



FISH LATERAL LINE SYSTEM

By Dale Barrett

The lateral line system, found in many fishes and in some aquatic amphibians, is sensitive to differences in water pressure. These differences may be due to changes in depth or to the current like waves caused by approaching objects. The basic sensory unit of the lateral line system is the neuromast, which is a bundle of sensory and supporting cells whose projecting hairs are encased in a gelatinous cap. The neuromasts continuously send out trains of nerve impulses. When pressure waves cause the gelatinous caps of the neuromasts to move, bending the enclosed hairs, the frequency of the nerve impulses is either increased or decreased, depending on the direction of bending.

Neuromasts may occur singly, in small groups called pit organs, or in rows within grooves or canals, where they are referred to as the lateral line system. The lateral line system runs along the sides of the body onto

the head, where it divides into three branches, two to the snout and one to the lower jaw.



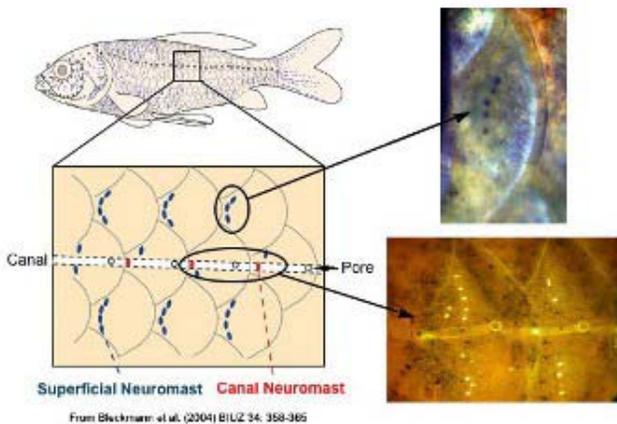
Neuromast in a row commonly known as the lateral line.

Neuromast pit organs on the top of the head and commonly located around the lower part of the eye.

The lateral line system is a collection of small mechanoreceptive patches or neuromasts located superficially on the skin or just under the skin in fluid-filled canals on the head and body of all fishes. The mechanoreceptive component of the neuromast is the hair cell - the same sensory cell found in all vertebrate ears, including the human ear.



A swimming fish sets up a pressure wave in the water that is detectable by the lateral line systems of other fishes. It also sets up a bow wave in front of itself, the pressure of which is higher than that of the wave flow along its sides. These near-field differences are registered by its lateral line system. As the fish approaches an object, such as a rock or the glass wall of an aquarium, the pressure waves around its body are distorted, and these changes are quickly detected by the lateral line system, enabling the fish to swerve or to take other suitable action. Because sound waves are waves of pressure, the lateral line system is also able to detect very low-frequency sounds of 100 Hz or less.



Lateral Line Physiology and Anatomy

These cells convert mechanical energy into electrical energy when their apical hairs or "cilia" are displaced. The nerves contacting these receptors enter the brain in close association with the auditory processing areas of the fish nervous system. Although auditory and lateral line pathways in the central nervous system are separate, they are largely parallel and share many of the same organizational features and may share common principles of operation.

The receptors in the lateral line are neuromasts, each of which is composed of a group of hair cells. The hairs are surrounded

by a protruding jelly-like cupula, typically 1/10 to 1/5 mm long. The hair cells and cupulas of the neuromasts are usually at the bottom of a visible pit or groove in the fish. The hair cells in the lateral line are similar to the hair cells inside the vertebrate inner ear, indicating that the lateral line and the inner ear share a common origin.

Methods of Producing Realistic Lateral Lines

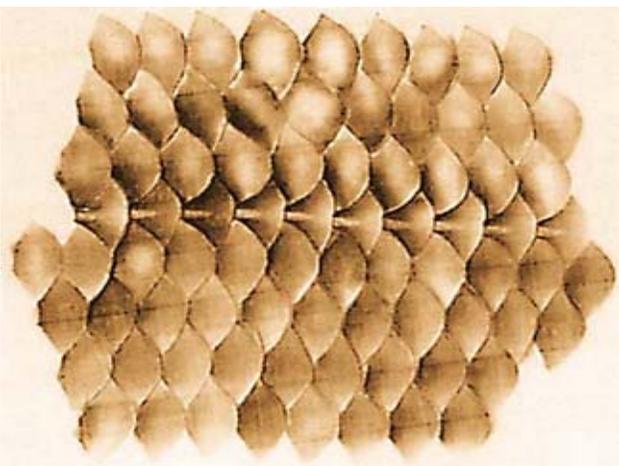
A- Carving with a pear or drum shaped diamond bit - The lateral line is one of the more prominent features in the overall surface of the fish. The placement, direction, and thickness will depend upon the reference



material used and the species of fish. In this method you simply draw the lateral line on the side of the fish and then using a diamond bit of your preference, cut on both sides of the pencil line to create a raised line. This anatomical feature must be consistent in its height, width, and direction.



B- Burning Technique – This produces a very realistic lateral line and is done as you burn the scales in your carving. The most important step to this process is to start your scale-burning pattern from the lateral line and work outward. It's best to draw your lateral line on the side of the fish with a pencil and then start your scale pattern. As you burn scales over the lateral line you simply use the edge of your scale pen and burn lightly on each side of the pencil line. Below is a picture of the results, again as in all techniques, practice makes perfect.



C- Pat Kennedy Scale burning tip - The Pat Kennedy Fish Scale System was designed exclusively for Colwood's woodburning tools. It is available through various suppliers for the cost of around \$29.95.

D- Barrett Scale tool - This tool was introduced by Dale Barrett and is a combination tool that does both scales and lateral lines by embossing. The medium trout scale tool has the lateral line maker cut into the tool. They are available through Cascade Carvers Supply in Kennewick, Washington.



First, draw in the lateral line with pencil.



Align the lateral line notch with the pencil line. With continual pressure; pull the tool along the pencil line. Practice to determine the pressure needed for your carving.



Sand lightly along the lateral line with fine grit sand paper to blend the depression back into the body of your carving.



E- Embossing Star Wheel - This is an excellent method if you are doing a smoothie to minimize the effect of texture yet create a nice looking lateral line. The process is relatively simple and requires little practice. Purchase a star wheel at your local craft store and roll it across the lateral line you have drawn with your pencil.



G.- Vail Scale Thread Technique - This is another one of those methods that will require some practice to perfect, but is very effective in doing a smoothie with a veil scale technique. If you recall in our Scale Tipping Journal the veil scale is created by spraying a semi-transparent coat of silver or gold over wedding veil material that is adhered to the surface of your carving. All you do in this case is to lay a piece of thread on top of the veil material where you want the lateral line to appear. Once you spray with a semi-transparent coat of paint and remove the veil material, your lateral line will appear much like the scales you created using this method.

F- Texturing technique - This technique produces very nice results and is an excellent backup in the event you forget to put the lateral line on before you do your scaling technique. There are several products out in the market that works well for this process. I prefer using a 00 size brush and paint a small amount of Jo Sonja's texture paste on the trailing edge of the scales where the lateral line should be on the carving.



H.- Reverse Embossing with Water Re-hydration - This method is very effective but will take some practice to perfect. The first thing you do is mark your lateral line



with a pencil. You then take an embossing tool of your choice and depress the pencil line on the wood being careful to not break the fibers of the wood.



You then sand down the carving to the level of the depressed lateral line. Next you lay a thin bead of water on the lateral line.



The water will cause the depressed lateral line to re-hydrate and rise above the rest of the wood. Practice and experimentation will be needed to produce competitive results.



Rainbow Trout by Dale Barrett

Dale Barrett is a gifted artisan that has won many awards in the international fish carving community. He dedicates his time and talents to teaching others the art of fish carving. Dale is a founding board member of the National Fish Carvers Guild and is currently Secretary of the NFCG.

