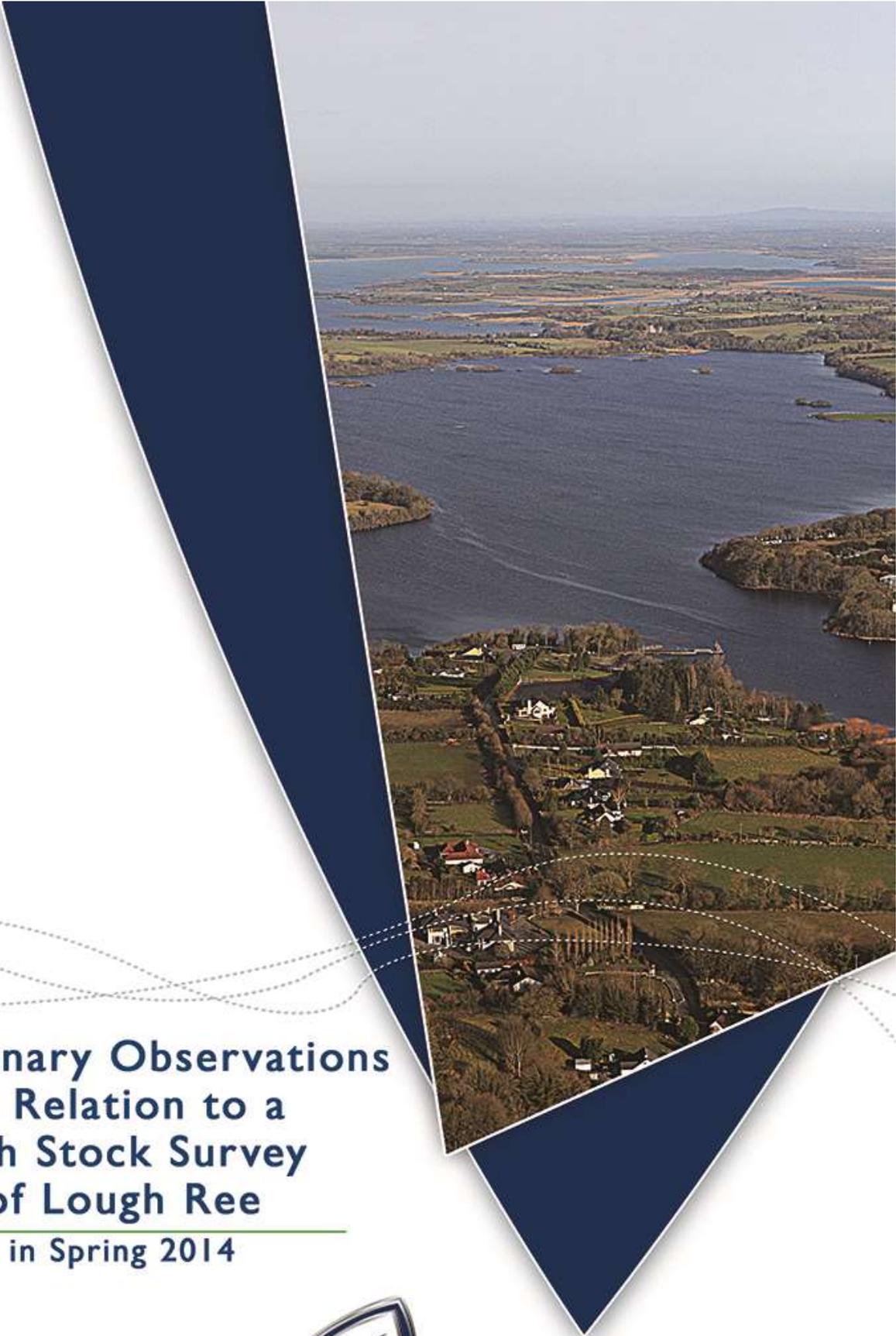


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**Preliminary Observations
in Relation to a
Fish Stock Survey
of Lough Ree**

in Spring 2014



**Preliminary Observations in Relation to
A Fish Stock Survey of Lough Ree in Spring, 2014.**



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I.F.I., Swords

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Preliminary Observations in Relation to A Fish Stock Survey of Lough Ree in Spring, 2014.

1. Introduction

A comprehensive survey of adult fish stocks in Lough Ree (Shannon Catchment) was carried out in late February/early March 2014. This document provides one with preliminary results in relation to some of the findings and a comparison of these data with previous surveys for other Irish lakes. This was the first such survey carried out on L. Ree so no comparison with a previous data set for this water is possible.

2. Methodologies

A survey technique, involving special “trains” of gill nets, developed and in use by the fishery service since the 1970’s to survey fish stocks in Irish lakes, was utilised. The consistent use of this same technique, at the same time of year, allows one to look at any survey data set, either within or between waters, in a comparative sense. As this was the first survey of its kind on L. Ree any comparison here must be made with the results of surveys in other Irish lakes which were surveyed during the same seasonal period.

In the case of L. Ree the survey involved the selection of 200 randomly selected locations for sampling. A train of survey nets was fished overnight at each of these locations. Following the servicing of nets they were reset at a new survey location and subsequently serviced the next day. A total of five separate survey crews were involved in this operation which commenced on February 26th and was completed on March 12th. The locations sampled were located using mobile G.P.S. units. The location of the sampling sites is illustrated in Figure 1.

During the course of the survey all live brown trout taken in the nets (and in good condition) were released back into lake, all live pike 70cm and greater in length (and in good condition) were released and all live cyprinids/perch 25cm and greater in length (and in good condition) were also released back into the lake. Prior to release all of these fish were measured and a proportion were scaled for subsequent growth and age analysis. A number of the released pike were floy tagged. The remaining fish were euthanized and subsequently used to generate biological details in relation to their age, sexual maturity, feeding habits and general parasite load.

The reader should note that experience with the utilisation of this survey technique over many years has shown that it would generate useful data in relation to stocks of all of the following species should they be present – Char, Perch, Pike, Pollan, Roach, Roach/Bream Hybrids and Trout. Experience has shown that springtime surveys will not evaluate the status of other lake dwelling fishes that remain relatively “dormant” until early summer. In the case of L. Ree this would include both Bream and Tench.

A total of 76 pike released were also tagged with numbered floy tags. The purpose of this exercise was to carry out an adult pike standing crop estimate for the lake – returns will be obtained from a number of pike angling competitions to be held in April, 2014. A comparison of the number of tagged and untagged pike captured by anglers in these competitions will hopefully allow one to generate an estimate of the stock.

The reader should note that a comparison of the relative density of any fish recorded in these surveys across one or more waters over a period of years is made by comparing “Catch per Unit of Effort Values” (C.P.U.E.). The C.P.U.E. value for any species in a particular survey is calculated by dividing the total number of fish of a particular species which were caught in the survey by the netting effort. For example if 100 trout were captured in a survey where 100 sites were surveyed then a C.P.U.E. value of 1.0 would be assigned to the trout sample for that survey- ie. total no. fish divided by no. sites sampled.

As an addendum to this survey a dredge sample was taken at each of the 200 netting sites to establish the distribution of both Zebra mussels and/ or Corbicula (Asian Clams) throughout this water body.

As a biosecurity measure all boats and equipment used were “sanatised”, prior to and after this survey, to ensure that there would be no transfer of organisms to, or from, L. Ree to other waters.

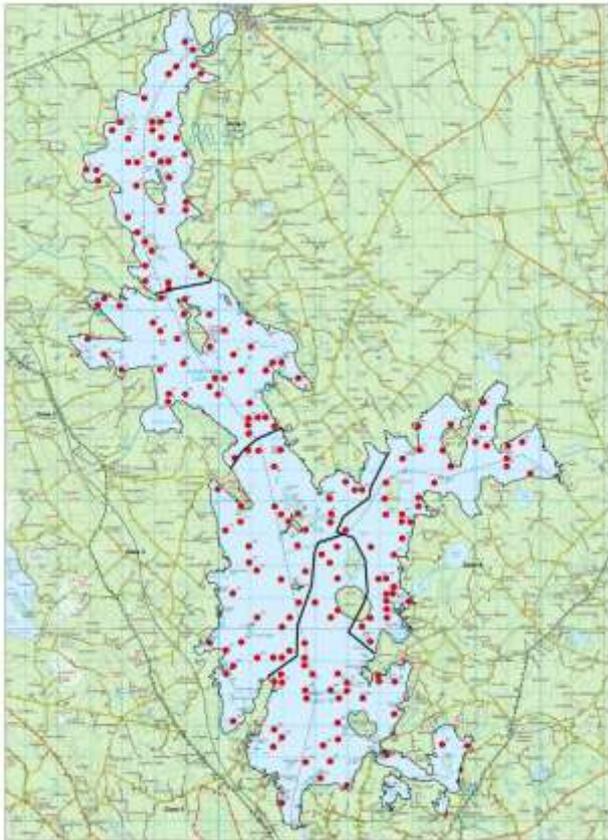


Figure1. The location of the 200 randomly selected sampling sites in the L. Ree fish stock survey.

3.Results

Data from the L. Ree survey are presented here in a format which allows comparison with other Irish lakes.

3.1 Fish Species encountered and Relative Densities.

A total of seven fish species were encountered in the course of this survey - Bream, Eels, Perch, Pike, Pollan, Roach, Rudd and Trout. Roach/Bream hybrids and a few Rudd/Roach hybrids were also noted. The authors are aware that a Tench population is also present – in early spring this species is still in hibernation and will not be encountered in a survey of this nature.

The relative densities of some species, as CPUE values, encountered in this survey are presented in Table 1. These values are subsequently compared with survey results from other Irish lakes in the sub sections of the report dealing with some individual fish species (Pike, Trout and Roach). A complete review of CPUE values for all species will be provided in a final report.

Fish Species	Total No. Captured	Total No. Released alive	Total No. Retained for Analysis	C.P.U.E. Value
Pike	276	145	131	1.38
Trout	223	135	88	1.12
Roach	3853	1616	2237	19.36
Pollan	28	0	28	0.14

Table 1. CPUE values recorded for four fish species in the L. Ree survey and the numbers released and retained in relation to each species.

3.2. The Pike Stock

Lough Ree has long since been regarded as one of Ireland’s premier pike angling fisheries. The 2014 survey of L. Ree indicates that, currently, there is a balanced adult pike stock in this fishery (Figure 2 a).

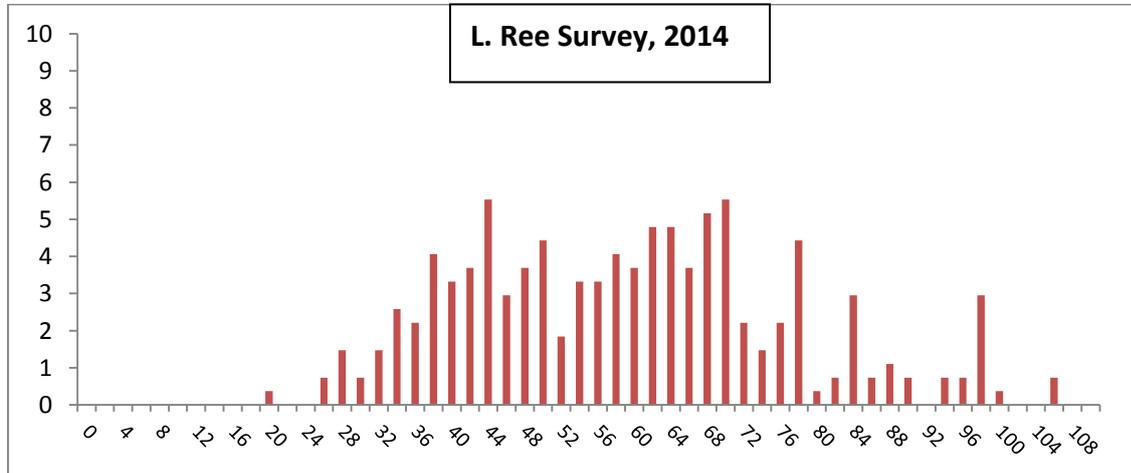


Figure 2a. Percentage length frequency distribution of Pike in the 2014 L. Ree survey.

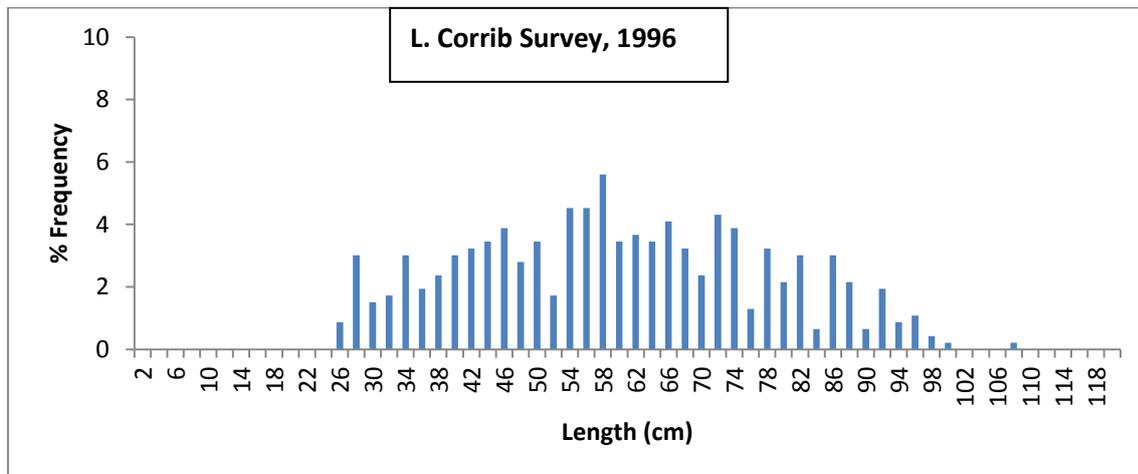


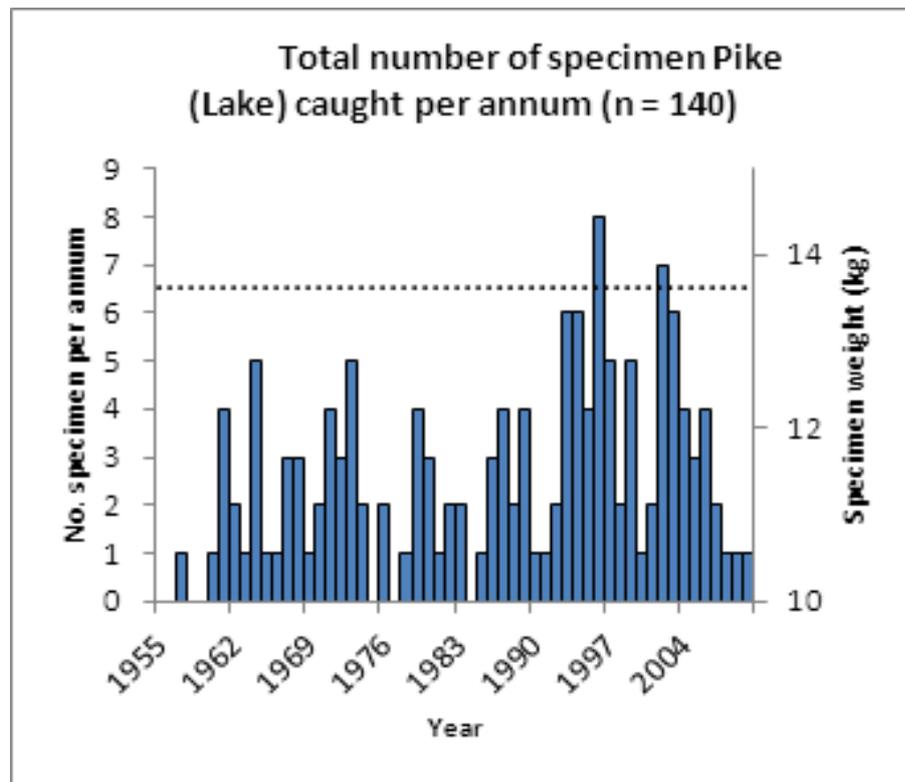
Figure 2b. Percentage length frequency distribution of Pike in the 1996 L. Corrib survey.

In comparative terms the estimated pike stock structure on L. Ree is best compared with a pike stock structure estimated for L. Corrib in 1996. The reader should note that there had been no pike management programme on L. Corrib for ten years prior to 1996. Consequently the pike populations on Corrib in 1996 and Ree in 2014 are comparable in terms of both stocks being “natural undisturbed stocks” at those particular points in time. The data from both lakes are, unsurprisingly, remarkably similar. They reflect a normal stock distribution across the full range of adult fish sizes. They indicate that, prior to 1996 in L. Corrib and, prior to 2014 in L. Ree significant numbers of pike were not being cropped by anglers. This is a particularly important finding in relation to the L. Ree

population in that it shows that pike anglers on this water are returning most of the pike they capture alive. Were they retaining a significant number of fish then the larger pike (≥ 60.0 cm) would not be so well represented in the stock (Fig. 2a).

The relative density of pike (C.P.U.E.) captured in the L. Ree survey (1.38) is similar to the C.P.U.E. value for the Corrib in the 1996 survey (1.84) – a time when there had been no management of pike stocks on this water for the previous decade. These data suggest that L. Ree is one of Irelands more productive pike fisheries.

The reader will note that no specimen pike were captured in the L. Ree survey suggesting that there are few such fish in this population presently (Fig. 2a) – the Irish Specimen Fish Committee (ISFC) have set the lake pike specimen weight at 30lbs. Such fish are generally ≥ 125 cm. in length. Only one pike was noted in the L. Ree survey over 100cm. in length, a fish measuring 105cm. The I.S.F.C. designated specimen weight for lake pike has remained unchanged at 30lbs. from 1955 to date. A review of the ISFC records in relation to lake pike specimen records indicates that greatest numbers of such fish were captured annually in a period from the early 1990's up to 2006. Thereafter from 2007 to 2013 there has been a very marked decline in lake pike specimen claims.



Specimen Lake Pike Awards for;-	
Year	Number
2011	0
2012	0
2013	1

Figure 3. Specimen lake pike awards annually from the ISFC from 1955 to date.

The authors believe that the current dearth of very large pike (≥ 125 cm) being caught in Irish lakes with undisturbed pike populations, including L. Ree, in contrast to the significant numbers of such fish caught in the '90's and '00's, may well be a reflection of the major ecological instability of these waters since the late 1970's.

These changes might be summarised as follows:-

- From the late 1970's onwards roach were introduced to and rapidly spread through the Erne and Shannon systems.
- At the same time there was a measureable increase in enrichment in our waters leading to cultural eutrophication problems.
- With hindsight we now know that the introduction of roach at a time when our lakes were becoming more eutrophic was most unfortunate – roach thrive in eutrophic conditions, completely changing the balance in lake fish stock terms. A long term data set for fish stocks on L. Sheelin from 1978 to date and additional information from L. Derravagh shows that once roach became prolific in these lakes the available fish fodder(roach) for pike increased by up to **600%**. This may well have accomodated the expansion of specimen pike numbers throughout all “roach infested waters”including L. Ree and is possibly a factor in explaining the increase in the number of specimen lake pike recorded by the ISFC in the 1990's and '00's (Fig. 3).
- In the late 1980's and through the early 1990's zebra mussels gradually colonised all lakes through the Shannon and Erne Systems including Loughs' Ree, Sheelin and Derravaragh. The fish stock data set for L. Sheelin and information from L Derravaragh indicate that once zebra mussels became established on these lakes(2004 onwards) the very large roach stocks present virtually collpsed (Fig. 4). It is likely that this trend in relation to fluctuating fish stocks with a reduced level of fodder fish for pike also took place in Lough Ree and in most other waters throughout the Shannon and Erne Systems.This train of events may explain why no pike of specimen size were encountered in the L. Ree survey and why so few specimens have been recorded by the ISFC nationally since 2006.

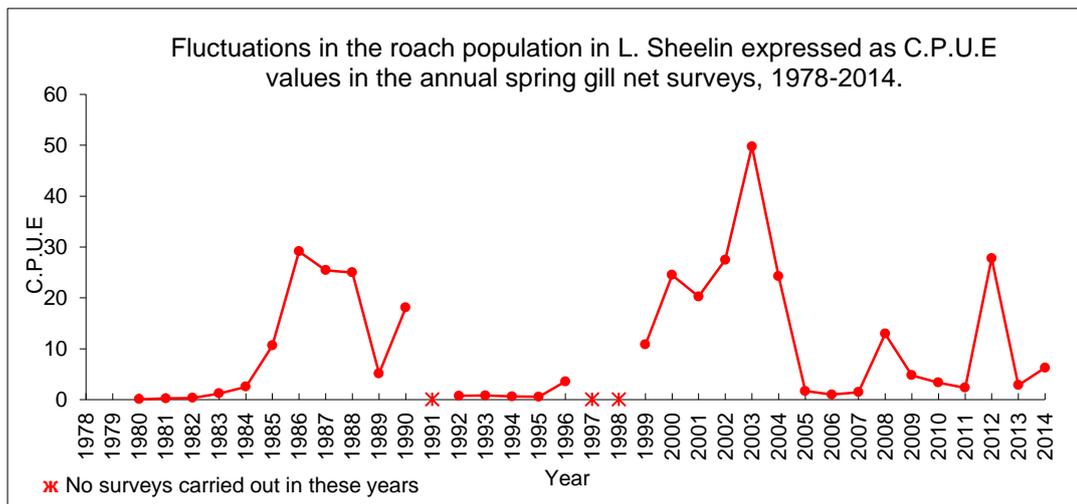


Figure 4. Fluctuations in the CPUE values for Roach recorded in the annual fish stock surveys on L. Sheelin. Zebra mussels were first recorded on L. Sheelin in 2004.

3.3. The Trout Population

The trout C.P.U.E. figure recorded for the L. Ree survey in 2014 was 1.12. This is a good stock density figure for trout in what is a “mixed fishery” – ie. a water which is regarded as a valuable fishery for trout, pike and coarse fish where no pike stock management is practised. The Ree C.P.U.E. figure can be put in perspective when compared to “managed lake trout fisheries” – ie waters where, in some instances, pike stocks are managed (Table 1.)

Lake	Year	CPUE Value
L. Carra	1996	4.43
L. Carra	2001	6.17
L. Carra	2009	4.37
L. Ennell	2004	3.43
Sheelin	2013	2.0
Sheelin	2014	2.9
Corrib	1996	1.95
Corrib	2012	1.5
Ree	2014	1.12

Table 1. A range of C.P.U.E. values recorded for trout stocks in some managed lake trout fisheries and L. Ree since 1996.

The variation in the CPUE values for trout recorded in a range of waters in Table 1 reflect both important management and ecological differences between these waters.

The highest trout CPUE values have been recorded in L. Carra, a lake where there are no significant cultural eutrophication problems. No zebra mussels, roach or cyprinid hybrid stocks have been recorded here to date. L. Carra is also ecologically unsuited to perch who are only present in small numbers. A small managed pike stock is present in this water. With a limited predator stock, few competitors for food, normal zooplankton production (because of the absence of zebra mussels) and an adequate spawning and nursery catchment for trout to spawn one would expect high trout CPUE values.

Different combinations of the ecological factors outlined above, in different lakes, are responsible for the lower trout CPUE values recorded in other lakes.

It is not surprising that the CPUE value for trout in L. Ree was at 1.12 when one considers that there is a large undisturbed stock of the trout's principal predator (pike), limited zooplankton production because of the large zebra mussel stock and substantial populations of other fishes (roach, cyprinid hybrids and perch) whose diet overlap significantly with trout. The extensive stream enhancement programmes which have been carried out by IFI personnel, in collaboration with local angling groups, over the last decade have undoubtedly helped to maintain this relatively high trout CPUE value in L. Ree. There is clearly a high level of satisfaction among trout anglers in relation to the quality of their sport on L. Ree in recent years indicating that trout stock densities in selected areas at certain times of the year are sufficient to provide quality angling.

Observations by IFI staff in the L. Ree area who have fished this water since childhood indicate that there has been a marked change in this fishery from a trout angling perspective over the last decade- up to 10 years ago trout angling on the lake was largely confined to people trolling in springtime and dapping the Mayfly. Over the last ten years while these angling practices have continued they have been supplemented with wet and dry fly angling during the Mayfly and wet fly angling in August/September period.

The increased trout angling effort may be due, in part, to an increasing trout population, a reflection of the extensive stream enhancement programmes. Available information from observed angling patterns on L. Sheelin suggest that the large zebra mussel population on L. Ree may also be playing a pivotal role in the expansion of trout angling activities on Ree. In L. Sheelin, in the late 1970's, prior to the introduction of zebra mussels to this water, anglers, at that time, expressed concern that they were only catching trout $\geq 0.7\text{kg}$'s – their concern was that there were no smaller trout in the lake which would inevitably lead to a collapse of the trout stock. Netting surveys at that time indicated that there were substantial numbers of smaller (≤ 0.7) trout in the lake. However they were feeding exclusively on zooplankton - such fish will largely ignore anglers' flies and therefore not feature in their catches. Since zebra mussels have become established on L. Sheelin plankton levels have declined resulting in all sizes of trout feeding on whatever flies and other macro invertebrates are available. As a consequence trout are "more vulnerable" from an angling perspective. It is likely that this phenomenon has also played some role in both the expansion of the trout angling season on L. Ree and an increased vulnerability of trout the angler.

3.3.1. The Trout Stock Structure on L. Ree.

A review of the percentage length frequency distribution of the trout sample in the L. Ree survey indicates the presence of a very balanced trout population in the lake in 2014 (Fig. 5). Data indicate the presence of significant numbers of fish across all year classes from 2+ to 6+ years of age and possibly some older fish. The regularity of trout recruitment to the lake stock over the last six years is encouraging from a long-term management point of view. It illustrates two very important points;-

- Regular annual recruitment of juvenile trout to the lake, as is illustrated in these data, will guarantee the presence of a substantial adult stock in the lake, thereby ensuring reasonable trout angling opportunities for at least the next few years.

- The data suggest that this stock is not being heavily cropped by anglers and/or commercial fishermen – if it were one would expect to see a significantly greater decline in the proportion of trout in the stock which were ≥ 40.0 cm in length.

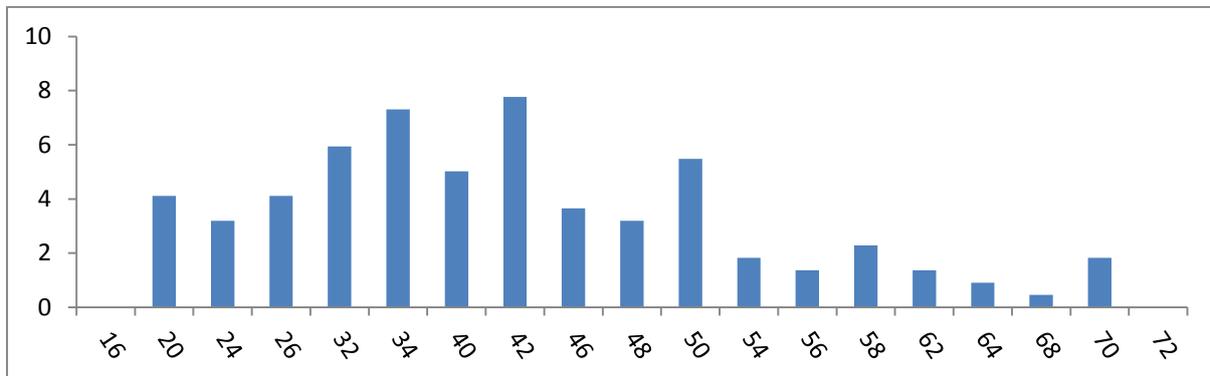


Figure 5. The percentage length frequency distribution pattern for the trout sample in the L. Ree. survey in 2014.

3.3.2. Trout Genetic Studies

To date a detail genetic study of trout stocks has been completed in the lower Shannon Catchment encompassing samples from all sub catchments from the Big Brosna south to the dam at Parteen. This has allowed one to understand the dynamics of trout populations in the lower Shannon and establish the origins of adult trout in the Lough Derg stock. Currently this study has been extended to include a sampling programme for all sub catchments in the Shannon from Carrick-on-Shannon south to, and including the Suck. The completion of this study will allow one to establish the source of the adult trout in Lough Ree and the relative importance of the various sub catchments in maintaining this population. The trout scales from L. Ree trout, kindly collected by anglers in the 2013 season, in combination with trout scales from fish encountered in the Ree lake survey will all be used in this study. The latter group will be particularly useful in looking at the distribution of fish from the different tributaries after they enter the lake – GPS data are available in relation to the location of all of the trout encountered in the survey. Similar data compiled in relation to the adult trout population in L. Corrib has shown that most trout from particular sub catchments, on migrating to the lake, stay in areas close to their natal sub catchment(Figure 6). There was one exception to this generalisation (Figure 7) where a majority of the trout travelled a significant distance from the outfall of their natal rivers (Bealnabrack and Cornamona). These two rivers discharge to a very deep area of L. Corrib where little food is available for trout. This presumably forces the trout to migrate farther south to where shallower more productive feeding areas are available.

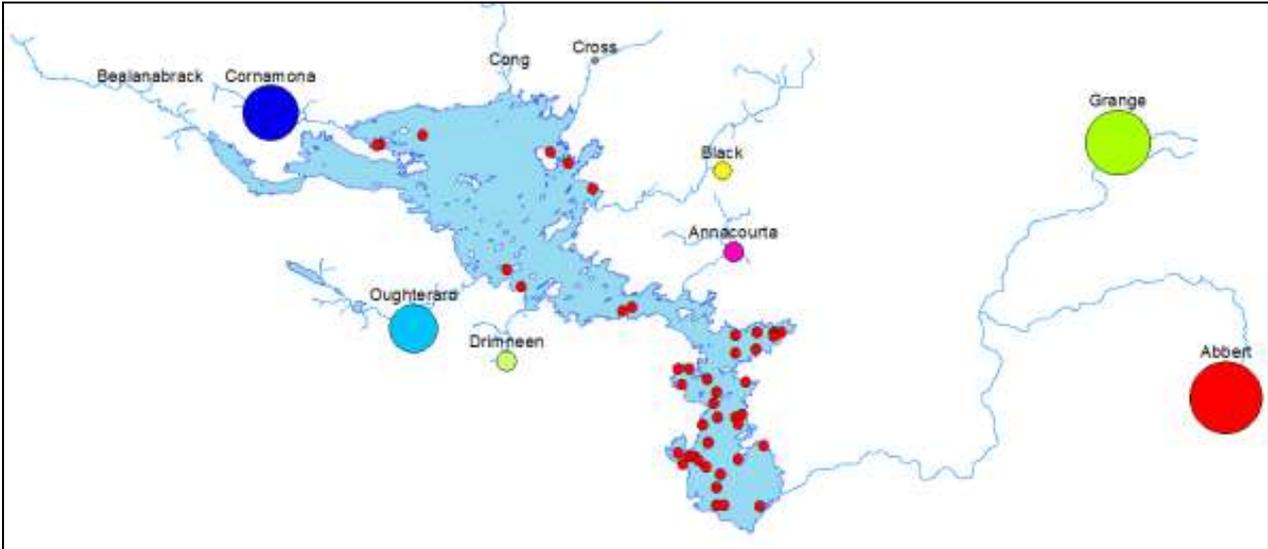


Figure 6. The distribution of adult trout in L. Corrib of River Abbert origin.

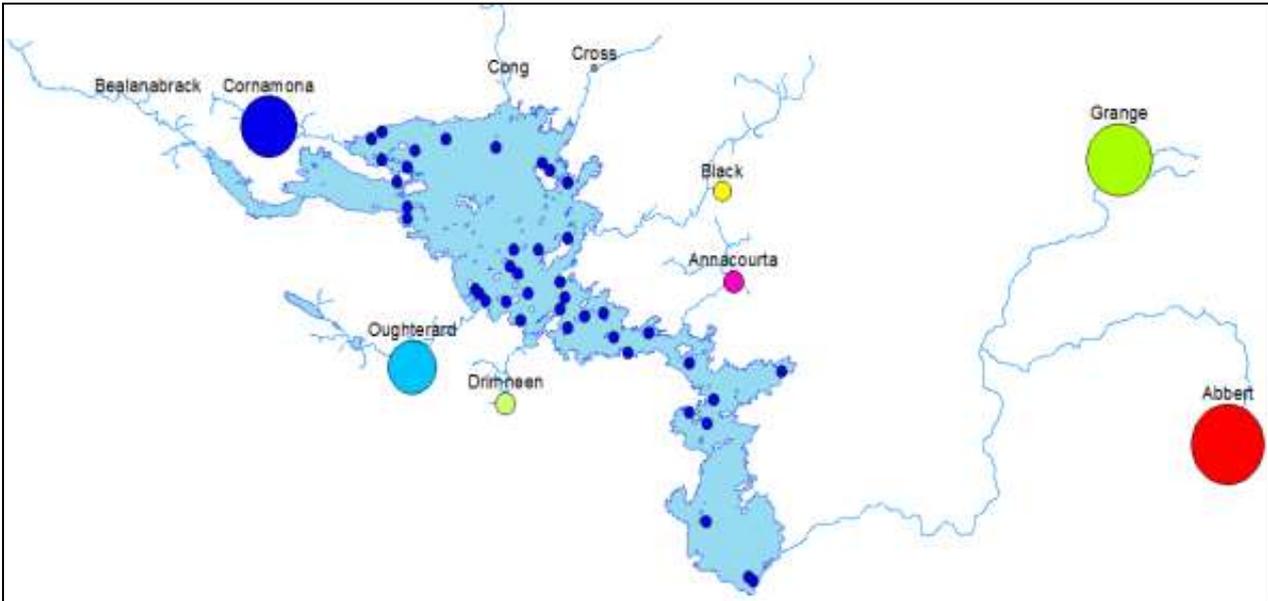


Figure 7. The distribution of adult trout in L. Corrib of Bealanabrack or Cornamona River origin.

3.4. Roach Stocks

The 2014 survey of L. Ree established that there is a relatively large stock of roach in the lake presently – a CPUE of 19.36 was obtained for this species. As there is no previous data available for roach stocks in L. Ree the relative density of roach in L. Ree presently is best compared with the historical data base for roach stocks in Loughs Derravaragh and Sheelin where many annual CPUE values are available back to 1980. The data set on annual CPUE values recorded for roach in L. Sheelin annual fish stock surveys has been illustrated already in Figure 4. This illustration is repeated here for the convenience of the reader (Fig. 4).

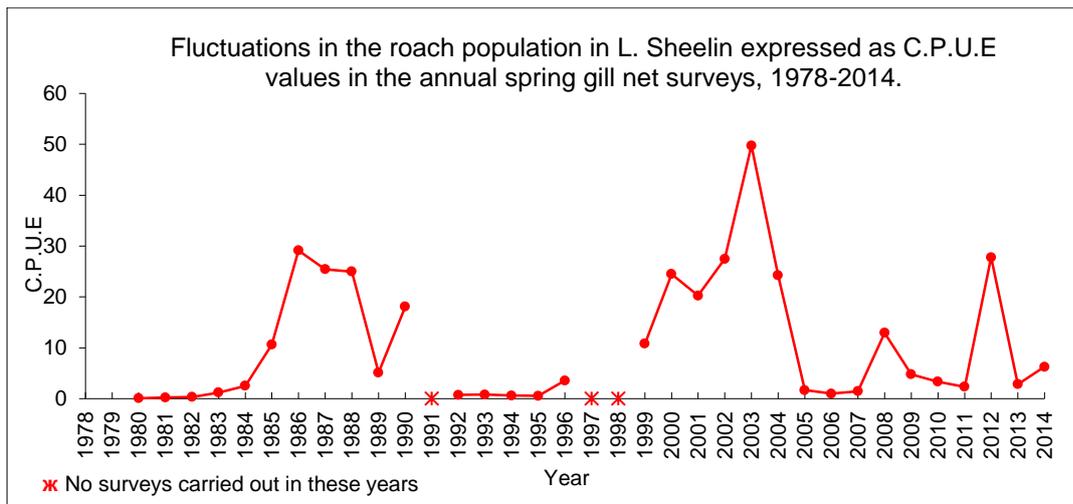


Figure 4 (Repeated). Fluctuations in the CPUE values for Roach recorded in the annual fish stock surveys on L. Sheelin. Zebra mussels were first recorded on L. Sheelin in 2004.

Since the introduction of roach to L. Sheelin one has observed large fluctuations in the stock density. Roach CPUE values peaked at a value of 49.7 in 2003. Since the zebra mussel stock became abundant roach standing crops have declined markedly currently standing at a CPUE value of 6.3 for the 2014 survey. A similar trend was evident in L. Derravaragh where very high roach CPUE values were recorded through the mid- 1980's into the early 1990's. In this water roach CPUE values peaked at an even higher level (112.44). Following the introduction of zebra mussels to L. Derravaragh in the noughties the roach CPUE value had fallen to 2.5 in 2005.

These trends suggest that the the roach population in L. Ree may have been at a much higher level than it is presently. Comment in Section 3.2. above outlines how such an alteration in roach stocks may have impinged negatively on the pike stock and been of advantage to the trout population.

3.5. Pollan.

This is the first time that a significant sample of adult pollan have been captured in L. Ree. It is of interest to note that they were all living in deep water in the southwestern corner of the lake. Their location here will be of assistance to IFI in targeting acoustic studies of this species in the future.

3.6. Other Fish Species

Data analysis is not yet complete in relation to the other fish species encountered. However, it can be stated that there are currently significant stocks of both perch and roach/bream hybrids in L. Ree. Other cyprinid hybrids (rudd/roach) are rare. While some bream were captured in the course of the survey experience has shown that many bream are relatively “moribund” until May which means that the numbers of this species encountered in the survey are a significant under-estimation of the actual stock present.

4.Dredge Samples.

Dredge samples were taken at each of the 200 netting sites to evaluate the distribution of the asian clams (*Corbicula*). No evidence of this species was found in any of the samples taken in situ or those brought back to the lab for more detailed examination. The presence of zebra mussel was noted in the majority of the samples taken. Two observations are worth noting in relation to these findings;-

- The widespread zebra mussel population in L. Ree is likely to be a reflection of ongoing cultural eutrophication problems in this catchment.
- Our colleague Dr. J. Caffery (pers comm) has recorded the presence of *Corbicula* in the Shannon upstream at Carrick-on-Shannon. The absence of *Corbicula* from the 200 dredge samples in L. Ree suggests that its colonisation of the Shannon system may proceed at a slower pace than that observed by zebra mussels.

5. Summary Comment

- Excellent pike stocks, capable of providing quality angling, are present in L. Ree currently. The percentage length frequency distribution of the current stock indicates that excess pike numbers are not being cropped by anglers. There is a steady recruitment rate of younger fish into the stock which should guarantee good adult stocks into the future.

The absence of any very large specimen pike ($\geq 125\text{cm}$) in the L Ree survey sample suggests that there are few such fish in the stock presently. This may be linked, indirectly, to the introduction of zebra mussels which are “capping” roach production.

- The current trout population is clearly sufficient to provide good angling at certain times of year. A review of the trout stock structure is very encouraging from a fishery management perspective. Annual recruitment of trout from the streams has been very steady over the last five years resulting in the presence of a very balanced stock across the size range from 2+ to 6+ years of age. This will ensure the availability of sufficient trout to provide quality angling on a seasonal basis over the next few years.
- A review of a long term survey data base for L. Sheelin indicates that the introduction of zebra mussels has “masked” an ongoing cultural eutrophication problem. This has resulted in the demise of a very large roach stock and the partial recovery of both trout and perch stocks. In L. Sheelin it is also clear that the trout stock, in the absence of large zooplankton blooms, is more vulnerable to anglers. It is likely that a similar pattern of events has taken place in L. Ree over the last 15 years.
- The establishment of zebra mussel populations in many Irish lakes has led to a remarkable recovery in mayfly (*Ephemera danica*) populations. I.F.I. staff has noted this trend on many waters including Loughs' Arrow, Key and Sheelin. The scientific rationale for this trend is not clear. In these circumstances it is likely that the presence of a zebra mussel stock on L. Ree may also have had positive consequences for its mayfly population.
- The survey indicates that there are currently significant stocks of cyprinids and their hybrids in L. Ree. Data suggest that the stock density of these species should be sufficient to maintain the existing quality cyprinid fishery in this water.

6. Acknowledgements.

The authors (M.O'Grady and K. Delanty) are most grateful to the management and staff of the Shannon River Basin District and our colleagues in I.F.I., Swords, who could not have been more helpful in terms of organising and assisting in the field work aspects of this survey. A special word of thanks is due to our colleague Dr. Willie Roche for supplying the I.S.F.C. data.

A series of white dashed lines forming a wavy pattern across the middle of the dark blue background.

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