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NATURAL HISTORY NOTE

Catch and release: Novel predation strategy by white-bellied sea-eagle (*Haliaeetus leucogaster*) on island flying fox (*Pteropus hypomelanus*) in Peninsular Malaysia demonstrates flying fox swimming ability

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ABSTRACT

Raptors are one of the known predators of flying foxes (*Pteropus* spp.), but this predator-prey relationship is poorly understood. Here, we report an opportunistic observation of a pair of white-bellied sea-eagles (*Haliaeetus leucogaster*) employing an undocumented predation technique on an island flying fox (*Pteropus hypomelanus*) individual from Tioman Island, off the east coast of Peninsular Malaysia. The sea-eagles appeared to deliberately drop the flying fox in the sea, repeatedly. Systematic observations could help determine the frequency of this predator-prey interaction, and improve our understanding of it.

Birds of prey (Accipitriformes and Falconiformes), also commonly known as raptors (Christie & Ferguson-Lees 2010), are known diurnal predators of bats (Chiroptera). Some of the most frequent predation records by raptors on bats involve fruit bats (Pteropodidae) of the genus *Pteropus*, possibly owing to their relatively frequent diurnal activity and in aggregated open roosting places of these bats (Mikula et al. 2016). Indeed, predation attempts on flying foxes (*Pteropus* spp.) by large raptors, including the white-bellied sea-eagle (*Haliaeetus leucogaster*) has been previously reported in the scientific literature (e.g. Ratcliffe 1932, Nelson 1965, Grant & Banack 1995, Pikacha et al. 2012). Risk of predation by diurnal raptors is an important factor influencing the timing of evening emergence of flying foxes from day roosts (Welbergen 2006). More detailed and long-term observations, however, appear to be scanty, and this type of predator-prey interaction is still poorly understood. Also, all such observations of attacks by diurnal raptors on flying foxes have only been reported from Australia and the Pacific, with no records for Southeast Asia.

Here, we report an opportunistic observation from Peninsular Malaysia on 28 September 2017, during which we observed a pair of white-bellied sea-eagles employing a novel hunting technique to predate on the island flying fox (*Pteropus hypomelanus*) on Tioman Island (2°48'38" N, 104°10'38" E). The island flying fox is found on islands of South and Southeast Asia ranging from the Maldives, Andaman and Nicobar Islands, the Philippines, Melanesia, Sulawesi, Papua New Guinea, and islands off the Malay Peninsula and Sundaland. It is listed as a species of Least Concern by the IUCN Red List, with a decreasing population trend (Francis et al. 2008). In Peninsular Malaysia, where this observation was recorded, the species is listed as Endangered and Protected (Chu 2017, Perhilitan 2017).

The predation attempt occurred around 11:50 hrs when a single sea-eagle snatched a flying fox directly from its roost tree by the beach. The site was a known roost of the species on the western coast of the island, where the bats roost on several coastal tree species next to the beach. Although the catch event was outside of our line of sight, we heard a cacophony of vocalisations (probably from the flying fox colony, Fig. 1 SM), and later observed the sea-eagle flying out to sea clutching a struggling flying fox in its talons (Fig. 1). Once the sea-eagle was about 100 m out from the shore, it dropped the flying fox into the sea while another sea-eagle flew in circles a short distance away (Fig. 2).

After the flying fox was dropped into the sea, we observed that instead of drowning, it was able to swim at the surface using synchronised forearm strokes back towards the beach (Fig. 3; Supplementary Video 1). Although there is no known record of the swimming ability of this species in the scientific

Fig. 1 - A white-bellied sea-eagle holding an island flying fox in its talons over the sea while another eagle flew a short distance away.

Fig. 3 - Island flying fox swimming towards the beach.

Fig. 2 - The island flying fox on the surface of the water (red arrow) after it was dropped by the sea-eagle holding it.

Fig. 4 - Sequence of events when the white-bellied sea-eagle caught and released the island flying fox a second time.

literature, flying foxes are known to swim (Jeffrey 2016), in a manner similar to other swimming bats (Twente 1959). The pair of sea-eagles then flew back to land, and perched in a tree by the beach. They were clearly observing the flying fox as it swam.

The flying fox took 20 mins to swim close to shore through the waves; however, at this point it was snatched again by one of the sea-eagles, which proceeded to fly a little further out to sea and repeated the action of dropping the flying fox into the water (Fig. 4). The flying fox then swam back again and started crawling up the beach (Fig.2 SM). The movement of the bat on land was slow and laboured, and its left patagium was punctured (Supplementary Video 2). At this point we were forced to cut our observations short as we had to move to another site, and left our observation spot near the beach. It was thus unclear whether the sea-eagles repeated this treatment, and if so, how many times further.

Informal enquiries with nearby residents on the island who were present during the observation confirmed that such predation attempts involving this sequence of events happened quite frequently at this particular roost, and appeared to be common at this location. Although the main food of the white-bellied sea-eagle includes fish and sea snakes in the Thai-Malay Peninsula (Wells et al. 1999), these birds also feed on crustaceans, birds, reptiles, and mammals, including *Pteropus* bats (Ratcliffe 1932, Nelson 1965, Marchant & Higgins 1994, Debus 2008, Olsen et al. 2013). The success rate of this predation technique is unknown. Although we cannot tell whether the sea-eagles were taking turns, it is possible that they may have been hunting as a pair using the sea to tire out – or potentially drown – such a large prey animal with the strength and ability to fight back, and potentially even making use of the bats' swimming ability to achieve this. White-bellied sea-eagles are known to exhibit cooperative hunting behaviour (Marchant & Higgins 1994). The closely-related bald eagle (*H. leucocephalus*) has also been recorded hunting in numbers to tire or weaken ducks in the water, or taking turns to haul heavy prey (Bent 1937).

Such intriguing predation behaviour by sea-eagles on flying foxes appears to be a novel scientific record that has never before been reported in the literature. White-bellied sea-eagles generally forage by quartering, high soaring, or still hunting from a perch, and then attacking in a glide or dive to snatch prey from ground, trees, or water surface (del Hoyo et al. 1994). A literature search using Web of Science and Google Scholar returned no notes on the hunting behaviour that we observed. Further, Wells et al. (1999) noted that there are no records of white-bellied sea-eagles feeding or hunting on land in the Thai-Malay Peninsula. Although this particular flying fox colony has since moved to a different roost location as of early 2019, it is worth conducting more systematic observations to determine

whether this predator-prey interaction is still occurring there and elsewhere, and to attempt to better understand it to determine its impact on the bat population.

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