DISTRIBUTION OF FISHES

By John Bondhus

The range and potential range of any species of fish are very important. The current range when compared with habitat requirements can usually tell you if a species exists in a given body of water even before you look for them. Potential range can give clues to possible success in stocking a new species as well as warn of potential dangers of their introduction in a new area where they may spread rapidly.

There are four types of barriers that work together to determine actual range. For simplicity lets call them temperature, water chemistry, habitat, and physical barriers. Although habitat could also include temperature and water chemistry, lets keep 4 headings for the sake of explanation.

Water temperature often controls the northern and southern limits of a species range. There are several types of temperature and probably only one acts as the final barrier in a given area. Examples of temperature variations are the upper and lower extreme temperature, average upper temperature range or lower temperature range and range between upper and lower temperature, time of temperature variation compared to photo period and daily temperature fluctuation.

In Northern Pike, for example, the range is probably determined by spawning conditions. The range lies very near to the 50° July isotherm line in the north on a climate map and the 40° January isotherm line in the south. This means the Northern Pike must warm up to 50° in the summer before the fish will spawn in the spring and won't spawn unless the temperature is down to at least 40° or colder in the winter which is approximately the temperature Northerns spawn at.

In most cases the temperature limits would not be strict clean cut borders but would have many stragglers extending further beyond the boundries for some distance depending on the way the temperature difference affects the species in question. In addition to the Northern and Southern limits, other areas such as spring fed streams that never fluctuate enough to reach both these 40 and 50° extremes would not allow Northern Pike to spawn even though they may be very comfortable at the temperature of the creek. Hot springs and power plant heated water could be potential spawning limitations as the Pike could seek the warmer temperature even in the winter and never get cold enough to spawn in the spring but research has not yet checked out this idea.

Water chemistry includes factors such as alkalinity--acidity or P.H. hardness, total dissolved solids, turbidity, salinity, various poisons and pollution. Normally the water chemistry barriers except salinity can be local barriers but P.H. and hardness can be major factors as the Black Banded Sunfish seems to be restricted to the acid waters of the eastern central coastal area and even the far ranging Chain Pickerel may be limited to the softer water regions of the U.S. when comparing its range to a map of surface water hardness of the U.S. Turbidity also can cover large areas such as many western states which have little vegetation to help keep runoff water clear and probably prevents many eastern species from spreading westward.

Other habitat barriers are areas where a stronger competitor species prevents the spread of a species or areas where its natural forage is missing thus preventing its spread. Competitive introductions such as the sea lamprey and common Carp have decreased the range of many species.

Suitable habitat for some stage of their life history or spawning of a fish can restrict its range such as a fish from fast moving streams that can not spawn in still or slow moving water thus trout and sculpin are usually found in hilly areas and sunfish in slow rivers and lakes. Factors such as bottom type prevent walleyes and trout from spawning successfully in silt bottom lakes. A specific disease or parasite could be a limiting factor if the parasites range is limited to a specific area and of course fishing pressure near a metropolitan area can eliminate many of the longer lived species such as sturgeon and muskellunge.

Another factor is seasons of high and low water flow. An early spring spawning fish who lays eggs in shallow water relying on floods to keep them covered with water wouldn't survive long in an area where water levels are lowering every spring.

Physical barriers are very important to distribution and in most cases limit at least parts of a species range. Since fish can't walk or fly, they are confined to river systems and the lakes in them that are connected to the river system. The biggest reason river systems are used to show the range of a species is that once in a given river the species can spread rapidly through the system to all connecting lakes and streams until it reaches a barrier of some type. Possible barriers are physical barriers such as waterfalls, rapids, and dams and the chemistry, temperature, and habitat barriers mentioned previously.

Once a species gains access to an area and occupies the area except where barriers prevent its spread, it then waits until opportunities arise that allow it to cross the barriers. Short barriers such as waterfalls, and nearby landlocked lakes are often crossed during floods or birds and animals carrying fish or fish eggs on them from one body of water to the other. This type of spreading takes a lot of time and the number of barriers a particular species has managed to get over often gives a clue as to how long it has been in the area. Waterfalls are especially good for this as in many cases they were not waterfalls throughout their history and most of the species above them were present in the area before the falls formed a time barrier. A check of geological history often can give a date when the falls was formed. Dams built by men are comparatively recent and their only real value is to stop recent fish introductions from spreading. In many cases they give clues as to when or if a species was introduced into a river system by thoroughly studying the present distribution in the area and the dates of the various dams construction.

In the northern states, glaciers eliminated all fish life up until 10-25,000 years ago and thus waterfalls are more effective in these areas than further south. In many cases though, glaciers contributed to the spread of many species also as in many cases they blocked northward flowing rivers and forced them south letting the southern species back into northern drainages. They also blocked northern rivers and formed many huge lakes which crossed many drainage systems thus allowing many species to spread easily to many watersheds quickly and inhabit many now landlocked lakes easily.

Most lakes in a given river system drain into the river at some time or another even if it is not apparent how because you must remember that even what may appear to be a 20 foot high bank around the lake now well above flood stage may have been under water 10,000 years ago. It often requires a close check of the regions geological history to determine if a lake was truly landlocked or what time it was connected to the river system. In some cases there were lakes in the U.S. before the arrival of man that had no fish but the exceptions are few and in many cases those lakes with only one or two species for a long period of time developed their own relict species or subspecies if they had 100,000 years or more to do it in. Most cases like this occur in the Southwestern United States where no flooding could occur thus spreading the range of other species. The species in much of the southwest reached these areas long ago before the present river systems changed their courses or lowered the water tables of some of the large lakes that once occurred in this area.

A thorough study of a given species range after eliminating possible introductions by man, will give you many of the species habitat limitations. Thus a species that can't stand salt water may not show a wide spread in range if the only way to spread to the next river is by going to the ocean and then up the next stream. If it can't spread by salt water the only other method is by accidental flooding, rivers changing course, animals carrying it, or glaciers.

In the same way a species nearing its temperature extreme couldn't follow the river further to spread into another river in the same latitude unless it could do it accidentally.

The same is true of mountain species who couldn't spread through lowland quiet streams into the next mountain stream without accidental introductions which are even less common in mountainous areas.

Once a species habitat requirements are known, it can be used to determine if the species will populate a new area if introduced there. Then a more thorough evaluation of the species potential harm or good can be made before its introduction either by stocking, putting in a canal or supplying a fishway around a waterfall or dam. We all know some of the harmful introductions such as the Welland canal and the Sea Lamprey, stocking Carp, and accidental introductions of some species in Florida. Many of the game fish stockings also proved harmful but in less obvious ways by quietly destroying the ecological balance in their area and also many introductions brought with them diseases which were unknown in the area before as many fish diseases and parasites are also tied closely to river drainage systems.