Tionscadal Soláthair Uisce
Water Supply Project

Environmental Impact Assessment Report (EIAR)

Volume 6 of 6: Appendices

(Appendix 8.23) Aquatic Invasive Species and Macrophyte Survey at Lough Derg and Parteen Basin

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Uisce Éireann
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Jacobs

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WATER SUPPLY PROJECT
EASTERN AND MIDLANDS REGION

Report on
Aquatic Invasive Species and Macrophyte Survey at Lough Derg and Parteen Basin Abstraction Site

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1. Introduction

This report presents the results of an aquatic survey to assess the current condition of the proposed Raw Water Intake and Pumping Station (RWI&PS) location for the Water Supply Project Eastern and Midlands Region (WSP) and to determine the current distribution of invasive aquatic species within Parteen Basin and lower reaches of Lough Derg including the Asian clam (*Corbicula fluminea*), zebra mussel (*Dreissena polymorpha*), quagga mussel (*Dreissena rostriformis bugensis*) and starry stonewort (*Nitellopsis obtusa*). Previous surveys of the lower sections of Lough Derg and Parteen Basin were undertaken by EirEco Environmental Consultants in August 2017, August 2019 and August 2021.

2. Methodology

The surveys were undertaken on the 8th of August 2024 using a 4.5m RIB with a 20hp outboard engine. The weather at the time of survey was dry but overcast (cloud cover 8/8) with temperatures of approximately 18°C and light to moderate south-westerly winds (F2-4).

Three survey methods were employed to determine the presence of invasive species. A grapnel was used for sampling *Nitellopsis* while a scraper was used to sample vertical surfaces for mussel growth. This consisted of a 4m pole with a 15cm scraper blade with mussels collected in a mesh pocket attached below the scraper. A basket dredge was used to collect mussels from sediments to determine whether the Asian clam has extended its range southwards in Lough Derg from its current known distribution at the northern end of the lake.

A SCUBA survey was undertaken at the intake location which allowed for a visual assessment of the aquatic vegetation communities, substrates and associated biota, and allowed for the collection of further sediments for sieving within the support vessel to determine presence of juvenile clams. The SCUBA survey was undertaken by a qualified and experienced team comprising Paul Murphy (HSE Part IV, PADI Dive Master) as lead diver, Brian Murphy (HSE Part IV, II & I, PADI Dive Instructor) as standby diver and John Kinsella (HSE Part IV, PADI Dive Instructor) as dive supervisor and boat coxswain. Dr. Dan Minchin provided technical knowledge on suitable locations to undertake the invasive species surveys in Lough Derg and Parteen Basin, and provided confirmation on species identification.

A Biosecurity protocol was rigidly followed to avoid the potential for transfer of invasive alien species to or from the site in accordance with guidance produced by Invasive Species Ireland and Inland Fisheries Ireland (*Decontamination and Disinfection procedures for equipment and personnel*). A specific Biosecurity Method Statement was produced for the survey operation.

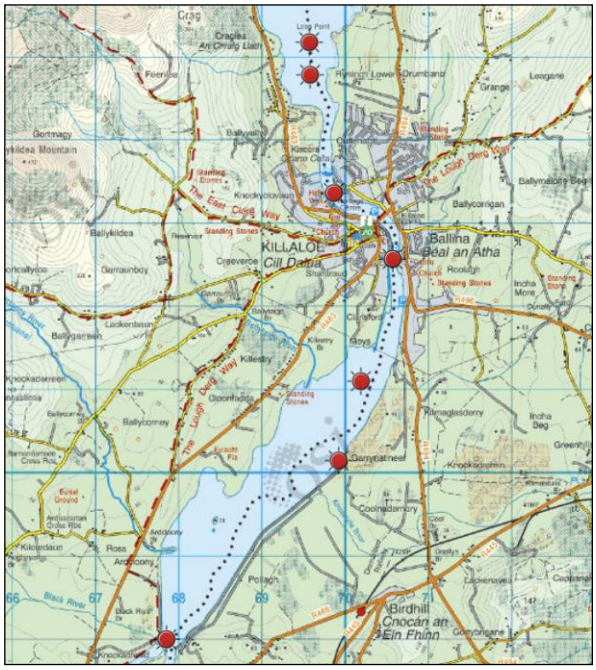

Figure 1. Survey locations for invasive species in Lough Derg and Parteen Basin (red dots). (*Source: NPWS Mapviewer*)

3. Results

3.1 Results of Invasive Species survey in lower Lough Derg and Parteen Basin

The sampling locations for invasive species and a summary of results is shown in Figure 2.

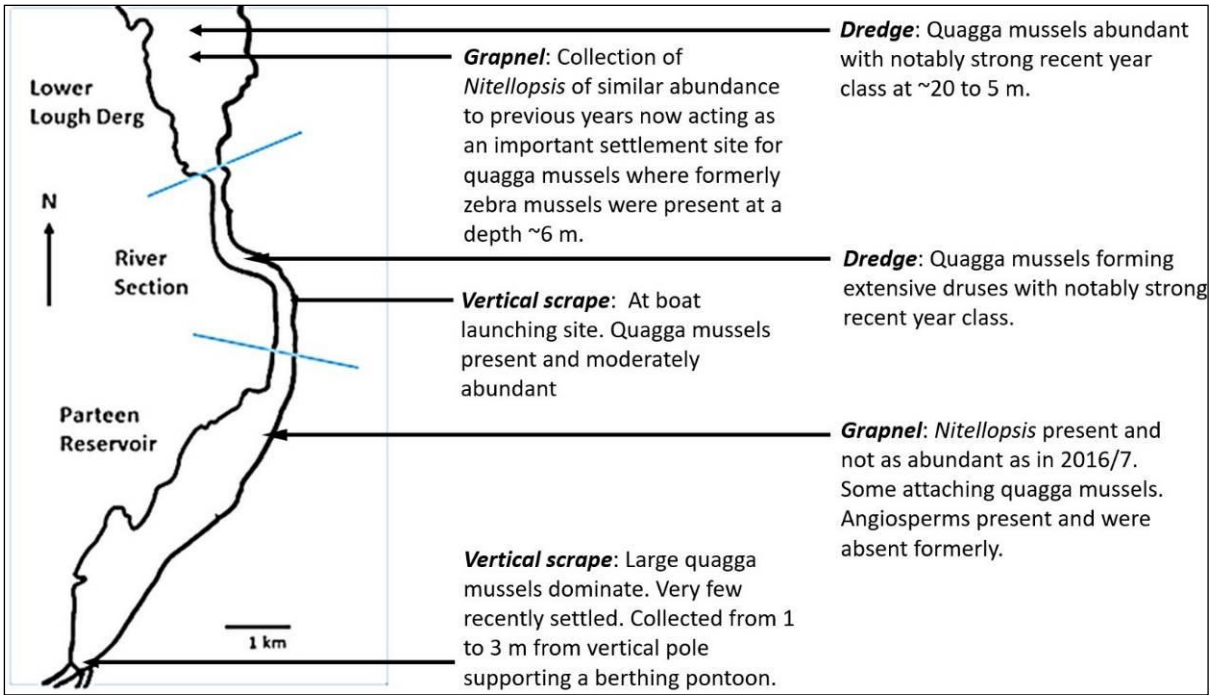

Figure 2. Sampling locations and summary results for invasive species.

Zebra mussel (*Dreissena polymorpha*)

This mussel was present in considerably lower numbers than previously recorded having been displaced by extensive numbers of the quagga mussel. Recent settlements of the quagga mussel have taken place on the zebra mussel and the larger quagga mussel observed probably represented a settlement in the previous year. The zebra mussel abundance was less than 5% of all the mussels obtained at each sampled site. Both mussel species attach by means of byssal threads. While zebra mussels were present at all sites investigated no recent settlement stages were noticed.

Quagga mussel (*Dreissena rostriformis bugensis*)

This mussel now dominates most of the firm surfaces of bedrock, stones, gravels and shells and also attached to aquatic macrophytes at all sites sampled. This species was first located in Ireland in the river section between Lough Derg and Parteen Basin in 2021 (Figure 2). It has since become dominant and is currently in an outbreak stage. Very few living zebra mussels were found alongside quagga mussels. In lower Lough Derg and the river section this mussel has a very strong recent year class at a modal size of 3 to 4mm shell length. Unexpectedly, the southern region of the Parteen Reservoir had remarkably few mussels that relate to the outbreak stage elsewhere. The vertical surface of the sampling station consisted of two size modes that approximate at 14mm and 20mm shell length and probably represent two separate year classes. In lower Lough Derg the quagga mussel is found attached in abundance to Nitellopsis, though fewer mussels were found attached from plants in the Parteen Reservoir.

The extensive settlement of the quagga mussel was first recorded from the river section above the Parteen Reservoir in 2021 (Baars *et al*., 2022). This mussel has expanded rapidly in the lower Shannon (Flynn *et al*., 2023) and is presently in an outbreak stage. Should the quagga mussel even have a moderate survival rate, it will dominate the benthos to result in extensive fouling of firm surfaces and aquatic macrophytes. This follows the pattern of the zebra mussel that underwent an outbreak stage over the period 2000 to 2003. At this time very extensive settlements have resulted in considerable fouling of firm surfaces due to its capability of attaching by means of byssal threads. Since the outbreak stage zebra mussel settlements gradually moderated within Lough Derg, with settlements becoming impacted by its own abundance and by the settlement of the muddy-tube forming invasive amphipod *Chelicorophium curvispinum*. The great majority of mussel larvae are thought to originate from within Lough Derg carried down-lake by water currents.

The recent extensive settlement of the quagga mussel in the lower Lough Derg and river section appeared to be almost absent in the most southern region of the Parteen Reservoir, although a moderate settlement was found attached to Nitellopsis in the Parteen Reservoir. This variability is not easily explained other than perhaps due to low summer water flows and from filtration from the plankton while passing through the Parteen Reservoir. This may not be the pattern in every year. The presence of such large numbers of the quagga mussel above the planned abstraction point should be of special concern. The previous report provided to Irish Water (Minchin, 2016) showed the zebra mussel was commonly attached to shells and stones in the Parteen Reservoir, sufficient to prompt a study in the following year for zebra mussel larval occurrence and duration in the plankton (Minchin and Boelens, 2017). This report provided evidence of peak settlement times from 12 July to 12 September with some settlement occurring from mid-June to the end of October 2017. Since the quagga mussel may have a different reproductive period, that may also change on account of its potential increase in biomass. Consequently, the settlement period(s) for the zebra mussel cannot be relied upon to be the same as for the quagga mussel. The overall biology of the quagga mussel, while similar, has important differences, being adapted for a greater overall depth range and for cooler water, that has resulted in it becoming dominant over the zebra mussel in many studies where it occurs in Europe and North America (Strayer *et al.*, 2019).

Asian clam (*Corbicula fluminea*)

No clams were obtained in any of the dredge samples. It was first recorded in the mid-lake region of Lough Derg in January 2011 where it may have been present since 2007 (Minchin 2014). The Asian clam is capable of resulting in reduced flow and blockages at extraction points, though is unlikely to have the same impact as that of the zebra or quagga mussel as it does not possess byssal threads to which it can attach to vertical surfaces. While this clam was not found in the current survey, it will eventually arrive in the Parteen Basin. While we have no current information of the front position for this species, the last known southerly extent was approximately 3 km north of the southernmost part of Lough Derg. Its southern progression may be slow due to the presence of the intervening deep trench and resultant lower water flows. The spread of this clam appears to be mainly due to byssal thread production that acts as a dragline where there are water currents (Minchin and Boelens, 2018). This clam does not have a pelagic larval stage unlike the zebra and quagga mussel.

Starry stonewort (*Nitellopsis obtusa*)

Starry Stonewort (Figure 3) was first recorded in Lough Derg and the Parteen Basin in 2016 (Minchin et. al, 2016), though it is suspected to have been present for many years prior to discovery due to the extent of the beds it formed. It occurs to a greater depth than other submerged macrophytes within the lake system, including other non-native species. Starry stonewort has expanded its range since it was first recorded from the Parteen Reservoir (Minchin *et al.*, 2017) to now form extensive meadows in both Lough Derg and Lough Ree (Flynn *et al.*, 2024). These plants may be contributing to clearer water by adsorbing nutrients, as these plants are perennial much of the nutrient becomes retained. Water clarity may also be enhanced due to the high abundance of filter feeding bivalves.

Figure 3. Starry Stonewort from dredge in lower section of Lough Derg.

3.2 Results of SCUBA Survey at proposed WSP Intake site

As previously described from earlier reports on the aquatic ecology at the proposed WSP intake location (EirEco 2017, 2019 and 2022), the shoreline in the vicinity of the proposed abstraction is gently shelving with the upper shore comprised of cobble and gravel. At a distance of approximately 5m offshore with a depth of 1m of water, the substrate changes from cobble and gravel to a silty, sandy gravel with scattered coble and small boulder. This continues to a depth of approximately 2.5m where it becomes a silty sand, while from 3m and deeper it is comprised of a fine silt.

The shallow upper shore zone (to approximately 0.5m) has cobbles which were originally covered with a light layer of Krustenstein, a blue-green algal crust associated with oligotrophic alkaline waters, during the initial survey in undertaken by EirEco in 2017 (EirEco 2017; Appendix A8.17). During the current survey there was a thin coating of flocculent algae which has blanketed the substrate and appears to have supressed the growth of plants with only very small amounts of horned pondweed (*Zannichellia palustris*) and stonewort (*Chara virgata*) present (Figure 4). Zebra mussels are present on hard substrates in moderate amounts becoming more abundant in lower levels down to 3m where silt substrates dominate.

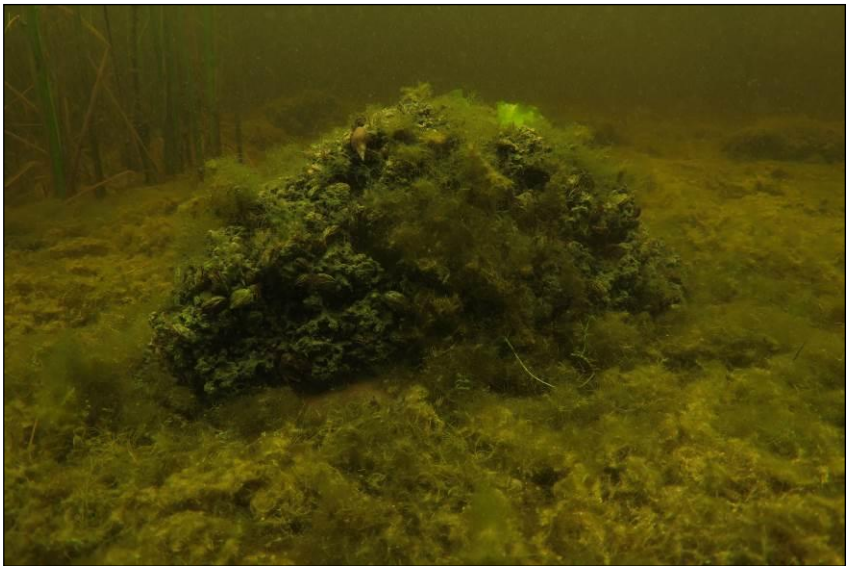

Figure 4. Algal floc and zebra mussel in shallow water (c1m depth).

In water from 1.0 to 1.5m in depth, small amounts of stonewort are present, though much of it appears to be unrooted drift material. Yellow water lily (*Nuphar lutea*) and the submerged form of bulrush (*Schoenoplectus lacustris*) are occasional to frequent. The submerged form of arrowhead (*Saggitaria sagittifolia*) forms isolated dense stands which appear to be more extensive than in previous surveys. Shining pondweed (*Potamogeton lucens*), perfoliate pondweed (*P. perfoliatus*) and spiked water milfoil (*Myriophyllum spicatum*) and Nuttall's pondweed (*Elodea nuttallii*) occur in small amounts. Cobbles and other hard substrates (including old tree roots) support high densities of zebra mussel. Areas devoid of vegetation have a thin mat of coalescing algae cover, while there are pockets of cloud algae in slightly deeper water.

In water from 1.5m to 2.5m in depth, both bulrush and arrowhead form dense stands with occasional clumps of yellow waterlily over a bed of Charophytes (*Chara virgata*) (Figure 5). The bulrush forms emergent reed beds while the arrowhead remains abundant in submerged form. All vegetation thins out towards 3.0m depth with only small amounts of ivy-leaved duckweed (*Lemna trisulca*) in deeper water. No macrophytes were recorded below 3.5m (euphotic depth) though zebra mussels were recorded in small amounts to 5m in depth, forming dense aggregations on any hard substrate.

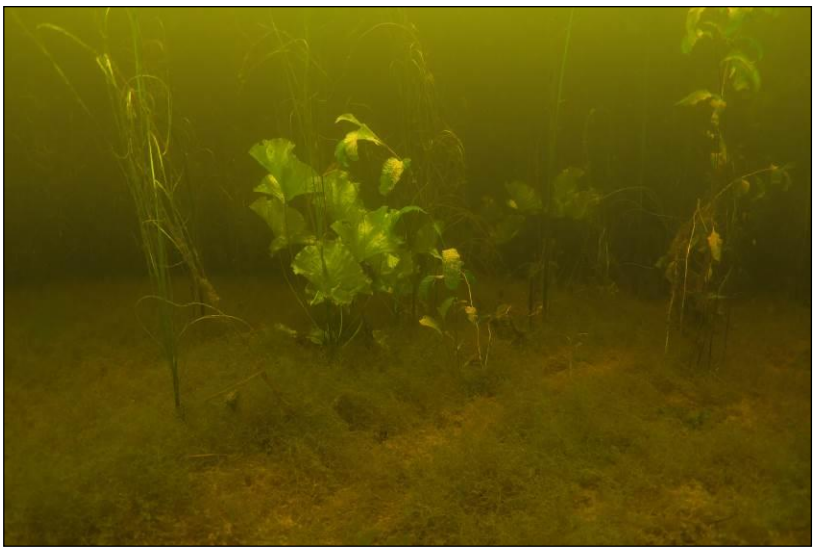

Figure 5. Vegetation at 1.5 to 2.5m.

No evidence of Asian clam was recorded during the dive survey. While there was no significant change observed in the macrophyte composition from the previous surveys undertaken at the site in 2017, 2019 and 2022 (EirEco 2017, 2019 and 2022), flocculent algae were more abundant in the shallower zones (<1m depth).

4. Conclusion

The extensive settlement of the quagga mussel which was first recorded from the river section above the Parteen Reservoir in 2021 (Baars *et al.*, 2022) has continued and is presently considered to be in an outbreak stage. The mussel was recorded at the downstream end of Parteen Basin (adjacent to the Parteen Weir where two early-stage settlement cohorts were identified). The Quagga mussel is expected to out-compete and dominate over the long-established zebra mussel.

No evidence of Asian clam was recorded during the dredge surveys undertaken in lower Lough Derg and in the Parteen Basin.

Starry stonewort was abundant at all stations dredged, though no evidence of the plant was recorded from the vicinity of the proposed WSP intake location.

The results from the dive survey at the proposed WSP intake location found no significant change observed in the macrophyte composition from the previous surveys undertaken at the site in 2017, 2019 and 2022 (EirEco 2017, 2019 and 2022), though flocculent algae were more abundant in the shallower zones (<1m depth).

5. References

Baars JR, Caplice MB, Flynn O, O'Leary K, Swanwick H, Minchin D. (2022). *The Ponto-Caspian quagga mussel, Dreissena rostriformis bugensis Andrusov, 1897, is established in Ireland. BioInvasions Records*. **11**(1):173-80.

EirEco Environmental Consultants (Sept. 2017). *Water Supply Project Eastern and midlands region; Report on Aquatic Ecological Survey at the Proposed Parteen Basin Abstraction Site 2017.*

EirEco Environmental Consultants (Sept. 2019). *Water Supply Project Eastern and midlands region; Report on Aquatic Ecological Survey at the Proposed Parteen Basin Abstraction Site 2019*.

EirEco Environmental Consultants (Sept. 2022). Water Supply Project Eastern and midlands region; Report on Aquatic Ecological Survey at the Proposed Parteen Basin Abstraction Site 2022.

Flynn O, Minchin D, Caplice MB, O'Leary K, Swanwick H, Baars JR. (2023). *Early stage of invasion of the quagga mussel (Dreissena rostriformis bugensis) within the interconnected lakes Lough Ree and Lough Derg of the Shannon River system, Ireland*. *Aquatic Invasions*. **18**(4):473-86.

Flynn O, O'Leary K, Bentov-Lagman S, Minchin D, Baars JR. (2024). *Hydroacoustic surveys detect and quantify extensive beds of the invasive charophyte Nitellopsis obtusa in Irish lakes*. Management of Biological Invasions.15(2):275-88.

Minchin, D. and Boelens, R. (2016). *Asian clam* Corbicula fluminea *populations in the Shannon and Erne River catchments 2011-2016.* A report to Waterways Ireland and Irish Water. Moi Report 122/2016.

Minchin, D., Boelens, R. and Roden, C. (2016). *The first record of Nitellopsis obtusa in Ireland*. Irish Naturalists Journal. Vol 35. Part 2.

Minchin D (2016). *The zebra mussel in the Parteen Reservoir and Lower Lough Derg*. A report to Irish Water and Waterways Ireland. Lough Derg Science Group MOI 121/2016, 11pp.

Minchin D and Boelens R (2017). *Zebra mussel larval abundance above the Parteen Reservoir during 2017*. A report to Irish Water. Lough Derg Science Group 122/2017, 11pp.

Minchin D, Boelens R (2018). Na*tural dispersal of the introduced Asian clam Corbicula fluminea (Müller, 1774) (Cyrenidae) within two temperate lakes.* BioInvasions Records 7(3): 259–268.

Minchin D, Boelens R, Roden C. (2017). *The first record of Nitellopsis obtusa (NA Desvaux) J. Groves (Charophyceae, Characeae) in Ireland (H9, H10).* The Irish Naturalists' Journal. **9**:105-9.