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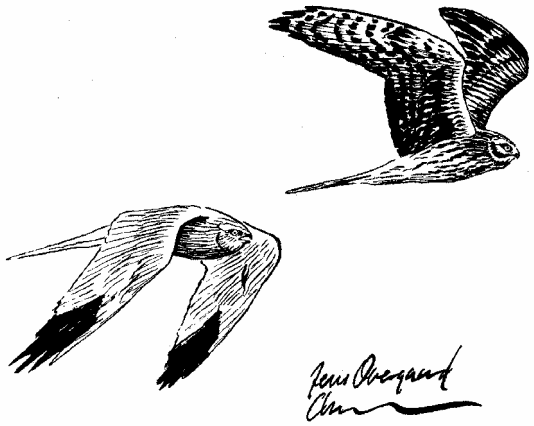
International Action Plan for the Pallid Harrier (*Circus macrourus*)



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BirdLife INTERNATIONAL

International Action Plan for the Pallid Harrier (*Circus macrourus*)

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Timetable

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Geographical scope

This Action Plan is for implementation in countries within the present or former breeding range of the Pallid Harrier (Azerbaijan, China, Kazakhstan, Moldova, Mongolia, Romania, Russia, Turkey and Ukraine), and on migration routes and in the winter range in Afghanistan, Armenia, Azerbaijan, Bangladesh, Benin, Botswana, Bulgaria, Burkina Faso, Burundi, Cameroon, Chad, China, Cyprus, Egypt, Ethiopia, Gambia, Georgia, Ghana, Guinea, Guinea-Bissau, India, Iran, Iraq, Israel, Jordan, Kazakhstan, Kenya, Kyrgyzstan, Lebanon, Libya, Malawi, Mali, Mongolia, Mozambique, Namibia, Nepal, Niger, Nigeria, Oman, Pakistan, Rwanda, Saudi Arabia, Senegal, Somalia, South Africa, Sri Lanka, Sudan, Syria, Tajikistan, Tanzania, Togo, Tunisia, Turkey, Turkmenistan, UAE, Uganda, Uzbekistan, Yemen, Zambia and Zimbabwe.

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SUMMARY

Agricultural development has resulted in fragmentation of the Pallid Harrier's former core breeding range and has caused a population decline. This has been particularly noticeable in Eastern Europe, west of the Volga River. At the same time there have been instances of breeding in new areas, mostly far north of the range indicated in the standard handbooks. Most breeding pairs shift nesting places from year to year, probably tracking changes in the abundance of small rodent prey. Thus, local fluctuations in the Pallid Harrier population and range movements have hampered survey work. A preliminary assessment of the total breeding population of the Pallid Harrier at the beginning of the XXI century is 9,000 – 15,000 pairs, and it is evidently in decline. There is an urgent need for a structured program of surveys, research, monitoring and conservation action at breeding grounds.

Reliable records of the species on migration routes and on winter grounds are also difficult to obtain due to the rarity of the species, its broad-front migration strategy, and difficulties in field identification. Further survey work and research is needed on this species in the winter range in order to be able to target conservation action effectively. However, some important concentrations have already been located in India and Africa where strict conservation measures are required now.

Threats and limiting factors

- Agricultural development of natural, semi-natural and marginal humid grassland habitats and drainage of wetlands – critical.
- Use of harmful pesticides, rodenticides and other toxic chemicals – low (breeding range) and critical (winter range).
- Grass burning, cutting and overgrazing – medium (breeding range) and critical (winter range).
- Cessation of moderate traditional grazing – medium (breeding range) and high (winter range).
- Food availability – medium.
- Illegal shooting and trapping – low.

Conservation priorities

- Encourage conservation of wetlands and ponds in typical steppe grassland and semi-desert – high.
- Support moderate grazing and conservation of grasslands – high.
- Develop survey methodology (including GIS) and carry out surveys, primarily in the core breeding range and, secondarily, to establish its northern and southern range limits as well as to search for new nesting places outside core breeding grounds – high.
- Carry out research into diet and foraging range size, and their role in the movement of populations – high.
- Lobby for enactment of legislation and enforcement of legislation banning the use of harmful pesticides in the winter range, and in the recovering agricultural economy in the breeding range – high.
- Survey grassland and thorn-forest areas in African and Indian winter range for significant roosting concentrations, including tracking birds by means of satellite telemetry as soon as feasible – high.
- Review roost site and catchment area management at winter roosts, most urgently in areas where agriculture is changing due to new irrigation schemes, and pursue any necessary conservation action – high.
- Carry out research into pesticide residues in corpses, and pesticide use in winter roost catchment areas – high.
- Encourage full legal protection and education in countries on migration routes and in the winter range – high.

INTRODUCTION

The Pallid Harrier (*Circus macrourus*) is classified as ' Near Threatened' at global level (BirdLife International 2000), a Species of European Conservation Concern (SPEC) Category 3, and '(Endangered)' for Europe (Tucker and Heath 1994). It is listed in Appendix II of CITES, Annex II of the Bonn and Bern Conventions and in Annex I of the EU Birds Directive. It is also listed in the Red Data Books of Belarus (1993), Ukraine (1994) and Russia (2000). The species is rare, highly dispersed and poorly studied. In recent decades the population and range appear to be declining and fragmenting, particularly in Europe.

BACKGROUND INFORMATION

Distribution and population

Breeding range

Standard references show the Pallid Harrier breeding range extending from eastern Romania and Moldova eastwards through southern Belarus, Ukraine, southern Russia (mostly up to 55 N) and Kazakhstan to Lake Baikal, western Mongolia and north-western China (Dementiev and Gladkov 1951; Vaurie 1965; Brown and Amadon 1968; Glutz von Blotzheim *et al.* 1971; Cramp and Simmons 1980; Flint *et al.* 1984; Stepanyan 1990; del Hoyo *et al.* 1994; Flint 1995; Hagemeijer and Blair 1997; Snow and Perrins 1998; BirdLife International 2000; Ilyashenko 2001). However, at present the core breeding range probably covers a smaller area from the Volga River eastwards through the Urals, Southern Siberia and North-Central Kazakhstan. In Europe the breeding range is highly fragmented and its western limits shift from year to year. At the same time there is some evidence of recent expansion of Pallid Harriers to the north, due either to a shortage of typical humid habitats in the south or as a result of long-term fluctuations of the species' breeding range.

ROMANIA

In the past there have been a few records of presumed nesting in the east, in Dobrudja province near the Danube Delta (Ciochia 1992; Munteanu *et al.* 1994) and the population has been assessed as up to 4 pairs (Hagemeijer and Blair, 1997) or 0-20 pairs and declining (BirdLife International - European Birds Census Council 2000). However, in the last decade there has been no evidence of breeding in Romania (D. Munteanu, pers. comm. 2002).

MOLDOVA

The last certain nesting record was in 1962. Since then, Pallid Harriers have been recorded only on migration (Averin *et al.* 1971, 1981). The population was assessed as 2-5 pairs, declining (Hagemeijer and Blair 1997; BirdLife International - European Birds Census Council 2000). At present the population is likely to be 0-2 pairs (N. Zubkov, pers. comm. 2002).

BELARUS

There were a few summer records of the species in the 1970-90s, close to the southern border along the Pripyat River, south of 53 N (Red Data Book of Belarus 1993; Nikiforov *et al.* 1997). The population was assessed as 0-5 pairs in 1993 (V. Ivanovsky and A. Tishechkin, pers. comm. 2002 in Gensbol 1995) and 2 pairs (Hagemeijer and Blair 1997). More recently (BirdLife International - European Birds Census Council, 2000) the species is no longer listed as breeding in Belarus.

UKRAINE

In the middle of the 20th century, the species nested "through the entire Ukraine except mountain regions" (Zubarovsky 1977). By the 1970-80s, only 12 nesting areas were shown on the map in the Red Data Book of Ukraine (1994), and more recently only 3-5 (Mikityuk 1999; V. Vetrov and V. Grishchenko, pers. comm. 2002). This shows how rapidly the breeding range was fragmented and the population declined. Close to southern Belarus, in the Sumskaya region of northern Ukraine, from 1-2 (Mikityuk 1999) to 5-7 pairs (Afanasiev 1998) nested in the 1990s on 10,000 sq. km. Another 1-2 pairs were recorded in the Samarsky Forest, close to the left bank of the Middle Dnepr River. On its eastern side, nesting was recorded in the 1970s (Red Data Book of Ukraine, 1994). The total number in the Ukraine was assessed as 10-17 pairs in 1986 (Gensbol 1995; Hagemeijer and Blair 1997;

BirdLife International - European Birds Census Council 2000) or more recently as 3-6 (up to 10) and rapidly declining (Mikityuk 1999). At present, the Pallid Harrier population in Ukraine can be assessed as 0-10 pairs (V. Vetrov and Yu. Milobog, pers.comm.).

AZERBAIJAN, ARMENIA AND GEORGIA

Solitary pairs are presumed to nest occasionally in Azerbaijan (Fauna of Azerbaijan 1976; Sultanov *et al*. 1997; E. Sultanov, pers. comm. 2002). In Armenia, the species is recorded only on migration (Adamian and Klem 1999; V. Ananian, pers. comm. 2002). Despite 7 summer records (mostly of solitary males), nesting of the Pallid Harrier has never been proved in Georgia (A. Abuladze, pers. comm. 2002).

TURKEY

Up to the 1990s the Pallid Harrier was recorded only on migration (Kasparek 1992) and wintering in the south-east (E. Vaassen, pers. comm. 2002). Recently an isolated population of 2-20 pairs was discovered in Central Turkey (Pleasance 1997).

RUSSIA

Based on publications and some very reliable recent unpublished data, a preliminary assessment of the size of the entire Russian population of the Pallid Harrier was made by the participants at the Workshop held in Moscow for the preparation of the present Action Plan as 3,300-6,600 pairs (see also Table 1).

1. European area

West of the Volga River, the breeding range of the Pallid Harrier is no longer continuous. Through southern European Russia, up to the Lower and Middle Volga, it is highly fragmented into widely separated and shifting nesting locations. The recent compilation of all available data for the Important Bird Areas (IBAs) in Russia (2000) clearly shows this range fragmentation.

The Pallid Harrier is mentioned as ‘nesting’, ‘probably nesting’ or ‘formerly nesting’ in more than 20 of the 48 Federal Units (administrative regions) of European Russia. However, particular nesting localities are only indicated within 11 regions. It is significant that these localities are widely dispersed through the country, both inside and outside (mostly to the north) the breeding range still outlined in recent handbooks. One unique instance of breeding was documented in the Volgograd Region, not far from the Russian-Ukrainian border, where in 1988 not less than 30 pairs nested in cultivated fields, including a colony of about 20 pairs in a wheat field of 150-200 ha (Vetrov 1992). Nests were also located in the neighbouring district of Rostov Region. The year 1988 was a peak year for voles (*Microtus* sp.) and there are no records of nesting in the area before or after 1988 (V. Vetrov, pers. comm. 2002). In southernmost European Russia, not more than 10 pairs are presumed to nest in Dagestan (Dzhamirzoev et al. 2000) and 50-100 pairs in the Krasnodar Region (Lokhman 2000).

The species is likely to have almost totally disappeared as a nesting bird from former steppes north of the Caucasus (Melgunov and Bicherev 1984; Belik 1995, 2000; Khokhlov 1995). In the highly developed forest-steppe areas along the Oka, Don and Sura river basins, a few pairs nest irregularly and far distant from each other (Galushin 1971; Klimov and Aleksandrov 1992; Vertebrate animals… 1996; Bakka *et al.* 1997; Spiridonov 1997; Spiridonov and Konstantinov 2000; Grishutkin 1998; Rare birds… 1998; Red Data Book of the Moscow Region 1998; Sokolov 2000; Bogomolov 2001a, 2001b; Korkina and Salagin 2001; Lapshin and Lysenkov 2001; Lebyazhinskaya 2001; Margolin 2001; Morozov 2001; Sapetina 2001; Sarychev *et al.* 2001; Zubakin 2001). All the above and many other sources strongly suggest that in total there are likely to be less than 100 breeding pairs west of the Volga River.

At the same time, some new nesting areas of the Pallid Harrier were recorded in the 1980s and 1990s, north of the core breeding range and in wetland habitats typical for the species in the south. About 300-400 km north of the main breeding range, a pair nested in 1983 in wet meadows on the north bank of the Upper Volga River in the Kostroma Region (58N-41E) (Kuznetsov 1994), and in 1999 a nesting pair was noted on a wet swamp in the northern Moscow Region (T. V. Sviridova, pers. comm. 2002). One pair nested on sewage disposal fields close to Saransk City in Mordovia

(Spiridonov and Konstantinov 2000; Lapshin and Lysenkov 2001). Occupied nests were found in clearings among taiga in 1992 (Lapushkin et al. 1995) and on grass fields in 1998 (Shepel et al. 1998), west of the Northern Ural Mountains in the Perm Region (57N-58E), i.e. 200-300 km north of the known breeding range. The Pallid Harrier appeared in the Perm Region from the beginning of the 1990s (Shepel, 2001). The species was also often recorded in the 1990s in the neighbouring Kirov Region (Sotnikov 1999). The northernmost nest with eggs was recorded in July 1998 in wet swamp in the forest-tundra of the southern Yamal Peninsula (67N-68E), over 1,500 km north-east of the generally accepted breeding range (Morozov 1998). A female with two young was seen in early September on the Kanin Peninsula (Eskelin and Tolvanen 1997). A male was recorded in July 1996 near the Polar Urals (Wuczynski 1997). Breeding behaviour in a male was noted in 1995 in southern Karelia (61N-33E), not far from the Russian-Finland border (Zimin et al. 1997) and about 700 km north of the known range. The first breeding case (in the mixed pair with the Montagu's Harrier) was recorded in 1994 in southern Finland (Zimin et al. 1997). It has to be borne in mind that males are highly mobile in spring (Davygora 1998), and courtship behaviour does not necessarily indicate nesting (Davygora 1992).

Although its casual presence and invasions (with occasional nesting) to North and West European countries are well documented (Glutz von Blotzheim 1971; Cramp and Simmons 1980; Forsman 1993; Hadasch 1994; Gensbol 1995), there is reason to believe that the number of such instances increased during the final decades of the 20th century and it may result in a range expansion northwards.

Between the Middle Volga and Upper Ural rivers there is more widespread evidence of breeding than in the western part of the range (Lindeman 1971; Davygora 1985, 2000; Chibilev 1995; Red Data Book of the Saratov region 1996; Korovin 1997, 2001; Belik 1998; Zavyalov et al. 1999). For example, in the southern Chelyabinsk Region (Southern Urals), the population density on fallow land was at its highest in 2000, during a peak in vole numbers, with 0.2 breeding pairs/sq.km. (Korovin 2001). Near a small forest plantation in the semi-desert east of the Lower Volga River in 1960s, the density was even higher, i.e. 6-8 pairs in 0.6 sq.km. (Lindeman 1971).

The Orenburg Region, south of the Urals, lies within the optimal species' breeding range. Density in steppe habitats fluctuates from 2.2 to 6.2 pairs (on average 3.5)/100 sq. km., depending on the number of small rodents (Davygora 1985; Davygora and Belik 1994). The total population of the species, on 124,000 sq. km., is assessed at 500-1,000 breeding pairs (Red Data Book of the Orenburg Region 1998). About 100-200 pairs are in the European (north-western) part of the region, while the other 400-800 pairs are in the Asiatic part south and east of the Ural River. Data obtained by V.P. Belik (1998) showed a density, south-west of the Ural Mountains, of 0.3–1.0 pairs/100 sq.km., while the total Pallid Harrier population in a south-eastern part of European Russia was assessed as 1,000-3,000 pairs (Belik 1998).

Pallid Harrier populations throughout the entire Urals (587,000 sq.km.) were surveyed by I. Karyakin and others, mostly in the 1990s, the density varied from 2-44 pairs per 1,000 sq.km. These data were extrapolated with the help of modern GIS methodology to the whole of the Urals. The highest number was estimated for Bashkortostan (600-800 pairs per 144,000 sq. km) and the Chelyabinsk Region (700-900 pairs per 88,000 sq. km.), 90% of which lies in Asiatic Russia. The total Pallid Harrier population for the Urals was assessed as 1,450-1,850 pairs (Karyakin 1998): about half in Europe and half in Asia.

All researchers agree on an overall decline of the species throughout its breeding range, in particular west of the Volga River. Therefore it was suggested to include the species in the Red Data Book of Russia (Davygora and Belik 1990). Later it was found that, in accordance with the new IUCN criteria, the Pallid Harrier was classified as 'Near Threatened' and it was included both in the Red Data Book of Russia (2001) and in the list of Threatened Birds of the World (BirdLife International, 2000). Recently, there are some signs of a slight increase in numbers, but only in the northern taiga habitat (Shepel *et al.* 1998; Sotnikov 1999; Bogomolov 2001b).

Taking into consideration results of the above studies, the Pallid Harrier Action Plan Workshop (Moscow, March 2002) assessed the total breeding population of the species in Europe (including the European Rusia) as between 300 and 1,100 pairs, which is more or less similar to early provisional

estimates (e.g. Galushin 1994, 1995; Tucker and Heath 1994; Belik 1998; Snow and Perrins 1998; BirdLife International – European Bird Populations 2000).

2. Asiatic area

East of the Urals, the Pallid Harrier occurs along the Russian-Kazakhstan border up to the Altai and western Sayan mountains (Danilov 1976; Kuchin 1976; Kustov 1982; Rogacheva 1992; Red Data Book of the Altay Republic 1996; Blinova and Blinov 1997; Balatsky 1998; Yakimenko 1998; Belyankin 1999; Morozov and Kornev 1999; Ryabitsev and Tarasov 1999; Tsybulin 1999; Shepel and Lapushkin 1999; Kassal 2000). The species appears to have recently penetrated into the forests north of its typical steppe and forest-steppe habitats. The species is only an occasional vagrant in the Lake Baikal area (Durnev *et al.* 1996; V. Ryabtsev, I. Fefelov, pers. comm. 2002). Population changes between 2000 and 2001 were noted along the Russian-Kazakhstan border, depending on the number of small rodents (V. Morozov *in press*). However, no systematic surveys of Pallid Harrier populations in Asiatic Russia have been published during the last 20 years. Based on the densities in the eastern Urals (800-900 pairs) and in the Asiatic part of the Orenburg Region (400-800 pairs), and on some recent unpublished data along a northern border of the species' breeding range in southern Siberia, the Pallid Harrier Action Plan workshop preliminary assessment of the total number in Asiatic part of Russia was 3,000-5,500 pairs.

Unpublished results from recent extrapolation of surveys in 1999-2001 by I. Karyakin through south-western Siberia showed that despite large fluctuations from year to year (from 0-20 pairs/per 100 sq.km in the same areas), the total population on over one million sq. km. was estimated at about 12,000 pairs. About a half of these are moving between southern Siberia and northern Kazakhstan. These results are comparable with old data obtained by Osmolovskaya (1953), Gibet (1960) and Danilov (1976), but no other new data have been collected there for the last 40-50 years. The majority of the workshop participants considered that the numbers extrapolated from rapid surveys by I. Karyakin (indicated by an asterisk * in the notes to Table 1) need to be checked in the course of implementation of the Action Plan.

KAZAKHSTAN.

The greater part of the recent core breeding range of the Pallid Harrier extends through the steppe and semi-deserts of North-Central Kazakhstan, the mountain foothills in south-eastern Kazakhstan and the semi-deserts of the Mangyshlak peninsular in the south west (Korelov 1962; Red Data Book of Kazakhstan 1996; Berezovikov and Vorobiev 1999; Bragin 1999; Gavrilov 1999; Berezovikov *et al.* 2000a, 2000b; Berezovikov and Erokhov 2000; Kovshar and Berezovikov 2000). There are no signs of significant shifts of breeding range there over the last 10-20 years. Detailed population surveys were carried out in the Naurzum Nature Reserve and adjacent areas from the end of 1990s by E. Bragin and the international team of T. Katzner (from 1997), B. Arroyo, M. Madders, R. Wills and J. Watson (all in 2000). In 2000 (a year of apparently good prey densities) about 50 pairs nested on 200 sq.km; almost 30 nests and broods were actually found (B. Arroyo, E. Bragin, pers.comm.). Despite yearly fluctuations in numbers, the population of the species in Northern Kazakhstan appears to have been relatively stable during the last decade of the 20th century (E. Bragin, T. Katzner, pers. comm. 2002). Due to the relatively small area surveyed, extrapolation of the above data to the entire breeding range of the Pallid Harrier in Kazakhstan (over one million sq.km.) is unrealistic without the help of GIS methodology. A tentative and conservative preliminary estimate of the breeding population in Kazakhstan would be between 5,300-8,500 breeding pairs, considerable numbers of which can shift between Kazakhstan and Russia from year to year. The north-western part of Kazakhstan, west of the Ural River, geographically belongs to Europe. Assuming that the breeding density of the species there does not much differ from that throughout the Urals and North Kazakhstan, 300-1,000 pairs are located in the European area of the country, and 5,000-7,500 pairs in the Asiatic area.

MONGOLIA

Virtually nothing is known about the breeding range and population in Mongolia. In the list of Mongolian birds, the status of the Pallid Harrier is classified as either 'unknown' (Stepanyan *et al.* 1988) or as 'migrant' or 'vagrant' (Fomin and Bold 1991). The species was not found in northern (Sumijaa and Skryabin 1989) and eastern (Popov 1999) parts of the country, while a map by Dawaa *et*

al. (1994) shows the species to be present in western Mongolia. The number of breeding pairs (if any) is unknown and is unlikely to exceed 100 pairs.

CHINA

The Pallid Harrier breeds in the extreme north west of China, within the Sinkang-Uigur region, i.e. along the Tien-Shan Mountains and in Dzungaria (Cheng 1987). There are no data on numbers and habitats. Based on areas where the Pallid Harrier is likely to breed, the total number in north-western China could be more than 1,000 pairs.

Table 1. Preliminary assessment of the world Pallid Harrier breeding population agreed by participants at the Pallid Harrier Action Plan Workshop (Moscow, March 2002).

Country	Total No. of pairs	Europe No. of pairs	Asia No. of pairs	Trend***
Romania	0?	0?	-	- 2
Moldova	0-2	0-2	-	- 2
Belarus	0-5	0-5	-	- 1
Ukraine	0-10	0-10	-	- 2
Azerbaijan	0-1	0-1		- 2
Turkey	2-20	2-20	-	- 1
Russia	3,300-6,600	300-1100	3,000-5,500	- 1
Kazakhstan	5,300-8,500	300-1,000	5,000-7,500	0
Mongolia	?*	-	?*	?
China	?*	-	?*	?
Total	**8,600-15,100**	**600-2,100**	**8,000-13,000**	**- 1**

- ** If populations in Mongolia and China exist, they probably amount to more than 1,000 pairs.
- *** Key to Trends: 0 = stable, -1 = moderate decrease, -2 = large decrease.

Extrapolation from data provided by I. Karyakin suggests about 12,000 pairs for Russia, over 10,000 pairs for Kazakhstan and up to 22,000 pairs for the entire population of the species (see reservations about these results in text above).

The Pallid Harrier population assessment in Table 1 is highly provisional because of the lack of wide-scale surveys, particularly in the Asiatic part of the breeding range. Taking this into consideration, in round numbers the current global population of Pallid Harrier cannot be presumed to be more than 20,000 breeding pairs. At the same time the European population is known to be declining.

Life History

Breeding habitats

Wetlands and other humid areas amidst grasslands of steppe and forest-steppe are the typical habitat of the Pallid Harrier (Davygora 1986, 1998; Tucker and Evans 1997). These habitats still exist in southern Russia and Kazakhstan. However, many of these habitats have been developed or cultivated. Pallid Harrier rarely nest in agricultural fields, although it can use them apparently without difficulty in years of good food abundance. The limiting factor in this habitat is therefore probably the food availability (food being in general less available in agricultural fields). The preferred breeding habitats in the steppe are wet grasslands close to small rivers and lakes, and marshlands. The Pallid Harrier can even nest in swamps or moist islands on lakes. More recently, it has been noted to colonise clearances and other openings in forests in the north.

The Pallid Harrier breeding range consists of three zones. They are: (1) the optimal one (mostly humid habitats in steppe, forest-steppe and semi deserts upon Northern Eurasia); (2) areas of sporadic breeding (a forest zone in Europe and northern desert grasslands in Kazakhstan; (3) incidental breeding during invasions of northern, central and even western Europe (Davygora and Belik 1994).

Nesting

The Pallid Harrier nests both solitarily (mostly in the north) and in loose groups of 3-5 pairs (in pristine humid grassland habitats), sometimes close to Montagu’s Harrier's nests. Nests are on the

ground, in both tall (over 50 cm) and shorter grass, and in swamps. Nesting distribution shifts from year to year depending on the abundance of small mammals. However, in the most suitable habitats some breeding sites can be used for a succession of years. The typical clutch is of 4-5 eggs incubated for 30 days, from which 2-3 young fledge in 35-40 days. The female incubates the eggs and broods the nestlings, while usually the male provides food for them.

Food and foraging

Small mammals and birds (mostly larks and pipits) are the preferred prey, at least in summer. Pallid Harriers are thought to search for areas with high densities of small mammals in early spring. Alternative foods are lizards and large insects (mainly locusts and grasshoppers).

Small passerine birds (mostly larks) and orthoptera are important prey during migration and on wintering grounds. As harriers forage far afield from their roosts (up to 20+ km) by day, land uses over a wide area around roost sites (in the roost 'catchment' areas) are therefore relevant and lead us to adopt the 'landscape', as opposed to the 'island' perspective, on winter harrier conservation (Wiens 1985; Clarke 1996a).

Grasslands and thorn forest are known to be important to Pallid Harriers for hunting in India (Clarke 1996b). Preferred habitats in parts of Africa include both grasslands and croplands. The Pallid Harrier has a number of structural characteristics consistent with adaptation to catch agile prey, especially small birds. Observation of males early and late in the day in the surroundings of the big roost site at Velavadar in India (Clarke 1996b), has shown that hunting flight is fast, low and direct, using the stands of taller grass to steal up on flocks of larks feeding on the ground. Habitat structure is, therefore, important and at risk from overgrazing or excess harvesting. Territorial behaviour has been observed between males, probably limiting the carrying capacity of prime foraging habitat. In Africa, precise knowledge of diet is still required; Brown *et al.* (1982) stated that food was "not well documented in winter quarters". In several accounts from Africa it is said to hunt near grass or savanna fires.

Interspecific competition

In the winter range in India, it has been found that some harriers (mainly male Pallid Harriers) hunt solely in grassland for open-country passerines such as larks, some harriers (mainly Montagu's Harriers of both sexes) forage solely for orthoptera in croplands and grassland, and some harriers hunt a mix of prey, including small birds, orthoptera, small mammals and reptiles (Clarke 1996b).

Vigorous bird-chasing is not observed in Montagu's Harrier. Male Pallid Harriers will chase small birds in level flight and even stoop at them, quite unlike Montagu's Harrier. Morphologically, the Pallid Harrier is more adapted to catch flying birds than any other harrier (Davygora 1998).

More research is needed to obtain a full understanding of the role of prey specialisation both in nesting and wintering harriers, but conservation of the prey resources in grassland and croplands is likely to be crucial, to enable the two species to co-exist without strong competition for the same foods.

Feeding on small birds in open country probably results in the Pallid Harrier being more diffuse in its distribution, whereas Montagu's Harrier concentrates more on crop fields and other vegetation areas holding good numbers of prey, such as locusts and grasshoppers. In Africa, the Pallid Harrier is generally characterised as occurring in drier habitats than Montagu's Harrier, and usually frequenting lightly wooded areas. It occurs beyond the more easterly-biased range of Montagu's Harrier in Southern Africa, in more arid westerly regions (Steyn 1982) and in the drier habitats in West Africa (Thiollay 1989).

Migration

The Pallid Harrier is a broad-front migrant that does not concentrate through mountain passes or on short sea crossings, as many other raptors do. This broad-front migration strategy protects the Pallid Harrier from shooting and other problems met by many other raptors at such migration bottlenecks. European populations of the Pallid Harrier migrate mostly to Africa (Moreau 1972; Curry-Lindahl 1981). Migrants were recorded in 36 countries and recently recorded through 12 raptor

migration sites: Bab-el-Mandeb Strait in Djibouti, Suez Canal in Egypt, Lake Langano in Ethiopia, Tsavo and Lake Ololokwi in Kenya, Niger Valley in Mali, Akagera in Rwanda, Mti Mwili and Lake Manyara in Tanzania, Cape Bon in Tunisia, Lundazi and Lake Chvego in Zimbabwe (Zalles and Bildstein 2000).

Asian populations migrate both to Eastern Africa and Southern Asia. Over one million raptors migrate through Israel each spring and autumn. However, the Pallid Harrier is a rare migrant there: up to 113 individuals recorded (on average 56) in spring and up to 129 (on average 40) in autumn (Shirihai *et al.* 2000). Few Pallid Harriers were recorded as autumn migrants in Turkey (up to 133), Cyprus ("fairly common passage migrant", M. Charalamides, pers. comm. 2002), Jordan (up to 164), Syria, Lebanon, Kuwait, Qatar, Saudi Arabia, Oman, UAE , Yemen (Shirihai *et al.* 2000; Zalles and Bildstein 2000). Pallid Harriers also migrate along the western coast of the Caspian Sea (Kostin and Butiev 2000) and south-east coast of the Black Sea in Georgia: 177 individuals were counted in the autumn of 1997 (Abuladze 1999) and 150 on average during the 1975 – 1977 autumn seasons. In total, up to 3,000-5,000 Pallid Harriers cross western Georgia in autumn and 1,000-2,000 in spring (A. Abuladze, pers. comm. 2002). In the Middle and Central East they are recorded in Iran, Iraq, Afghanistan, Turkmenistan, Uzbekistan, Kazakhstan (207 in autumn 1987 via the Chokpak Pass), Mongolia, China, Pakistan (up to 33 on the Indian Ocean coast), India, Sri Lanka, Myanmar, Nepal (Zalles and Bildstein 2000). The Pallid Harrier was not recorded in south-east Asia in the course of the 2001 Raptor Migration Project (M. Chang, Malaysia, and Nguen Cu, Vietnam, pers. comm. 2002).

Winter range

The principal wintering grounds of the Pallid Harrier are open country throughout the Indian sub-continent, the savanna belt in Africa south of the Sahara, and the East African steppes. The Pallid Harrier occupies this vast distribution area during the northern winter, from October to March, and shares it with (the generally more common) Montagu's Harrier. Because of plumage similarities, it is difficult to differentiate between these two species in the field, especially female and juveniles. They also mix at the same night roosts. Roost site conservation measures (mainly in grasslands) will therefore benefit both, but it is important to be aware that they can occupy different foraging niches.

Communal roosting in winter

By day, harriers are very mobile, widely dispersed and therefore difficult to count. However, their use of communal night roosts in winter enables counts to be made. They roost on the ground, typically in favoured patches of rank ground vegetation at traditional sites in natural or semi-natural habitats such as grassland and marshes, but occasionally on bare ground. Because of the traditional and recurring nature of roosts, protection of roost sites from overgrazing, excess harvesting and other threats is crucial. Stereotype behaviours are associated with roosting, including pre- and post-roosting gatherings on bare ground nearby, and milling over the roost site prior to settling. The largest recorded roosts involving Pallid Harriers are in the grasslands of the Blackbuck National Park, Velavadar in Gujarat, NW India: up to 3,000 birds (Clarke *et al.* 1998) and in the Rollapadu Wildlife Sanctuary in Andhra Pradesh, S. India up to 1,000 birds (Rahmani and Manakadan 1987;, Clarke and Prakash 1997). These are regular, traditional roosts, attracting mainly Montagu's Harriers, but at Velavadar up to 25% Pallid Harriers and at Rollapadu perhaps 10%. The roost at Velavadar sometimes holds about 1% of the estimated world population of Pallid Harrier. Smaller but significant mixed roosts have been found in grassland at Alwal Kancha in Andhra Pradesh: up to 217 birds (Ganesh and Kanniah 2000) and on bare ground on the Little Rann desert in Gujarat up to 120 birds (Clarke 1996b). Large numbers of smaller roosts occur in the Indian sub-continent, where a joint Bombay Natural History Society/Hawk and Owl Trust survey has been initiated.

In Africa, few roosts containing Pallid Harriers have been documented in the literature, but many must occur throughout the winter range of the species there. The largest one reported was of 'hundreds' of migrating harriers roosting in grassland in the SE Serengeti near Mti Mwili, Tanzania in March 1998 (Zalles and Bildstein 2000). It is now important to find and record more roosts in Africa.

Winter distribution

Apart from a few systematic atlas projects, little quantitative information on the winter distribution of Pallid Harrier is so far published, with most accounts based on subjective judgements

of how "common" the species is. In harriers, the sexes can have different patterns of distribution in winter, and because of the difficulties in separating female Pallid and Montagu's Harriers in the field, much of the published information is based on records of males. There is a lack of information on the winter distribution and habitat requirements of female Pallid Harriers.

Far East

The Pallid Harrier is said to occur in both Burma and SE China in winter, but it seems unlikely that there are any significant concentrations there.

Indian subcontinent

Earlier literature suggests that the Pallid Harrier used to be more widespread and common than Montagu's Harrier in the Indian subcontinent (Ali and Ripley 1978). Recent experience, however, shows that Montagu's Harrier outnumbers Pallid Harrier by at least 3:1. Modern sources (e.g. Grimmett *et al.* 1998, Kazmierczak and Perlo 2000) show a blanket distribution for Pallid Harrier in India, but not for Montagu's, possibly because Montagu's Harrier masses more in areas good for orthoptera. The Pallid Harrier is reported to be more widespread and common than Montagu's Harrier in Pakistan (Roberts 1991).

Middle East

A small number winter in cultivated areas and semi-desert, but the Pallid Harrier is mainly an autumn and spring migrant through the Middle East.

Africa

During the 1940-60s, Brown (1972) considered that the Pallid Harrier outnumbered Montagu's Harrier in both West and East Africa: in the latter by 3-4:1. He characterised both species as "among the commoner migrant hawks of savanna and grassland", but noted a severe decrease in harriers on the East African plains, and had "little doubt that some disaster has stricken the populations that used to come to East Africa". The decline may have been much worse for the Pallid Harrier because it is now decidedly the scarcer of the two species. Steyn and Arnott (1990) also noticed a decrease in migrant Montagu's and Pallid Harriers in the grasslands of Matabeleland (now part of Zimbabwe) in the 1960s-70s. Both authors considered that Palearctic harriers suffered no competition from other raptors for their foraging niche in Africa, and that conditions on Palearctic breeding grounds were to blame. This was when birds of prey in Europe were in steep decline due to organochlorine pesticide poisoning there. It is difficult to assess if there has since been any improvement in numbers wintering in Africa, but no obvious improvement has been suggested in the literature.

North-East Africa

Egypt is mainly a migration area, but a few Pallid Harriers winter in the Nile Delta and Valley (Goodman and Meininger 1989). The Pallid Harrier is common in open and acacia grassland in the Sudan, where it outnumbers Montagu's Harrier in the north and is said to prefer drier habitat (Nickolaus 1987), in Ethiopia, and in Somalia in the north west and south, where it is said to be more associated with wetlands than Montagu's Harrier (Ash and Miskell 1998).

West Africa

In the sub-Saharan savanna belts, the Pallid Harrier is most numerous in the southern Sahel, but it is also well distributed south through Sudan to Northern Guinea savannas. It is increasingly frequent in ratio to Montagu's Harrier from west (Senegal) to east (Chad), but much less common than Montagu's overall, using drier and less wooded areas (Thiollay 1989). In Cameroon, Thiollay (2001) made comparative road transect counts of raptors in 1973 and 2000. There was little change in the status of the Pallid Harrier despite a great increase in the human population and consequential habitat degradation. However, any trend could have been masked by the scarcity of the species (only 11-16 birds in about 1300 km) and the fact that the 2000 counts followed good rains, whereas the 1973 counts did not. Montagu's Harrier was four times as numerous in 1973 and twelve times as numerous in 2000.

East Africa

In the steppes of East Africa in Kenya, Tanzania and adjacent areas, adult male Montagu's Harriers generally outnumber adult male Pallid Harriers by about 2:1 (Vande Weghe 1978; Brown *et al.* 1982; Lewis and Pomeroy 1989; Stronach 1992), although the Pallid Harrier is reported to be often the more numerous species in S.E. Kenya and on the Masai Steppe in N. Tanzania (Zimmerman *et al.* 1996). The dynamics of the East African steppes are largely governed by the seasonal rains of the Inter-Tropical Convergence Zone, which generate flushes of prey: initially insects, but then birds, mammals and reptiles. In the Serengeti, adult male Montagu's and Pallid Harriers predominate over ringtails in October-February, especially in November-December before the rains, and harriers are more common in the grasslands than in the surrounding area (Stronach 1991). Although harrier roosts in East African grasslands are largely undocumented, numbers of Montagu's and some Pallid Harriers, many of them males, have been observed post-roosting on mornings in January on park roads in the Masai Mara (M. Wilkes, pers. comm. 2002). There may be less pressure on harriers for roosting space in these large grasslands. Different predator avoidance habits may have evolved there; roosting on acacia bushes has been observed at midday (R. Davies, pers. comm. 2002).

Southern Africa

In Southern Africa the Pallid Harrier ranges more towards the drier west than Montagu's, but it is generally less common (Steyn 1982; Harrison *et al.* 1997). It is now rare in Zimbabwe, showing a more marked and possibly earlier decline than Montagu's Harrier (Stuart Irwin 1981). It is also rare in Botswana (Newman 1989; Penry 1994), where known localities (grasslands in the north) for both Pallid and Montagu's are the Savuti and Mababwe Depression, Deception Valley, Lake Xau, Makgadikgadi Pans (Harrison *et al.* 1997). In South Africa it is now a rare vagrant in the Transvaal in the Bushveld and Highveld (Tarboton and Allan 1984), where it was once considered common in the nineteenth century, and in Cape Province (Hockey *et al.* 1989).

THREATS AND LIMITING FACTORS

During the 1950s – 1970s, raptor populations in Northern Eurasia were significantly reduced by persecution as 'vermin', the extensive use of DDT, other pesticides and rodenticides, and the wide-scale development of virgin steppe lands in southern Russia and northern Kazakhstan that are the typical nesting habitats of the Pallid Harrier. Over the last 10-20 years, persecution and use of harmful chemicals have all decreased, and the populations of some raptor species have begun to recover. However, land development, including the drainage of wetland as well as abandonment of extensive cattle grazing and spring burning of grass in Kazakhstan, are likely to have a lasting effect on the Pallid Harrier populations.

The Pallid Harrier spends about six months every year on its wintering grounds, where degradation of roosting and hunting habitats as well as the use of pesticides, overgrazing and decrease of food availability can have significant effects on the population.

Threats along migration ways are still less known and have to be studied.

Direct mortality

Illegal shooting and trapping

Breeding range: occasional during spring hunting of ducks in some southern localities. No direct persecution is known due to the legal protection of raptors, the environmental education of people and the high price of cartridges.

Importance: low (locally).

On migration: mass shooting of migratory raptors is known along the south-eastern coast of the Black Sea in Georgia, Turkey and Syria due to poor law enforcement. Losses of Pallid Harriers there are unrecorded, but quite likely. There are no data on shooting from elsewhere on migration.

Importance: low (locally).

Winter range: occasional shooting is possible in Africa, but not in India (where hunting is illegal).

Importance: low or none.

Toxic chemicals: rodenticides and pesticides

Breeding range: in the past (1960-80s), they were an important factor in the mortality of rodent-eating raptors, including Pallid Harriers (Belik 1997, 200b). At present, pesticides and rodenticides are practically not used on breeding grounds, mostly because of the general decline in agriculture in former USSR countries. Nevertheless, this could become an important factor again, when agriculture in Russia, Ukraine and Kazakhstan begins to recover. Quite recently, in 2000 and 2001, chemicals were sprayed from light agricultural planes to stop locust invasions over large areas in the south, including the breeding range of the Pallid Harrier. The consequences of their use for raptors and other birds have to be studied.

Importance: low.

In the winter range and on migration areas: pesticides are still in use in Africa and southern Asia, including on important wintering grounds in India. For example, at Rollapadu in Andhra Pradesh, India, the agriculture in the surrounding area is intensive, with extensive use of pesticides. Corpses of harriers are found in a major harrier roost, untouched by predators/scavengers and eaten only by ants.

Importance: critical.

Egg collection

No cases are known.

Importance: nil.

Trampling by cattle/sheep

Wetlands and wet grasslands are not normally used for grazing.

Importance: nil.

Terrestrial predators

Watchdogs avoid wetland habitats, while foxes sometimes try to find harriers' nests on the ground. However, Pallid Harriers are vigorous enough to defend their clutches and broods against terrestrial predators.

Importance: nil or low (locally).

Raptors and corvids

Young and adult Pallid Harriers are preyed on by large eagles in Northern Kazakhstan (T. Katzner, pers. comm. 2002). Corvids are capable of destroying the clutches of any ground nesting birds, including the Pallid Harrier, when incubating females are disturbed by human activity.

Importance: low (locally).

Agricultural operations

Locally, late ploughing or early harvesting destroys clutches or broods of some Pallid Harriers nesting in agricultural fields.

Importance: low.

Hay collection

In the breeding range, humid grasslands are not used for hay collection.

Importance: low.

In the winter range grass cutting can be a critical factor where, if excessive, it can destroy available roosting and foraging habitat.

Importance: critical.

Spring burning of grass

In the northern part of the breeding range, grass is usually burned before the nesting of the Pallid Harrier, while in the southern part fires from time to time destroy harriers' nests.

Importance: low (in Russia) and medium (Kazakhstan).

At wintering grounds the burning of dry grass can totally destroy major food resources of the Pallid Harriers.

Importance: critical.

Electrocution

Electrocution is not a problem as, unlike many other raptors, harriers do not use power line poles as observation points.

Importance: nil.

Human disturbance

Human disturbance is infrequent in the wetlands used for breeding or in the grasslands used for winter roosting, but can be an agent causing egg loss (see **Raptors and corvids** above)

Importance: low (locally).

Domestic animals

Cattle, sheep and watchdogs usually avoid the humid habitats used by Pallid Harriers for nesting.

Importance: nil.

Indirect factors

Agricultural development

Breeding range: large areas of natural grassland habitats, including humid areas and small wetlands, have been almost entirely degraded in the south of the breeding range and transformed into agricultural landscapes which are generally less suitable for nesting. Set-aside arable land is not readily utilised for nesting by ground-nesting raptors such as the Pallid Harrier, but may be used as foraging habitat.

Importance: high.

Winter range: traditionally subject to flexible, nomadic grazing regimes, and partly used as hunting preserves, the systems of grassland and thorn-forest commons used for roosting and foraging in the semi-arid areas of India, sub-Saharan Africa and East Africa are now under threat from changing land tenure regimes, overgrazing, excess harvesting, conversion to croplands and development. Degradation of traditional croplands is also a threat; the largest known winter roost in the world, at Velavadar, is located on an alluvial plain of salt flats and black cotton soil known as the 'Bhal', covering 3,000-4,000 sq. km. along the western shore of the Gulf of Cambay. This is traditionally a low-input, low-output arable farming area known for cotton and wheat. Irrigation channels from the major Sardar Sarovar Project have reached the Bhal, bringing the possibility of intensification of agriculture, increased use of pesticides, and unsustainable use of saline land.

Importance: critical.

Grazing

Breeding range: overgrazing is rare, temporary and very local. Moderate grazing is indirectly beneficial, providing a balance between some cover and open areas where susliks and other rodents can be hunted by harriers. Cessation of grazing due to economic changes in the former USSR in the1990s led to the growth of tall and dense grass cover, resulting in some reduction of availability of Pallid Harrier's prey.

Importance: medium.

Winter range: overgrazing is an important threat on grassland and thorn-forest commons, leading to degradation of roost sites and reducing the abundance of lark prey.

Importance: high.

Afforestation

To some extent, the Pallid Harrier uses forests both in the north and south. The edges of forest patches in the forest-steppe are used by the Pallid Harriers as hunting habitats. Trees provide nest sites for corvids, which are only harmful when harriers are disturbed in their nests by human activity.

Importance: nil.

Food availability

Breeding range: intensification of agriculture including use of pesticides and rodenticides in the past, resulted in the decrease of available prey. Recent data on the matter are not available.

Importance: medium.

Winter range: there is little firm knowledge of important prey, either in India or Africa, other than Short-toed Larks at Velavadar in India, and large orthoptera found in stomach contents in east and southern Africa in old accounts.

Importance: medium.

Interspecific competition

Breeding range: nesting and hunting habitats of the Pallid, Montagu's and Hen Harriers are usually separated, although some competition between the former two can occur locally.

Importance: nil.

Winter range: although Pallid and Montagu's Harriers occur in the same areas and often roost together, their food niches are different. Montagu's Harrier hunts rodents, locusts and other large insects, while the Pallid Harrier catches mostly larks and other small birds.

Importance: nil.

Climate change

The influence of climate change on the Pallid Harrier is yet to be researched.

Importance: low.

Table 2. Overview of threats to the Pallid Harrier and their relevance to breeding, migration and wintering grounds

Threats	Breeding grounds	Migration	Wintering grounds
1. Direct mortality			
Illegal hunting			
Toxic chemicals: pesticides and rodenticides			
Egg collection			
Trampling by cattle/sheep			
Terrestrial predators			
Predation by raptors and corvids			
Agricultural operations			
Hay collection			
Spring burning of grass			
Electrocution			
Human disturbance			
Disturbance by domestic animals			
2. Indirect factors			
Agricultural development			
Land abandonment			
Overgrazing			
Abandonment of extensive grazing			
Afforestation			
Reduced food availability			
Interspecific competition			
Climate change			

High and critical Medium Low Nil

CONSERVATION STATUS AND PROTECTIVE MEASURES

The Pallid Harrier is classified as 'Near-Threatened' at global level, as 'Endangered' at European level, and classified as SPEC 3. The species is included in Annex I of the EU Bird Directive, Annex 2 of both the Bern and Bonn Conventions, Annex 2 of CITES and in the Annex to the Russian-Indian Agreement on the Protection of Migrating Birds.

Romania, Moldova, Belarus, Ukraine

Legally protected and included in the Red Data Books of Belarus (1993), Moldova (2001) and Ukraine (1994).

Turkey

The species, as with all raptors, is legally protected.

Russia

Legally protected. Included in Red Data Book of Russian Federation (2001) and 21 regional Red Data Books. Protected within five State Nature Reserves.

Kazakhstan

Legally protected. It is not included in the Red Data Book of Kazakhstan (1996). Protected within the Naurzum Nature Reserve.

Mongolia

No special protective measures.

China

Protective legislation and measures are unknown.

Migration routes

Protective legislation and measures are unknown. In all EU countries the species is fully protected, but only a few Pallid Harriers migrate through Central and Western Europe.

Wintering grounds

Protective legislation and measures are unknown.

AIMS AND OBJECTIVES

Aims

1. To conserve the Pallid Harrier throughout its breeding and winter range, and on migration.
2. To promote breeding range and population recovery to a level at which the Pallid Harrier no longer qualifies as a Near Threatened species at global level.

Objectives

1. Policy and legislation

1.1 Promote policies ensuring long-term conservation of the Pallid Harrier and its habitats.

1.1.1 *Agriculture*

The conservation of uncultivated humid semi-natural grasslands along rivers, around lakes, on grassed slopes and in marginal areas, and the creation or maintenance of some uncultivated areas (set-aside) amongst agricultural fields to provide foraging habitat in farmland must be encouraged. For example, perennial grasses such as wheatgrass (*Agropyron*) and enhanced crop diversity can be promoted to establish habitat mosaics giving improved nesting and foraging opportunities for the Pallid Harrier.

Conservation of grasslands, moderate grazing and the prevention of overgrazing must be encouraged on breeding and wintering grounds, to give the correct balance between prey density and vulnerability. To this end, harrier conservation needs to be taken into consideration in land use policy on wintering grounds also.

Harrier conservation should be linked with the 'Project Bustard' proposed by the Bombay Natural History Society in India as a flagship for the threatened grasslands, and with other grassland conservation initiatives.

Roost site and 'roost-catchment area' management plans need to be reviewed and their implementation monitored at the largest known roosts. In particular, the Sardar Sarovar Project impact assessment and the impacts of the Project for a radius of 20 km from Velavadar (the largest recorded harrier roost in the world) need to be assessed, with a view to making any necessary recommendations on agricultural practices.

The use of harmful pesticides, rodenticides and other toxic chemicals should be banned and the ban should also be enforced in the breeding range.

Research should be set up into pesticide use legislation and enforcement on wintering grounds, based on research projects into pesticide use carried out in the Rollapadu and Velavadar roost catchments.

Priority: high (critical).

Time-scale: long.

1.1.2 *Protected areas*

Specific conservation measures in existing protected areas used by the Pallid Harrier must be developed and implemented. All Important Bird Areas holding breeding pairs of the Pallid

Harrier should be protected. The establishment of protected areas of different status (federal, regional, local) should be promoted in places with significant congregations of wintering Pallid Harriers.

Priority: medium.

Time-scale: long.

1.2 Protective legislation and its enforcement at state, regional and local levels should be promoted, including involvement by volunteers from bird conservation NGOs.

Priority: medium.

Time-scale: long.

2. Species and habitat protection

2.1 To continue efforts for identification, designation, monitoring and protection of new Important Bird Areas in the breeding and winter range.

Priority: medium.

Time-scale: long.

2.2 To encourage appropriate habitat management in areas suitable for breeding, migration and wintering of the Pallid Harrier. To support sustainable use of pastures via moderate grazing of grasslands and conservation of ponds and canals in the breeding range.

Priority: high.

Time-scale: long.

2.3 To prevent occasional shooting, nest robbing and destruction through local educational campaigns, as well as by strict legislation on the trade of animals or animal products. To strengthen enforcement of bird protection legislation in countries through which the Pallid Harrier migrates.

Priority: high (medium).

Time-scale: long.

2.4 To promote legislation at state, regional and local levels for better conservation of the Pallid Harrier and to make the necessary efforts for its practical implementations, including involvement of volunteers by bird conservation NGOs.

Priority: medium.

Time-scale: long.

2.5 To reduce human disturbance of breeding and wintering birds by tourists *et al.* and by domestic animals.

Priority: high.

Time-scale: long.

3. Research and monitoring

Effective conservation must be underpinned by a proper understanding of the species' requirements.

Key issues:

The distribution of breeding Pallid Harriers appears to fluctuate from year to year, with some regions occupied intermittently. These fluctuations are presumably related to the variation in prey abundance.

- There has been a long-term contraction of range in the European part of the range, apparently associated with agricultural intensification. Elsewhere, the distribution is poorly understood.
- In assessing the current distribution, it is therefore important to differentiate between "core" parts of the range that are consistently occupied, "peripheral" parts that are occupied intermittently, and "degraded" parts where populations have crashed. Historically, degraded parts may have been "core" or "peripheral".
- Numbers in core regions apparently declined in the period 1950-70s, coincident with large-scale conversion of steppe lands to cereal production. Subsequently, numbers in these regions are reported to have stabilised.
- More needs to be known about the wintering distribution, and links between breeding and wintering regions. Some very large communal roosts have been identified in India, apparently comprising mainly males.

3.1 Research to be carried out across the entire species range

3.1.1 Review literature to determine known distribution and habitat use; compile bibliography on the Pallid Harrier.

Priority: medium

Time-scale: ongoing.

3.1.2 Explore use of GIS to construct predictive models of distribution and abundance. Refine models by carrying out ground checks in sample areas / habitats.

Priority: high.

Time-scale: immediate/ongoing.

3.1.3 Determine individual range size and investigate foraging behaviour in sample areas stratified by region and habitat, using direct observations / terrestrial radio telemetry.

Priority: medium.

Time-scale: ongoing.

3.1.4 Investigate relationships between Pallid and sympatric harrier species in the breeding and winter range.

Priority: medium.

Time-scale: immediate/ongoing.

3.1.5 Demographic studies to assess population viability.

Priority: high.

Time-scale: long.

3.1.6 To study contamination of Pallid Harriers and their prey of breeding, migration and wintering grounds by pesticides and other toxic chemicals, including pesticide analysis of harriers' corpses, but firstly of wintering grounds.

Priority: high.

Time-scale: urgent.

3.2 Research to be carried out in the breeding range

3.2.1 Investigate breeding density within different habitats across potential range.

Priority: critical - within potential core range,

medium - within peripheral range.

Time-scale: immediate/ongoing.

3.2.2 Investigate nest site selection and breeding success across potential range.

Priority: high - within potential core range,

medium - within peripheral range.

Time-scale: urgent.

3.2.3 Investigate habitat fragmentation and the minimum area (i) used for breeding (ii) successful for breeding and (iii) different prey spectrum in different habitat patches.

Priority: high - within potential core range,

medium - within peripheral range.

Time-scale: urgent.

3.3 Research to be carried out along the migratory flyway and/or in the wintering areas.

3.3.1 Identify migration routes and links between breeding and wintering populations using satellite telemetry, wing-tagging and ringing.

Priority: high.

Time-scale: long.

3.3.2 Systematically survey grassland and thorn-forest commons in India and Africa to assess habitat threats and count roosting harriers at dusk.

Priority: high.

Time-scale: ongoing.

3.3.3 Investigate wintering distribution of males and females in India and Africa.

Priority: high.

Time-scale: immediate/ongoing.

3.3.4 Review the Pallid Harrier winter range for other examples of irrigation schemes and investigate their impact on the species.

Priority: high.

Time-scale: immediate/ongoing.

3.3.5 Investigate causes of mortality in wintering areas and on migration routes.

Priority: high.

Time-scale: immediate/ongoing.

3.3.6 Arrange particular monitoring of small rodent population dynamics in connection with yearly inter-range movements of Pallid Harriers, and extend pellet analysis to roosts in other areas of India and Africa.

Priority: medium.

Time-scale: long.

3.3.7 To survey pesticide use along migration routes and on wintering grounds and strictly limit or even stop their use in those areas.

Priority: high.

Time-scale: urgent.

4. Public awareness, education and training

4.1 Raise awareness concerning the critical status of the Pallid Harrier, through scientific papers, popular articles and books, papers, television and other mass media. Establish an international web site for the Pallid Harrier.

Priority: high.

Time-scale: long.

4.2 Disseminate experience in proper management of the Pallid Harrier nesting and wintering habitats, including crop diversity, moderate grassland grazing, traditional irrigation, prevention of grass burning, etc.

Priority: medium.

Time-scale: long.

4.3 To continue environmental education and training concerning the ecology and significance of the Pallid Harrier and other raptors, including their field identification and survey methodology.

Priority: medium.

Time-scale: long.

4.4 Organise training courses on modern methodology, such as GIS data analysis, radio-tracking and use of satellite transmitters, and analysis of the information obtained.

Priority: high.

Time-scale: immediate.

4.5 Raise awareness of local people and organizations on the need for protection of Pallid Harrier congregations in the winter range, including establishing input into the educational system in roost catchment areas.

Priority: medium.

Time-scale: long.

5. International co-operation

5.1 International, European and Asian organizations should include conservation provisions for threatened birds, including the Pallid Harrier, into agreements and other documents regarding agriculture, forestry, environment and economic support of Eastern European, Asiatic and African countries.

Priority: high.

Time-scale: immediate.

5.2 Establish close collaboration with research and conservation organizations such as the IUCN/SSC Falconiformes Conservation and Assessment Plan, Raptor Research Foundation, The Peregrine Fund, World Working Group on Birds of Prey and Owls, the Montagu's Harrier Working Group, the Bombay Natural History Society, etc.

Priority: high.

Time-scale: immediate.

5.3 Encourage and support any international, bi-lateral and national actions directed to the protection of the Pallid Harrier and its habitats.

Priority: high.

Time-scale: long.

5.4 Implement joint research and conservation action in order to improve the protection of the Pallid Harrier and monitor its range, population status and ecology on breeding, migration and wintering grounds.

Priority: high.

Time-scale: long.

5.5 Establish an International Pallid Harrier Working Group and support its activity. Hold a workshop on the methodology and calendar for the Pallid Harrier Action Plan implementation.

Priority: high.

Time-scale: immediate/ongoing.

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ANNEX 1. RECOMMENDED CONSERVATION ACTIONS BY COUNTRY

Romania

To check previously known breeding places of the Pallid Harrier and provide protection.

Moldova

To clarify the status of the Pallid Harrier in Moldova and protect breeding pairs (if any).

Belarus

To study the distribution of the Pallid Harrier at the northern limit of its breeding range in Belarus.

Ukraine

To monitor the last known breeding places of the Pallid Harrier.

To protect the Important Bird Areas which support nesting Pallid Harrier.

To initiate national or joint research projects in search of still unknown Pallid Harrier breeding areas.

Turkey

To continue monitoring of known breeding population.

To survey other areas likely to hold breeding pairs.

To provide reliable protection of migrating Pallid Harriers and other raptors, especially in the north-east.

To include the Pallid Harrier in a national Red Data list.

Russia

To intensify monitoring of known breeding populations of the Pallid Harrier.

To encourage more precise assessment of breeding populations over large areas by national and international team research using GIS, satellite telemetry and other adequate methodologies. In particular, to survey areas such as the Urals and Southern Siberia where the status of the species needs to be verified.

To establish close co-operation with national and international ornithological and conservation organizations in order to co-ordinate research and protection of the Pallid Harrier with neighbouring countries.

To study pesticide contamination of Pallid Harriers and their prey.

To attract the attention of field researchers to the possibilities of finding the Pallid Harrier nesting outside its traditional breeding range.

To protect and monitor IBAs used by Pallid Harriers.

Kazakhstan

To promote and support the monitoring of Pallid Harrier populations by national and joint international research teams.

To establish the technical and financial possibilities of satellite telemetry of Pallid Harrier movements, in order to get more accurate information on the link between breeding and wintering grounds.

To study pesticide contamination of Pallid Harriers and their prey.

To promote research into the southern limits of Pallid Harrier distribution.

To renew observation of raptor migration along southern mountain ridges.

To include the Pallid Harrier in the Red Data Book.

Mongolia

To clarify the status of the Pallid Harrier in the country by surveying western areas.

To include the Pallid Harrier in the Red Data Book.

China

To survey north-western areas in order to clarify the breeding range and population status of the Pallid Harrier in the country.

To arrange legal protection of the Pallid Harrier.

AREAS OF MIGRATIONS AND INVASIONS

North European and West European countries

To continue monitoring the Pallid Harrier, taking into consideration the possible movement of its breeding range to the north-west.

South European and Middle East countries

To promote the monitoring of the Pallid Harrier in migration areas.

To encourage a search for other areas important for Pallid Harrier migration.

To structure monitoring to enable comparison of previous and new data on Pallid Harrier migration in view of its dramatic decline in Eastern European breeding grounds.

To prevent shooting and trapping of Pallid Harriers on migration.

WINTERING GROUNDS

Africa and Indian subcontinent

To monitor the known wintering places of the Pallid Harrier, and search for others.

To study the pesticide contamination of Pallid Harriers, their environment and prey.

To provide reliable protection of wintering concentrations of the Pallid Harrier.

To limit severely or stop the use of harmful pesticides and other toxic chemicals in the wintering grounds of the Pallid Harrier.