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Windsurfing in Mute Swans (*Cygnus olor*)

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ABSTRACT.—Mute Swans (*Cygnus olor*) were observed using tailwind as a support for high-speed water transportation on three different occasions in three different locations in Sweden. With the wings arched over the back, they traveled ~100 m in an inlet of the Baltic Sea in Stockholm, several hundred meters in Lake Hjälstaviken in Enköping, and ~350 m in Lake Krankesjön in Lund. The speed of the movement was estimated to be much higher than normally seen for swimming swans. The first observation included two Mute Swans traveling one after another in the same direction, the second observation was of one single individual traveling towards a group of conspecifics, and the third observation was of a single individual traveling by itself. This behavior may serve as a means of medium-distance water transportation in this heavy bird species. *Received 24 September 2015. Accepted 12 January 2016.*

Key words: aggressive posture, *Cygnus olor*, Mute Swan, water transportation, windsurfing.

Birds commonly make use of wind for transportation. Several species belonging to different orders may glide or sail in the air. Examples include albatrosses (Croxall 1991), Common Snipes (*Gallinago gallinago*; Bent 1927), Mourning Doves (*Zenaida macroura*; Miller and Miller 1958), Turkey Vultures (*Cathartes aura*; Tyler 1937) and swifts (Collins 1991). The birds stretch out their wings and utilize the thermal columns and winds to glide medium- or long distances with less effort than flapping flight. On the ground level, however, the prerequisites for getting increased speed with the help from the wind are limiting usage. Birds that could benefit from ground wind would likely have to be living in open areas and have their bodies considerably elevated from the ground. Indeed, support by tailwind has been reported from the flightless Rheas (*Rhea americana*) in South America. The Rheas are large birds (1.5 m tall) and have disproportionally large feathers (2.5 m) as compared to other birds in the same order (Davies 2003) and may use the wings as sails when running (Davies 1991). It has been estimated that the cost of running in Rheas is about twice as large as four-legged animals of the same size (Taylor et al. 1971), thus support by the wind could play an important role. Wind-assisted travel does not only occur on land; an animal using the wind for travel on water surfaces is the Fishing spider (*Dolomedes triton*). When the wind was between 1.8 m/s and 5.8 m/s (4–13 mph), the spiders lifted their second pair of legs to increase the wind-catching capability and glide rapidly on the water surface (Deshefy 1981).

Mute Swans (*Cygnus olor*) are large-bodied, herbivorous birds that live predominantly in open-

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water habitats (Birkhead and Perrins 1986). They are similar in size to Trumpeter Swans (*Cygnus buccinator*), and weigh on average 10.8 kg (males weigh 11–12 kg and females 8.5–9 kg; Kear 2005). The Mute Swan is one of the heaviest birds that can fly (Dunning 1993). In the aggressive posture 'busking' of Mute Swans, the wings are arched above the back, with the secondary feathers raised above the head, creating an enlarged circular profile when viewed from the front (Cramp et al. 1977). Mute Swans may be seen swimming with feathers raised and occasionally make use of the wind for somewhat increased speed over short distances. In this paper, I describe three observations of a pronounced usage for the arched wings when the swans move up to several hundred meters at high speed. To distinguish the mode of water-surface transportation from sailing used as a synonym of air gliding, I hereafter use the term windsurfing.

OBSERVATIONS

Three observations of windsurfing in Mute Swans (*Cygnus olor*) were made. The first took place in Brunnsviken, which is a brackish lake / inlet of the Baltic Sea in central Stockholm, Sweden (59° 22′ N, 18° 2′ E) on 6 October 1999 at 0840 Central European Time (CET). The site of the observation is 250 m from West to East and 2250 m from North West to South East. At the time of observation, the wind was northern at a speed of 6 m/s (~22 km/h). At first sight it seemed as if a plastic bag was moving quickly on top of the water, but at a closer look a Mute Swan was observed moving at exceptionally high speed. The distance covered was about 100 m as visually estimated from the observation point. A couple of minutes later, another Mute Swan was moving in the same direction and at the same speed. The position where they stopped was the same for both birds; in the open water and empty of any conspecifics. The Mute Swans were windsurfing in a southern direction, i.e., in tailwind, using the arched wings as sails. When the birds changed direction and were swimming against the wind, the speed was again normal and their wings were folded along their bodies.

The second observation took place in the Lake Hjälstaviken in Enköping, Sweden (59° 40′ N, 17°

23′ E) on 9 March 2014 at 1500–1600 CET. Lake Hjälstaviken is a Ramsar site (a wetland of particular importance for waterfowl) with an area of agricultural land adjacent to it and thus eutrophic. The site of the observation is 450 m from West to East and 1100 m from North to South. At the time of observation the wind was southern at a speed of 7 m/s (~25 km/h). One Mute Swan was repeatedly (at least three times) windsurfing a distance of ~400 m before encountering another group of Mute Swans (see video in supplementary data). The distance traveled was estimated after judging the start and end of the windsurfing from the observation point and then measuring the distance on a map placed at the visitors' entrance of Hjälstaviken. The speed of the Mute Swan was estimated to an average of 1.3 m/s (400 m in 5 mins). When arriving to the other group of Mute Swans, the windsurfing individual was chased away by flight (see video in supplementary data).

The third observation took place in Lake Krankesjön in Lund, Sweden (55° 42′ N, 13° 28′ E) on 30 April 2015 at 1200–1300 CET. The lake is a Natura 2000 area that is 1400 m from South West to North East and 2800 m from North West to South East. Krankesjön is situated in an area of agricultural land and thus eutrophic. At the time of observation the wind was southern at a speed of 7 m/s (~25 km/h). One single Mute Swan was traveling about 350 m with the wind. No other birds were present in the vicinity.

DISCUSSION

Wind-assisted traveling on water surfaces (i.e., windsurfing) as a means of transportation has received little attention from those interested in swans and other birds of open waters. The observations suggest that Mute Swans are capable of using the arched wings in order to move at high speed in tailwind. For Mute Swans, swimming is one of the most important activities and as much as 45% of their life is spent swimming (Black and Rees 1984, Keane and O'Halloran 1992). In comparison, for Whooper Swans (*Cygnus cygnus*) the most important activity was feeding, while only 28% of their day was spent swimming (Black and Rees 1984). Swimming is an energetically expensive activity for Mute Swans and the key

factor influencing the behavioral decision to switch between terrestrial and aquatic feeding habitats (Wood et al. 2013). Therefore, using wind for transportation may have impact on the daily energy spent. In the second observation, the speed was estimated to 1.3 m/s, which is equivalent to two body lengths per second (body length of Mute Swans at the water line is estimated to 0.625 m; Kear 2005). If the Mute Swan would have been swimming at the same speed, the energetic cost would have been ~12 times the basal metabolic rate (BMR). This figure is based on the energetic cost of swimming in Mute Swans as developed by Wood et al. (2013) where the cost of swimming (in W) is equal to $314.9 \ v^2 - 87.2 \ v + 59.0$ (v velocity in m/s). For the speed 1.3 m/s, the energy is thus 477.8 W, which with a BMR of 39 W (as calculated by Wood et al. 2013) is 12.25 times the BMR. As a comparison, twelve times the BMR is equivalent to the energy cost for a human playing squash (Taylor et al. 1978).

In particular, windsurfing would be an advantageous alternative to flying when the Mute Swans want to move with the wind. Mute Swans are heavy birds, and therefore take-off and flight are energy consuming. When starting, the Mute Swans flap their wings and must run on the water towards the wind. This means that when a Mute Swan wants to move in the same direction as the wind, it first has to fly in the opposite direction before being able to turn in the air and fly with the wind. As an appreciation of the effort needed to lift from the water, observations of Mute Swans starting from land have shown that they require about 20 m for take-off and the same distance for clearing obstacles such as houses (Kear 1988).

Whether windsurfing is unique to Mute Swans remains to be seen, but it is more likely to arise in large birds such as Mute Swans, since similarly-shaped but smaller waterfowl do not have the same problem of starting flight in tailwind. Also, Mute Swans are commonly raising their wings for display and aggressive behavior (such as the behavior in the end of the second observation when the windsurfing Mute Swan was chased away by a group of other Mute Swans) and could suggest that windsurfing may have been developed from situations when aggressive postures have been displayed.

For all observations, the wind speed was about 6–7 m/s (25 km/h) and the locations were small water bodies in areas of flat land. In a larger water body, the same wind speed would give rise to waves that could preclude the Mute Swans from windsurfing. This probably limits the observations of windsurfing Mute Swans to small lakes in flat landscapes under windy conditions. It is likely that windsurfing is more common than reported here, but more observations would be needed to fully understand its function. Of all observed modes of locomotion in birds: flying, gliding (sailing), swimming and walking/running, one now can add windsurfing to the list.

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Neotropical Records of Nearctic Raptors: Observational Data from Veracruz, Mexico

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ABSTRACT.—Extralimital records of birds, including diurnal raptors, are frequently set in localities along migration flyways. Normally, these records pertain to a few individuals that are away from their usual flight routes and found in areas that range from tens to a few hundred km from their usual distribution. Here, we report 77 migration records of Nearctic hawks and eagles from a site in the Neotropical region. These records belong to five well-known Nearctic species: Golden Eagle, Northern Goshawk, Bald Eagle, Ferruginous Hawk, and Rough-legged Hawk. The Veracruz River of Raptors Project's (VRR) observational data represent the most reliable and abundant data source of raptor migration along the region and country, including the southernmost cluster of records of these Nearctic species in the continent. *Received 24 September 2015. Accepted 12 January 2016.*

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The most important migratory hawkwatch for diurnal raptors (vultures, hawks, falcons) in the world, where an average of 5.1 million birds can be observed annually during their spring and autumn migrations, is located in central Veracruz, Mexico (Ruelas Inzunza et al. 2000, 2009; Bildstein 2006; Bildstein et al. 2008; Smith et al. 2008). The site's concentrated flights result from its location, at the intersection of two major mountainous systems, the Sierra Madre Oriental and the Central Volcanic Belt, which constrain the width of the Gulf of Mexico Coastal Plain at about 19° N (Ruelas Inzunza et al. 2000). This geographic bottleneck within the course of the coastal plain reduces the area where thermal-soaring migrants can find reliable lift for energy-saving flights, and funnels the migrations of hundreds of Neotropical migrants, including vultures, hawks, falcons, pelicans, anhingas, and storks, through a corridor no wider than a few tens of kilometers (Ruelas Inzunza et al. 2005, 2010).

Migrations of diurnal raptors recorded here are dominated by four species of mostly Nearctic-breeding species (in order of abundance): Turkey Vulture (*Cathartes aura*), Broad-winged Hawk (*Buteo platypterus*), Swainson's Hawk (*Buteo swainsoni*), and Mississippi Kite (*Ictinia missis-*