

Short communication

Antecedent description and depiction of the recently described cetacean behaviour of trap/tread-water feeding inferred from a nineteenth-century sighting of a ‘sea monster’ in the Gulf of Suez, Egypt

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Abstract - In 2017 and 2018, two groups of biologists published papers in which they independently described what was referred to as a ‘novel’ or ‘new’ feeding behaviour for cetaceans. Called ‘trap’ or ‘tread-water’ feeding, the behaviour was of interest as it was the first time that passive or stationary in contrast to lunge, and vertical as opposed to horizontal position, feeding had been observed by whales. A subsequent historical ecology paper suggested that the recently described behaviour had in fact been previously observed and documented by illustrators and writers in Classical Antiquity and the Middle Ages. Because yesterday’s ‘sea monsters’ are today’s megafauna, recounted sightings of the former can provide early insight into whale behaviour. One such example is an 19th century sighting of a ‘sea monster’ in the Gulf of Suez, whose description and illustration are nearly identical to modern scientific reporting of whales engaged in trap/tread-water feeding. Such concordance is further evidence in support of a historical precedence with respect to observing and documenting this behaviour.

Key words: passive feeding, ‘sea monster’, whale behaviour.

Riassunto - Antecedente descrizione e rappresentazione del comportamento di *trap/tread-water feeding* recentemente descritto per i cetacei desunto da un avvistamento del diciannovesimo secolo di un “mostro marino” nel Golfo di Suez, Egitto.

Nel 2017 e nel 2018, due gruppi di biologi hanno pubblicato articoli in cui hanno descritto in modo indipendente quello che è stato definito un comportamento alimentare “nuovo” o “inedito” per i cetacei. Chiamato *trap/tread water feeding*, il comportamento si era rivelato interessante perché era la prima volta che si osservava nei cetacei un’alimentazione passiva o stazionaria, in contrasto con il *lunge feeding*, e in posizione verticale anziché orizzontale. Un successivo articolo di ecologia storica ha suggerito che il comportamento recentemente descritto era stato in realtà già osservato e documentato da illustratori e scrittori dell’antichità classica e del Medioevo. Poiché i “mostri marini” di ieri sono la megafauna di oggi, i resoconti di avvistamenti dei primi possono rappresentare una prima descrizione del comportamento dei cetacei. Un esempio è l’avvistamento nel XIX secolo di un “mostro marino” nel Golfo di Suez, la cui descrizione e illustrazione sono quasi

identiche ai moderni resoconti scientifici sulle balene impegnate nel *trap/tread-water feeding*. Tale concordanza è un’ulteriore prova a sostegno di un precedente storico per quanto riguarda l’osservazione e la documentazione di questo comportamento.

Parole chiave: alimentazione passiva, “mostro marino”, comportamento dei cetacei.

INTRODUCTION

At some point prior to 2017, researchers studying Bryde’s whales *Balaenoptera edeni* in the upper Gulf of Thailand observed what they described as ‘a novel head-lifting feeding behavior’ (Iwata *et al.*, 2017). Thirty-one animals were observed on 58 occasions to hold their vertical posture for periods of several seconds with their mouths open at the water surface. Treading water this way allowed the whales to position their lower jaws on the sea surface, thereby creating a channel in the corners between the vertical and horizontal jaws into which water flowed into their mouths accompanied by targeted shoals of anchovies. Photographs and a video show such whales next rapidly closing their mouths before resubmerging. Iwata *et al.* (2017) considered that this ‘discovery of tread-water feeding in Bryde’s whales represents the first report of passive feeding in baleen whales’.

Between 2011 and 2015, 16 humpback whales *Megaptera novaeangliae* off Vancouver Island in Canada were observed to engage in what was also considered to be ‘a new feeding strategy,’ with the ensuing paper being thought by McMillan *et al.* (2018) to ‘provide the first description of this foraging innovation’ (the authors had been unaware of the earlier publication by Iwata *et al.*, 2017). Here, whales remained in a stationary or near-stationary position vertically in the water with their mouths held open for extended periods of time before jaws were rapidly closed upon shoals of juvenile Pacific herring *Clupea pallasii*. In some instances, whales were observed to use their flippers or to spin their bodies in such a way as to direct prey into their mouths. The authors believed that what they termed ‘trap feeding’ was an adaptive behavioural response to feed on small, diffuse patches of prey with a minimum expenditure of energy. Interestingly, this specialized hunting behaviour was always associated with

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the presence of piscivorous birds which are known to be able to influence prey movement and shoaling dynamics. It was suggested that fish flee the birds by moving toward the apparent shelter of the trap feeding whale's mouth.

Antecedent iconography and description

Despite the respective beliefs by both Iwata *et al.* (2017) and McMillan *et al.* (2018) in the novelty of their independent observations, McCarthy *et al.* (2023a) have recently suggested that 'trap or tread-water feeding...[is] not...an animal kingdom "invention" of the 21st century, but rather an occasional strategy with much deeper roots'. The most compelling evidence offered for this assertion comes from the *Konungs skuggsjá (King's Mirror)*, a mid-thirteenth-century text that contains chapters on the marvelous marine fauna around Iceland. The descriptions of various creatures in the text are so accurate that the identities of more than two dozen marine animals can confidently be made (Whitaker, 1986), and natural explanations offered for others that had been thought at the time to be sea monsters (Lehn, 1981; Lehn & Schroeder, 2003, 2004; France, 2021a, in press). McCarthy *et al.* contend that the description of a mysterious creature called a *hafgufa* in the *King's Mirror* exemplifies the cetacean behaviour of trap/tread-water feeding. Moreover, they propose that the *hafgufa* tradition can be traced further back to the *Physiologus*, a second-century manuscript written in Egypt that was widely distributed throughout medieval Europe, where its descriptions of animals were contained in many bestiaries. In particular, it is the text's description of a particular whale called an 'aspidochelone' that the authors suggest also refers to trap/tread-water feeding.

In both these cases, that the animals in the ancient texts were described as exhaling indicates that the actions took place at or above the surface of the water, as is indicative of trap/tread-water feeding. As convincing as these two examples seem to be with respect to historical antecedence for the recently described, so-called 'novel,' 'new' or 'first' descriptions of trap/tread-water feeding, McCarthy *et al.*'s (2023a) presentation of a series of illustrations from several editions of the *Physiologus*, as well as from a famous Renaissance map and a handful of medieval manuscripts, do not really provide supportive evidence. With one exception, these illustrations depict various whales with their open mouths filled with fish, all occurring *beneath* the surface of the water. Moreover, in contrast to the digital diagrams that the authors create to show trap/tread-water feeding, in which humpback whales are positioned vertically with their gaping mouths in the air, the early illustrations are of whales oriented horizontally, as might be expected in traditional lunge, rather than stationary trap/tread-water, feeding.

Further antecedent evidence from a sea monster sighting

The purpose of this note is to present another antecedent example of observing an animal engaged in what closely matches the recently described cetacean behaviour of trap/tread-water feeding. Being from the nineteenth century, the description of this encounter falls between that of the thirteenth-century *King's Mirror*, inferred to

be an early example of such behaviour by McCarthy *et al.* (2023a), and those of the modern scientific descriptions (Iwata *et al.*, 2017; McMillan *et al.*, 2018). More significantly, the accompanying illustration of this encounter provides a much more convincing depiction of inferred trap/tread-water feeding than do any of the earlier illustrations shown in McCarthy *et al.* (2023a, 2023b).

The contention that yesterday's sea monsters are today's megafauna (Mazzoldi *et al.*, 2019) is no more accurate than with respect to whales (Papadopoulos & Ruscillo, 2002; Szabo, 2008; Hendriks, 2018; Brito *et al.*, 2019). As such, it is now recognized that a rich source of potential information exists buried in the corpus of sea monster sightings that can be mined in the same way that historical ecologists (e.g., Pauly, 1995) have done with other non-traditional sources. In like manner, the careful parsing of the words in anecdotal descriptions and the reinterpretation of accompanying illustrations of sea monster sightings have suggested that these contain some of the earliest – if not the first – mentions of various facets of cetacean biology, including historical distributions (Parsons, 2004), breaching and reproduction (Paxton *et al.*, 2005), spy-hopping (France, in press), and pre-plastic entanglement (France, 2016, 2018). Nor is McCarthy *et al.*'s (2023a) recent thesis the first time that cetacean feeding behaviour has been invoked as a modern explanation for an antecedent sea monster. Galbreath (2015) proposed that the cylindrical shape of the famous 1848 *Daedalus* sighting – the subject of a lively debate in scientific journals throughout the nineteenth century (Westrum, 1979; Lyons, 2009) – was due to surface skim feeding by a rorqual whale, although some consider this interpretation to be far-fetched (anonymous reviewer, pers. comm.).

Through the historical ecology lens of forensic detection (McClenachan, 2015; Alexander *et al.*, 2017), what should be made of the sea monster that was observed during the 1879 transit of the H.M.S. *Philomel* through the Gulf of Suez at the top of the Red Sea? Could this be another example in the *longue durée* of trap/tread-water feeding? Andrews' (1879) rendition of the encounter was published, as were many such, in an illustrated weekly newspaper, in this case, *The Graphic*:

When first observed it was rather more than a mile distant on the port bow, its snout projecting from the surface of the water, and strongly marked ripples showing the position of the body. It then opened its jaws, as shown in the sketch, and shut them again several times, forcing the water from between them as it did so in all directions in large jets. From time to time a portion of the back and dorsal fin appeared at some distance from the head. After remaining some little time in the above-described position, it disappeared, and on coming to the surface again, it repeated the action of elevating the head and opening the jaws several times, turning slowly from side to side as it did so [Fig. 1].

On approach of the ship the monster swam swiftly away, leaving a broad track like the wake of a ship, and disappeared beneath the waves.

The colour of that portion of the body that was seen was black, as was also the upper jaw. The lower jaw was grey round the mouth, but of a bright salmon colour underneath (like the belly of some kinds of lizard) becoming redder as it approached the throat. The inside of the mouth appeared to be grey with white stripes, parallel

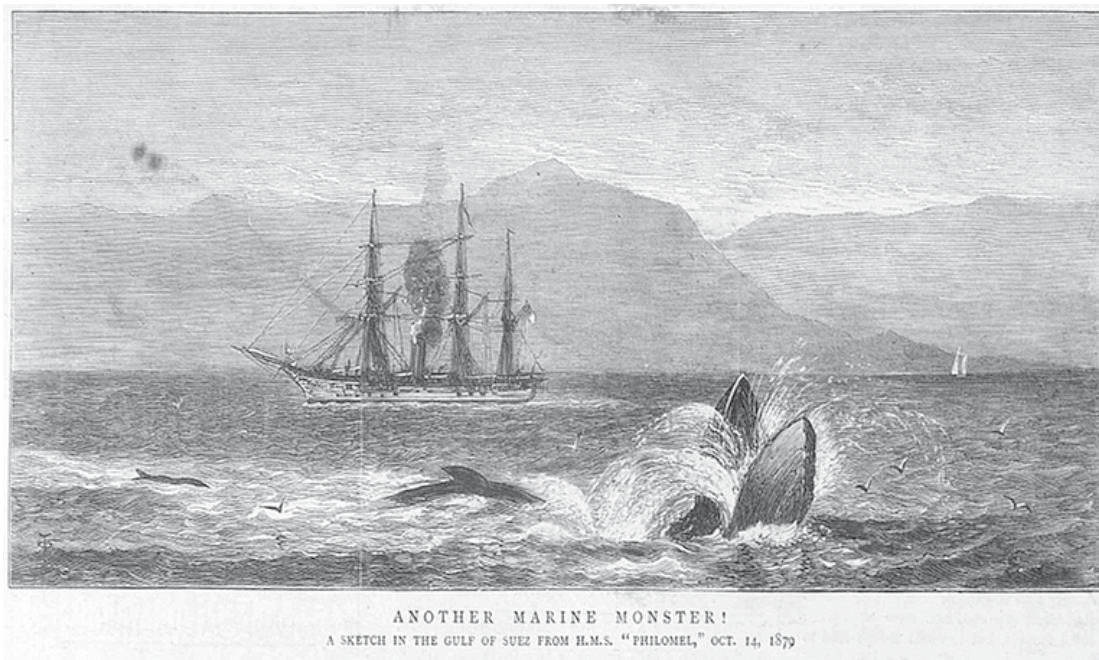


Fig. 1 - Illustration of a nineteenth-century encounter with a purported sea monster observed in the Gulf of Suez (Andrews, 1879). The vertical body position and open mouth of what is obviously a baleen whale (the rightward animal in the group) closely resembles the photographs and digital reconstructions of the recently described, so-called 'new' or 'first' descriptions of the stationary hunting behaviour of trap/tread-water feeding, as shown in Iwata *et al.* (2017), McMillan *et al.* (2018), McCarthy *et al.* (2023a, 2023b), and Lu (2023). The illustration, drawn in concordance to the eyewitness report, is emblematic of the instance of such whales 'rapidly closing them [their mouths] to trap prey' (McCarthy *et al.*, 2023a). Note the presence of seabirds, something common to all modern recorded instances of such feeding documented in humpback whales, an association which may be related to shoaling fish being driven to seek the apparent shelter of the whale's open mouth (McMillan *et al.*, 2018).

to the edges of the jaw, very distinctly marked. These might have been rows of teeth, or some substance resembling whalebone. The height the snout that was elevated above the surface of the water was at least fifteen feet, and the spread of the jaws quite twenty feet.

Given that the nineteenth century was replete with accounts of observers conflating or misidentifying whales as sea monsters (France, 2016), particularly in regions that were incompletely explored, such as the arctic or Africa (France, 2018, 2021a, 2021b), it is not entirely surprising that the same mistake was made with respect to the *Philomel* creature in the Gulf of Suez. Although the early commentator, Gould (1886), imagined the animal to be some newly observed species of giant fish, the description and depiction so obviously pertain to a baleen cetacean that, writing almost a century later, even Heuvelmans (1968: 283), the father of cryptozoology, had no hesitation in stating that 'Personally I should not like to swear that the *Philomel* monster was not a large whale of a known species—some of them have reddish throats.' The mention of teeth 'resembling whalebone' indicates a baleen whale, whereas the pleated throat groves shown in the figure denote a rorqual species. Bright pink colouration in species whose undersides are normally white, such as minke whales *B. acutorostata*, is due to 'belly flops' from rigorous feeding or to blood shunting to ventral capillaries to prevent heat stroke (Anonymous, 2019, 2020; see a photograph of this colouration for a trap-feeding Bryde's whale in McCarthy *et al.*, 2023b).

Both Bryde's and Humpback whales, the two species formally identified to engage in trap/tread-water feeding

(Iwata *et al.*, 2017; McMillan *et al.*, 2018), are known to occur in the Red Sea, as are Omura's whales *B. omura*, another rorqual species (Gladstone & Fisher, 2000; Notarbartolo di Sciarra *et al.*, 2017). Several online mentions exist from whale watching organizations concerning the presence of minke whales in the Red Sea, though such has yet to be formally confirmed in the scientific literature.

DISCUSSION

When compared with the photographs, illustrations, and text in Iwata *et al.* (2017), McMillan *et al.* (2018), and McCarthy *et al.* (2023a, 2023b), both the description and the depiction of the misconstrued sea monster seen by the *Philomel* crew in the Gulf of Suez in the nineteenth century are highly suggestive of a whale having been observed engaged in trap/tread-water feeding. Indeed, as a consequence of simply being more recent than the two textual accounts and the eight illustrations from Classical Antiquity and the Middle Ages identified by McCarthy *et al.* (2023a), the details in the present example provide even stronger support for those authors' contention that this particular strategy of passive hunting, formally described in the scientific literature only in 2017 and 2018, has been observed and documented, albeit unknowingly, throughout the past and in at least one location, Egypt, distant from either Thailand or Canada. It is likely that the feeding behaviour is ubiquitous and may be a characteristic of numerous baleen species.

Finally, the present work joins a growing corpus in demonstrating that ancient, medieval and premodern art can provide useful information about the historic marine environment of Mediterranean countries (Camuffo, 2001; Papadopoulos & Ruscillo, 2002; Stothers, 2004; Guidetti & Micheli, 2011; Jaffe, 2013; France, 2021b).

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