Status of the Green Sturgeon, *Acipenser medirostris*, in Canada*

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The Green Sturgeon (*Acipenser medirostris*) is an anadromous Pacific sturgeon which is rare in Canadian waters. It occurs in North America in coastal waters from the Aleutian Islands and the Gulf of Alaska to Ensenada, Mexico and is known from Korea, Japan and the Bering Sea. Little is known of the life history, biology or habitat requirements of the species, but it is seldom found above brackish waters in large rivers such as the Fraser. It is thought that the life history may be similar to that of other sturgeons, and that they move into rivers in the fall and winter to spawn in the spring. The flesh and roe of the species has a disagreeable taste and odour and there is no commercial fishery. Green Sturgeon are, at times, taken incidentally as part of the salmon gillnet fishery. Given the protection of seasons and size limits, the limiting factors for the welfare of present populations would seem to be suitable spawning and feeding habitat. Dam construction on major rivers and other activities such as mining which alter the aquatic environment could be detrimental to this species and the White Sturgeon (*Acipenser transmontanus*) as well.

L'Esturgeon vert (*Acipenser medirostris*) est un poisson anadrome de la côte du Pacifique, qui est rare dans les eaux canadiennes. En Amérique du Nord, il fréquente les eaux côtières à partir des îles Aleutiens et du golfe de l'Alaska jusqu'à Ensenada au Mexique. Il a aussi été signalé en Corée, au Japon et dans la mer de Béring. Peu de données sont disponibles sur le cycle vital, la biologie et les besoins de l'espèce en matière d'habitat, mais on sait qu'elle est rarement présente en amont des eaux saumâtres dans les grands cours d'eau comme le fleuve Fraser. On suppose que son cycle vital est semblable à celui d'autres esturgeons et que l'espèce pénètre dans les rivières en automne et en hiver pour frayer au printemps. Comme sa chair et ses oeufs ont une odeur et un goût désagréables, il n'existe aucune pêche commerciale de l'esturgeon vert mais celle-ci est souvent une prise accidentelle dans la pêche du saumon au filet maillant. Étant donnée la protection offerte par les saisons de pêche et les limites de taille, les facteurs limitatifs du bon état des populations existantes semblent être la disponibilité de frayères et de zones d'alimentation adéquates. La construction de barrages sur les principaux cours d'eau et d'autres activités comme l'exploitation de mines, qui modifient l'environnement aquatique, pourraient être néfastes à l'esturgeon vert ainsi qu'à l'esturgeon blanc (*Acipenser transmontanus*) dont l'aire de répartition marine est semblable.

Key Words: Green Sturgeon, *Acipenser medirostris*, sturgeons, rare fishes, North Pacific.

The sturgeons are large, heavy fishes with extended hard snouts; the mouth is vertical and sucker-like with four barbels. The body is covered by five rows of bony plates in place of scales. These are primitive fishes with the entire skeleton being composed of cartilage; the notochord is persistent and extends into the tail.

The Green Sturgeon (*Acipenser medirostris*) is a little known, rare species which is smaller than the other Pacific Sturgeon, the White Sturgeon (*Acipenser transmontanus*). These fish (Figure 1) are dark to olive-green in colour dorsally with the ventral surface being a lighter, paler shade of green.

Green Sturgeon are rarely found in fresh water but may move into the brackish estuaries of larger rivers and even into freshwater to spawn. Although generally smaller than the White Sturgeon, they may reach lengths of up to 213 cm and weights of up to 136 kg. The usual weight in Canadian waters is 20 to 40 kg (*see* Scott and Crossman 1973).

Distribution

The Green Sturgeon is an anadromous Pacific species found from the Amur River in Siberia to northern Japan, Korea and the Bering Sea (McPhail and Lindsey 1970). In North America (Figure 2), the species has been recorded from Ensenada, Mexico (Moyle 1976) to the Aleutian Islands of Alaska (Morrow 1980) and is usually found near the mouths or estuaries of larger rivers (Hart 1973).

In Canada, little is known of the status of this fish, but there are authenticated records from the west coast of Vancouver Island, near Victoria

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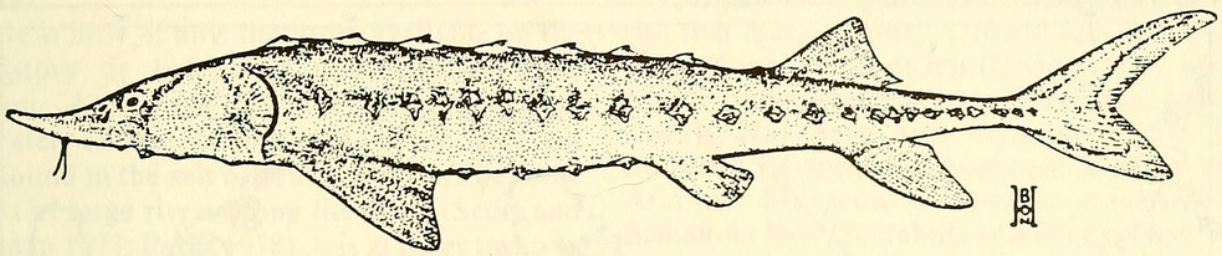

FIGURE 1. Green Sturgeon, *Acipenser medirostris* [from Scott and Crossman (1973), by permission].

(Figure 3) and in the Fraser and Skeena rivers (Scott and Crossman 1973). There are unauthenticated reports of Green Sturgeon in northern British Columbia waters as well (E. Lane, Malaspina College, Nanaimo, British Columbia; personal communication). These fish are smaller and much less common than the White Sturgeon and rarely found above brackish water (Parks 1978).

Protection

Commercial fisheries exist for White Sturgeon in the tidal zone of the Columbia and Fraser rivers, but because Green Sturgeon are less abundant and smaller (158 kg maximum weight as compared to well over 454 kg for the White Sturgeon) and, the flesh is of inferior quality, they are harvested mainly as incidental species in gillnet fisheries for salmon (Parks 1978).

Season closures for other species and size restrictions are the only regulations that provide protection for these sturgeon populations. In Canada, any fish over 100 cm may be taken and in the U.S. in the Columbia River, a minimum size limit of 1.22 m protects younger fish, while a maximum size limit of 6 ft. (1.83 m) protects the female brood stocks. In non tidal waters of the Fraser River they may be taken only by angling; fish under 100 cm or over 200 cm may not be retained.

Population Size and Trends

Little is known of the status of this species and there is a definite requirement for population and distribution work on both Green and White Sturgeon. Some have been taken from time to time off the west coast of Vancouver Island (E. Lane, personal communication). Scott and Crossman (1973) and Hart (1973) indicate that it is not as abundant as the White Sturgeon.

Some idea of numbers may be gained from catch statistics. Green Sturgeon made up 5, 21 and 22% of total Columbia River sturgeon harvests in the periods 1941 to 1950, 1951 to 1960 and 1960 to 1971 respectively (Parks 1978). Using average annual landing statistics and average weights given by Parks (1978) this translates into roughly 200 to 500 fish per year for the period 1941 to 1950 and 1400 fish for the period 1951 to 1970. Semakula and Larkin (1968) indicated that the average spawning population of White Sturgeon in the Fraser River probably consisted of from 300 to 600 females. If Green Sturgeon are less abundant than the White Sturgeon, then spawning populations in Canadian waters must be indeed small. Moyle (1976) indicates that the species is much rarer than the White Sturgeon and in California, makes up less than 3% of sturgeon catch statistics.

FIGURE 2. North American range of the Green Sturgeon.

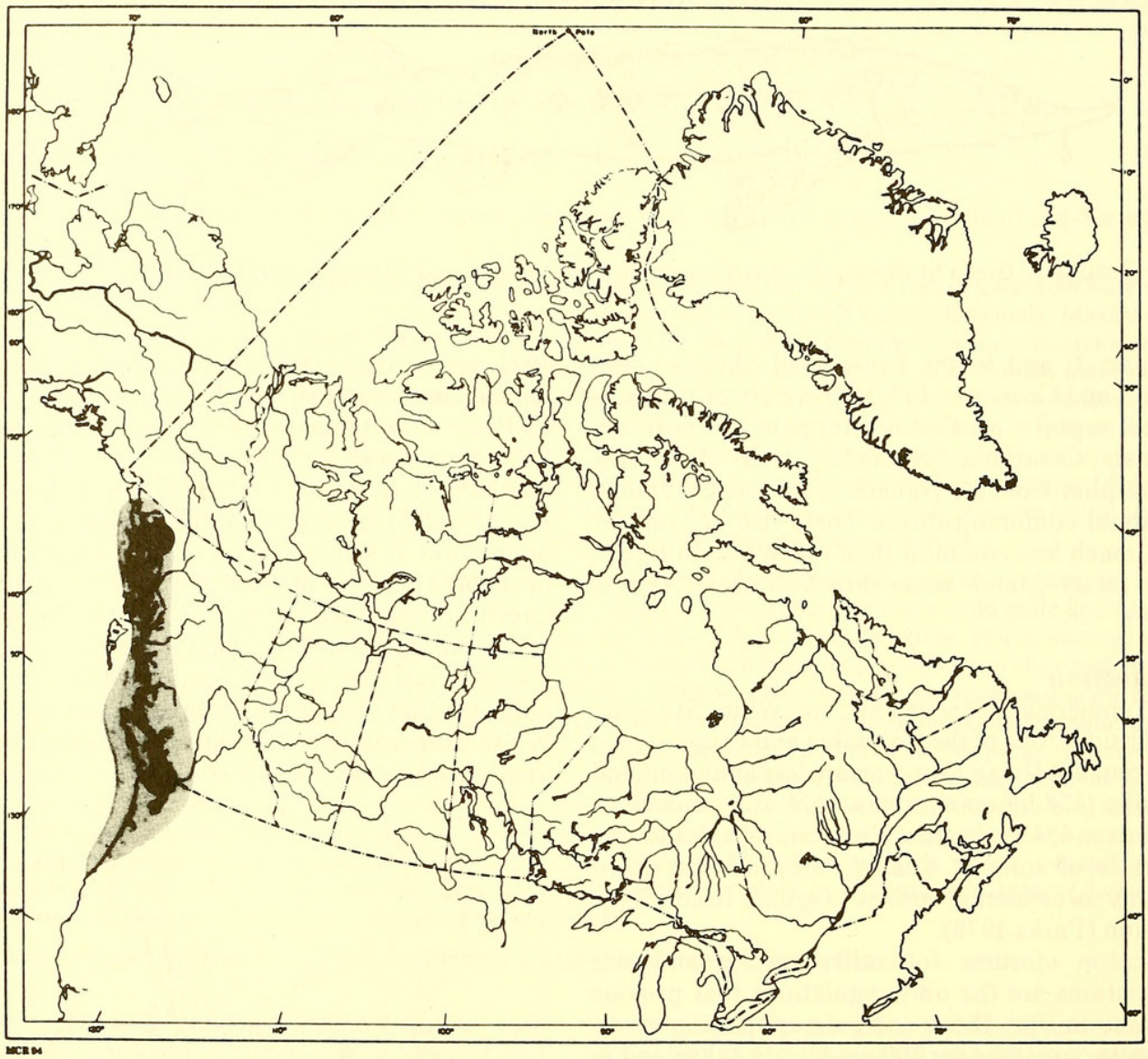

FIGURE 3. Canadian distribution of the Green Sturgeon: ● Authenticated records (*see* text); shaded area depicts the probable range.

There are no indications of population trends for the species; and, as mentioned previously, no good data exists on abundance or distribution. Increased catches of Green Sturgeon over the period 1940 to 1970, may reflect the imposition of maximum and minimum size restrictions which might mean the inclusion of more of the smaller species in catch statistics, but this is merely speculation. Green Sturgeon are mainly an incidental species in the salmon gillnet fishery and increased take of these fish in salt or brackish waters over the period indicated could also reflect increased effort in the salmon fishery. There is no evidence for a general population decline.

In 1985 and 1986 joint studies were conducted by Malaspina College and the British Columbia Ministry of the Environment in the Fraser River between Albrion and Chilliwack (50 to 90 km from the Fraser River mouth). Approximately 900 sturgeon were tagged in 1985 and 500 in 1986. However, little attention was paid to species identification in 1985 (it was assumed that all were White Sturgeon) but care was taken in 1986. Of the 500 tagged in 1986 only two appeared "different" but were not positively identified as Green Sturgeon (W. T. Munro, Wildlife Branch, British Columbia Ministry of the Environment, personal communication). Recent information suggests that the sturgeon of the Skeena River are Green Sturgeon. A few are taken each year near the mouth of the salmon gillnet fishery. (W. T. Munro, personal communication).

Habitat

There is little, if any, literature available on the life history or habitat requirements of these sturgeon. Apparently these fish rarely occupy freshwater, except to spawn. However, they are often found in the salt or brackish waters near the mouths of large rivers along the coast (Scott and Crossman 1973; Parks 1978). It is at times taken as an incidental species in the salmon gillnet fisheries in the Columbia and Fraser rivers and may move into freshwater during the fall and winter to spawn in the spring (Scott and Crossman 1973).

The life history and habitat requirements are thought to be similar to those of the White Sturgeon (Scott and Crossman 1973; Morrow 1980). White Sturgeon are thought to stay close to shore in shallow marine waters and seasonal movements are related to water temperature (Haynes and Gray 1981). They have been taken in water of temperatures ranging from 0°C to 23°C (Scott and Crossman 1973). Spawning may take place over rocky bottoms in swift waters, near rapids or waterfalls, when temperatures are from 8.9° to 16.7°C, as has been reported for the White Sturgeon (Scott and Crossman 1973). Diel movements are probably related to temperature and food requirements (Haynes and Gray 1981).

The Green Sturgeon, like other sturgeon, is a bottom feeder, the food consisting predominantly of chironomids, mysids, *Daphnia, Chaobus* larvae, molluscs, copepods and other invertebrates. Large fish may also take fish and crayfish which have been sucked up off the bottom or taken alive (Scott and Crossman 1973). There may be some competition with the White Sturgeon for food and suitable habitat, however, Green Sturgeon are seldom far from salt water — White Sturgeon are often found far inland and may spawn at sea. Deterioration in water quality from mining activities has been shown to affect sturgeon movements and reproduction probably through impact on the food supply (Graham 1981).

General Biology

No information exists on the biology of this species. Since it is usually seen in rivers in the fall as an incidental catch of the salmon fishery, it has been assumed that it may move into freshwater during the fall and winter to spawn in the spring (Scott and Crossman 1973). The life history may be similar to that of the White Sturgeon which spawns during the spring in water temperatures of 8 to 16°C (Scott and Crossman 1973; Moyle 1976; Wydoski and Whitney 1979).

Sturgeon in general are long-lived, slow growing fish that mature slowly. Growth rate may only be 51 to 76 mm a year or less (Greeley 1937; Magnin 1963a: Shortnose Sturgeon (*Acipenser brevirostrum*); Harkness and Dymond 1961; Lake Sturgeon (*Acipenser fulvescens*); Magnin 1963b: Atlantic Sturgeon (*Acipenser oxyrhynchus*); Semakula 1963; Semakula and Larkin 1968: White Sturgeon) until well past maturity and ages for some sturgeons may exceed 100 years (Mackay 1963). Growth rate in length decreases after sexual maturity and increases thereafter are mainly in weight. Age of maturity varies with species and location, but may be in the order of 11 to 22 years for males and 14 to 34 years for females (Roussow 1957: Lake Sturgeon; Magnin 1963 a,b: Shortnose and Atlantic Sturgeon; Semakula 1963; Semakula and Larkin 1968: White Sturgeon). This literature also indicates that the females spawn more than once after first spawning, but only after increasing intervals of years. In younger females, the interval may be 4 years and 9 to 11 years in older females. The largest Green Sturgeon reported was 2.3 m in length and weighed 158 kg however, they seldom exceed 1.3 m and 45 kg and most of those caught weigh between 20 to 40 kg (Moyle 1976; Wydoski and Whitney 1979).

As indicated previously, little is known of the movements of Green Sturgeon, but they are seldom found upstream of brackish water (Parks 1978). It is assumed that they move into the lower reaches of the rivers in the fall and winter to spawn in the spring (Scott and Crossman 1973). Spawning requirements may be similar to those of the White Sturgeon and movements may be dictated by water temperatures. Tagging studies carried out in California indicated that Green Sturgeon do move great distances. Fish tagged in San Pablo Bay, California, have been recovered along the Oregon and Washington coasts (Wydoski and Whitney 1979).

Nothing is known of the behaviour or adaptability of these fish although the White Sturgeon which has an overlapping distribution has been found to be sensitive to habitat perturbations caused by mining activities (Graham 1981). Semakula and Larkin (1968) have also shown that the sturgeon fishery of British Columbia exhibits the properties [as described by Ricker (1963)] of fish stocks with great longevity that respond to exploitation with drastic population declines and slow recovery.

Limiting Factors

The main limiting factors for Green Sturgeon may be the availability of large rivers with suitable estuaries. Estuarine pollution may be detrimental

as may alterations in habitat through mining or other industrial activities. Such effects may be indirect because of their more direct effects on the forage base.

Commercial exploitation could seriously deplete existing populations, but the flesh and roe of this species is inferior to that of other sturgeon, and is not likely to be utilized commercially. As it is taken only incidentally in the salmon fishery, and the older fish are probably unexploited, this does not seem to be a serious factor at present. Sturgeon catches have been relatively stable over the past few years (Parks 1978) and current regulations of size limits and closed seasons for other species may be successful in maintaining the populations. The sturgeon sports fishery in the Fraser River may account for small numbers of fish each year but the numbers of this species taken are apparently not significant.

Special Significance of the Species

The Green Sturgeon is not utilized commercially in Canada, as the flesh and roe have a disagreeable taste and odour. A small commercial enterprise has apparently existed in the Bering Sea (Magnin 1959), but this would not affect Canadian stocks.

Evaluation

It would appear that Green Sturgeon are not common in Canadian waters even though they may appear in numbers in some years off Vancouver Island. What little is known of the population would suggest that adult populations are in the low thousands and they certainly may not be as abundant as the Shortnose Sturgeon of New Brunswick which COSEWIC has categorized as rare.

Since the flesh is not desirable commercially, they are not threatened directly by the sturgeon fishery, but are taken incidentally as a by-catch of the salmon fishery. There is no indication that populations are declining, but more protection could be afforded through more restrictive seasons and size limits. The species should be considered as rare until evidence of population size and trends is forthcoming.

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