

Bittern
(*Botaurus stellaris*)



European Union Action Plan for Bittern (*Botaurus stellaris*)

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Reviews

This action plan will be monitored annually by the compilers and reviewed every five years
(first review due 2001).

Geographical scope

This plan is intended for implementation by conservation organisations and others within the whole of the EU, although it is recognised that the Bittern does not currently breed in all member states. In implementing this plan, it will be important to target actions towards areas where it will be most effective in maintaining the range and numbers of Bitterns. Even areas with small, fragmented populations (such as in Italy, southern Germany and the UK) are important for maintaining the range of the species. Some of the actions proposed are targeted at non-EU countries, particularly Poland, where there are still substantial Bittern populations, since the status of the species in Europe as a whole is probably linked to its future in these core areas. It should also be remembered that enlargement of the EU within the next few years may well include a number of these countries.

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SUMMARY

There are small breeding populations of Bitterns in most EU and other European countries, though around three quarters of the European total are found in Russia and the Ukraine (see Table 1, p 4). Half of these populations declined between 1970 and 1990 (Tucker & Heath 1994). Loss and deterioration in quality of wetland habitats are mainly responsible. The Bittern is a 'SPEC 3' species, indicating that its populations are not concentrated in Europe but that it has an unfavourable conservation status in Europe.

The EU total of breeding Bitterns is not known with any degree of accuracy because few countries have conducted systematic surveys and no reliable method of censusing large reedbed sites is available. The figures given in Tucker & Heath (which give a maximum total for the EU of 2000 'pairs') must therefore be treated with great caution, but it appears that the main populations are to be found in northern and central parts of the EU, coinciding with the distribution of large reedbeds. Small, fragmented populations are found in outlying parts such as the UK, Denmark and Spain.

Threats and limiting factors

- Degradation of habitat - high
- Food availability - high
- Lack of large reedbeds - medium/high
- Hard weather in winter - potentially high (mainly in combination with degradation of habitat)
- Sea level rise, salt water intrusion - high for specific sites (eg around 25 IBAs in NW Europe)
- Recreation - high at specific sites
- Excessive water abstraction - high in some areas
- Pollution (contamination of birds) - low
- Persecution – low

Conservation priorities

The main objective of this plan is to maintain the current range of the Bittern throughout the EU, even in areas where its numbers are low. Top priorities are as follows:

- To ensure the protection and integrity of existing natural or semi-natural large (over 50 hectare) reedbeds and associated wetlands, particularly existing Bittern breeding sites.
- To ensure the protection and appropriate management of existing 'artificial' Bittern breeding sites and other large reedbeds to fulfil their potential for Bitterns.

In addition, for countries with small, fragmented populations:

- To encourage the creation of substantial new areas of suitable reedbed and associated wetland habitats for Bitterns in existing, former and new breeding localities, in order to enable the consolidation and spread of their populations.

The main actions that will be necessary to address these priorities are as follows:

- Ensure the long-term continuation of suitable reedbed habitat for Bitterns, either through management or through natural processes at reedbeds that are not intensively managed. Former and current Bittern breeding sites should be targeted.

Priority: high, essential

- Ensure that reedbed sites that could or do support Bitterns are protected from harmful influences such as development or disturbance.

Priority: high

- Develop a census technique for booming Bitterns at large sites and use it to make an accurate estimate of the total breeding population and establish a monitoring programme.

Priority: high, essential

- Set up research projects in contrasting core areas for Bitterns to study their ecology, behaviour, breeding biology etc.

Priority: high, essential

- Promote the conservation of reedbeds and Bitterns in Eastern Europe and in wintering areas around the Mediterranean, through liaison with NGOs and other organisations to reach individuals and agencies responsible for wetlands.

Priority: high, essential

- Investigate the European trade in reed for thatching

Priority: medium

1. Introduction

The Bittern is listed as a 'SPEC 3' vulnerable species in Tucker & Heath (1994), indicating that it is a species whose populations are not concentrated in Europe, but which has an unfavourable conservation status in Europe. It is a declining breeding species that is dependent on reedbeds, a scarce, specialised habitat. The overall population has been declining in size and range during the 20th century (though with recent increases in northern Europe - see Table 1, pg 4), and if action is not taken to reverse this trend, the species could become extinct in a number of European countries. The maintenance, rehabilitation and establishment of suitable reedbed habitats and associated wetlands are of paramount importance for this species.

The Bittern is listed in Annex I of the EC Wild Birds Directive, Appendix II of the Bern Convention and Appendix II of the Bonn Convention. It is also listed as one of the waterfowl species used to identify wetlands of international importance under the Ramsar Convention. High priority should be afforded to conservation action for Bittern in the EU as a whole, even though the Bittern is not currently regarded as a high priority in some individual countries, or is just one of a suite of species associated with reedswamp and associated habitats. It should be noted that actions for this species may well be of direct benefit to a range of other wetland species, but it is possible that some prescriptions may have an adverse impact on other wildlife. In these circumstances, implementers of this plan must balance the needs of the various priority species accordingly.

The basis of this action plan was laid down at a workshop held at LBV headquarters at Hilpoltstein, Bavaria, on 17-18 April 1996, attended by representatives from six EU countries (Austria, France, Germany, Italy, the Netherlands and the United Kingdom) and Poland.

2. Background Information

2.1. Distribution and population

Palaearctic. The Bittern breeds throughout much of Europe (see Table 1), north Africa and central and eastern Asia, with an outlying population in southern Africa. In northern Europe it is largely migratory, in central and Western Europe it is partially resident, and in southern European countries, such as Greece, breeding is sporadic but wintering birds are widespread.

The European population, excluding the former USSR, was estimated to be between 2500 and 2700 pairs in 1976. However, the hard winter of 1978/79 resulted in a 30-50% decline in European populations (Day 1981). In southern Europe the Bittern tends to be a winter visitor and passage migrant. In Greece, for example, birds are regularly seen in winter and at times of severe cold weather exhausted individuals turn up in remarkably high numbers.

There is concern for the status of the Bittern in a number of European countries. See Table 1 for the most recent population estimates. Individual country accounts have been supplied mainly by local contacts.

Table 1: Breeding population of the Bittern in Europe (taken from Tucker & Heath 1994)				
Country	Breeding population Size (prs)	Year	Trend	Breeding range trend
European Union				
Austria	(100-150)	-	(F)	0
Belgium	2-13	1981-90	-1	-1
Denmark	57-76	1991	+2	(0)
Finland	100-150	1992	+2	+1
France	300-350	1990	-1	-1
Germany	400-600	-	-2	0
Italy	20-30	-	(-1)	(-1)
Netherlands	150-275	1989-91	-2	-2
Portugal	(1-5)	1989	-	-
Spain	25-25	-	-2	-2
Sweden	200-300	1987	0	0
United Kingdom	16-16	1988-91	-2	-2
<hr/>				
EU total	1370-2000	NB: No breeding Bitterns in Greece, Ireland or Luxembourg		
Non-EU				
Albania	1-10	1964	-1	(-1)
Belarus	950-1,200	1990	(0)	0
Bulgaria	(10-50)	-	(-1)	(0)
Croatia	30-50	-	-1*	-1*
Czech Republic	20-30	-	-1	-1
Estonia	200-300	-	+1	0
Hungary	400-500	-	0	0
Latvia	200-300	-	(0)	(0)
Lithuania	200-250	1985-88	(0)	(0)
Moldova	150-200	1990	-1	-1
Poland	1,100-1,400	-	0	0
Romania	(500-2,000)	-	(-1)	0
Russia	(10,000-30,000)	-	(-1)	(0)
Slovakia	50-150	-	-1	-1
Slovenia	(5-10)	-	(0)	(0)
Turkey	(30-500)	-	(-1)	0
Ukraine	4,000-4,300	1988	0	0
<hr/>				
Non-EU total	17,825-37,250			
European total (approx) 19,000-43,000				
Trends: (1970-1990)	+2 Large increase +1 Small increase 0 Stable -2 Large decrease -1 Small decrease			
Data quality:	Bold = reliable quantitative data Normal type = incomplete quantitative data Brackets () = no quantitative data * = data quality not provided			

NB Although the totals are described as 'pairs', in fact the figures will in most cases refer to calling males.

2.2. Life history

Breeding

Males advertise their territories by booming and there is some evidence that they are polygamous (Gauckler & Kraus 1965). The nest consists of a platform of reed stems amongst standing reeds. Usually four to five eggs are laid in April-May. As far as is known, all incubation and chick rearing are carried out by the female. The young can leave the nest 12 days after hatching but may stay on the nest platform longer before dispersing into the reedbed. The female may build further platforms for the young while they are dependent on her for food. Fledging takes place between June and early August in northern Europe (Cramp & Simmons 1977), May-June in Mediterranean Countries (L Puglisi *pers comm*). Little is known about fledging success, chick survival or chick diet (but see Gauckler & Kraus 1965, Dement'ev & Gladkov 1951 and Pchelintzev 1990).

Wintering and migration

The migratory patterns of populations in the EU depend on their location:

- In United Kingdom and Atlantic coastal areas Bitterns tend to be resident, since the climate is relatively mild in most winters, and normally abundant rainfall keeps the reedbeds moist in all but the driest summers. The resident breeding population is augmented by wintering birds from further north and east.
- Continental birds inhabit northern and inland regions of the EU, where winters are cold and shallow water freezes solid for long periods. These Bitterns are mainly migratory, wandering south and west to reach suitable wintering areas. They are highly vulnerable at this time, and populations may crash after particularly severe weather in their wintering areas (more so than the Atlantic coast birds).
- Mediterranean birds are mainly resident, since freezing up of the water bodies in their wetland habitats is rare. However, extremely dry summers cause severe problems in some areas due to drying out of water bodies, and it is thought that Bitterns may have to subsist on a variety of non-aquatic prey, such as small mammals, at this time.

Feeding

Bitterns are fairly eclectic and flexible in their choice of food, which is predominantly fish, amphibians and insects, but also small birds and mammals (Cramp & Simmons 1977). In the Netherlands, small mammals are regarded as important in severe winters (Tom den Boer *pers comm*). Bitterns require adequate feeding opportunities for primarily aquatic animals - fish, amphibians, invertebrates and some birds. In mainland Europe, amphibians may be a more important part of the diet; in Britain this may also be the case where they are numerous, because they are available at an important time of the year (pre-breeding), but most reedbeds have poor invertebrate populations. At some sites in northern Europe eels *Anguilla anguilla* appear to be the principal food and here the availability of an unimpeded run for eels is important. Eels of 3-4 years of age, about 100 grams in weight and 35cm long, appear to be the optimum size for Bittern. Larger eels frequent dykes whilst the smaller ones are more likely to penetrate into wet reedbed. By contrast, in at least one Bittern site in Italy, wintering (and probably breeding) Bitterns feed largely on very small (2-5cm) fish, predominantly two species of mosquito fish *Gambusia holbrooki* and *Aphanius fasciatus* (L Puglisi *pers comm*).

Habitat requirements

A secretive species which has been very little studied to date. It is found mainly in beds of common reed *Phragmites australis*, either pure stands or mixed with other fen species, though birds have bred occasionally in other dense aquatic vegetation such as saw sedge *Cladium mariscus* and lesser reed mace *Typha angustifolia*. Adults have been shown by analysis of records of booming to be largely site faithful in any one year (Smith *pers comm*). Analysis of breeding sites shows that Bitterns utilise large, wet reedbeds with areas of open water. Research in England originally indicated that booming males required a reedbed of at least 20 hectares in extent, but it now appears that smaller sites may be utilised provided that other feeding areas are available nearby. In continental Europe, where there are highly productive reedbeds, Bitterns can certainly exist in sites of less than 20 hectares (2-40 hectares in den Boer 1992). Some much smaller reedbeds support breeding birds, but these birds are dependent on a network of reed-fringed dykes or more open wetland habitats and

other reedbeds over a much wider area for foraging (Tyler *pers comm*).

In the UK, smaller occupied sites are also significantly wetter and 'purer' than other occupied sites (Tyler, Smith & Burges 1998). Overall, the most important factors in explaining Bittern usage are the area of reed, reedbed wetness (as indicated by low levels of scrub, reed leaf litter and old reed stem density) and the 'purity' of the reedbed (Tyler, Smith & Burges 1998). They do not breed in dry reedbeds, which lack aquatic food sources, or estuarine reedbeds, where salinity levels are too high for amphibians to survive and where tidal fluctuations could lead to nest flooding and limited feeding opportunities (Bibby & Lunn 1982). Most of the sites utilised are large, however this is probably because such sites provide a variety of wet feeding areas, rather than reflecting size alone (Bibby & Lunn 1982).

In reedbeds established in shallow water (less than 30cm deep), foraging areas (at least in winter) are changed according to the water level (L Puglisi *pers comm*). In these reedbeds, marked and rapid variations during the breeding season could reduce the availability of aquatic food, so Bitterns tend to avoid wetlands with water levels which fluctuate widely (Cramp & Simmons 1977). Reedbeds established in deeper water (over 30cm) appear to be less prone to drying out.

Because of their specific habitat requirements, Bitterns are dependent on reedbeds at early stages in the natural succession. Before man's impact on his environment reached the level that it has today across the EU, reedbeds were often short-lived habitats of the transition period from open water to scrub and woodland. However, in natural sites such as unregulated river valleys, seasonal effects, particularly deep and prolonged flooding or scouring by ice floes, could prevent the establishment of woody species and remove any accumulated silt and reed litter. Such natural sites are now scarce or absent in most EU countries, but where they occur it is extremely important that they are maintained in a natural state. Not only are they likely to be richer in wildlife than more artificial sites, but they are not dependent on intensive intervention by man for their survival.

The problem facing many of our remaining reedbeds is that they are now part of highly modified and fragmented wetland systems. Natural processes are no longer allowed to affect them, and as a result natural succession is speeded up. Only by large-

scale management can this succession be halted at the stage where it is suitable for Bitterns and other wetland species. Conservation management is costly and labour-intensive, so finding the resources to fund the long-term management of substantial areas of reedbed places a large burden on conservation organisations. Commercial exploitation of reed is possible in some areas, either for thatching or for livestock bedding, and it should be possible to create new commercially-managed reedbeds which are capable of supporting Bitterns. However, there is a danger that seeing the reedbed primarily as an economic resource may lead to insensitive and inappropriate harvesting methods, which may conflict with the requirements of wildlife.

Burning is sometimes seen as a cheap and simple way to halt or reverse natural succession, by eliminating woody species and removing dead plant material, but this technique must be used with caution. The resultant ash is rich in soluble nutrients that can lead to water quality problems, and there is always a risk of large fires getting out of control. There are also potential adverse effects on invertebrates if burning is carried out on a large scale.

2.3. Threats and limiting factors

Degradation of habitat - seral succession and inappropriate management

Reedbeds represent an early stage in the seral succession of lowland freshwater vegetation communities. In some areas, reedbeds appear to be relatively long-lived, with natural processes such as deep and regular floods, preventing succession. However, in other areas, without careful management or changes to the water levels reedbeds will naturally dry out as leaf litter accumulates and thus, with time, the surface of the reedbed rises. This in turn will lead to the invasion of sallow *Salix*, alder *Alnus* or other woody species and the development of wet carr woodland. Slowing this succession can be achieved by raising water levels, harvesting and burning the reeds, cutting invasive scrub, or digging out the reedbed (all of which can also provide additional foraging areas). The latter technique produces longer lasting benefit but is significantly more expensive (Burgess & Evans 1989). Experiments at sites in Denmark and Sweden have shown that management by rotavation of rhizomes can be used to reverse the succession (K Smith *pers comm*).

The commercial management of reedbeds is not necessarily incompatible with use by Bitterns. Management by regular cutting favours a monoculture of reed and retention of high water levels in spring and summer to promote rapid growth prevents a build-up of reed litter and provides foraging sites for Bitterns. Commercial beds are often burnt after cutting in winter which also helps to remove reed litter. The problems with commercial cutting occur if too large an area is cut in any one year (which can result in inadequate cover in winter and lack of suitable nesting habitat in spring), if there is pressure to take a crop every year, and if commercial beds lack sufficient dykes and areas of edge for feeding.

In many parts of Europe, Bitterns occupy reedbeds around the edges of commercially-managed fishponds. This is especially true of parts of Eastern Europe (Hungary, Poland and Russia for example), where there are very large complexes of ponds. Here, reed-cutting is intended to allow access to the water and to prevent encroachment of invading reed into the open water. The fish-rearing process itself can potentially cause problems of eutrophication, particularly if the water is overstocked, but at least ensures wet conditions and a good food supply for Bitterns. Privatisation of fish-farming in former communist states may in future have a large adverse effect on wetland birds, including the Bittern. This may come about through intensification of the enterprise or conversion to other uses.

To maintain the transitional phase of reedbed development favoured by Bitterns, two basic approaches to conservation management are required, if natural processes are absent. First, to retard the drying out of the reedbed by water level control, cutting or burning the reed, or a combination of these techniques. Second, to dig out sections of reedbed on a rotational compartment basis to ensure continual provision of young reedbed. The latter technique is important in the long term retention of suitable sites, but is very labour intensive and probably only practicable on a small scale. Accurate management of water levels is important and large fluctuations in levels (such as can occur with reedbeds fringing water storage reservoirs) are highly detrimental.

It must be remembered that some reedbeds, particularly the larger sites, have considerable wildlife importance apart from Bitterns (such as purple heron *Ardea purpurea*, spoonbill *Platalea leucorodia*, bearded tit *Panurus biarmicus*, Savi's warbler

Locustella luscinioides, otter *Lutra lutra*, Fenn's wainscot moth *Arenostola brevilingua* and so on). Therefore, while Bitterns will in many cases be a priority, and an ideal 'flagship' species for this habitat, the requirements of these other species should not be overlooked and careful planning of large-scale work should be undertaken before work commences.

Overall EU Importance: high

Degradation of habitat – pollution

Water quality is also important in maintaining breeding habitat. Heavy silt loads can exacerbate the drying out of the reedbeds, while overstocking of commercial fishponds can cause eutrophication of the Bitterns' feeding areas. In addition, the eutrophication of water supplies can adversely affect reed quality, and is believed to have resulted in reed die-back and problems of reed rehabilitation in some areas. Inputs of nitrates and phosphates have increased markedly and have led to the break up and degeneration of floating mats of reed in some sites in the UK. This results in the development of anoxic sediments that will not support food or reed recolonisation. Algal blooms resulting from eutrophication could also decrease Bittern feeding efficiency because of turbidity and direct fish kills: these have increased markedly. Botulism is also becoming a severe problem in France.

Overall EU Importance: locally high

Food availability

It is important not just that food is present at a site but also that it is available to the birds. For example deep, steep-sided dykes may contain good fish populations but these may be inaccessible to Bitterns. Pollution can also affect food availability. There is little understanding as yet about the management of sites to provide good food resources. In Italy, as many as 19 wintering Bitterns have been seen in an area of only 15 hectares where the water depth was 10-20cm in depth, providing ideal conditions for capturing small fish such as *Gambusia* and *Aphanius* (L Puglisi *pers comm*).

Overall EU Importance: high

Lack of large reedbeds

It is clear that in countries with little remaining reedbed habitat, some Bittern populations have been limited by the availability of large, wet reedbeds with

adequate feeding conditions. Recent quantitative work has confirmed that site size is of major importance for Bitterns in these areas (Tyler, Smith & Burges 1998). Although Bitterns are not entirely confined to large reedbeds, the birds breeding at smaller sites are known to utilise reed-fringed dykes over a large area in adjacent habitat. The lack of large reedbeds is not thought to be a limiting factor in all EU countries (see Table 2), but Bittern populations may be very prone to local extinctions when they occur in small, isolated sites.

Overall EU Importance: medium/high

Hard weather

The impact of hard winters is best monitored by assessing the decline of breeding populations in the following summer. Hard weather fluctuations will always have been a natural process, but there is now some concern because recovery appears to be slow (indicating poor breeding success) and suitable wintering sites in the south and west of Europe may not be available. The impact of hard winters on populations is not clear cut because the number of birds moving south and west is probably increased by severe weather. For example, after some hard winters the population breeding in England has not been significantly affected despite apparently high mortality. Conversely the severe winter of 1978-79 resulted in a 30-40% decline in parts of Europe the following summer. Hard weather may play an important role in the dispersal of this species. It is known that young birds tend to disperse away from the natal reedbed and this underlies support for the protection of reedbeds outside the current breeding range. Analysis of voice prints indicates that breeding males are site faithful.

Overall EU Importance: potentially high in conjunction with other factors

Sea level rise, salt water intrusion

Sea level rise and a breakdown in sea defences would be very damaging to Bittern habitats in certain areas because of the resultant tidal fluctuations in water levels and possibly because of reduced food availability. There are occasional saline intrusions at a number of sites in north west Europe, and around 25 IBAs supporting breeding Bitterns in north west Europe appear to be at some risk from future sea level rise. Future investigation may show that this risk is higher than currently realised.

Overall EU Importance: potentially high for specific sites

Recreation

Wetlands are coming under increasing pressure from many forms of recreation. In recent years more people are visiting the countryside and looking for quiet areas such as reedbeds. They can cause damage both by trampling growing reed and by disturbing wildlife at critical times. In the past, quiet pursuits such as angling and boating were most widespread, but more recently noisy aquatic sports (water-skiing, speedboat racing and so on) have become very much more popular and are having an adverse effect on wildlife, both through noise disturbance and physical damage from the wake of fast boats, particularly to reed fringes.

Overall EU Importance: high at specific sites

Excessive water abstraction

Excessive water abstraction in the catchment of key reedbed sites could either lead directly to drying of the reedbed or cause indirect damage either through difficulties in water level control or by affecting eel runs (see 2.4. below). Such problems are most likely to occur in drier areas where demand for water may outstrip supplies. This problem can also apply to newly-created sites, and it may not be possible to secure a water supply to some specific locations. Spring-fed wintering sites have been lost in some areas, as a result of which winter mortality may well have increased.

Overall EU Importance: high in some areas

Pollution: contamination of birds

Bitterns, like grey herons *Ardea cinerea* and other fish-eating species, are potentially at risk from heavy metal and pesticide pollution, being at the top of the food chain. Pesticide levels were known to be high in grey herons in the 1950s and 1960s but contamination has declined since then and the heron population is increasing (Newton *et al* 1995), though in some countries cessation of hunting may have been at least partially responsible for this.

There is no substantial information available on pesticides in Bitterns, as very few corpses are recovered or analysed. In any case some of the birds that are recovered will be a result of cold weather movements, possibly of continental origin, and therefore will not

provide information on pesticide loads in their breeding localities. Heavy metal (eg mercury) pollution is a potential problem in some areas. Sampling of eels in river systems in the UK has shown high levels of PCBs and organochlorines but sampling at Bittern sites has not indicated a problem for these specific localities.

Overall EU Importance: low in terms of population, potentially high for particular sites

Persecution

The Bittern is fully protected throughout the EU and is not a quarry species. In general, it does not suffer from illegal persecution, although in particular areas (such as southern France) individual Bitterns may be shot by wildfowlers. This can occur either through ignorance of the species, poor visibility (especially shooting at night) or irresponsibility. Shot birds may well be wintering individuals from other countries, so shooting may have an impact far from where it takes place.

Overall EU Importance: low.

TABLE 2 :

IMPORTANCE OF TRHEATS AND LIMITING FACTORS IN EACH EU COUNTRY

	1	2	3	4	5	6	7	8	9	10	Bittern population
Austria	-	0	0	0	-	0	0	0	-	0	100-150
Belgium	-	-	-	-	-	-	-	-	-	-	60-65
Denmark	++	+	0	+	+	+	0	0	-	0	80+
Finland	0	0	0	0	0	+	0	0	0	0	250-300
France	++	++	0	+	0	0	+	+	0	+	300-350 ?
Germany	++	+	0	++	+	0	+	+	0	0	900-1000
Greece	-	-	0	0	-	0	-	-	-	-	0 ?
Ireland	no Bittern population										0
Italy	++	-	0	0	0	0	+	-	-	+	35-65 ?
Luxembourg	no Bittern population										0
Netherlands	++	+	-	+	+	0	+	++	0	0	150-275
Portugal	+	0	0	+	0	0	0	0	0	+	0 ?
Spain	++	+	0	++	0	0	0	++	0	0	30+
Sweden	-	0	0	+	+	++	0	-	0	-	400
UK	++	+	++	++	0	0	++	+	0	+	20

- = no information
- 0 = not important
- + = of some importance
- ++ = very important

Key

1. **Degradation of habitat - seral succession and inappropriate management**
2. **Degradation of habitat - pollution**
3. **Food availability**
4. **Lack of large reedbeds**
5. **Hard weather**
6. **Sea level rise, salt water intrusion**
7. **Recreation**
8. **Excessive water abstraction**
9. **Pollution: contamination of birds**
10. **Persecution**

2.4. Conservation status and recent conservation measures

Austria

Full legal protection.

The Bittern now occurs only in the eastern part of Austria, in the huge reedbeds of the Neusiedlersee (103km² in the Austrian part of the lake) and neighbouring smaller reed-fringed lakes. Since the main reedbed is up to 5km broad, it is impossible to census Bitterns accurately. However, in 1995 reliable quantitative data were obtained for a sample site, and by extrapolation, combined with counts from smaller breeding sites, a total of 100-150 booming males was estimated for the whole region. It is thought that this probably represents a lower than usual density, but with no comparable figures for other years this is uncertain.

The reedbeds of the Neusiedlersee are now apparently at their greatest extent in the 20th century, and consist of a mosaic of habitat sub-types. Natural succession appears to be occurring slowly (one study area remains healthy reedbed after 30 years without management), but it is unknown which parts of the reedbed are preferred and hence whether the Bittern is benefiting from these processes. It is known that some species such as the great reed warbler *Acrocephalus arundinaceus* have declined while others are increasing, but it is impossible to separate out the requirements of Bittern from those of other reedbed species with the current level of knowledge.

Important Concentrations: only found in Burgenland (Neusiedlersee and neighbouring smaller lakes which are Special Protection Areas under the EU Birds Directive).

- Neusiedlersee has recently been designated a National Park. Cutting and burning of reed have decreased over the last 30 years, and during this time the populations of some associated bird species have changed significantly (though trends in the Bittern population are unknown). No reedbed management appears to be necessary at present, but a two-year study of distribution and habitat selection of the Bittern and other reedbed species has recently been completed (including a sample census of Bitterns in

order to enable a total population estimate to be made).

Belgium

Full legal protection.

The population was estimated to be around 60-65 'pairs' in the late 1970s, all located in the north east of the country.

Important Concentrations: Campine.

- 16 Bittern breeding sites are IBAs, all of which are designated SPAs under the Birds Directive: 003 Polderkomplex, 005 Krekengebied, 008 Kuifend/ Blokkersdijk, 012 Zegge, 013 Ronde Put/Wateringen, 015 Leopoldsburg-Zwarte Beek, 017 Helchteren-Meeuwen, 018 Hamonterheide and adjacent sites, 019 Vijverkomplex, 020 Bokrijk, 021 De Maten, 022 Mechelse Heide/Vallei Ziepbeek, 023 Valleé de la Dyle and adjacent sites, 024 Bassin de la Haine, 025 Entre-Sambre-et-Meuse.

Denmark

Full legal protection.

The population is small but increasing (the 1993-1996 population estimate is 150-200 'pairs'), and has spread over much of the country within the last 20 years. There is no recent national census information.

After a period of expansion of breeding area and population growth at the beginning of the 20th century the Danish population suffered severe setbacks from 1930-1950, mainly caused by drainage of several important breeding localities. The population remained low (10-20 'pairs') until the beginning of the 1970s. During the years 1978-81 the population was estimated at 24-40 'pairs'. Since 1980 the Danish population of the bittern has increased rapidly and the 1993-96 population estimate is 150-200 'pairs'. The reasons for this dramatic recovery are not clear, though improved water level management at some key sites and the total protection of grey heron since 1981, thereby limiting accidental killing as a result of misidentification, are probably contributing factors.

Overlying the long-term trends are year-to-year fluctuations reflecting increased mortality during harsh winters.

Important Concentrations: Vejlerne.

- 7 Bittern breeding sites are IBAs, all of which are designated SPAs under the Birds Directive: 013 Vejlerne, 041 Vest Stadil Fjord, 049 Vadehavet, 053 Hostrup Sø, 057 Sønder Ådal, 063 Sydfynske Øhav, 097 Arresø. Booming Bittern numbers have increased at the main site (Vejlerne) from around 5 in 1978 to approximately 80 in 1995 out of a Danish total of around 150. The increase is thought to be related to mild winters and increased water levels in the reedbed. In the best area in 1995 there were 29-38 booming males in 500 hectares (around 1 male per 15 hectares). The booming season now starts in early/mid February through until the end of June. In the 1980s it did not start until late March - possibly this is the result of warmer winters or wetter reedbed conditions.

Finland

Full legal protection.

The most extensive reedbeds are in the southern third of the country, but single large reedbeds can be found up to the northern Bay of Bothnia (only rarely inland this far north). They are usually in suitable condition for Bitterns, though not managed commercially, but even the largest appear to support only 3-6 booming males. After colonisation from the south at the end of the 19th century, Bitterns increased slowly but numbers fell in the 1980s due to a series of cold winters. More recently, the population has fluctuated between 150 and 250 booming males, but has generally increased in numbers and range, probably with continuing immigration from the south, and is expected to rise to perhaps 300 in the near future. The population increase has been linked to an expansion in reedbeds due to the lack of cattle grazing on lake shores since the late 1960s.

Important Concentrations: Coastal and inland reedbeds in southern Finland.

- No special conservation measures for the Bittern, but some of the most important breeding sites (holding some tens of breeding males) have been protected as nature reserves. The number of protected sites is hoped to rise following the national IBA/Natura-2000 review in 1996-97.

- Annual monitoring of booming males, and some opportunistic ringing of young birds. 3 Bittern breeding sites are IBAs: 025 Kaupunginselkä-Stensbölefjärden, 027 Teutjärvi/Suvijärvi, 031 Siikalahti. The last has been designated an SPA.

France

Full legal protection.

The Bittern population is thought to have decreased substantially from the mid-1940s to the present day, due mainly to loss of suitable habitat. Today most breeding records are from two distinct areas, the Mediterranean coast (particularly the Camargue), and mostly inland sites in the north east. Other important localities include La Brenne, Grande Brière and the west coast around the mouth of the Loire.

The *Nouvelle Atlas des Oiseaux Nicheurs de France* gives an estimate for 1985-1989 of 300-350 booming males, but this figure must be treated with caution because of the difficulties of censusing large sites. France also has a significant wintering population of Bitterns, both local residents and immigrants from other countries, and it is thought that the Atlantic coast may be particularly important.

Important Concentrations: Camargue and the north east of France (Picardie, Loire-Atlantique, Champagne-Ardenne, Centre and Lorraine).

- Most Bittern localities are SPAs, and 26 breeding sites are IBAs: 005 Etangs de la Horre, 006 Marais de Saint-Gond, 007 Etang de Belval en Argonne, 008 Lac du Der-Chantecoq, 009 Etangs de la Somme, 010 Marais de Sacy, 011 Estuaire de la Seine, 012 La Brenne, 015 Etang de l'Arche, 025 Bresse, 026 Vallée de la Scarpe, 027 Marais de Balançon, 028 La Chaussée, 029 Lac de Madine, 030 Etang de Lindre, 042 Marais de Brière, 043 Estuaire de la Loire, 044 Lac de Grand-Lieu, 045 Baie et Marais de Bourgneuf, 059 Marais de la Baie d'Audierne, 103 La Dombes, 119 Etang de Vendres, 124 Etang de Capestang, 127 Etangs et Salins d'Aigues-Mortes, 130 Camargue, 132 Marais entre Crau et Grand Rhône.
- Important reedbed breeding localities lie within the Camargue Regional Park. The Station Biologique de la Tour du Valat has recently set up a research programme on

the structure and management of reedbeds, and in 1997 will be launching a five-year study of the distribution and abundance of vulnerable bird species occurring in Camargue reedbeds.

- There is an ACNAT, LIFE programme operating in La Brenne concerning reedbed management for Bitterns, also a number of management agreements.

Germany

Full legal protection.

In Germany, Bitterns are found mainly in the north and east of the country, while other regions have been abandoned despite retaining apparently suitable reedbed habitat. Generally extensive wetland systems are favoured, but in Bavaria the small, isolated population is confined to reed-fringed fishponds. The population as a whole has declined in recent years, and habitat loss is regarded as the main reason for the decline, but in the northern state of Schleswig Holstein it has increased and the population is now about 150 males (the highest for some decades). The total German population was estimated in 1994 to be 430-510 booming males.

Important Concentrations: Schleswig Holstein, other states in the north and east.

- 36 Bittern breeding sites are IBAs(* indicates main breeding sites with at least 5 males): **Former FRG** 009 Lebrader and adjacent sites, 010 Grosser Plöner See, 011 Warder See, 015 Strandseen und Fischteiche im Südwesten Fehmarns, 025 Sorge-Niederung, 027 *Naturpark Lauenburgische Seen, *038 Ostfriesische Meere, 046 Dümmer, 048 Steinhuder Meer, 049 Ostenholzer Moor/Meissendorfer Teiche, 051 Östlicher Barnbruch, 052 Niedersächsischer Drömling, 053 Riddagshausen-Weddeler Teichgebiet, 055 Zwillbrocker Venn/Vredener Wiesen, 086 Main-Tal bei Schweinfurt, 087 Aisch-Regnitz-Grund, 090 Charlottenhofer Weihergebiet. **Former GDR** 006 Gothensee and adjacent sites, 007 Kuhlraeder Moor/Röggeliner See, 008 Teichgebiet Lewitz, 009 Krakower Obersee, 010 *Ostufer Müritz and adjacent sites, 013 *Peenetalmoor/Anklamer Stadtbruch, 014 Galenbecker See/Putzarer See, 015 Koblenzter See/Latzig See, 016 Moränenlandschaft Temmen-Ringenwalde, 018 Untere Havelniederung

and adjacent sites, 019 Kremmener Luch, 020 Rietzer See, 023 Felchowsee, 034 Teichgebiet Niederspree.

- Of the most important sites (marked *) Peenetalmoor/Anklamer is not an SPA and Lauenburgische Seen is only partly designated.
- There is no current activity aimed specifically at the conservation of the Bittern, but local efforts are being made by statutory authorities and NGOs to protect large reedbeds and their associated wildlife that may be threatened by destruction or disturbance.
- A four-year LIFE funded project began in 1997. It is being undertaken by LBV, to purchase reed-fringed fishponds in Bavaria, which support the only population of Bitterns in southern Germany. Safeguard of this small, isolated population is important to maintain the range of the species.

Greece

Full legal protection.

Bitterns are not known to breed in Greece, though there have been records of possible breeding in recent years and it is conceivable that up to ten 'pairs' may be present. Despite destruction of reedbeds, many extensive areas of apparently suitable habitat remain unoccupied. They are regular and widespread, but not numerous, winter visitors to western and northern Greece. In times of severe weather further north, exhausted individuals turn up in remarkable numbers throughout southern Greece and many of the islands, in all kinds of habitats and sometimes in unlikely places. They are scarce but regular on spring migration (late March to early May), but less often recorded in autumn. Usually only single birds are seen on migration, but small parties may be observed at this time (the largest flock so far recorded is 13).

Important concentrations: No proved breeding, but up to ten 'pairs' may possibly exist. Widespread in winter, particularly in the west and north, and on migration. An important concentration is recorded in Divari Pilou lagoon, an IBA which is included in the national SCI list under the Habitats Directive.

Ireland

Full legal protection.

Bitterns do not breed in Ireland, and wintering records are very scarce.

Italy

Full legal protection.

The Bittern was described as a common breeder in Italy in the 19th century, but habitat loss and perhaps hunting pressure caused its disappearance from most of its former range. Apparently suitable, but unoccupied, reedbeds still occur in a number of areas - in north eastern Italy, there are large wetlands with extensive reedbeds along the Adriatic coast and the Po Delta. Elsewhere, there are individual large reedbeds in Sardinia and Apulia. However, there are few records of booming males from these regions. No national census has been carried out, so a tentative estimate of 35-65 booming males is not wholly reliable. However, the most important regions have been identified as Piedmont, Tuscany (with two reedbeds over 1500 hectares in extent) and Umbria (all in the north west and centre of the country). Here, more detailed census work has been carried out and a total of 35-53 males estimated. Recently, Bitterns have been found feeding and booming in rice fields.

Wintering Bitterns are more widespread, mainly in northern Italy. Migrating birds are seen from late February until early May, but most in March and early April.

Important Concentrations: Piedmont and Tuscany.

- 7 Bittern breeding sites are IBAs: 006 Lago di Candia, 033 Laguna di Caorle, 050 Lago and Palude di Massaciuccoli, 052 Palude di Fucecchio, 059 Palude Diaccia-Botrona, 095 wetlands of Golfo di Manfredonia, 122 Stagno di Colostrai.
- Of these, Lago di Candia, Laguna di Caorle, Palude di Fucecchio and the Stagno di Colostrai are not designated as SPAs
- A group from the Dipartimento di Scienze del Comportamento Animale e dell'Uomo in Pisa has been working on Bitterns for some years. Research is being carried out on vocalisation and winter foraging behaviour.

- The only specific conservation project in operation at present is the preparation of a management plan by the Dipartimento for the Migliarino S. Rossore Massaciuccoli Regional Park.

- Since 1991 a census of booming Bitterns in Piedmont, Tuscany and Umbria has been carried out.

- A bid for LIFE funding is currently being made concerning Lago di Montepulciano.

Luxembourg

Full legal protection.

There is no breeding Bittern population and regular winter records come from only one site.

Important concentrations: regular winter records of 1-5 birds from just one site (IBA 003-1 Remerschen/Wintrange).

Netherlands

Full legal protection.

Breeding sites for Bitterns are widely distributed throughout the Netherlands, reflecting the abundance of reedbeds of all sizes. The population fluctuates widely according to the severity of winter weather in Europe. It has been reduced to a low of 200-300 booming males, but has reached 500-700 booming males in good years (figures from the 1973-85). However, recently there has been a severe downward trend, and the long-term average breeding population has been estimated at 150-275, 60% of these within IBAs (although little population monitoring takes place). Reedbeds over 50 hectares are widespread in the Netherlands, but loss of suitable habitat is regarded as a contributory cause of the decline. During the cold winter of 1995-96, many starving Bitterns were taken into captivity and a proportion rehabilitated and released early in the spring. Recovery after cold winters is slow, suggesting that there is poor breeding success. Other problems include too intensive reed-cutting at some sites and adverse water level control.

Important Concentrations: Widespread.

- Vogelbescherming Nederland is carrying out conservation work for Bitterns, and has compiled a Marshland Habitat Action. This focuses on action for six key

('flagship') Red List wetland species, including the Bittern.

- Management takes a variety of forms, including manipulating water levels combined with grazing by greylag geese *Anser anser*, and commercial reed-cutting. Bank improvements are carried out in such a way as to produce conservation benefits.
- A number of important reedbed sites are maintained by river dynamics rather than direct management.
- The majority of Dutch Bitterns nest within IBAs, so IBA-targeted work is a priority. 26 Bittern breeding sites are IBAs (* indicates main breeding sites with at least 5 males): 002-02 Texel: Duinen, 006-00 Ameland, 008-00 Schiermonnikoog, 012-00 Lauwersmeer, 017-03 Voornes Duin, 028-01 Makkumer-en Kooiward, 028-02 Workumerwaard, 030-00 Ketelmeer, 031-00 Zwarte Meer, 032-00 Drontermeer, 033-00 Veluwemeer, 035-02 Eemmeer, 036-01 IJssel: Deventer-Ketelmeer, 037-00 *Gelderse Poort, 039-00 Waal: Ewijk-Waardenburg, 040-00 De Biesbosch, 042-00 Zuidlaardermeer/Onnerpolder, 043-00 Groote Wielen, 044-00 Oude Venen, 045-00 De Deelen, 048-00 Witte en Zwarte Brekken, 051-00 Rottige Meenthe en Oldelamer, 052-00 *De Weerribben, 053-00 De Wieden, 054-00 *Oostvaardersplassen, 057-00 Zeevang, 058-00 Wormer-en Jisperveld, 059-01 *Ilperveld e.o, 059-02 Polder Oostzaan, 060-00 *Oostelijke Vechtplassen, 061-00 Naardermeer, 063-00 Nieuwkoopse Plassen, 065-00 Zouweboezem, 073-00 Mariapeel en Deurnesepeel, 074-00 Groote Peel, 075-00 Strabrechtse Heide en Beuven, 207-00 De Hamert
- Of the most important sites (marked *), Ilperveld, Geldese Poort and Oostelijke Vechtplassen have not been designated as SPAs.

Portugal

Full legal protection.

Now only an occasional breeder, with the last confirmed breeding in 1987 at a single site (booming male, nest and 4 young seen). At a site in the Algarve, a male held territory until 1990 but no proof of breeding was obtained. Occasional observations are made during the winter and early spring, particularly in Santo André Lagoon (Alentejo) and Rio

Formosa (Algarve). The species is considered as 'Endangered' in the Portuguese Red List. There are no specific conservation projects for the Bittern, but 3 sites where Bitterns have been recorded recently are IBAs - 019 Murta Dam (where breeding was confirmed), 021 Santo André Lagoon and 025 Ria Formosa. All are designated SPAs under the EU Birds Directive.

Spain

Full legal protection.

A rare breeding species in Spain, occurring in the regions of Cataluña (Delta del Ebro, Aiguamolls de l'Empordà), Valencia (Prat de Cabanes-Torreblanca, Marjal del Moro), Balears (S'Albuferade Mallorca), Andalucía (Marismas del Guadalquivir), Castilla-La Mancha (Tablas de Daimiel, Laguna del Taray), Navarra and Aragón. There are at least 29-30 booming males, each with one or more females.

Important Concentrations: Delta del Ebro (10 males), Marismas del Guadalquivir (6 males), Aiguamolls de l'Empordà (5 males).

- The Bittern is considered as 'Endangered' in the National Catalogue of Threatened Species (Royal Decree 439/90).
- 8 Bittern breeding sites are IBAs and have been designated as SPAs: Parque Nacional de Doñana, Albufera de Mallorca, Tablas de Daimiel, Aiguamolls de l'Empordà, Delta del Ebro, Prat de Cabanes-Torreblanca, Marjal del Moro and Laguna de Pitillas.
- Recovery Plans are being prepared in Cataluña and Navarra.
- Part of a LIFE-Nature funded project in Cataluña is aimed at restoring wetlands and purchasing land to establish reserves to act as refuges for Bitterns.

Sweden

Full legal protection.

The Swedish population reached around 450 booming males in the late 1970s. It crashed by 35-40% after the hard winter of 1978-79 but is now estimated at around 400 pairs, over 90% of them located in central Sweden (between 58° and 60°N). Numbers fluctuate according to the severity of winters in western Europe, where most of the Swedish

birds winter (although a few birds remain in southern Sweden).

Important Concentrations: Central Sweden, between 58° and 60°N.

- 8 Bittern breeding sites are Ramsar sites and IBAs (002 River Klingavälsen/Lake Krankesjön, 003 River Helgeån, 013 Lake Tåkern, 014 Lake Hornborgasjön, 015 Dättern/Södra Brandfjorden, 017 Bay of Kilsviken, 018 Former Lake Kvismaren, 020 Lake Hjälstaviken). 31 Bittern breeding sites are SPAs.
- A good deal of management work is taking place at key sites, in particular at Lake Hornborga (4125 hectares) where a whole lake system, which was formerly dry reedbed, has been rehabilitated over the last five years by a government scheme which raised the water level by 0.85 metres. Around 90% of the site is now open water, with fringing reed and other vegetation, and the Bittern population has increased from 1-2 booming males before restoration to about 10 after the restoration.

United Kingdom

Full legal protection.

Bitterns returned to breed in eastern England in 1911, following extinction in the late 19th century. The population and range increased so that by 1954 there were an estimated 78-83 booming males within seven counties. The population had declined to 15-17 booming males by 1994, with a slight recovery in 1995-96 to around 20 booming males, but in 1997 there were only 12 males following a severe winter in 1996-97. All but one of the breeding sites are to be found in a restricted coastal area of eastern England, but there is an outlying population (3 males in 1997) at a coastal nature reserve in north west England. Between 30 and 100 birds are recorded in most winters, depending on its severity, which influences the size of the influx of birds from the continent.

Important concentrations: Coast of East Anglia.

- 5 Bittern breeding sites are IBAs: 137 Leighton Moss, 165 North Norfolk Coast, 166 Upper Thurne Broads and Marshes, 167 Ant Broads and Marshes, 171 Minsmere/Walberswick.

- The Bittern is regarded as a high priority species in the UK, and is the subject of considerable conservation effort by statutory authorities and NGOs. Almost all of the tiny population is to be found on reedbed reserves managed by voluntary and government conservation organisations. Intensive work on the species has been carried out by the RSPB over a number of years.
- Management is targeted on maintaining the quality of existing breeding localities, rehabilitating former or potential breeding sites, and creating totally new reedbeds on former arable land. Additional funding is being provided by a government (English Nature) Species Recovery Programme. A LIFE funded project is currently being undertaken by NGOs and statutory authorities at 12 sites across the country. These currently hold breeding Bitterns or are considered to be capable of supporting the species following suitable habitat management.

3. Aims and Objectives

Aims

In the short term, to maintain population distribution in EU countries where the Bittern population is currently stable, and to halt declines where population size and distribution are currently diminishing.

(It must be recognised that populations will fluctuate according to severe winter weather - this objective therefore relates to mean or weather-corrected figures).

By the year 2000 to place the Bittern's range on an upward trend across the EU, and enhance numbers in countries with small, fragmented or isolated populations at risk of extinction.

NB: A long-term aim relating to population size cannot be formulated at present, because no reliable population estimates are available for countries which have large reedbeds holding substantial numbers of Bitterns. During the first three years of this plan, it will be essential to develop standard methodology for censusing Bitterns at large sites, and to use this to

produce an overall population estimate across the EU and establish effective monitoring. At the first revision of this plan, the population estimate can then be used to formulate a long-term objective.

Objectives

Broad Policies

To ensure the protection and integrity of existing natural or semi-natural large reedbeds, including existing Bittern breeding sites.

To ensure the protection and appropriate management of existing 'artificial' Bittern breeding sites and other large reedbeds to fulfil their potential for Bittern.

For EU countries with small, fragmented populations, to encourage the creation of substantial new areas of suitable reedbed habitat for Bitterns in existing, former and new breeding areas, in order to enable the consolidation and spread of their populations.

3.1. Policy and legislation

3.1.1. Ensure that the water authorities in each country take reedbeds into account when planning their capital or maintenance works

In past years major river engineering and drainage schemes were aimed at preventing flooding of agricultural and urban land, or to allow more intensive agricultural use of floodplains. In these circumstances, natural wetlands including reedbeds were not considered to be of importance and were often ignored when devising plans of work. In recent years the situation has changed to some extent, and sites of high wildlife interest are often taken into consideration through mechanisms such as environmental impact assessments, but it remains the case that land of high direct economic value will be more highly regarded than 'unproductive' land of little or no economic value.

If Bitterns and other wetland species are to be sufficiently well protected, water management agencies throughout the EU must be persuaded to give full consideration to reedbeds and other wetland habitats when planning their programmes of work in rural

areas. Positive water management is a crucial element of this, particularly for protected and designated sites, to ensure that these habitats retain or increase their wildlife interest. In the face of an increasing incidence of drought, combined with an ever-increasing demand for water, water conservation measures should be urgently promoted through mechanisms such as catchment management plans.

Priority : high
Timescale: ongoing

3.1.2. Investigate the extent to which EU external funds are being used to destroy wetlands in Eastern Europe

As mentioned elsewhere in this plan, Eastern Europe still has extensive reedbeds and other wetlands, which hold large numbers of Bitterns. It appears that the destruction which has taken place in EU countries is now being repeated in eastern Europe, using EU funds. Whilst it is understandable that the people of eastern Europe wish to see their living standards raised through the opening up of their land to more intensive agriculture, it is vital that mechanisms for safeguarding the most important wildlife sites are put in place (such as application of the Ramsar Convention and environmental impact assessment of any proposed large-scale development programmes).

Priority : high
Timescale: short

3.1.3. Identify and designate the most important areas for Bitterns, and undertake sample counts to investigate trends in numbers

The current lack of knowledge of Bittern numbers and distribution means that further IBA survey work in countries with substantial populations should be encouraged. Although some wetland inventories already exist (such as for the Black Sea and other parts of the former CIS), this will help to identify the most important areas for priority birds, including the Bittern, and determine sites for targeting as strictly protected reserves, particularly in central and eastern Europe. Within the EU, designation and management of key sites for Bittern as SPAs under the Birds Directive is a priority. At the same time, sample counts of Bitterns should be made. These will help in the process of designation and also give baseline data on trends in numbers.

Priority : high
Timescale: short/medium

3.1.4. *On former wetland sites, promote the use of surplus agricultural land being put into permanent setaside as reedbeds (but avoiding areas of other conservation value)*

Across the EU, much of the lowland land surface has been converted to agricultural land use, even where severe constraints such as high water tables exist. In recent years, this has led to large-scale over-production of arable crops, to the extent that the European Union has agreed limitations on crop production. Set-aside schemes currently reduce the area of land producing crops in any one year, but cannot guarantee to operate in the future. However, there are now proposals for permanently removing large areas of land from agriculture. For example, in Bavaria alone some 800,000 hectares of land are to be taken out of agriculture on a permanent basis, and there are schemes for wetland rehabilitation in Denmark and in the Rhine floodplain.

Such proposals clearly have the potential to be of great value for wildlife if appropriate alternative management of the land can be agreed, and the area of wetlands in the EU could be increased enormously in areas where the water table is naturally near the soil surface. In the context of this plan, there is the opportunity to promote the use of surplus agricultural land as reedbeds in wet situations, although care should be taken not to establish reedbeds in sites that already support habitats of high conservation value. Priority should be given to agricultural land adjacent to existing wetlands and fishponds, particularly in areas from which Bitterns have been recently lost.

Priority : medium
Timescale: short/medium

3.1.5. *Ensure that the relevant legislation in each EU country is appropriate for the conservation of reedbeds and Bitterns and is applied where necessary to protect Bittern populations*

The Bittern is protected throughout the EU, but at present reedbeds are not regarded as a habitat type of Community interest (they are not listed in the EU Habitats Directive, for example). However, it may be that in some individual EU countries a greater level of

protection may need to be introduced. It will be necessary for the situation to be kept under review in each country and representations made to the governments of member states when appropriate. It should be noted that a number of recent EU initiatives could provide support for reedbeds (such as Communication on the Wise Use of Wetlands, Coastal Zone Management Demonstration Programme, Water Policy framework directive). In addition, a number of mechanisms already exist to co-ordinate land-use planning (such as Strategic Environmental Assessment, Catchment Management Plans and Coastal Zone Management Plans). These must be applied at an administrative level to ensure that Bitterns are taken into account during the planning process.

Priority : medium
Timescale: ongoing

3.1.6. *Ensure the production and implementation of National Recovery Plans for Bitterns in all EU member states in which the species occurs*

The overall EU status of the Bittern is of concern, and while action by non-governmental organisations can achieve a great deal, national governments should express a commitment to maintaining stable Bittern populations or increasing declining populations by adopting national action plans based on this document.

Priority: medium
Timescale: medium

3.1.7. *Protected areas policy*

Protected areas policies and regulation should promote the conservation management of all Important Bird Areas where the Bittern breeds, migrate and winter. Since Bitterns are restricted to specific habitats (reed beds) and a limited number of sites, the protection of IBAs is a useful tool towards an effective protection of the species.

Countries that have embarked on the process of accession to the European Union (very important for Bittern: Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia) should consider what opportunities exist to use the approximation process and any associated funding support to establish and manage a network of protected areas.

Priority: high
Time-scale: medium

3.2. Species and habitat protection

3.2.1. Ensure the long-term continuation of natural processes at large reedbeds suitable for Bitterns that are not intensively managed

Naturally-occurring reedbeds occur in many parts of Europe, and may be very large in extent. These sites are likely to be more valuable in conservation terms than managed sites - they often contain a greater range of characteristic species in a diverse habitat mosaic, and they do not require large management resources to maintain their interest. It should therefore be a high priority, wherever possible, to maintain the long-term integrity and natural processes of such sites that do, or might, support Bitterns. This will require sensitive long-term strategic planning for water resources.

Priority : high, essential
Timescale: ongoing

3.2.2. Ensure the appropriate management of other reedbeds holding Bitterns, either by 'conservation management' specifically for reedbed birds or by commercial enterprises

Although the sites described in Action 2.1 above are likely to be the most important in wildlife terms, it must be accepted that in lowland parts of the EU reedbeds will in most cases only be maintained into the future by some form of management. Traditionally, reedbeds have been used for a variety of purposes, such as cutting for roofing thatch and livestock bedding or, with associated open water, fish culture. Management techniques such as digging out of ditches or burning have prevented the processes of natural succession from taking place. There is no reason why traditional management should not continue to maintain important reedbeds for Bitterns and other species. Indeed this may be the only way in which essential management can be financed, although, in some circumstances it may be necessary to introduce some form of subsidy to maintain traditional enterprises such as fish culture.

However, commercial management does carry risks. If the enterprise collapses then management will cease. Conversely,

intensification of previously traditional practices may compromise the wildlife interest of the site, for example by removing too much standing reed in one year or digging deep ponds with steep sides which do not provide suitable feeding areas for wetland birds. Management for conservation overcomes these potential problems, even though it is a costly exercise unless some financial return can be achieved, for example through sale of reed. It does, though, enable a management plan to be devised and implemented which is closely targeted towards conservation aims and does not insist on a commercial return on the investment. For the most important managed sites, therefore, conservation management should be considered as a worthwhile option.

Priority : critical
Timescale: ongoing

3.2.3. Ensure that intensively managed reedbed sites which could, or do, support Bitterns are protected from harmful influences (development, recreation, other disturbance etc)

Reedbeds requiring active management tend to be small or fragmented sites within agricultural landscapes. They are vulnerable, because of their small size, to a variety of outside influences that can destroy or greatly diminish their interest. Among these influences are the following:

- changes in hydrology from intensification of agriculture, river management and so on. Over-abstraction of water for irrigation is a potential major threat to reedbeds in the EU
- mineral extraction on or adjacent to the site
- increasing recreation (both watersports and quiet pastimes such as angling and birdwatching)
- uncontrolled burning

The long-term future of these sites will depend on more focused management of water resources (both quantity and quality) in catchment areas, including strategic planning for conservation and demand management.

Priority : high
Timescale: ongoing

3.2.4. *Promote the acquisition and management of land, by the relevant statutory agencies, as reedbeds for a variety of purposes such as water purification, flood storage and so on*

Although many reedbeds have been destroyed through river engineering and other floodplain modifications, in some circumstances new reedbeds can be deliberately established. There is now an opportunity, such as through catchment management planning and coastal zone management, to improve the status and extent of this habitat. For example, reedbeds are being increasingly used for water purification instead of, or in combination with, more conventional forms of sewage treatment. Also, modifications to hydrological systems have led to damaging floods and water control agencies are being forced to set up flood storage reservoirs in river valleys to contain excess floodwater at critical periods. Developments such as these can provide valuable reedbed habitat, and should be promoted to appropriate agencies when circumstances permit.

Priority : medium
Timescale: ongoing

3.2.5. *In all countries with Bittern populations, ensure that the main breeding and wintering localities are given statutory protection*

Until recent years, Bittern populations within the core areas of their range had not been regarded as conservation priorities. Even now, substantial areas of natural reedbeds remain, and Bitterns are considered by many people not to be under threat. However, wherever they occur reedbed systems are vulnerable to damage or destruction, and if Bittern populations and range are to be maintained permanently then the main breeding and wintering localities must be safeguarded. All sites holding significant populations of Bitterns should be designated as Special Protection Areas under the Birds Directive. This can then be followed up, if necessary, by formulating programmes of positive management, which may be used to attract substantial funding from EU sources such as the LIFE regulation.

Priority : high
Timescale: ongoing

3.2.6. *In countries with small Bittern populations and fragmented remnant reedbeds, promote the acquisition of existing reedbeds in appropriate areas in order to safeguard, and permit the spread of, Bitterns*

In the UK and some other countries, all of the substantial wetland systems which once existed have been largely destroyed. Those fragments which remain are vulnerable to outside influences and rapid natural succession, so in order to safeguard Bitterns and their habitats direct intervention by conservation organisations will be necessary in some cases. The only means of ensuring long-term or permanent protection and positive management is through the purchase or lease of land by an appropriate government agency or voluntary conservation organisation.

In exceptional circumstances, it may also be necessary to acquire land of low existing conservation value in order to create a completely new reedbed, but this should be given lower priority than the continued management of existing reedbeds.

Priority : high
Timescale: ongoing

3.2.7. *Consider the possible harmful effects of power lines on Bitterns, and if large numbers of casualties are discovered under particular stretches, install effective markers*

Power lines have been responsible for the deaths of many large birds of a variety of species, perhaps particularly those dependent on wetlands. It has been suggested that Bitterns may be vulnerable, and individual cases of several Bitterns being found dead under a short length of power line have been recorded.

It seems likely that such incidents are uncommon, and that this type of mortality is not significant. However, if any particular stretches of power line are identified as causing multiple deaths of Bitterns, steps should be taken locally to persuade the relevant agency to put them underground or, at the very least, to provide clear markers on the cables to make them more conspicuous.

Priority : low
Timescale: ongoing

3.2.8. *Investigate the European trade in reed for thatching*

The import and export of reed between countries in Europe, both within and outside the EU, is clearly dictating the management of large areas of Bittern habitat. Changes in management prompted by prescriptions within this plan may have adverse effects on Bitterns elsewhere (for example, increasing the extent of commercially-managed reed within the EU could reduce the demand for reed in Poland and lead to a decrease in active management there).

Priority : medium
Timescale: short

3.2.9. *Promote the conservation of reedbeds and Bitterns in eastern Europe through liaison with statutory conservation and other authorities and NGOs*

Many EU countries have lost wetland systems on a large scale, and Bittern populations are in decline in most of these. By contrast, in parts of eastern Europe wetlands are much more widespread and populations are reasonably healthy. Under these circumstances, it is possible that EU Bittern populations are augmented by immigration from the east. Further, it is likely that within a few years a number of these countries will join the EU, so for both reasons it is in the long-term interest of EU conservation to safeguard the wildlife-rich habitats of countries such as Poland. Large sums of money will be spent in modernising and intensifying agriculture, leading to the destruction of many areas that are currently of great wildlife interest. Wetlands will be particularly at risk, so efforts should be made to assess the relative value of key sites and to ensure the permanent protection of the best examples. A start is being made through IBA inventories, but this does not, in itself, give protection to any site. In general the relevant authorities and NGOs in central and eastern Europe have limited influence and financial backing. It is therefore essential that the EU, its constituent governments and NGOs assist in building the capacity of their eastern European counterparts to ensure that they can follow up the identification of important sites with realistic measures for long-term safeguard.

Countries that have embarked on the process of accession to the European Union should consider what opportunities exist to

use the approximation process and any associated funding support to establish and manage a network of protected areas.

Priority : high, essential
Timescale: ongoing

3.2.10. *Investigate the situation regarding Bitterns wintering in the Mediterranean (non-EU countries in Europe and north Africa). Gather information on wetland sites and promote their protection*

Many of the breeding Bitterns in the EU migrate south for the winter, and although the main wintering areas are largely unknown, it is likely that non-EU countries in south-east Europe and north Africa are involved. In conjunction with the proposed survey of breeding Bitterns outlined in Actions 3.1 and 3.2 below, there is a need for information to be gathered on the numbers and distribution of wintering birds outside the EU. Since there are severe threats to wetlands in most countries, any key sites which are identified may need protection.

Priority : medium
Timescale: ongoing

3.3. Monitoring and research

3.3.1. *Develop a standard method for censusing Bitterns at large sites, within 3 years*

At present, the only reliable method for censusing Bitterns in the breeding season is to identify booming males, which are territorial and site faithful during the breeding season. Analysis of sound recordings allows individual males to be distinguished, and this method has allowed a very accurate annual estimate of the UK population to be made in recent years.

Unfortunately, this census method is only possible for small or fragmented sites, where calling males can be pinpointed to within a very small area. For substantial reedbeds, which hold large numbers of Bitterns, this technique is unworkable. In an attempt to address this problem, at the Neusiedlersee (Austria), a trial census was carried out in 1994 in a sample area of the reedbed of around 23km². Calling Bitterns were located from three points simultaneously and mapped, giving an estimated total of 18 males. By extrapolation, it is thought that

there are around 100 booming males in the whole reedbed (which is some 103km² in extent and up to 5km broad). In a similar attempt at census work at a site of some 150 hectares in Italy, five people were required and the result was no more than an estimate of 7-9 males.

If conservation action for Bitterns is to be planned in a co-ordinated way across the EU and elsewhere in Europe, it would be extremely valuable to know the size and distribution of the population. It is therefore proposed that a concerted effort is made, by interested parties in countries with substantial Bittern populations, to develop a reliable census method at large reedbeds (over 500 hectares). A timescale of three years is set for this action (1997-99), since much of our longer-term work needs to be targeted at the most important localities.

Priority : high, essential
Timescale: short

3.3.2. *Use this methodology to carry out a full census of Bitterns across the EU and the rest of Europe, and decide on frequency of repeat surveys*

Once Action 3.1 has been completed, the next step will be to use this census methodology to conduct a Europe-wide survey in the year 2000, which will serve as the baseline for future estimates and for identifying trends in population. (It must be recognised that since the Bittern fluctuates in numbers according to the severity of winter weather, the population in 2000 may be substantially above or below the long-term mean figure). The greatest effort should be concentrated in EU countries with large reedbeds (Austria, Finland, France, Germany, Netherlands, Sweden), and on European non-EU countries with large Bittern populations (Belarus, Hungary, Poland, Romania, Russia, Ukraine). At the same time, agreement should be reached on the frequency of repeat surveys. Ideally these would be at intervals of, say, three or five years, but the resources required may be beyond what is available, so a realistic target will need to be set. It may be that, particularly in those countries with the greatest extent of reedbeds, accurate surveys of sample sites rather than a full census may be all that is achievable. This would allow trends to be assessed and full estimates to be made.

Priority : high, essential
Timescale: short, then ongoing

3.3.3. *Carry out annual monitoring at selected sites in order to identify population trends, particularly in relation to severe winter weather*

Many reedbeds across the EU are protected by nature conservation organisations that have associated wardening and/or research staff. At a selection of these sites, it is proposed that Bittern censuses should be carried out annually, particularly in localities which are most often subject to severe winter weather (northern and central Europe). This will enable the effects of winter weather on populations to be assessed more systematically than is possible at present. Ideally, this annual monitoring should be linked with studies of the migrations of Bitterns, to clarify the processes operating during the non-breeding season.

Priority : high
Timescale: ongoing

3.3.4. *Set up research projects in contrasting core areas for Bitterns to study their ecology, behaviour, breeding biology, management for food supplies etc*

There is an increasing interest in Bitterns in Europe, although the few research programmes which are complete or in progress tend to be in countries with small and fragmented populations, where they are regarded as species of high conservation importance (such as the UK and Italy). There is now a need to set up research projects in core areas for the Bittern, in order to study the species in more optimum habitat. It is proposed that study sites should include reedbeds both around fishponds or lakes and in unregulated river valleys, and the work should include the mapping of habitat features in sites both occupied and unoccupied by Bitterns. Because of the work already in progress in certain areas, it is suggested that research should be concentrated at the following three study areas:

Neusiedlersee (Austria) - a National Park, preliminary studies under way

Camargue (France) - a National Park and already being studied in detail by research workers from the Station Biologique de la Tour du Valat

Milic (Poland) - an area of fishponds, with a university field station.

Priority : high, essential
Timescale: ongoing

3.3.5. *Take advantage of opportunities to study other little-known aspects of the Bittern*

Because of its highly secretive behaviour and inaccessible habitat, our knowledge of the Bittern is still rudimentary compared with many other species. The research project outlined in 3.4 above will increase our understanding of some of the fundamental aspects of Bittern ecology, but cannot hope to answer all of the basic questions. In particular, we need to know more about the following:

- requirements of female Bitterns (which are almost impossible to study in detail)
- the process of colonisation of sites, metapopulation dynamics
- site fidelity of males and females
- productivity

These are just some of the subject areas about which information is lacking, and any data would add to our overall knowledge of the species.

Priority : high
Timescale: ongoing

3.3.6. *Maintain a database on European ringing recoveries of Bitterns, to try to establish the importance of various mortality factors and movements of different populations*

Because so little appears to be known about Bitterns, it is important that complete data on ringing recoveries which has been gathered from around the EU and elsewhere in Europe is held on one database. Analysis of these ringing recoveries is essential, and it may be necessary to review the benefits of ringing Bitterns, in order to give guidance on setting up new ringing studies. The possibility of tracking Bitterns by satellite, in order to link breeding and wintering areas, is an exciting prospect and one which should be explored.

Priority : high
Timescale: short, then ongoing

3.3.7. *Use rehabilitated winter casualties to investigate the ecology, behaviour and movements of these birds by the use of rings and/or radio tags*

The opportunistic use of rehabilitated Bitterns by attaching rings or radio-tags is attractive because it is much easier and less intrusive than capturing birds in the wild. The numbers of Bitterns brought into bird hospitals can be surprisingly large (for example, during the 1995-96 winter 45-50 were brought into the 150 bird hospitals in the Netherlands, and at least 20 of these were subsequently released into the wild). The results may not be identical to what would be achieved using 'normal' Bitterns, but it has already been found that a good proportion of winter casualties can, when nursed back to health and released in a suitable locality, survive and behave apparently normally.

Priority : medium
Timescale: ongoing

3.3.8. *Use rehabilitated winter casualties to assess the sex ratios of Bitterns in different wintering areas*

It appears from winter casualties in the UK that the sex ratio is heavily biased towards males. Although the sample size is small, this may indicate that the two sexes have separate wintering areas, and it would be valuable to collate data from winter casualties in other countries in order to investigate this possibility further.

Priority : medium
Timescale: ongoing

3.3.9. *Promote the establishment of a Bittern study group with regular newsletters*

The recent workshop on Bitterns, which was held in order to discuss the content of this plan, brought together individuals from a number of European countries with an interest in and involvement with Bitterns. The exchange of knowledge and requests for information was a positive and stimulating exercise, and led to the suggestion that a study group should be established to provide a forum for the sharing of information. The details of such a study group (including its composition, organisation, form of newsletters and so on) have not yet been debated, but it is proposed that interested

parties should discuss the issue and put forward an outline for wider comment.

Priority : medium
Timescale: short

3.4. Public awareness and training

3.4.1. Produce an advisory leaflet in each country supporting Bitterns, promoting reedbed conservation and targeting a range of reedbed species

Many important reedbeds are in private hands, and although they may not be under direct threat they could often be improved considerably for wildlife through enhanced management. There is therefore a need for printed material to be produced and distributed to the owners of reedbeds, explaining their conservation importance for a range of species, not just the Bittern, and offering suggestions for improvement (such as limiting disturbance, maintenance of water levels, periodic cutting and so on).

A number of agencies, particularly the water authorities, can have a large influence on reedbeds for good or bad. These wetland habitats can easily be destroyed by inappropriate river channelling, dredging and so on, but can also be created or enlarged during major engineering works. Advisory material should therefore be promoted to the relevant water agencies, and wherever possible in conjunction with direct local contact over individual sites.

Priority : medium
Timescale: short

3.4.2. At major Bittern sites which are reserves with visitor facilities, develop educational programmes to raise awareness of the conservation importance of, and problems facing, reedbeds and their associated wildlife, especially Bitterns

Wetland reserves often contain spectacular birds which can be seen at fairly close quarters on standing water (flamingos *Phoenicopterus spp*, swans *Cygnus spp* and so on), so visitors to such sites may be expected to gain an immediate appreciation of species which are highly visible. Information about these species can be put over fairly simply by the managers of visitor facilities.

It is much more difficult for visitors to gain an appreciation of reedbed habitats and associated species, like the Bittern, which they are very unlikely to see in the wild. However, if these specialised species are to be more highly regarded in the future, organisations and individuals involved in education and interpretation programmes on reserves should make it a priority to target reedbeds when developing new subject areas.

Priority : low overall, high at specific sites
Timescale: ongoing

3.4.3 Where circumstances require it, develop public awareness programmes to limit disturbance of reedbeds through uncontrolled access, increasing recreational activities and so on

Disturbance to reedbeds from recreation is increasing in many areas - physical destruction of vegetation and accidental disturbance to wildlife can both cause damage to important sites. Some sites are well protected by physical barriers to entry or wardening staff able to patrol them, but at unprotected sites in areas with high recreational pressure, efforts should be made to increase public awareness of the problem.

Priority : high at individual sites
Timescale: ongoing

3.4.4. In countries where wildfowling is a popular pursuit, promote the value to wildfowl of reedbed management in wetland areas

In some parts of Europe, the shooting of waterfowl is a popular sport and an important part of rural life. In these areas, wetlands are appreciated as wildfowl habitat but there is little knowledge of the habitat requirements of non-quarry species. It would be of benefit in these areas to raise the profile of reedbeds as wildlife habitats and increase awareness among the local communities of the value of sympathetic management both for protected and quarry species.

Priority : low
Timescale: ongoing

4. References

Austria

Dvorak M, Ranner A and Berg H M, 1993. Atlas der Brutvögel Österreichs. Ergebnisse der Brutvogelkartierung 1981-1985.

Dick G, Dvorak M, Grüll A, Kohler B and Rauer G, 1994. Vogelparadies mit Zukunft? Ramsar- Gebiet Neusiedlersee-Seewinkel. Umweltbundesamt.

Denmark

Hermansen P, 1972. Rordrømmens yngletid, aegantal og forekomst i Danmark. *Dansk Orn. Foren. Tidsskr.* 66: 57-63.

Finland

Hyttiä K *et al*, 1983. Suomen Lintuatlas: 24-25.

Lammi E, 1977. Päijät-Hämeen Linnut.

France

Duhautois L, 1983. Hérons paludicoles. SNPN, Paris.

Duhautois L, 1984. Hérons pourprés et Butors: le déclin. *Le courrier de la Nature* 92: 21-29.

Fauvel B, 1992. Les oiseaux de Champagne-Ardenne. LPO Champagne-Ardenne.

Kérautret L, 1969. Notes sur le comportement diurne du Butoir étoilé. *L'Oiseau et la Revue Française d'Ornithologie* 39: 176-178.

Loison M, 1991. Comportement alimentaire d'un Grand Butor. *Aves* 28(1): 39.

Recorbet B, 1992. Les oiseaux de Loire-Atlantique. Groupe Ornithologique de Loire-Atlantique.

Sermet E, 1980. Observation sur la pêche du Grand Butor. *Nos Oiseaux* 35(5): 242-243.

Germany

Bauer H G and Berthold P, 1996. Die Vögel Mitteleuropas, Bestandsentwicklung und Gefährdungsursachen. AULA-Verlag Wiesbaden (*in prep*).

Bauer K M and Glutz von Blotzheim U N, 1966. Handbuch der Vögel Mitteleuropas. Band I. Akademische Verlagsgesellschaft.

Bezzel E, 1985. Kompendium der Vögel Mitteleuropas: Nonpasseriformes. AULA-Verlag Wiesbaden.

Gauckler V A and Kraus M, 1965. Die grosse Rohrdommel als Brutvogel und Durchzügler in Nordbayern. *Anzeiger der ornithol. Gesellschaft* 7: 273-282.

Gauckler V A and Kraus M, 1965. Zur Brutbiologie der Grossen Rohrdommel (*Botaurus stellaris*) Die Vogelwelt 86:129-145.

Gentz K, 1965. Die Grosse Rohrdommel. Die neue Brehm-Bücherei. A Ziemsen, Verlag, Wittenberg.

Glätzer G and Theiss N, 1986. Die Rohrdommel brütet 1986 erstmals am Grossen Nassanger Weiher/Trieb. *Anzeiger der ornithol. Gesellschaft* 25: 238-239.

Leibl F, 1993. Zum derzeitigen Auftreten der Grossen Rohrdommel in der Oberpfalz. *Acta Albertina Ratisbonensia, Band* 49: 67-70.

Madlow W and Sermisch M 1987. Beobachtungen an zwei überwinternden Rohrdommeln in Berlin (West). *Ornithologische Mitt.* 39(3): 67-69.

Zink G, 1958. Vom Zug der Grossen Rohrdommel nach den Ringfunden. *Die Vogelwarte* 19: 243-247.

Italy

Alessandria G, Della Toffola M and Carpegna F, 1992. Nuovo sito di riproduzione di Tarabuzo *Botaurus stellaris*, e di Airone rosso *Ardea purpurea*, in Piemonte. *Riv. Piem. St. Naty.* 13: 97 -102

Bordignon L, 1990. Conferma della nidificazione di Tarabuso in Piemonte. *Avocetta* 14: 73-74.

Brichetti P, 1983. Distribuzione geografica degli uccelli nidificanti in Italia, Corsica e Isole Maltesi. 3

Famiglie Phoenicopteridae, Ardeidae (generi *Botaurus*, *Ixobrychus*). *Natura Bresciana. Ann. Mus. civ. Sc.Nat. Brescia* 20: 197-234.

Brichetti P, 1992. Tarabuso. In P Brichetti, P De Franceschi and N Baccetti (Eds): *Fauna d'Italia - XXIX, Aves I*. Ed, Calderini, Bologna: 130-137.

Fontanelli A, Perfetti L, Puglisi L and Taverni M, 1995. Attività di canto in una popolazione di Tarabuso della Toscana. In M Pandolfi e U F Foschi (Eds): *Atti VII Convegno Nazionale di Ornitologia Ric. Biol. Selvaggina, Suppl. XXII*: 631-633.

Musetti C and Voleri A, 1991. Censimento del Tarabuso nella zone umide della Versilia. *Picus* 17(3): 135-136.

Puglisi L and Cima O, 1995. Attuale consistenza della popolazione di Tarabuso nella palude di Massaciuccoli. *Avocetta* 19: 154.

Puglisi L, Cima O and Baldaccini N E, 1994. Foraging behaviour in Bittern: resources are shared or divided? *Boll. Zool. Suppl.* 61: 42.

Puglisi L, Cima O and Baldaccini N E, 1995. Pattern stagionale di canto nel Tarabuso. *Avocetta* 19: 61.

Puglisi L, Cima O and Baldaccini N E, 1995. Ricerche sulla biologia del Tarabuso nella Toscana marittima: quali input per la sua conservazione? In M Lambertini e F Casale (Eds): *La conservazione degli uccelli in Italia. Boll. Mus. St. Nat. Lunigiana* 9: 69-74.

Puglisi L, Cima O and Baldaccini N E, *in press*. A study of the seasonal booming activity in the Bittern: what is the biological significance of the booms? *Ibis*.

Puglisi L, Fontanelli A, Perfetti A and Taverni M, 1995. The population of Bittern in the Diaccia Botrona marsh (Central Italy): four years of census (1991-94). *Avocetta* 19: *in press*.

Romè A, 1982. Il Tarabuso in Toscana. In *Atti. I Conv. It. Orn.*: 177-180.

Netherlands

Bosch G, 1969. De Roerdomp in Friesland. *Vanellus* 22: 143.

Braaksma S, 1958. Aanvullende gegevens over de stand van de Roerdomp, als broedvogel in Nederland. *Ardea* 46: 158-166.

Braaksma S and Mörzer Bruyns M F, 1954. De stand van de Roerdomp *Botaurus stellaris* in Nederland tot 1953. *Ardea* 42: 151-162.

Kwak R, 1989. Kwalitatieve beschrijving van de ontwikkeling van de broedvogelstand van onze moerasvogels in de periode 1978-1988. *Report, SOVON, Beek. de Rijk J*, 1987.

Roerdompen in Nederland van 1500-1800. *Vogeljaar* 35: 338-339. den Boer T, 1992. De roerdomp-wintermaatregelen en bescherming. Actie Rapport Vogelbescherming 5. *Report Vogelbescherming Nederland, Zeist*.

Osiek E R and Hustings F, 1994. Red data and important birds in the Netherlands. *Technical Report* 12: 42-43, *Vogelbescherming Nederland*.

Portielje A F J, 1926. Zur Ethologie bezw. Psychologie von *Botaurus stellaris*. *Ardea* 15: 1-15.

Van den Tempel R and Osiek E R, 1994. Areas Important for Birds in the Netherlands. *Technical Report 13E, Vogelbescherming Nederland*.

Van der Hut R M G, 1995. Roerdompen in Noord-Holland: aantalsontwikkeling 1950-1955. *Graspieper* 15: 83-91.

Woets D, 1990. Roerdompen in de Noordwesthoek. Over het voorkomen van de soort als broedvogel in Weerribben en Wieden. *Noordwesthoek* 17.2: 13-18.

Portugal

Carlson A, Carlson L and Smith, 1990. *Noticiário Ornitológico. Airo* 2.

Rufino (coord.) 1989. Atlas das aves que nidificam em Portugal Continental. CEMPA, SNPRCN, Lisboa.

Vowles G A and Vowles R S, 1994. Breeding Birds of the Algarve. Centro de Estudos Ornitológicos do Algarve.

Spain

Blanco J C and González J L, 1992. Libro Rojo de los Vertebrados de España. *Collección Técnica*. ICONA.

Gonzales L M, Gonzales J L and De La Cuesta L, 1984. Sobre la alimentación del Avetoro Comùn en España. *Doñana, Acta Vertebrata* 11(1): 140-141.

United Kingdom

Batten L A, Bibby C J, Clement P, Elliott G D and Porter R F, 1990. Red Data Birds in Britain. T & A D Poyser, London.

Bibby C J, 1981. Wintering Bitterns in Britain. *Brit. Birds* 74:1-10.

Bibby C J and Lunn J, 1982. Conservation of reedbeds and their avifauna in England and Wales. *Biological Conservation* 23:167-186.

Bibby C J, Robinson P J and Bland, E, 1990. The impact of egg collecting on scarce breeding birds. *RSPB Conserv. Rev.* 4:22-25.

Burgess N D and Evans C E, 1989. The management of reedbeds for birds. A management case study. RSPB, Sandy.

Cramp S and Simmons K E L (Eds), 1977. The birds of the Western Palearctic, Volume 1. Oxford University Press, Oxford.

Day J C U and Wilson J, 1978. Breeding Bitterns in Britain. *Brit. Birds* 71: 285-300.

Day J C U 1981. Status of Bitterns in Europe since 1976. *Brit. Birds* 74: 10-16.

Gilbert G, McGregor P K and Tyler G, 1994. Vocal individuality as a census tool: practical considerations illustrated by a study of two rare species. *Journal of Field Ornithology* 65(3): 335-348.

McGregor P K and Byle P, 1992. Individually distinctive Bittern booms: potential as a census tool. *Bioacoustics* 4: 93-109.

Hawke C and José P, 1996. Reed bed management for commercial and wildlife interests. RSPB.

Hutchinson C D, 1989. Birds in Ireland. T & A D Poyser, Calton.

Newton I, Wyllie I and Asher A, 1994. Pollutants in Great Bitterns. *British Birds* 87: 22-25.

Smith K W and Tyler G A, 1993. Trends in the numbers of breeding Bitterns in the UK. In *Britain's Birds in 1990-91: the conservation and monitoring review*. JNCC.

Spencer R and the Rare Breeding Birds Panel, 1989. Rare breeding birds in the United Kingdom in 1987. *Brit. Birds* 82:477-504.

Stroud D A, Mudge G P and Pienkowski M W, 1990. Protecting internationally important bird sites. NCC, Peterborough.

Tyler G A *in prep*. The relationship between the numbers of breeding Bitterns *Botaurus stellaris* in UK reedbeds and measures of the habitat.

Tyler G A, Smith K W and Burges D J 1998. Reedbed management and breeding bitterns *Botaurus stellaris* in the UK. *Biological Conservation*, 86, 257-266.

Former USSR

Dement'ev G P and Gladkov N A, 1951. Birds of the Soviet Union, Vol 2.

Pchelintzev V G, 1990. On the feeding of the Bittern. *Tr. Zool. Inst. Akad. Nauk SSSR* 213:91-93.

5. ANNEX

Recommended Conservation Actions by Country

Austria

- 1.1 Ensure that the water authorities take reedbeds into account when planning their capital or maintenance works.
- 1.4 On former wetland sites, promote the use of surplus agricultural land being put into permanent setaside as reedbeds (but avoiding areas of other conservation value).
- 1.6 Ensure the production and implementation of a National Recovery Plan for Bitterns.
- 1.7 Promote the designation, protection and appropriate management of IBAs with significant Bittern populations.
- 2.1 Ensure the long-term continuation of natural processes at large reedbeds suitable for Bitterns which are not intensively managed.
- 2.2 Ensure the appropriate management of other reedbeds holding Bitterns, either by 'conservation management' specifically for reedbed birds or by commercial enterprises.
- 2.4 Promote the acquisition and management of land, by the relevant statutory agencies, as reedbeds for a variety of purposes such as water purification, flood storage and so on.
- 2.9 Promote the conservation of reedbeds and Bitterns in eastern Europe through liaison with governmental and non-governmental bodies.
- 3.1 Develop a standard method for censusing Bitterns at large sites, within 3 years.
- 3.2 Use the methodology developed under 3.1 to carry out a full census of Bitterns, and decide on frequency of repeat surveys.

- 3.4 Set up research projects in contrasting core areas for Bitterns to study their ecology, behaviour, breeding biology, management for food supplies etc.
- 3.5 Take advantage of opportunities to study other little-known aspects of the Bittern.
- 3.6 Maintain a database on European ringing recoveries of Bitterns, to try to establish the importance of various mortality factors and movements of different populations.
- 4.1 Produce an advisory leaflet promoting reedbed conservation and targeting a range of reedbed species.
- 4.2 At major Bittern sites which are reserves with visitor facilities, develop educational programmes to raise awareness of the conservation importance of, and problems facing, reedbeds and their associated wildlife, especially Bitterns.

Belgium

- 1.1 Ensure that the water authorities take reedbeds into account when planning their capital or maintenance works.
- 1.4 On former wetland sites, promote the use of surplus agricultural land being put into permanent setaside as reedbeds (but avoiding areas of other conservation value).
- 1.6 Ensure the production and implementation of a National Recovery Plan for Bitterns.
- 1.7 Promote the designation, protection and appropriate management of IBAs with significant Bittern populations.
- 2.2 Ensure the appropriate management of other reedbeds holding Bitterns, either by 'conservation management' specifically for reedbed birds or by commercial enterprises.

- 2.3 Ensure that intensively managed reedbed sites which could, or do, support Bitterns are protected from harmful influences (development, recreation, other disturbance etc).
- 2.4 Promote the acquisition and management of land, by the relevant statutory agencies, as reedbeds for a variety of purposes such as water purification, flood storage and so on.
- 2.6 Promote the acquisition of existing reedbeds in appropriate areas in order to safeguard, and permit the spread of, Bitterns.
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- 2.2 Ensure the appropriate management of other reedbeds holding Bitterns, either by 'conservation management' specifically for reedbed birds or by commercial enterprises.
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- 3.7 Use rehabilitated winter casualties to investigate the ecology, behaviour and movements of these birds by the use of rings and/or radio tags.
- 3.8 Use rehabilitated winter casualties to assess the sex ratios of Bitterns in different wintering areas.
- 4.1 Produce an advisory leaflet promoting reedbed conservation and targeting a range of reedbed species.

4.3 Where circumstances require it, develop public awareness programmes to limit disturbance of reedbeds through uncontrolled access, increasing recreational activities and so on.

Finland

1.1 Ensure that the water authorities take reedbeds into account when planning their capital or maintenance works.

1.3 Identify and designate the most important areas for Bitterns, and undertake sample counts to investigate trends in numbers.

1.4 On former wetland sites, promote the use of surplus agricultural land being put into permanent setaside as reedbeds (but avoiding areas of other conservation value).

1.5 Ensure that the relevant legislation is appropriate for the conservation of reedbeds and Bitterns and is applied where necessary to protect Bittern populations.

1.6 Ensure the production and implementation of a National Recovery Plan for Bitterns.

1.7 Promote the designation, protection and appropriate management of IBAs with significant Bittern populations.

2.1 Ensure the long-term continuation of natural processes at large reedbeds suitable for Bitterns that are not intensively managed.

2.2 Ensure the appropriate management of other reedbeds holding Bitterns, either by 'conservation management' specifically for reedbed birds or by commercial enterprises.

2.3 Ensure that intensively managed reedbed sites that could, or do, support Bitterns are protected from harmful influences (development, recreation, other disturbance etc).

2.4 Promote the acquisition and management of land, by the relevant statutory agencies, as reedbeds for a variety of purposes such as water purification, flood storage and so on.

2.5 Ensure that the main breeding and wintering localities are given statutory protection.

2.7 Consider the possible harmful effects of power lines on Bitterns, and if large numbers of casualties are discovered under particular stretches, install effective markers.

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France

- 1.1 Ensure that the water authorities take reedbeds into account when planning their capital or maintenance works.
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- 4.3 Where circumstances require it, develop public awareness programmes to limit disturbance of reedbeds through uncontrolled

- access, increasing recreational activities and so on.
- 4.4 Promote the value to wildfowl of reedbed management in wetland areas.

Germany

- 1.1, 2.1, 2.3 Prevention of drying out of wetlands, particularly reedbeds through ground water lowering and drainage.
- 1.3, 1.5, 1.7, 2.5 Special protection for the breeding, migration and overwintering sites of Bitterns in order to prevent development, disturbance and any other threats (this includes declaration of fish protection zones, reduction in reed mowing, prevention of illegal persecution).
- 1.4, 2.4 Creation of new shallow water areas with surrounding marginal vegetation for example by the removal of artificial water courses or reflooding of previously drained areas.
- 2.1, 2.2 Promotion of the natural development of fish populations with a rich supply of small fish species.
- 2.2 Restricting mowing of reed to a minimum, for example only in areas where the reed is too dense for Bitterns and other reedbed birds.
- 2.4 Land purchase.

Greece

- 1.1 Ensure that the water authorities take reedbeds into account when planning their capital or maintenance works.
- 1.3 Identify and designate the most important areas for Bitterns, and undertake sample counts to investigate trends in numbers.
- 1.5 Ensure that the relevant legislation is appropriate for the conservation of reedbeds and Bitterns and is applied where necessary to protect Bittern populations.

- 1.6 Ensure the production and implementation of a National Recovery Plan for Bitterns.
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- 2.6 Promote the acquisition of existing reedbeds in appropriate areas in order to safeguard, and permit the spread of, Bitterns.
- 3.2 Use the methodology developed under 3.1 to carry out a full census of Bitterns, and decide on frequency of repeat surveys.
- 3.6 Maintain a database on European ringing recoveries of Bitterns, to try to establish the importance of various mortality factors and movements of different populations.

Italy

- 1.1 Ensure that the water authorities take reedbeds into account when planning their capital or maintenance works.
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Spain

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**Importance of recommended conservation actions
by country**

Importance of each action:

++ = very important + = moderately important 0 = not relevant

Action	Ö	BE	DK	SF	FR	DE	GR	IT	NL	PT	SP	SW	UK
1.1	+	+	+	+	+	0	+	+	+	+	+	+	+
1.2	0	0	0	0	0	++	0	0	0	0	0	0	0
1.3	0	0	0	+	+	++	+	0	0	0	0	+	0
1.4	+	+	+	+	+	+	0	+	+	0	0	0	+
1.5	0	0	0	+	+	+	+	+	+	+	+	0	0
1.6	+	+	+	+	+	+	+	+	+	+	+	+	+
1.7	+	+	+	+	+	+	+	+	+	+	+	+	+
Action	Ö	BE	DK	SF	FR	DE	GR	IT	NL	PT	SP	SW	UK
2.1	++	0	+	++	++	+	0	0	+	0	0	++	0
2.2	+	+	++	+	+	++	+	+	++	0	+	0	++
2.3	0	+	+	+	+	++	0	0	0	0	+	0	+
2.4	+	+	+	+	+	+	+	+	+	+	+	+	+
2.5	0	0	0	+	+	+	0	0	+	0	0	+	0
2.6	0	++	++	0	0	0	+	++	0	+	+	0	++
2.7	0	0	0	+	+	0	0	0	0	0	0	+	0
2.8	0	0	+	0	+	0	0	0	+	0	0	+	+
2.9	+	0	+	0	0	0	0	0	0	0	0	0	0
2.10	0	0	0	0	0	0	0	0	0	0	0	0	0
Action	Ö	BE	DK	SF	FR	DE	GR	IT	NL	PT	SP	SW	UK
3.1	++	0	+	++	++	0	0	0	+	0	0	++	0
3.2	++	+	+	++	++	0	+	+	+	+	+	++	+
3.3	0	0	+	++	++	0	0	0	+	0	0	++	++
3.4	++	0	0	+	++	0	0	+	0	0	0	+	+
3.5	+	0	0	+	+	0	0	+	0	0	0	0	+
3.6	+	+	+	++	+	0	+	+	0	+	+	+	+
3.7	0	0	+	+	+	0	0	0	+	0	0	+	+
3.8	0	0	+	0	+	0	0	0	+	0	0	+	+
3.9	0	0	0	0	0	0	0	0	0	0	0	0	0
Action	Ö	BE	DK	SF	FR	DE	GR	IT	NL	PT	SP	SW	UK
4.1	+	+	+	++	++	0	0	+	+	0	0	+	+
4.2	+	0	0	0	+	0	0	0	0	0	0	+	+
4.3	0	0	+	+	+	0	0	+	+	0	0	+	+
4.4	0	0	0	+	0	0	+	0	+	0	0	0	0

NB: Ireland and Luxembourg do not currently support Bittern populations