SCIENCE INFORMATION ON AVON RIVER FISH SPECIES

Context

The Nova Scotia Department of Transportation and Public Works is preparing to complete an Environmental Assessment for the twinning of Highway 101 in the general area of the Avon River Causeway. The Habitat Protection and Sustainable Development (HPSD) Division of Maritimes DFO will be reviewing this project to determine whether a section 35(2) Fishery Act authorization will be required to permit the harmful alteration, disruption or disruption of fish habitat, and, if so, to determine what compensation and monitoring may be required.

To determine the types and quality of fish habitat potentially impacted by a project and the fish species that may be utilizing these habitats, DFO traditionally requests that the proponent conduct an electro-seining survey. Given that the Avon River is an iBoF (inner Bay of Fundy) watershed, the proponent may have difficulty in obtaining an electro-seining permit. A thorough review of existing information may be a reasonable alternative in this case.

Presently there is significant public interest in the project. DFO will require the fish species information as a basis for decision-making.

Background

To facilitate the review process and to minimize the impact of further fish sampling on a listed endangered species as well as on species currently under review, HPSD has requested science to provide or recommend the sources of acceptable information on the likely presence of fish in the Avon River and in the vicinity of the causeway with particular attention to fish and habitat in the construction area under consideration.

Response

Records of the fish species present in the Avon River, in the vicinity of the pre-causeway estuary, and in the vicinity of the post causeway estuary have been included in or have been the focus of at least one review, one thesis and one contracted study.

A previous Science Response with respect to the Avon River (DFO, 2006) provided historical references for recreational and commercial species known to inhabit the Avon River and included results of directed electrofishing conducted periodically by the Department of Fisheries and Oceans from the period 1968 to 2002 that was used to document habitat and distribution of freshwater fish in the Avon River. These data are on file with the Population Ecology Division. While the information has been used to investigate previous habitat inquiries, all of the information has not appeared in published science documents.

A thesis titled “Historic examination of the changes in diadromous fish populations and potential anthropogenic stressors in the Avon River watershed, Nova Scotia” (Isaacman, 2005) provides a through review of the recorded as well as local knowledge concerning diadromous fish in Avon River. This document is based on literature and interviews and does not contain new information from direct field sampling for fish.

A study of the fish populations and salt marsh productivity near the Windsor Causeway was contracted by the Nova Scotia Department of Transportation and Public Works to Acadia Centre for Estuarine Research in 2003 (Daborn *et al.*, 2004). This study focused on:

- Occurrence of diadromous fish in the Avon Estuary, Pesaquid Lake and the lower Avon River;
- Occurrence of larval fish in Pesaquid Lake and the lower Avon River;
- Fish utilization of the channels and mudflats on the seaward side of the Windsor Causeway;
- Physicochemical conditions in Pesaquid Lakeand the lower Avon River, and flow conditions at the Causeway gates.

Tables 2.1 and 3.1 in Daborn *et al.* (2004) presents lists of species known or expected in the Avon estuary Pesquid Lake and Avon River and whether that species was captured in the 2003 survey. The species list is considered to be complete for the fishing gear deployed, and it is accepted that non-captures of some species in 2003, while perhaps indicative of the relative abundance of those species, does not eliminate the possibility of their presence given more extensive effort or gear. However, it is likely that some species, e.g., Atlantic salmon, which are currently listed as endangered, are not currently present in the freshwater portion as suggested by the fish sampling data. This observation was supported by electrofishing conducted in 2002 and 2003 (Gibson *et al.,* 2003). However, this observation neither excludes the possibility of the presence of adult Atlantic salmon in the seaward side of the causeway nor the possibility that salmon could be observed in the Avon River. The data does suggest, however, that the origin of any such fish would likely be other than the Avon River.

Information presented by Daborn *et al.* (2004) on the conditions at the causeway gates during gate openings for fish passage suggests excessive velocities through the openings. As mentioned in their discussion, observations of gaspereau and blueback herring in Pesquid Lake indicate that some fish passage does occur. However, the lack of observations for diadromous species less tolerant of high velocities, e.g., smelt and shad, suggests that the recent absence of these species in the river may be the result of inadequate or inappropriate fish passage.

Being catadromous, upstream passage of recruiting glass eels and elvers would likely be the most impeded of all fishes by velocity barriers at the gates. Elvers are present in observable numbers below the gates around May-June. The existing operating regime discourages filling of the headpond with estuarial water, and freshwater eel production may therefore be negatively affected. There is now general recognition that catadromy, while a characteristic life-history tactic, is probably a facultative and not obligate process for the American eel, i.e., recruitment to freshwater at an early age is not obligate. This means that the estuary lying below the causeway likely functions as rearing habitat for the species, including the young recruiting age classes. In north-temperate climes, American eel are noted for seeking freshwater winter refugial habitat. This may be the case in many if not all of the macro-tidal estuaries of the inner Bay of Fundy, including the Avon Estuary. Thus, the operating regime at the gates may impede access to winter habitat of otherwise competent eels.

These observations indicate that a more through review of fish passage options associated with any development at the site is warranted if fish population development is a consideration.

Conclusions

Historical and recent descriptions of the fish species in the Avon River, Pesquid Lake (an artificial (headpond) lake maintained by a causeway), and in the tidal portion of the Avon estuary immediately below the causeway have been described and reported.

The data and observations indicate that changes in species distribution and abundance have occurred since agricultural and domestic use, hydro development, and the installation of the causeway.

While fish habitats above the causeway have been negatively impacted, capacity exists in the riverine habitat and within the newly created brackish lake for some diadromous and migratory species.

Fish passage at the existing causeway, affected by manipulations of lake elevations and gate openings, has been inadequate to allow passage of some species and is perhaps limiting the development of other species.

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Sources of information

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