Ornis Fennica 91:48–56. 2014

Phalacrocorax carbo sinensis in Europe – indigenous or introduced?

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Received 24 April 2013, accepted 12 December 2013

Since many years now it is rumoured that the inland European cormorant *Phalacrocorax carbo sinensis* was introduced by Dutchmen from China to Holland in the 16th century to perform cormorant fishing in Europe and thus has to be classified an Invasive Alien Species (IAS). Although this hypothesis is not based on scientific evidence it has already been referred to in scientific literature. To check its plausibility, this review confronts three essential aspects of the introduction hypothesis with German sources mainly from the Middle Ages and historical reports on European cormorant fishing. The analyses show that there is no evidence for the introduction of birds from China. Instead, a medieval breeding record as well as regular appearance of the cormorant in religious and secular literature from the Middle Ages show that the bird was at least temporarily well-known in deeper inland regions of the German-speaking area. The results raise strong doubts about the hypothesis of *Phalacrocorax carbo sinensis* being an introduced alien species.

1. Introduction

As a consequence of heavy persecution during the whole of the 19th century, around 1900 the inland race of the Great Cormorant *Phalacrocorax carbo sinensis* had disappeared from many parts of its north-western European breeding range. Protection measures, starting already at the beginning of the 20th century, permitted a slight recovery and recolonization of some former breeding areas (e.g., Denmark, Sweden; Herrmann 2011). However, from the 1950s until the end of the 1970s the population remained about stagnant, most likely due to the adverse effects of organo-chlorine contaminants like PCB and DDT. With the ban of DDT during the 1970s the cormorant population started to grow rapidly and to expand towards the north and east. During the 1990s and at the beginning of the 21st century the population reached a level not known before (Herrmann 2012b).

The effect of this development on fish stocks lead to demands for a pan-European population control primarily by fishery and anglers associations.

Based on a supposed lack of historical evidence for inland cormorant breeding in Europe, Olburs (2008, 2009) arranged and formulated an already existing speculation stating that the subspecies *P. c. sinensis* was introduced by Dutchmen during the 16th century by importing trained fishing cormorants from China to Europe to use them for aristocratic "sports". The introduction hypothesis was also referred to in scientific literature as a conceivable possibility (Steffens 2010) or as a fact (Pažur 2002).

The most frequently cited source was a reference to a Flemish falconer who presented trained cormorants to the French king at Fontainebleau at the beginning of the 17th century (d'Arcussia 1617). Moreover, the contradictory geographic

name *sinensis* ("Chinese") (Blumenbach 1798) gave additional rise to the introduction hypothesis.

This paper presents a review of historical documents and literature from the German-speaking area as well as contemporary reports regarding European cormorant fishing. The results will be used to critically examine the introduction hypothesis on the basis of three of its core assumptions:

1. Is there any evidence for a causal relationship between the beginning of cormorant fishing at European courts and trade relations between Holland and China? If so, the analysis of preserved sources would have to bring confirming results, such as reports on the import of birds by the Dutch from China to the places where cormorant fishing was practised in Europe.

2. Is the name *sinensis* for the north-western European inland subspecies of *P. carbo* an indication of its introduction from China? Since the first description is still valid today, its examination would have to show the reasons for this naming. Indications of an introduction of trained birds could possibly be found here as well.

3. Are there medieval accounts of *P. c. sinensis* breeding in inland regions of north-western Europe – or at least details on significant populations that cannot be explained by, e.g., rare visits by wintering *Phalacrocorax carbo carbo*? If *P. c. sinensis* was introduced in the 16th century, this question would have to be answered in the negative. On the other hand, medieval accounts of breeding colonies or high populations would raise strong doubts about the introduction hypothesis.

2. Material and methods

During researches for an extensive article about the local history of the cormorant that will be published soon (M. Beike, C. Herrmann & R. Kinzelbach in prep.), historical Latin names of the cormorant (like "corvus aquaticus" including the declensions) as well as vernacular German names (like "Scharbe") – in total over 200 names and spellings – were collected and entered in internet search engines. In this way, a first complex of historical sources was explored and checked for faunistic information. The sources used by the authors were identified and copies were researched online or obtained in printed form. This procedure was continued to the "deadlock", when no more sources were mentioned.

However, *P. c. carbo* is an occasional tree breeder in some European regions, although always in mixed colonies together with *P. c. sinensis*. As a rule, these colonies are situated close to the sea shores (Marion & Le Gentil 2006) so that it can be stated that *P. c. carbo* always breeds within reach of the preferred maritime habitat. Additionally, an investigation of osteo-archeological findings from the Swedish islands of Öland and Gotland by Ericsson & Hernandez Carrasquilla (1997) proved that at least until 1500 the maritime subspecies *P. c. carbo* bred in this region of the Baltic Sea. The authors based their results on the size of excavated humeri compared with new material from museums etc. In Germany, Denmark and other neighbouring countries, numerous findings of bones of *P. carbo* have also been made (Piehler 1976, Heinrich 2007). However, until now a thorough analysis whether the bones from the south-western Baltic belong to *P. c. carbo* or *P. c. sinensis* is still missing (Herrmann 2012a). So, to be on the safe side, we concentrate on medieval cormorant records from regions that are at least one hundred kilometres away from the sea to be able to clearly attribute them to *P. c. sinensis*.

3. Results

3.1. Cormorant fishing in Europe

Fishing with cormorants in Europe is documented in several reports, especially from the English and French courts in the 17th century. An extensive synopsis hereof has been published recently (Beike 2012). Therein, the question if Dutchmen are responsible for the introduction of trained cormorants or at least the idea of cormorant fishing as a leisure time activity is dealt with in detail. Based on speculations by Salvin & Freeman (1859), who associated European cormorant fishing to (merely assumed) reports of Jesuit missionaries from China, and on the mentioning of a Flemish fal-

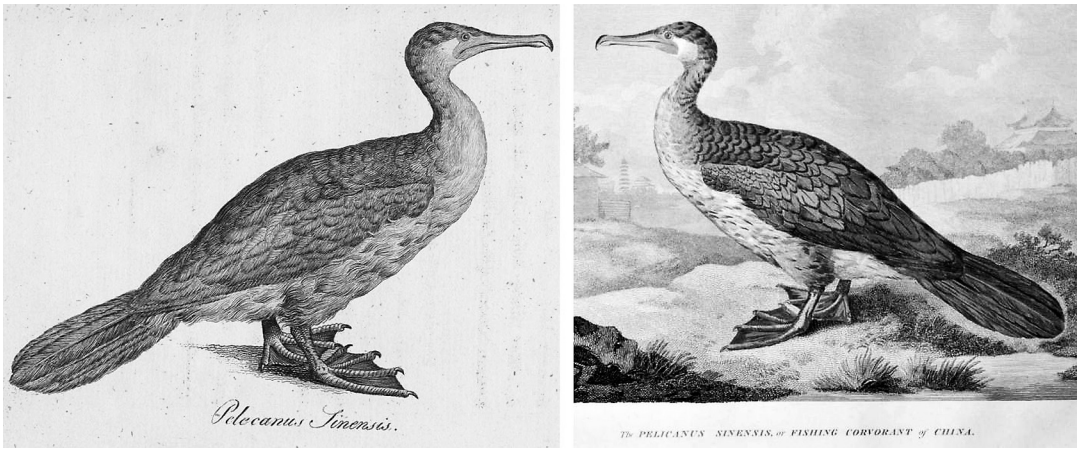

Fig. 1. Blumenbach's *Pelecanus sinensis* from 1798 (left) and its model (Staunton 1796) taken from the folio atlas accompanying the travel account by Staunton (1797) (right). The description says: "The *PELICANUS SINENSIS*, or FISHING CORVORANT of CHINA"

coner by d'Arcussia (1617), who presented trained cormorants to the French king, Dunoyer de Noirmont (1867) was the first one to suspect the introduction of the idea of cormorant fishing (but not of any trained birds) by Dutchmen in the 17th century. Since then, this mere presumption somehow was improperly converted into a fact. However, Beike (2012) identified the mentioned Fleming as a subordinate employee of the English court, who periodically was given the task of conveying trained cormorants to other European rulers as diplomatic gifts and furthermore performing the birds' unique skills (see also Hinds 1910). The only reported origins of the cormorants were breeding colonies in the "northern parts" of Great Britain. Explicitly named were the Isle of Man (rock-breeders) (Anonymous 1864) and the area of Reedham in Norfolk (tree-breeders) (Browne 1835). At a certain time, most likely the early 17th century, the birds were also collected as nestlings in the huge tree breeding colony of Zevenhuizen in the Netherlands to export them to England, where they were trained (Hegenitius & Ortelius 1630, Swammerdam 1737).

Summarising the available data, European cormorant fishing provably started in England at the beginning of the 17th century (Beike 2012), whereas the first reliable report on a fishing cormorant which was trained in Holland dates back as late as to the beginning of the 19th century (Naumann & Naumann 1817). Until this point, cormorant fishing even seems to have been unknown there. Contemporary Dutch sources speak of it as a curiosity (Nieuhof 1666, Dapper 1670, Nieuhof 1670, Swaen 1948).

A report of cormorant fishing in Venice from Scaliger (1557), however, dates from a time too early to reliably connect it with the English royal cormorant fishing more than 50 years later. In addition, the described methods used in Venice and afterwards in England clearly differ, so that this special report has to be seen as an individual case (Beike 2012).

3.2. The history of the name *sinensis*

In his description, Johann Friedrich Blumenbach (1798) copied an engraving of a juvenile fishing cormorant from a travel report from China by the British embassy official George Staunton (1737–1801) who observed the trained fishing bird on site (Staunton 1797, see also Fig. 1). Blumenbach literally translated the attached description of the bird into German and this is often considered to be the first description of the subspecies *P. c. sinensis*. However, according to Mlíkovský (2011), the *Pelecanus sinensis*, as the bird is named in the travel report, was described for the first time by Staunton (1796) from a single specimen obtained by the Macartney Embassy to China in November 1793 at Lake Weishan, China. The subspecies authorship thus becomes *Phalacrocorax carbo si-*

nensis (Staunton, 1796). According to this history, the holotype for the description of *P. c. sinensis* did not originate from Europe, but was collected in China.

The European inland cormorant, however, was described by Brehm (1824) as an own species under the name *Carbo subcormoranus*. Almost 100 years later, Claud B. Ticehurst (1923) noticed as a result of anatomical comparisons that the bird used for fishing in China and originally described by Blumenbach (1798) (or, according to our current knowledge: Staunton 1796) was anatomically identical with Brehm's *Carbo subcormoranus*. Hence, according to the priority rule, *Phalacrocorax carbo sinensis* had to be considered as the valid name also for the European inland cormorant.

In 1928 the American zoologists Outram Bangs and James L. Peters confirmed Ticehurst's results on the basis of the analysis of three birds from the Chinese provinces of Qinghai and Gansu. They concluded that "now that the Common Cormorant of Europe must be called *sinensis*, this seems an opportune time to point out once more the fallacy of bestowing geographic names." (Bangs & Peters 1928).

3.3. Historical data

3.3.1. Cultural history

As soon as the first written documents appeared in the history of the German language, authors mention the cormorant, beginning in the first half of the 9th century, most likely in the 840s. Walahfrid Strabo, abbot of the monastery of Reichenau, an island in Lake Constance, used the cormorant as a gloss for the "mergulus", one of the "unclean" birds in the Book of Leviticus in the medieval version of the Bible (Vulgata). These glosses did not aim at a precise translation. Instead, they were vernacular interpretations of terms unknown to the listeners, especially the "simple people" (see also Steinmeyer & Sievers 1879). The glosses were supposed to enable them to understand the religious messages of the Bible. To achieve this goal, the authors had to use well-known terms that people knew from their daily life. The cormorant, in Walahfrid's interpretation, is a "black bird diving into the water to procure fish... He stands for those who are reborn by Baptism but still long for the world's lowest avidities" (Stiftsbibliothek St. Gallen 2013a).

About 150 years later, around the turn of the millenium, Notker Labeo, principal of the monastery school in St. Gallen (Switzerland), situated close to Lake Constance as well, mentioned the cormorant in his commentary on the Book of Psalms, again to explain a biblical bird unknown to his pupils – the "pelican". Notker says that "natural scientists" report that the pelican "does not digest what he devours, just like the cormorant here on these lakes" (Stiftsbibliothek St. Gallen 2013b). Most likely he referred to Lake Constance (which, to explain the plural form, is both geographically and colloquially subdivided into several parts), but it cannot be excluded that he also had other lakes in mind, such as Lake Zürich.

Likewise, the cormorant left his marks in secular German literature of the Medieval. In the Traugemundslied, contained in a manuscript from the 14th century and written in the area of Strasbourg (Handschriftencensus 2013), the cormorant is said to have no stomach (Wolfskehl & von der Leyen 1924) – a misconception that closely resembles the explanations of Notker Labeo. The cormorant also appears in the so-called Vogelparlamente ("bird parliaments") or Vogelsprachen ("birds' speeches"), which can be found from the 14th century onwards and whose content slightly differs from work to work. But following a common structure, several kinds of birds make characterizing or describing statements (Busch 2001), in which the tense relationship between man and cormorant at that time found particular expression. In a text from the 15th century, written in the Nuremberg area, in which the birds give some advice to the "king", portrayed by the wren (in German "Zaunkönig" = "fence king"), the cormorant tells him to "commit murder" and allow robbery to make people fear his power (Bayerische Staatsbibliothek 2013).

3.3.2. Faunistic evidence

In the middle of the 13th century, Albertus Magnus described the cormorant's "injurious" effects on the fish fauna (Stadler 1916). This points to "cor-

morant problems" of monastery fish-farming at that time. This is confirmed about one hundred years after Albertus Magnus in Silesia. On October 12, 1377, Holy Roman Emperor Charles IV gave order to the people of Breslau (today Wrocław) "to kill and erase the water ravens... in those places where they live and have their nests". This had become necessary "because the water ravens... cause huge damage to the fishes in the water" (Korn 1870). In 1431, local breeding colonies are confirmed by a vow of high-ranking personalities from Breslau. They swear to "thoroughly banish and erase the water ravens and herons at Ronenberg and elsewhere in the country, where they nest, and destroy their nests every year, so that they cannot raise their young any more" (Klose 1781). "Ronenberg", or in modern spelling Romberg, is a village situated about 15 km to the west of Breslau. Today's Polish name is Samotwór (Knie 1845).

In the area of Trachenberg (Zmigrod) and Militsch (Milicz), approximately 40 kilometers north of Romberg, fish farming started in the 13th century (Anonymous 1940). Correspondingly, in 1310 a fish pond is mentioned in Schalkau (Skałka), only 2 kilometers south of Samotwor (Grünhagen & Wuttke 1892).

From 1331 to 1394, an aristocratic family is recorded in the Breslau area of which several members carried the cognomen "Wasserrabe" (= "water raven") (Heyne 1864; Grünhagen & Wuttke 1903), which in this case was positively connotated: In both above-mentioned breeding records it is determined that the breeding colonies of cormorants and grey herons must not be preserved any longer, which proves that the cormorant, for any reason and just like the grey heron, was a "noble" bird exclusively reserved for aristocratic hawking. This shows that a stable (not necessarily breeding) population of the cormorant had existed for a longer time before the first undoubtable breeding report in 1377 (see above). However, in the case of the grey heron, aristocratic hawking provably required carefully preserved breeding colonies to keep up the population (Kinzelbach 2008, Brauneis 2012). In Holland this is also reported for the cormorant (J. de Rijk in prep.). This suggests cormorant breeding for the area of Breslau at least from the second quarter of the 14th century onwards.

3.3.3. Bounties in the southern German speaking area

In Switzerland, numerous high rewards were offered from the late 15th until well into the 16th century for killing cormorants. Starting in 1484 in Luzern (Schweizerisches Idiotikon online 2012), a few years later, at the turn of the century, there obviously was a significant increase of the cormorant population which in 1510 lead to a cooperation of the three Swiss cities of Bern, Fribourg and Solothurn to combat the birds "because the cormorants do noticeable damage to the fishes" (Liebenau 1897).

An increase of the cormorant population in the southern part of the German speaking area around 1500 is also suggested by records from the Bavarian city of Augsburg, where in the year 1498 bounties were paid for 32 cormorants, whereas in the decades before and after the numbers were much smaller (Wiedemann 1890). In addition, there is a copperplate print by the unknown master P.P.W. which depicts two fish catching cormorants in Lake Constance not far from the city of Lindau (P.P.W. between 1502 and 1506).

4. Discussion

This review critically examines the hypothesis of *P. c. sinensis* being introduced to Europe. Here, I discuss three of its core assumptions in the light of the results obtained in the literature review.

1. Is there any evidence for a causal relationship between the beginning of cormorant fishing at European courts and trade relations between Holland and China?

There is not any known document reporting the transport of living cormorants from China to Europe. The birds used in cormorant fishing were procured in breeding colonies in Britain (Browne 1835, Anonymous 1864), at a certain time also in the Netherlands (Hegenitius & Ortelius 1630).

The introduction of the idea of cormorant fishing by the Dutch was initially based on a Fleming (Salvin & Freeman 1859, Dunoyer de Noirmont 1867) who presented trained birds to the French king in the early 17th century (d'Arcussia 1617).

But this man was an envoy of the English court. Therefore, his appearance is no indication of Holland being the origin of European cormorant fishing. Instead, this kind of "sports" has started in England and seemingly was unknown in Holland until the 19th century (Beike 2012). Holland did not play any further role in establishing cormorant fishing in Europe than being the place of origin of the above-mentioned cormorant trainer in service to the English king.

2. Is the name *sinensis* for the north-western European inland subspecies of *P. carbo* an indication of its introduction from China?

Blumenbachs original description from 1798 did not refer to a specimen from Europe. He reproduced a description of the *Pelecanus sinensis* published by Staunton (1796) in his travel report and the accompanying folio atlas. Hence, the authorship for the subspecies *Phalacrocorax carbo sinensis*, according to our current knowledge, has to be assigned to Staunton (1796) (Mlíkovský 2011). The bird described by Staunton was obtained by the Macartney Embassy in China in November 1793 from Lake Weishan. The inland cormorant of Europe was assigned to the subspecies *P. c. sinensis* not before 1923, when Ticehurst concluded from anatomical studies that the Chinese and the European inland cormorants are identical, to which Outram & Bangs (1928) agreed, pointing out "the fallacy of bestowing geographic names".

3. Are there medieval accounts of *P. c. sinensis* breeding in inland regions of north-western Europe – or at least details on significant populations that cannot be explained by, e.g., rare visits from wintering *P. c. carbo*?

The Middle Ages and the beginning of modern times are not separated from each other by a fixed date but by a gradual shift characterized by a variety of important inventions, discoveries and developments. Two of these significant factors are of prime importance for the search of medieval ornithological data – the invention of letterpress printing and the scientification of the idea of nature. In the Middle Ages, copying and spreading texts was possible only by hand. Johannes Gutenberg's invention of letterpress printing in the middle of the 15th century suddenly offered the opportunity, once the setting was done, to make much more copies in a much shorter period of time. Besides the scientification, this is one reason why we today have much more faunistic information even from the 16th century compared with the available data from the Middle Ages. Conrad Gessners *De avium natura* from 1555 is a perfect example for this hand-in-hand development (Kinzelbach 1999).

Therefore, the interpretation of medieval sources requires great caution to avoid misinterpretations (see also Dinzelbacher 2000, 2008). Whereas a small number of cormorant records from, e.g., the comparatively well documented 18th century indeed can be seen as evidence for only a few breeding sites (like in Herrmann 2011), a corresponding interpretation of a similar data situation from the Middle Ages would be improper. Due to the above-mentioned circumstances, written traditions are much rarer and, to make things worse, hardly accessible. Most of them lie as unica hidden in local archives and only coincidentally come to the surface in printed copies published by local historians. Since the digitalisation of historical documents on the internet proceeds very quickly, further discovery of previously unknown medieval breeding evidence is to be expected. In addition, most promising researches could be started in archives that cover historical fish-farming regions or areas with natural lakes, such as Lake Constance, Mecklenburg-Western Pomerania, Masuria, Bohemia or Silesia.

The earliest known written documents from Germany with reference to the cormorant serve religious and didactic benefits, as was typical especially in the Early Middle Ages. The faunistic information included in these manuscripts has to be evaluated strictly with regard to this fact. This needs extensive efforts to figure out the authors' intentions when writing down the name of the cormorant: To fulfil their function as vernacular interpretations of terms unknown to the readers or listeners, the texts of Notker Labeo and Walahfrid Strabo required common knowledge of the cormorant's habits and especially the "voracious" hunting behaviour in groups, resulting from regular presence of the bird, which in turn can only be explained by the presence of the subspecies *P. c. sinensis*.

In the middle of the 13th century, Albertus

Magnus describes “injurious” effects on the fish fauna (Stadler 1916). This can be confirmed by the reports from 1377 (Korn 1870) and 1431 (Klose 1781) on cormorant breeding sites in the region of Breslau, where the birds most likely already had nested for a longer time and which is situated approximately 350 km from the Baltic Sea. Regarding the geographical circumstances, the subspecies that bred here must have been *P. c. sinensis*.

About one hundred years later, high rewards were offered in Switzerland for killing cormorants, which culminated in a supraregional cooperation. The obvious increase of the cormorant population, possibly due to breeding somewhere in this region, can also only be attributed to *P. c. sinensis*. In conclusion, the introduction hypothesis cannot be conciliated with the available historical data; there is no evidence that *P. c. sinensis* was absent at that time and introduced to Europe from China at any later point in history.

Acknowledgements. I wish to thank Mr. C. Herrmann for his support throughout my researches and revision of this manuscript.

Merimetson *sinensis*-alalajin luonnonvaraisuudesta Euroopassa

Merimetson sisämaamuodon (*Phalacrocorax carbo sinensis*) on viime vuosina väitetty vierasperäiseksi Euroopassa, ja tuoduksi Eurooppaan kalastustarkoituksiin Kiinasta 1500-luvulla Hollantilaisten toimesta. Vaikka väittämä ei ole perustunut tieteelliseen näyttöön, on vierasperäisyys-hypoteesi esiintynyt myös tieteellisessä kirjallisuudessa. Tässä artikkelissa käsitellään hypoteesin kannalta kolmea keskeistä näkökohtaa, perustuen saksankielisiin keskiaikaisiin ja muihin historiallisiin kirjallisuuslähteisiin. Lähteet käsittelevät merimetson käyttöä kalastuksessa Länsi-Euroopassa, sekä esiintymistä sisämaassa saksankielisessä Keski-Euroopassa.

Kirjallisuuskatsauksessa ei löytynyt viitteitä *sinensis*-merimetsojen tuonnista Kiinasta Eurooppaan. Sen sijaan merimetso tunnettiin keskiajalla saksankielisen Keski-Euroopan sisäosissa sekä pesimälintuna että tavallisesti esiintyvänä lajina, sekä uskonnollisen että sekularistisen kirjallisuuden perusteella. Tulosten perusteella *sinensis*-merimetson vierasperäisyys-hypoteesi on vahvasti kyseenalainen.

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