Kat (American Eel): Life History
Scientific Name: Anguilla rostrata

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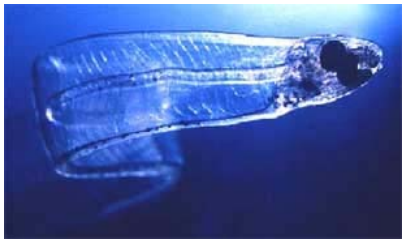
Fact Sheet 6

The Lifecycle of Kat (American Eel)

Kat is a catadromous fish which means its spends a majority of its life in fresh water prior to spawning in the sea. The actual birthplace of Kat is not known but the smallest larvae are found in the Sargasso Sea, east of the Bahamas in the Atlantic Ocean (see map on next page). There are no documented cases of the presence of a mature Kat in this area at this stage of life. It begins its life between January and March as transparent larvae, shaped like a willow leaf. These feed on plankton over the next year, and develop into the transparent, glass eel, while traveling in the Gulf Stream to the North American coast.



This is the larvae of Kat (Anguilla rostrata) as it approaches the North American Eastern Coast from the Sargasso Sea. Image available on-line from: http://www.ecoscope.com/ asburyp1.htm

In May the glass eel makes it way to fresh water where it slowly develops pigment and becomes known as an elver and is now about 4 to 7 cm in length. Once in the fresh water, they are known as yellow eel and will be yellow to olive in colour for the next several years. They are carnivorous, feeding at night or on dull days on the bottom on a variety of organisms from snails to small fishes. In the fall, the eels will remain in the river or return to the estuary to over winter, burrowing down in the soft mud.

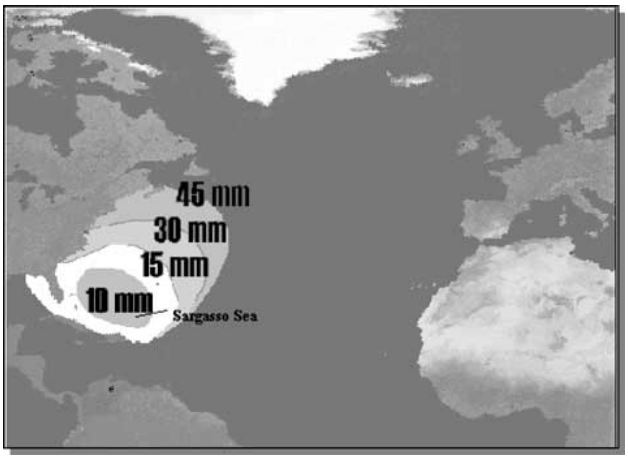
The winter eel fishery was the most active fishery for Mi'kmaq in the Antigonish area particularly in Antigonish Harbour. This fishery started at the fall freeze up until the spring thaw. During the early spring when fishing through the ices, eel grass will get caught up on the eel spear. When cleaning the spear, small glass eels can be seen sticking to the grass. This is the first visual contact individuals will have with the glass eel during the winter spear fishery.

The yellow eel will remain in the inland water systems anywhere from 7-30 years or until they reach their sexual maturity. At this stage, they begin their seaward migration taking on a bronze to black colour with a silver sheen, thus called silver eels, and return to the [Sargasso] sea to spawn (Eales 1966).

Distribution of the American Eel Larvae

As indicated on Map 1, the larvae changes in size as it drifts in the Gulf Stream. When they approach and reach fresh water they change in shape and appearance. "It is believed that the larvae (lecptocephalus stage) undergo both active and passive swimming while in the Gulf Stream. Before the larvae undertake to bridge the roughly 160 kilometer gap from the Gulf Stream to coastal waters, they undergo a metamorphosis and are transformed into the glass eel (size range 5—8 cm). The body form now resembles the adult eel in shape but lacks pigmentation. It is better suited to the active swimming required for them to reach the coast."

Map 1: Migration Route of American Eel Larvae



Source: Available on-line at http://www.ecoscope.com/eelbase.htm

The Sargasso Sea as shown on Map 1 is the area where the smallest American eel larvae are found. The actual spawning area still remains a mystery. The numbers represent the larvae's growth as it drifts with the Gulf Stream along the North American Eastern Coast.

The Last Journey

The duration of qsow (silver eel's) oceanic travel varies, depending on environmental conditions and its ability to grow. If contamination levels are high, sexual maturity can be delayed or impaired, thus inhibiting its growth. Kat [American eel's] potential to lay eggs depends on a length-weight relationship, therefore, its fecundity can range between 0.5 and 4.0 million eggs per female; large females (1000 mm in length), potentially produce as many as 8.5 million eggs (Facey and Van Den Avyle 1987 in Atlantic States Marine Fisheries Commission 2000).

People often assume the Kat will spawn more than once in its lifetime. This is not true. Kat only spawns once and then dies. Therefore, regardless of when Kat is caught it is prior to reaching sexual maturity. This will contribute to its threats to biological reproduction and abundance.

Migrating Kat have been observed to cover 38 km in 40 hours (Stasko and Rommel 1977). Migration has been suggested to occur within the upper few hundred meters of the water column. However, Robins et al. (1979) photographed two Anguilla eel, believed to be pre-spawn American eel, at depths of about 2,000 m (on the floor of the Atlantic Ocean) in the Bahamas. (Atlantic States Marine Fisheries 2000 p.10).

Pre-Spawning Mortality

There are many possible factors which contribute to the Kat (American Eel's) pre-spawning mortality. These include:

- Chemical contamination of its inland water habitat and oceanic waters;
- Over fishing;
- Lack of policies and management plans;
- Sarguusum seaweed harvesting;
- Loss of habitat due to deforestation, agricultural practices, obstruction of waterways from dams and causeways;
- Restocking practices of rivers and lakes with fish species that are valued by recreational fishers (ex. Stockpiling lakes and rivers with trout increases the competition for food amongst various fish species namely the American Eel.);
- Change in ocean climate.

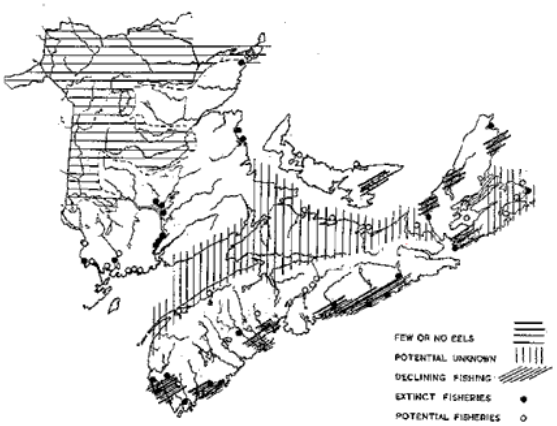
The lack of knowledge surrounding Kat has led to inadequate management of certain areas of the commercial eel fishery. Therefore, decisions are being guided by incomplete scientific research. Kat is a single panmitic population meaning that it is of one single breeding stock. Offspring from any parents can inhabit any portion of the species range (any river system along the North American east coast). Therefore, absence of basic population dynamics data for American eels has not enabled an evaluation of the effects of potentially high exploitation rates on regional stocks and the population as a whole. Also, estimates of exploitation rates for numerous regional stocks into one exploitation rate for the single panmitic population does not exist.

As with many fisheries the eel fishery has undergone various technological advancements that have increased fishing effort and catches. The commercial fishery brought about the use of motorized boats and electric flood lights instead of the traditional canoe and kerosene lantern. Kat is one of the few fish species that are caught on a year round basis as an elver, yellow and silver eel. Therefore, every living Kat is caught prior to sexual maturity thus contributing to its biological vulnerability and threats to abundance..

Maritime Eel Landings 1920-2000

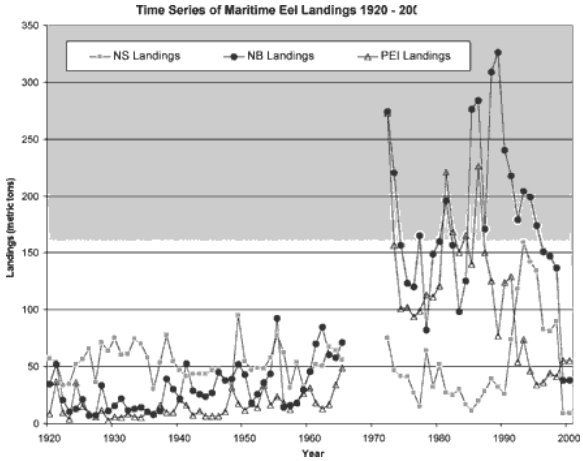
Map 2 illustrates the situation of the eel fishery in the Maritime Provinces in the 1960s. Many areas along the Bay of Fundy and the Southern Gulf of Nova Scotia had not yet developed a commercial fishery and the potential was unknown as shown on the map (Eales 1966 p. 47). In recent decades this has changed dramatically. Graph 1 below shows the explosion of the commercial eel fishery landings and values for the Maritime provinces in the 1980s and onwards until a sharp crash occurred in the late 1990s. The rise in landings and values was attributed to a new demand from the Asian markets.

Map 2: The Status of the 1960s Eel Fishery in the Maritime Provinces



The information contained in Graph 1 is based upon various D.F.O. eel landings data (Nova Scotia Department of Fisheries, Economic Branch 1963 and Department of Fisheries and Oceans, Statistics Branch 2000. This graph indicates the commercial eel fishery landings during the period of 1920 to 2000 with the exception of a gap between 1965 and 1975 due to unreported fish landings.

The line with grey squares [NS Landings] indicate that the Nova Scotia eel fishery with activity on a moderate scale up to the mid-1960s, with the majority of commercial activity occurring in south shore areas and the upper Southwest Margaree river area. Antigonish, Tatamagouche,



Shelbourne, Yarmouth and the Cape Breton area were mostly food fisheries, with a small scale selling of fish to customers in the local area (Eales 1966).

The line with black circles [NB Landings] indicate the New Brunswick eel landings. These landings are slightly less than Nova Scotia. The commercial activity occurred in the St. John; Fredericton, St. George, Chatham, Tracadie and Richibucto areas. The peddled and food fishery occurred in Eel River Bridge, Shediac and other areas. (Eales 1966).

From 1920 to 1965, the main method of fishing was with spears and eel pots there were approximately 280 people fishing for eels in 1962. Many of the eels were handled by dealers and were shipped and sold to the United states and Europe. The fyke net was introduced approximately from 1961 to 1965 in P.E.I. by the provincial government with their usage spreading to other Maritime provinces as well. The landings show a definite increase due to this change of method and increased effort.

Another change in the eel fishery occurred during the mid-1980s with the spearing eels with a light (sasegwa) (flamboying). Gas lanterns were now being replaced by high intensity lights and generators. This method of fishing was unlicensed in the Gulf area and continued until 1993. At this point, there was a freeze on all new eel fishing gear types. D.F.O. implemented a licensed eel spear fishery and banned the usage of electronic lights during the night time fishing in 1993.

Approximately in 1993, N.S. eel landings were on the rise, whereas P.E.I. and N.B. landings were beginning to decline. By 1994-95, N.S. landings then begin to decline to these current levels. In the year 2000, N.S. experiences an all time low compared to pre-1965 figures. N.B. and P.E. I. Landings are reduced but only to the average rate compared to pre-1965 figures.

Environmental Indicators

People often view Kat behaviour as similar to Pul_moo (The Atlantic Salmon). Pierre Biard, a Jesuit living in Acadie during the early 1600s describes this misconception "...in the middle of September [the Mi'kmaq] withdraw from the sea, beyond the reach of the tide, to the little rivers, where the eels spawn, of which they lay in a supply; they are good and fat" (Biard, Pierre in Thwaites 1896 in Holmes-Whitehead 1991 p.34-36.) The fact is Kat behaviour is in total contrast to that of Pul_moo. For instance, Pul_moo spawns in the river whereas Kat spawns in the sea. Pul_moo living environment is the ocean whereas the Kat is the inland water systems. Pul_moo will spawn in the river more than once in its lifetime whereas Kat will only spawn once in the sea and then die.

Kat is also noted for accumulating high concentrations of contaminants. Because eels live on the bottom of estuaries, rivers, and lakes and spend the winter buried in the mud—they are susceptible to poisoning and accumulation of contaminants (PCB's, lead, pesticides) (Haro et al., 2000). They are able to live in areas unsuitable for many other types of fish. For example, studies performed at Kejimkujik National Park have identified highly acidic waters inhabited only

by yellow perch and Kat (Parks Canada. Available on-line: http://parkscanada.pch.gc.ca/parks/nova_scotia/Kejimkujik_np/english/water_e.htm.). With these facts in mind, Kat can be used to tell us about the health of both the oceanic waters and the inland water system.

We should listen more to the animals...

Other Interesting Facts

Historically, Kat were very abundant in the East Coast streams, comprising more than 25 percent of the total fish biomass (Smith and Saunders 1955; Ogden 1970 in Interstate Fishery Management Plan for American Eel April 2000 p.iv). If this number is decreasing, what does this mean for the existence of other species?

Kat was also noted for migrating over land in order to reach another body of water. This slime was referred to as Skimogan. One eel would go as far as it could until it had no more slime to move, in turn, the next eel would be able to make it a little farther and so forth. This would create a road of slime helping Kat reach its destination.

Historically, Kat had access to 565,000 miles of fresh water but due to the construction of dams this number was severely decreased to 90,755 miles available for migratory process (Ibid. P.36).

The yellow eel prior to becoming a silver eel will undergo several physiological changes. These include: (1) a color change from yellow/green to metallic, bronze-black sheen; (2) body fattening; (3) skin thickening; (4) enlargement of the eye and change in visual pigment; (5) increased length of capillaries in the rete of the swim bladder; and (6) digestive tract degeneration. (Facey and Van Den Avyle 1987 in Interstate Fishery Management Plan for American Eel 2000 p.10).

Note Regarding Mi’kmaq Words

The following is a list of the Mi’kmaq words appearing in this Fact Sheet together with their English translations (Prosper 2001:14):

Kat—An eel.

Qsow— Silver eel.

Pul_moo—Salmon.

Skimogan—Eel Slime.

Sasegwa—Fishing eels with a light.

Many interrelationships exist between the Mi’kmaq people and Kat. These relationships are expressed in various Mi’kmaq words, legends, customs, traditions, ceremonies, etc. The next fact sheet will explore and describe the Mi’kmaq people’s cultural connection to Kat...

References

Atlantic State Marine Fisheries Commission. 2000. Interstate Fishery Management Plan for American Eel (*Anguilla rostrata*). Fishery Management Report No. 36 of the Atlantic State Marine Fisheries Commission. Available on-line: http://www.asmfc.org/PUB/FMRS/American%20FMP.pdf.

Department of Fisheries and Oceans. 2000. Available on-line: http://www.dfo-mpo.gc/communic/statistics/stat_e.htm

Eales, J. G. 1966. *A Survey of Eel Fishing in the Maritime Provinces.* Ottawa: Industrial Development Service Department of Fisheries of Canada.

Haro, A., W. Richkus, K. Whalen, A. Hoar, W. Dieter Busch, S. Lary, T. Brush, and D. Dixon. 2000. Population Decline of the American eel: Implications for Research and Management. Fisheries 25(9):7-16.

Holmes-Whitehead, Ruth. 1991. *The Old Man Told Us.* Halifax: Nimbus Publishing Limited.

Hutchison, Susan. 1981. Upstream Migration of the Glass-eel (Anguilla rostrata) in Nova Scotia. *Manuscript and Technical Report Series Project Report No. 81-02*. Nova Scotia: Estuarine and Inland Fisheries Nova Scotia Department of Fisheries.

Kils, Uwe. No Date. Glass Eel Photograph [on-line]. Rutger’s Institute of Learning and Coastal Sciences. Available on-line from: http://www.ecoscope.com /asburypl.htm.

Kils, Uwe. No Date. Distribution of Eel Larvae by length along the Eastern seaboard of North American [on-line]. Rutger’s Institute of Learning and Coastal Sciences. Available on-line from: http://www.ecoscope.com/eelbase.htm.

Nova Scotia Department of Fisheries, Economics Branch. 1963. *Notes and Statistics on the Eel Fisheries in the Maritime Provinces.* Nova Scotia Department of Fisheries, Economics Branch: Halifax.

Parks Canada. No Date. Kejimkujik National Park of Canada. Available on-line: http//www.parkscanada.pch.gc.ca/parks/nova_scotia/Kejimkujik_np/english /water_e.htm.

Prosper, Kerry. 2001. The Mi’kmaq and Kat (American Eel). Antigonish: Social Research for Sustainable Fisheries, St. Francis Xavier University. Available on-line: http://www.stfx.ca/people/adavis/srsf/200561.htm.