Reactions of breeding common swifts (Apus apus) to explosions

Authors: Hahn, Amnonn, and Yosef, Reuven

Source: Journal of Vertebrate Biology, 71(21060)

Published By: Institute of Vertebrate Biology, Czech Academy of Sciences

URL: https://doi.org/10.25225/JVB.21060
Reactions of breeding common swifts (Apus apus) to explosions

Amnonn HAHN1 and Reuven YOSEF2*

1 Friends of the Swifts, Givatayim, Israel; e-mail: hahn@bezeqint.net
2 Ben Gurion University of the Negev, Eilat, Israel; e-mail: ryosef60@gmail.com

Abstract. Sonic booms or disruptive explosions cause differing response in wildlife. In May 2021, when missiles were fired at urban areas in Israel, we observed the responses of breeding common swifts (Apus apus). In both nests, the initial boom resulted in a startled awakening of the swifts. In one case, a parent engaged in displacement behaviour of feeding the young while in the second case a parent tried to clamber up the walls. Our data support earlier studies that although auditory booms are disruptive, they do not result in nest abandonment or nest failure.

Key words: nest-box, rockets, booms, stress

A sonic boom is the sound heard on the ground, due to shock-waves, following the passage of an aircraft at supersonic speeds (Thompson & Parnell 1967). Most organisms studied, including humans, are known to give a “startle response” although specific individuals may react more drastically than others (Bell 1972), based on individual personality or social status (Sion 2018).

Espmark (1972) exposed reindeer to varying degrees of booms and did not elicit a uniform behavioural response. He reasoned that this can be explained by the fact that animal may be adapted to the booms and partly because of differing sensitivities at the individual or species levels. Similar results were found for migratory waders that foraged in salt pans that were located at the northern edge of a runway of a regional airport with a very high frequency of take-offs and landings (Glaser et al. 1998). A similar lack of response was also reported for wild turkey (Meleagris gallopavo silvestris) (Lynch & Speake 1978) and colonial nesting gulls (Laridae) and cormorants (Phalocrocoracidae) (Schreiber & Schreiber 1980).

However, Burger (1981) found that in herring gulls (Larus argentatus) no effects of subsonic aircraft on nesting gulls were noted. But, when supersonic transports overflew, significantly more nesting gulls were flushed from their nests and engaged in fights wherein many eggs were broken. At the end of the incubation period this resulted in lower mean clutch sizes in high bird density areas, because of the greater potential for fights in the colony compared with solitary nesting pairs.

Austin et al. (1970) reported a mass failure of hatching in sooty terns (Sterna fuscata) on the Dry Tortugas and considered the sonic booms of low-flying military aircraft to be the possible cause. They had no direct observations to confirm the connection between the incidents, but in many of the eggs that failed to hatch they identified longitudinal hairline cracks which supported the idea. In order to refute the claims several studies were undertaken, mostly by the US Air Force (e.g. Bowles et al. 1991, 1994) but also other researchers (Heinemann & LeBrocq 1965, Cottereau 1978, Cogger & Zegarra 1980), and
they found no evidence that sonic booms affect the hatchability of eggs in chicken (\textit{Gallus gallus domesticus}) or common quail (\textit{Coturnix coturnix}) eggs under controlled situations. To the contrary, Bowles et al. (1994) concluded that hatchability was actually significantly greater after exposure to sonic booms. However, it is important to note that none of these latter comparisons were on eggs of marine birds or in natural environments, but under controlled conditions and of eggs of domestic fowl.

The effect of loud noises and sonic booms have been shown in laboratory animals to elicit changes in heart rate, increased irritability, altered rates of maintenance behaviour (see Ellis 1981), permanent auditory damage in mammals (Majeau-Chargois 1969), a pandemonium response in domestic turkey (Bell 1972), and in the wild, stampeding in Pinnipeds (Bowles & Stewart 1980).

In a study of raptors, Ellis (1981) observed much individual and species-specific variation but generalized that small nestlings do not respond to jet aircraft, but large nestlings in open nests may cower and those in cavities retreat into its recesses; but adults appeared immune even if flushed, in proximity to aircraft and usually return to the nest and settle within a short period of time. In all cases, fledging success was not adversely affected. However, Bunnell et al. (1981) attributed the decline of white pelicans (\textit{Pelecanus erythrorhynchos}) in British Columbia to low altitude hazing from aircraft.

It is of interest to note the paucity of publications on the effects of irruptive noises on wildlife in recent decades. To date, there is little research into reactions of wildlife to explosions that have a different sonic character than the booms of aircraft.

Here we report our observations of common swifts (\textit{Apus apus}) during an engagement in May 2021 between Israel and the Palestinians in the Gaza Strip. During this action the Islamic fundamentalist terrorist organisation Hamas fired rockets at civilian targets in Israel, including the major conurbation of Tel Aviv. The non-profit NGO, Friends of the Swifts, had placed nest-boxes as replacement nest sites following extensive urban restoration projects in the area. In some of these nest boxes Closed-Circuit Television (CCTV) cameras had been placed to facilitate an on-going study of the breeding biology of swifts. During the night of 11 May 2021, a heavy barrage of rockets targeted the area and many explosions were evident. Most rockets were intercepted and destroyed in the air by the Israeli “Iron Dome” air-defence system and swifts heard the resultant explosions (Movie S1). The sequence of events, and the cameras in the nest-boxes, allowed us to confirm the reactions of the brooding swifts. We concentrate on describing the reactions and sequence of events in nest A6 and 19M that were equipped with cameras and broadcasting live on YouTube (Movies S2 and S3).

One of the cameras’ is located in A. Hahn’s apartment in Givatayim looking out towards the common swift nest box number 19, which is seen

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{fig1.png}
\caption{Outgoing Iron Dome rockets, that have targeted incoming missiles, pass behind the nest box of the common swifts (to the right in the forefront) in Givatayim, Israel.}
\end{figure}
closest to the frame on the right (Fig. 1). Between 21:02:06-21:03:18 h, the “Iron Dome” response to the rockets is evident in the background from 21:02:16 to the boom and flash at 21:02:28 (Movie S1). At 21:02:34 a direct hit is recorded to the west in central Tel Aviv and the resulting mushroom cloud is seen rising until the end at 21:03:18.

Concurrently, in the middle chamber of the nest-box, 19M (between 21:02:20-21:02:53 h) only one parent is present and is roosting adjacent to three nestlings. The nestlings are on average 37 days since hatching and settled in the nest cup (Movie S2). At 21:02:27 the first rocket explodes ~ 400 meters from the nest box, and the resultant boom is heard distinctly in the footage, and all four individuals are startled awake (Fig. 2). Between 21:02:40-21:02:47 four additional booms are heard further away but do not illicit further response. However, at 21:02:40 the parent touches the bill of the nearest nestling initiating a feeding response. This is an unusual time for feeding in swifts, which are diurnal insectivores, and the parent most probably does not have prey in its crop with which to feed
the nestling. Hence, we associate this behaviour as “displacement behaviour” (Mohiyeddini et al. 2015) wherein the parent involves itself in activity with which it is most accustomed with the nestlings at a time of stress.

Earlier, in A6 (between 20:47:33-20:49:22 h) both parents are in the nest box with their three nestlings that are on average 26 days since hatching (Movie S3). Owing to the fact that common swifts are monomorphic we are unable to distinguish the sexes of the parents. One parent is rooting on the floor while the other is covering the nestlings. At 20:47:44 the first shriek of the rocket is heard and the subsequent boom is heard. We assume the rocket to have been within ca. 400 m of the nest box. The startle reaction of the parents is evident, with the individual covering the nestlings attempting to clamber up the nest box walls in the corner while the one on the floor rushes to cover the nestlings (Fig. 3). Additional booms are heard constantly between 20:48:01-20:48:59, but they appear to be relatively distant. From 20:49:00 till 20:49:16 another series of booms are heard in the immediate proximity, to which the adults are seen to flinch several times and the individual in the corner attempts to scramble up the nest box wall. This individual is apparently most under stress while the second individual places its beak on the nest cup. During the whole episode, the nestlings also responded to the booms with a startle response, opened and closed their beaks and huddled together under the parent that climbed up the wall.

In conclusion, our observations contribute to our understanding of the response of wildlife to irruptive, explosive booms, especially at unusual hours of their diurnal cycle. All swifts responded to the booms and showed varying degrees of stress and stress-related behaviours. Our data corroborate the findings of earlier studies showing that, although the auditory booms are disruptive to the birds, they are not the cause of nest abandonment or nest failure. In our study, all the nestlings involved subsequently fledged successfully.

Acknowledgements

We thank the editor and two anonymous reviewers who improved an earlier draft of the paper. Author contributions: A. Hahn and R. Yosef—conceptualization, quality control, writing the paper.
Reactions of common swift to explosions

J. Vertebr. Biol. 2022, 71: 21060

Literature

Austin O.L., Jr., Robertson W.B., Jr. & Woolfenden G.E. 1970: Mass hatching failure in Dry Tortugas sooty terns. Proceedings, 15th International Ornithological Congress, the Hague, Netherlands: 627.

Bell W.B. 1972: Animal response to sonic booms. J. Acoust. Soc. Am. 51: 758–765.

Bowles A.E., Awbrey F.T. & Jehl J.R. 1991: The effects of high-amplitude impulsive noise on hatching success: a reanalysis of the sooty tern incident. Noise and Sonic Boom Technology Program, Brooks Air Force Base, Texas, USA.

Bowles A.E., Knobler M., Sneddon M.W. & Kugler B.A. 1994: Effects of simulated sonic booms on the hatchability of white leghorn chicken eggs. Noise and Sonic Boom Technology Program, Brooks Air Force Base, Texas, USA.

Bowles A.E. & Stewart B.S. 1980: Disturbances to the pinnipeds and birds of San Miguel Island, 1979-1980. In: Jehl J.R., Jr. & Cooper C.F. (eds.), Potential effects of space shuttle sonic booms on the biota and geology of the California Channel Islands: research reports. Center for Marine Studies, San Diego State University, USA: 99–137.

Bunnell S.L., Dunbar D., Koza L. & Ryder G. 1981: Effects of disturbance on the productivity and numbers of white pelicans in British Columbia – observations and models. Colon. Waterbirds 4: 2–11.

Burger J. 1981: Behavioral responses of herring gulls (Larus argentatus) to aircraft noise. Environ. Pollut. 24: 177–184.

Cogger E.A. & Zegarra E.G. 1980: Sonic booms and reproductive performance of marine birds: studies on domestic fowl as analogues. In: Jehl J.R., Jr. & Cooper C.F. (eds.), Potential effects of space shuttle sonic booms on the biota and geology of the California Channel Islands: research reports. Center for Marine Studies, San Diego State University, USA: 163–194.

Cottereau P. 1978: Effect of sonic boom from aircraft on wildlife and animal husbandry. In: Fletcher J.L. & Busnel R.G. (eds.), Effects of noise on wildlife. Academic Press, New York, USA: 63–79.

Ellis D.H. 1981: Response of raptorial birds to low level military jets and sonic booms. Defense Technical Information Center, USA.

Espmark Y. 1972: Behaviour reactions of reindeer exposed to sonic booms. Deer 2: 800–802.

Glaser R.L., Horsepool K., Simhai N. & Yosef R. 1998: The effects of disturbance on migrant waders at Eilat, Israel. Sandgrouse 20: 30–35.

Heinemann J.M. & LeBrocq E.F. 1965: Effect of the sonic boom on hatchability of chicken eggs. Defense Technical Information Center, USA.

Lynch T.E. & Speake D.W. 1978: Eastern wild turkey behavioral responses induced by sonic boom. In: Fletcher J.L. & Busnel R.G. (eds.), Effects of noise on wildlife. Academic Press, New York, USA: 47–62.

Majeau-Chargois D.A. 1969: The effect of sonic boom exposure to the guinea pig cochlea. Louisiana State University, USA.

Mohiyeddini C., Bauer S. & Semple S. 2015: Neuroticism and stress: the role of displacement behavior. Anxiety Stress Coping 28: 391–407.

Schreiber E.A. & Schreiber R.W. 1980: Effects of impulse noise on seabirds of the Channel Islands. In: Jehl J.R., Jr. & Cooper C.F. (eds.), Potential effects of space shuttle sonic booms on the biota and geology of the California Channel Islands: research reports. Center for Marine Studies, San Diego State University, USA: 138–162.

Sion G. 2018: Foot-preference underlies bite-scar asymmetry in the gecko Ptyodactylus guttatus. Laterality 23: 129–151.

Thompson J.R. & Parnell J.E. 1967: Sonic boom and the SST: an examination of the sonic boom and its effects. Aircr. Eng. Aerosp. Technol. 39: 14–18.

Supplementary online material

Movie S1. Video clip from CCTV camera looking out from AH’s apartment in Givatayim, between 21:02:06-21:03:18 h. The camera points towards nest box number 19, that is seen closest to the frame on the right, and in which a pair of common swift have a brood of three nestlings. Evidenced is the response of the Iron Dome to two incoming rockets between 21:02:16 and up to the boom and flash at 21:02:28. At 21:02:34 a direct hit is recorded to the west in central Tel Aviv and the resulting mushroom cloud is seen rising until the end at 21:03:18 (https://www.ivb.cz/wp-content/uploads/JVB-vol.-71-2022-HahnA.-YosefR.-Movie-S1.mp4).
**Movie S2.** Video clip from CCTV camera in nest 19M during the rocket attack and resultant explosions. The parent and nestlings are startled awake and results in a pseudo-feeding bout between the parent and the nestling nearest to it (https://www.ivb.cz/wp-content/uploads/JVB-vol.-71-2022-HahnA.-YosefR.-Movie-S2.mp4).

**Movie S3.** Video clip from CCTV camera in nest A6 where both parents and their three nestlings are brooding for the night. The occupants are startled awake by the explosions and the parent that is on the nestlings attempts to climb up the walls of the nearest corner while the second parent covers the nestlings, but then moves back to the side (https://www.ivb.cz/wp-content/uploads/JVB-vol.-71-2022-HahnA.-YosefR.-Movie-S3.mp4).