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Fish Stock Assessment of Castlewellan Lake

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Introduction

Castlewellan Lake is situated within the grounds of Castlewellan Forest Park in Co. Down. The lake is 36.2 hectares and has a maximum depth of approximately 20 m. The Castlewellan catchment is covered by 94% forestry (McElarney et al., 2015). The lake is considered eutrophic (Griffiths et al., 2015) and forms part of DAERA's public angling estate. It is regularly stocked with brown trout and rainbow trout. The fishery is open to angling from the 1st March to the 31st October each year. This survey was requested by DAERA following anecdotal reports of the expansion of the recently introduced roach population and concerns that rising roach numbers linked to adverse ecological change might have contributed to recent algal blooms. The lake had been previously surveyed in 2011 (McElarney et al., 2015).

Materials and Methods

The lake was sampled over 2 nights from the 7th to the 9th July. Anglers were discouraged from fishing during the survey period. Considering Castlewellan's size and maximum depth (Figure 1) a total of two gangs of double trap Dutch fyke nets and five EU standard monofilament multimesh gill nets (12 panel, 5 - 55mm) (CEN, 2005) were utilised. Nets were positioned at 7 sites in varying depth strata. Nets were deployed in the afternoon and retrieved the following morning. The location of each net was precisely recorded using a handheld GPS.

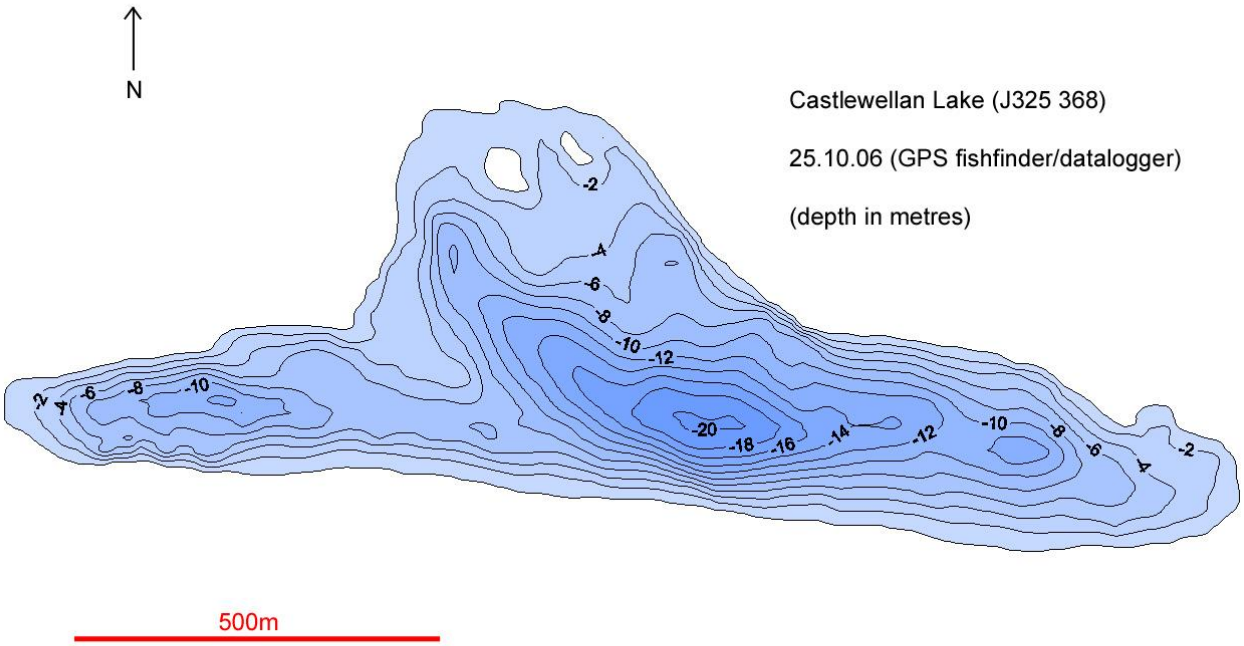

Figure 1: Bathymetric profile of Castlewellan Lake

On retrieving the nets, any live trout were recorded and released. All other fish were removed from the nets, placed in sample bags, labelled and returned to the lab to be frozen for later analysis. In the laboratory, thawed fish were identified to species level and measured (fork length ± 1 mm, blotted wet mass ± 0.1 g). Ageing structures were removed from each wild fish: scales were taken from brown trout and opercular bones from perch. In all fish, a longitudinal ventral incision from the vent to a line level with the pectoral fin was made. The sex of each individual fish was recorded following visual assessment of gonads following Nikolsky (1963). Presence or absence of endoparasites was also recorded.

Results

Five species of fish were captured; brown trout (n=5), European eel (n=3), gudgeon (n=50), perch (n=386) and roach (n=89) (Table 1). The presence of three spined stickleback was also confirmed through stomach content analysis of predators.

*Table 1: Catch per Unit Effort (CPUE (±SE)) and Biomass per Unit Effort (BPUE (±SE)) of each species sampled from Castlewellan. *Metrics for European eel were calculated from fyke net catches only.*

Species	Brown Trout	Eel*	Gudgeon	Perch	Roach
CPUE (no.)	0.024 (±0.01)	0.05 (±0.02)	0.238 (±0.16)	1.84 (±0.95)	0.424 (±0.22)
BPUE (g)	19.119 (±12.41)	17.68 (±1.32)	2.190 (±1.32)	32.076 (±17.27)	16.599 (±7.6)

The brown trout captured were all ex-farm stocked fish, they ranged in length from 31 to 60 cm (Figure 2) and in weight from 321 to 2361 g. Stomach content analysis revealed that the primary prey item of these fish was three spined sticklebacks.

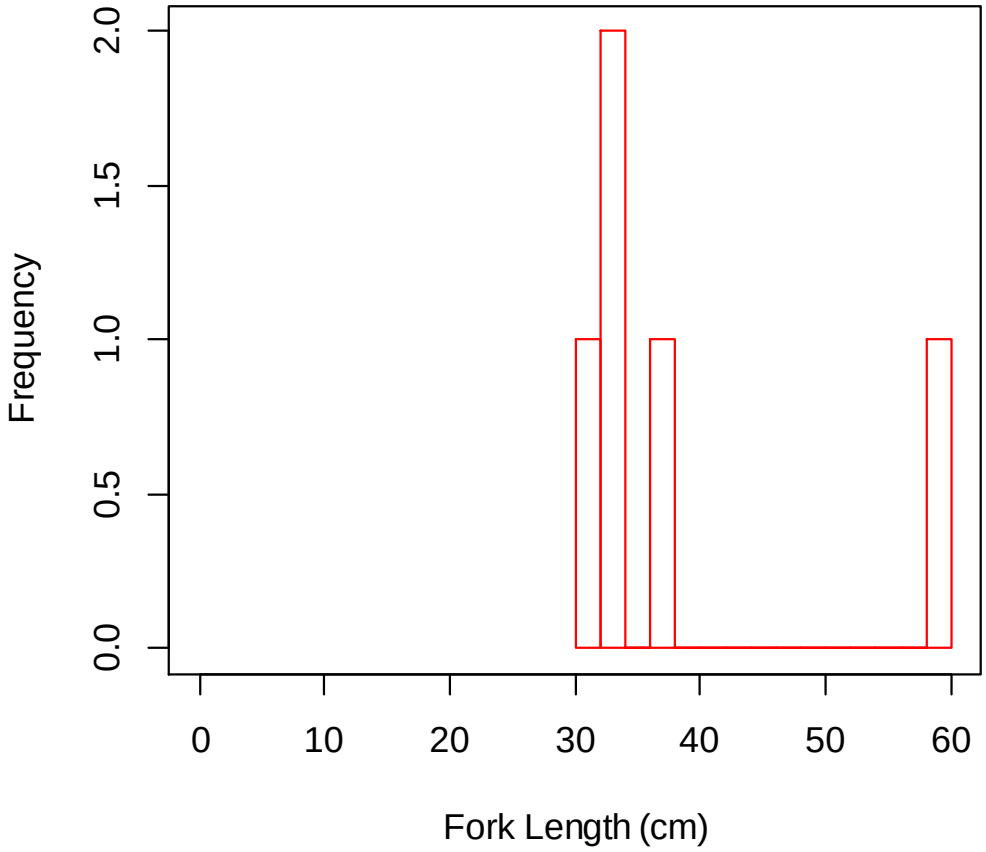

Figure 2: Length frequency histogram of brown trout captured from Castlewellan Lake.

Three individual European eels were captured in the fyke nets. These fish ranged in length from 48 to 74 cm and ranged in weight from 167 to 813 g. All specimens were female. They exhibited piscivory and were found to have roach and gudgeon among their stomach contents. An individual eel was found to be infected with the endoparasite *Anguillicola crassus*.

Gudgeon captured during the survey ranged in length from 5 to 12.5 cm (Figure 3) and in weight from 2 to 23 g. Gudgeon were predominantly captured in nets set in shallow water <3 m.

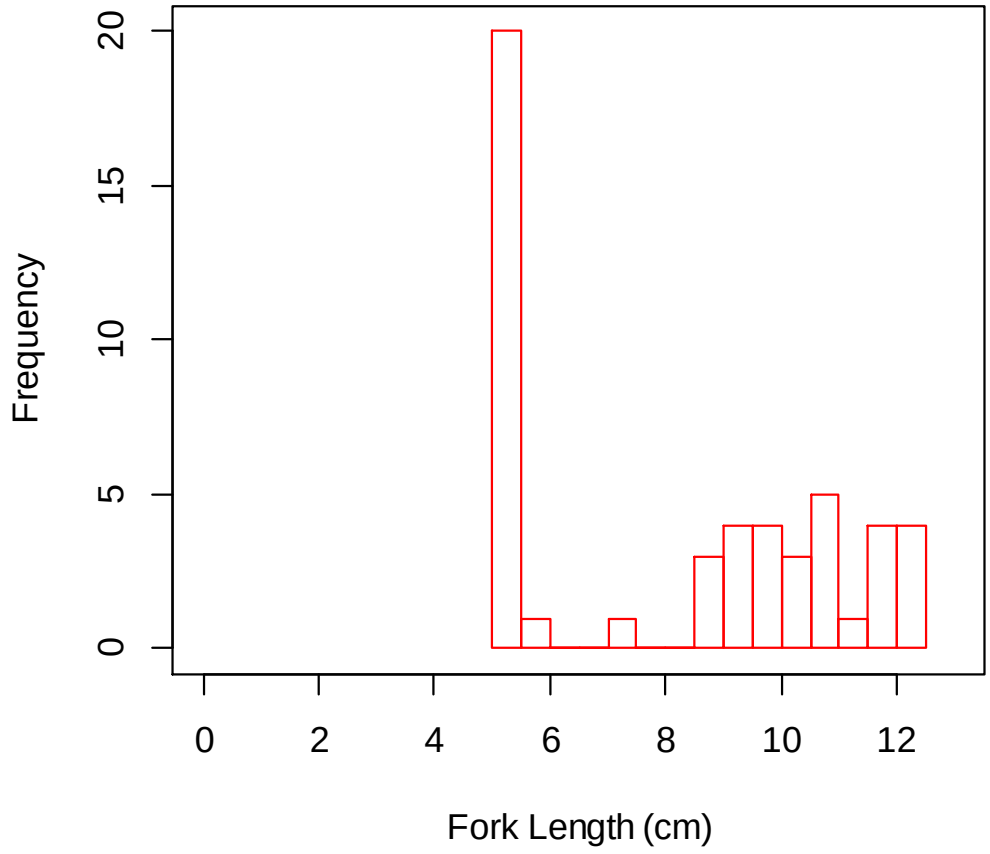

Figure 3: Length frequency histogram of gudgeon captured from Castlewellan Lake.

Perch were the dominant species recorded from the survey. Perch ranged in length from 6 to 29 cm (Figure 4) and ranged in weight from 2 to 401 g. At the time of the survey most perch stomachs were empty and piscivory was not noted.

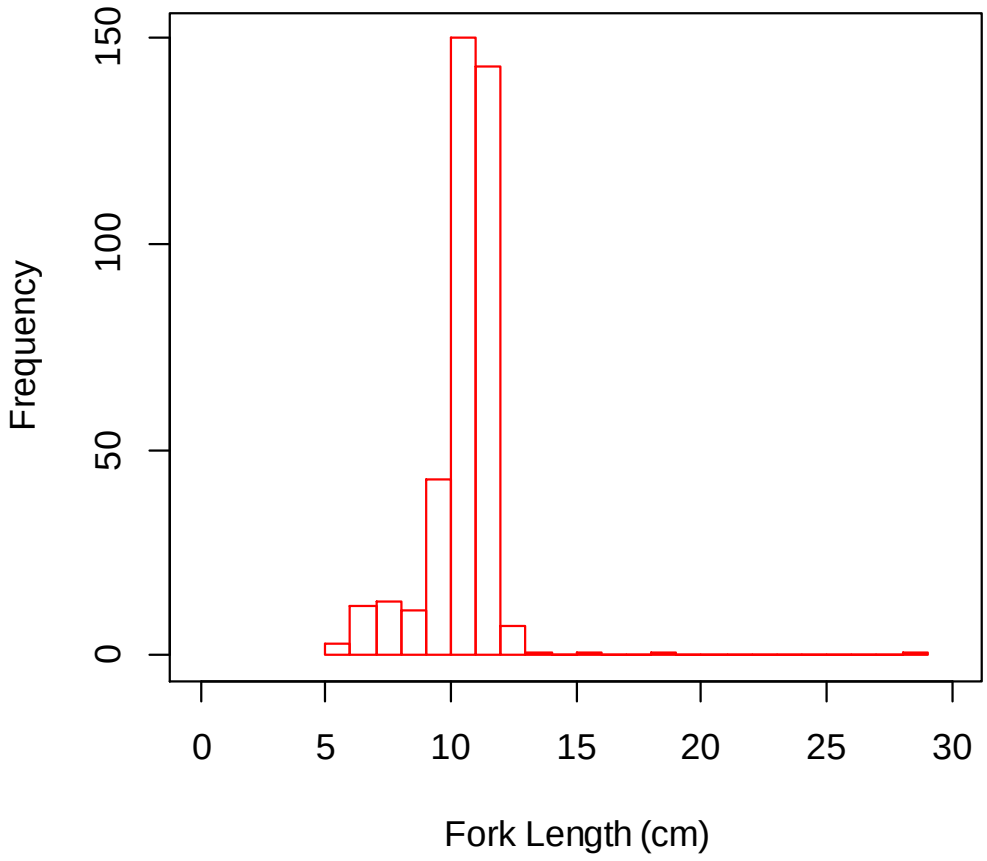

Figure 4: Length frequency histogram of perch captured from Castlewellan Lake.

Roach ranged in length from 10 to 22 cm (Figure 5) and in weight from 15 to 181 g. Four specimens of roach harboured the endoparasite *Ligula intestinalis*. Roach exhibited a sex ratio of 4 males : 5 females.

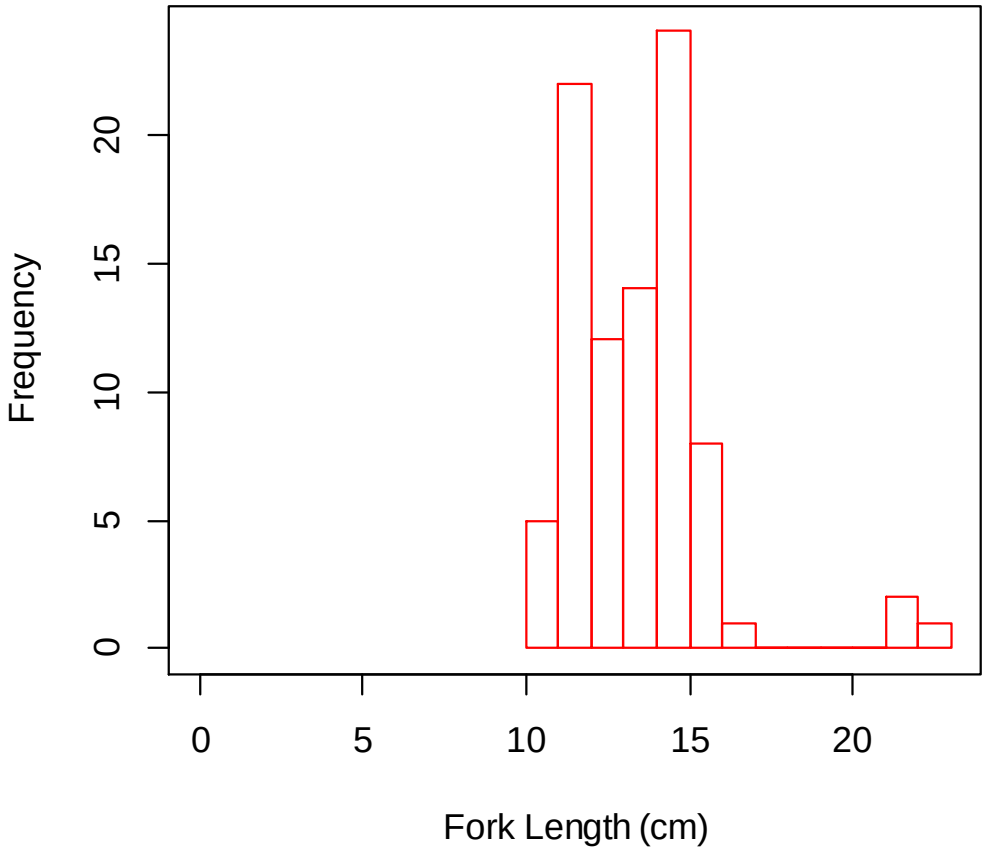

Figure 5: Length frequency histogram of roach captured from Castlewellan Lake.

Discussion

This survey found that the fish community of Castlewellan Lake consists of 5 species, brown trout, European eel, gudgeon, perch and roach. Abundance metrics for each species show that in comparison to the 2011 survey results the population size has remained stable for eels and gudgeon. The perch population has increased by approximately 30 %. The stocked brown trout population has halved and rainbow trout which had been recorded in 2011 where absent from this survey. The roach population had increased significantly (CPUE 2011 = 0.026 and CPUE 2021 = 0.42).

The expansion of the roach population may be linked to increased nutrient input in the lake. Whilst not yet at a level where overstocking is a concern, it is possible that in the future roach will become the dominant species in terms of both number and biomass, particularly if nutrient levels and primary productivity increase. If this occurs it could have the potential to limit the capacity for trout stocking as set by limits to avoid zooplankton grazing and algal blooms and pose problems to management of the site as a stocked game (salmonid) fishery. It would be advisable to analyse water samples for nitrogen and phosphorous and if these are elevated, determine the cause/source and evaluate if mitigation is possible.

Ensuring that there is a good stock of trout in the lake prior to roach spawning (typically May), is another possible interim management measure which may apply predatory pressure on deposited roach ova and emerging fry. Given the possibility of rapid change in roach numbers, it would be prudent to repeat the fish survey within 3 years and reassess the situation. If the population is still increasing, targeted netting during the spawning season could provide some level of control.

Castlewellan Lake was experimentally stocked with the Irish native opossum shrimp *Mysis salemaai (*formerly *Mysis relicta*) in 1969 (MANI, 1969). Samples of *M. salemaai* were removed from the river Bann at Movanagher canal and transported to Castlewellan Lake with the aim of creating a new high protein food source for fishes. Examination of fish stomachs from surveys in 1980 (DASS, 1980) and 2011 (Griffiths et al., 2015, McElarney et al., 2015) revealed that mysids contributed considerably to the diet of both brown trout and perch. A detailed examination of stomach contents in this current survey found no mysid prey items in either of the above species. Eutrophication, climate change/hot weather events or both may have had an impact on the *Mysis salemaai* population. *As M. Salemaai* has in addition to being fish prey, an ecological function as a grazer of smaller plankton, in addition to analysing stomach contents in future fish survey, conducting targeted plankton net tows could establish whether or not it is still present.

References

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