insects (raw)</td>
<td>Locusts and grasshoppers: Locusta migratoria, Acridium melanohodon, Ruspolia differens</td>
<td>larva</td>
<td>14-18</td>
</tr>
<tr>
<td></td>
<td>Locusts and grasshoppers: Locusta migratoria, Acridium melanohodon, Ruspolia differens</td>
<td>Adult</td>
<td>13-28</td>
</tr>
</tbody>
</table>

Sphenarium purpurascens (chapulines - Mexico) Adult 35-48

Silkworm (Bombyx mori) Caterpillar 10-17

Palmworm beetles: Rhynchophorus palmarum, R. phoenicis, Callipogon barbatus Larva 7-36

Yellow mealworm (Tenebrio molitor) Larva 14-25

Crickets Adult 8-25

Termites Adult 13-28

Cattle Beef (raw) 19-26

Reptiles (cooked) Turtles: Chelodina rugosa, Chelonia depressa Flesh 25-27

Intestine 18

Liver 11

Heart 17-23

Tilapia 16-19

Mackerel 16-28

Catfish 17-28

Prawn (Malaysia) 16-19

Shrimp 13-27

Moluscs Cuttlefish, squid 15-18

United States, Illinois Yellow mealworm, larva, raw Tenebrio molitor 206

United States, Illinois Yellow mealworm, adult, raw Tenebrio molitor 138

Ivory Coast Termite, adult, de-winged, dried, flour Macrotermes subhyalinus 535

Mexico, Veracruz State Leafcutter ant, adult, raw Atta mexicana 404

Mexico, Hidalgo State Honey ant, adult, raw Myrmecocystus melliger 116

Thailand Field cricket, raw Gryllus bimaculatus 120

Thailand Giant water bug, raw Lethocerus indicus 165

Thailand Rice grasshopper, raw Oxya japonica 149

Thailand Grasshopper, raw Cyrtacanthacris tatarica 89

Thailand Domesticated silkworm, pupa, raw Bombyx mori 94

The Netherlands Migratory locust, adult, raw Locusta migratoria 179

Table 2: Examples of energy content of differently processed insect species, by region.

The world population as of now is 7,518,254,096 as per the record of 02:35 pm Indian Standard Time (IST) of 14th July, 2017. It is expected that 2050, the projected world population is 9.8 billion and 11.2 billion during 2100 [3]. This enormous population needs food supply on regular basis for their survival and growth. The land and aquatic resources have already reached the critical level and under this circumstance insects can provide an alternative food source as they are rich in protein and other minerals (Table 1). In addition, insects also provide dietary energy (Table 2).

References
Assets of Publishing with us

- Global archiving of articles
- Immediate, unrestricted online access
- Rigorous Peer Review Process
- Authors Retain Copyrights
- Unique DOI for all articles

http://biomedres.us/