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Field Note

European starlings fly before they fledge

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Abstract: Aircraft bird strikes are increasing globally. Bird strikes constitute a major human health and safety risk and result in millions of dollars in economic impacts. Invasive avian species, such as the European starling (*Sturnus vulgaris*; starlings), have been implicated in bird strikes in North America. Because this species is highly adaptive and has been successful at establishing in new areas, such as airports, it is essential that managers better understand the potential risks and how to mitigate them. Herein we present a case study regarding a novel observation of unique starling nesting behavior that may pose a risk to airport operations and aircraft.

Key words: aircraft, biosecurity, bird/wildlife aircraft strike hazard (BASH), European starling, invasive species, long-distance vector, *Sturnus vulgaris*

Bird and other wildlife collisions with aircraft pose a serious threat to safety and the economy, annually causing millions of dollars in damage, loss of aircraft, and occasionally the loss of life. Between 1990 and 2005, wildlife strikes caused >500 human fatalities worldwide while annual cost estimates of wildlife strikes with civil aircraft topped $1.2 billion (Allan 2002, Cleary et al. 2006). Managing wildlife at airports is the most effective tool to reduce bird–aircraft strikes because most strikes occur under 150 m, often during takeoff or approach (Cleary et al. 2006). Reports show that although the total number of reported strikes has increased, damaging strikes in the airport environment have decreased. The decline in damaging strikes can be attributed in part to increases in the development and use of wildlife hazard management plans at airports (Dolbeer 2011).

Many airports, both commercial and military, employ U.S. Department of Agricultulture (USDA) Animal and Plant Health Inspection Service (APHIS) Wildlife Services (WS) wildlife biologists to mitigate the risks of wildlife strikes. Bird/Wildlife Aircraft Strike Hazard (BASH) wildlife biologists attempt to reduce wildlife strikes by hazing wildlife from active surfaces, translocation, lethal removal, and habitat modifications. When necessary, BASH wildlife biologists also take on the role of invasive species control, especially where BASH risks intersect with large populations of problematic nonnative fauna.

Biosecurity is "a strategic and integrated approach to analysing and managing relevant risks to human, animal and plant life and health associated risks for the environment" (Food and Agriculture Organization of the United Nations 2010). Effective biosecurity protocols require that linkages between remote areas be monitored and the potential to transmit unwanted vectors, such as invasive species, between these areas be minimized.

Invasive species cost the American economy upwards of $138 billion annually and can have devastating impacts on native flora and fauna as well as be a vector for disease (Lounibos 2002, Pimental 2005). Aircraft can be a potential vector for spreading invasive species over long distances. As the numbers of air travel destinations and passengers continuously increase, the risk of invasive species dispersal, particularly between destinations with similar climates, also increases (Tatem 2009). In 2013, a Qantas aircraft carried a live scrub python (*Morelia amethistina)* from Australia to Papua New Guinea (844 km) in its landing gear (Shears and Adams 2013). Pathogen-carrying vectors like the mosquito (*Anopheles gambiae*) have been documented on board aircraft and were the likely cause of malaria outbreaks in northeast Brazil after arriving from Africa in the 1930s (Soper and Wilson 1943).

European starlings (*Sturnus vulgaris*; starlings; Figure 1) were introduced into the United States in 1890 and 1891 and have become permanently established, with population estimates topping 200 million (Cabe 1993). Starlings readily colonize

Figure 1. Adult European starling (*Sturnus vulgaris*) carrying food to nestlings in the wing of an aircraft on permanent display at Naval Base Ventura County Point Mugu Missile Park, Ventura County, California, USA (*photo by J. Psiropoulos*).

new areas, damage crops, transmit disease, displace native cavity nesters, and compete for resources with native fauna (Linz et al. 2007). Estimates of starling damage annually in the United States exceed $800 million (Pimental et al. 2000). Starlings also threaten human safety when they strike aircraft. In 1960, Eastern Airlines flight 375 departed Logan International Airport in Boston, Massachusetts, USA, then crashed after ingesting starlings in 3 engines. All 62 people on board were killed when the aircraft crashed (Civil Aeronautics Board 1962). Because starlings are successful at establishing in new areas, have devastating impacts on native flora and fauna, and cause damage to aircraft, it is essential that managers mitigate these risks.

Study area

Naval Base Ventura County (NBVC) Point Mugu is a 1,820-ha naval air station located in Ventura County, California, USA, 56 km northwest of Los Angeles (Figure 2). The station hosts many tenant commands including multiple aircraft squadrons, a weapons division, fleet readiness center, Air National Guard, U.S. Coast Guard, and an offshore range. The U.S. Navy contracts Phoenix Air to operate 3 Embraer-120 Brasilia aircraft to shuttle personnel between Point Mugu and NBVC San Nicolas Island (SNI) and Naval Air Weapons Station (NAWS) China Lake. The SNI area is part of the Channel Islands archipelago and is located approximately 105 km south of NBVC Point Mugu, while NAWS China Lake is approximately 217 km to the northeast in the Mojave Desert. The

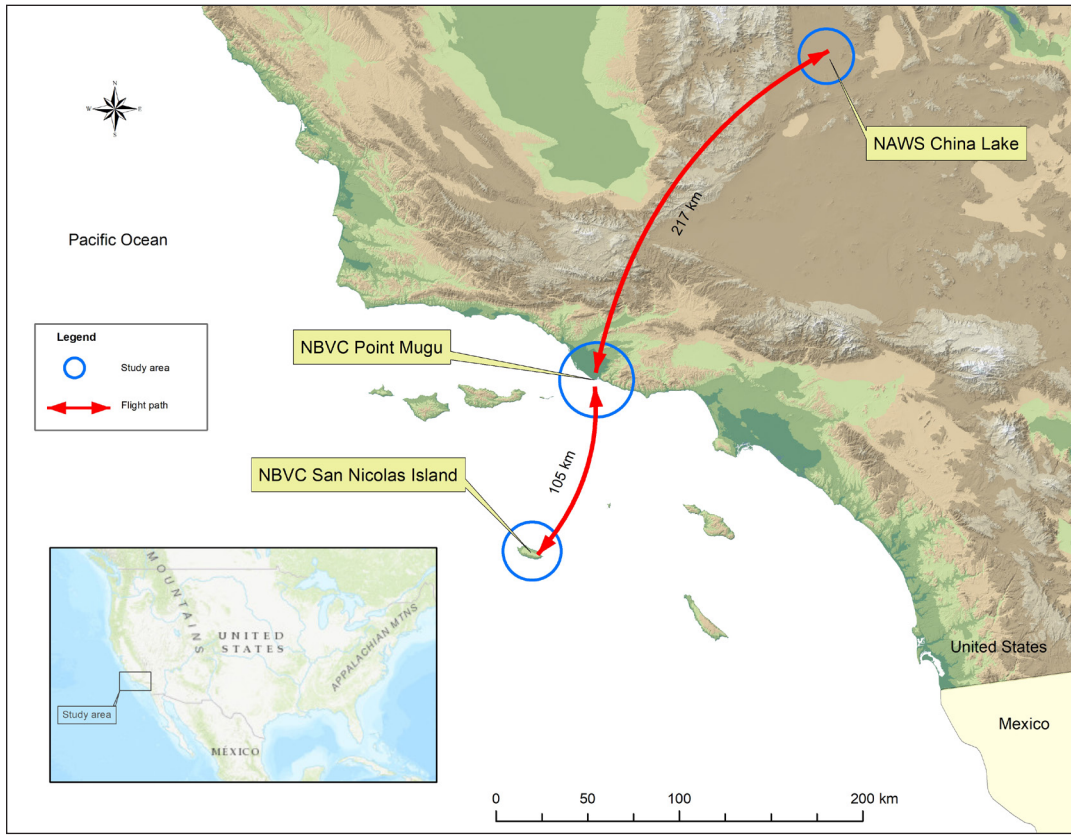

Figure 2. Naval Base Ventura County Point Mugu, Ventura County, California, USA.

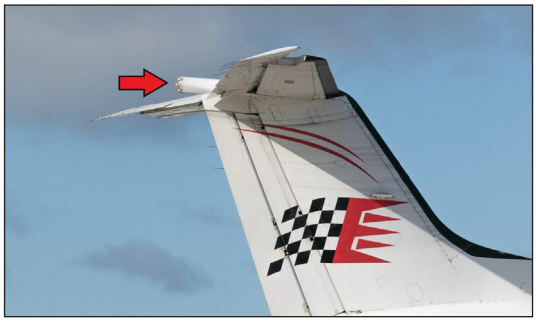

Figure 3. Location of European starling (*Sturnus vulgaris*) nest in aircraft tail fin, Naval Base Ventura County Point Mugu, Ventura County, California, USA (*photo by J. Psiropoulos*).

Figure 4. Nest with European starling (*Sturnus vulgaris*) chicks removed from aircraft, Naval Base Ventura County Point Mugu, Ventura County, California, USA (*photo by L. Selner*).

NAWS China Lake area occupies portions of Inyo, Kern, and San Bernardino counties.

Observation

On May 9, 2018, aircraft maintenance crews on NBVC Point Mugu noticed an adult starling waiting with food for a plane to land and then flying into the tail fin area. They removed an active starling nest from the tail fin of a Phoenix Air-operated Brasilia EMB-120 aircraft. The nest was located at the junction of the stabilizers and the elevators (Figure 3). A WS BASH biologist collected the nest and found that it contained 3 downy chicks (Figure 4).

Discussion

Starling eggs have an incubation period on average of 12 days. Eggs are incubated 18–23 hours per day depending on ambient temperatures. After hatching, it takes 7 days before down is present and 3 weeks until they fledge (Linz et al. 2007). Thus, the WS BASH biologist was able to confirm the estimated laying date by rearing the nestlings to fledging, which occurred on May 11, implying an estimated laying date of April 20.

During the likely incubation period, the aircraft visited NAWS China Lake 7 times and NBVC SNI 20 times. Flight times to China lake and SNI are 35 minutes and 25 minutes, respectively. Planes typically make their return flights within an hour. Ground speed of the aircraft is approximately 400 km/hour. The average cruising altitude of flights to NAWS China Lake is 3,960 m and 1,675 m to SNI. Air temperature at these altitudes ranges from 4–18 °C. (B. Crowe, Phoenix Air, personal communication). The ambient temperature inside the tail fin at altitude is unknown, but survival is unlikely unless the eggs were brooded by a parent, suggesting that they were incubated in flight.

In May 2019, WS BASH biologists were again contacted about starlings nesting in Brasilia aircraft. Maintenance crews had removed nesting material from all 3 of the aircraft permanently stationed there. Nest building in the aircraft was discovered before eggs were laid, indicating that the previous incident had raised local awareness of the importance of inspections and prevented further such transport of invasive species.

Management implications

Wildlife managers need to do everything in their power to reduce the negative impacts of invasive species. Whether removing starlings or other vectors from an airfield to reduce the risk of bird strikes, or preventing their spread through aircraft, strict standards and protocols need to be in place to reduce the costly and potentially dangerous impacts of invasive starlings. Installations, widlife refuges, municipalities, islands, or managers of land with endemic flora and fauna need to have formal biosecurity measures in place to protect their resources.

Management recommendations derived from this case study include: (1) regular and thorough aircraft inspections should target potential invasive species and BASH threats, with inspections conducted at departing and arriving airfields; (2) managers should develop a plan for addressing stowaway fauna that includes specific methods of detecting, containing,

and neutralizing avian, reptilian, mammalian, and invertebrate threats; and (3) maintenance personnel should be encouraged to report any similar incidents to WS BASH biologists to more fully understand the scope of this type of event.

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