A COMMON TERN *STERNA HIRUNDO* CAPTURING AN AIRBORNE FLYING SQUID: A NOVEL FORAGING TECHNIQUE?

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ABSTRACT

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Seabirds forage in the air-water interface and have adapted various feeding techniques to exploit resources at or beneath the surface. Here I present photographic evidence of a novel feeding technique by an Eastern Common Tern *Sterna hirundo longipennis*: the capture of an airborne flying squid. Terns are generally plunge-divers for fish or shrimp, but they are also known to feed extensively on insects and occasionally by kleptoparasitism. Aerial pursuit/capture may be more common among seabirds in areas where flying prey are abundant. This new observation highlights the opportunistic nature and flexibility of seabirds in obtaining prey, as well as the paucity of prior seabird observations in tropical Southeast Asia.

Key words: aerial feeding, Philippines, Ommastrephidae, seabirds, Sternidae

Seabirds have evolved the ability to exploit resources in the marine environment in a variety of ways. They have adapted various feeding methods to acquire their food, such as pursuit diving, plunge diving, surface dipping, surface seizing, scavenging, and aerial feeding (Ashmole 1971). Some seabirds specialize in one main feeding technique (e.g., pursuit diving in cormorants, alcids, penguins; surface seizing by many petrels, albatross), while others use one or more methods depending on circumstances. Seabirds are generally considered opportunistic feeders, in that their diet changes to reflect the availability of the prey base (Montevecchi & Myers 1996, Shealer 2002). For example, the diet of Common Terns *Sterna hirundo* breeding in Newfoundland, Canada corresponds to changes in local fisheries (Montevecchi & Myers 1995). Similarly, adult and young Laughing Gulls *Leucophaeus atricilla* have been observed to use different food sources and adopt feeding methods that are the most efficient at each site (Burger & Gochfeld 1983).

The Common Tern has a circumpolar distribution, breeding in the middle latitudes of the northern hemisphere and wintering in the tropics and in some parts in the southern hemisphere (Becker & Ludwigs 2004). They can be long-distance migrants or, in some cases, remain year-round in their wintering areas (Kennedy *et al.* 2000). The diet of Common Terns wintering off southern Brazil is composed mainly of fish (93% by mass) and various insects (3% by mass but 67% by number), with some stomach samples also containing two cephalopod species: *Loligo sanpaulensis* and *Argonauta nodosa* (Bugoni & Vooren 2004). In Argentina, Common Tern diet was composed mainly of the Argentine anchovy *Engraulis anchoita*, which is abundant in the area (Mauco & Favero 2004), while those breeding in Long Island, New York, USA mainly caught sand-eels *Ammodytes americanus* and bay anchovies *Anchoa mitchilli* (Safina & Burger 1985). In tropical Southeast Asia, little is known about the foraging ecology and diet of seabirds. This paper is the first report of a wintering Eastern Common Tern capturing an airborne flying squid.

On 24 April 2014 at 10h08 in the Tañon Strait Protected Seascape (TSPS; 09.59496°N, 123.2534°E), I was participating in a cetacean photo-identification survey on a 9.8 m flatboat with a 40 HP (29.8 kW) outboard engine. I used a digital SLR camera (Canon EOS 1D Mark IIN with Canon EF 100–400 mm lens) to photograph a tern catching a flying squid in the air (Fig. 1). The photograph shows 26 individual flying squids with one in the beak of the tern (Fig. 2, inset). Based on published bill length of an Eastern Common Tern (35 mm; Hitchcock & Favaloro 1951), the size of the captured squid was small (estimated squid mantle length was 45 mm), and it may be one of several ommastrephid flying squid such as *Nototodarus hawaiiensis* or *Sthenoteuthis oualaniensis* (Fig. 2). The squids launch themselves into the air using jet propulsion (Muramatsu *et al.* 2013), as seen in the trail of water behind the squids in Figure 2. During several marine mammal surveys and on multiple occasions per trip, I observed that the survey boat triggers the escape behavior of flying squids and elicits their "flying" behavior. In addition, spinner dolphin *Stenella longirostris* groups and mixed schools of yellowfin *Thunnus albacares* with skipjack tuna *Katsuwonus pelamis* also elicit the escape behavior of squids near the surface.

Volant prey (flying fish and flying squids) are some of the most abundant prey organisms near the surface of tropical oceans (Lewallen *et al.* 2018), and they are an important component in the diet of many tropical seabirds (Spear *et al.* 2007). Together with the fact that resources are patchily distributed in these low productivity zones, this prey availability has synergistically shaped morphological and behavioral adaptations of tropical seabirds (Ballance & Pitman 1999, Hertel & Ballance 1999). Aerial feeding is a technique that is unique to tropical seabirds to capture volant prey items (Ashmole 1971). Red-footed Boobies *Sula sula* are known to feed on flying fish and have evolved morphological features and flight styles suited to such a specialized feeding technique (Diamond 1974, Hertel & Ballance 1999, Weimerskirch *et al.* 2005). The same suite of ecomorphological features that allow for quick aerial maneuvres to capture flying fish are

Fig. 1. An Eastern Common Tern *Sterna hirundo longipennis* capturing a flying squid on the wing in the Tañon Strait Protected Seascape on 24 April 2014.

Fig. 2. The flying squid may be one of several species from the family Ommastrephidae. (Inset) a cropped image of Figure 1 showing details of the prey capture.

also suitable for capturing flying squid, which are slower and much less aerodynamic compared to airborne flying fish. Photographic evidence of a Red-footed Booby feeding on flying squid in Japan was documented by Muramatsu *et al.* (2016). In the eastern tropical Pacific, ommastrephid squids are an important component of the diet of tropical seabirds (Spear *et al.* 2007). While it is known that many tropical seabirds capture volant prey (Ballance & Pitman 1999), detailed descriptions of the timing and geographical distribution of such feeding are lacking and remain as anecdotes in seabird diet publications. The frequency of this feeding technique and the proportion of volant prey captured through aerial feeding by tropical seabirds has, to the best of my knowledge, not been quantified yet.

Common Terns in the TSPS have been observed participating in a feeding frenzy with tuna, a common phenomenon throughout tropical oceans (e.g., Au & Pitman 1986, Spear *et al.* 2007). Tropical seabirds associate with subsurface predators, particularly tunas, which drive prey to the surface (Au & Pitman 1986). In Philippine waters, the identity of the prey species is unknown during these frenzied events, which often invoke some squids to flee from the predators. This opportunity to capture prey when they flee may be a primary reason for Common Terns to associate with subsurface predators. The photograph included in this paper (Fig. 1) represents a single instance of this predation, though it is apparently common. More than 50 species of seabirds have been recorded throughout the Philippines (Kennedy *et al.* 2000). However, little is known of their distribution in offshore environments (Sabater *et al.* 2011). Opportunistic observations are therefore increasingly relevant to understand aspects of seabird ecology in marine waters of Southeast Asia. Future observers engaged in other marine activities may be able to contribute important observations. This first report of Common Terns exploiting the escape behavior of ommastrephid squids contributes to an understanding of the foraging ecology of seabirds in little-studied parts of their range.

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