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STUDY OF ANIMAL DEVELOPMENT AND BIODIVERSITY

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INTRODUCTION

Animal development is a spectacular process and represents a masterpiece of temporal and spatial control of gene expression. Developmental genetics is a very helpful discipline. It studies the effect that genes have in a phenotype, given normal or abnormal epigenetic parameters. The findings of developmental biology can help to understand developmental malfunctions such as chromosomal aberrations, for example, Down syndrome. An understanding of the specialization of cells during embryogenesis may yield information on how to specialize stem cells to specific tissues and organs, which could lead to the specific cloning of organs for medical purposes. Another biologically important process that occurs during development is apoptosis - programmed cell death or "suicide". Many developmental models are used to elucidate the physiology and molecular basis of this cellular process. Similarly, a deeper understanding of developmental biology can foster greater progress in the treatment of congenital disorders and diseases, e.g. studying human sex determination can lead to treatment for disorders such as congenital adrenal hyperplasia.

Developmental biology is the study of the process by which organisms grow and develop. Modern developmental biology studies the genetic control of cell growth, differentiation and "morphogenesis," which is the process that gives rise to tissues, organs and anatomy. Developmental biology is that branch of life science, which deals with the study of the process by which organisms grow and develop.

RELATED FIELDS OF STUDY

Embryology is a subfield, the study of organisms between the one-cell stage (generally, the zygote) and the end of the embryonic stage. Embryology was originally a more descriptive science until the 20th century. Embryology and developmental biology today deal with the various steps necessary for the correct and complete formation of the body of a living organism.

The related field of evolutionary developmental biology was formed largely in the 1990s and is a synthesis of findings from molecular developmental biology and evolutionary biology which considers the diversity of organism form in an evolutionary context.

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REVIEW OF LITERATURE

A variety of objective measures have been created in order to empirically measure biodiversity. Each measure of biodiversity relates to a particular use of the data. For practical conservationists, measurements should include a quantification of values that are commonly-shared among locally affected organisms, including humans. For others, a more economically defensible definition should allow the ensuring of continued possibilities for both adaptation and future use by humans, assuring environmental sustainability.

Distribution

A conifer forest in the Swiss Alps (National Park).

Selection bias continues to bedevil modern estimates of biodiversity. In 1768 Rev. Gilbert White succinctly observed of his Selborne, Hampshire "all nature is so full, that that district produces the most variety which is the most examined."

Nevertheless, biodiversity is not distributed evenly on Earth. It is consistently richer in the tropics and in other localized regions such as the Cape Floristic Province. As one approaches polar regions one generally finds fewer species. Flora and fauna diversity depends on climate, altitude, soils and the presence of other species. In the year 2006 large numbers of the Earth's species were formally classified as rare or endangered or threatened species; moreover, many scientists have estimated that there are millions more species actually endangered which have not yet been formally recognized. About 40 percent of the 40,177 species assessed using the IUCN Red List criteria, are now listed as threatened species with extinction - a total of 16,119 species.

Even though biodiversity declines from the equator to the poles in terrestrial ecoregions, whether this is so in aquatic ecosystems is still a hypothesis to be tested, especially in marine ecosystems where causes of this phenomenon are unclear. In addition, particularly in marine ecosystems, there are several well stated cases where diversity in higher latitudes actually increases. Therefore, the lack of information on biodiversity of Tropics and Polar Regions prevents scientific conclusions on the distribution of the world's aquatic biodiversity.

A biodiversity hotspot is a region with a high level of endemic species. These biodiversity hotspots were first identified by Dr. Norman Myers in two articles in the scientific journal The Environmentalist. Dense human habitation tends to occur near hotspots. Most hotspots are located in the tropics and most of them are forests.

Brazil's Atlantic Forest is considered a hotspot of biodiversity and contains roughly 20,000 plant species, 1350 vertebrates, and millions of insects, about half of which occur nowhere else in the world. The island of Madagascar including the unique Madagascar dry deciduous forests and lowland rainforests possess a very high ratio of species endemism and biodiversity, since the island separated from mainland Africa 65 million years ago, most of the species and ecosystems have evolved independently producing unique species different from those in other parts of Africa.

Many regions of high biodiversity (as well as high endemism) arise from very specialized habitats which require unusual adaptation mechanisms. For example, the peat bogs of Northern Europe.

RESEARCH METHODOLOGY

Biodiversity is beginning to be evaluated and its evolution analysed (through observations, inventories, conservation...) as well as being taken into account in political and judicial decisions:

- The relationship between law and ecosystems is very ancient and has consequences for biodiversity. It is related to property rights, both private and public. It can define protection for threatened ecosystems, but also some rights and duties (for example, fishing rights, hunting rights).
- Law regarding species is a more recent issue. It defines species that must be protected because they may be threatened by extinction. The U.S. Endangered Species Act is an example of an attempt to address the "law and species" issue.

- Laws regarding gene pools are only about a century old[citation needed]. While the genetic approach is not new (domestication, plant traditional selection methods), progress made in the genetic field in the past 20 years have led to a tightening of laws in this field. With the new technologies of genetic analysis and genetic engineering, people are going through gene patenting, processes patenting, and a totally new concept of genetic resources. A very hot debate today seeks to define whether the resource is the gene, the organism itself, or its DNA.

The 1972 UNESCO World Heritage convention established that biological resources, such as plants, were the common heritage of mankind. These rules probably inspired the creation of great public banks of genetic resources, located outside the source-countries.

New global agreements (e.g., Convention on Biological Diversity), now give **sovereign national rights over biological resources** (not property). The idea of static conservation of biodiversity is disappearing and being replaced by the idea of dynamic conservation, through the notion of resource and innovation.

The new agreements commit countries to **conserve biodiversity**, **develop resources for sustainability** and **share the benefits** resulting from their use. Under new rules, it is expected that bioprospecting or collection of natural products has to be allowed by the biodiversity-rich country, in exchange for a share of the benefits.

Sovereignty principles can rely upon what is better known as Access and Benefit Sharing Agreements (ABAs). The Convention on Biodiversity spirit implies a prior informed consent between the source country and the collector, to establish which resource will be used and for what, and to settle on a fair agreement on benefit sharing. Bioprospecting can become a type of biopiracy when those principles are not respected.

Uniform approval for use of biodiversity as a legal standard has not been achieved, however. At least one legal commentator has argued that biodiversity should not be used as a legal standard, arguing that the multiple layers of scientific uncertainty inherent in the concept of biodiversity will cause administrative waste and increase litigation without promoting preservation goals. See Fred Bosselman, A Dozen Biodiversity Puzzles, N.Y.U. Environmental Law Journal 364 (2004).

Another great principle is that an organism must be viable at all stages of its development and at all stages of its evolution. This is obviously true, and it follows that there are constraints on the evolution of development, behaviour and structure of organisms. The main constraint, over which there has been much debate, is the requirement that changes in the system during evolution should be relatively small changes, because the body systems are so complex and interlinked. This is a sound principle, though there may be rare exceptions: polyploidy in plants is common, and the symbiosis of micro-organisms that formed the eukaryota is a more exotic example.

CONCLUSION

The significance of an adaptation can only be understood in relation to the total biology of the species. Julian Huxley Adaptation is, first of all, a process, rather than a physical part of a body. The distinction may be seen in an internal parasite (such as a fluke), where the bodily structure is greatly simplified, but nevertheless the organism is highly adapted to its unusual environment. From this we see that adaptation is not just a matter of visible traits: in such parasites critical adaptations take place in the life-cycle, which is often quite complex. However, as a practical term, adaptation is often used for the product: those features of a species which result from the process. Many aspects of an animal or plant can be correctly called adaptations, though there are always some features whose function is in doubt. By using the term adaptation for the evolutionary process, and adaptive trait for the bodily part or function (the product), the two senses of the word may be distinguished.

Adaptation may be seen as one aspect of a two-stage process. First, there is speciation (species-splitting or cladogenesis), caused by geographical isolation or some other mechanism. Second, there follows adaptation, driven by natural selection. Something like this must have happened with Darwin's finches, and there are many other examples. The present favourite is the evolution of cichlid fish in African lakes, where the question of reproductive isolation is much more complex.

All adaptations help organisms survive in their ecological niches. These adaptative traits may be structural, behavioral or physiological. Structural adaptations are physical features of an organism (shape, body covering, defensive or offensive armament); and also the internal organization). Behavioural adaptations are composed of inherited behaviour chains and/or the ability to learn: behaviours may be inherited in detail (instincts), or a tendency for learning may be inherited (see neuropsychology). Examples: searching for food, mating, vocalizations. Physiological adaptations permit the organism to perform special functions (for instance, making venom, secreting slime, phototropism); but also more general functions such as growth and development, temperature regulation, ionic balance and other aspects of homeostasis. Adaptation, then, affects all aspects of the life of an organism.

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