

**THE OPEN UNIVERSITY OF SRI LANKA****M.Sc. In Environmental Sciences Level 08 (2018)****Department of Zoology****ZYPA 602 NEP -2214 Biodiversity Conservation and Management
Final Examination 2018**

Date: 25th November 2018**Time.13.30hrs to -16.30 hrs**

Answer only four (o4) questions

1. "You probably did not know mushrooms could be used to construct buildings and cure diseases. Mushrooms are being tested in innovative and imaginative ways to help society. Engineers, medical researchers, and designers are utilizing the natural abilities of various fungi for antibiotics, building materials, water filtration, toxic waste cleanup, pest abatement, textiles, and other purposes. Champions for fungi explain that many fungi are so good at surviving that they are able to adapt and feed on toxic or non-biodegradable materials such as oil or plastics. The process is known as mycoremediation, which is sought after for oil cleanups and expedited composting. What's more, the mushrooms that bloom from these cleanups are still a safe food source. Mushroom bricks are being tested as a building material that uses water as an adhesive agent in terms of durability, flame retardancy, strength, and flexibility. Mushrooms are also investigated for medicinal uses. Those working with fungi are confident about the infinite possibilities for these versatile mushrooms to solve modern problems".

- 1.1 Which type of 'resource use' is indicated in the paragraph above? Give your answer drawing upon the examples given in this paragraph and explain briefly.
- 1.2 Select from the following list (a-e) the main biodiversity values of fungi as shown in the paragraph above and explain your selection in full.
 - (a) Direct Extractive use value (b) Indirect use value (c) Optional use value
 - (d) Aesthetic value. (e) Bequest value
- 1.3 Which of the non-use biodiversity values listed above are most applicable in terms of economic considerations for conservation of fungi? Explain your answer using the examples given in the above paragraph.
- 1.4 Give the main features that make fungi distinct from animals and plants, and justify why they are in a Kingdom of their own.

2. Many marine resources are used in technology and industry. So far, relatively few marine plants, animals and microbes are responsible for an impressive yield of more than 12,000 new chemicals, and most Bioprospecting experiments have been carried out in the tropical seas. Coral reef ecosystems are ideal targets because of their high biodiversity and intense competition for space, leading to a chemical warfare among sessile organisms. Soft bodied sessile invertebrates in particular, such as sponges, soft corals, sea-fans and sea-squirts, are renowned for their refined chemical arsenals of bioactive compounds because they lack the means for mechanical defense. They are among the least studied marine organisms, with new species discovered almost daily.”

Source: adapted from Meliane, I. (2004). A Biological gold rush. World Conservation, Volume 35, No. 1. p 20.35

- 2.1 To what Kingdom of life and Phyla (and class where relevant) do sponges, soft corals, sea-fans and sea-squirts belong to? Explain the main features of the phyla that these organisms belong to and the diversity within these phyla and the environments that they occur in.
- 2.2 What is the most relevant article in the CBD that covers Bioprospecting, as applicable to marine species to be investigated for medicinal use by a developed country party to the CBD in the territorial waters of Sri Lanka?
- 2.3 What are the 2 main conditions imposed on the developed countries using genetic resources in the relevant CBD article to assist the country of origin for such resources?
- 2.4 How can the source country that owns the genetic resources benefit from the above 2 conditions? Explain.

3.0 Your friend's daughter who is in year 11 has gained this information from the National Biodiversity Strategic Action Plan 2016-2022.

Sri Lanka has a very high diversity among its wild fauna and flora. This includes 778 of indigenous species of vertebrates among which are a number of endemic species. Endemism is particularly high among the freshwater fishes, amphibians and reptiles. Species diversity is also high among the invertebrate groups that have been fairly well investigated to date, such as the land snails and butterflies.

- 3.1 She wants to know the meaning of an “indigenous vertebrate species” and an endemic species. Explain these terms in one paragraph giving examples.
- 3.2. Which level of biodiversity (i.e. genes, species, ecosystems) is implied as having “high diversity” in this paragraph? Explain how this is linked to diversity of ecosystems and genes.
- 3.3. What are the vertebrate classes mentioned in this paragraph with “highest” number of species found only in Sri Lanka?
- 3.4 According to the paragraph, what invertebrate phylum/phyla are represented by the groups that show high diversity in Sri Lanka, and what classes in these phyla are represented in it?
- 3.5. Does the paragraph imply that among invertebrates, species diversity is high only among the groups mentioned in the paragraph? What can be said about other groups?
- 3.6 Which Article of the Convention on Biological Diversity supports survey and monitoring of biodiversity? How could this be applicable to many invertebrate groups in Sri Lanka?

- 4.0 Your colleague is hoping to publish a description of a recently proposed new species (*Leptus leptus*) which he is describing using 1 holotype and multiple syntypes, but with no paratypes.
- 4.1 What do the terms holotype, syntypes and paratypes mean?
- 4.2 Is your colleague following correct procedure to make the new scientific name “available” for use? Justify your answer based on the definitions and features of type specimens.
- 4.3 Judging from the name proposed for the new species, it is an animal or plant? Explain your answer.
- 4.4. What are the main points pertaining to naming of animals according to International Code of Zoological Nomenclature (ICZN)? Discuss its obvious differences from the International Code of Botanical Nomenclature.
- 4.5 Explain the difference between Monophyletic, Polyphyletic and Paraphyletic groupings using birds, mammals, fishes and reptiles as examples.
- 5.0 Over exploitation for the ornamental fishery is severely threatening many aquatic plants, causing populations to decline. The 2012 National Red List recognizes five *Cryptocoryne* species as Critically Endangered (CR), three as Endangered (EN), and two as Vulnerable (VU). *Lagenandra erosa* de Wit, one of the six endemic species in the country from the genus *Lagenandra* is also recognized as Critically Endangered in the 2012 National Red List. Its locality is unknown, but is believed to be restricted to the wetzone. All other *Lagenandra* species in the country are listed as Endangered (EN). Of these, *Lagenandra thwaitesii* Engler with a silver margin on its blade is restricted to Kalutara, Galle and Ratnapura districts, and has a high demand as an ornamental aquatic.
- 5.1 Explain the definition of the above categories of threat for the *Cryptocoryne* species. Which organisation handles the global Red List with these threat categories? What are the other categories recognized in this global Red List?
- 5.2 Considering the causes of threat and geographical spread of the species in Sri Lanka, analyze the advantages and disadvantages of *in-situ* and *ex-situ* conservation for *Lagenandra erosa* and *Lagenandra thwaitesii*. Explain the differences between these approaches.
- 5.3 Explain the meaning of natural extinction and extinction due to human action.

6. A National Park in Sri Lanka is in the process of formulating a communication and education and public awareness campaign to popularize their protected areas to get more foreign visitors. However, poaching continued to be a problem for the managers of the reserve and this is giving it bad publicity online. The relationship between reserve managers and the local people is very poor. This too has to be addressed. The reserve is located in the coastal zone and is rated highly for its birds and scenic beauty. This reserve is also an International Biosphere Reserve. While there is a fair amount of local visitors at the park during some parts of the year, there are very few foreign visitors to the reserve. The staff are also not capable of catering to foreign visitors. At a recent staff meeting the two issues that needed immediate attention were listed as (a) Reduce poaching and (b) increase foreign visitors to the reserve. A consultant hired to formulate a communications strategy to address these issues suggested that (a) they should send in frequent articles about the park to the national newspapers in Sinhala and English, (b) produce a beautiful film about the reserve to be shown on national television in Sinhala, (c) have regular radio broadcasts and interviews with reserve staff and university academics about the reserve in Sinhala, and (d) produce quality brochures and booklets about the reserve in English for foreign tourists. However, the reserve's staff are not happy with these suggestions.

6.1 What is the main mode of communication suggested by the consultant (i.e. is it interactive or instrumental)? Review the consultant's approach in relation to the communication needs.

6.2 Help the reserve manager by suggesting a step-wise approach to formulate an effective communication strategy & action plan, taking into account the need for communication objectives, roles and goals of communication, key target groups, messages and means that could be used. Suggest how delivery of outputs can be made effective and timely through the planning process, within the available budget.

6.3 Using the plan you present, suggest how instrumental and interactive communication can be used effectively to reach both the key communication needs for this reserve.