Aquatic Biodiversity in the Hawkesbury-Nepean Region

[an extract from: NSW DPI (2006) *Reducing the impact of road crossing on aquatic habitat in coastal waterways – Hawkesbury-Nepean, NSW*, Report to the New South Wales Environmental Trust, NSW DPI, Flemington, NSW]

The Hawkesbury-Nepean region comprises freshwater, estuarine and marine environments that contain an extensive range of aquatic habitats including montane streams, lowland floodplain wetlands and coastal lagoons. Within these broad habitat types, niche habitats such as pools and riffles, gravel beds, snags, aquatic vegetation and riparian vegetation are present, diversifying the habitat available to aquatic species in the Hawkesbury-Nepean catchment.

There is a variety of aquatic and riparian vegetation that is present within the majority of the Hawkesbury-Nepean catchment. Estuaries within the region are characterized by the presence of mangrove and saltmarsh communities, with swamp oak (*Casuarina glauca*), common reed (*Phragmites australis*) and paperbark (*Melaleuca quinquenervia*) also found along freshwater margins (DEC, 2004). Riparian vegetation in the catchment is dominated by stands of river oak (*Casuarina cunninghamiana*), with water gum (*Tristania laurina*) also present along the river and creek banks of the wetter and more protected areas (DEC, 2004).

This extensive range of aquatic and riparian habitat supports a diverse assemblage of species, including over 50 species of finfish (see Table 1). Nine of these species are introduced, competing with the native fish species found within the catchment. The pressures from introduced species, as well as other factors such as reduced water quality, increased fishing pressure, and habitat degradation, have resulted in a decline in the population densities of native fish both within the Hawkesbury-Nepean, and elsewhere.

The native fish populations in the Hawkesbury-Nepean catchment consist of potamodromous species that undertake migration wholly within freshwater systems, catadromous species who migrate between freshwater and sea, and amphidromous species, that complete non-breeding migrations between freshwater and sea (Harris et al., 1994). This has resulted in the potential widespread distribution of native fish throughout the entire catchment.

Of these native species, seven are listed as threatened in NSW waters. Important indigenous freshwater species including Macquarie perch[1] (*Macquaria australasica*), and the Australian grayling[1] (*Prototroctes maraena*) have been recorded in the Hawkesbury-Nepean catchment, with pressures such as habitat degradation, competition, and predation from introduced fish species affecting their populations. Three threatened species also recorded from the catchment: Silver perch[2] (*Bidyanus bidyanus*), Murray cod[2] (*Maccullochella peelii peelii*), and Trout cod[3] (*Maccullochella macquariensis*) are found in the Hawkesbury-Nepean catchment as a result of stocking. Key threatened estuarine species, including the Black Cod[1] (*Epinephelus daemelii*) and the Green sawfish[4] (*Pristis zijsron*), are also likely to occur in the Hawkesbury estuary - both of these species have been affected by commercial and recreational fishing impacts, and the degradation of critical estuarine habitats.

The region also supports an array of aquatic macroinvertebrates including insects, prawns, crayfish and freshwater mussels. The macroinvertebrate communities of the Hawkesbury-Nepean catchment are moderately to significantly impaired,

---

[1] Listed as 'Vulnerable' under the EPBC Act and protected under the FM Act.
[2] Listed as 'Vulnerable' under the NSW Fisheries Management Act, 1994 (FM Act).
[3] Listed as 'Endangered' under the EPBC Act and protected under the FM Act.
[4] Listed as 'Endangered' under the NSW Threatened Species Conservation Act 1995

predominantly due to the pressures associated with river regulation, water extraction and agricultural landuse issues (Bishop et al., 2002). Both the threatened Adams emerald dragonfly[1] (*Archaeophya adamsi*) and Sydney Hawk dragonfly[2] (*Austrocordulia leonardi*) have an expected distribution within the Hawkesbury-Nepean catchment, with records indicating their presence in the lower subregion of the catchment. These rare dragonflies have only been recorded on limited occasions, with activities such as habitat degradation and water pollution significantly affecting their populations.

Over 60 species of frogs are also found in the region including several threatened species such as the Giant burrowing frog, the Green and golden bell frog, the Giant barred frog, the Red-crowned toadlet, the Stuttering frog, Littlejohn's tree frog and the Booroolong frog.

All these species are dependent on healthy waterways and access to a range of diverse aquatic habitats for their survival. In recognition of this, numerous river and floodplain communities of the Hawkesbury-Nepean catchment have been listed as an Endangered Ecological Community[4] (EEC), including freshwater wetlands in the Sydney Basin, montane peatlands and swamps, Swamp oak floodplain forest, Swamp Sclerophyll forest on coastal floodplains, River flat Eucalypt forest on coastal floodplains, and coastal saltmarsh in the Sydney Basin. This listing includes all native fish and aquatic invertebrates, as well as other aquatic and terrestrial biota that are associated with these communities - recognising the rarity, vulnerability, and ecological importance in the region (DEC, 2006).

As with rivers and lakes, these wetland, saltmarsh, and swamp communities are subject to pressures such as fragmentation, flood mitigation, draining and infilling, and modification of freshwater and tidal flows due to installation of artificial structures (e.g. weirs, dams). Therefore, aquatic habitat rehabilitation, in particular reinstating stream connectivity, is essential for maintaining aquatic biodiversity and protecting the integrity of these habitats in the Hawkesbury- Nepean catchment. This particular project was designed to identify locations where the greatest environmental gains could be made when undertaking such remediation works.

For the whole document, see

NSW DPI (2006) *Reducing the impact of road crossing on aquatic habitat in coastal waterways – Hawkesbury-Nepean, NSW*, Report to the New South Wales Environmental Trust, NSW DPI, Flemington, NSW

References in this extract:

Bishop, K., Growns, I., ChurchT., Warner, R., and Taylor-Wood, E. (2002) *Status of the Health of the Hawkesbury-Nepean River*, Hawkesbury-Nepean River Management Forum, Sydney, NSW.

Harris, J.H., Thorncraft, G., and Wem, P. (1994) Evaluation of Rock-ramp Fishways in Australia, in *Rehabilitation of Freshwater Fisheries*, I.G. Cowx (Ed), Oxford Fishing News Books.

New South Wales Department of Environment and Conservation (2004), *Bioregions of NSW, biodiversity, conservation, history*, Website: http://www.nationalparks.nsw.gov.au/npws.nsf/Content/bioregions, accessed April 2006.

New South Wales Department of Environment and Conservation (2006), Threatened Species Website: http://www.threatenedspecies.environment.nsw.gov.au. Accessed April 2006.

Table 1: Freshwater and estuarine fish in the Hawkesbury-Nepean, NSW

Scientific Name	Common Names	Status	Migration[5] and habitat
Acanthopagrus australis	Yellowfin bream Silver bream	Common	Amphidromous; coastal marine; estuaries and inshore reefs
Acanthogobius flavimanus	Yellowfin goby	Exotic	Freshwater reaches of streams just above tidal influence.
Amniataba percoides	Banded grunter	Exotic; Noxious listing, NSW	Freshwater habitats – in Clarence River and has the potential to spread to the Hawkesbury-Nepean region
Anguillia australis	Short-finned eel	Common	Catadromous; coastal rivers & wetlands
Anguilla reinhardtii	Long-finned eel Marbled eel	Common	Catadromous; coastal rivers
Atherinosoma microstoma	Smallmouthed hardyhead	Common	Unknown migration pattern; coastal estuarine and fresh waters
Bidyanus bidyanus	Silver Perch	Threatened Species (*Vulnerable*)	Large scale migration; Habitat is predominantly in lowland and slope waterways. Present as a result of stocking.
Caranx sexfasciatus	Bigeye trevally	Common	Marine; juveniles common in mangrove estuaries, tidal creeks and can enter freshwater.
Carassius auratus	Goldfish	Exotic	Widespread in lowland rivers.
Carcharhinus leucas	Bull shark	Common (not abundant)	Estuaries, lower reaches of rivers; coastal waters.
Chanos chanos	Milkfish	Common	Marine and warm water, shallow estuaries and rivers, will travel up rivers
Cyprinus carpio	Common carp	Exotic; Noxious listing	Still gentle flowing rivers in inland NSW and some catchments along the coast.
Elops hawaiensis	Giant herring	Common	Sheltered embayments and estuaries.
Epinephelusn daemelii	Black cod	NSW Threatened Species (*vulnerable*)	Inshore marine caves and rocky reefs; larger juveniles around rocky shores in estuaries (natural distribution to south of Bega NSW)
Galaxias brevipinnis	Climbing galaxias	Uncertain; Distribution contracted	Amphidromous; headwaters and forested streams
Galaxias maculatus	Common jollytail	Common	Catadromous; coastal streams, lakes and lagoons – salt and fresh water environs
Galaxias olidus	Mountain galaxias	Common	Local migration; moderate and high elevations in coastal and inland rivers.
Gambusia holbrooki	Gambusia, Plague minnow	Exotic; Noxious Listing	Widespread in coastal and inland NSW.
Gobiomorphus australis	Striped gudgeon	Common	Amphidromous; coastal streams generally at lower elevations.

[5] Migration patterns of freshwater fish include: *Potamodromous* – fish that migrate wholly within fresh water; *Anadromous* – fish that spend most of their life in the sea and migrate to fresh water to breed; *Catadromous* - fish that spend most of their life in fresh water and migrate to the sea to breed; *Amphidromous* - fish that migrate between sea and fresh water, but not for the purpose of breeding.

Scientific Name	**Common Names**	Status	**Migration[5] and habitat**
Gobiomorphus coxii	Cox's gudgeon	Common	Potamodromous; freshwater reaches of coastal rivers
Hypseleotris compressa	Empire gudgeon	Common throughout its range	Unknown migration; lower reaches of coastal rivers.
Hypseleotris galii	Firetailed gudgeon	Common	Potamodromous; freshwater reaches of coastal streams.
Hypseleotris sp	Gudgeon	Common	Unknown migration; lower reaches of coastal rivers.
Macquaria australasica	Macquarie perch	Threatened species	Potamodromous; Hawkesbury River, Shoalhaven River and inland NSW.
Maccullochella macquariensis	Trout cod	Threatened species (*endangered*)	Potamodromous; prefer deep flowing freshwaters with woody debris. Present as a result of stocking.
Macquaria novemaculeata	Australian bass	Uncertain	Catadromous; Coastal rivers up to 600m altitude.
Maccullochella peelii peelii	Murray cod	Federally Threatened Species (*Vulnerable*)	Potamodromous; Habitat predominantly in lowland and slope waterways. Present as a result of stocking
Megalops cyprinoides	Oxeye herring	Abundant throughout its range	Amphidromous; tropical waters, estuaries and northern coastal fresh waters
Melanotaenia duboulayi	Duboulay's rainbowfish	Relatively common throughout its range	Local migration; coastal waterways from Macleay River north into QLD
Misgurnis anguillicaudatus	Oriental wetherloach	Exotic	Still and slow-flowing freshwaters with muddy substrate.
Mordacia mordax	Shortheaded lamprey	Moderately abundant in some rivers	Anadromous; coastal rivers from Hawkesbury River to southern catchments
Mordacia praecox	Non-parasitic lamprey	Uncertain	Anadromous; has been found in Moruya and Tuross Rivers in NSW.
Mugil cephalus	Striped mullet Sea mullet	Common	Amphidromous; lower reaches and estuaries of coastal catchments
Mugilogobius platynotus	Flat backed goby	Common	Estuaries, can tolerate freshwater but mainly a marine species
Myxus petardi	Freshwater mullet	Common	Catadromous; freshwater reaches of coastal rivers north of Georges River into QLD
Notesthes robusta	Bullrout	Limited abundance but not threatened	Catadromous; tidal estuaries and fresh waters
Oncorhynchus mykiss	Rainbow trout	Exotic	Local migration; montane regions along the Great Dividing Range
Philypnodon grandiceps	Flathead gudgeon	Common	Unknown migration; inland and coastal waters especially lakes and dams
Philypnodon sp.1	Dwarf flathead gudgeon	Common	Unknown migration; coastal and inland streams
Potamalosa richmondia	Freshwater herring	Not common but not considered under threat	Catadromous; estuaries and coastal fresh water rivers
Prototroctes maraena	Australian grayling	Federally Threatened (*Vulnerable*)	Catadromous; coastal freshwater systems.

Scientific Name	**Common Names**	Status	**Migration[5] and habitat**
Pristis zijsron	Green sawfish	NSW Threatened Species (*Endangered*)	Amphidromous; lower reaches and estuaries of coastal catchments. Last confirmed sighting in 1972
Pseudomugil signifer	Southern blue-eye	Common	Amphidromous; eastern draining catchments
Retropinna semoni	Australian smelt	Common	Potamodromous; Inland and coastal freshwater
Rhabdosargus sarba	Tarwhine	Common	Coastal waters, often entering estuaries
Rhadinocentrus ornatus	Softspined rainbowfish	Common	Potamodromous; Inland and coastal freshwater
Salmo trutta	Brown trout	Exotic	Restricted to cooler waters; montane waterways above 600m elevation.
Scatophagus argus	Spotted scat	Common	Estuarine and coastal, mangrove creeks, lower reaches of freshwater streams.
Selenotoca multifasciata	Banded scat	Common.	Estuarine and coastal, mangrove creeks, lower reaches of freshwater streams
Tanichthys albonubes	White cloud; Mountain minnow	Exotic	Temperate freshwaters
Tandanus tandanus	Freshwater catfish	Not common	Potamodromous, still and slow moving freshwater in mid to lowland slopes