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Vocal signalling by Eurasian Spoonbills *Platalea leucorodia* in flocks before migratory departure

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(Abstract)

We describe a vocal signal and associated postures shown by Eurasian Spoonbills *Platalea leucorodia leucorodia* just before the departure of (part of) the flock from a site, but also occurring in flight. Onomatopoeitically called ‘ook’, it is a soft muffled sound that was noticed in spoonbills at a stopover site during southward migration in southwestern France and at a post-breeding feeding site in The Netherlands. When making the ‘ook’-sounds, adults as well as juveniles contributed to what looked like dialogues, the sound of the juvenile having a higher pitch than that of the adult. On the basis of their specific occurrence in pre-departure contexts, we propose that the vocalizations function during collective decision-making, perhaps contributing to reach consensus before and during non-routine group movements from one place to another.

SAMENVATTING

Lepelaars staan bekend als ‘stille vogels’, maar dat blijkt niet altijd zo te zijn. In dit artikel beschrijven we formeel de (her-)ontdekking van zachte korte roepjes van individuele lepelaars voorafgaande aan het vertrek van een verzamelplaats in zuidwest Frankrijk. Het geluid nabootsend, beschreef Ernst Poorter (2018) deze roep als ‘oek’, en het werkelijk maken van deze geluiden als het werkwoord ‘oeken’. Bij het uiten van een ‘oek’ wordt de lepelsnavel tot horizontaal opgetild, licht geopend, en de keel zwelt een beetje op. Lepelaars maken deze ‘oek’-geluiden net voor of tijdens gezamenlijke, gevlogen, verplaatsingen, waarbij het lijkt alsof de vogels in een groep ‘in overleg’ zijn. Dat gebeurde tijdens de trek, maar ook in de foerageergebieden in en net na de broedtijd. De ‘oek’-roepjes van een juveniel waren hoger en heser dan die van de volwassen lepelaar waarmee de jonge vogel optrok. Op grond van het specifieke voorkomen voorafgaande aan het vertrek van een plek, formuleren wij de hypothese dat het ‘oeken’ een functie heeft bij het bereiken van gezamenlijke beslissingen.

(INTRODUCTION)

Although it is no news that many birds migrate in groups, the possibility that individuals in pre-departing flocks actively engage in communication about what happens next (e.g. Raveling 1969, Black 1988), is receiving renewed interest now that the study of collective decision-

making in animal groups gains momentum (Couzin 2009, and see e.g. Conradt & Roper 2003, Conradt & Roper 2005, Helm *et al.* 2006, Sankey *et al.* 2021). For long-distance migratory shorebirds, descriptive studies have drawn attention to the surge in vocalizations in onshore flocks as the birds become restless and become involved in low circling flights in the hours and minutes before departure in structured flight formations (Piersma *et al.* 1990, Tulp *et al.* 1994, Leyrer *et al.* 2009, Conklin & Battley 2011). This happens often, but not always, before sunset. The vocalizations of shorebirds before and during departure on long-distance flights (rather than during daily commutes or winter mass displacements, see Piersma *et al.* 1990) are usually described in the category ‘contact-alarm calls’ (Cramp & Simmons 1983).

It remains an open question whether these vocalizations are functionally similar to the vocalizations accompanied by ritualized head and neck movements of particular flock-members in swans and geese prior to take-off from a local patch (Raveling 1969, Black 1988). Hausberger *et al.* (2020) show that a faster calling rhythm is associated with higher probabilities that both members of pairs of Pale-winged Starling *Onychognathus nabouroup* fly away. For Whooper Swans *Cygnus cygnus* and Bewick’s Swans *Cygnus columbianus bewickii* such signalling by both members of a pair increases in frequency in the 30 s before take-off (Black 1988).

Eurasian Spoonbills *Platalea leucorodia* have a strong reputation as ‘silent birds’. The two European handbooks, by Bauer & Glutz von Blotzheim (1966) and by Cramp & Simmons (1977), provide near-identical descriptions of their voices, in the latter summarized as: “Generally silent; voice little used except for soft murmurs at close range, and at breeding colonies where adults occasionally utter deep-grunting ‘huh-huh-huh’, also rendered ‘hou-hou-hourour-hourour’, and probably equivalent to groaning calls at nest-relief.” In addition, the rasping sounds of begging chicks are described. That the vocalizations of spoonbills are barely audible to human observers except at close range, does not mean that such vocalizations are not important to either sender or receiver, or that they are uninteresting.

In this note we describe specific vocalizations expressed with equally specific movements of head and bill by Eurasian Spoonbills *Platalea leucorodia leucorodia* (henceforth spoonbills). These sounds and behaviours especially occur in the minutes before take-off on long-distance migration flights, but in other contexts too. These vocalizations and their occurrence appear not to have not been formally described. However, they were documented in a

self-published book by Poorter (2018), findings which we have considered in the present account.

STUDY SYSTEM AND METHODS

In August-September several thousand spoonbills leave their breeding areas in Denmark, Germany, The Netherlands, Belgium and France to migrate to wintering areas on the southern Iberian peninsula and along the northwest coast of Africa (Lok *et al.* 2011, Hortas & Ruiz 2015). Their migration can be characterized as ‘hopping’ (rather than the ‘jumping’ type of migration with long-distance flights Piersma 1987). To what may add up to 5000 km long migrations, the spoonbills regularly make stops between the flights carried out both during day and night (Lok *et al.* 2015, Piersma *et al.* 2021).

An important stopping site for spoonbills are the shallow margins of especially the southernmost basin of the National Nature Reserve Marais d’Orx (43.60°N, 01.39°W) on the Atlantic coast near the city of Bayonne in southwest France. For southward migrating spoonbills continuing migration to southern Iberia and West-Africa, the Marais d’Orx is one of the last suitable stopping sites before a flight across the mountain range that links the Pyrennees with the Cantabrian Mountains, and then across the Spanish plateau (Piersma *et al.* 2021). Based on daily observations and colour-ring readings from mid-August to mid-October 2016-2020, it is estimated that between 3500 and 6400 spoonbills from northwest Europe make a stop in Marais d’Orx every autumn migration (F. Lagarde unpubl. Obs.) Assuming a source population of about 20,000 spoonbills, we further estimate that at least a quarter of the spoonbills from northwest Europe make a stop in Marais d’Orx (F. Lagarde unpubl. obs.). Of the individually marked spoonbills, ca. 75% were ringed as chicks in The Netherlands, the remainder in other breeding areas north of Marais d’Orx.

The data of numbers and origins of spoonbills reported above were collected during standardized morning surveys of spoonbill flocks in the Marais d’Orx. Becoming increasingly familiar with the routines of the spoonbills, of which part of the resting flocks would normally leave the shallow lake in course of the morning towards the south, we noticed that such departures tended to be preceded by specific movements of head and bill by some of the flock-members. We began to realize that what was happening in front of us looked like social vocalizations possibly related to a decision to depart from the stopover site. First year birds were

distinguished by their light-coloured, pinkish, bills rather than the black bills decorated by yellow tips. First year birds also show the distinct black wing tips typical of immatures (Cramp & Simmons 1977; <https://www.surfbirds.com/mb/Features/spoonbill/ageing-spoonbill-0402.html>).

On 28 July 2018 Hilco Jansma filmed a sequence lasting 1 min and 50 s of an unringed adult accompanied by a colour-ringed juvenile at Wetering-Oost in De Weerribben, The Netherlands (52.77°N, 05.99°E). The chick carried the ring combination aGP/YNfP, applied on 11 May 2018 at Onderdijk-Vooroever, The Netherlands (52.74°N, 05.15°E), ca. 60 km west of the filming location. If the adult would have been the parent of the juvenile, they would have been together for a full two months after fledging. Interestingly, on 30 September 2018 the juvenile was observed again at Marais d'Orx by FL. Despite the observations of birds making the calls at the Marais d'Orx, we were not able to collect good recordings. Only vocalizations made at De Weerribben were usable and were isolated from the original video with version 2.4.2 of Audacity® from <https://audacityteam.org/>. A total of 10 vocalizations made by the adult and three sounds made by the juvenile were used. Sonograms were produced with version 2.6L of Syrinx, a sound recording/editing/playback program designed specifically for research in animal acoustic communication. We measured the lowest and the highest frequencies of each sound. The duration of a single notes is simply the time between the start and finish of that note. The duration of what we called 'double sounds' represents the time between the start of the first and the finish of the last note including the interval between them. We used XLSTAT v2020.5 to calculate averages with standard deviations of the durations of the sounds. The fully filmed sequence of the dialogue of spoonbills in De Weerribben is available in online material (<https://vimeo.com/497642942>).

RESULTS

During the actual uttering of what we discovered was a soft sound, a spoonbill raises its bill, inflates its bare throat, and opens the horizontally (or slightly upward and forward) held bill slightly to let the sound escape (Fig. 1). Poorter (2018) describes the sound as a muffled 'ook', with a soft k, a gentle honking. Some listeners interpret the sound as a surprised 'huh?'. The 'ook'-sounds are often repeated several times in a row. Although the horizontal posture of the slightly opened bill is distinct and easy to recognize (Fig. 2), the soft sounds can only be heard

from ca 100 m away under wind still conditions. In the adult, the ‘ook’ sound could be a single note or or be a quick repeat of that note, the ‘double sound’ (Fig. 3). In the juvenile the sound was a simple decrescendo ‘pchiuuuu’, higher pitched and less loud than the ‘ook’ of the adult.

In the adult the ‘ook’ is harmonic, i.e. a sound with multiple waves at frequencies which are multiples of the ‘first harmonic’, or fundamental frequency (Fig. 3a). The sounds having durations varying from 0.074 to 0.236 s (average \pm SD is 0.115 ± 0.047 s, $n=10$). Frequencies range from 0.26 to 2.38 kHz, the sound being louder in the lower frequency range (from 0.25 to 0.62 kHz). In the double ‘ook’, the two parts are separated by a very short time interval (0.073 ± 0.021 sec, $n=6$). The average duration of the double sound of the adult is 0.278 ± 0.014 s ($n=6$). In the juvenile, the average duration of the sound is 0.281 ± 0.021 ($n=3$), with frequencies varying between 1.05 and 3.33 kHz, so the sounds are slightly longer and higher than those of the adult (Fig. 4).

We never observed ‘ooks’ in flocks of resting and sleeping spoonbills. In the flocks at Marais d’Orx both adults and juveniles appear to engage in what appear to be dialogues, and it always happened in the minutes before departure of all or most birds in that flock. Generally, one bird started to vocalize to which others began to respond. In this way, situations of calmth could quickly change into an atmosphere of increasing restlessness as more birds became vocal and also flapped their wings a few times. After a few minutes this usually resulted in the departure of part or most of the flock. For a departure to occur, single birds, usually the individuals making the ‘ook’ sounds, tended to be the first to take off, quickly followed by others.

DISCUSSION

The description of the specific vocalizations and postures of Eurasian Spoonbills just before departure from either a migratory stopover site (Marais d’Orx) or a foraging spot (De Weerribben) is similar to the description of what Poorter (2018) has named ‘ook’ sounds (in Dutch written as ‘oek’, the verb was ‘oeken’). He additionally describes that when a spoonbill makes the sound, not only is the bill held horizontally and a little forward, the feathers of the neck are ‘laid down’. Poorter calls it a ‘soliciting display’ and interprets it as an invitation by an individual ready to fly up and depart, usually on migration, to others in the flock to follow. He describes how ‘ook’ sounds are ‘infectious’ and copied by others (but also that this sometimes was not the case). Having seen it hundreds of times, Poorter claims that ‘ook’ sounds reliably

predict take-off. Poorter heard ‘ooks’ from spoonbills flying in daylight as well as in darkness. In addition, he also describes the occurrence of ‘ooks’ by adults coming back in the colony after a foraging trip, after which the chicks approach the adult to be fed. In a rather different context, ‘ook’ sounds would also be made by spoonbills ‘mobbing’ a Red Fox *Vulpes vulpes* near a breeding colony, and mobbing a Greater Black-backed Gull *Larus marinus* killing a duck.

In the absence of good recordings from the Marais d’Orx, we quantified the sound structure of ‘ooks’ based on a record made during the post-breeding period in The Netherlands by an adult and a juvenile. To us, these sounds are identical to what we have heard at Marais d’Orx. The sounds of the juvenile spoonbill made in the context of its departure with an adult clearly differ from the rasping ‘tchirrrr’ sounds made by begging chicks in the nest (Cramp & Simmons 1977) and by begging young after fledging (Poorter 2018, Piersma *et al.* 2021). We assume that higher pitched sound of the juvenile represents a voice that still has to mature. This correlates with a doubling of the length of the trachea to 40 cm in an adult compared with several juvenile Eurasian Spoonbills (T. Piersma & A. Dekinga unpubl. observ., and see Fitch 1999).

Previously, specific pre-flight calls have been described for Palm Cockatoo *Probosciger aterrimus* (Zdenek *et al.* 2015), mynas *Acridotheres* sp. (Jaimipak *et al.* 2019) and Mallards *Anas platyrhynchos* (Abraham 1974), but none of these authors mention a context of apparent dialogue so striking in the spoonbills. This sense of dialogue also characterizes the vocal rituals in geese and swans before their movements as pairs or family groups (Raveling 1969, Black 1988). On most occasions when we saw and heard the ‘ook’ vocalizations in spoonbill flocks resting at Marais d’Orx, several individuals were implicated in what appeared to be a dialogue. Adults and juveniles both took part, so rather than older birds simply directing or recruiting flock members, it seems to be more of a ‘discussion’ between individuals.

Conradt & Roper (2003) describes two mechanisms whereby a group could reach communal decisions: dominance-based (one individual decides) and democratic (group members decide by some kind of majority). For Ravens *Corvus corax*, it has been claimed that flocks flying from a roosting to a feeding area are led by a single bird (Wright *et al.* 2003). In migrating Broad-winged Hawks *Buteo platypterus*, juveniles were more likely to follow experienced adults than *vice versa* (Maransky 2009). Given that we observed that juveniles as well as adults made the ‘ook’ sounds, the spoonbill dialogue may indicate democratic decision making, but equally some birds may have a bigger voice in the decision to leave than others. It may ‘simply’ signal

an inclination to leave, but we should also be open to the possibility that additional meaning is transmitted. Further work on the incidence of ‘ooking’ is clearly warranted, preferably in individually known spoonbills. The Marais d’Orx, as a stopover site where hundreds of individually ringed spoonbills from northwest Europe embark on what is probably a challenging flight across the mountains and the high plateau of Spain, provides a great setting for further studies.

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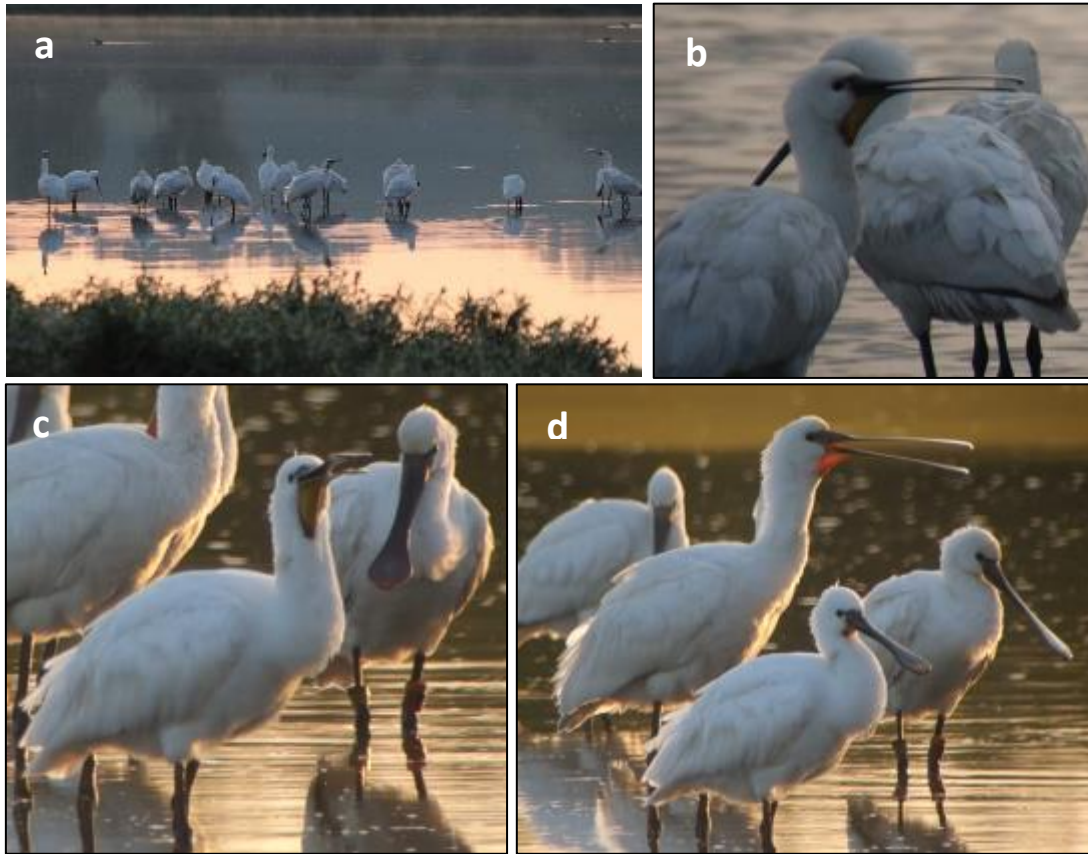


Figure 1. (a) Resting flock of Eurasian Spoonbills shortly before departure from Marais d'Orx, with three birds calling 'ook' at the same time (the one on the left, one in the middle and the one on the right) (b & c) adult spoonbills calling the 'ook'. (c) Juvenile spoonbill answering in a dialogue with adult individuals. Photos by FL and Stephanie Favril.

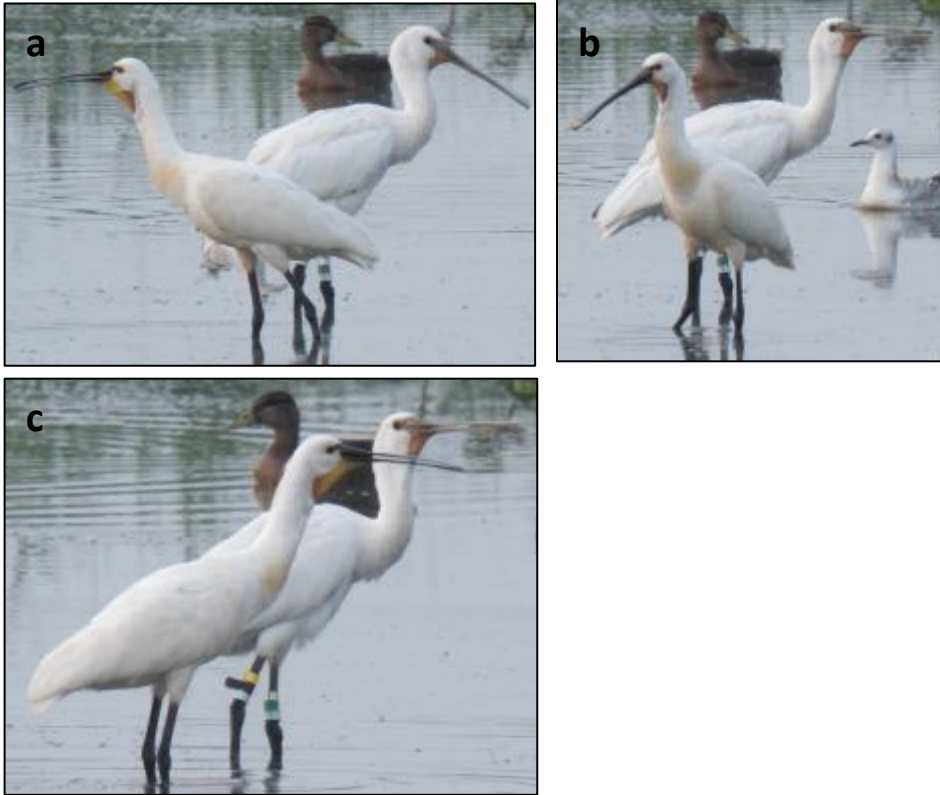


Figure 2. The two Eurasian Spoonbill in dialogue at a feeding site in De Weerribben, The Netherlands, on 28 July 2018. (a) Adult alone calling, (b) juvenile alone calling and (c) both birds calling together. Photos by Hilco Jansma.

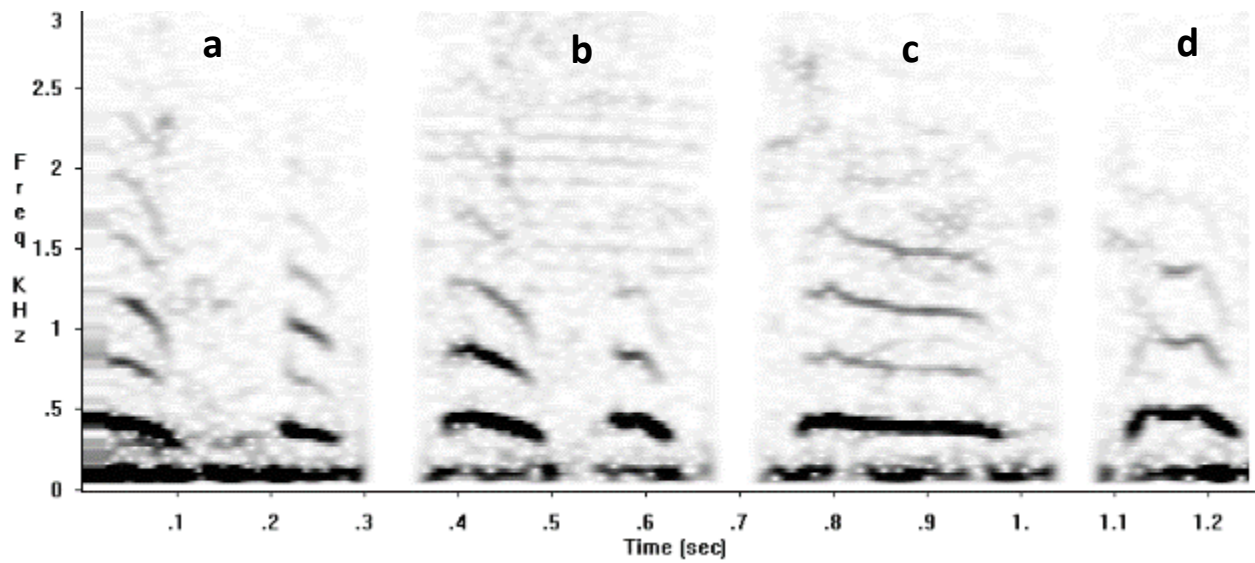


Figure 3. Sonograms of adult ‘ook’ sounds: (a & b) double sound, (c & d) single sounds. Recordings at a feeding site in De Weerribben, The Netherlands, on 28 July 2018.

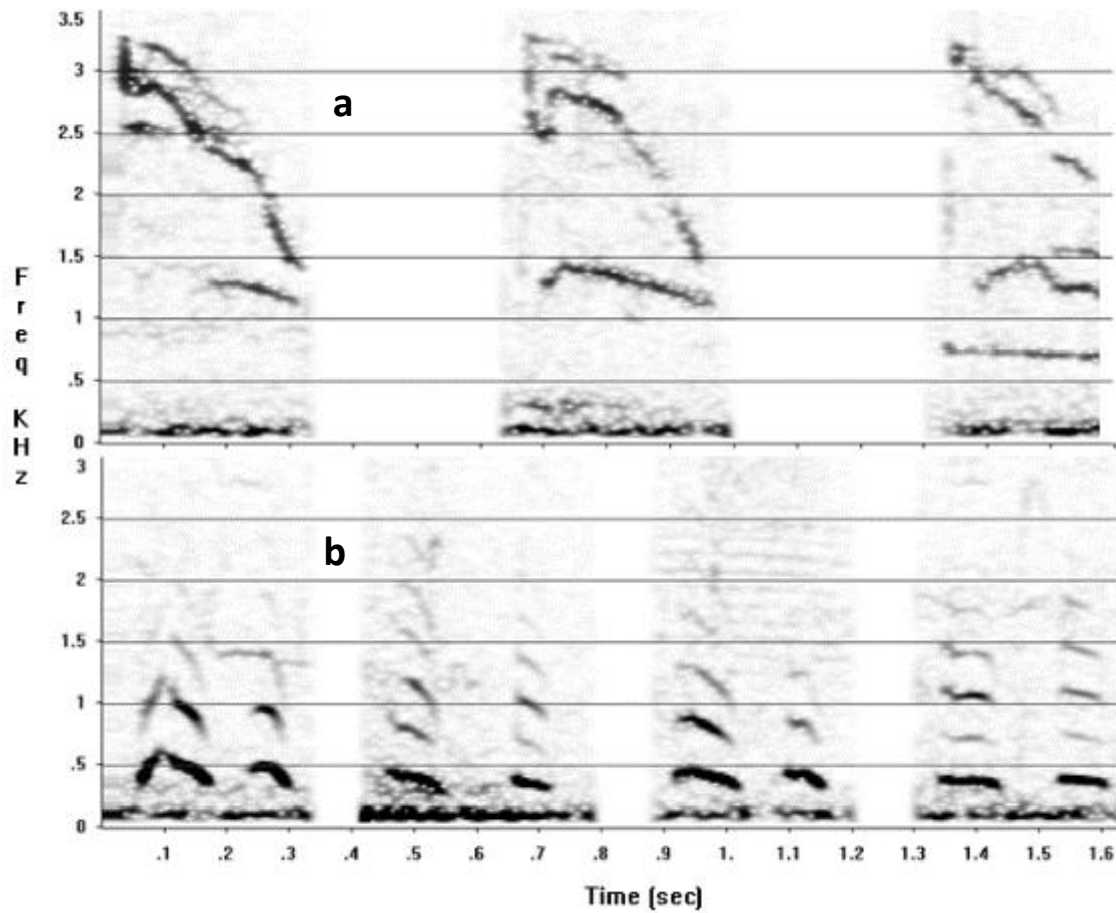


Figure 4. Sonograms of (a) three juvenile and (b) four adult 'ook' sounds made by respectively a parent and its flighted chick before their departure from a feeding spot in De Weerribben, The Netherlands, on 28 July 2018.