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Novel insights into the hunting behaviour of the winghead shark (*Eusphyra blochii*) from an aerial observation

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ABSTRACT

Direct records of hunting behaviour in hammerhead sharks are limited, particularly for the Critically Endangered winghead shark (*Eusphyra blochii*). We report on an opportunistic drone-based observation of a winghead shark pursuing and consuming a teleost fish at Magnetic Island, Queensland, Australia. During the interaction, the shark alternated between rapid turning manoeuvres and directed pursuit while repeatedly re-establishing proximity to its prey following attempted escapes. As the encounter progressed, the shark maintained a close-range pursuit, including repeated dorsoventral adjustments of the cephalofoil in response to vertical prey movements, and rapid, sharp turns before ultimately capturing and consuming the fish. These observations are consistent with hypotheses that the expanded cephalofoil of winghead sharks enhances manoeuvrability and facilitates pursuit of agile teleost prey.

Keywords: cephalofoil, hammerhead sharks, hunting, winghead shark.

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Of the 10 currently recognised hammerhead species (family Sphyrnidae), 9 are listed as Threatened by the International Union for Conservation of Nature (IUCN). Nevertheless, hammerheads remain comparatively understudied, and unresolved questions surrounding their ecology, habitat use, and behaviour continue to constrain evidence-based conservation and management strategies (e.g. Gallagher and Klimley 2018; Lubitz *et al.* 2023; Boube *et al.* 2025). In particular, direct observational evidence of how their distinctive morphological adaptations, such as the cephalofoil, translate into prey searching and prey capture behaviours remains rare. To date, detailed observations of hunting sequences in hammerheads have been largely limited to the great hammerhead (*Sphyrna mokarran*) that utilises pin and pivot movements during pursuit and capture of batoid prey (Strong *et al.* 1990; Chapman and Gruber 2002; Roemer *et al.* 2016; Lubitz *et al.* 2023), with comparable behavioural observations lacking for most other sphyrnid species.

The Critically Endangered winghead shark (*Eusphyra blochii*) is a small-bodied, tropical hammerhead patchily distributed throughout shallow, coastal waters of the Indo-West Pacific, where it commonly inhabits turbid inshore environments including bays and estuaries (Stevens and Lyle 1989; Heupel *et al.* 2015; Lubitz and Barnett 2023). The species possesses the most laterally expanded cephalofoil of any hammerhead species, with the width of the head reaching up to half of its total body length (Compagno 1984). Despite its distinctive morphological characteristics and broad geographic distribution, little is known regarding the behavioural ecology of this species and current knowledge is largely restricted to aspects of distribution, fisheries interactions, diet, age-and-growth, and reproduction (Stevens and Lyle 1989; Harry *et al.* 2011; Heupel *et al.* 2015; Lubitz and Barnett 2023; Lewis *et al.* 2025).

Evidence suggests that the winghead shark primarily feeds on small teleost fishes and cephalopods (Stevens and Lyle 1989). Gaylord *et al.* (2020) examined the hydrodynamic function of the hammerhead cephalofoil using computational fluid dynamics across multiple sphyrnid species, including the winghead shark. Contrary to the long-standing hypothesis that the cephalofoil primarily functions as a lift-generating structure, limited evidence to support enhanced lift production was found. Hammerheads also have an increased ability for dorsoventral head movements compared to carcharhinid sharks (Nakaya 1995). For the winghead, it was hence proposed that the cephalofoil may

improve manoeuvrability and prey-capture performance, particularly during pursuit of small, agile teleost prey (Gaylord *et al.* 2020).

We present, to our knowledge, the first visual record of a complete prey-pursuit and consumption sequence for a winghead shark. This opportunistic drone observation recorded at Horseshoe Bay on Magnetic Island, Queensland, Australia (Fig. 1) on the 19 April 2026 at 7:41 am AEST documented a likely mature winghead shark of ~150 cm total length (estimated from video footage) detecting, pursuing, and consuming an unidentified teleost fish (full video provided in Supplementary material). Since this study describes an opportunistic observation viewed passively without animal interaction or environmental manipulation, ethics approval was not sought.

The 143 s observation begins with the shark swimming in a directed, straight-line trajectory before initiating rapid turning movements, likely indicating initial prey detection and the onset of close-range pursuit. For the first 95 s, rapid turns and straight-line following behaviours alternated, mainly below the surface (Fig. 2). During this phase, the teleost fish periodically increased its distance from the shark, although the shark repeatedly re-established proximity to the prey item (Fig. 2).

After ~95 s, the shark remained within only a few body lengths of the fish, with increasingly frequent close-range interactions (only centimetres from the cephalofoil), most often near the surface of the water (Fig. 2*d*). At 1 min and 50 s, while still pursuing the fish, that had apparently dived below the surface, the winghead rapidly angled its cephalofoil downward before the remainder of the body followed in a steep subsurface manoeuvre (Fig. 2*b*, *c*). Immediately afterwards, the shark sharply angled the cephalofoil upward, redirecting the body back toward the surface.

This sequence of dorsoventral manoeuvres was repeated multiple times during pursuit, after which the shark again reduced the distance to the prey and resumed close-range pursuit (Fig. 2*d*). Following this, the teleost fish was unable to substantially increase its distance from the shark and remained in proximity to the cephalofoil throughout repeated pursuit manoeuvres by the shark. The winghead closely mirrored the rapid, directional changes of the prey, pivoting and turning sharply around its body axis before ultimately capturing and consuming the fish (Fig. 2*e*, *f*).

Our observations support the hypothesis that the exceptionally broad cephalofoil of winghead sharks may represent an adaptation for pursuing agile teleost prey (Gaylord *et al.* 2020) that dominate the species' diet (Stevens and Lyle 1989). The rapid turning manoeuvres and repeated dorsoventral adjustments of the cephalofoil observed during prey pursuit are in line with the structure facilitating fine-scale manoeuvrability and positional control within the water column. These observations support previous hydrodynamic modelling indicating that the cephalofoil primarily functions to enhance manoeuvrability and prey-capture performance rather than lift generation alone (Gaylord *et al.* 2020). Our observations are markedly different from those exhibited by the great hammerhead that uses pin and pivot behaviours to immobilise and consume larger, benthic batoid prey such as stingrays compared to the smaller, pelagic teleost prey pursuit

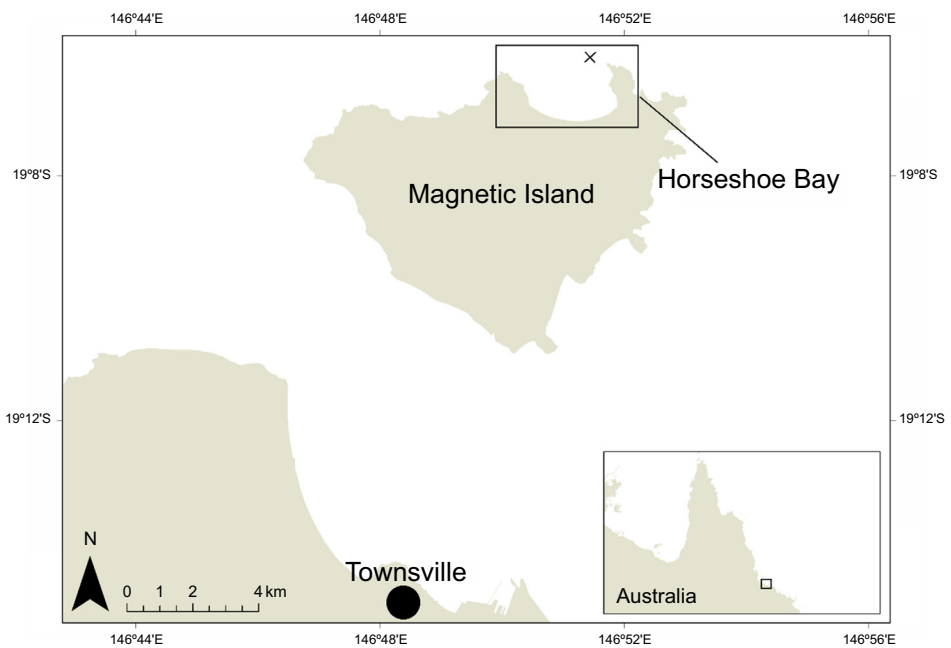

Fig. 1. Map of the study area indicating Horseshoe Bay on Magnetic Island, Queensland, Australia. The X indicates the location at which the hunt occurred.

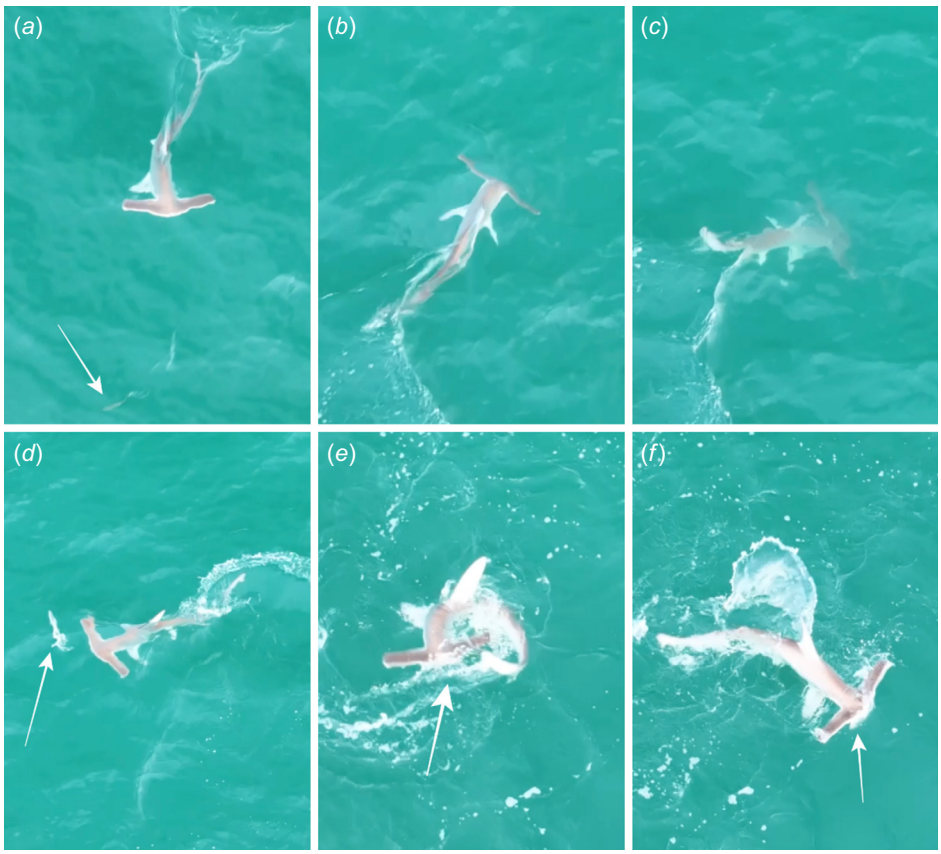

Fig. 2. (*a*) Straight-line pursuit by the winghead as the teleost fish manages to increase its distance to the shark; (*b*) rapid downward movement of cephalofoil in response to diving teleost fish; (*c*) the body of the winghead manoeuvres downward, following the initial downward movement of the cephalofoil; (*d*) close pursuit by the winghead, maintaining proximity to the teleost fish; (*e*) rapid, sharp turn and pivot of the body matching erratic prey movements; (*f*) consumption of teleost fish following rapid, sharp turns by the winghead. White arrow indicates location of the teleost fish.

by the winghead shark (Strong *et al.* 1990; Chapman and Gruber 2002; Lubitz *et al.* 2023). Although based on a single opportunistic observation, the sequence provides rare direct behavioural insights into prey pursuit of a winghead shark, and broadly highlights the value of opportunistic field-based behavioural observations in validating theoretical predictions regarding the functional significance of distinctive morphological adaptations in sharks.

Supplementary material

Supplementary material can be accessed from the article page online.

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Data availability. The video observation used in this study is available in full in the supplementary material.

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