Lower Lough Erne fish stocks, DCAL-AFBI Surveys 1991 to 2010

Summary report for meeting with Erne trout Anglers, 5th November 2012

Robert Rosell, AFBI

Introduction

Lower Lough Erne fish stocks are monitored by gill net survey. These surveys to the current design began in 1991, with surveys were initially at variable intervals. Due to the value of the long term time series surveys are now conducted every three years. Surveys are generally conducted from June to September , and data are available from 1991, 1996, 2000, 2002, 2004, 2007, and 2010. The next survey is planned for 2013.

The nets used in the surveys are of two types, “Survey” nets and “Fixed mesh size” nets: Nets are set at sites around the margin of Lower Lough Erne at a standard set of sites representing a range of habitats, and fish shore slopes and water depths down to about 8 metres.

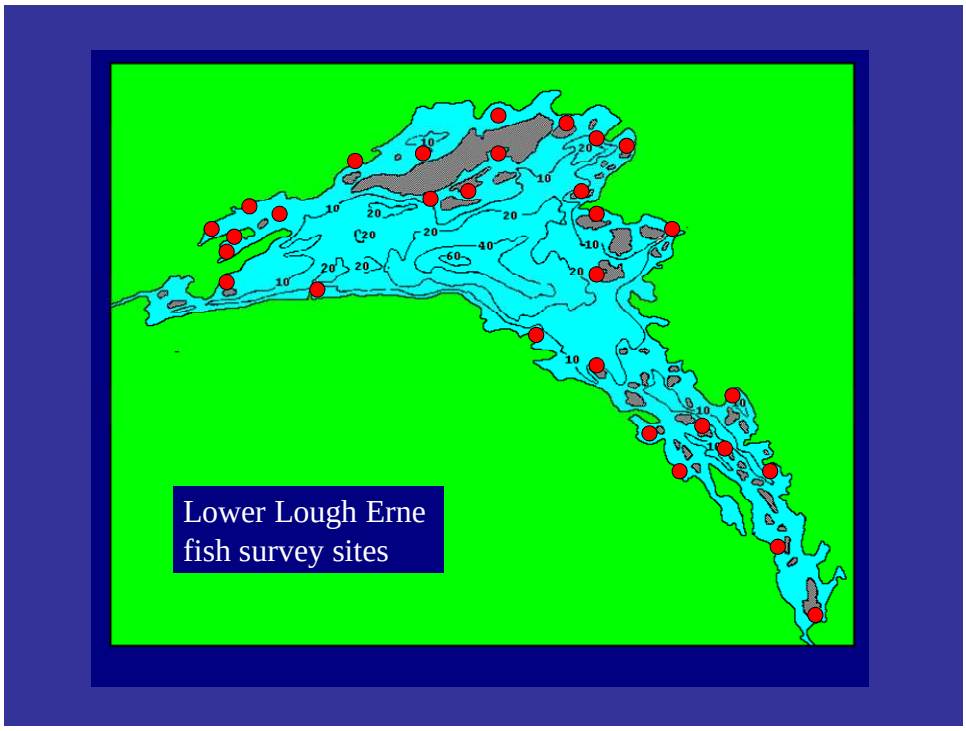


Fig. 1 Net survey sites used in 2010

“Multi-panel” or “Survey” nets

These consist of a number of panels ranging from small to large mesh sizes in one single net (Fig. 2). These are designed to catch a broadly representative sample of fish of all sizes and species present and over time the catches from these give an index of the overall fish population. Changes in net material availability and standardisation of methods (the latest change for the Water Framework Directive) have over time forced several changes in net design. The early series used 6 panel nets of meshes from 12.5 to 46 mm. This was replaced

in 2004 with a 12 panel net with meshes in an incremental progression from 8 to 50mm, and changed again to the current WFD standardised net of 5 to 55 mm meshes in a geometric progression. Each time the net type has changed the two have been run together for at least one survey to inter-calibrate the results and create a basis for a standard time series.

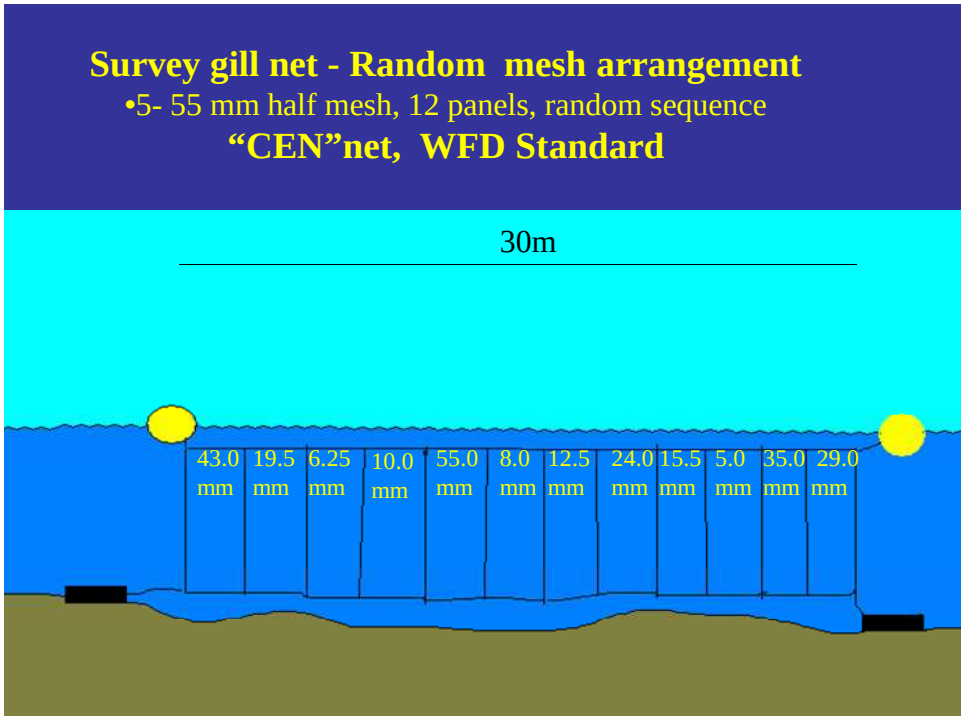


Fig 2 Layout of a Mesh sizes in a CEN standard Gill net

"Fixed mesh" nets

These are nets of a single mesh size. They are selective for a particular size range of each particular species. The most important of these nets trialled is a net of fixed 50mm (formerly 2 inch) square meshes. This is particularly useful for pike above about 50 cm and trout above 30 cm, and gives a good indication of the "takeable" population of these species. This net series also has the advantage that there is some data going back to 1971using nets of this type.

Data processing

All fish caught are recorded to their location and net type. Details including the length of net set are used to calculate standardised catch per unit effort: either in catch per metre of net or catch per whole net of a particular length. The fish are frozen, and taken to the AFBI Laboratories for analysis of length, weight, sex and age of each individual. Other parameters (e.g. stomach contents and parasite burdens) have been recorded in relation to particular investigations.

Expression of results: numbers of fish

The core data are the adjusted “survey” net time series, in terms of numbers and weights of the major species. The raw numbers data are dominated by smaller species, roach and perch, as one would expect in a natural population. (Fig. 3).

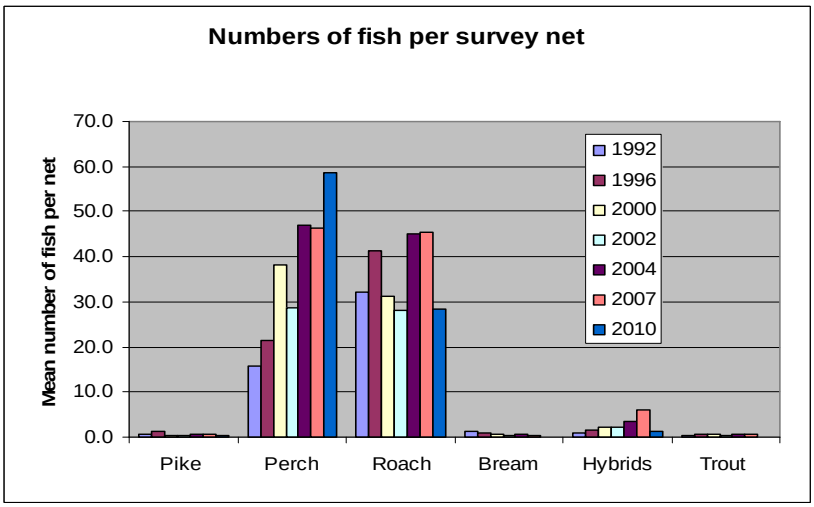


Fig 3 Numbers of fish per survey net split to species, 1992 to 2010, raw numbers

In order to show the trends in the data for all species data in a single easy to understand picture, the numbers data is log transformed and corrected for effort (fig 4):

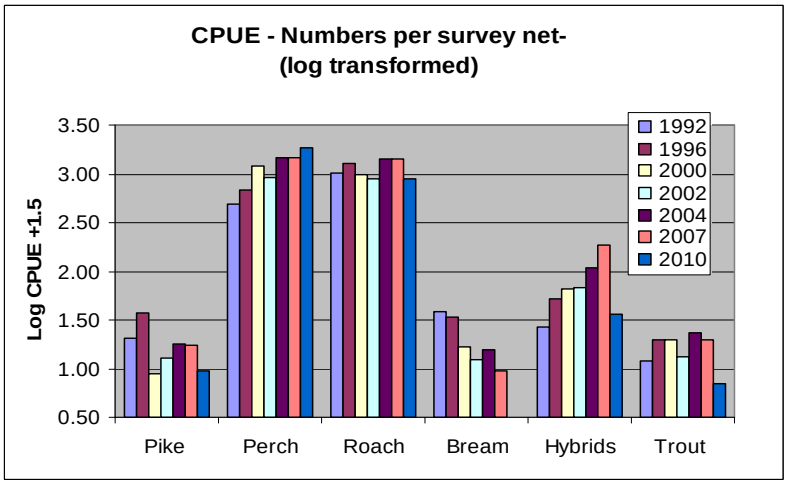


Fig 4 Catch per survey net split to species, 1992 to 2010, Y axis transformed to log scale show trends in one figure

Numbers or weight?

Analysis of any population should not only look at number, but also consider relative total weights (biomass) . The following graph shows clearly that the weight (Biomass) of fish present is still dominated by roach weights. Whereas survey net catches of perch have risen steadily over the past 15 years , probably driven by ecological changes due to the zebra mussel invasion of the late 1990s, this has not yet translated into perch dominance by weight. (Fig. 5)

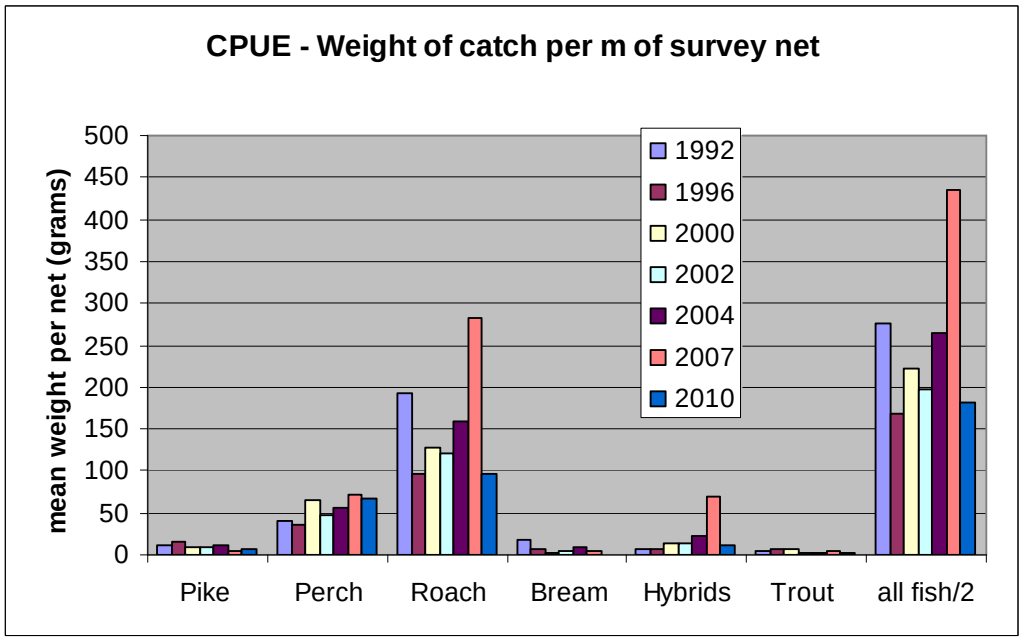


Fig 5 Catch of fish in weights per metre of survey net set. Note that the weight of roach drives the trends in total fish biomass ("all fish/2")

Change in ratio of perch to roach numbers

The extent of the change in relative abundance of roach and perch post zebra mussel is shown in figure 6. Between them these two fish species make up 90% of the survey gillnet catches. There was a step change after the zebra Mussel introduction and population explosion from 1996 to 2000, and the trend is still shifting . Perch are now dominant in numerical terms. However due to large numbers of small perch as opposed to fewer roach which are on average heavier, biomass is still dominated by roach (Fig.6).

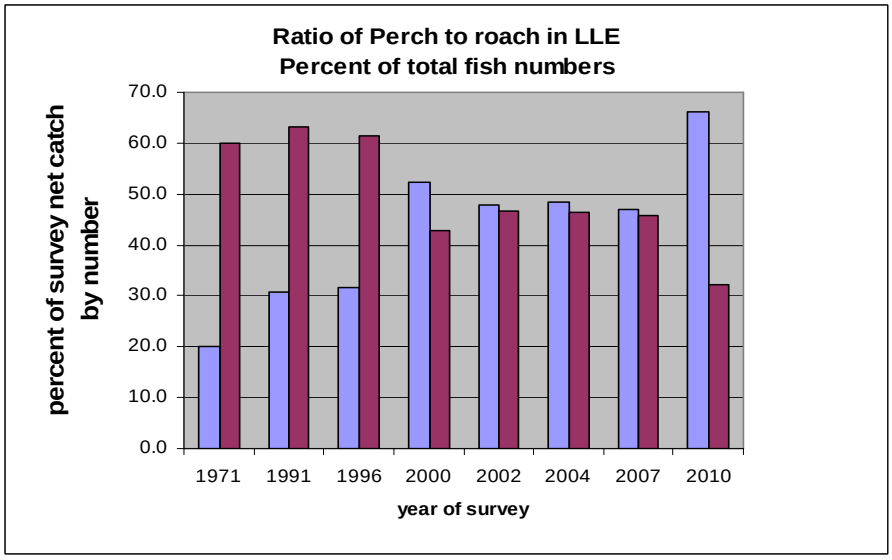


Fig 6 Changes in percent of survey net catch of perch (blue) and roach (maroon) 1992 to 2010.

The roach population is often dominated by fish of particular ages, deriving from variable spawning success. The following series of graphs (Fig 7) show roach successfully spawned from a strong year class circa 1995passing through the population and eventually disappearing through old age in 2010. Thereafter, the roach population appears currently to be more uniformly distributed by age than it has been since surveys began.

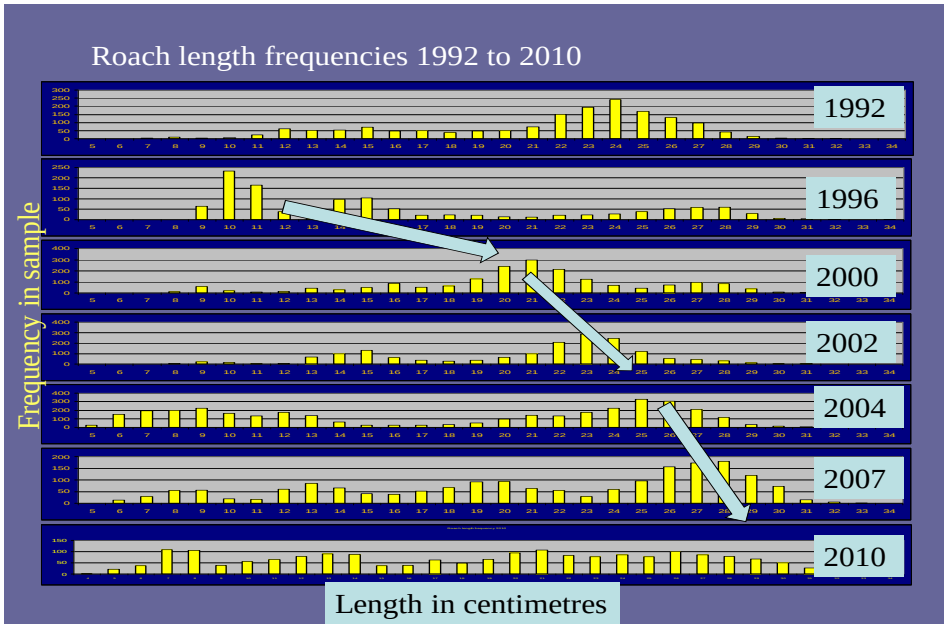


Fig. 7 Roach length frequency distribution showing the track of two strong year groups first evident in 1996 and passing out of the population through old age (at circa 12 years) between 2007 and 2010.

This instability in the roach population has an effect at any one time on the perch to roach biomass ratio. The equivalent total perch weights per unit effort are relatively stable over time, but the variation in roach weights can be marked as strong year classes pass through (Fig 8.)

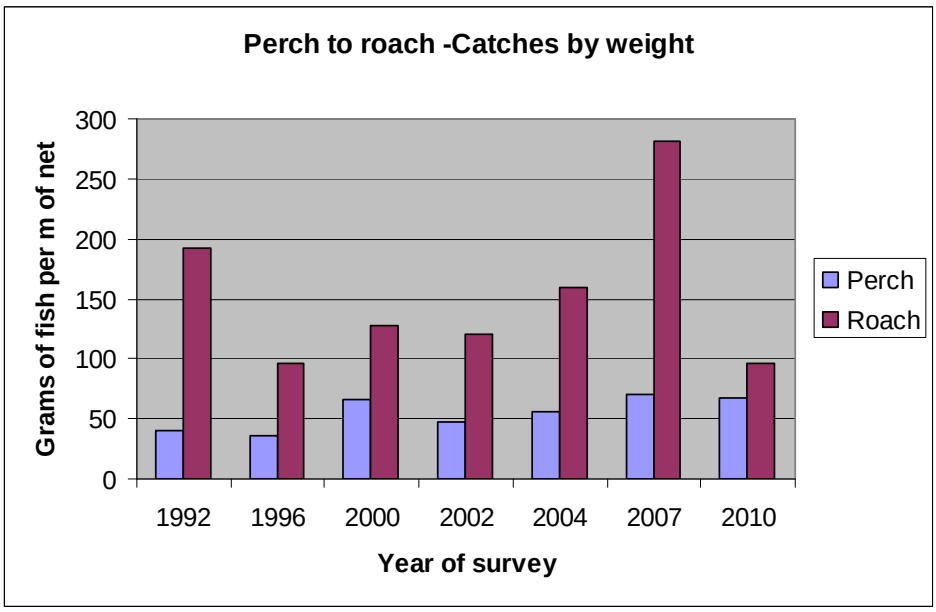


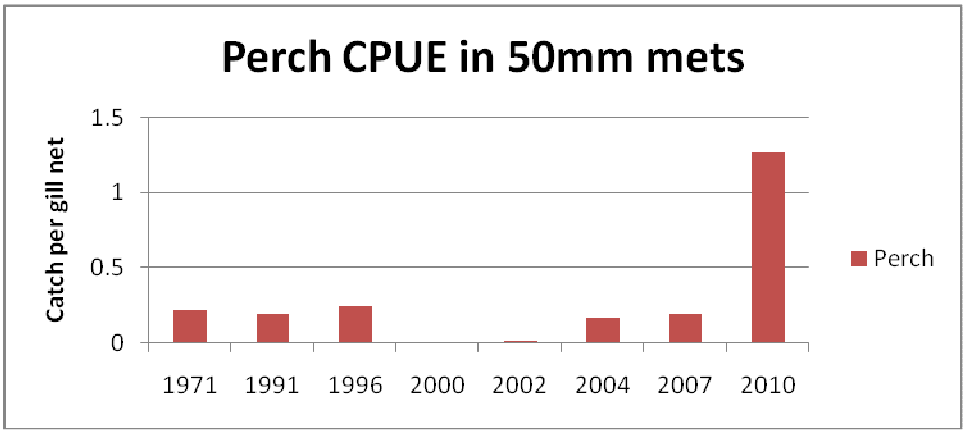
Fig 9 Perch and roach catches by weight in survey nets. Note perch (blue) total weights rising slowly but roach (maroon) weights are highly variable. One can see the growth and eventual death of the 1995 and 1994 born strong roach cohort in catches from 1996 on.

Supporting data from the large mesh 50mm fixed mesh nets.

As described above, the survey nets are supplemented with "fixed mesh" 50mm gill nets to increase the sample size and population trend information of less abundant larger species. Of particular interest are larger individuals of trout, pike and bream.

Notably in 2010, there was a also small catch (just over one per 30m panel of 50mm mesh net) of large perch in the 50mm nets (Fig 9). This represents a 5 fold increase over all previous surveys where this mesh size nets only rarely caught perch. If future surveys show this to be a major new feature of the perch population, rather than a one off event from a particular set of conditions, the implications for total ecology of increased numbers of fish eating perch will

need to be considered. It is worth noting that with perch reaching a maximum 12-13 years of age these fish are the first maximum age perch derived from a post-zebra mussel scenario.



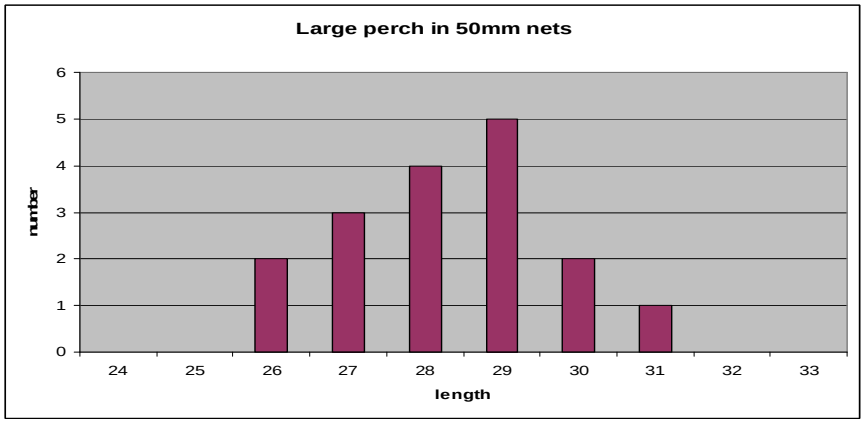


Fig. 9 a: Perch catches in 50mm nets 1971 to 2010, and b: Length frequency of the 2010 sample

Pike and trout in 50mm nets

The numbers of larger pike and trout in the 50 mm nets are shown in Fig.10. This data shows no clear relationship between the two, but sample sizes are small and confidence limits high. Note that both pike (>50cm) and trout (>30) cm in 50mm nets showed an increase in 2010 over two low years in 2004 and 2007.

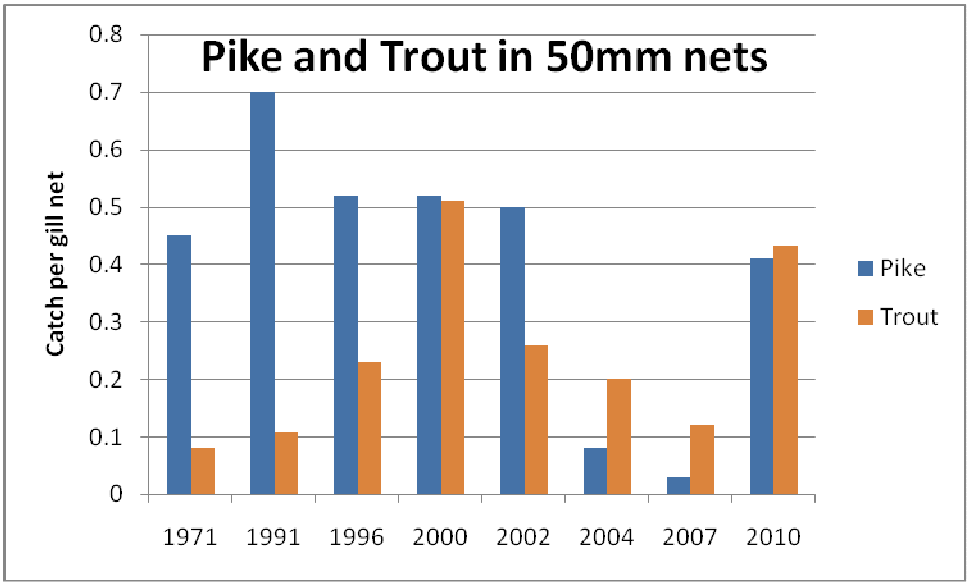


Fig.10 Pike and trout in large mesh nets

Roach, Bream and Hybrids in 50mm nets

Roach in 50mm nets showed a steady increase as a strong year class passed through the system from 1996 to 2010, probably due to die progressively of old age after 2010 (Fig 11, also fig 7 above) . Bream numbers suffered a major decline from 2004 (Fig. 11). Competition with the strong roach group and aggressive hybridisation with spawning roach alongside bream are among the possible reasons for bream decline.

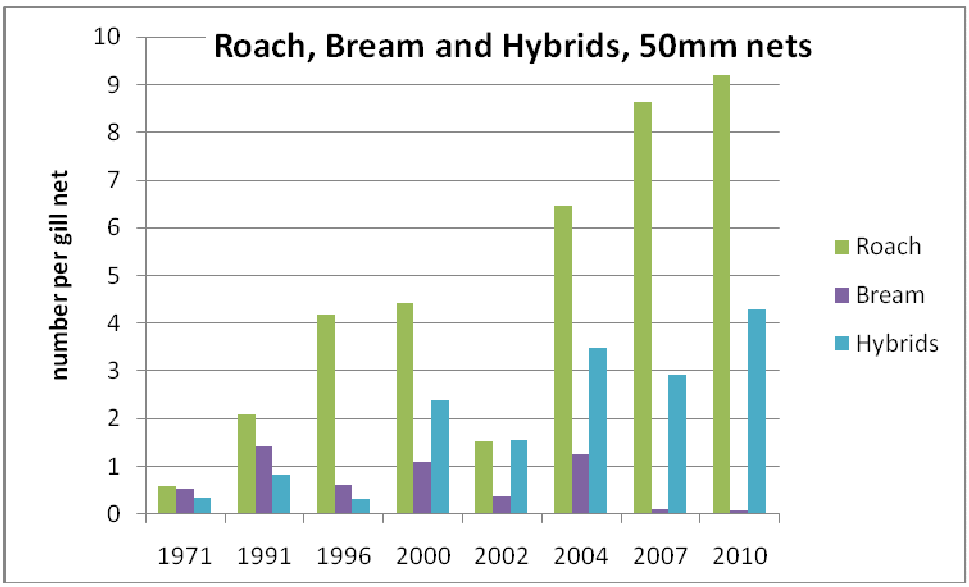


Fig 11, roach, bream and hybrids in 50mm gill nets

Extracted selected data on trout stocks

The survey and 50mm single mesh net catches of trout are shown in fig 12a and 12b. Note that sample sizes of trout in these lake margin survey nets are very small, confidence limits high and conclusions tempered accordingly .

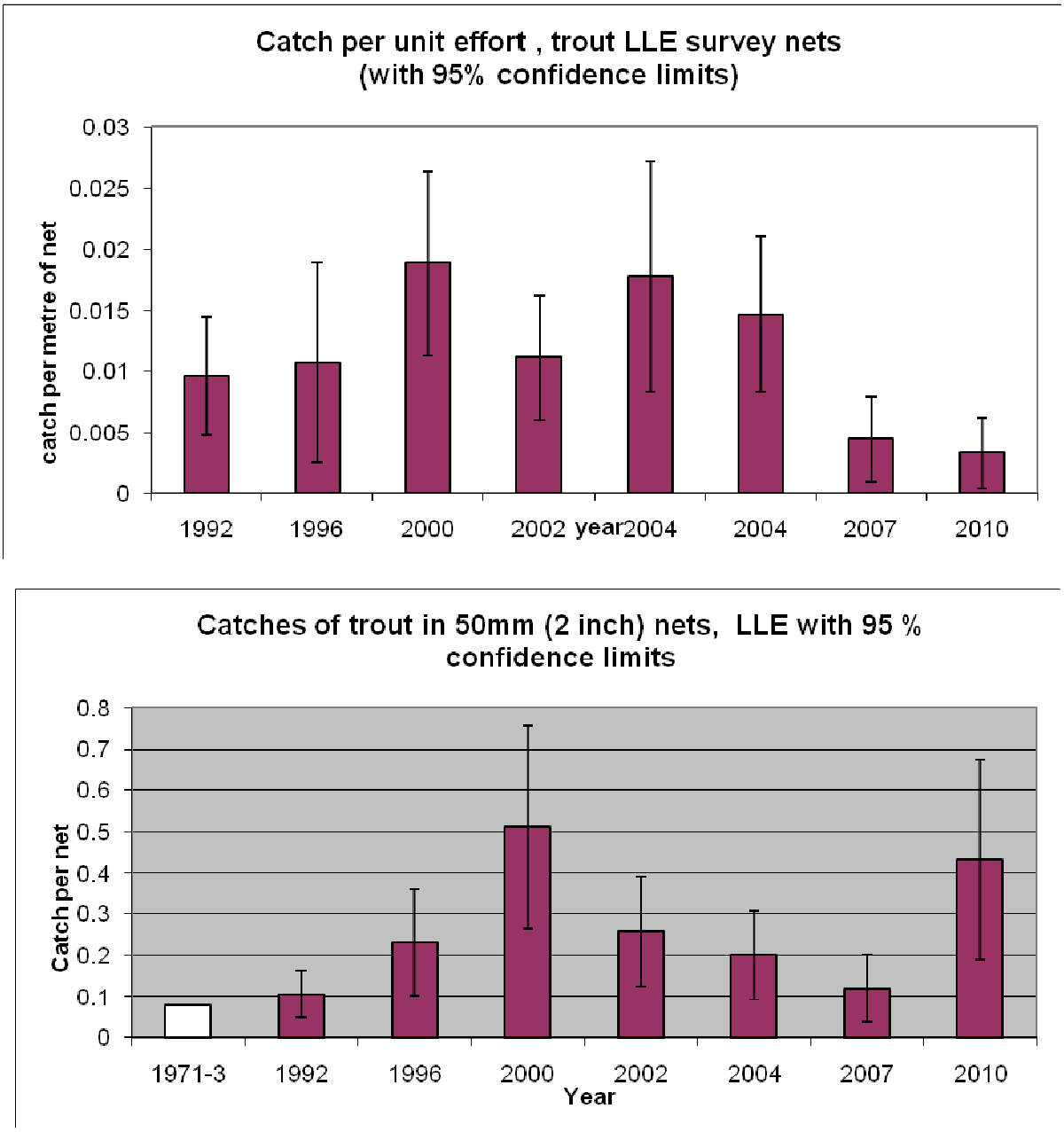


Fig 12a and 12b trout numbers in survey nets (top, 12a) and 50mm fixed mesh nets (12b, bottom)

Figs 12a and 12b show trout data taken in isolation from the other fish species from the surveys . The upper figure 12a shows catch per unit effort as a measure of abundance of fish in the "survey" net series, and shows relatively low numbers in 2007 and 2010. These multi-mesh nets catch fish of ages mainly 1 or 2 years after entering the lake, which are mainly under or just reaching angler take-able size. The low count in 2010 may correlate with noted poor recruitment of 0+ year old trout in the Garvery river index river electro-fishing data in 2007. If so then numbers could be expected to recover by 2012. There was no obvious reason for the low 2007 count of survey net trout, and there is no corresponding river index data. Note the double entry for 2004 in fig 12a: this is a CPUE comparison for the 6 panel and 12 panel nets: Similar analysis is required and has yet to be completed for the 2010 comparison between two different 12 panel "Baltic" and new WFD standardised "CEN" type. The data in 12a is from the older "Baltic" type known to be compatible with the earlier time series data.

The Lower figure 12b shows numbers of larger trout 9 (over 30 cm) caught in the 50mm mesh nets in 2010. These were relatively high in the context of the time series, and this group of year classes are likely to have formed good breeding stocks in 2011 and 2012.

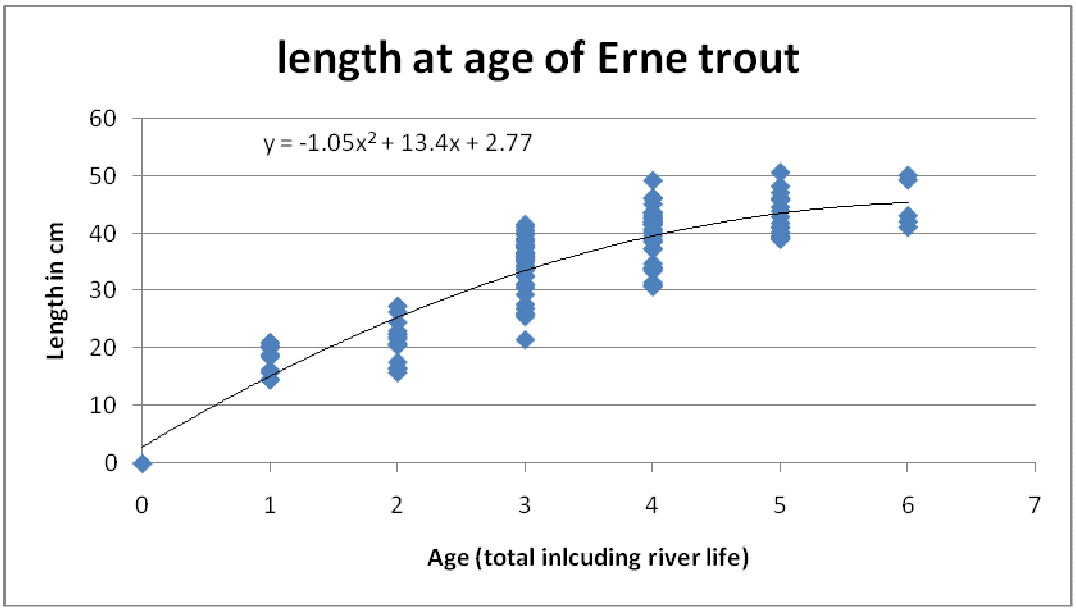


Fig 13. Length at age of Lough Erne trout

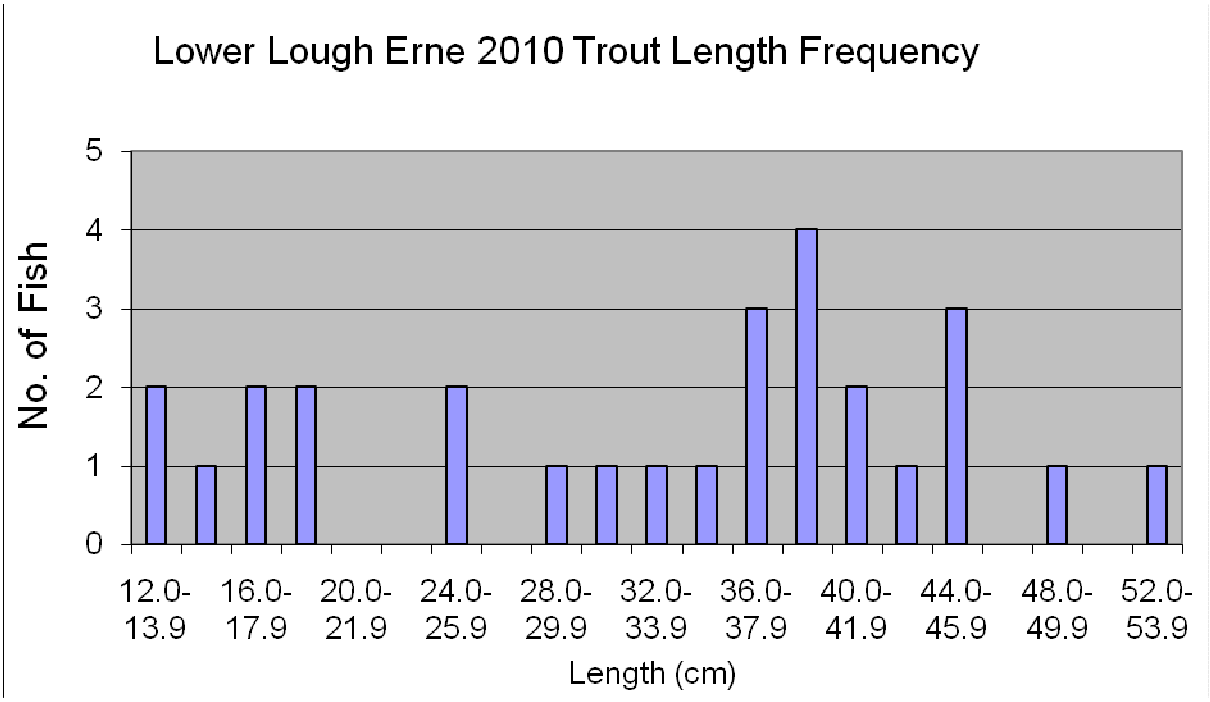


Fig 14. All trout sampled in gill nets, 2010.

Amalgamated data from the 2000 to 2004 surveys gives a length-at age plot for Lower Lough Erne trout (Fig 13). Mean length at age 3 (most fish enter the lake at age 2) averages 33.5 cm, and fish generally reach 40 cm their second year after entering the lake. Typical weights at these age points for fish in good condition approximate to 1lb (450g) and 2 lb (900g) respectively. Fig 14 shows the lengths encountered in the total 2010 sample, indicating a spread of fish across all size classes.