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Chapter 1 : Brook Trout - Salvelinus fontinalis - Literature - Encyclopedia of Life

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At both sites, brook charr had recently emerged from the gravel substrate into still-water pools along the sides of the rivers. Pool areas ranged from 1. For 73 charr captured after observation, fork lengths and wet masses were 2. Observations of individual brook charr were made between and daily unless prevented by rain or overcast skies. Recently emerged brook charr tend to hide or move out of the pool when an observer arrives and it takes 2 min, on average, for individuals to return and resume their activity Grant and Noakes After 10 min, a focal individual was selected haphazardly for behavioral measurements. Behavior of focal individuals was measured over 20 min. A countdown timer beeped every 5 s over the min duration and the behavior of the focal fish was recorded for every third 5-s interval. Behavior of the focal fish during the 5-s interval was categorized as an attempt to capture a prey item or search for prey. An attempt to capture prey was identified by an individual making a conspicuous and rapid change in speed and direction to intercept a potential prey item. Search for prey was assigned to intervals when the focal fish did not attempt to capture a prey item. The fish was considered to have moved if it traversed more than 1 body length during the 5-s interval. Behavioral measurements were recorded on a Sony microcassette recorder in the field and transcribed later. The absence and occurrence of movement during 5-s intervals of search were used to estimate the proportion of search time a fish spent moving during the period of observation. Seventy-seven percent 74 of 96 individuals were captured. Individuals that were not captured included both charr that were sedentary during the focal observation period and charr that were active. Failure to capture the focal individual occurred because individuals were lost from sight due to wind-induced ripples on the water surface, and, while evading capture, movement among other individuals in the pool, or movement from lit to shaded areas, or from open areas to cover. When the focal individual was captured, it was placed in a labeled, 1 l glass Mason jar with a mesh lid and the jar was submerged downstream in a separate pool not used for observation until the exit experiment was prepared. Observations of the next focal individual were made at a different pool or, in the case of 1 large pool at the Caledon site, a different section of the pool, to minimize effects of our activity on the behavior of remaining charr. Up to 3 fish were captured per day due to space and time limitations set by experiments 2 and 3. Within the apparatus was a vertical, free-standing black PVC tube 32 cm height and 12 cm diameter with a 2 cm wide opening along the entire height of the tube and a sliding door that could be opened manually. The tube was placed at a narrow end of the aquarium with the tube opening oriented toward the opposite end. To minimize any effect of daily variation in sunlight on exit times, the apparatus was positioned in the shadow of a tree, or, if needed, the shadow of the person who observed the fish. In the latter situation, the person providing shade stood behind the opening of the tube. In both situations, time for the fish to exit the tube was recorded by a second observer positioned approximately 90 deg to the tube opening. Exit times for each fish were quantified under 2 treatments: Order of the treatments was determined randomly for each fish to balance sequential effects. The first trial for a test fish commenced within 30 min of capturing the individual. The second trial commenced within 2 min of completion of the first trial. At the beginning of each trial, a fish was placed from the top into the closed tube and was given 5 min to adjust. The tube door was then opened and time for the test fish to exit entirely from the tube was recorded. If a fish failed to exit from the tube after s, then s was recorded. Between the first and second trials, test individuals were removed from the aquarium using a dip net and held in the water outside of the aquarium while the aquarium was lifted in the water column and set back down on the stream bottom to facilitate exchange of water and minimize changes in oxygen concentration and water temperature over the course of the trials. The test fish was then placed back into the tube for the second trial. On completion of the trials, the test fish was placed in its labeled Mason jar until all fish captured on a given day were tested. The experimental apparatus consisted of 4 clear, double-walled glass chambers of approximately 50 ml volume. Three chambers held a single test fish each. The fourth empty chamber served as a control to measure changes in oxygen concentration in the absence of a test fish. Each chamber sat atop a stir plate with a 0. The action of the stir bar ensured even oxygen distribution in the water. Plastic mesh was placed over the depression so that fish could rest on the chamber bottom without being disturbed by the stir bar. Plastic tubing connected the chambers in series to a water bath maintaining water temperature at 10 oC. Oxygen concentrations in the water of each chamber were measured to the nearest 0. The probes were connected to a Lab Pro serial interface connected to a desktop computer Vernier Software and Technology. Probes were operated continuously from 1 week prior to the beginning of the experimental trials to the time of the last trial to ensure measurements of oxygen concentration were consistent. The KCl electrolyte solution in the probes was changed twice during the sampling period for the same reason. On days of field observation, captured fish brought to the Hagen Aqualab were placed in the glass chambers and given approximately 20 h to acclimate. Chambers were covered with paper lids to prevent fish from jumping out and surrounded by hanging black plastic to eliminate light and minimize possible disturbances due to actions of the experimenters or interactions among test fish. The next morning, any nitrogenous waste accumulated overnight was suctioned out of the chambers using a ml syringe and half of the water in each chamber was gently removed and replaced with air-saturated, autoclaved well water. Waste removal and water replacement were carried out to minimize any bacterial effects on oxygen consumption and to ensure maximum oxygen saturation at the beginning of each trial. Oxygen probes were calibrated daily after waste removal. Calibration values were corrected for temperature and daily atmospheric pressure. Trials commenced each morning at approximately and continued for min. Trials were conducted at the same time each day to minimize any influence of time of day might have on oxygen consumption. The remainder of the equation adjusts for the number of moles of oxygen in water. For each trial, recordings of oxygen concentration in individual chambers were plotted against time. Volume of the chamber was estimated as the difference in mass between the entire apparatus chamber, probe, stir bar, and mesh with and without water. After each trial, individuals were anesthetized in their chamber with 0. The Ziploc containers had mesh on all sides to allow the exchange of water. The containers were floated in a larger holding tank and the individual was allowed to recover for 24 h in 10 oC water with Water in the chambers was replaced with oxygenated, autoclaved well water in preparation for the next set of trials. Two additional steps were taken to assess the suitability of our measurements of oxygen consumption. First, we assessed the repeatability of measurements in a set of preliminary trials where resting oxygen consumption for an individual was measured 1 day and again the next day.

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Chapter 2 : Brook trout - Wikipedia

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The specific epithet "fontinalis" comes from the Latin for "of a spring or fountain", in reference to the clear, cold streams and ponds in its native habitat. The species was later moved to the char genus Salvelinus. Though commonly called a trout , the brook trout is thus actually one of the chars, which in North America also include the lake trout , bull trout , Dolly Varden , and the Arctic char. There is little recognized systematic substructure in the brook trout, but two subspecies have been proposed. On the other hand, three ecological forms are distinguished. Subspecies[edit] The aurora trout , S. Behnke as a highly specialized form of brook trout. Behnke describes three ecological forms of the brook trout. A sea-run form that migrates into saltwater for short periods of time to feed evolved along the Atlantic coastline. Finally, a smaller generalist form that evolved in the small lakes, ponds, rivers, and streams throughout most of the original native range. All three forms have the same general appearance. Hybrids[edit] Tiger trout top 3 , splake bottom The brook trout produces hybrids both with its congeners Salvelinus namaycush and Salvelinus alpinus , and intergeneric hybrids with Salmo trutta. Although uncommon in nature, they are artificially propagated in substantial numbers for stocking into brook trout or lake trout habitats. Splake grow more quickly than brook trout and become piscivorous sooner and are more tolerant of competitors than brook trout. Tiger trout occur very rarely naturally, but are sometimes artificially propagated. Such crosses are almost always reproductively sterile. They are popular with many fish-stocking programs because they can grow quickly, and may help keep rough fish populations in check due to their highly piscivorous fish-eating nature. A distinctive sprinkling of red dots, surrounded by blue halos, occurs along the flanks. The belly and lower fins are reddish in color, the latter with white leading edges. Often, the belly, particularly of the males, becomes very red or orange when the fish are spawning. Brook trout can reach at least seven years of age, with reports of year-old specimens observed in California habitats to which the species has been introduced. Growth rates are dependent on season, age, water and ambient air temperatures, and flow rates. In general, flow rates affect the rate of change in the relationship between temperature and growth rate. For example, in spring, growth increased with temperature at a faster rate with high flow rates than with low flow rates. The brook trout was eventually introduced into suitable habitats throughout the western U. Habitat[edit] Typical southern Appalachian brook trout habitat The brook trout inhabits large and small lakes, rivers, streams, creeks, and spring ponds. They prefer clear waters of high purity and a narrow pH range and are sensitive to poor oxygenation, pollution, and changes in pH caused by environmental effects such as acid rain. The typical pH range of brook trout waters is 5. Warm summer temperatures and low flow rates are stressful on brook trout populationsâ€”especially larger fish. In Ontario and Michigan , efforts are underway to restore and recover coaster populations. Salters may spend up to three months at sea feeding on crustaceans, fish, and marine worms in the spring, not straying more than a few miles from the river mouth. The fish return to freshwater tributaries to spawn in the late summer or autumn. While in salt water, salters gain a more silvery color, losing much of the distinctive markings seen in freshwater. However, within two weeks of returning to fresh water, they assume typical brook trout color and markings. One or more males approach the female, fertilizing the eggs as the female expresses them. A majority of spawnings involve peripheral males which directly influences the number of eggs that survive into adulthood. In general, the larger the number of peripheral males present, the more likely the eggs will be cannibalized. The female then buries the eggs in a small gravel mound; they hatch in 95 to days. Purportedly it illustrates an occasion when Daniel Webster , an avid angler, caught a large about Cook, caught a Revenues derived from the sale of fishing licenses have been used to restore many sections of creeks and streams to brook trout habitat. Cook on the Nipigon River, Ontario, in July Artificial propagation and aquaculture[edit]

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Brook trout are also commercially raised in large numbers for food production, being sold for human consumption in both fresh and smoked forms. Brook trout populations, if already stressed by overharvest or by temperature, are very susceptible to damage by the introduction of exogenous species. Many lacustrine populations of brook trout have been extirpated by the introduction of other species, particularly percids , but sometimes other spiny-rayed fishes. In the Lamar River drainage, a mandatory kill regulation for any brook trout caught is in effect.

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Chapter 3 : References Used for Salvelinus fontinalis

The oxygen consumption of Salvelinus fontinalis. 1. The oxygen consumption of Salvelinus fontinalis. by S V Job Print book: State or province government publication.

No special status Other Comments When in breeding colors the male brook trout are considered by many to be one of the most colorful and beautiful of all freshwater fishes LaConte, Another interesting fact is that brook trout are actually a char not a trout LaConte, The brook trout has also been hybridized with the brown trout, by combining brown trout Salmo trutta eggs with brook trout sperm, to produce a sterile tiger or zebra trout, which has proven itself to be a very good gamefish Mills, Nearctic living in the Nearctic biogeographic province, the northern part of the New World. This includes Greenland, the Canadian Arctic islands, and all of the North American as far south as the highlands of central Mexico. Neotropical living in the southern part of the New World. In other words, Central and South America. Palearctic living in the northern part of the Old World. In otherwords, Europe and Asia and northern Africa. Animals with bilateral symmetry have dorsal and ventral sides, as well as anterior and posterior ends. Synapomorphy of the Bilateria. Ecotourism implies that there are existing programs that profit from the appreciation of natural areas or animals. Iteroparous animals must, by definition, survive over multiple seasons or periodic condition changes. In other words, India and southeast Asia. Iowa Fish and Fishing. Iowa Department of Natural Resources. Accessed November 04, at http: Breeding success of male brook trout Salvelinus fontinalis in the wild. Molecular Ecology, 12 9: Fishes of the Great Lakes Region. University of Michigan Press. Symposium on Salmon and Trout in Streams. The University of British Columbia: A resource, its ecology, and management. Bungay, Suffolk, Great Britain: Freshwater Fishes of Canada. Minister of Supply and Services Canada. New York City, New York: Fish of the Great Lakes.

Chapter 4 : ADW: Salvelinus fontinalis: INFORMATION

fontinalis, Bmax and Kd values did not change with temperature acclimation. Ouabain-sensitive oxygen consumption (OS) in hepatocytes of R. rutilus was 73 times higher in the cold- than in the warm-acclimated group.

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Japan Ministry of Environment0 List of alien species recognized to be established in Japan or found in the Japanese wild. Labrador Inuit Committee on Literacy. Department of Education, St. Copeland0 A catalogue of the fishes of the fresh waters of North America. A revised and annotated checklist. Bloom0 Rapid chromosome preparations from solid tissues of fishes. Greven0 Database of fish chromosomes.

Chapter 5 : Formats and Editions of The oxygen consumption of Salvelinus fontinalis. [blog.quintoapp.com]

UNIVERSITY OF TORONTO-8 I 0 LOG I CAL S ERI ES NO. 61 By S.V. JOB e Oxygen Consumption of Ivelinus fontinalis Publications of the Ontario Fisheries Research.

Find articles by Christian Tudorache Robyn A. Benfey Find articles by Tillmann J. Received Nov 25; Accepted Dec Abstract Several measures have been developed to quantify swimming performance to understand various aspects of ecology and behaviour, as well as to help design functional applications for fishways and aquaculture. One of those measures, the optimal swimming speed, is the speed at which the cost of transport COT is minimal, where COT is defined as the cost of moving unit mass over unit distance. The experimental protocol to determine the optimal swimming speed involves forced-swimming in a flume or respirometer. In this study, a 4. The optimal swimming speed and the preferred swimming speed of brook charr were determined and a comparison of the two reveals that the optimal swimming speed The preferred swimming speed can be advantageous for the determination of swimming speeds for the use in aquaculture studies. Swimming behaviour, Brook charr, Optimal swimming speed, Preferred swimming speed, Raceway, Respirometry Introduction A number of swimming performance levels have been described for fishes: Each swimming level has its own energetic characteristics, but sustained and prolonged swimming are mainly powered by red aerobic muscles while burst swimming is powered by white anaerobic muscles Beamish Aerobically powered swimming modes are used for volitional routine swimming, important in activities such as migration, foraging, courtship, agonistic interactions. Beamish ; Videler Such speeds are commonly small compared with the speed range of fishes and various measures of performance have been sought that pertain to such speeds. One such measure of performance at the low speed end of the spectrum at which volitional behaviour usually occurs is the optimal swimming speed defined at the speed at which the cost of transport COT is smallest Tucker COT is in turn defined as the cost of moving unit mass over unit distance. Optimal swimming speed can be affected by various factors. Most commonly, Uopt is based on rates of oxygen consumption, and hence is affected by temperature, fish size, endothermy and other factors influencing standard metabolic rate Weihs a ; Beamish ; Webb ; Tudorache et al. Weihs a has also shown that net energy gain can be used in considering Uopt, when slightly different values are obtained reflecting an ecological factor, food density. Because Uopt is a performance measure similar to speeds of fish during volitional activity, it has been used to evaluate the economics of routine activities and migration e. Hinch and Rand ; Tudorache et al. Several other measures of swimming performance are in common use, such as the critical swimming speed, Ucrit, determined by forced-swimming increasing velocity tests Brett However, there are both methodological difficulties in determining Ucrit e. The defining characteristic of speeds used in routine activities is, of course, that they are volitional, and hence, fish can choose the speed at which they swim. This leads to the concept that there are preferred speeds, Upref, for fishes. For example, fishes in lotic situations typically choose locations within a small speed range and in lentic situations, swim for most of the time within a similar small speed range. Upref is therefore a direct measure of performance relevant to behaviours central to fish ecology, and hence also to human-managed systems. Therefore, we explored the use of Upref as a volitional swimming speed, using a tilted raceway setup with gradually increasing upstream water speed to determine Upref in a repeatable fashion Peake and Farrell We also compared Upref with Uopt calculated from metabolic rate measured during forced-swimming tests in a Blazka-type respirometer. Materials and methods Fish Brook charr Fish were fed a salmonid grower diet Corey Feed Mills Ltd. Fish fed and behaved naturally in captivity. The experiments were conducted between July and August, Ten fish were used in both Upref and Uopt trials. For five fish, Upref was measured first followed by Uopt, and for the remainder, Uopt was determined before transfer to the tilted flume to determine Upref. Preferred swimming speed Upref Upref was determined in a Plexiglas raceway with gradually increasing water speed due to a 3. A grid on the bottom over the entire length of the raceway facilitated orientation and scaling.