

NORFOLK BIODIVERSITY ACTION PLAN

CRUCIAN CARP (*Carassius carassius*)

A cryptic, mainly benthic, freshwater fish, with a long dorsal fin (without barbs), a rounded forehead and no barbels. Normally of olive golden-brown colour, the pelvic fins are pinkish with the first ray having darker (blackish) pigmentation. Found in freshwater systems, but characteristic of ponds and river backwaters.

Reference: LS/3	Local Species Action Plan 3
Plan Authors:	G.H. Copp (Cefas/BU) and C.D. Sayer (UCL)
Plan Co-ordinator:	Waterbodies BAP Topic Group
Plan Leaders:	UCL and Cefas/BU
Date: Feb 2010	Stage: Final
Plan Duration:	Six Years: Feb 2010 to Jan 2016

1. CURRENT STATUS

International and National Status

- Crucian carp *Carassius carassius* is classified in the IUCN Red List of Threatened Species as 'Least Concern', but with the caveat: Population trend: decreasing. Evidence of, and reasons for, the latter have been attributed to acidification (Holopainen & Ikari 1992), loss of habitat (Copp 1991, Schwevers *et al.* 1999), displacement by introduced gibel carp (Navodaru *et al.* 2002), and extirpation by introduced goldfish *Carassius auratus* and common carp *Cyprinus carpio* through hybridization (Wheeler 2000, Hänfling *et al.* 2005, Smartt 2007). Indeed, recent unpublished genetic analysis has revealed that fish in northern France thought to be *C. carassius* are in fact gibel carp (*Carassius gibelio*), the same species blamed for the decline of *C. carassius* in the Lower Danube (Navodaru *et al.* 2002).
- With a native distribution originally limited to southeast England (Wheeler 1972, 2000), records of *C. carassius* distribution since 1960 include sites throughout most of England and parts of Wales (Marlborough 1967a, Maitland 1972, Davies *et al.* 2004).
- The species' distribution is, however, unreliable because of confusion between *C. carassius* and the natural brown variety of *C. auratus* (Wheeler 2000, Hickley & Chare 2004), including erroneous reference to gibel (aka Prussian) carp *C. gibelio* (see Wheeler 2000).
- *Carassius carassius* is recognised in both local (Conservators of Epping Forest 2002, Lambeth Borough Council 2006, London Councils 2007) and national (Environment Agency 2003, 2008) initiatives to educate the public about the plight of the species and its conservation.

Norfolk Status

- The region of Norfolk and northern Suffolk, but excluding the Broads (Ellis 1965), is thought to be a stronghold for *C. carassius* (Copp & Sayer 2009). Other neighbouring counties within the native *C. carassius* range include Middlesex (Marlborough 1967b), Essex (Wheeler 1998, Tarkan *et al.* 2009), Hertfordshire (Copp *et al.* 2008a, 2008b), the counties encompassed by the Lower Thames catchment (i.e. Middlesex, Surrey, Kent) and possibly Cambridgeshire.
- Recent research on the distribution of *C. carassius* in Norfolk (Copp & Sayer 2009, Sayer *et al.*, submitted) has revealed a species occurrence decline of around 75% between the 1970s and 2008–2009 (of 28 ponds known to have contained *C. carassius* in the 1970s, only five retained the species). This decline is well above the 25% and

50% declines stipulated in the second and third BAP criteria, respectively (Copp & Sayer 2009).

2. CURRENT FACTORS CAUSING LOSS OR DECLINE IN NORFOLK

The threats to this species in the Norfolk (and neighbouring counties) include:

- Genetic contamination through hybridization with introduced *Carassius auratus* and varieties of common carp *Cyprinus carpio* (Hänfling *et al.* 2005, Smartt 2007), including 'koi' and 'chagoi', which are released illegally into open waters (Copp *et al.* 2005).
- Loss of habitat due to river regulation (Copp 1991; Schwevers *et al.* 1999, Navodaru *et al.* 2002).
- Changes in agricultural and landuse practices, especially the terrestrialsation of ponds (Schwevers *et al.* 1999, Sayer *et al.*, submitted).
- A previous lack of recognition of *C. carassius* as a characteristic pond species (see Copp *et al.* 2008b)

3. CURRENT ACTION IN NORFOLK

- *Carassius carassius* is a central component of pond conservation initiatives in North Norfolk, led by Dr. Carl Sayer (UCL-London), which has led to an established and increasing interest amongst land owners and anglers in *C. carassius* conservation.
- A village meeting was held in Bodham (near Holt, Norfolk) in spring 2009 to inform local stakeholders on initiatives into the conservation of *C. carassius* in north Norfolk.
- The character (water chemistry, aquatic invertebrates and plants) of ponds inhabited by *C. carassius* in north Norfolk is being assessed by Cefas and UCL along side assessments of the species' status in order to aid conservation initiatives.
- A tissue library has been established, which will be analysed once the necessary funds are obtained, so as to determine whether or not *C. carassius* populations in Norfolk are genetically distinct within England and within its native European range.

4. ACTION PLAN OBJECTIVES AND TARGETS

National

As *C. carassius* has not yet been included on the UK list of priority species, there are no national BAP objectives or targets for this species. Note, however, that the Environment Agency (national level) has begun to raise public awareness about concerns regarding the decline of *C. carassius* (Environment Agency 2003) and it has also restocked the species into some appropriate water bodies, e.g. in Norfolk (Environment Agency 2008).

Norfolk

Objectives:

- Determine the genetic character of English *C. carassius*. This has received only limited study in the UK (Hänfling *et al.* 2005), and this work did not shed any light on the amount of genetic variability within England (i.e. are Norfolk *C. carassius* unique relative to other parts of the UK?), nor within the species' native European range. Prior to any restocking of the species (from sources outside Norfolk), one of the objectives of this plan is to complete a genetic analysis of existing tissue samples from populations in north Norfolk, Hertfordshire and Essex (stored at Cefas-Lowestoft) as well as from the EA brood stock population at Culverton. Progress will be reported from research that is anticipated for autumn 2011, pending financial support for completion of the laboratory analysis, aiming to advise management plans with particular regard to the sources of fish used in the rehabilitation (i.e. stocking) of existing populations and the re-introduction of the species to appropriate ponds (e.g. where previously present but subsequently extirpated).
- Acquire baseline information on population status and distribution across the county;
- Increase the number of viable populations in a 'pilot' area of the county (North Norfolk);
- Raise awareness of the species' importance and conservation needs.

Targets:

- Range – Based on the results of research by Sayer *et al.* (submitted), a 75% reduction in *C. carassius* range is assumed throughout North Norfolk for the last three decades. The target for the five year period of 2010 to 2015 will be to double the current range in North Norfolk (i.e. increase from 20 % to 40 % occurrence in ponds that were known previously to contain crucian carp) through restocking and habitat enhancement. Progress towards this target will be reported from a survey (i.e. estimate of range) that is anticipated for spring 2015.
- Population Size – The survey results for North Norfolk (Sayer *et al.*, submitted) indicate that only one population of *C. carassius* (from 22 ponds surveyed, 5 %) was sufficiently abundant to be considered 'self sustaining'. The target for 2015 is to double the proportion of ponds in North Norfolk (known previously to contain the species) with self-sustaining populations (i.e. from 5 to 10 %) through restocking and habitat enhancement. Progress towards this target will be reported from a population survey that is anticipated for spring 2015.

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(priority actions are given in **bold**)

NORFOLK ACTION		LEAD ACTION BY	PARTNERS	DEADLINES
5.1	Policy and Legislation			
5.1.1	Prepare and publish one or more papers on the biogeographical status of <i>C. carassius</i> in England and the need for BAP designation throughout its perceived native range.	UCL, Cefas/BU		2015
5.1.2	Prepare proposal for consideration by Government to have <i>C. carassius</i> taken off the list of species that may be removed from open waters under the Water Resources Act (1991).	Cefas/BU, UCL	NE	June 2011
5.2	Site/Species Safeguard and Management			
5.2.1	Promote the natural recovery of existing <i>C. carassius</i> populations by restoring at least five ponds in North Norfolk by 2015. This will be achieved by enhancing habitat conditions (eg, by thinning riparian vegetation) and the fish community (e.g. by removing non-native fishes).	NE, NCC	EA, Cefas/BU, UCL, BFS, RSPB	Dec. 2015
5.2.2	Assess the feasibility/desirability of introducing <i>C. carassius</i> into ponds of its former range, including wetland areas.	EA, Cefas/BU, BFS	UCL, NE, RSPB, NBP	Dec. 2012
5.3	Advisory			
5.3.1	Develop a short guidance note on the importance, locations and management requirements of <i>C. carassius</i> , for distribution to landowners, NE agri-environment staff and EA fisheries officers.	UCL, Cefas/BU, BFS	NE, EA	Dec. 2011

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NORFOLK ACTION		LEAD ACTION BY	PARTNERS	DEADLINES
5.4	Future Research and Monitoring			
5.4.1	Carry out a survey of 20 ponds adjacent to the existing data base for North Norfolk (near Holt and Bodham) to confirm the observed decline for this area.	UCL, Cefas/BU	BFS	Dec. 2011
5.4.2	Seek financial support and carry out surveys of the ponds of Manor Farm to assess the distribution of <i>C. carassius</i> and any relationships between the presence of fish and other aquatic organisms.	UCL, Cefas/BU	EA, NE, NBIS, BFS, Manor Farm	Dec. 2012
5.4.3	Carry out at least one survey of 20–30 ponds in other parts of Norfolk to ascertain the current status of the species.	UCL, Cefas/BU	BFS, EA, NE, NBIS	Dec. 2015
5.4.4	Collect and analyse tissue samples in order to determine the genetic character of English <i>C. carassius</i>, with particular regard to any uniqueness of populations in Norfolk, so as to inform future management (in particular as regards stocking and re-introductions).	Cefas/BU, UoH, UCL	EA	Dec. 2011
5.4.5	Transmit data gathered during surveys and monitoring of the species to the Norfolk Biodiversity Information Service (for incorporation into local databases) as well as to JNCC, NBN and BRC (for incorporation into national databases).	UCL, Cefas/BU	NE, EA	by December of each year

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NORFOLK ACTION		LEAD ACTION BY	PARTNERS	DEADLINES
5.5	Communications and Publicity			
5.5.1	Raise awareness amongst the wider public and ecological community through, such as: articles in popular science and/or general publications (e.g. Norfolk Coast Guardian, Eastern Daily Press, EA e-newsletters); meetings with local landowners and angling clubs (at least one per annum); provision of guidance material for inclusion on stakeholders' websites (e.g. Norfolk Anglers' Conservation Association, Pond Conservation Trust, etc).	UCL, Cefas/BU	NE, EA	by December of each year
5.5.2	Update BARS on an annual basis.	UCL, Cefas/BU		by December of each year
5.5.3	Present oral and poster communications at international and national workshops on pond conservation (at least one meeting per annum)	UCL, Cefas/BU		by December of each year
5.6	Links with Other Plans			
5.6.1	The present plan should be considered, where appropriate, in conjunction with the Norfolk Ponds HAP (2010).	Waterbodies BAP Topic Group		
5.6.1	The present plan should be proposed to other eastern counties (within <i>C. carassius</i> ' native range) as a template for local BAP designation in those counties.	Cefas/BU, UCL	Waterbodies BAP Topic Group	

Abbreviations

BA	Broads Authority
BFS	Bedwell Fisheries Services
BU	Bournemouth University (School of Conservation Science)
Cefas	Centre for Environment, Fisheries & Aquaculture Science (Salmon & Freshwater Team)
EA	Environment Agency
NBIS	Norfolk Biodiversity Information Service
NCC	Norfolk County Council
NE	Natural England
RSPB	Royal Society for the Protection of Birds
UCL	University College – London (Environmental Change Research Centre)
UoH	University of Hull
WMA	Water Management Alliance

MANAGEMENT GUIDANCE

(This guidance is a general summary; for more detailed information or advice, please consult the references or contacts below.)

C. carassius is a cryptic but robust species, growing best in still, open waters with some submerged vegetation. Despite its ability to withstand low oxygen conditions, *C. carassius* is a relatively poor competitor. It is also subject to genetic contamination from non-native species, in particular congener *C. auratus* and also *Cyprinus carpio*, both of which are known to be released (often illegally) into both rivers (Copp *et al.* 2006) and ponds (Wheeler 1998, Copp *et al.* 2005). So, for all types of ponds, elimination of *Carassius auratus* and *Cyprinus carpio* is essential and either de-silting or sediment compacting (using Siltex®) may be appropriate (see Copp *et al.* 2008b).

For ornamental ponds, management recommendations have been published to provide guidance on how to favour *C. carassius* in ornamental ponds (Copp *et al.* 2008b). This includes the elimination of *C. auratus* and *Cyprinus carpio*, the maintenance of open waters (e.g. thinning back species of lily) and either de-silting or sediment compacting, where appropriate.

For urban ponds, management strategies published by local authorities (Conservators of Epping Forest 2002, Lambeth Borough Council 2006) to enhance habitat and raise awareness about *C. carassius* will benefit from recommendations elaborated and subsequently implemented in Epping Forest (Copp *et al.* 2005). These include the categorisation of ponds according to their situation, with some ponds (especially those far from roads) dedicated to *C. carassius* conservation, some to amphibian conservation (which may not conflict with that of *C. carassius*, as there is no evidence yet that amphibians are impacted adversely by this fish species), and some ponds (in particular those close to roads) are acknowledged as likely to be 'dump sites' for unwanted aquarium and garden organisms (pet fish, plants, etc.). During regular monitoring of these ponds, any non-native fish and plant species should be removed, and in the case of urban 'dump sites', the populations that develop from abandoned pet fish should be removed and disposed of appropriately in order to avoid animal health risks (i.e. abandoned pet fish often carry diseases that can be passed on to native species).

In rural areas, including agricultural settings, elimination of *C. auratus* and *Cyprinus carpio* should be combined with the thinning or removal of riparian vegetation, especially along the south side (to increase exposure of the pond to light) and/or sides that block prevailing winds, which can help keep the duckweed cover to a minimum. In some cases, either de-silting or sediment compacting may be deemed appropriate, and in some cases deepening of the pond may be required to ensure that the pond does not dry out during periods of low precipitation. When dredging is undertaken, remodelling of the pond's shape to create shallow areas would favour the co-existence of *Carassius carassius* and both invertebrate (e.g. dragon and damselflies) and amphibian species.

In river flood plains, *C. carassius* will be favoured by the reconnection of isolated floodplain water bodies, as fish reproductive function (i.e. the role of water body types in fish reproduction) in flood plain rivers is determined by the diversity and connectivity of floodplain aquatic ecosystems (Copp 1989). So these are important components in the management and rehabilitation of lowland floodplain hydrosystems (Copp 1991, Cowx *et al.* 2004).

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