TAXONOMY & ITS IMPORTANCE Taxonomy is the science of classifying organisms. The word "Taxonomy" was first proposed by French Professor A. P. de Candolle as 'Taxonomie' in 1813 and 'Taxeonomie' in 1819. However, the word Taxonomy has been in use for the last 170 years and the words 'Taxonomie' and 'Taxeonomie' are considered 'long forgotten names' The word Taxonomy originated from the Greek words "taxis" meaning "arrangements" and "nomos" meaning "law". Mayr (1971) considers taxonomy as the theory and practice of classifying the organisms. The term 'Systematics' originates from the Latinized Greek word 'Systema' as applied to systems of classification developed by Carolus linnaeus in 1735. Simpson (1961) defined Systematics as the scientific study of the kinds and diversity of organisms and all relationships among them. Various specialists have given various definitions to these terms, but the fact remains that today both terms are used interchangeably in the fields of animal and plant classification. 1. Importance of Taxonomy to Biodiversity and Conservation Approximately 1.5 million species of animals and 0.5 million species of plants have so far been identified and described by taxonomists during the last 230 years. This forms only 10% or less than 10% of the world's organisms (Winston, 2000). It may take several thousand years to identify and describe the remaining species if the number of bonafied taxonomists is not increased from the present state. It is believed that several hundreds of species may become extinct before we discover them. In order to know which species are endangered or threatened we must know what they are and what we have to conserve. Herein lies the importance of taxonomy. The greatest threat to taxonomy is that it is considered as an outdated science that doesn't need the best of minds. Another is that taxonomy doesn't need hard work. These criticisms are mainly from workers of other disciplines such as Molecular biology, Physiology, Biotechnology etc. However, these criticisms do not stand because of the reasons mentioned above. Taxonomy needs hard field-oriented work often in dangerous situations. Only an intelligent scientist can make correct analyses of various taxa and it needs year's expertise to identify a species authentically. It is ironic to note that often the very same persons who criticize taxonomy wants prompt and urgent identification of the specimens they want to work with. 2. Importance of Taxonomy in Research and Studies Before starting any kind of studies, one needs to know the correct scientific name of the organisms on which one is going to study. This is important because the correct scientific name of the organism is a functional label using which various pieces of information concerning that organism, including all the past work done on it, can be regained and stored ensuring easy reference (Narendran, 2000). To give an example how a research effort could land in trouble if the organisms involved are not identified by bonafide taxonomists, an interesting real but sad story which happened in a South Indian University is sighted. A professor (a non-taxonomist) gave a research problem on the reproductive physiology of two species (?) of crabs to two different students (one student had to work with one species and the other on another species). Both these students worked on their respective species of crabs for two years and then the guide (research supervisor) got these specimens identified by a specialist who found that the two 'species' of crabs represented one species as the differences involved were only variations. This had resulted in utter confusion and finally one student had to change the topic of his research after wasting' two years. This clearly shows how important it is to get one's specimens Importance of Taxonomy to .3 .identified by a bonafied taxonomist before one start working on it

Taxonomic identification of the organism, which causes or transmits disease, is absolutely Medicine essential for effective treatment. A few years ago, a patient was sent to the author by a doctor of a medical college with a request to let him know what insect causes the blisters on his bod Though the doctor's treatment was effective in healing the blisters, they occurred time and again. On seeing the blisters, the author could easily identify that the blister beetles caused the blisters and the patient was instructed to remove or destroy the beetles, which were coming to his bedroom at night, being attracted to light. When the beetles were prevented, removed or Blister beetles destroyed, the blisters never reappeared. In a different instance, another doctor sent a small girl to this author for identifying an insect that caused skin eruptions and itching. skin eruptions She was advised not to play with her pet dog since the problem was caused by the bite of the dog flea Ctenocephalides canis. Ctenocephalides canis There are several species and infra-specific categories of plants that are used in Ayurvedic medicine (ancient Indian medical system, also known as Ayurveda). The traditional physicians used some crude or native methods (a kind of taxonomy?) to identify each variety of plants. Scientific taxonomic identification of these plants has contributed greatly in recent times to the preparation of Ayurvedic medicine in much more effective ways. 4. Importance of Taxonomy to Agriculture and Pest management Taxonomy plays a major role in the management of crop pests by biological means. The correct identification of both the pest and its natural enemies is of maximum importance when the natural enemies are imported or transferred from one region to another in order to bring about biological control of the pests. Taxonomists through their research and assistance can help biological control workers by: 1. Providing correct identification of pest species and information on its probable home. 2. Directing and conducting surveys for natural enemies existing in the original home of the pest. 3. Making an inventory of natural enemies and alternate hosts of the natural enemies in the country of introduction. 4. Providing catalogues, revisions, handbooks, host-parasite lists, identification keys etc. 5. Help the biological control workers to find related information hidden under obsolete species name and 6. Help to differentiate between introduced and indigenous natural enemies in order to properly document the effect of bio-control programmes. Schauff and LaSalle (1998) described several types of errors biological control workers make if they don't have the help of taxonomists. They may inadvertently import a species of natural enemy that may be already present in the country of introduction. They may spend several days studying the biology of a species that may have already been done under an unpublished or published synonym of the species. The bio-control workers may spend a lot of money and effort in shipping, breeding, etc. of wrong species of natural enemies such as hyper-parasites or natural enemies that don't attack target hosts but are generalists which may attack non-target host etc. 5. Identification of the pest Correct identification of the target pest is the most important step to be taken before initiating any biological control programme. For this a taxonomist's help is absolutely essential. Once the species is correctly identified, its original home can be determined and all available information on its biology, natural enemies, distribution etc. can be retrieved and stored. A wrong identification of the pest can lead (this usually happens when the identification is not made by a bonafide specialist) to un-necessary .wastage of time, energy and money in searching and finding the natural enemies of the pest in question

An interesting example showing such a mistake in the beginning of a biological control programme of a

serious pest and later success of the biological control of the pest when a taxonomist's help was obtained is known from Kenya (Africa). Planococcus kenyae (le Pelley) (Homoptera: Pseudococcidae) various other food crops. Only after the pest was correctly identified by was a serious pest of coffee and a specialist as a new species (Planococcus kenyae) occurring in the nearby countries viz. Uganda and Tanganyika, a search was conducted in these countries and effective natural enemies were imported to Kenya which resulted in the complete control of the pest (Le Pelley, 1943). 6. Identification of natural enemies As in the case of pests, identification of the natural enemies of the pest is also very important in the biological control of pests. A good example of the initial failure of a biological control programme due to misidentification of an insect parasitoid is given by Rosen and DeBach (1973). Aonidella aurantii (Maskell) (Homoptera: Diaspididae) was a serious pest of Citrus in California, U.S.A. Various species of Aphelinids attacking this pest in the Oriental Region was misidentified as Aphytis chrysomphali (Mercet) (Hymenoptera: Chalcidoidea: Aphelinidae) which is an efficient parasitoid already present in California. For several years repeated attempts were made to find out the effective endoparasitoids of the pest ignoring the species of Aphytis present in the Oriental Region. Finally, a taxonomic study revealed that those species of Aphytis present in the Orient were not Aphytis chrysomphali but two distinct species viz. Aphytis lingnanensis Compere and A. melinus De Bach which are efficient biological control agents of Aonidella aurantii. later by the use of these efficient parasitoids, successful biological control of the pest could be achieved after fifty years since the pest problem started. 7. Importance of taxonomic literature in Pest management In order to find out various pieces of information such as locality, distribution, hosts, diagnostic features, natural enemies, etc., one has to search the relevant taxonomic literature that may either provide full or in part the necessary information required for. The taxonomic literature has great use in pest management programmes. There are several examples in the history of biological control projects to show how important the taxonomic literature is in solving pest problems. Blackwelder (1967), gives an interesting account of how taxonomic literature helped in controlling the weed Opuntia in Australia. The prickly pears were brought to Australia for use as border fences. Soon they spread to alarming numbers and reached the status of a serious weed. The speed at which the weed spread was so enormous that their increase has been called “one of botanical wonders of the world” (Blackwelder, 1967). Within 20 years the cactus spread from 10 million to 50 million acres. Entomologists and botanists searched various taxonomic literatures for all pertinent information such as the various species involved, their distribution, habits and especially their natural enemies. As a result, they found out about 160 different kinds of natural enemies of these prickly pears. Out of the 12 most promising ones introduced to Australia, viz., Cactoblastis cactorum (Berg) (Lepidoptera: Phycitidae) described in 1887 from South America proved to be the most successful. Thus, an insect discovered and described 65 years ago, became instrumental, half a century later in saving Australia from prickly pears. 8. Importance of Taxonomy in Quarantine In order to prevent accidental or otherwise introduction of plants and animals to a country from another country, governments have established quarantine laboratories in every nation. These quarantine agencies inspect every plant or animal brought to the respective countries. With the help of taxonomists, the quarantine agencies determine whether the imported plant or animal is harmful or not and based on their advice, prevent the entry of harmful plants and animals. 9. Importance of

Taxonomy to National Defense In these days of germ warfare, it is essential to identify the organisms introduced into a country by the enemies. For each soldier it is necessary to have some basic knowledge of taxonomy to recognize the local fauna and flora with which he has to work so that contact with disease spreading animals or plants can be avoided. Making available the valuable contributions by taxonomists over the years can make the identification of dangerous organisms in the war areas easy. 10. Importance of Taxonomy to Fisheries In order to find out the edible varieties of aquatic organisms, taxonomist's help can be required for better prospects. Taxonomic knowledge of organisms that form food for fishes can help the fishermen to locate the localities where these organisms are abundant. The distribution of each aquatic organism can be found out from the relevant taxonomic publications or with sharing the unpublished information the specialist can provide. 11. Importance of Taxonomy to Parasitology and Veterinary Science As in the case of identification of parasites of man, a taxonomist's contribution will be of great help in veterinary science also. A thorough taxonomic revision of these parasitic organisms will be of much use for experts of veterinary and as medical sciences. Thus taxonomy, parasitology, veterinary and medical sciences are all interconnected and interdisciplinary and one cannot exist without the other. Herein lies the importance of taxonomy to other branches of science. 12. Importance of Taxonomy in conservation of Plants and Animals Though opinions differ on the number of estimated species of animals and plants living on earth, the middle of the road assumptions places it at 13.6 million (Cherian, 1996) and of these only 1.75 million species has so far been named and described by taxonomists and this has taken over 250 years. It is estimated that at the present rate it may take about 1000 years to complete the alpha taxonomy of various fauna and flora, existing in the world. Besides mass destruction of habitats, especially forests in tropical countries are causing destruction and eventual extinction of large number of species. Even by the most conservative estimate, the rate of loss of species is shocking–the number of species that disappears each year is at least 27000, each day it is 74 and each hour it is 3! (Gadagkar, 1998). It is high time that we reorient our priorities and start to document our faunal diversity before it is gone (Gupta, 1987). There is an unspoken principle of human behavior important to conservation: the more we know of an ecosystem, the less the chances of our destroying it (Narendran and Cherian, 2004). As the Senegalese conservationist Baba Dioum has said "In the end we will conserve only what we love, we will love only what we understand, we will understand only what we are taught" Hence let us learn first the alpha taxonomy to know what we have and then decide which one is endangered and which one is to be .conserved