



An overview of Quaternary bird remains from the southern part of the North Sea

U vindt een Nederlandse samenvatting aan het eind van de tekst.

BRAM W. LANGEVELD
NATURAL HISTORY MUSEUM
ROTTERDAM
WESTZEEDIJK 345
3015 AA ROTTERDAM
THE NETHERLANDS
LANGEVELD@HETNATUURHISTORISCH.NL

Abstract | Bird skeletal remains fished directly from the North Sea are scarce, most likely due to their generally small size, but they are more common in material collected from nourished beaches. Quaternary (estimated as predominantly Late Pleistocene to Early Holocene) remains of at least 48 bird species are currently known from the North Sea; this includes humeri of *Cephus grylle* (Linnaeus, 1758) and *Calidris alba* (Pallas, 1764)/*C. alpina* (Linnaeus, 1758)/*C. temminckii* (Leisler, 1812) which are reported here for





FIGURE. | *Geese in flight.*
Photo: Pixabay.com.



FIGURE 1. | *Selected Quaternary bird remains from the southern part of the North Sea. A: Calidris alba (Pallas, 1764)/C. alpina (Linnaeus, 1758)/C. temminckii (Leisler, 1812), humerus, Banjaardstrand, private coll. Henk ter Steege, cranial view; B: Cepphus grylle (Linnaeus, 1758), humerus, Zandmotor, private coll. Rick van Bragt, cranial view; C: Lagopus lagopus (Linnaeus, 1758), humerus, Zandmotor, coll. Natural History Museum Rotterdam NMR998900006029, cranial view; D: Tetrao praeurogallus Jánossy, 1969, carpometacarpus, Maasvlakte 2, private coll. Kommer Tanis 4364, dorsal view; E: Bubo scandiacus (Linnaeus, 1758), tarsometatarsus, Zandmotor, private coll. Heleen Zwennes 547-ZM-17, dorsal view; F: Pinguinus impennis (Linnaeus, 1758), humerus, Westenschouwen, private coll. Hester Loeff, cranial view; G: Phalacrocorax cf. aristotelis (Linnaeus, 1761), tarsometatarsus, Katwijk, private coll. Arie Twigt V22, dorsal view. Scale bar represents 2 cm (A) or 4 cm (B-G). C-E from Langeveld (2020b); F photograph Hester Loeff; G from Langeveld & Twigt (2021).*

the first time; additionally a new record of *Pinguinus impennis* (Linnaeus, 1758) demonstrates Westenschouwen as the sixteenth Dutch beach site for this species. Compared to the mammal record, the avifauna remains relatively poorly known, due to scarcity of material and comparatively low research effort. Lack of dating poses a problem when interpreting the record. The fossil bird record does however contain taxa that do not currently occur in the study area or are extinct (e.g. *Pinguinus impennis*) and species that based on their ecology/biostratigraphy must date from the Pleistocene and therefore adds to our understanding of the past ecosystems of the North Sea area.

Introduction

Bird skeletal remains fished directly from the North Sea are scarce, most likely due to their generally small size (Langeveld & Tanis, 2015), as they are more common in material collected from nourished beaches (Langeveld *et al.*, 2017) and generally bird remains do have reasonable preservation potential (Olsen, 1979). Since the review of the record by Langeveld (2020b), additional fossil bird remains were published by Langeveld & Twigt (2021), Langeveld & Verhoeff (2021), Langeveld *et al.* (2021), Schoemaker (2021) and Langeveld & ter Steege (2022). Quaternary remains of at least 48 species are currently known from the North Sea (Langeveld, 2020b; Langeveld & Twigt, 2021; Schoemaker, 2021; and new data below) (Table 1; Fig. 1). These are predominantly extant species, but some of those species no longer

TABLE 1. | All bird taxa known through fossils from the Pleistocene/Holocene of the southern part of the North Sea.

Identifications at family or genus level are only listed when they represent one or more other species in that family or genus.

*: first reported in the present paper; a-k: previously published: a: Langeveld *et al.* (2017); b: Langeveld (2016); c: Langeveld (2020b); d: de Bruijn & de Bruijn (2016); e: Langeveld & Twigt (2021); f: Langeveld & Mol (2017); g: Langeveld & Tanis (2015); h: Stewart (2001); i: summarized by Langeveld (2020a); j: Langeveld *et al.* (2016); k: Schoemaker (2021).

Family	Species	Dutch name
Anatidae	<i>Cygnus olor</i> (Gmelin, 1789) ^a	knobbelzwaan
	<i>Anas</i> sp. indet. ^a	eend onbepaald
	<i>Anas querquedula</i> Linnaeus, 1758/A. <i>crecca</i> Linnaeus, 1758 ^a	zomertaling/wintertaling
	<i>Bucephala clangula</i> (Linnaeus, 1758) ^a	brilduiker
	<i>Clangula hyemalis</i> (Linnaeus, 1758) ^a	ijseend
	<i>Melanitta nigra</i> (Linnaeus, 1758) ^a	zwarte zee-eend
	<i>Anser</i> spp. (large geese) ^a	gans onbepaald (groot)
	<i>Anser/Branta</i> spp. 1 (medium geese) ^a	gans onbepaald (middel)
	<i>Anser/Branta</i> spp. 2 (small geese) ^a	gans onbepaald (klein)
	<i>Anser</i> cf. <i>djuktaiensis</i> Zelenkov & Kurochkin, 2014 ^a	uitgestorven gans
Phasianidae	<i>Lagopus lagopus</i> (Linnaeus, 1758) ^b	moerassneeuwhoen
	<i>Tetrao praeurogallus</i> Jánossy, 1969 ^c	uitgestorven auerhoen
Gaviidae	<i>Gavia arctica</i> (Linnaeus, 1758) ^a	parelduiker
	<i>Gavia immer</i> (Brünnich, 1764) ^c	ijsduiker
	<i>Gavia stellata</i> (Pontoppidan, 1763) ^a	roodkeelduiker
Procellariidae	<i>Calonectris</i> sp./ <i>Pterodroma</i> sp. ^c	stormvogel onbepaald
	<i>Puffinus</i> sp. ^a	pijlstormvogel onbepaald
Podicipedidae	<i>Podiceps</i> cf. <i>cristatus</i> (Linnaeus, 1758) ^d	fuut
Ciconiidae	<i>Ciconia nigra</i> (Linnaeus, 1758) ^c	zwarte ooievaar
Ardeidae	<i>Ardea</i> sp. ^a	reiger onbepaald
Sulidae	<i>Morus bassanus</i> (Linnaeus, 1758) ^a	jan-van-gent
Phalacrocoracidae	<i>Phalacrocorax</i> cf. <i>aristotelis</i> (Linnaeus, 1761) ^a	kuifaalscholver
	<i>Phalacrocorax carbo</i> (Linnaeus, 1758) ^a	aalscholver
	<i>Phalacrocorax carbo</i> cf. <i>carbo</i> (Linnaeus, 1758) ^f	grote aalscholver
Pandionidae	<i>Pandion haliaetus</i> (Linnaeus, 1758) ^c	visarend
Accipitridae	Accipitridae indet. ^a	roofvogel onbepaald
	<i>Accipiter gentilis</i> (Linnaeus, 1758) ^c	havik
	<i>Haliaeetus albicilla</i> (Linnaeus, 1758) ^a	zeearend
Rallidae	<i>Fulica atra</i> Linnaeus, 1758 ^a	meerkoet
Gruidae	<i>Grus grus</i> (Linnaeus, 1758) ^d	kraanvogel
Haematopodidae	<i>Haematopus ostralegus</i> Linnaeus, 1758 ^a	scholekster
Scolopacidae	<i>Calidris canutus</i> (Linnaeus, 1758) ^a	kanoet
	* <i>Calidris alba</i> (Pallas, 1764)/ <i>C. alpina</i> (Linnaeus, 1758)/ <i>C. temminckii</i> (Leisler, 1812)	drieteenstrandloper/ bonte strandloper/ Temmincks strandloper
	<i>Gallinago gallinago</i> (Linnaeus, 1758) ^a	watersnip
	<i>Limnocyttus minimus</i> (Brünnich, 1764) ^a	bokje
	<i>Numenius arquata</i> (Linnaeus, 1758) ^h	wulp
Laridae	Laridae indet. ^a	meeuw onbepaald
	<i>Chroicocephalus</i> cf. <i>ridibundus</i> (Linnaeus, 1766) ^a	kokmeeuw
	<i>Larus marinus</i> Linnaeus, 1758 ^a	grote mantelmeeuw
Stercorariidae	<i>Stercorarius pomarinus</i> (Temminck, 1815) ^c	middelste jager
Alcidae	<i>Alca torda</i> Linnaeus, 1758 ^a	alk
	<i>Alle alle</i> (Linnaeus, 1758) ^c	kleine alk
	* <i>Cephus grylle</i> (Linnaeus, 1758)	zwarte zeekoet
	<i>Pinguinus impennis</i> (Linnaeus, 1758) ⁱ	reuzenalk
	<i>Uria aalge</i> (Pontoppidan, 1763) ^c	zeekoet
Strigidae	<i>Bubo bubo</i> (Linnaeus, 1758) ^j	oehoe
	<i>Bubo scandiacus</i> (Linnaeus, 1758) ^c	sneeuwuil
	<i>Surnia ulula</i> (Linnaeus, 1758) ^k	sperweruil
Passeriformes	Passeriformes indet. ^h	zangvogel onbepaald



live in the study area (e.g. *Lagopus lagopus* (Linnaeus, 1758) (Fig. 1C) and *Bubo scandiacus* (Linnaeus, 1758) (Fig. 1E)) and some are extinct (e.g. *Pinguinus impennis* (Linnaeus, 1758) (Fig. 1F) and *Tetrao praeurogallus* Jánossy, 1969 (Fig. 1D)). Radio-carbon dating of the bird remains generally is not successful (Langeveld *et al.*, 2017; van der Plicht & Kuitens, this volume). The geological age of the fossil bird remains is estimated as predominantly Late Pleistocene (Weichselian) to Early Holocene based on state of fossilization and other finds from the same beaches, although they may very rarely be from the Early or Middle Pleistocene (Langeveld, 2020b). The Dutch fossil bird record is better known onshore, especially from Holocene archeozoological studies (Clason & Prummel, 1978; Çakırlar *et al.*, 2019). Records of fossil avifauna from the North Sea published since Langeveld (2020b) are summarized and new material is added in this paper.

Methods

Material was obtained on loan from private collector citizen scientists that are active on nourished beaches. Information on sites is contained in Mol & Bakker (this volume). Identifications were made through direct comparison with the avian osteological collection of the Natural History Museum Rotterdam (NMR) (Slieker *et al.*, 2021) and consultation of osteological literature. Anatomical terminology follows Baumel & Witmer (1993). Orientation follows Cohen & Serjeantson (1996). Taxonomy follows Gill & Donsker (2020). Measurements follow von den Driesch (1976).

Results

Two specimens represent taxa new for the southern part of the North Sea; additionally a new record of *Pinguinus impennis* represents a sixteenth Dutch beach site for this species.

Family Alcidae

Cephus grylle (Linnaeus, 1758)

Material – Zandmotor: coll. Rick van Bragt, 1 humerus (Fig. 1B).

The presence of a canalis n. coracobrachialis cranialis on this complete and rather well-preserved left humerus (GL: 59.5 mm) demonstrates it is a Charadriiformes; the slightly flattened humeral shaft and the distal elongation of the tuberculum dorsale into a crista m. supracoracoidei allow identification as Alcidae (Smith, 2011). The humeral shaft flattening is only very moderate, which combined with the presence of a large and deep fossa pneumotricipitalis matches *Cephus grylle*. Its GL fits well with this taxon (Langeveld, 2020a).

Pinguinus impennis (Linnaeus, 1758)

Material – Westenschouwen: coll. Hester Loeff, 1 humerus (Fig. 1F).

The presence of a canalis n. coracobrachialis cranialis on this proximal fragment of a right humerus demonstrates it is a Charadriiformes; the flattened humeral shaft and the distal elongation of the tuberculum dorsale into a crista m. supracoracoidei allow identification as Alcidae (Smith, 2011). Its Bp measures c. 25 mm and this points to *Pinguinus impennis* (Langeveld, 2020a), as its lack of mineralization excludes Early Pleistocene or older taxa.

Family Scolopacidae

Calidris alba (Pallas, 1764)/*C. alpina* (Linnaeus, 1758)/*C. temminckii* (Leisler, 1812)

Material – Banjaardstrand: coll. Henk ter Steege, 1 humerus (Fig. 1A).

This humerus is slightly damaged proximally while it misses the condyles distally. The processus supracondylicus radialis has broken off. Its GL could not be measured. However, following Hordijk *et al.* (2015: fig. 23) another measurement was taken: GLpsr which measures the length from the proximal end of the humerus to the proximal attachment of the processus supracondylicus radialis. GLpsr in this specimen is 24.4 mm. This matches well with the GLpsr of *Calidris alpina* in NMR (NMR998900005237: GLpsr: 25.0 mm). *Actitis hypoleucos* (Linnaeus, 1758) is of similar size but the crus dorsale fossae of the fossil is flat instead of raised, raised being the condition in *A. hypoleucos* (Meijer *et al.*, 2013). Most

other Scolopacidae are somewhat (including *Limnocyrtus minimus* (Brünnich, 1764)) or significantly larger than *Calidris alpina*; however the similar-sized *C. alba* and *C. temminckii* (van Gils & Wiersma, 1996) could not be discerned from *C. alpina*.

Discussion

Langeveld (2020b) recently discussed (aspects of) the fossil bird record of the North Sea. The two taxa reported here as new for that record do not add significant details; nor does *Phalacrocorax cf. aristotelis* (Linnaeus, 1761) reported since then by Langeveld & Twigt (2021) (Fig. 1G). Schoemaker (2021) reported the first record of *Surnia ulula* (Linnaeus, 1758); this species currently does not occur in the study area and is confined to forest tundra and boreal taiga of the Holarctic where it prefers open areas and sparse woodland (del Hoyo *et al.*, 1999). Langeveld *et al.* (2021) noted the heterogeneity of the bird fossil record recovered from various Dutch beaches. This most likely represents the heterogeneity of that record in the various sand source areas and may well be caused by paleoecological (Langeveld *et al.*, 2021) or stratigraphical differences between the sites.

Conclusion

Quaternary (predominantly Late Pleistocene/Holocene) fossils of at least 48 bird species are known from the southern part of the North Sea (Table 1) through finds by citizen scientists on nourished beaches. Compared to the mammal record, the avifauna remains relatively poorly known, due to scarcity of material and comparatively low research effort. Lack of dating poses a problem when interpreting the record. The fossil bird record does however contain taxa that do not currently occur in the study area and species that based on their ecology/biostratigraphy must date from the Pleistocene and therefore adds to our understanding of the past ecosystems of the North Sea area. More specimens need to be collected, studied and dated in order to gain more insight into the Quaternary avifauna of what is now the southern part of the North Sea (Langeveld, 2020b).

Acknowledgements

Rick van Bragt, Hester Loeff and Henk ter Steege made fossil material



available for study. Dick Mol initiated the production of this volume.

Samenvatting

Fossiele vogelresten worden slechts zelden uit de Noordzee opgevist, waarschijnlijk als gevolg van hun geringe formaat, maar worden wel regelmatig op opgespoten stranden verzameld. Onder gunstige omstandigheden hebben vogelresten immers geen heel slechte kans om fossiel bewaard te blijven. Kwartaire (naar schatting voornamelijk uit het Laat-Pleistoceen tot Vroeg-Holoceen) resten van ten minste 48 vogelsoorten zijn nu uit de Noordzee bekend; daaronder zijn ook humeri van zwarte zeekoet *Cephus grylle* (Linnaeus, 1758) en drieteenstrandloper *Calidris alba* (Pallas, 1764)/bonte strandloper *C. alpina* (Linnaeus, 1758)/Temmincks strandloper *C. temminckii* (Leisler, 1812) die hier voor het eerst gemeld worden. In vergelijking met de

fossiele zoogdierfauna blijft de fossiele avifauna relatief slecht bekend, door schaarsheid van materiaal en doordat er weinig onderzoek aan gedaan is. Het gebrek aan absolute dateringen vormt een probleem bij interpretatie van de fossielen. De fossiele avifauna bevat echter wel soorten die tegenwoordig niet in het studiegebied voorkomen of uitgestorven zijn (zoals de reuzenalk; zie kader) en soorten die gebaseerd op hun ecologie of biostratigrafie uit het Pleistoceen moeten stammen en draagt dus bij aan een beter begrip van de fossiele ecosystemen van dat wat nu de Noordzee is.

REUZENALK

De reuzenalk (Afb. 2) was een grote, niet-vliegende alk van de Noord-Atlantische Oceaan. Een evenknie van de pinguïns op het zuidelijk halfrond, maar niet nauwverwant. De soort stierf rond 1844 uit als direct gevolg van bejaging door de mens (Fuller, 1999). Skeletresten uit Nederland en de aangrenzende zuidelijke Noordzee werden als zeldzaam beschouwd, maar dankzij vondsten op de Nederlandse opgespoten stranden zijn inmiddels meer dan 125 (sub)fossiele botten bekend geworden, doordat ze door citizen scientists verzameld zijn. Een deel hiervan wordt nu bewaard in museumcollecties. Het materiaal werd op 16 stranden verzameld; recentelijk kwam het strand van Westenschouwen bij de vindplaatsen van Langeveld (2020a) door de vondst van een proximale fragment van een opperarmbeen uit de rechtersleugel (Fig. 1F). Er werden vier ¹⁴C-dateringen uitgevoerd aan diverse strandvondsten met resultaten van 1425-1300 BC tot meer dan 48.000 cal BP. De grote hoeveelheid resten veranderde het beeld van de reuzenalk in de zuidelijke Noordzee van een zeldzame dwaalgast naar waarschijnlijk een algemene of geregelde wintergast gedurende de afgelopen millennia (Langeveld, 2020a).



AFBEELDING 2. | Reconstructie van de reuzenalk broedend in een grote kolonie.
Illustratie: Remie Bakker/Manimal Works, Rotterdam.

