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Environment, Marine and Fisheries Group
Department of Agriculture, Environment and Rural Affairs

Ref: Request for Scientific advice regarding Eel Management options.

Dear ██████████,

The Eel Management Plan (EMP) for the Neagh/ Bann River Basin District sets a silver eel escapement target within the range of 160 to 240 tonnes per year following the requirements of the EU Regulation 1100/2007. Section 13.1.2 of this EMP states that:

“should mark recapture estimation in future indicate that escapement is falling below the target of **200t** per year, measured on a rolling average basis, this will necessarily trigger measures to reduce exploitation of yellow or silver eels”.

Recent three-year rolling escapement estimates are:

- **144 tonnes in 2023** (average annual escapement from 2021 to 2023),
- **124 tonnes in 2024** (2022-2024) and
- **92 tonnes in 2025** (2023-2025)

With the commencement of The Eel Fishing (Amendment) Regulations (Northern Ireland) 2025 on the 1st of January 2026, DAERA requested that AFBI provide catch advice to inform the management of the commercial eel fisheries on Lough Neagh for the 2026 fishing season.

Catch advice for 2026

AFBI have developed a tool allowing the estimation of permissible catches (of eels within the Lough Neagh commercial fishery, based on the Predicted Eel Population Lifetime Mortality Rate Model (Beverton & Holt Model as described in Aprahamian and Evans *et al* 2021¹), which uses known recruitment and stocking history of eels in Lough Neagh. This tool generates an annual predicted output (in tonnes) of eels from the Lough Neagh system (see Table 1). By subtracting the 200 tonnes silver eel escapement target from predicted outputs, the projected amount of permissible fishery harvest in Tonnes is presented for each year from 2026 to 2030 in Table 1.

¹ Aprahamian, M. W., Evans, D. W., Briand, C., Walker, A. M., McElarney, Y., & Allen, M. (2021). The changing times of Europe's largest remaining commercially harvested population of eel *Anguilla anguilla* L. *Journal of Fish Biology*, 99(4), 1201–1221. <https://doi.org/10.1111/jfb.14820>

Table 1: Lough Neagh predicted eel output based on a tool derived from the Predicted Eel population Lifetime mortality rate model (as published in Aprahamian and Evans *et al* 2021). The Permissible catch refers to the tonnage of eels available for capture after compliance with the 200 Tonnes silver eel escapement target.

Year	Predicted eel output (tonnes)	Permissible catch (tonnes)
2026	371	171
2027	385	185
2028	385	185
2029	401	201
2030	394	194

Using the tool described above we have also looked at the long-term trend of predicted output vs observed output (See Table 2 and Figure 1).

Table 2: Lough Neagh predicted eel output for the years 2020 to 2025 based on a tool derived from the Predicted Eel population Lifetime mortality rate model (as published in Aprahamian and Evans *et al* 2021) and the observed output of eels from the system in the same years. Note that the observed outputs are the sum of the catches from the yellow and silver eel commercial fisheries plus the silver eel escapement estimate for the year.

Year	Predicted eel output (tonnes)	Observed output (tonnes)
2020	378	300
2021	361	324
2022	351	331
2023	340	216
2024	346	79
2025	362	121

The data in Table 2 suggest that predicted eel output for the years 2023 to 2025 has diverged markedly from observed output.

The trend between model predictions and observed outputs has been examined over a longer period of time (1990 to 2025). In previous years, predicted versus observed values have been relatively consistent, with the model tending to slightly underestimate observed outputs (markedly so in 2018 when elevated water temperatures lead to increased feeding and a dramatic increase in the observed eel outputs from the system against those predicted), however this trend has shown a pronounced reversal during 2023-2025 (Figure 1).

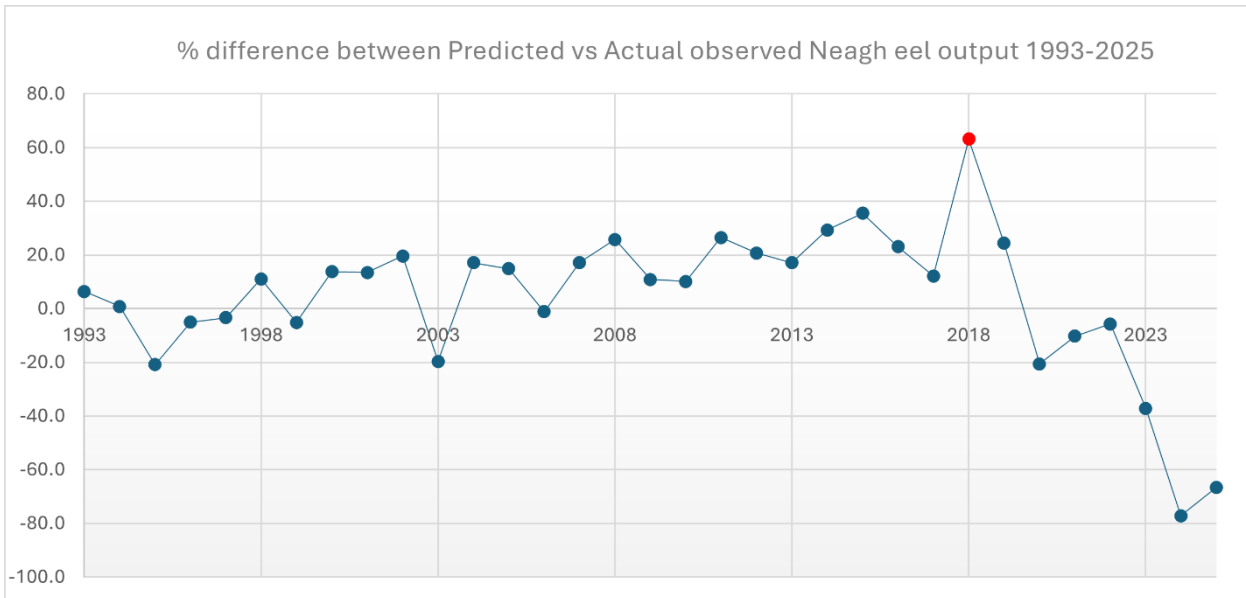


Figure 1. Long term trend of the % difference between Beverton & Holt predicted versus observed Lough Neagh eel output for the years 1990 to 2025. In 2018 (shown as the red dot on the graph) elevated water temperatures lead to increased feeding and a dramatic increase in the observed eel outputs from the system against those predicted.

The years 2023-2025 have been characterized by pronounced environmental change in the Lough. Originally detected in the early 2000's, zebra mussel populations have proliferated in recent years. As is typical with zebra mussel invasions, these recognized ecosystem engineers initiate ecological changes to affected systems, and among the changes, Lough Neagh has seen significant increases in water clarity and the development of large macrophyte beds around its margins, and highly visible blue green algal blooms have been widely reported in the media since summer 2023.

While supporting empirical data are currently unavailable, the ecological changes observed may account for the reduction in observed eel output. In the absence of any mass mortality events or reports of moribund eels in the Lough, the reduced observed output infers a change in eel behavioral traits, resulting in an extended residence time within the lake, and as a result, current eel ontogeny (life course of an individual) may deviate from the values utilized within the Predicted Eel Population Lifetime Mortality Rate Model (Beverton & Holt Model as described in Aprahamian and Evans *et al* 2021).

It is worth noting that following a summer of elevated water temperatures in 2018, the observed output of eels from the Lough was significantly higher than predicted (Figure 1). Aprahamian et al., (2021) noted the plasticity and rapid adaptability of the eel population in Lough Neagh to changing environmental conditions, such as heat and its effect on increased feeding stimulus, resulting in a higher proportion of yellow eels maturing into silver eels than normal. As such, more eels left the system in the Autumn of 2018, leaving a deficit for future silver eel outputs, and observed outputs in the ensuing years did indeed drop.

The average difference between predicted and observed outputs for the years 2023 to 2025 is approximately -60% (see Figure 1). Under application of the precautionary approach, we would recommend that a similar weighting is applied to the permissible catch for 2026 (i.e. a 60% reduction from predicted). The permissible catches for the years 2026 to 2030, applying the precautionary principle as described above, are shown in Table 3.

Table 3: Lough Neagh predicted eel output based on a tool derived from the Predicted Eel population Lifetime mortality rate model (as published in Aprahamian and Evans *et al* 2021). The Permissible catch refers to the tonnage of eels available for capture after compliance with the 200 Tonnes silver eel escapement target. The precautionary approach has been applied, and the predicted outputs have been reduced by 60% (as outlined in the text above).

Year	Predicted eel output (tonnes)	Adjusted predicted eel output (tonnes)	Permissible catch (tonnes)
2026	371	148.4	0
2027	385	154	0
2028	385	154	0
2029	401	160	0
2030	394	157.6	0

These predictions are based on current observations, however given the current rate of ecological change within the Lough, these values are subject to change and should be reviewed annually.

RECOMMENDATIONS

DAERA should be mindful of the current International Council for the Exploration of the Sea (ICES) Working Group on Eels (WGEEL) advice as per fishing opportunities for European eels which states that “when the precautionary approach is applied there should be zero catches in all habitats in 2026”.

As outlined in the paragraphs above the recent steep departure in the relationship between predicted and observed eel outputs (potentially driven by current ecological conditions in the Lough), may be the result of a change in residence time for eels within the lake. This in turn could impact our model predictions by underestimating the lifetime mortality rate and as a result, overestimating predicted outputs. AFBI therefore recommend the application of the precautionary approach and the utilization of the adjusted predicted outputs from Table 3. Based on the evidence provided, the permissible total catch of eels for the 2026 season therefore, is zero.

Yours Sincerely,

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Fisheries and Aquatic Ecosystems Branch
 Freshwater Fisheries Section

