Fish anatomy critical analysis

Science, Anatomy

The following illustration of a largemouth bass shows some of the common external features that are used to describe the differences among fish species. Fish are animals that are cold-blooded, have fins and a backbone. Most fish have scales and breathe with gills. There are about 22, 000 species of fish that began evolving around 480 million years ago. The largemouth billustrated abovethe typical torplike (fusiform) shape associated with many fishes used by the fish to maintain its position, move, steer and stop.

They are either single fins alonthe centerline of the fish, such as the dorsal (back) fins, caudal (tail) fin and anal fin, or paired fins, which include the pectoral (chest) and pelvic (hip) fins. Fishes such as catfish have another fleshy lobe behind the dorsal fin, called an adipose (fat) fin that is not illustrated here. The dorsal and anal fins primarily help fish to not roll over onto their sides. The caudal fin is the main fin for propulsion to move the fish forward. The paired fins assist with steering, stoppingand hovering.

Scales in most bony fishes (most freshwater fishes other than gar that have ganoid scales, and catfish which have no scales) are either ctenoid or cycloid. Ctenoid scales have jagged edges and cycloid have smooth rounded edges. Ctenii are tiny, comblike projections on the exposed (posterior) edge of ctenoid scales. Bass and most other fish with spines have ctenoid scales composed of connective tissue covered with calcium. Most fishes also have a very important mucus layer covering the body that helps prevent infection.

Anglers should be careful not to rub this " slime" off when handling a fish that is to be released. Maryland Envirothon 1 In many freshwater fishes the fins are supported by spines that are rigid and may be quite sharp thus playing a defensive role. Catfish have notably hard sharp fins that anglers

should be wary of. The soft dorsal and caudal fins are composed of rays, as are portions of other fins. Rays are less rigid and frequently branched. The gills are the breathing apparatus of fish and are highly vascularized giving them their bright red cover.

An operculum (gill cover) that is a flexible bony plate protects the sensitive gills. Water is " inhaled" through the mouth, passes over the gills and " exhaled" from beneath the operculum. Fish see through their eyes and can detect color. The eyes are rounder in fish than mammals because of the refractive index of water and focus is achieved by mthe lens in and out, not distorting it as in mammals. water and can be quite sensitive. Eels and catfish have particularly well developed senses of smell. larger it is the bigger the prey it can consume.

Fish hava sense of taste and may sample items to taste them before swallowing if they are not obvious prey items. Some are primmostly other fish). The imported grass carp is one of the few large fishes that are primarily herbivorous (eating plants). Fish may or may not have teeth depending on the species. Fishchain pickerel and gar have obvious canine-shaped teeth. Other fish have less obvious teeth, such as the cardiform teeth in catfish which feel like a roughened area at the front of the mouthor vomerine teeth that are tiny patches of teeth, for example, in the roof of a striped bass' mouth.

Grass carp and other minnows have pharyngeal teeth modified from their gill arches for grinding that are located in the throat. that are open to the water through a series of pores (creating a line along the side of the fish). The lateral line primarily senses water currents and pressure, and movement in

the water. immediately in front of the anal fin. are used to describe the differences between fish that are described in more detail below. Maryland Envirothon 2 front of thhollow and house and protect the delicate spinal cord. SPINAL CORD: Cbrain, as well as in BRAIN: Thbehaviors processed here.

LATERAL LINEO sense organs; detectunderwater vibrations and is capable of determinthe direction of their source. (See Issue 8 of The City Fisher for minformation.) SWIM (or AIRBLA hollow, gas-fillbalance organ a fish to conserve energyby maintaining neutral buoyancy (suspending) in water. Fish caught fromvery deep water sometimes need to have air releasreleased and return to deep water, dusurface. Species of fish that do not possess a swim bladder sink to the bottom if they stopswimming. GILLS: Aif the fish KIDNEY: ed from their swim bladder before they can be idney is alsbody, allowing certain fish species to exist in freshwater or saltwater, and in some cases (such assnook or tarpon) both. Maryland Envirothon 3 STOMACH AND INTESTINES: Break down (digest) fo Fish such as tilapia that are herbivomatter is usually tough and fibrous and more difficult to break down into usable components. A great deal about fish feeding habits can be determined by examining stomach contents. PYLORIC CAECA: This organ with fingerlike projections is located near the junction of the stomach and theindigestion, may functio VENT: The site of waste elimination from the fish’s body.

LIVER: This important organ has a number of functions. It abr importantas playing a role in nitrogen (waste) excretion. HEART: Circulates blood throughout the body. Oxygen ava kidneys an GONADS (REPRODUCTIVE ORGANS): In adult female bass, the bright oranbufertilizing the eggs, are

much smaller and wh(or roe) of certain fish are considered a delicacy, as in the case of caviar from sturgeon. MUSCLES: Provide movement and locomotion. This is the part of the fish that is usually eaten, and Measuring a Fish of the fish with the mouth closed and the tail fin aying along a tape measure, then pinch the tail fin closed and determine the total length, do NOT pull a flexible tape measure along the curve of the fish. Conversely, most marine (saltwater regulations) refer to the " fork length", and scientists often use " standard length" which is to the end of the fleshy part of t Maryland Envirothon 4 aby minor damage to the tanor does it give too much credit to a fish for the relatively light weight tail when calculating fish's condition. " Girth" is best measured with a fabric ruler, such as tailors use.

It can also be determined by drawing a string around the fish at its widest point marking where the string overlaps and then the overlapping points on a conventional ruler. Knowing the girth is important when trying certify a fish for a record, and provides useful information Using total length and girth you can get a rough estimate of a fish's weight using various formulas. Length-Weight Formulas to Estimate Fish Weights biologists use. The equation is: Log (weight in grams)= -4. 83 + 1. 923 x Log (total length in millimeters) + 1. 57 x Log (girth millimeters). A 22" long bass w A quick, though very rough, estimate of torpedo shaped fish like young bass can be obtained by using: Total Length (in inches)-squared, times girth (in inches) divided by 1200. A 22" long Another common option used for estimating bass weights is: Girth (in inches)-squared, times length (in inches) divided by 800. A 22" long bass with a girth of 15 How Fish Swim alternately on each side first toward one

side and then toward the other, results in a series of waves traveling down the fish's body.

The rear part of each wave thrusts against the water and propels the fish forward. Maryland Envirothon 5 This type of movement is quite clearly seen in the freshwater eel. Because movement of the head back and forth exerts drag, which consumes additional energy and slows travel, a great many fishes have modified this snakelike motion by keeping the waves very small along most of the length of the body, in some cases showing no obvious movement at all, and then increasing them sharply in the tail region.

It is the end of the traveling waves that moves the tail forcefully back and forth, providing the main propulsion for forward motion. A simpler form of tail propulsion seen in such inflexible-bodied fishes as the trunkfish, which simply alternates contractions of all the muscle blocks on one side of the body with those on the other side, causing the tail to move from side to side like a sculling paddle. Some of the predatory bony fishes are the fastest swimmers; they can cruise at speeds that are between three and six times their body lele0. 8 km/hr (0. mph), swim very slowly; others, such as the salmon, which may reach a sustained speed of 13 km/hr (8 mph), move much faster; and it has been estimated that tuna may reach speeds of 80 km/hr (50 mph), and swordfish, 97 km/hr (60 mph). Introduction to Aging Fish: What Are Otoliths? directly behind the brain of bony fishes. There are three types of o 1. Sagitta—the largest of the 3 pairs of otoliths; involved in the detection of sound and process of hear 3. Lapillus—involved in the detection of gravitational force and sound (Popper and Lu 2000) re are many different shapes and sizes of otoliths different.

Otoliths are important to scientific age and growth studies. This figure shows the growth rings of a sagittal otolith section viewed under reflective light. The darker area or “ translucent zone” represents a period of fast growth. The whiter area or “ opaque zone” represents a period of slower growth. The age of the fish is estimated by counting the annuli, or opaque bands, of the thin sections, as one would count rings on a tree to determine its age. Maryland Envirothon 6 Before age data can be used, the method of estimating age by counting annuli must be validated for each species to which it is applied.

There are several ways to validate age, or prove that “ one annulus is equal to one year. ” Most obvious might be to simply rear fish from spawn, sacrifice the fish after a few years, and compare the number of rings to the known age of those fish. This process can be time consuming and expensive. It also creates the possibility of abnormal growth patterns caused by laboratory settings (Campana, 2001). Although this method may not be practical for validating annular ring formation, a similar method is effective in validating daily ring formation (Campana and Neilson, 1985).

To avoid the effects of long-term laboratory exposure, tag and release of wild fish can be useful in validating annulus deposition. This figure shows the fluorescent tag of a common snook otolith. A captured common snook was injected with oxytetracycline (OTC), a chemical that is incorporated into calcium-rich structures including otoliths. The fish was then tagged and released. Seven years later, the fish was recaptured, sacrificed, and processed for aging. The OTC, which binds to the calcium in the otolith,

appears as a glowing band when the otolith is viewed using fluorescence microscopy.

The number of annuli between capture and recapture is also seven. Information like this is key to linking a single annulus to one year of growth, but such information relies heavily on time and chance. The age data gathered from otolith examinations allow scientists to model growth rates, maximum age, age at maturity, and the trend of future generations. Literature

References

1. Florida Fish and Wildlife Conservation Commission. http://www. floridamarine. org/features/view_article. asp? id= 21978 and http://myfwc. com/Fishing/Fishes/anatomy. html. Fish and Wildlife Research