Internationally important stopover area for the globally-threatened Common Pochard *Aythya ferina* in the Volga River delta

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Abstract

The Common Pochard *Aythya ferina* (hereafter Pochard), is a widespread freshwater diving duck of the Palearctic. A large and rapid decrease in abundance resulted in it being classified as Vulnerable in the International Union for Conservation of Nature's (IUCN) Red List in 2015 and it is now considered to be a threatened species globally. The objective of this study was to provide reliable data on numbers and habitat use for Pochard in the delta area of the River Volga (southern European Russia) during their autumn migration. The total number of Pochard staging in the River Volga's avandelta was estimated at *c.* 346,000–390,000 individuals in mid-November 2020 and *c.* 153,200–170,000 in mid-November 2021. Several sites with large numbers of staging Pochard were identified within the delta, and the Volga River delta currently holds the most important stopover concentrations of Pochard in the Palearctic. A large-scale monitoring and research programme is required for Pochard in the delta of the River Volga, because such information is essential for the effective conservation of this globally-threatened species.

Key words: Common Pochard, migration, numbers, Volga River delta.

The Common Pochard *Aythya ferina* (hereafter Pochard) is a predominantly freshwater diving duck, common and widespread as a breeding species south of the tundra and northern taiga across the Palearctic (Kear 2005). Following a large and rapid decrease in numbers, it was classified as Vulnerable by the International Union for Conservation of Nature's (IUCN) Red List in 2015 (based on the 30–49% decline in breeding population size over the course of three generation spans or 22.8 years criterion) and it is now a globally-threatened species (BirdLife International 2015). Significant decreases in numbers have been recorded across the entire range of the species except for certain parts of Siberia (Fox *et al.* 2016; Mikhantyev & Selivanova 2016; Mischenko *et al.* 2020). The rapidly declining population of Pochard breeding in European Russia is currently estimated at about 50,000–80,000 pairs (Mischenko & Sarychev 2020).

The survival of this threatened species is dependent, in part, on the conservation and sustainable management of a network of wetlands of critical importance for post-breeding concentrations (Fox *et al.* 2016). Consideration of the data available (*e.g.* in the Russian literature, Important Bird Area (IBA) inventories and the Critical Sites Network (CSN) tool) indicates that, in recent decades, the delta of the River Volga in southern Russia has become the most important autumn stopover site of the Pochard across the Palearctic. Systematic counts of waterbirds staging in the region are however lacking. The objectives of this study therefore were to provide reliable data on numbers and habitat use for Pochard staging in the Volga Delta during autumn migration, in order to advise on the effective conservation of this vulnerable species.

Methods

Study area

The delta of the River Volga is the largest river delta in Europe, with a total area of 19,000 km^2 (Fig. 1). The most important part for biodiversity is designated as the "River Volga Delta" Ramsar Site (total area: 8,000 km^2) of which 679 km^2 is additionally protected as the Astrakhan State Biosphere Reserve with three separate sections: Damchiksky, Trekhizbinsky and Obzhorovsky (Fig. 1).

Habitats of the delta include an extensive network of natural channels and smaller streams, numerous islands (ranging from 200–2,000 ha), spits, shallow sandy areas, lakes and bays overgrown with helophytic vegetation (Belevich 1963). The distinctive feature of the lower part of the River Volga's delta is an extensive avandelta (a subaqueous zone separating the prodelta from the delta plain), which is a wide platform of sediments inclining gently for 35–50 km towards the Caspian Sea.

Major fluctuations in water levels are characteristic of this area. There was a marked increase in the water levels of the Caspian Sea from 1978, which peaked in 1995, followed by a decline from 1996 onwards. Reasons for the fluctuations are yet to be fully ascertained, but likely include precipitation and evaporation rates (Chen *et al.* 2017). In 2021, the water level in the avandelta proper dropped to only 0.2–0.4 m, a decrease of 1.19 m in comparison with the levels estimated in 2005 (Rusanov

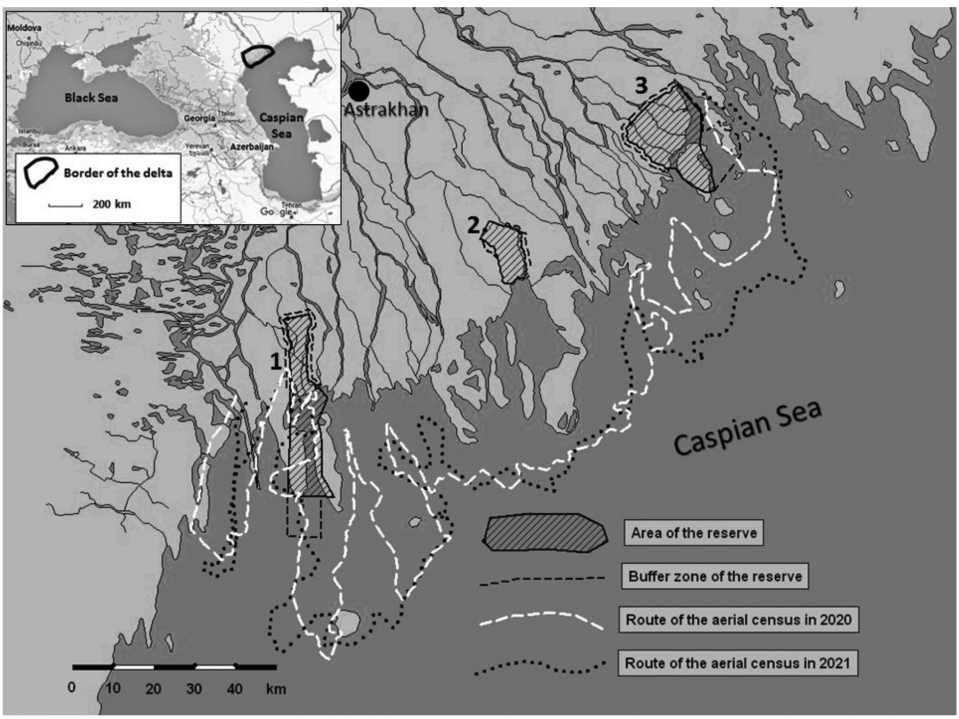

Figure 1. Location of the Volga River delta, the Astrakhan State Biosphere Reserve and routes flown during the aerial censuses in 2020–2021. Sections of the Reserve: 1 = Damchiksky, 2 = Trekhizbinsky, 3 = Obzhorovsky.

2013; Astrakhan State Biosphere Reserve unpubl. data 2021). The avandelta is notable for its very rich aquatic plant communities (Chervyakova 1965).

Data collection

A combination of aerial and boat surveys was used to census ducks on the avandelta during 13–18 November 2020 and 12–14 November 2021. The type of aircraft (AN-2), count methods and routes taken during the aerial surveys (Fig. 1) were the same as those used for surveys made of birds on the delta area in 2002–2008 (Rusanov 2004, 2013) and in 2018–2019 (Perkovskii *et al.,* unpubl. data), to permit comparison of the 2020–2021 data with earlier estimates of the numbers present. The routes flown in 2020 and 2021 were *c.* 600 km each year in length, made at an average flight height of 100 m and an average speed of 160 km/h. The duration of each census was about 5 hours. Aerial surveys were conducted only on days with good visibility, with two observers undertaking the survey (one each side of the cabin). Numbers of ducks were recorded as the total count for each point of the route where the birds were encountered, and the count area extended to 1,000 m on each side of the aircraft.

Numbers of Pochard present during the earlier counts (in November 2002–2008 and 2018–2019) were very approximate estimates, derived from the total number of all diving ducks recorded during the aerial surveys and a rough visual assessment of the proportion of Pochard amongst them. In 2020–2021, however, a more precise estimate of the proportion of Pochard in mixed flocks of diving ducks was obtained by analysing photographs taken, using a camera with a 70–200 mm lens, of all flocks of ducks observed during the surveys. A total of 8,746 photographs were taken in 2020 and 7,959 in 2021, of which *c.* 70% (good quality photos) were inspected. These were used to calculate the total numbers of diving ducks among all ducks counted during the aerial surveys, and to assess the proportion of Pochard present in both years. Two ornithologists inspected the photographs to verify the estimates.

Boat surveys undertaken in mid-November in 2020 and 2021 covered a major part of the Damchiksky section of the Astrakhan State Biosphere Reserve. These surveys followed the same *c.* 150 km route each year, and the count areas covered in calm sea conditions extended up to 500 m on each side of the boat. The numbers of ducks counted along the Damchiksky's water courses and also the aquatic vegetation observed on the route, in order to: (1) estimate the proportion of Pochard present in mixed flocks of staging ducks, and (2) describe in detail the key habitats supporting the largest flocks of Pochards. As for the aerial surveys, photographs were taken during the boat surveys which were then inspected on computer screens, resulting in 8,908 diving ducks being identified from the boat in 2020 and 8,086 in 2021. The total number of Pochard present in the study area was calculated by determining the proportion of Pochard among diving ducks that could be recognised to species level in the images and applying this measure to the total number of diving ducks counted.

Results

In total, *c.* 2,165,000 diving ducks of all species were counted in the avandelta of the River Volga during the mid-November 2020 aerial survey. We estimated that Pochard formed *c.* 16–18% of all diving ducks encountered, equating to *c.* 346,000–390,000 individuals recorded. The following year (in mid-November 2021), *c.* 766,300 diving ducks were counted during the aerial survey made along the same route, with Pochard accounting for *c.* 20–22% of the diving duck species identified by the two assessors; *c.* 153,200–170,000 individual birds.

The total number of diving ducks estimated from boat surveys in the Damchiksky area was 70,000 individuals in mid-November 2020 and 37,400 in mid-November 2021. Inspection of photographs found that Pochards formed *c.* 17% of all diving ducks counted in the Damchiksky area in 2020 and *c.* 21% in 2021, amounting to 11,900 and 7,900 individuals, respectively. The marked difference between 2020 and 2021 in the number of Pochard found in Damchiksky and on the avandelta more widely may be attributable to low water levels observed in autumn 2021, with some very shallow areas becoming unsuitable for Pochard and other diving ducks in this year.

It is therefore possible that some Pochard were staging in deeper waters in November 2021, beyond the areas covered by the aerial and boat surveys.

Only diving duck species (Pochard, Tufted Duck *Aythya fuligula*, Common Goldeneye *Bucephala clangula* and Smew *Mergellus albellus*) were in the mixed flocks of ducks seen staging in the study area during the 2020 boat surveys. This contrasted with several dabbling duck species (Mallard *Anas platyrhynchos*, Gadwall *Mareca strepera*, Northern Shoveler *Spatula clypeata*) and Eurasian Coot *Fulica atra* recorded in the flocks encountered in 2021, although these formed ≤ 1% of the totals counted. Boat surveys in Damchiksky found that Tufted Duck clearly dominated mixed flocks in this area, comprising 79.3% of all ducks identified in mid-November 2020 and 57.3% in mid-November 2021. Several sites holding large flocks (> 10,000 individuals) of staging Pochard (in combination, amounting to > 70% of all Pochard recorded each year) were observed for the first time in the Damchiksky section of the Astrakhan State Biosphere Reserve and in certain other areas of the avandelta in mid-November 2020 and 2021 (Fig. 2). In 2020, the Pochard congregated into eight main

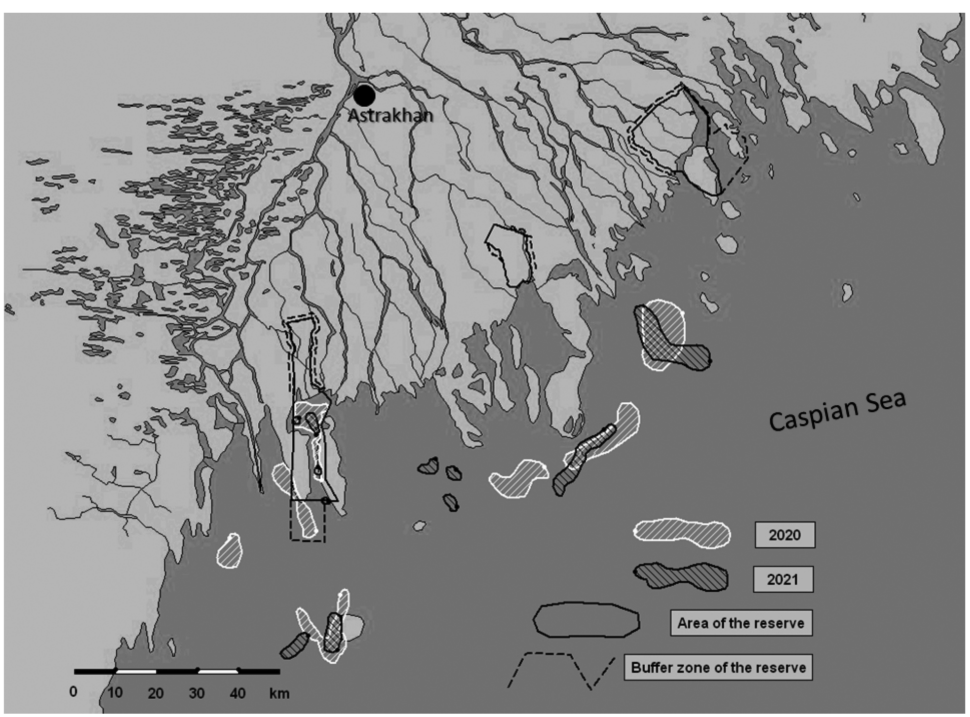

Figure 2. Location of sites holding large flocks of staging Pochard (in combination, amounting to > 70% of all Pochard recorded each year) in the avandelta of the River Volga during mid-November 2020 and 2021.

sites in the study area, while in 2021 they were more dispersed across 11 sites, probably due to very low water levels in the avandelta. The key staging sites were found to be in areas with submerged vegetation, dominated by freshwater green algae *Charophyte* sp. and pondweeds *Potamogeton* sp.

Discussion

Internationally important numbers of Pochard staging on the delta of the River Volga during autumn migration have been found only during the last 30 years (Krivenko 1999; Rusanov 2011). In the 20th century the delta was a major stopover and moulting site of dabbling ducks, whilst numbers of staging diving ducks were very low; for instance, in the autumns of 1960–1964, Pochard formed only 0.2% of all ducks recorded as staging in the region (Isakov & Krivonosov 1969). The biomass of submerged vegetation (particularly of stoneworts *Chara* sp.) at that time was very high but the water level (≤ 0.5 m) was too low for diving duck species (Chervyakova 1965). The Caspian Sea is characterised by high fluctuations in water levels, caused mainly by climatic factors (Baidin & Kosarev 1986), and the last increase in water levels during 1978–1995 (Chen *et al.* 2017) resulted in a rapid decline in the abundance of several submerged vegetation species (notably Starry Stonewort *Nitellopsis obtusa* and Common Stonewort *Chara vulgaris*) which provide important food resources for Pochard over large areas of the avandelta (Baldina *et al.* 2000; Rusanov 2011). The number of diving ducks (including Pochard) present during autumn migration however rose significantly with the increase in the Caspian Sea's water levels (Rusanov 2013), perhaps reflecting both the availability and the accessibility of food. Studies of Pochard staging in the avandelta of the River Volga in the 1970s showed that Charophyceae play an important role in the diet of this species, with the thallus and oospores of Starry Stonewort and other Charophyceae forming almost 50% of the Pochard's diet there in autumn (Rusanov 1979). The importance of Charophytes has similarly been reported for Pochard staging and wintering in Britain (Olney 1968), and Broad-leaved Pondweed *Potamogeton natans* is the main food for breeding and post-breeding birds (forming up to 70% of their diet) in some Belarussian wetlands (A. Kozulin & O. Ostrovsky, unpubl. data).

Very high numbers of Pochard were found to be using the Volga Delta as an autumn staging site following the decrease in water levels in the Caspian Sea from 1996 onwards, although marked annual fluctuations were reported. Numbers of Pochard estimated from counts made of mixed diving duck flocks during the November 2002–2003 and 2008 aerial surveys ranged from *c.* 240,000 up to *c.* 530,000 individuals each year (Rusanov 2004, 2013), with Pochard thought to comprise *c.* 18% of all staging ducks present in November 2008 (Rusanov 2013). More recently, totals for all diving ducks counted in the Volga avandelta during aerial surveys in 2018–2019 amounted to *c.* 2,600,000 (on 20 November 2018) and 750,000 individuals (on 7 November 2019), respectively (Perkovskii *et al.*, unpubl. data). The exact proportion of Pochard in the diving duck flocks was not determined on these occasions, but from the ratio identified

among diving ducks in 2020 and 2021 it is likely that the avandelta supported *c.* 440,000–500,000 Pochard in November 2018, and *c.* 130,000–150,000 in November 2019. Continuation of the decrease in water levels may however result in a marked decline in the numbers of Pochard staging in the avandelta region each autumn. Female Pochard tagged with GPS/GMS loggers (with dive sensors) in Lithuania and Belarus in 2018–2021 fed at depths of up to 1 m, mostly at up to 0.6 m (Švažas & Kozulin, unpubl. data). A further drop in water levels may force Pochard staging on the River Volga delta to feed in deeper and more saline areas located south of the avandelta, where communities of submerged vegetation are less developed (Chervyakova 1965).

The total number of Pochard globally is currently put at 1.23–1.33 million individuals (Wetlands International 2019). The 153,200–170,000 and 346,000–390,000 birds reported here for the delta of the River Volga in 2020–2021, which are consistent with other (albeit less rigorous) estimates made in recent years, thus indicate that the delta now supports up to 30% of all individuals of the species during autumn migration. It is currently the most important stopover site in the Palearctic for Pochard during autumn migration, yet only some of the key areas for Pochard within the avandelta are protected as part of the Astrakhan State Biosphere Reserve or its buffer zone (Fig. 2). Within the Reserve, almost all types of human activities including hunting and fishing are prohibited; only scientific research is allowed in its territory. Hunting is also prohibited in the buffer zone, but some types of economic activity are permitted in this area. Given that the results of this study show that the Pochard also congregate outside the buffer zone, the findings should facilitate a plan to extend the boundaries of the Reserve, so that the species is protected at all important stopover sites on the delta.

The marked increase in the number of Pochard staging in the Volga Delta in recent decades also suggests a certain redistribution of birds between the major stopover sites of the species in Europe, possibly caused by global climate change. The Pochard's second largest autumn stopover site in southern Russia is in the Taman Bay and Kerch Strait of the Azov Sea, where *c.* 144,000 individuals occurred in mid-November 2018 and 36,000 in mid-November 2019 (Y. Lokhman, unpubl. data). Stopover sites located in the Volga River delta and in the bays of the Azov Sea are unlikely to be used by the same individuals, because the surveys were undertaken at both sites in mid-November. As for the Volga Delta, numbers of staging Pochard in the Azov Sea were significantly higher in autumn 2018 in comparison with 2019.

It is likely that some of the Pochard staging in the delta of the River Volga during autumn spend the winter in the inshore waters of the Caspian Sea. The highest counts from the Caspian Sea in January were recorded in Azerbaijan in 1991, when up to 197,000 individuals were reported at Kyzylagach Bay and 93,000 at Kirov Bay (Sultanov 2000; Delany *et al.* 2006). Mid-January counts of > 10,000 Pochard have been made at several other sites along the coast of the Caspian Sea – in

Dagestan Republic of Russia, Turkmenistan, Uzbekistan, Kazakhstan and Iran (Delany *et al.* 2006; Mansoori 2009; Bukreev *et al.* 2018) – and, during the last 20 years, the Azov Sea and Black Sea region of Russia has become a principal wintering area for Pochard, possibly due to an increase of air temperature in this region in winter (Solokha & Lokhman 2017). The highest January count along the coast of the Azov Sea and the Black Sea coast of Russia was recorded in 2019, with nearly 260,000 Pochard reported (Solokha & Lokhman 2021). It is likely that these wintering flocks included birds that breed in southeast European Russia and Ukraine, which have shortened their migratory route in the warmer conditions associated with global climate change.

In conclusion, the delta of the River Volga is now a globally important stopover site for Pochard. For this reason, we urge the development of a large-scale Pochard monitoring and research programme to cover the entire delta, including areas where aerial and boat surveys have not yet been performed. Such information would provide a rationale for the effective conservation of this globally-threatened species and the sustainable use of habitats particularly important for Pochard in the region.

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Photograph: Common Pochard pair, by Jonas Vėgėlė.