Does translocation and restocking confer any benefit to the European eel population? A review

Mike Pawson

Background

The European Commission has established an Eel Recovery Plan (ERP) with the objectives of protection, recovery and sustainable use of the European eel stock.

To achieve these objectives, Member States have an obligation to develop EMPs for each of their river basin districts (RBDs).

The objective is to provide a long-term escapement to the sea of the biomass of silver eel equivalent to 40% of the best estimate of the theoretical escapement if the stock had been free of anthropogenic influences.

ERP Stocking option

Article 7 of EU COM 1100/2007 requires that any Member State that permits fishing for glass eels/elvers must reserve at least 35% of the catch for stocking purposes within the EU in the first year of a compulsory EMP, increasing by at least 5% per year to achieve at least 60% by 31st July 2013.

Given the high price of glass eels/elvers on the commercial market (around Euro 350-650 per kg in 2012) and the relative scarcity of glass eels, stocking programmes must be as cost-effective as possible.

The benefits of stocking with young eels will not be realised for at least 5-10 years, when the growing yellow eels begin to mature into silver eels (except in Mediterranean areas).

Purpose of Review

This review was commissioned by SEG via the Living North Sea project, to provide a synthesis of the available data and information about the instances and effectiveness of re-stocking with eels as a conservation measure to increase the net production of silver eels.

Question “is there a net benefit of trans-locating eels compared with leaving them to migrate naturally.”

The remit of this review does not extend to evaluating the availability of eels for stocking, costs of stocking, or the reproductive capacity of silver eels.

Main findings of the review: survival

There is considerable evidence that stocked eels do survive and escape as silver eels, but it is difficult to evaluate whether survival to escaping silver eel is reduced by translocation (to the extent that there may be an overall loss to spawner production).

This is mainly because stocking studies have not been accompanied by controls without translocation.

Models do exist that might provide indicative outcomes, but many assumptions are unproven.

It is, nevertheless, logical to assume that enhancing eel populations throughout the species natural range where recruitment has been poor, must increase overall production.

Main findings of the review: growth and yield

It is equally unclear whether there are differences in the growth rate of stocked and naturally recruited eel that may lead to an overall loss of biomass of escaping silver eel.

Even if stocked eels do grow more slowly than native eels (for which there is no evidence), density effects on growth and sex ratio are more likely to influence growth rates and eventual biomass production.

The available evidence shows no clear relationship between stocking density and yield.

This probably reflects the variations in stocked waters' carrying capacity for eels, and also in the various studies' protocols.

Main findings of the review: yield per recruit

Estimates of the yield that results from stocking with glass eels or small yellow eels have generally been within the range 20-70 g per recruit (4-14 kg per hectare, at a nominal stocking density of 200 glass eels per hectare).

There is obviously a confounding effect on yield of stocking density and potential productivity of the water body into which eels are stocked.

The evidence demonstrates that stocking with eels leads to a quantifiable increase in yield of yellow or silver eel in the stocking location, but we cannot say whether this is an overall increase compared to leaving the glass eels *in situ* (and not catching them for purposes other than stocking).

Main findings of the review: sex ratio

We do not know whether changes in the **sex ratio** of eels at different stock densities represent a risk to reproduction (during spawning).

This is chiefly because the influence of sex ratio at spawning is not known, though it might be presumed that a shift towards females would result in higher overall population fecundity.

The default strategy would be to stock in such a way that local densities mirror those that obtained during the period when recruitment was high (1950-1970), if known.

Main findings of the review: on growing

There do not appear to be any benefits arising from on-growing of glass eels in aquaculture facilities before stocking (in terms of overall survival and growth).

However, holding glass eels with at least maintenance feeding until the time that they can be stocked with a good chance of survival in otherwise cold or ice-bound northern waters is a positive option.

Main findings of the review: behaviour

There is insufficient evidence to know whether any behavioural impairments due to translocation could reduce the success of spawning.

There is evidence that the migratory behaviour of stocked-origin silver eels is similar to that of native eels.

It would be prudent, however, to ensure that stocking results in well dispersed eels, and only occurs where there are few if any obstacles to sea-ward migration.

Main findings of the review: disease and parasites:

As with any translocation of living material, there a risk of spreading of disease and parasites when eels are moved from one area to another.

This can be minimised by using glass eels caught by fishing methods that cause the least damage and transporting them quickly in conditions that avoid undue stress (density, water quality, temperature).

If it is considered necessary to hold eels prior to stocking, it is advisable to start with good quality glass eels (free of parasites and disease, and from areas with low chemical contamination risk) and to use quarantine facilities where eels can be tested, if necessary.

Main findings of the review: genetics

Current scientific opinion is that the European eel population is essentially genetically unstructured (panmictic).

It seems unlikely that the genetic structure of eel populations in stocked waters could be altered by introductions of eels from elsewhere.

Any genetic variation due to temporal or spatial sub-structuring within recruitment is likely to be minimised by stocking either locally or where eels no longer recruit naturally (but growth and escapement opportunities are good).

Conclusions and Recommendations

Despite a considerable body of information, there are no clear answers to most eel stocking issues.

This is chiefly because very few studies have been carried out in a controlled way.

To help future decisions, documented assessments of the risks of stocking should be carried out (with explicit scientific input), both to judge whether stocking should take place and to assist with post-stocking monitoring.

Monitoring should aim to assess whether stocking has been successful in achieving its objectives (usually lacking) and to guide corrective measures, if necessary.

Conclusions and Recommendations

Where stocking continues, this review indicates that there are advantages of stocking directly with glass eels/elvers.

There are larger numbers available (though in a limited season) that have not been subject to local density-dependent and habitat-influenced mortality.

They carry a low risk of disease and parasite transfer, and are likely to have lower impact on populations at recipient sites.

The advantages of stocking with small yellow eels (wild-caught) are a lower mortality after stocking, shorter time before spawning escapement and, possibly, later relocation could facilitate seaward migration.

An observation

This review was concerned with the potential effects on silver eel production of trans-locating eels.

An obvious concern, that stocked-origin silver eels may lack the behavioural attributes to reach the spawning grounds, is being addressed by the EELIAD project.

However, even if this is demonstrated, it is doubtful if any quantitative evaluation of the contribution of stocked eels to the next generation of glass eels can be derived other than as a proportional contribution to silver eel escapement.

Acknowledgements

I would like to thank a large number of people who provided sources of information for this review at short notice, encouraged and co-ordinated by Andrew Kerr and Barry Bendall.

These include: Miran Aprahamian; David Bunt; Alain Crivelli; Richard Fordham; Matthew Gollock; Brian Knights; Arne Koops; Didier Moreau; Ans Mouton; Michael Pedersen; Marcello Schiavina; Alan Walker; Peter Wood and Klaus Wysujack.

However, I take full responsibility for the views expressed in this presentation.