



Dictionary of
AQUATIC RESOURCES AND FISHERIES



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FOREWORD

The present book entitled "**Dictionary of Aquatic Resources and Fisheries**" meets the needs of limnologists, conservationists, aquaculturists and fisheries workers as a ready reckner for understanding the terminology employed in aquatic science, fisheries and allied aquaculture. Getting stuck-up in the nomenclatural jargon or failir ; to institute a correct expression in writing or verbal presentation on aquatic functioning and resource management is a common difficulty faced by research workers and managers of aquatic resources and water conservationists equally.

The present work would greatly ease these difficulties and would also make the teaching of these and allied subjects easier. Advantageously, the subject matter covered in this book is dealt with alphabetically with an initiation of a representative drawing of a resource or environmental aspect. This has made the referencing more pleasant and appealing. The meaning of each term or expression is described in details and not merely defined. This would facilitate the class-room teaching of different disciplines of the subjects.

The necessity of such a dictionary on aquatic scientific terms, aquaculture and general capture fisheries along with the details of each aquatic animal and plant resources was felt by the workers engaged in the study, research and teaching of the aquatic science and here is a guide which would put all the queries of such workers to rest. I have pleasure in writing this foreword to the book written by Drs V.P. Saini, L.L. Sharma and N.C. Ujjania who have years of experience in the field touched by this directory.

To my surprise, the physiological, environmental, geographical and even cytological terminology such as EPA, drainage basin and allelic, A+D, gene effects have been effectively and convincingly described. The water related legal terminology like clear water act (CWA) and coastal zone management act (CZMA) have been adequately described indicating even the years in which these laws were enacted. The above are only the stray examples I have quoted, but the entire book is replete with such seemingly out of the way but in reality most required scientific vocabulary for the experts in the aquatic science. The book thus encompasses the broad spectrum of aquatic and related sciences. The value of this book has thus not been limited to aquatic and fisheries scientists alone but could also be referred to by irrigation engineers and scientists engaged in fish embryology, cytological and aquatic botanists equally.

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PREFACE

Planet's wealth— the fishes and aquatic resources are very vast and diverse. The aquatic resources of the country are large in terms of 2.15 million ha of ponds and tanks and 3 million ha reservoirs in addition to 1.3 million ha of beels and derelict waters that could be put to different fish culture practices. These aquatic ecosystems are very dynamic and considered as an important field of science of high practical utility, which is facing severe threat from cultural activities. Looking to the significant role of aquatic resources and fisheries, Indian universities have included these aspects in their syllabi of basic sciences and fisheries courses. The basic terminology used in the aquatic resources and fisheries courses is not conveniently available at one place. Keeping this problem in view, we have written this book for UG and PG students and other readers. During the writing of this text we always remained conscious of the difficulties of students and readers of the subject, as this is merely a compilation from different sources for the benefit of readers. Though we have taken special care to give a correct account, yet we are fully aware of our limitations. If the readers come across any inconsistencies the authors would welcome suggestions for further improvements.

We owe a deep debt of gratitude to Dr. V. S. Durve Ex. Prof. & Head Dept. of Limnology & Fisheries for his foreword and continued encouragements. We are indebted to Dr Pratap Sing (Director Research—Maharana Pratap University of Agriculture & Technology, Udaipur) and Dr H.C.L.Gupta (Dean College of Fisheries—Maharana Pratap University of Agriculture & Technology, Udaipur) for their kind patronage and encouragements. We also thank all the faculty members and staff of Fisheries College—MPUAT, Udaipur for their timely cooperation. The authors are also grateful to Agro-Tech Publisher, Udaipur for the generous cooperation in the publication of this book. At last but not the least, we extend cordial thanks to our family members who eagerly awaiting this publication.

V. P. Saini
L. L. Sharma
N. C. Ujjania

ABOUT THE AUTHORS

Dr. V. P. Saini (Assistant Professor, Department of Aquaculture, Maharana Pratap University of Agriculture & Technology, Udaipur) had his M.Sc. (1990) and Ph.D. (1994) in Limnology and Fisheries from Rajasthan Agricultural University, Bikaner (Rajasthan). In 1998 he did certificate course – CES (Certificate in Environmental Studies) from Indira Gandhi Open University, New Delhi. Beginning his professional career in 1994, Dr. Saini has worked at RTADCF, Udaipur as Hatchery Development Officer. In 1996 Dr. Saini joined University services as Assistant Professor. For the last over 12 years, he has been actively engaged in research and teaching. Dr. Saini has published over 30 research papers, one book in reputed journals, and developed two water samplers and one field kit for microbiological analysis of water. Presently he is attached with Non-Plan research project on aquaculture.

Dr. L. L. Sharma (Associate Professor and Head, Department of Aquaculture, Maharana Pratap University of Agriculture & Technology, Udaipur) passed his M.Sc. (Zoology) in First Division with specialization in Limnology and Fisheries in 1973 from the ML Sukhadia University, Udaipur and did his Ph.D. in 1980 on "Limnological aspects of Udaipur waters in comparison to selected waters of Rajasthan" from the same University. He has been an active scholar in the field of Environment and Limnology for the last over 30 years and has contributed 70 research papers and 33 popular articles on different aspects of aquatic ecology, fisheries and environment in reputed journals. Dr. Sharma was closely associated with the research projects sponsored by the D.S.T. (New Delhi and Jaipur) DOD, ICAR DoEn, UNICEF and Department of Atomic Energy (BRNS). Dr. Sharma is an active member of several NGO's and academic associations. He has visited Sri Lanka, Denmark, Germany, Netherlands and Japan for attending seminars, symposia and environmental activities. Dr. Sharma has been pursuing research in the field of Limnology, Inland Aquaculture, Aquatic Pollution, Aquatic Biodiversity, Thermal ecology and conservation of lakes.

Dr. N. C. Ujjania, Asstt. Professor (Fisheries), Maharana Pratap University of Agriculture & Technology, Udaipur had his M.Sc. (Limnology & Fisheries) in 1997 from RAU, Bikaner and Ph.D (FRM) from Central Institute of Fisheries Education (Deemed University, ICAR, New Delhi) Mumbai. Dr Ujjania worked at KFUPM, Dhahran (KAS) as Fisheries Biologist for UN sponsored project and subsequently in a research project of CIFE, Mumbai. For about one decade he has been actively engaged in research on fish and fisheries. Dr Ujjania has published over 20 publications including research paper, research reports, extension manuals etc. Presently he is attached with KVK (Maharana Pratap University of Agriculture & Technology, Udaipur) Kota and working with the farmers for extension of aquacultural activities.

ABOUT THE BOOK

Water being a critical factor for life on earth needs thorough information in order to understand basic facts related to specific ecosystems. Understanding basic terminology of aquatic resources and fisheries bears much importance in view of increasing attention being paid to the management of our water resources. With a view to acquaint readers to the terminology in vogue the world over an attempt has been made to compile and present terminology pertaining to aquatic resources and fisheries in the form of this book. This publication would be useful to the teachers, researchers, extension workers etc. engaged in the study and management of aquatic resources.

In this publication, over 8000 words are compiled for the benefit of readers. These are arranged in alphabetical order. Wherever a word is bearing more than one meaning, these are stated separately under heading 1,2,3, ...The synonyms wherever appear are indicated in the parenthesis. When two different words have same meaning, their entries are not repeated. In such cases the cross-reference frequently form an integral part of the text and a cross-reference is often placed within the text and is preceded by 'See also'.

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A



AQUACULTURE

ABALONE: A mollusc, related to a sea snail, similar in flavor to a clam. It may be cooked by various methods and is best suited to very long or very short cooking times. Also called "swabi" in Japanese cuisine and "loco" in South American cuisine.

ABANDONED WELL: A well, which is no longer used, or a well removed from service; a well whose use has been permanently discontinued or which is in a state of such disrepair that it cannot be used for its intended purpose. Generally, abandoned wells will be filled with concrete or cement grout to protect groundwater from waste and contamination.

ABANDONMENT: Failure to put a water right to *Beneficial Use* for generally five or more years, in which the owner of the water right states that the water right will not be used, or takes such actions that would prevent the water from being beneficially used.

ABIOTIC: Pertaining to any non-biological factor or influence, such as geological or meteorological characteristics.

ABANDONMENT OF A DAM: In a legal

sense, abandonment is most precisely described as transfer of all rights, title and interest in a dam to the current property owner. Abandonment may also involve the slow but resolute erosion of rights to a dam by non-use, physical destruction, and lack of maintenance or intent of same. In this latter instance the final determination of legal abandonment can only be decided by the court holding jurisdiction.

ABIOTIC FACTOR: The physical, chemical and other non-living components of the environment that an organism lives in. These factors include all aspects of climate, geology, and atmosphere that affect ecological systems.

ABDOMEN: That portion of body which contains the viscera.

ABIOSESTON: Nonliving components of the seston.

ABIOTA: Those non-living factors which are present in and affect the characteristics of a given ecosystem.

ABIOTIC STRESS: The effect of non-living

factors which can harm living organisms. These non-living factors include drought, extreme temperatures, pollutants, etc.

ABLATION: Surgical removal of glands (eye stalk) to stimulate maturation or growth of prawn.

ABRASION RESISTANCE: This is the resistance of a material or specimen to wear of the whole or any part of it when rubbed against a surface. High abrasion resistance is a desirable feature of fishing twines and ropes.

ABSCISSIC ACID: A plant growth regulator involved in abscission, dormancy, stomatal opening/closure, and inhibition of seed germination. It also affects the regulation of somatic cell embryogenesis in some plant species.

ABSCISSA (Symbol X): (Mathematics) The coordinate representing the position of a point along a line perpendicular to the *y*-axis (*Ordinate*) in a *Plane Cartesian Coordinate System*.

ABSCISSION: The dropping of leaves from a plant. Premature abscission in certain plant species frequently results from excessive exposure to certain air contaminants.

ABSOLUTE ABUNDANCE: The total number of a kind of fish in the population. This is rarely known, but usually estimated from relative abundance, although other methods may be used.

ABSOLUTE FECUNDITY: Refers to all the ripe eggs in a fish ovary.

ABSOLUTE GROWTH: Average total length or weight of each age.

ABSOLUTE HUMIDITY: The actual weight of water vapor contained in a unit volume of the atmosphere, usually expressed in grams of water per kilogram of air. Compare to *Relative Humidity*.

ABSOLUTE TEMPERATURE (T): A temperature expressed on the thermodynamic scale, measured from *Absolute*

Zero, or 0 Kelvin (K), also equivalent to -273.15°C or -459.67°F .

ABSOLUTE ZERO: The zero value of thermodynamic temperature, or 0 Kelvin (K), also equivalent to -273.15° Celsius (C) on the *Centigrade Temperature Scale* or -459.67° Fahrenheit (F) on the *Fahrenheit Temperature Scale*.

ABSORB (L. *ab*, away + *sorbere*, to suck in): To suck up, or to take in. In the cell, materials are taken in (absorbed) from a solution. *cf adsorb*.

ABSORBER: A material capable of taking in a substance, such as oil, as a sponge takes up water.

ABSORPTION LOSS: The loss of water by *Infiltration* or *Seepage* into the soil during the process of priming, i.e., during the initial irrigation of a field; generally expressed as flow volume per unit of time.

ABSORPTION TOWER: (Air Quality) an air pollution control device in which contaminated air is passed through a tower containing substances (packing) possessing large surface area. Water is passed over the packing material in a countercurrent fashion, i.e., in a direction opposite to the passage of the air, and the air contaminants are then absorbed into the liquid.

ABSORPTION: (1) The entrance of water into the soil or rocks by all natural processes, including the infiltration of precipitation or snowmelt, gravity flow of streams into the valley alluvium into sinkholes or other large openings, and the movement of atmospheric moisture. (2) The uptake of water or dissolved chemicals by a cell or an organism (as tree roots absorb dissolved nutrients in soil). (3) More generally, the process by which substances in gaseous, liquid, or solid form dissolve or mix with other substances. Not to be confused with *Adsorption*.

ABUNDANCE: The property of a more than adequate quantity or supply.

ABUTMENT (of a Dam): The part of a

valley side wall against which a dam is constructed. An artificial abutment is sometimes constructed as a concrete gravity section to take the thrust of an *Arch Dam* where there is no suitable natural abutment. Right and left abutments are designated as one looks downstream.

ABUTMENT SEEPAGE: Reservoir water that moves through seams or pores in the dam's natural *Abutment* material and exists as seepage.

ABYSS PELAGIC: Open ocean (pelagic) environment below 4000 m. depth.

ABYSSAL: Relating to the bottom waters of the ocean depth.

ABYSSAL CLAY: Deep Ocean (pelagic) deposits containing less than 30 per cent biogenesis sediment.

ABYSSAL DEPTH: In a limnological sense, that depth at which the water remains uniform in temperature, or is "stagnant".

ABYSSAL ZONE: The bottom of a deep ocean. Also see *Bathyal Zone* and *Euphotic Zone*.

ABYSSOPELAGIC ZONE: Abyss meaning "no bottom", this zone of the ocean begins 4000 m below the surface of the ocean and extends down to the sea floor. This zone is home to a variety of unique creatures that are specially adapted to the inhospitable conditions that these depths create.

ACARICIDE: A pesticide used to kill or control mites or ticks.

ACCESS: The way for a person to enter a lake usually with a boat. Types of accesses include: *easement access*, *funnel access*, *lake access* and *public access*.

ACCESSORY BUDS: Lateral bud occurring at the base of a terminal bud or at the side of an axillary bud.

ACCLIMATIZATION: The physiological adjustment or adaptation by an organism to new physical and/or environmental conditions. With respect to water, it is frequently

used in reference to the ability of a species to tolerate changes in water temperature, degradation of water quality, or increased levels of salinity.

ACCOMMODATION: Adjustment to the changes of environmental conditions.

ACCRETION: The slow addition to land by deposition of water-borne sediment. An increase in land along the shores of a body of water, as by *alluvial* deposit. Accretion and alluvion are often used synonymously.

ACCULTURATION: The process of external change imposed on a population with less of traditional, social and cultural institutions.

ACEC: Area of Critical Environmental Concern.

ACELLULAR: Describing tissues or organisms that are not made up of separate cells but often have more than one nucleus. *cf* syncytium.

ACENTRIC CHROMOSOME: Chromosome fragment lacking a centromere.

ACEQUIA: (Southwestern U.S.) An irrigation canal.

ACETYL CO-ENZYME A : (ACETYL COA): A compound formed in the mitochondria when an acetyl group (CH_3CO^-) - derived from breakdown of fats, proteins, or carbohydrates - combines with the thiol group ($-\text{SH}$) of co-enzyme A.

ACID: (1) Corrosive substances with pH of less than 7.0; acidity is caused by high concentrations of hydrogen ions. (2) Chemicals that release hydrogen ions (H^+) in solution and produce hydronium ions (H_3O^+). Such solutions have a sour taste, neutralize bases, and conduct electricity. (3) Term applied to water with a pH of less than 7.0 on a pH scale of 0 to 14.

ACID AEROSOL: Airborne particles composed of sulfates (SO_x), sulfuric acid (H_2SO_4), nitrates (NO_x), and/or nitric acid (HNO_3). Dry particle diameters are typically less than

1-2 microns. Also see *Acid Deposition* and *Acid Fog*.

ACID DEPOSITION: The introduction of acidic material to the ground or to surface waters. Involves a complex chemical and atmospheric phenomenon that occurs when emissions of sulfur and nitrogen compounds and other substances are transformed by chemical processes in the atmosphere, often far from the original sources, and then become deposited on the land or surface waters in either wet or dry forms. *Wet Deposition* (commonly referred to as *Acid Rain* or *Acid Fog*) results from precipitation as rain, snow, or fog. *Dry Deposition* results from particle fallout or acidic gases.

ACID FOG: Airborne water droplets containing sulfuric acid and/or nitric acid. Typical diameters are 3-30 microns. Also see *Acid Deposition* and *Acid Aerosol*.

ACID LAKES: Lakes that have water with a pH less than 6 standard units.

ACID MINE DRAINAGE (AMD): Acidic water that flows into streams from abandoned mines or piles of mining waste or tailings. The acid arises from the oxidation of iron sulfide compounds in the mines by air, dissolved oxygen in the water, and chemoautotroph, which are bacteria that can use the iron sulfide as an energy source. Iron sulfide oxidation products include sulfuric acid, the presence of which has reduced or eliminated aquatic life in many streams in mining regions. Also see *Open-Pit Mining* and *Yellowboy*. Also referred to as *Acid Mine Waste*.

ACID NEUTRALIZING CAPACITY: A measure of the ability of water or soil to resist changes in pH.

ACID PRECIPITATION: Atmospheric deposition (rain, snow and dryfall) that is composed of the hydrolyzed by-products from oxidized halogen, nitrogen, and sulfur substances. Also see *Acid Rain*.

ACID RAIN: Rainfall with a pH of less than

7.0. One of the principle sources is the combining of rain (H_2O) and sulfur dioxide (SO_2), nitrous oxides (NO_x), and carbon dioxide (CO_2) emissions which are byproducts of the combustion of fossil fuels. These oxides react with the water vapor to form sulfuric (H_2SO_4), nitric (HNO_3), and carbonic acids (H_2CO_3). Long-term deposition of these acids is linked to adverse effects on aquatic organisms and plant life in areas with poor neutralizing (buffering) capacity. Also see *Acid Deposition*.

ACID SULPHATE SOILS: Acidic soils typically found where areas of mangrove have been cleared. Generally unuitable for pond construction.

ACID-FORMING MATERIAL: Material containing sulfide minerals or other materials, which if exposed to air, water, or weathering processes, will form sulfuric acid that may create *Acid Mine Drainage*.

ACIDIC DEPOSITION: The process by which acids are deposited in rain, snow, etc., called "wet deposition", and in "dry deposition", when particles such as fly ash, sulphates and nitrates, and gases such as sulphur dioxide and nitric oxide are deposited on, or adsorbed onto, surfaces. The dry particles or gases can be converted into acids after deposition or absorption when they contact water.

ACIDIC: The condition of water or soil that contains a sufficient amount of acid substances to lower the pH below 7.0.

ACIDIFICATION: Raising the acidity (lowering the pH) of a fluid by adding an acid.

ACIDITY: A measure of how acidic a solution may be. A solution with a pH of less than 7.0 is considered acidic. Solutions with a pH of less than 4.5 contain mineral acidity (due to strong inorganic acids); while a solution having a pH greater than 8.3 contains no acidity.

ACOELOMATE: Animals without a secondary body cavity (coelom).

ACQUIRED: Developed in response to the environment, not inherited, such as a character trait (acquired characteristic) resulting from environmental effect(s). *cf* acclimatization.

ACRE: A measure of area equal to 43,560 square feet (4,046.87 square meters). One square mile equals 640 acres, and is also referred to as a *Section*. An acre is slightly smaller in size than a football field.

ACREAGE: (1) an area of land or water measured in acres. (2) Number of acres.

ACRE-FEET (AF): A unit commonly used for measuring the volume of water. See *Acre-Foot*.

ACRE-FOOT (AF): A unit commonly used for measuring the volume of water; equal to the quantity of water required to cover one acre (43,560 square feet or 4,047 square meters) to a depth of 1 foot (0.30 meter) and equal to 43,560 cubic feet (1,234 cubic meters), or 325,951 gallons.

ACRE-INCH: The volume of water or solids that will cover one acre to a depth of one inch, equivalent to 3,630 cubic feet or 102.7 cubic meters.

ACRIDINE DYES: A class of positively charged polycyclic molecules that intercalate into DNA and induce frameshift mutations.

ACROCENTRIC: A chromosome that has its centromere near the end.

ACROPETAL: 1. Developing or blooming in succession towards the apex, such as leaves or flowers developing acropetally. 2. Transport or movement of substances towards the apex, such as the movement of water through the plant. The opposite tendency is termed basipetal.

ACROSOME: An apical organelle in the head of a spermatozoon, *q.v.*

ACTIN: One of the two contractile proteins in muscle (the other being myosin). Actin is also found in the microfilaments that form part of the cytoskeleton of all cells.

ACTIVATED CARBON ADSORPTION: The process of pollutants moving out of water and attaching on to *Activated Carbon*.

ACTIVATED CARBON: A material produced by heating coal or wood in such a manner as to yield a porous structure, creating a very large internal surface area. Activated carbon is available in both powdered and granular forms, and is widely used to adsorb organic compounds from water and wastewater. It provides a means of removing tastes and odors from drinking water. Also see *Granular Activated Carbon (GAC)*. Also referred to as *Activated Charcoal*.

ACTIVATED CHARCOAL (ACTIVATED CARBON): Charcoal which has been treated to remove hydrocarbons and to increase its adsorptive properties. It acts by condensing and holding a gas or solute onto its surface; thus inhibitory substances in nutrient medium may be adsorbed to charcoal included in the medium. Rooting factors such as phenolamines present as contaminants in charcoal may stimulate growth *in vitro*. Its addition to rooting medium may stimulate root initiation in some plant species. Activated charcoal may differ in origin and in composition. *cf* charcoal; phenolic oxidation.

ACTIVATED SLUDGE PROCESS: A method of *Secondary Wastewater Treatment* in which the waste is treated by microorganisms in a well-aerated tank to degrade the organic material. A sedimentation tank is then used to remove the resultant sludge.

ACTIVATED SLUDGE: The *Floc* produced in raw or settled wastewater due to the growth of bacteria and other organisms in the presence of *Dissolved Oxygen*. It is the product that results when primary effluent is mixed with bacteria-laden sludge and then agitated and aerated to promote biological treatment, speeding the breakdown of organic matter in raw sewage undergoing secondary waste treatment.

ACTIVATOR: 1. A Substance or physical agent that stimulates transcription of a

specific gene or operon. 2. A compound that, by binding to an allosteric site on an enzyme, enables the active site of the enzyme to bind to the substrate. See Gene Expression.

ACTIVE COLLECTION: In PGR: Defined in the international undertaking on plant genetic resources (FAO, 1983) As a collection which complements a base collection (Q.V.) and is a collection from which seed samples are drawn for distribution, exchange and other purposes such as multiplication and evaluation.

ACTIVE FAULT: A fault that has undergone movement in recent geologic time (the last 10,000 years) and may be subject to future movement. Also see *Fault*.

ACTIVE SITE: 1. A site on the surface of a catalyst at which activity occurs. 2. The site on the surface of an enzyme molecule that binds the substrate molecule.

ACTIVE SOLAR WATER HEATER: A water heating system in which heat from the sun is absorbed by collectors and transferred by pumps to a storage unit. The heated fluid in the storage unit conveys its heat to the domestic hot water system of the house through a heat exchanger.

ACTIVE STORAGE CAPACITY: The total amount of usable reservoir capacity available for seasonal or cyclic water storage. It is gross reservoir capacity minus inactive storage capacity. More specifically, the volume of water in a reservoir below the maximum controllable level and above the minimum controllable level that can be released under gravity. In general, it is the volume of water between the outlet works and the spillway crest. In some instances, *Minimum Pool* operating constraints may prevent lowering the reservoir to the level of the outlet works, and the water below the minimum pool level is not considered to be in active storage.

ACTIVITY: The effective concentration of a chemical based on thermodynamic considerations. Activity and concentration have the

same units and have the same value in very dilute solutions.

ACUTE: Designates an exposure to a dangerous substance or chemical in sufficient dosage to precipitate a severe reaction. *Acute Exposure* refers to such dosage levels received over a period of 24 hours or less. Longer-term exposures are referred to as *Chronic Exposure*.

ADAPTABILITY: The ability of an organism to alter its mode of behavior or even its physiology, when placed under a new type of stress.

ADAPTATION TRAITS: The complex of traits related to reproduction and survival of the individual in a particular production environment. Adaptation traits contribute to individual fitness; they are the traits subjected to selection during the evolution of animal genetic resources. By definition, these traits are also important to the ability of the animal genetic resource to be sustained in the production environment.

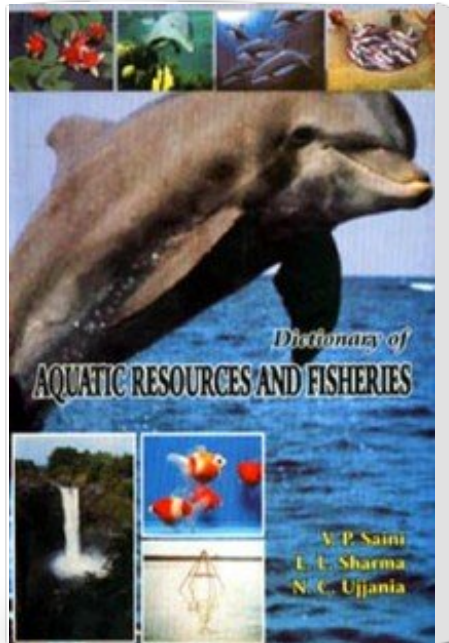
ADAPTATION: Changes in an organism's structure or habits that allow it to adjust to its surroundings, which usually makes them more likely to survive and reproduce than their competitors.

ADAPTIVE INFERIORITY: As used by Rubin off selection will operate to eliminate the hybrid in question.

ADAPTIVE MANAGEMENT: Management involving active responses to new information or the deliberate manipulation of fishing intensity or other aspects in order to learn something of their effects, within on stock several sub stocks can be regarded as experimental units. In which alternative strategies (different fishing intensities for example are applied).

ADAPTIVE RADIATION: The evolution of new forms, sub-species or species from one species of plant or animal in order to exploit new habitats or food sources. a.k.a. divergent evolution.

Dictionary of Aquatic Resources and Fisheries



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