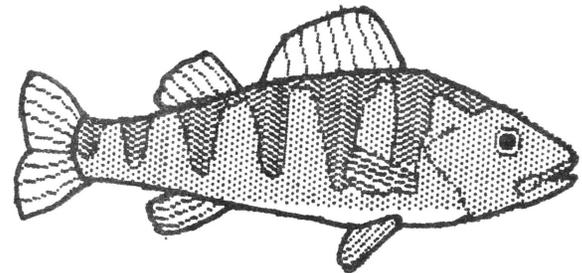


APPLE

**COMPUTER
BIOLOGY
LAB**

PERCH



CROSS EDUCATIONAL SOFTWARE

PERCH DISSECTION

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Larry Newby

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Cross Educational Software
1802 N. Trenton
Ruston, LA 71270
Phone 318-255-8921

INTRODUCTION

"PERCH DISSECTION" can be used as a pre-lab or post-lab computer activity. It gives instructions and definitions that a student should know before entering the lab. After a dissection the program can be used as a self-test. The reading level and content are meant for seventh and tenth grade biology students.

GETTING STARTED

All you have to do is put the disk in an Apple computer and turn on the power. After a few seconds the screen will show the menu on the next page. A color monitor will help, but the pictures are compatible with black and white. One exception is the circulatory system with its red and blue blood.

COPIES

This disk is protected against being copied. A backup disk is included in case of accident. If the disk doesn't run when you receive it, it will be replaced free. Just mail it back to Cross Educational Software. If the disk fails after being used for 30 days, it could be due to mishandling, such as a scratch or a fingerprint. After 30 days there is a \$6 charge to replace a disk.

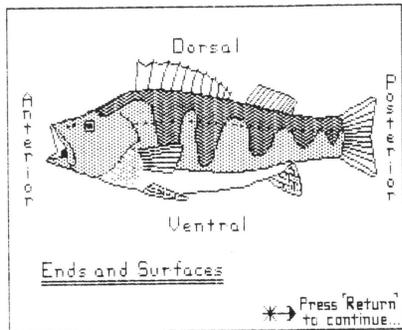
The manual may be freely reproduced for classroom use by the original purchaser.

MANUAL AND TESTS

The following pages are a summary of the program. The test pages can be duplicated and given to students if there isn't enough time for all students to run the program during class.

MAIN MENU

- 1) ORIENTATION
- 2) STRUCTURES AND FUNCTIONS
- 3) STUDENT CONTROLLED DISSECTION
- 4) SELF TEST



1) ORIENTATION: VOCABULARY LIST

AIR BLADDER	HEART	SKELETON
ANAL FIN	INTESTINE	SKULL
ANTERIOR	KIDNEY	SOFT DORSAL FIN
ANUS	LATERAL LINE	SPAWNING
AURICLE	LIVER	SPINAL COLUMN
BRAIN	MEDULLA	SPINAL CORD
CARDINAL VEIN	MILT	SPERM DUCT
CAUDAL FIN	MOUTH	SPLEEN
CEREBELLUM	NARE	SPINY DORSAL FIN
CEREBRUM	OPERCULUM	STOMACH
COLD-BLOODED	OVARY	TESTIS
DIFFUSION	OVIDUCT	TONGUE
DORSAL	OXYGEN POOR BLOOD	URINARY BLADDER
DORSAL AORTA	OXYGEN RICH BLOOD	URINARY DUCT
ESOPHAGUS	PECTORAL FIN	UROGENITAL OPENING
EYE	POSTERIOR	VENTRAL
FILAMENT	PYLORIC CAECA	VENTRAL AORTA
GILL	RIBS	VENTRICLE
GILL RAKER	SINUS VENOSUS	VERTEBRATE

GENERAL BACKGROUND

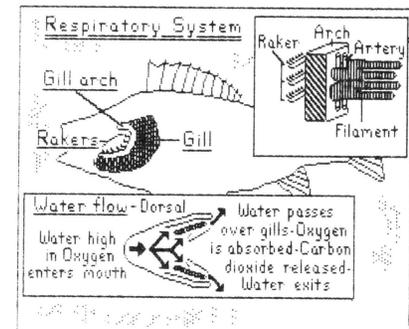
The perch is a cold-blooded vertebrate. This means its body temperature is the same as its surroundings and it has a backbone. The perch is a 'true' fish which means it has a bony skeleton and gills as the main respiratory organ. The perch is very well developed for its aquatic life. Its torpedo shaped body moves easily through the water. The fins provide an excellent way for the perch to propel, stabilize, and guide itself in the water. The overlapping scales provide a hard, flexible protection. The colors of the perch provide for excellent camouflage which protects it from the larger predators. It also makes it easier for the perch to hide while it searches for food.

The perch reproduces by means of external fertilization. This means that the eggs are fertilized outside of the female's body. The eggs are released from the body cavity of the female. This is called spawning. The male then covers them with his sperm cells or milt. This is not an efficient way to reproduce. Many eggs go unfertilized and are lost. The perch compensates for this by producing and releasing thousands of eggs during each spawning. This assures that the offspring will survive.

The perch has definite anterior and posterior ends. Distinct dorsal and ventral surfaces can also be observed.

2) DEFINITIONS OF STRUCTURES AND FUNCTIONS

A) RESPIRATORY SYSTEM



GILLS - Breathing structures in perch that exchange oxygen and carbon dioxide.

OXYGEN RICH BLOOD - Blood that has a high oxygen content and relatively low carbon dioxide content.

OXYGEN POOR BLOOD - Blood that is high in carbon dioxide and relatively low in oxygen.

CLOSED CIRCULATORY SYSTEM - A circulatory system in which the blood is always contained within vessels.

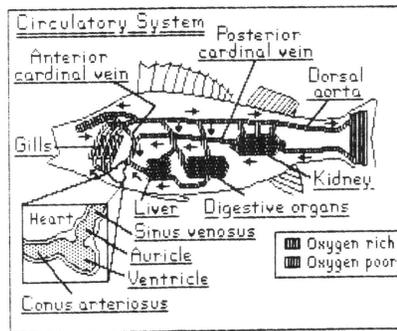
GILL RAKER - Projections on anterior of arches that catch foreign matter before it reaches gills.

GILL ARCHES - Structures that give support to the filaments.

FILAMENT - Thread-like structures that contain many capillaries. They provide for oxygen/carbon dioxide exchange.

DIFFUSION - The movement of molecules from where they are crowded to where they are not so crowded.

B) CIRCULATORY SYSTEM



HEART - Organ responsible for pumping blood around the body.

AURICLE - Receiving chamber of the heart. Pumps blood to the ventricle.

VENTRICLE - Muscular lower chamber of the heart. Pumps blood to the gills.

DORSAL AORTA - Main artery carrying blood to all parts of body.

VENTRAL AORTA - Main artery connecting ventricle with gills.

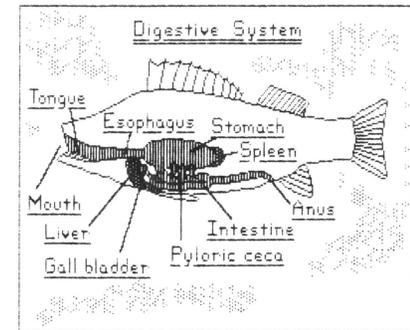
SINUS VENOSUS - Structure where the veins come together. Blood collects here before entering the auricle.

ANTERIOR CARDINAL VEIN - Main blood vessel returning oxygen poor blood from the anterior to the heart.

POSTERIOR CARDINAL VEIN - Main blood vessel returning oxygen poor blood from the posterior to the heart.

CONUS ARTERIOSUS - Main blood vessel leaving the ventricle of the heart.

C) DIGESTIVE SYSTEM



MOUTH - Opening at the anterior for eating food.

STOMACH - Muscular storage sac. Grinds and crushes food. Starts the process of digestion.

TONGUE - Structure in the mouth containing sensors for taste and detecting chemicals.

ESOPHAGUS - Tube that carries food from the mouth to the stomach.

INTESTINE - Area where food is digested and absorbed.

PYLORIC CAECA - Finger-like structures near the beginning of the intestine that release digestive enzymes.

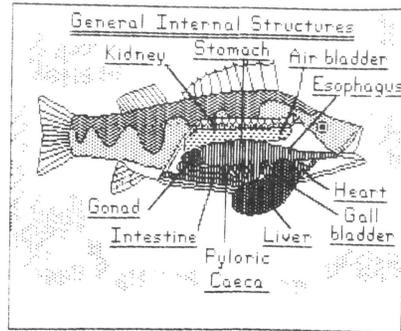
ANUS - Opening at posterior that is used for the elimination of waste.

LIVER - Large brownish-colored organ containing several lobes. Produces bile.

GALL BLADDER - Stores bile from the liver.

SPLEEN - Technically not part of the digestive system although it does break down old blood cells and recycle them.

D) GENERAL INTERNAL PARTS



AIR BLADDER - Thin-walled sac that keeps fish from sinking. Contains oxygen + carbon dioxide + nitrogen.

HEART - Organ responsible for pumping blood around the body.

KIDNEY - Removes organic waste from the blood. Located against the ventral surface of the spinal column.

ESOPHAGUS - Tube that carries food from the mouth to the stomach.

LIVER - Large brownish colored organ containing several lobes. Produces bile.

GALL BLADDER - Stores bile from the liver.

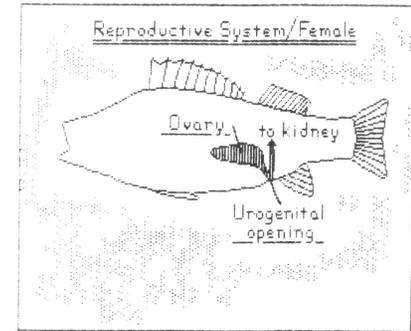
PYLORIC CAECA - Finger-like structures near the beginning of the intestine that release digestive enzymes.

INTESTINE - Area where food is digested and absorbed.

STOMACH - Muscular storage sac. Grinds and crushes food. Starts the process of digestion.

GONAD - Reproductive organ of perch. Testis in males and ovary in the female.

E) REPRODUCTIVE SYSTEM



TESTIS - (Testes-plural) produces sperm cells in the male.

SPERM DUCT - Carries sperm cells during the mating process.

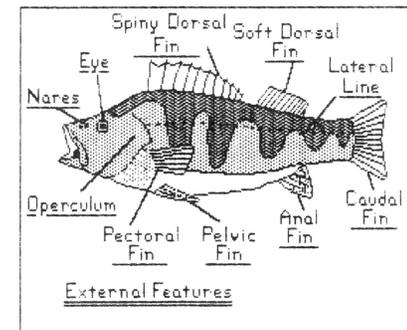
UROGENITAL OPENING - Opening posterior to the anus where sperm is released.

OVARY - Produces egg cells in the female.

OVIDUCT - Passageway for eggs to get outside female's body.

UROGENITAL OPENING - Opening posterior to anus where eggs are released.

F) EXTERNAL FEATURES



LATERAL LINE - Depth sensing structure on the side of the perch that senses any changes in water pressure.

NARE - Nostril-like openings on head that lead to chemical receptors.

OPERCULUM - Plate-like covering of the gills.

ANAL FIN - Fin near anus that helps balance the perch.

PECTORAL FIN - Fins nearest head that are used for balance as well as forward and backward movement.

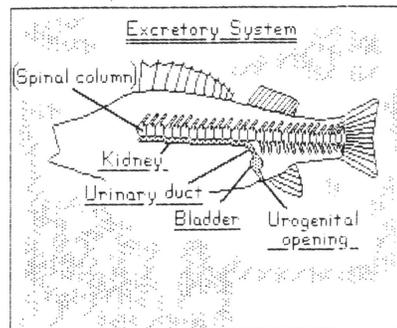
PELVIC FIN - Pair of fins on ventral surface used for movement and balance.

EYE - Structures for sight found on both sides of the perch's head.

SPINY DORSAL FIN - Larger dorsal fin at the anterior used for protection. It also functions as a keel.

SOFT DORSAL FIN - Smaller dorsal fin at the posterior which functions as a keel.

CAUDAL FIN - Large tail fin. Used for propelling fish forward.



G) EXCRETORY SYSTEM

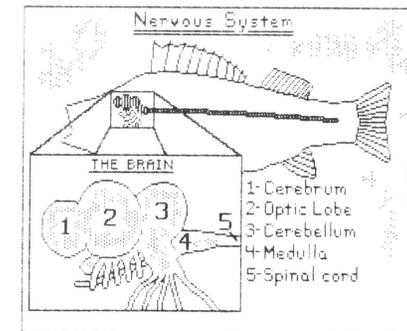
KIDNEY - Removes organic waste from the blood. Located against the ventral surface of spinal column.

UROGENITAL OPENING - Opening posterior to the anus where wastes are released.

URINARY BLADDER - Storage area for the nitrogen wastes from the kidney.

URINARY DUCT - Duct connecting kidney to the urinary bladder.

H) NERVOUS SYSTEM



BRAIN - Primary organ in the nervous system. Controls the center of the body.

SPINAL CORD - Main nervous system that is contained within the backbone. Carries messages to the entire body.

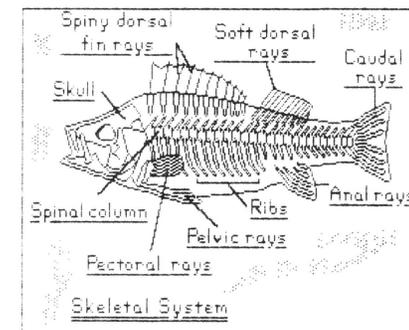
OPTIC LOBE - Receives messages from the eyes and other sensory organs. Sends messages to other brain parts.

CEREBELLUM - Part of brain that controls muscular activities.

CEREBRUM - Part of the brain that interprets smell and chemical sensation.

MEDULLA - Controls activities of the internal organs.

I) SKELETAL SYSTEM



SPINAL COLUMN - Protective vertebrae that surround the spinal cord. Provides support for other bones.

SKULL - Part of skeleton that encloses and protects the brain as well as supports jaws.

RIBS - Part of the skeleton that forms a protective cage around the internal organs.

SKELETON - The internal bony framework that gives support to the body.

SPINY DORSAL/ SOFT DORSAL/ CAUDAL/ ANAL/ PELVIC/ PECTORAL RAYS
Bony structures that give support to external appendages.

GUIDELINES FOR A PERCH DISSECTION

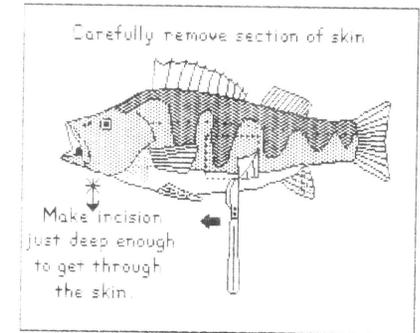
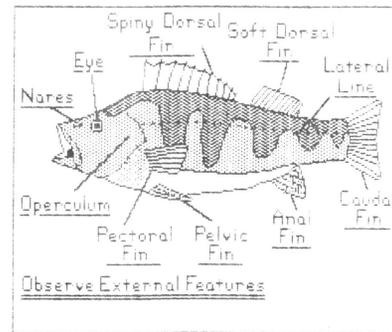
The following dissection may be used in conjunction with any type of biology or life science text. It may also be used as a pre-dissection activity to acquaint students with the general perch dissection guidelines or as a post-dissection activity to reinforce vocabulary and concepts covered in an actual perch dissection.

This program uses only a few keys:

<-- LEFT ARROW KEY (Back up a page.)
--> RIGHT ARROW KEY (Go ahead to the next page.)
'RTN' RETURN KEY (Switch between text and graphics.)
'ESC' ESCAPE (Get out.)

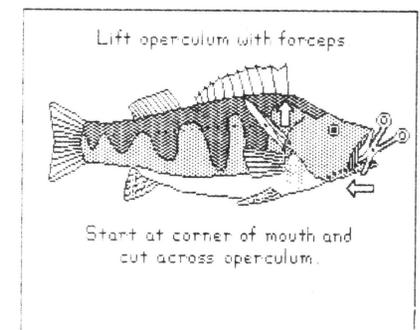
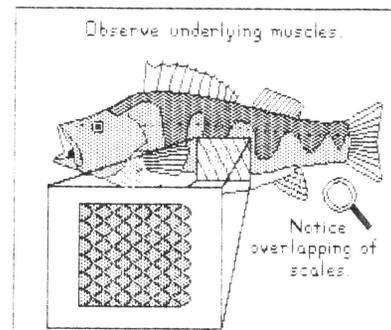
We shall begin this dissection by observing the external features of the perch. Notice the structure and placement of the different fins. The spiny and soft dorsal fins are found on the dorsal surface. The pectoral fins are found on the sides. The pelvic and anal fins are found on the ventral surface and the caudal fin is at the posterior. The nares are the nostril-like holes between the mouth and eyes.

Observe the operculum or gill cover. Move it up and down. Notice where and how it is attached. Take special note of the lateral line which extends along each side of the fish.



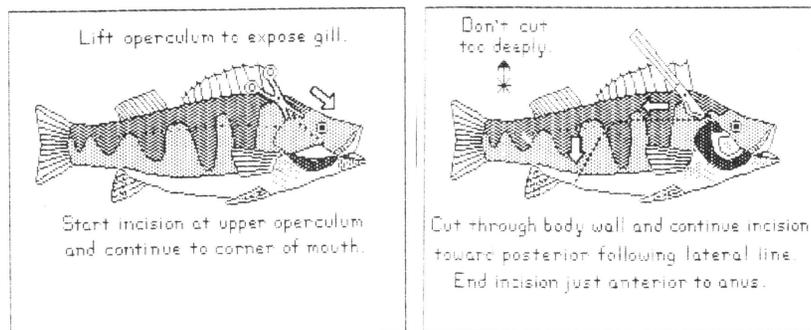
Let's take a closer look at the skin and underlying muscles. Using your scalpel, carefully remove a section of skin as shown in the picture. Try to cut only the skin and not too deeply into the underlying muscle. The scales will provide some resistance when cutting, so be patient. Peel back the skin as the incisions are made.

Once the skin section is removed, use a hand lens or magnifier to examine the overlapping structure. This provides the fish with a protective armor that is very flexible. Also examine the muscles of the fish. Notice how the muscles are well suited for an undulating or back-and-forth motion. This type of motion is most efficient for moving through the water.



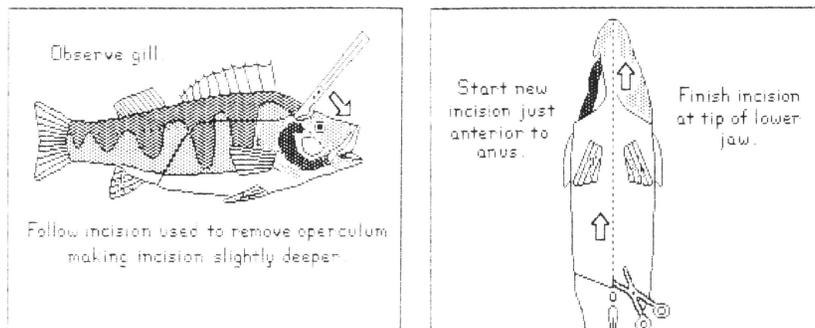
Turn the fish over to the right side. We shall now examine the placement and structure of a gill. In order to do so we must first remove the operculum or gill cover. Using your scissors, cut from the corner of the mouth to the lower posterior section of the operculum. (See illustration.) Lift the operculum with your forceps while you are cutting. It makes it easier to see what you are doing.

We shall now finish the removal of the operculum. Find the point at which the dorsal-most part of the operculum joins the head. Insert your scissors under the edge of the operculum and cut from that point to the corner of the mouth. (See the picture.) Sever any tissue that may still be connected and remove the operculum.



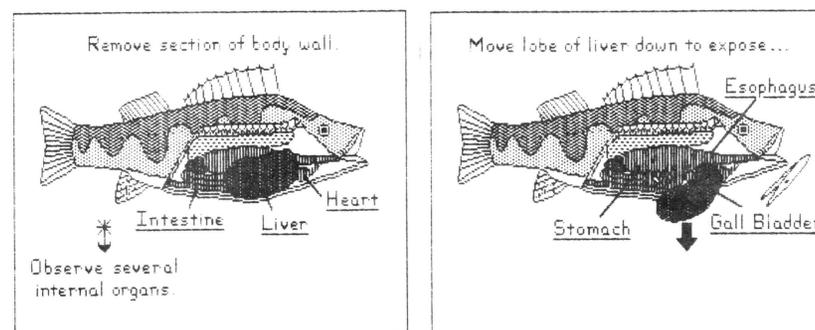
Observe the placement and structure of the gills. Next we shall remove a section of the body wall. Begin the incision at the point where the dorsal-most part of the operculum was attached. Continue this incision toward the posterior following the lateral line. (See picture) Cut deeply enough to cut through the ribs, but not so deeply as to damage the organs beneath them. Near the posterior end of the spiny dorsal fin, start curving the incision toward the anus. (See picture) End the incision just anterior to the anus.

Be sure the gill has been observed before the next incision is made. The next incision will follow the same line that was used to remove the operculum. The only difference is that we will make the incision deeper. This incision may be difficult because some bone must be cut. End this incision at the corner of the mouth. Use a great deal of care while cutting!



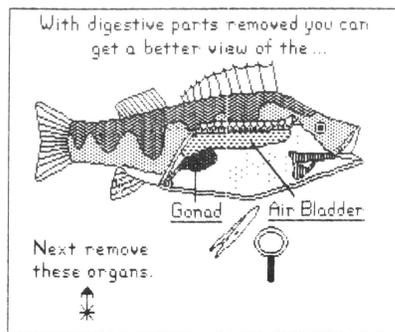
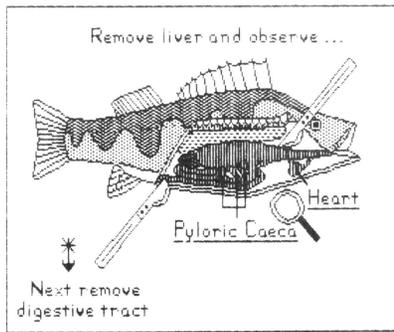
Next the perch should be turned ventral side up. Start an incision just anterior to the anus. Using your scissors cut in a straight line toward the tip of the lower jaw. Keep the blade of the scissors pressed tightly against the inside of the body wall. This will stop you from cutting too deeply. Finish the incision by cutting through the lower jaw.

In order to remove the section of the body wall, you may have to cut tissues that still remain attached. Observe the liver and the intestine. Also observe the heart. Notice how it is separated from the other internal organs.



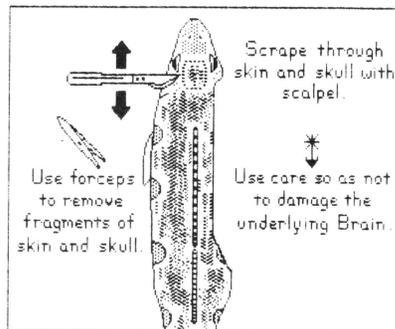
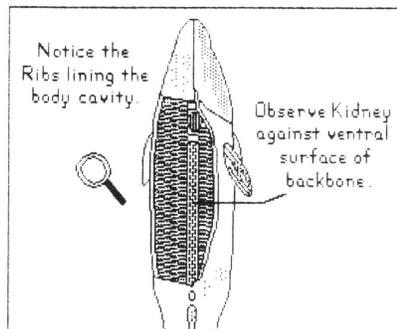
Using your forceps, move the liver. You should then have a better view of the large whitish colored stomach. Between the lobes of the liver you should be able to find the gall bladder. It is a greenish color. After these structures have been observed, the liver should be removed. This should be done carefully, one lobe at a time. When the liver is removed you may proceed to the next step.

Once the liver is removed you should have a better view of the pyloric caeca. They are tiny finger-like projections extending from the first section of the intestine. The heart can also be observed more closely once the liver is removed. Once these organs have been observed, you may continue by removing the digestive tract. Using your scalpel, carefully cut through the esophagus just anterior to the stomach. You should also cut through the intestine at a point just before it reaches the anus.



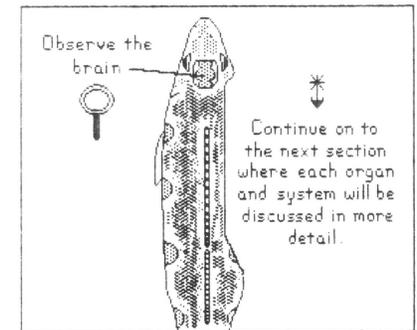
The bladder and gonads (testes or ovaries) should now be easily observed. The bladder is a structure that is used to give the perch buoyancy which keeps it from sinking. This bladder contains carbon dioxide, oxygen, and nitrogen. After you have observed these structures you should use your forceps to remove them.

Turn the perch over so you can look into the body cavity. You should be able to observe the kidneys of the perch pressed against the inside of the spinal column. After observing the kidneys you may proceed to the next step.



Turn the perch over so the dorsal surface is up. Using your scalpel carefully scrape away the scales, skin, flesh, and bone between and slightly posterior to the eyes. (See picture) Be careful not to press too hard on the skull. Remove any loosened skin or bone with your forceps. Break away sharp bone edges with the forceps.

Once the skull has been scraped away, the brain may be observed. Observe the different sections or lobes of the brain. You may wish to make this hole larger in order to observe how the brain is attached to the spinal cord.

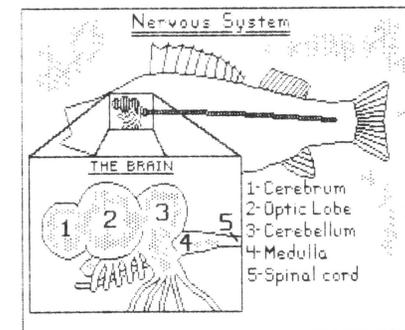


In the next section, each major system of the perch will be discussed in some detail. Using your dissected specimen, locate and investigate each system as well as the organs it contains.

INTERNAL SYSTEMS

In this section of the program, we shall take a closer look at several of the perch's internal systems and the functions of each. By using your dissected specimen for reference, you should be able to identify many of the structures and systems that will be discussed here.

NERVOUS SYSTEM



The nervous system of the perch is made up of the brain, spinal cord, and the thousands of nerves that branch to all parts of the body. The brain which is the control center of the body is protected within the skull. It is made up of several distinct parts and each of these parts has a special function.

The anterior-most section of the brain is the cerebrum. Its function is to control the voluntary muscles. It is also the center of the instincts.

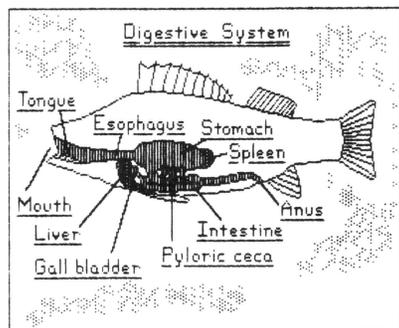
The optic lobes are found posterior to the cerebrum. They are the largest parts of the brain. These lobes receive signals from the eyes and are able to send messages to the other brain parts.

The cerebellum is found just behind the optic lobes. This is the center of coordination for the perch's muscles.

The medulla is located posterior and ventral to the cerebellum. It actually is the 'stem' of the spinal cord. The primary function of the medulla is to control the internal organs. These are such things as the heart, intestines, liver, etc.

The spinal cord is connected to the medulla and extends toward the posterior enclosed in the spinal column. It takes messages from the brain to all of the smaller nerves in the body.

DIGESTIVE SYSTEM



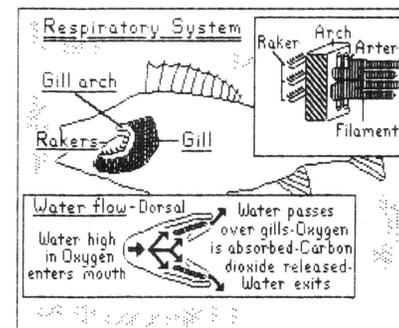
The digestive system of the perch begins at the mouth. The jaws are lined with many tiny teeth that all point toward the throat. Once the prey is trapped in the mouth it stands little chance of escape. Within the mouth we find the tongue. It is located on the bottom jaw. It does not function in the same ways as the human tongue but it does have special structures that give the perch a sense of taste and allow it to sense certain chemicals in the water.

The food travels through a tube called the esophagus before it enters the stomach. The stomach is straight which makes it possible for the perch to swallow very large prey. The stomach stores the food and starts the process of digestion.

From here the food moves into the intestine. On the first section of the intestine we find tiny finger-like projections called pyloric caeca. The function of the pyloric caeca is to release special digestive enzymes into the intestine. The liver produces bile which is stored in the gall bladder. The bile is released into the intestine and helps in the digestion of fats. While in the intestine the food is chemically digested and the nutrients absorbed. Any unusable material is eliminated through the anus.

The spleen is used for breaking down and recycling worn out blood cells.

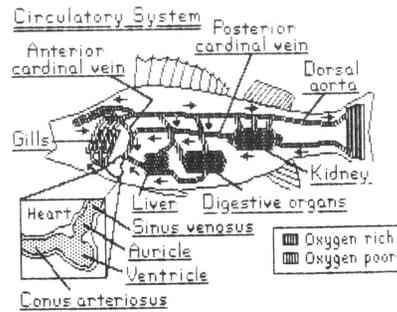
RESPIRATORY SYSTEM



The respiratory system has one main organ. This is the gill. The perch has four gills on each side. The gills are enclosed and protected by a hard plate called the operculum. The gills are thin, thread-like and are called filaments. These filaments are filled with tiny capillaries. These capillaries allow the blood to come in close contact with the water where the oxygen diffuses into the blood and the carbon dioxide diffuses out.

The filaments are given support by the gill arch. The gill arch is made of cartilage and contains the arteries that take blood to and from the filaments. On the anterior of the gill arches are found the rakers. The gill rakers are hard bone-like projections that are able to catch foreign particles before they are able to get to the gills. This may include vegetation, food particles, or other things.

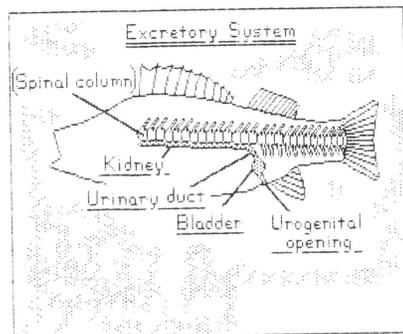
CIRCULATORY SYSTEM



The circulatory system of the perch is made up of the blood, arteries, veins, and the heart. The heart of the perch is made up of two main chambers; an auricle and a very muscular ventricle. The blood is similar to the blood of most other vertebrates in that it contains red and white cells.

The blood is forced out of the heart and into the conus arteriosus. This vessel joins the ventral aorta which leads to the gills. In the gills the carbon dioxide in the blood is exchanged for oxygen. The blood then continues into the dorsal aorta where it is distributed to the anterior and posterior of the fish. While circulating through the body, the oxygen is used and replaced with carbon dioxide. The blood is also responsible for food delivery and waste removal as well as numerous other functions. After picking up a load of carbon dioxide the blood rushes back to the heart through the veins. The veins come together into a thin-walled structure called the sinus venosus. From here the blood moves into the upper chamber of the heart or the auricle. From the auricle the blood is squeezed into the lower chamber or ventricle. The ventricle then forces the blood out under high pressure into the ventral aorta. The cycle then starts over.

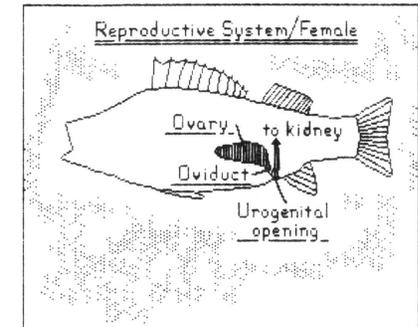
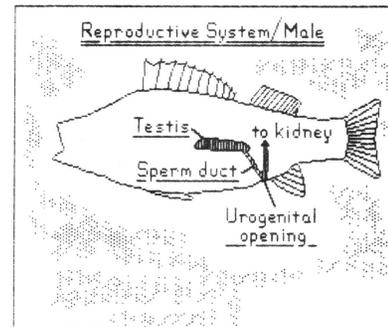
EXCRETORY SYSTEM



The excretory system of the perch is made up of one main organ. This organ is the kidney. The kidneys are located dorsal to the air bladder and just below the spinal column. The dorsal aorta runs just between them. The primary function of the kidney is to filter nitrogen wastes from the blood. This waste leaves the kidney through the urinary duct and is stored in the urinary bladder until it is eliminated from the body through the urogenital opening.

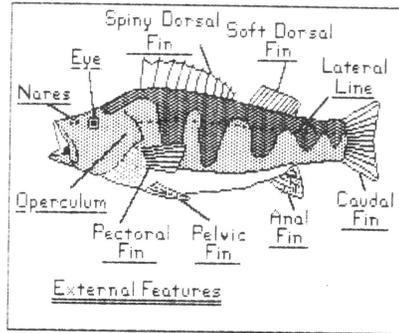
REPRODUCTIVE SYSTEM

The main organ in the males perch's reproductive system is the testis (plural-testes) This is the organ that produces the sperm or milt. The sperm is moved out of the testes, through the sperm duct, and out of the body at the urogenital opening. This sperm is then spread over the eggs laid by the female.



The main organ in the female perch's reproductive system is the ovary. The ovary is responsible for producing the eggs or female reproductive cells. These eggs are deposited on the bottom of a lake or stream. The male then passes over them, depositing the milt or sperm cells. In order to pass out of the body, the eggs must pass from the ovary through the oviduct and out through the urogenital opening.

EXTERNAL FEATURES

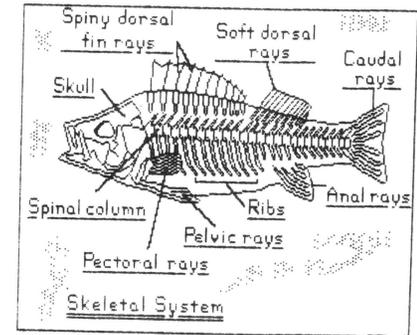


The perch has several distinct external features. We shall begin at the anterior end with the nare. The nare is a nostril-like structure located just anterior to the eye. It contains receptors which are used for smell. Also located in the head region is the operculum which is the protective plate which protects the gills. The main body of the perch consists of the remaining external features.

The lateral line starts just posterior to the operculum and runs the length of the perch's body on both sides. The job of the lateral line is to sense pressure changes and detect vibrations in the water. This is important for checking depth or an enemy's presence.

The perch has several different fins, each with a specific function. The pectoral fins are the fins nearest to the head. These fins are used to balance the fish and move it slowly backward or forward. Ventral to these fins are the pelvic fins. These are responsible for balance and steering the perch. On the ventral surface near the anus we find the anal fin. This fin helps to keep the perch stabilized as it swims. On the dorsal surface we find the spiny and soft dorsal fins. They both help to stabilize the fish and, in addition, the spiny dorsal fin acts as a protective device. By raising this fin the perch makes it almost impossible for an enemy to swallow it posterior end first. The caudal fin is also called the tail fin. It provides the main swimming thrust to propel the perch forward.

SKELETAL SYSTEM



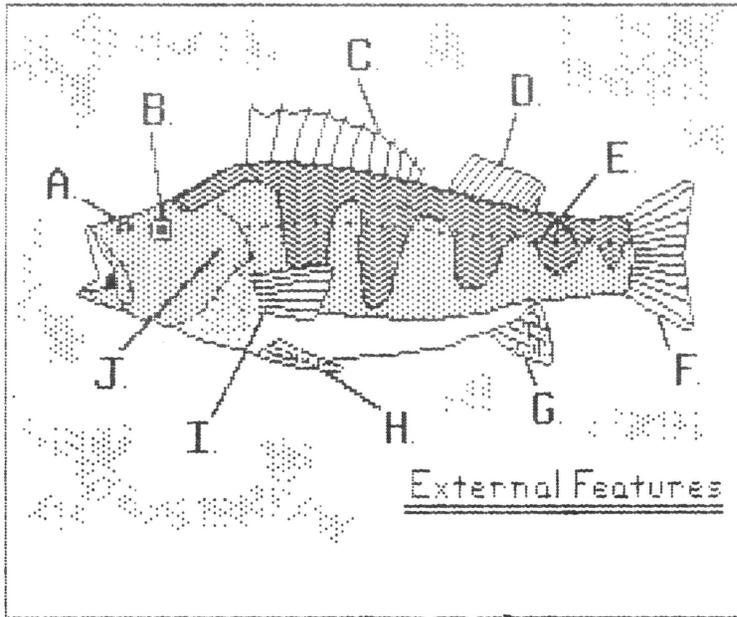
The skeletal system of the perch is made up of many different bones. In this dissection we shall discuss only a few of the most important ones.

The main bone structure that makes the perch a vertebrate is its backbone. This is also called the spinal column. It gives support to many of the other bones in the system. It also protects the delicate spinal cord that extends from the brain.

The skull of the perch is very important in that it encloses and protects the brain. It also provides support for the jaws.

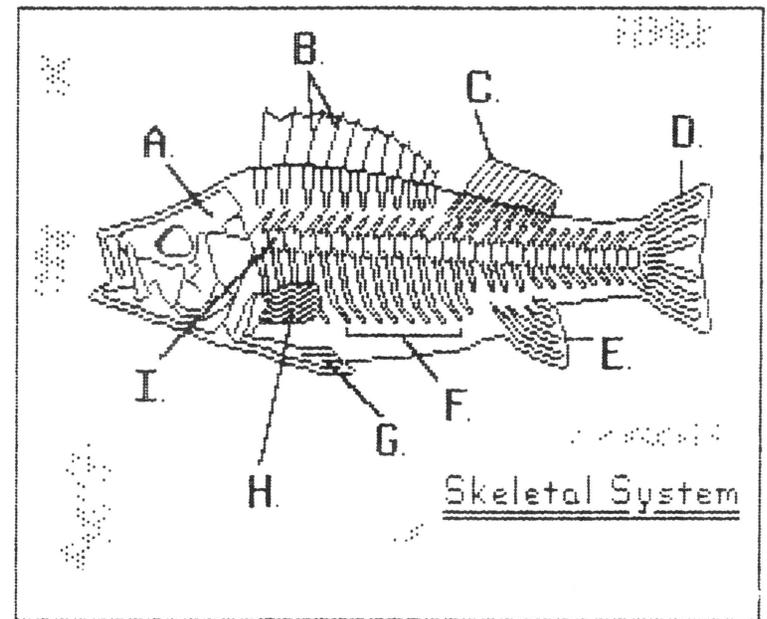
The ribs are supported by the spinal column. They are responsible for giving form and protection to the abdominal cavity which encloses the vital organs.

The different rays of the perch all have the same basic function. They all give support to the fins.



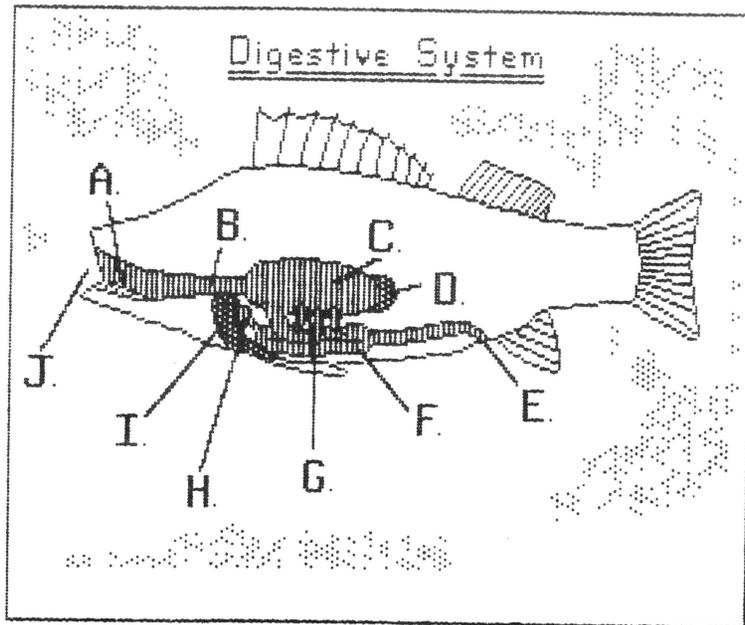
EXTERNAL FEATURES TEST

- 1. LATERAL LINE
- 2. EYE
- 3. ANAL FIN
- 4. PECTORAL FIN
- 5. PELVIC FIN
- 6. SPINY DORSAL FIN
- 7. NARES
- 8. SOFT DORSAL FIN
- 9. OPERCULUM
- 10. CAUDAL FIN



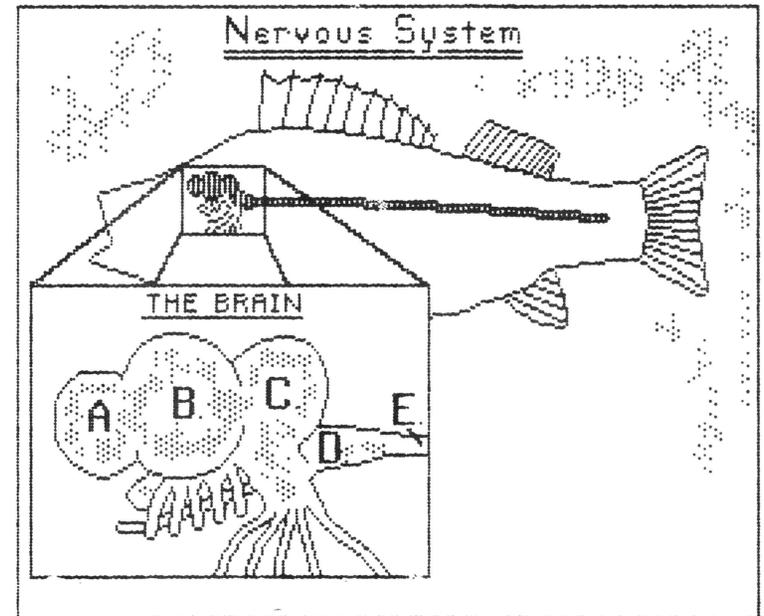
SKELETAL SYSTEM TEST

- 1. CAUDAL FIN
- 2. SPINAL COLUMN
- 3. SPINY DORSAL RAYS
- 4. ANAL FIN
- 5. SOFT DORSAL FIN
- 6. SKULL
- 7. PELVIC FIN
- 8. RIBS
- 9. PECTORAL FIN



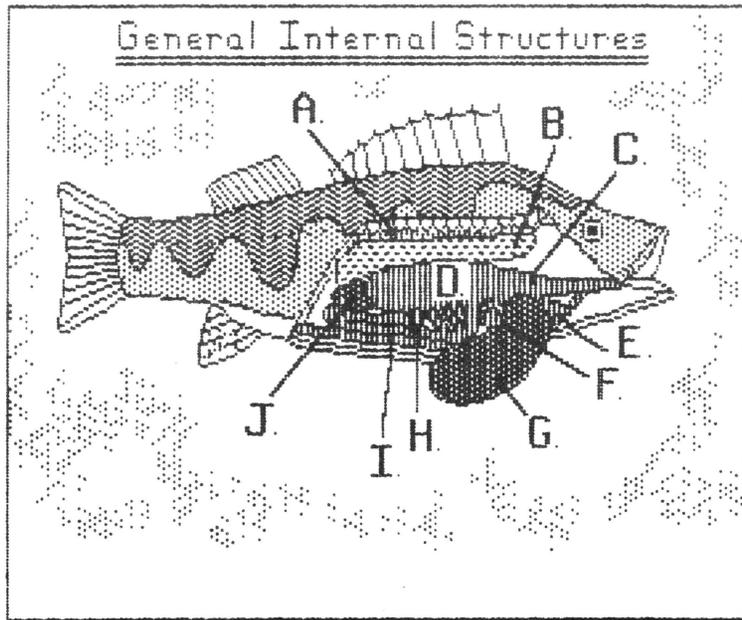
DIGESTIVE SYSTEM TEST

- ___ 1. LIVER
- ___ 2. STOMACH
- ___ 3. ESOPHAGUS
- ___ 4. PYLORIC CAECA
- ___ 5. ANUS
- ___ 6. TONGUE
- ___ 7. INTESTINE
- ___ 8. MOUTH
- ___ 9. GALL BLADDER
- ___ 10. SPLEEN



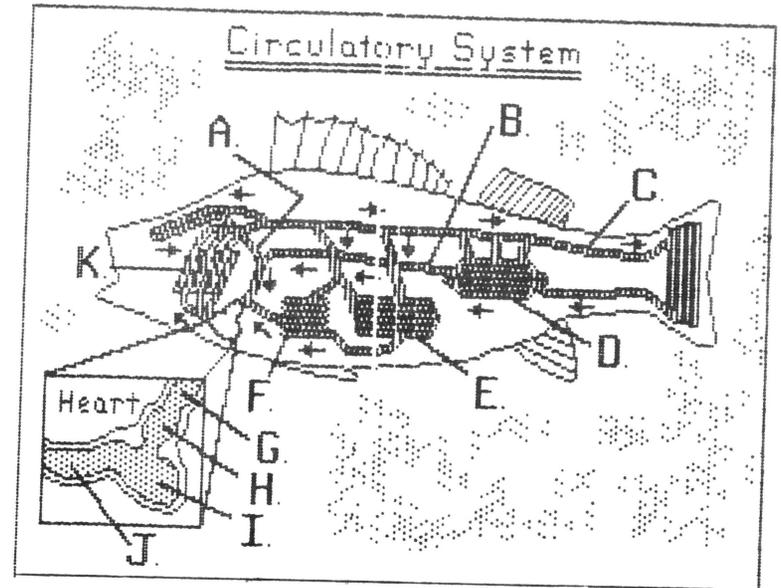
NERVOUS SYSTEM TEST

- ___ 1. MEDULLA
- ___ 2. OPTIC LOBE
- ___ 3. SPINAL CORD
- ___ 4. CEREBRUM
- ___ 5. CEREBELLUM



INTERNAL STRUCTURES TEST

- ___ 1. GONAD
- ___ 2. AIR BLADDER
- ___ 3. GALL BLADDER
- ___ 4. ESOPHAGUS
- ___ 5. KIDNEY
- ___ 6. INTESTINE
- ___ 7. STOMACH
- ___ 8. LIVER
- ___ 9. HEART
- ___ 10. PYLORIC CAECA



CIRCULATORY SYSTEM TEST

- ___ 1. LIVER AREA
- ___ 2. POSTERIOR CARDINAL VEIN
- ___ 3. VENTRICLE
- ___ 4. ANTERIOR CARDINAL VEIN
- ___ 5. DORSAL AORTA
- ___ 6. VENTRAL AORTA
- ___ 7. GILL AREA
- ___ 8. KIDNEY AREA
- ___ 9. AURICLE
- ___ 10. DIGESTIVE ORGAN AREA
- ___ 11. SINUS VENOSUS

MULTIPLE CHOICE TEST

- ___ 1) All of the following are external structures except the
A) nares. C) caudal fin.
B) operculum. D) pyloric caeca.
- ___ 2) The air bladder...
A) removes waste from the blood.
B) is part of the respiratory system.
C) stops the fish from sinking.
D) helps the heart.
- ___ 3) Which of these is part of the digestive system?
A) sinus venosus C) medulla
B) air bladder D) liver
- ___ 4) Oxygen enters the perch's bloodstream in the...
A) intestine. C) scales.
B) gills. D) caudal fin.
- ___ 5) All of these are fin types except...
A) optic B) pelvic C) pectoral D) caudal
- ___ 6) The cerebellum...
A) controls muscle movement.
B) controls internal organs.
C) gets information from the eyes.
D) senses chemicals in the water.
- ___ 7) The egg laying of the female is called...
A) circulating. C) sensing.
B) fertilizing. D) spawning.
- ___ 8) The main function of the caudal fin is to...
A) stabilize the fish. C) move the fish forward.
B) balance the fish. D) none of these
- ___ 9) The air bladder contains...
A) oxygen. C) carbon dioxide.
B) nitrogen. D) all of these
- ___ 10) Most of the food absorption takes place in the...
A) stomach. C) bladder.
B) intestine. D) gills.

TRUE / FALSE TEST # 1

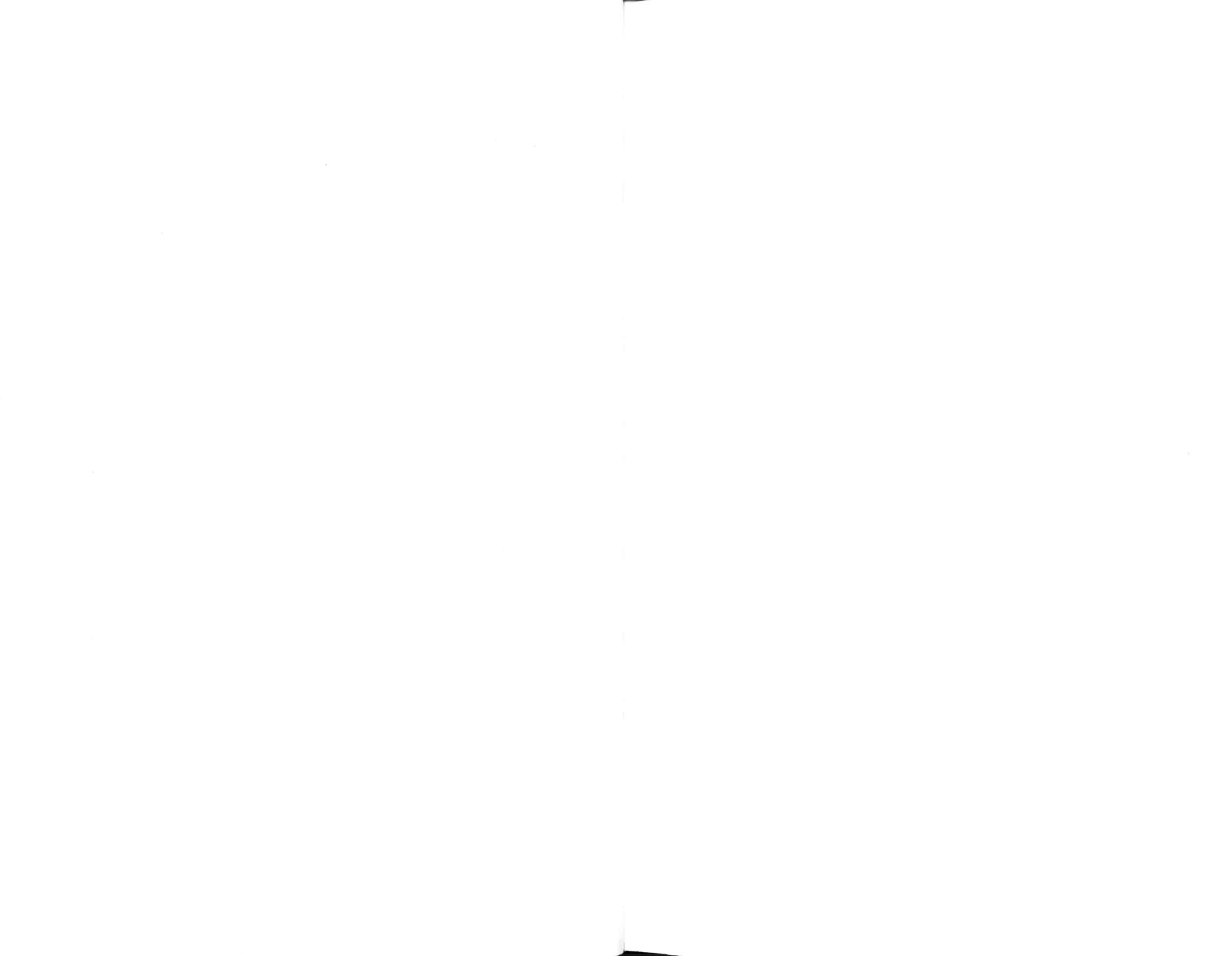
- ___ 1. The perch is a vertebrate.
- ___ 2. The body temperature of the perch is the same as its surroundings.
- ___ 3. The perch's heart has two chambers.
- ___ 4. The operculum covers the heart.
- ___ 5. The male gonads are called ovaries.
- ___ 6. The air bladder helps the perch breathe.
- ___ 7. The kidney is the main organ in the excretory system.
- ___ 8. The pyloric caeca are part of the circulatory system
- ___ 9. The largest part of the brain is the medulla.
- ___ 10. The lateral line senses depth.

TRUE / FALSE TEST # 2

- ___ 1. The perch is an invertebrate.
- ___ 2. The perch is cold-blooded.
- ___ 3. The perch's heart has three chambers.
- ___ 4. The operculum is an external structure.
- ___ 5. The female gonads are called ovaries.
- ___ 6. The air bladder helps in digestion.
- ___ 7. The main organ in the circulatory system is the kidney.
- ___ 8. The pyloric caeca are a part of the digestive system.
- ___ 9. The largest part of the brain the cerebrum.
- ___ 10. The lateral line is used for smell.

TRUE / FALSE TEST # 3

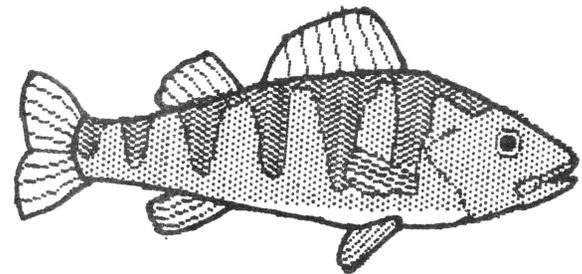
- ___ 1. The perch has a backbone.
- ___ 2. The perch is warm-blooded.
- ___ 3. The perch's heart has four chambers.
- ___ 4. The operculum covers the gills.
- ___ 5. The male gonads are called testes.
- ___ 6. The air bladder helps to circulate the blood.
- ___ 7. The main organ in the respiratory system is the gill.
- ___ 8. The pyloric caeca are part of the nervous system.
- ___ 9. The largest part of the brain is the cerebellum.
- ___ 10. The lateral line has no useful function in the perch.



APPLE

**COMPUTER
BIOLOGY
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PERCH



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