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**RE: DA2020/0552 - 181 Allambie Road ALLAMBIE HEIGHTS NSW 2100**

SUBMISSION RE:

GALAXIAS BREVIPINNIS: ENVIRONMENTAL ASPECTS, IMPACTS of  
Development application No: 2020/0552  
Address: 181 Allambie Road, Allambie Heights  
(Extension of Allambie Heights Village / William Charlton Village)

Submitted: 20 July 2020  
Submission Summary

Further disturbances to the freshwater ecology of the Manly Dam War Memorial Park catchment threaten the only confirmed population of *G. brevipinnis* within the Sydney Metropolitan area. Recent freshwater ecological surveys confirm that the species persists by the presence of a limited number of adult and juvenile individuals surviving in marginal habitat. Highly valued by the local community as part of the conservation values of the reserve, the *G. brevipinnis* population is already under pressure from multiple environmental impacts relating to urban development and other anthropogenic disturbances. Apart from its ecological values, the Manly Dam War Memorial Park ("The Reserve") also represents significant economic value to the local community, attracting over 300,000 visitors per annum who enjoy the Reserve's unique complement of natural and recreational attractions. The protection of public spaces like the Reserve benefits both the natural environment and the mental, physical, and social wellbeing of the local community and visitors.

1. Significant environmental aspects would include the removal of vegetation within the Reserve for fire hazard mitigation, increased area of any hardstand and similarly impervious surfaces;
2. Direct environmental impacts to freshwater ecology include, but are not limited to: changes to sub-catchment flow regimes, erosion and flooding of habitat with suspended sediment and debris, increase nutrient loads, increased water temperature due to surface runoff from non-vegetated areas, and increased turbidity;
3. Secondary impacts resulting from increased nutrient levels and temperature would include increased frequency of algal blooms and decrease in dissolved oxygen levels. Specifically, increased nutrient loads would support further incursions by invasive aquatic and terrestrial flora, reducing shaded areas of indigenous flora critical for meeting the habitat requirements of freshwater ecosystem macroinvertebrates and other fauna;
4. Tertiary impacts would include decrease in prey species abundance and diversity, and impairment of the *G. brevipinnis* population's ability to hunt for prey;
5. We can further infer that both direct and indirect impacts may lead to increased mortality in drought years, decreased fecundity during flood events during which the species breeds, and decreased general survival to adulthood for recruits due to overall decrease in preferred

habitat area and increased competition for areas occupied by the species' competitors and predators alike;

6. More generally, these impacts would reduce the overall species richness and abundance of freshwater macroinvertebrates within the freshwater tributaries of the reserve;

7. Further, any loss or negative impact to this species could be considered indicative of significant degradation of habitat quality and the Park's overall conservation value.

Significance: The conservation, cultural significance, ecological and scientific research values of this population of *Galaxias brevipinnis* are outlined below.

#### Introduction

The Manly Warringah War Memorial Park is situated between the Sydney metropolitan suburbs of Allambie Heights and Manly Vale, northeast of the Sydney CBD.

The park includes approximately 75% of the Manly Dam Warringah Memorial Park catchment area; the balance of the catchment tributaries is comprised largely of surface run-off collected from stormwater drains. The water quality and flow of these latter tributaries is critical for health of freshwater ecosystems within the Reserve.

A population of the native freshwater fish *Galaxias brevipinnis* was first recorded in Manly Dam Warringah Memorial Park Catchment in the early 1970's. The species is thought to have evolved before the separation of Gondwana, as populations are also found in New Zealand.

The life history of species is typically diadromous, and the population within the Reserve is an exceptional example of an isolated landlocked population within high quality habitat to the northernmost limit of its range. The population meets all criteria for protected population under the Threatened Species Act, for instance that the population has few surviving individuals located at the limit of the known distribution of the species within jurisdiction, with the exception that the population is yet to be tested for whether it is genetically distinct from other *G. brevipinnis* populations. Within the catchment itself there has been significant deterioration of freshwater stream habitat due to urban development related disturbances such as nutrient pollution, disrupted flow regimes, erosion, and subsequent algal growth.

Locally the species occurs in shallow creeks with Hawkesbury Sandstone substrate, sheltered by overhanging vegetation in open forest or closed woodland. While historically, these creeks in the present day Sydney metropolitan area would have included numerous areas supplying ideal habitat conditions for the species. Presently Manly Warringah War Memorial Park is the only remaining catchment in Metropolitan Sydney in which *G. brevipinnis* are confirmed as surviving within the upper reaches of catchment tributaries within the Reserve, where water is cool, clear, fast flowing and interspersed with waterfalls and pools. (confirmed by personal observation during site survey June 2020).

Further disturbances to the freshwater ecology of the catchment threaten the remaining population of *G. brevipinnis*.

#### DISCUSSION

The conservation, cultural significance, ecological and scientific research values of the *Galaxias brevipinnis* population are below. Further, any loss or negative impact to this species could be considered indicative of significant degradation of habitat quality and the Park's overall conservation value.

##### 1. Conservation value and ecological significance of *Galaxias brevipinnis*

*Galaxias brevipinnis* is a key ecosystem indicator species due to its preference for the following habitat features, as observed within the Manly Warringah War Memorial Park (the "Reserve"):

- o Smooth sandstone substrate, absent of phosphorus-dependent macro algae growth;

- o High water clarity i.e. low turbidity and free of floating debris;
- o Cool water pools interspersed with fast flowing streams;
- o Co-existence with macroinvertebrate communities;
- o Overhanging vegetation;
- o Presence of both aquatic and terrestrial prey species;
- o Absence of introduced predator species; and
- o Absence of competing freshwater fish species.

Hence the continued presence of the population of *Galaxias brevipinnis* is confirmation that the Reserve provides an outstanding example of a remnant Sydney forested freshwater ecosystems, which have largely disappeared since European settlement. Specifically, reserve represents a unique example of a high quality legacy freshwater ecosystem within a highly urbanised, residential and part-industrial area of the Sydney metropolitan area.

The Manly Warringah War Memorial Park population of *Galaxias brevipinnis* is also ecologically significant to the species within Australia, as it is located within the northerly limits of its Eastern Australian range.

## 2. Local cultural significance of *Galaxias brevipinnis*

The species is an iconic feature species of the Reserve, having been featured in the media as a land-locked population that has persisted for millions of years. There is much affection for this little fish in the local community, and meaning associated with the fact that this and other species where populations within the Park are of high conservation value have persisted within the Reservation bounds.

## 3. Scientific value of *Galaxias brevipinnis*

This population is possibly one of few surviving landlocked populations found within New South Wales, and certainly the only population surviving within this unique complement of Sandstone substrate and vegetation type and of scientific interest.

The narrow habitat preferences (niche) of this species within the Reserve are also of scientific interest in understanding the impacts of climate change, recreational use and urban edge dynamics on freshwater species including landlocked populations.

## 4. Educational Value of *Galaxias brevipinnis*

Numerous research field visits have been made to study the population, both for research and teaching purposes, since it's discovery. The population is an invaluable education resource for applied science students and primary and secondary school students.

### Threat of local extinction

The total number of mature individuals is very low and there is some evidence of possible range contraction within the Reserve for the *Galaxias brevipinnis* over the last decade.

The existing local population within the Reserve is under threat from pressures from local developments, recreational use and climate change. Specifically, local developments can directly and dramatically degrade the habitat and create lasting changes which overwhelm the ecological community's ability to recover at a local level. Legacy impacts of neighbouring developments in other sections of the Reserve have been documented by locals and include direct degradation such as:

- o nutrient and other chemical pollution
- o reduced freshwater flow including total water volume (both seasonally and overall), leading to drying out of previously perennial pools
- o persistent nutrient and other chemical pollution
- o increased physical pollution such as suspended debris
- o extreme pollution events during works

o weed encroachment.

#### CONCLUSION

In conclusion, *Galaxias brevipinnis* is highly valued by the local community as an iconic species within the Reserve. The species can be considered an ecological indicator due to its preference for marginal and quality freshwater habitats situated in similarly high-quality forested areas. It follows that the Reserve should be protected against any loss or negative impact to this population of *Galaxias brevipinnis* or its habitat. Due to the population's status as a locally iconic and ecosystem indicator species, any loss or negative impact could be further considered a significant degradation of the Reserve's multiple values, including its overall overall conservation, heritage, cultural, scientific and economic values.

Submitted by: Sonya Ku, Environmental Scientist.

Sonya Ku is an Environmental Scientist specialising in biodiversity conservation at the urban/wild interface, sustainability management and non-profit strategy.