ROUNDTABLE SESSION 4B

MANAGEMENT: HABITAT RESTORATION.

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EXECUTIVE SUMMARY

A list of discussion points/questions proposed by the chairpersons and participants was distributed at the beginning of the roundtable. Roundtable discussions focussed around these points and the differences in different countries and areas of Europe.

All agreed that the aim of restoration was to restore or create habitats such that native species inhabit the area whether restoration was proposed/undertaken whether on a catchment/national scale or a local project scale.

The subject was not contentious but there were major differences in the extent of habitat restoration work being undertaken in different areas of Europe. Therefore it was considered useful to include standard documents used by some conservationists such that it would aid others in an approach to restoration work where it was lacking.

DISCUSSION POINTS

Discussion points and/or questions raised:

1. Habitat restoration can mean restoring after disruption or it can mean creation as well (in America) which do we mean?

2. Habitat restoration can occur during and after construction projects. Engineering contractors may regard the job a failure if they leave irregular features as are necessary for habitat restoration for crayfish. Is communication before construction a feature of projects throughout Europe?

3. Does habitat restoration mean, « Restore bank and channel with natural materials; remove all polluting materials » or is the definition wider?

4. What can be done to improve the habitat if this is deemed necessary? ... in the river bed, river bank, indirectly, *e.g.* by flow changes.

5. As part of habitat restoration, should features be included in new concrete structures, *e.g.* ridges, cavities? Is incorporation of artificial secure interstices valuable and is it habitat restoration or habitat creation?

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6. What are the attributes of good crayfish habitats in terms of:
   - Water quantity
   - Water quality
   - Temperature
   - Population
   - Substrate
   - Channel Structure
   - Habitat composition
   - Disturbance
   - Predators
   - Non-native species
   - Distribution
   - Disease

7. Should we analysis of present good habitats provide a basis for recommendation of restorative features?

8. Is there a difficulty in generalisation because a good habitat in one river may not be in another?

9. Where should habitat restoration be prescribed, *e.g.* At new sites?, At sites where crayfish population at low density exists?, Linking populated sites?

10. Should we take measures to prevent activities that we think have caused decline, *e.g.* prevent cattle access to river, as habitat restoration measures?

11. Can habitat restoration be species specific, *e.g.* good habitat restoration for native crayfish may also be good for alien crayfish and predators such as otters?

12. The use of habitat restoration in the long term and short term.

13. Aim is to restore such that native species move back to the restored area.

14. Method of description and evaluation of the quality of aquatic habitats for *A. pallipes.*

15. In the marine environment, there are a number of experiments with « artificial reefs ». Are there such experiments in freshwater for crayfish?

THE ROUNDTABLE DISCUSSION

This roundtable discussed aquatic habitat attributes, which were favourable and unfavourable to crayfish. It was noted that there were a range of methods for evaluating aquatic habitats and the benefits of use of a standard format was promoted. As some participants were familiar with recording habitat in a standard way and others were not, it was requested that a standard crayfish record form be included in the text of the report on this roundtable (see Table I). It was noted that the standard form could be used as a basis for recording but in many circumstances further data would be added.

To restore a habitat to favourable conditions one first needs to know what conditions are favourable for crayfish.

The attributes of known good crayfish habitats provide a starting point and these were discussed point by point during the roundtable. It was noted that the attributes and targets for managing *Austropotamobius pallipes* had been published (HOLDICH and ROGERS, 2000) but this was not available in French, therefore it was requested that this table be included in French in the present report (see Table II). The consensus was broadly in agreement with information presented in Table II.

Table I
Crayfish recording sheet (as regularly used during crayfish surveys in the UK).

Tableau I
Feuille de signalement des écrevisses (utilisée régulièrement durant les études sur les écrevisses au Royaume Uni).

WATERCOURSE		NGR:		DATE:	
LOCATION:		SAMPLE METHODS:		SAMPLER:	
SITE DIAGRAM GENERAL COMMENTS: WEATHER:					
SUBSTRATA (mm)	**%**	**AV. DEPTH (cm)**		**FLOW (cm/sec):**	
Bedrock		**AV. WIDTH (m)**		Slack (< 10)	
Boulders (> 260)		**LAND USE:**	**%**	Slow (10-25)	
Cobbles (64-260)		Urban		Moderate (25-50)	
Pebbles (16-24)		Arable		Fast (50-100)	
Gravel (2-16)		Grazing		Spate (> 100)	
Sand (0.06-0.2)		Woodland		**PLANT COVER:**	**%**
Other		Moorland		Algae	
HABITAT:		Other		Moss	
Torrential		**CANOPY:**		Higher plants	
Riffle		Nil		**BANK STEEPNESS:**	
Fast run		Light		Left	
Slow run		Moderate		Right	
Pool		Heavy		**EXPOSED ROOTS**	**%**
Slack				**UNDERSTORY**	**%**

Table II
Attributes and targets for managing *A. pallipes* populations (after HOLDICH and ROGERS, 2000).

Tableau II
Caractéristiques et objectifs pour la gestion des populations d'*A. pallipes* (d'après HOLDICH et ROGERS, 2000).

Broad attribute	Specific attribute	Target	Caveats
Water quantity	Lotic. Lentic.	Flowing at all times. Present at bank level at all times.	Drought and over-abstraction may eliminate population. Low levels may lead to low oxygen levels.
Water quality	Calcium. pH. GQA. Biocides.	> 5.0 mg l^{-1} 6.5-9.0 Class A or B. Absent.	Higher levels better. 7.0 preferably. Occasionally found in lower class waters if oxygen levels OK. May recolonise after spill.
Temperature	Temperature.	Within seasonal limits.	High summer and low winter temperatures may cause mortalities.
Population	Age structure. Moulting. Breeding. 0+ juveniles.	No missing age classes. Early summer and autumn. Berried females - early winter. Present in early summer.	Disturbance of habitat is likely to affect one important stage of the life history or another. Mating usually in October-November. Release time depends on latitude and altitude.
Substrate	Sediment.	No accumulation of silt or sand on a regular basis.	Suspended sediment may not be harmful in short-term but can be if it builds up.
Channel structure	Bank. Poaching.	Some vertical sections, undercut. Light poaching only.	Strong enough to withstand burrowing. Causes increase in organic matter.
Habitat composition	Overhanging vegetation. Refuges. Submerged vegetation.	Present but with gaps. Variety present. Mosaic of beds and bare substrate.	Source of food and shading. Source of cover. Source of food and cover.
Disturbance	River/lake management. Bridge repairs etc.	No impact No impact	Sympathetic engineering. Rescue population, reintroduce.
Predators	Fish - chub, eel, perch, pike and trout. Birds – heron, crows etc.	Low levels	Many fish species prey on crayfish. Anglers may use crayfish as bait for certain species, *e.g.* chub.
Non-indigenous crayfish species	Signal, narrow-clawed, noble, red swamp and striped crayfish	Absence	Competitive exclusion likely. Eradication methods largely untried.
Distribution	Monitoring.	Up-to-date collation of records – native and non-indigenous	Funding needed for collation of records. Need for picture of national situation
Disease	Thelohaniasis (porcelain disease). Aphanomycosis (crayfish plague). Plus other bacterial diseases known to cause mass mortalities.	< 10% 0%. Disinfect equipment. Absent or at non-epidemic levels.	Thelohaniasis easy to diagnose Difficult to diagnose until too late. Usually 100% mortality. Very little studied in the British Isles. Legislation helps reduce spread. Disinfection of equipment.

Methods of incorporating favourable attributes both natural and artificial into habitats were discussed. Restoration provides the opportunity to incorporate as many as possible appropriate good attributes but also to provide artificial habitats.

The roundtable discussed a variety of artificial habitats (reefs) concluding that artificial habitats were more suitable for short-term retention of crayfish but that natural habitats were advisable for permanent installations. The use of short-term artificial habitats was expanded upon with reference to and descriptions of case studies in Britain and Switzerland, *e.g.* Conservation of crayfish during and after construction works at Dowdeswell Reservoir (ROGERS *et al.*, 1999).

It was highlighted that restoration could be considered on a variety of scales. On a small-scale it may involve mitigation measures taken during construction projects (PEAY, 2000), *e.g.* habitat restoration following bridge construction, whereas on a large scale it may involve river catchment restoration as a long-term process (DEPARTMENT OF THE ENVIRONMENT, 1995; ENVIRONMENT AGENCY, 2000). Emphasis varied according to the scale of the project; it tended to be more on factors such as water quality and quantity for large-scale projects whereas more weight was given to habitat creation and avoidance of sedimentation in a small-scale projects.

Restoration can mean restoring after disruption or it can mean creation as well; in larger scale projects restoration was more likely to be viewed, as creation of opportunities for crayfish colonisation *e.g.* by improvement of water quality whereas on a small scale project, it was often seen as restoration of habitat for crayfish displaced by engineering works. There is overlap between the definitions of creation and restoration in this context.

Communication with other disciplines, *e.g.* communication with engineers before construction starts, assists restoration of crayfish habitats and should be considered an essential part of habitat restoration.

CONCLUSION

There are many scales where there is conservation value in habitat restoration or creation. On a river catchment (and national) scale the work is more allied to creation and has greater emphasis on water quality and quantity issues whereas at a local level (small scale) the work is more often described as restoration (following construction and focuses on physical attributes. The aim in all cases is to restore or create habitats such that native species inhabit the area.

Artificial habitats were more suitable for short-term retention of crayfish but natural habitats were preferred for permanent installations.

Information transfer, *e.g.* by inclusion of Tables I and II in this document, will enable conservationists to direct more focus on habitat restoration where it has been lacking.

ACKNOWLEDGEMENTS

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REFERENCES

DEPARTMENT OF THE ENVIRONMENT, 1995. Biodiversity the UK Steering Group Report Volume 1: Meeting the Rio Challenge, ISBN 011 753218, and Volume 2: Action Plans, ISBN 011 753228.

ENVIRONMENT AGENCY, 2000. Focus on Biodiversity. www.environment-agency.gov.uk 2001.

HOLDICH D.M., ROGERS W.D., 2000. Habitat requirements of the white-clawed crayfish *Austropotamobius pallipes*. *In* : Crayfish Conference Leeds, ROGERS D. and BRICKLAND J. (Eds.), 109-121, Environment Agency, English Nature and International Association of Astacology.

PEAY S., 2000 Guidance on works affecting white-clawed crayfish. English Nature and Environment Agency, 27 p.

ROGERS D., HOLDICH D.M., CARTER E., 1999. Conservation of the native crayfish, *Austropotamobius pallipes,* population at Dowdeswell Reservoir during engineering works. *Freshwater Crayfish*, *12*, 942.