

The Stickleback Fish - A Story of Modern Evolution

This activity uses a virtual lab created by www.ck12.org. To complete this activity, students will need a computer with an internet connection and headphones to listen to audio. This worksheet is modified from the student worksheet provided by CK12. Also, make sure that your browser allows pop-up windows.

Background Information

Go to www.ck12.org and read the background information about the stickleback fish.

1. Summarize what happened to the fish in Lough Lake, include an explanation for what it happened.



Stickleback Evolution Lab -- www.ck12.org

Introduction:

1. Define "model organism."

2. What is the purpose of the spine?

4. How did ancestral populations of ocean-dwelling fish come to live in freshwater lakes?

5. Watch the video about genetic reduction in freshwater sticklebacks. The loss of the pelvic spines is similar to the loss of which body parts in other four-legged vertebrates?

6. Watch the video with evolutionary biologist Dr. Michael Bell. Why is the threespine stickleback a model organism for studies in evolution. List at least two reasons.

7. Click on the fish at the top of the page to go to the "overview." Then click on the interactive fish. Describe the location of the stickleback spine.



8. Watch the video about stickleback fish armor. In addition to the spines, what is another component of the armor of a stickleback fish?

Answers For The Stickleback Evolution Lab

Jonathan Losos



Answers For The Stickleback Evolution Lab:

Wild Immunology—The Answers Are Out There Gregory M. Woods, Andrew S. Flies, 2019-03-20 Go into partnership with nature she does more than half the work and asks none of the fee Martin H Fisher Nature has undertaken an immense amount of work throughout evolution The evolutionary process has provided a power of information that can address key questions such as Which immune molecules and pathways are conserved across species Which molecules and pathways are exploited by pathogens to cause disease What methods can be broadly used or readily adapted for wild immunology How does co infection and exposure to a dynamic environment affect immunity Section 1 addresses these questions through an evolutionary approach Laboratory mice have been instrumental in dissecting the nuances of the immune system The first paper investigates the immunology of wild mice and reviews how evolution and ecology sculpt differences in the immune responses of wild mice and laboratory mice A better understanding of wild immunology is required and sets the scene for the subsequent papers Although nature doesn't ask for a fee it is appropriate that nature is repaid in one form or another The translational theme of the second section incorporates papers that translate wild immunology back to nature But any non human non laboratory mouse research environment is hindered by a lack of research tools hence the underlying theme throughout the second section Physiological resource allocation is carefully balanced according to the most important needs of the body Tissue homeostasis can involve trade offs between energy requirements of the host and compensatory mechanisms to respond to infection The third section comprises a collection of papers that employ novel strategies to understand how the immune system is compensated under challenging physiological situations Technology has provided substantial advances in understanding the immune system at cellular and molecular levels The specificity of these tools e.g monoclonal antibodies often limits the study to a specific species or strain A consequence of similar genetic sequences or cross reactivity is that the technology can be adapted to wild species Section 4 provides two examples of probing wild immunology by adapting technology developed for laboratory species , The Handy Biology Answer Book Patricia Barnes-Svarney, Thomas E. Svarney, 2014-07-21 Easy to use and friendly guide explains the inner workings of cells bacteria viruses fungi plants animals as well as evolution the environment DNA and chromosomes genetics and genetic engineering laboratory techniques and much much more Gene therapy Forensic DNA profiling Biochemistry Biotechnology Cloning Stem Cells Super Bugs Genetically modified food Botany Zoology Sex The study of life and living organisms is ancient broad and ongoing Biology combines the Greek word for life bios with the suffix ology or science study knowledge of The new completely revised and updated The Handy Biology Answer Book examines explains and traces mankind's understanding of this important topic From the newsworthy to the practical and from the medical to the historical this entertaining and informative book brings the complexity of life into focus through the well researched answers to more than 1 250 common biology questions such as What is life Why do you need protein in your diet Do animals suffer from allergies just like humans

What is the Human Genome Project Why do birds fly in formation Can the environment affect genes Do bacteria get addicted to caffeine What was the historical significance of hemp How are seedless grapes grown What is social Darwinism Can animals suffer from psychological disorders The Handy Biology Answer Book has clear concise answers to questions on everything from genetics to the anatomy of cells to the emotional life of elephants and from the environment and ecology to human biology and evolution It s a must have for any student of life With many photos illustrations and other graphics this tome is richly illustrated Its helpful bibliography and extensive index add to its usefulness **GATE Question Bank - Ecology & Evolution** Mocktime Publication, 2400 MCQs GATE Ecology Evolution Chapterwise Question Bank Based on New Syllabus **Improbable Destinies** Jonathan Losos,2017-08-08 A dazzling tour of evolution in action that sheds light on one of the greatest debates in science The natural world is full of fascinating instances of convergence phenomena like eyes and wings and tree climbing lizards that have evolved independently multiple times Convergence suggests that evolution is predictable and if we could replay the tape of life we would get the same outcome But there are also many examples of contingency cases where the tiniest change a random mutation or an ancient butterfly sneeze caused evolution to take a completely different course So are we humans and all the plants and animals in the world today inevitabilities or evolutionary freaks What role does chance play in evolution And what could it tell us about life on other planets In Improbable Destinies renowned researcher Jonathan Losos reveals what the latest breakthroughs in evolutionary biology tell us about one of the greatest ongoing debates in science Evolution can occur far more rapidly than Darwin expected which has opened the door to something that was previously thought impossible experimental studies of evolution in nature Drawing on his own work with anole lizards on the Caribbean islands as well as studies of guppies foxes field mice and others being conducted around the world Losos reveals just how rapid and predictable evolution can be By charting the discoveries of the scientists who are rewriting our understanding of evolutionary biology Improbable Destinies will change the way we think and talk about evolution Explorations in Psychology Charlotte Doyle,1987 The book is divided into five parts Part I begins with a chapter on the brain and the nervous system the next two chapters cover the senses and perception Part II draws on two kinds of biological foundations the insights gained from the study of animals and the role of the body in human motivation and skilled action Part III conveys the stories of subjects studied under human cognition Part IV covers social influence and social perception Part V begins with the problem of how to define and measure intelligence and personality traits the book ends by considering the impact of emotions on the body Preface **The Neuroethology of Social Behavior** Joel D. Levine,Ana Silva,Gervasio Batista,2022-05-27 **Stanford** ,2003 **Ecological Genomics** Christian R. Landry,Nadia Aubin-Horth,2013-11-25 Researchers in the field of ecological genomics aim to determine how a genome or a population of genomes interacts with its environment across ecological and evolutionary timescales Ecological genomics is trans disciplinary by nature Ecologists have turned to genomics to be able to elucidate the mechanistic bases of the biodiversity

their research tries to understand Genomicists have turned to ecology in order to better explain the functional cellular and molecular variation they observed in their model organisms We provide an advanced level book that covers this recent research and proposes future development for this field A synthesis of the field of ecological genomics emerges from this volume Ecological Genomics covers a wide array of organisms microbes plants and animals in order to be able to identify central concepts that motivate and derive from recent investigations in different branches of the tree of life Ecological Genomics covers 3 fields of research that have most benefited from the recent technological and conceptual developments in the field of ecological genomics the study of life history evolution and its impact of genome architectures the study of the genomic bases of phenotypic plasticity and the study of the genomic bases of adaptation and speciation Fish as Models of Behaviour Fisheries Society of the British Isles. Annual Symposium,2003 *Educational Psychology* Richard C. Sprinthall,Norman A. Sprinthall,1981 Learning, Language, and Memory John W. Donahoe,Michael G. Wessells,1980 **Scientific American** ,1880 Monthly magazine devoted to topics of general scientific interest **Publications** Mental Health Research Institute,1956 The Glasgow Naturalist ,1996 **Worm Runner's Digest** ,1973 **Communicating the Catholic Vision of Life** Russell Edward Smith,1993 Twelfth Workshop for Bishops held from February 1 4 1993 Preface Includes bibliographical references **Encyclopedia of Psychology, 4 Volume Set** Raymond J. Corsini,1994-03 Includes entries on such topics as psychoanalysis assertiveness training neurotransmitters and small sample statistics **Journal of Biological Psychology; Or, Worm Runner's Digest** ,1972 New Scientist ,2001

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. 1. Wile?
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