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Ocean sunfish, genus *Mola* Kölreuter, 1766 (Pisces Molidae), exhibit surprising levels of agility during interactions with orca, *Orcinus orca* (Linnaeus, 1758) (Mammalia Delphinidae)

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ABSTRACT Ocean sunfish (*Mola* spp.) are well known for their large adult size and peculiar morphology, which in combination give them the resemblance of a giant, swimming fish head. At first glance, this unusual body form hints at locomotive ineptitude, and traditionally molids have indeed been considered poor swimmers. Although this archaic view has been thoroughly rebutted in recent years, with studies revealing molids are strong swimmers (for example their ability to rapidly accelerate, with recorded burst speeds for *Mola mola* of 6.6 m/s), their fine-scale maneuverability is unclear. Furthermore, many natural molid behaviours are not well understood, including antipredator behaviours, as opportunities to observe this taxa in the wild are limited. Unexpectedly, during a recent global review of molid interactions with orca (a molid predator), a number of video recordings revealed surprisingly rapid and agile molid movements. These included the molids turning up-side down, rolling backwards, pivoting and spinning. These behaviours appeared to be deliberate attempts on behalf of the molids to keep the clavus (‘tail’) towards the orca, keep the ventral area away, evade the orca, and/or discourage the orca from making physical contact. Here, we describe eight ‘Evade’ behaviours based on video analysis, present detailed descriptions and provide examples.

KEY WORDS Molid; killer whale; evasive behaviour; anti-predator behaviour; predator-prey interaction.

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INTRODUCTION

Molid species from the genus *Mola* (Family Molidae) are large marine, epipelagic - mesopelagic fishes, ubiquitous to tropical and temperate waters. Currently, three species are recognised; the ocean sunfish *Mola mola* (Linnaeus, 1758), giant sunfish *Mola alexandrini* (Ranzani, 1839) and hoodwinker sunfish *Mola tecta* Nyegaard et al., 2017 (Fricke et al., 2022; Sawai et al., 2018) (although we note not all agree on the nomenclature; Britz, 2022), hereafter referred to as molids. At least one species, *M. alexandrini*, can attain over 3.3 m in total length (TL) and over 2.7

tons in body weight (Gomes-Pereira et al., 2022), heavier than any other extant bony fish species (Sawai & Nyegaard, 2022). Molids are notable for their unusual morphology, whereby instead of a tail, elements from the dorsal and anal fins form a rudder-like back-end, termed a 'clavus' (Fraser-Brunner, 1951; Johnson & Britz, 2005). The body is oval and laterally compressed and does not flex; instead, the near-symmetrical dorsal and anal fins provide the means of propulsion through 'underwater flight' not dissimilar to that of penguins (Watanabe & Sato, 2008; Watanabe & Davenport, 2021).

Molids were traditionally considered slow, inefficient swimmers (see comments in Cartamil & Lowe, 2004; Watanabe & Sato, 2008), a reputation which likely arose from a combination of their unusual body morphology and the documented *M. mola* behaviour of 'basking' at the sea-surface to warm up in between deep foraging dives (Cartamil & Lowe, 2004; Nakamura et al., 2015; Nakamura & Yamada, 2022). However, *M. mola* has an effective locomotive system, with cruise speeds comparable to those of salmonoids and sharks (Watanabe & Sato, 2008; Watanabe & Davenport, 2021). They are also capable of rapid acceleration, with recorded burst speeds for *M. mola* of 2.2 – 2.4 m/s (Nakamura and Sato, 2014; Watanabe and Sato, 2008) and 6.6 m/s (Thys et al., 2015). A further account describes a *M. mola* catching a trolled lure towed at 3.6 m/s off Chincoteague, Virginia, USA (Kyle Krabill, pers. comm. 5 August 2020; see also https://www.youtube.com/watch?v=He7NOFfukwc). Further, molids (at least those under two meters) are capable of breaching (Hays et al., 2020; Thys et al., 2020).

Many molid behaviours are not well understood, in particular those that relate to interactions with conspecifics and other taxa, including responses to predators. Due to the extremely large growth spectrum of molids, they presumably rely on different antipredator behaviours and strategies during each life stage. Once molids are past the taxa-specific '*ostracioniform*' and '*molacanthiform*' early developmental stages, where they are adorned with numerous protective spines (Leis, 1977; Martin & Drewry, 1978; Thys et al., 2020), they presumably rely on fast growth (Nakatsubo & Hirose, 2007; Pan et al., 2016; Pope et al., 2010) to outgrow gape-limited predators. As juveniles and adults they do not have any obvious defences, and the notion that molids contain tetrodotoxin (Sodeman, 1989), a potent biotoxin used by many marine organisms as a defence against predation (Lorentz et al., 2016), has not been corroborated (Baptista et al., 2020, 2022; Huang et al., 2011; Saito et al., 1991). As adults, they remain potential prey for sealions (Nyegaard et al., 2019; Powell, 2001), orca (Gladstone, 1988; Visser et al., 2023; Visser & Fletcher, 2023), and some species of shark (Fergusson et al., 2000; Nyegaard et al., 2019; Pope et al., 2010). It has been proposed that swift, deep diving may be a response to predators (Cartamil & Lowe, 2004; Sims et al., 2009). Further, breaching in *Mola* has also been suggested to be a response to predators (Thys et al., 2020). However, scant information is available to corroborate these hypotheses and gain a more nuanced picture of molid responses to predators.

During a recent review of interactions between orca *Orcinus orca* (Linnaeus, 1758) and juvenile/adult molids (Visser et al., 2023), several unexpected and (to the best of our knowledge) undescribed molid behaviours were observed on video recordings. These behaviours appeared to be attempts to evade the orca and revealed unexpected levels of molid agility. Here we aim to describe these behaviours and illustrate key aspects so that they may be recognised in other contexts. To achieve this, we reviewed video recordings of interactions between orca and molids, examined the molid's reactions to orca, and identified those manoeuvres which repeated between interactions. Here, we present these as descriptions and illustrations, along with examples.

MATERIAL AND METHODS

Sources

We reviewed video recordings from four different orca-molid interactions. The videos were sourced online, but in three instances, the videographers made the original, unedited videos available for this study. In addition, we included a brief offline video in the review, to allow valuable context regarding molid breaching to be presented (Table 1).

For each interaction, the molid species was es-

Interaction	Date	Location	Camera position	Videographer	Source
Mex-2009	11/02/2009	Off Cabo San Lucas, Mexico	Top-side	Michael Van den berg	YouTube[1]
NZ-2013*	02/04/2013	Off Northland, New Zealand	Underwater	Mazdak Radjainia	YouTube[2]
SA-2019*	06/03/2019	False Bay, South Africa	Top-side	David Hurwitz	Private
Aus-2020*	05/03/2020	Bremer Canyon, Western Australia	Top-side & underwater	Craig and Stormy, Whale Watch Western Australia	YouTube[3]
Mex-2020*	16/07/2020	Off Michoacan and Colima, Mexico	Top-side	Cristobal Alvarez	Online video archive[4]

Table 1. Orca-molid interactions documented on video and reviewed in this study. *Denotes interactions where the videographers provided the original, unedited video in high resolution for use in this study. Dates are given as dd/mm/yyyy. 1: https://www.youtube.com/watch?v=Yf5MYigV4A0. 2: https://www.youtube.com/watch?v=ocvF9gv5M0s. 3: https://www.youtube.com/watch?v=wxio3TMNmWI. 4: https://tinyurl.com/MexInt-2020.

tablished to the lowest possible taxonomic level based on the morphology visible on the imagery, following Sawai et al. (2020). Molid size was estimated as Total Length [TL; anterior-most to posterior-most point, following Sawai et al. (2020)], based on the size relative to the orca, combined with a subjective judgement of the molid morphology [*Mola* spp. change morphology with growth (Nyegaard et al., 2018; Sawai et al., 2018, 2017; Watanabe & Sato, 2008)].

The videos were reviewed in an iterative way, noting behaviours that appeared to be reactions to the orca and which repeated across other videos. The interactions were studied at various video play back speeds, including frame-by-frame, to ascertain if the molids were driving the movements themselves, or if they were influenced by physical contact with the orca (i.e., being nudged, pushed, etc). Only voluntary movements were considered to be molid behaviours.

The behaviours were illustrated and described; 1) as diagrams outlining key aspect of each behaviour, 2) in table format with a brief description of each behaviour and, 3) using a series of frames extracted from the videos to illustrate movement.

RESULTS

The molid species could be ascertained in four interactions, with three *M. alexandrini* and one *M. mola* identified (Table 2). The fifth molid appeared to be *M. mola*, however, insufficient morphology was visible on the imagery to confirm this. The molids ranged in estimated size from ca. 1–2 m TL (Table 2).

Each of the five videos showed a single molid and multiple orca. The latter circled, approached and harassed the molids, including making physical contact. In turn, the molid reactive behaviours varied, were clearly driven by the molids themselves, and appeared to be attempts to evade the orca and/or discourage the orca from making physical contact. These are shown schematically in Fig. 1, and described in Table 3. The behaviours appeared to (approximately) escalate with orca proximity and are described below in the context of the following scenarios: 1) an orca approaches, but is not yet close enough to make physical contact with the molid; 2)

Interaction name	Molid species	Estimated total length (m)
Mex-2009	*Mola mola*	2
NZ-2013	*Mola alexandrini*	1 – 1.2
SA-2019	*Mola* sp.(likely *M. mola*)	1.5
Aus-2020	*Mola alexandrini*	1
Mex-2020	*Mola alexandrini*	1.5 – 2

Table 2. Species identification and estimated size of molids, determined visually from the video of orca-molid interactions listed in Table 1.

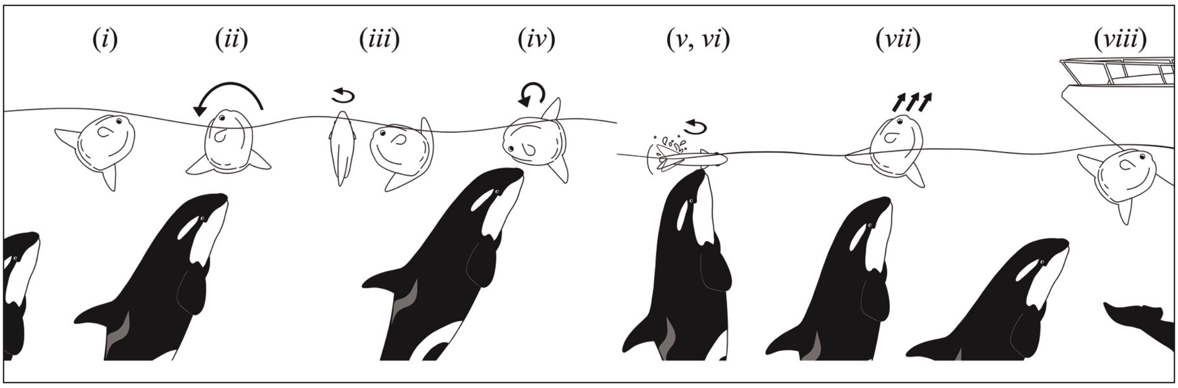

Figure 1. Molid 'Evade' behaviours described in Table 1: (*i*) 'Seek-surface' and 'Clavus-to-orca', (*ii*) 'Head-up', (*iii*) 'Pivot', (*iv*) 'Ventral-up', (*v, vi*) 'Spin' and 'Thrash', (*vii*) 'Breach', and (*viii*) 'Shelter'. Note these behaviours are not sequential. Illustration by LAF.

Reference to Figure 1	Behaviour term	Description of molid behaviour	Interactions, where this behaviour was observed
i	'Seek-surface'	Stationary (effectively) at the sea surface with the head angled slightly up	Mex-2009, NZ-2013, Aus-2020, Mex-2020
i	'Clavus-to-orca'	Actively keeps the clavus towards the orca	Mex-2009, NZ-2013, Aus-2020, Mex-2020
ii	'Head-up'	Abruptly obtains a near-vertical position with the head at or above water	Mex-2009, NZ-2013, Aus-2020, Mex-2020
iii	'Pivot'	From 'Head-up', pivots to quickly change direction; or, while upright, quickly changes direction 'on the spot'	Aus-2020, Mex-2020
iv	'Ventral-up'	From 'Head-up', inverts completely so the ventral area is at or above water	NZ-2013, Mex-2020
v	'Thrash'	Thrashes at the surface with the dorsal and/or anal fins, without moving forwards	Aus-2020, Mex-2020
vi	'Spin'	While parallel to the surface, spins rapidly	Aus-2020, Mex-2020
vii	'Breach'	Propels itself partially (at least half the body) or fully out of the water	Mex-2020, SA-2019
vii	'Shelter'[1]	Actively positions itself near a vessel (i.e., is not herded towards the vessel by orca), at a distance less than the length of the approaching orca.[1]	Mex-2009, Aus-2020

Table 3. Molid 'Evade' behaviours during orca interactions. Interaction names refer to Table 1.
[1]Note this behaviour is included here as tentative; see text for details.

the orca is as close as it will get to the molid during the pass (may make physical contact as it passes), and; 3) the orca shows sustained interest and close proximity to the molid, including instances of physical contact.

Approach by orca

When orca approached (as well as in between orca passes), no attempts to dive were observed for the molids in any of the videos. Instead, the molids repeatedly assumed a stationary position at or very near the sea surface with the head angled slightly upwards (here termed 'Seek-surface'), while actively keeping the clavus towards any close-by orca ('Clavus-to-orca') (*i* in Table 3 and on Figs. 1–4). This position was typically assumed in the early stages of an orca approach.

During an orca pass

As orca approached and neared the point of physical contact, or the point of closest proximity to the molid before passing it, molid behaviours varied. Some reactions included abruptly angling the head upwards and out of the water ('Head-up')

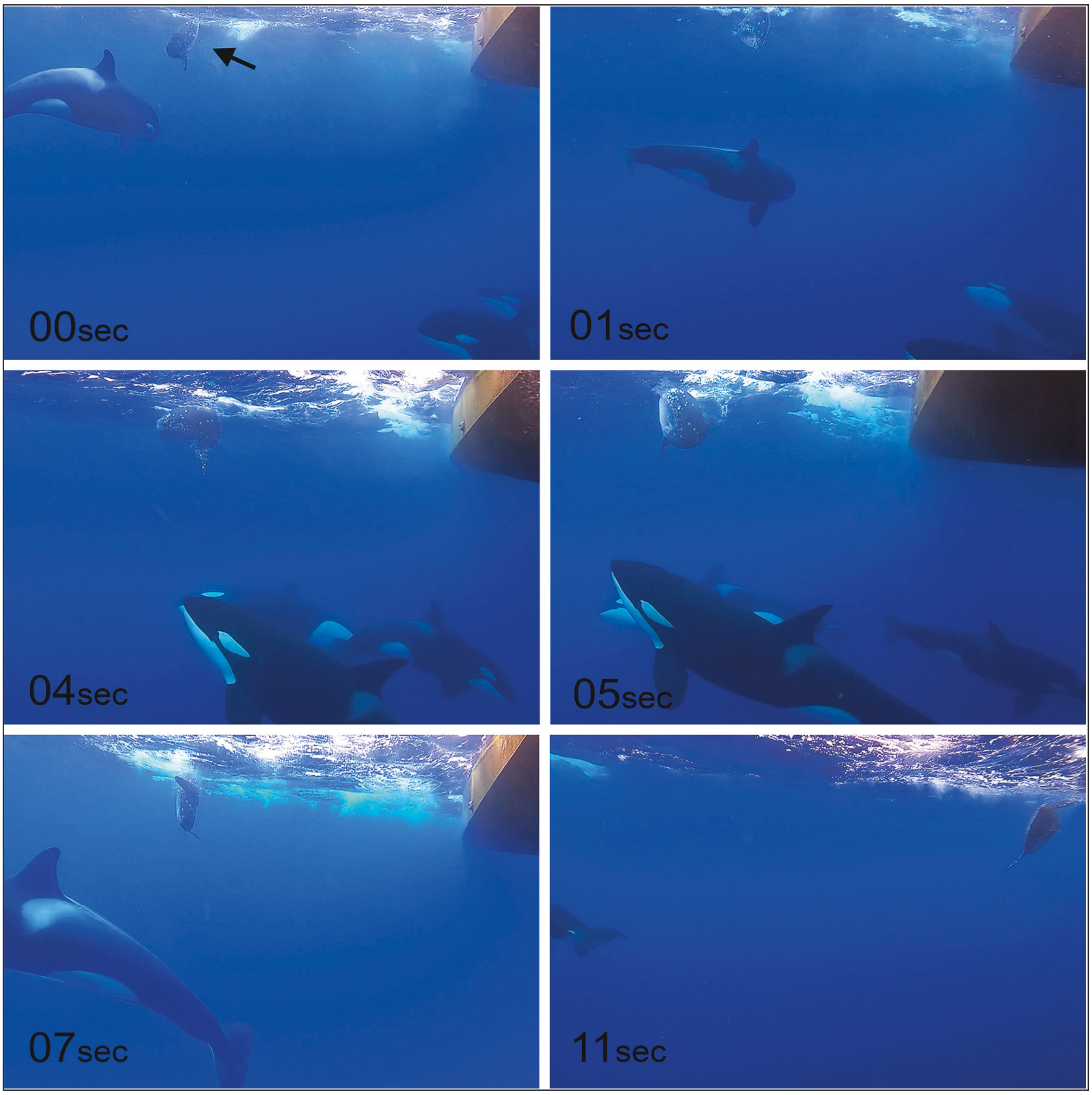

Figure 2. Underwater view of a *Mola alexandrini* (estimated 1 m total length) (arrow) exhibiting 'Evade' behaviours during orca passes. Time elapsed indicated in seconds. The molid assumes the positions 'Seek-surface' and 'Clavus-to-orca', as an orca approaches from the left (Image 1). From here it 'Pivots' to maintain 'Clavus-to-orca' during the pass (Image 2), and also achieves 'Clavus-to-orca' to two 'new' orca approaching from below and to the right (Image 3). As the orca pass directly underneath the molid, it assumes the 'Head-up' position (Image 4), and from here 'Pivots' again to maintain 'Clavus-to-orca' as they continue to the left (Images 5 and 6). Frames from video by Craig, Whale Watch Western Australia (Interaction Aus-2020, Table 1), reprinted with permission.

(*ii* in Table 3 and on Fig. 1, Fig. 2, Fig. 4). From the 'Head-up' position, a molid would at times 'Pivot' around its own length axis ('Pivot') (*iii* and on Figs. 1, 2), seemingly to maintain 'Clavus-to-orca' as the orca passed underneath, and/or to prepare to move in the opposite direction to the orca after the pass. This rapid change in direction 'on the spot' could also be achieved by the molids while in a more upright position, by using their powerful dorsal and anal fins to do so, without moving forwards (e.g., Fig. 3).

Alternatively, from the 'Head-up' position, the molids sometimes continued the backwards motion to briefly invert completely ('Ventral-up') (*iv* in

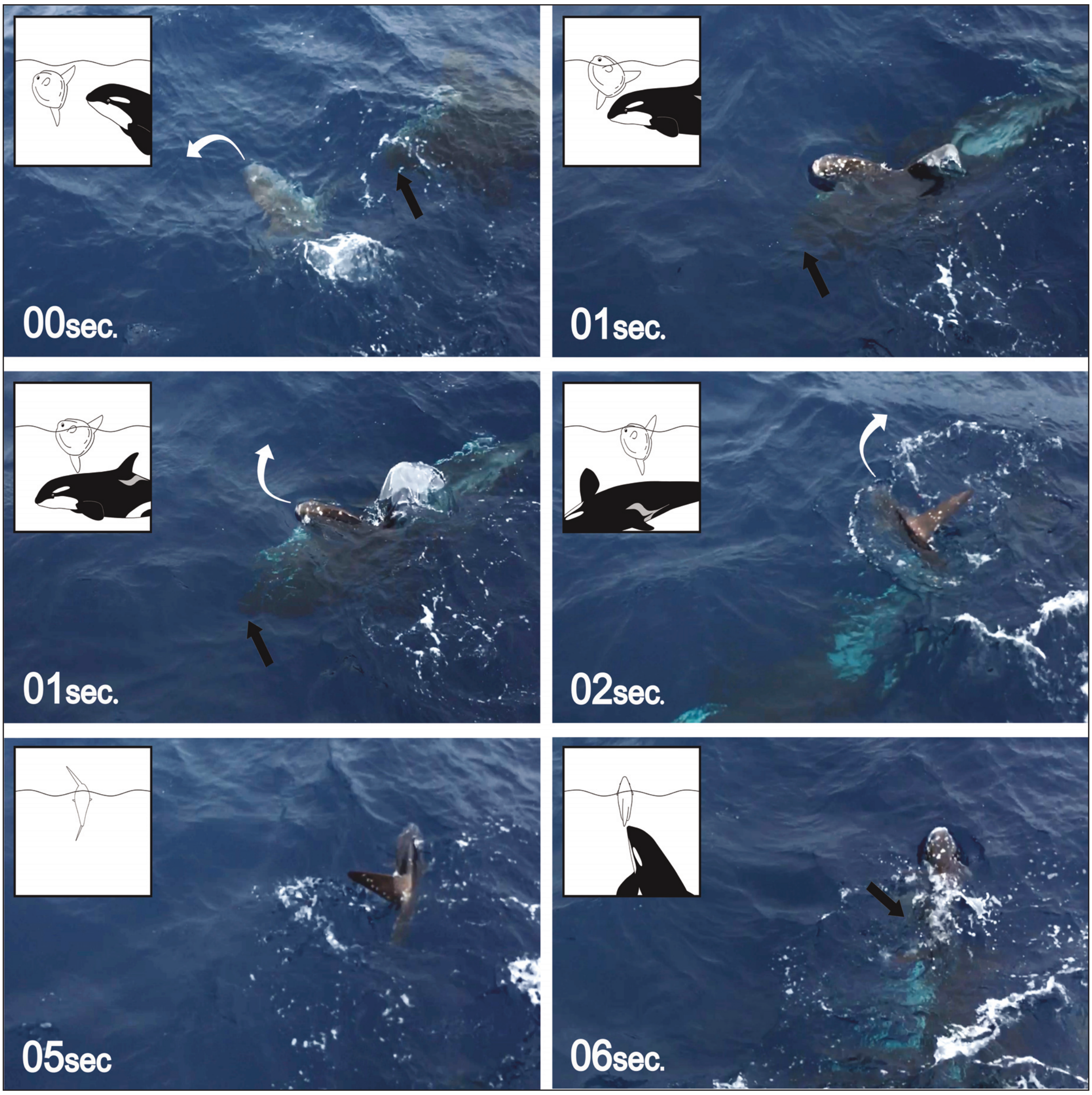

Figure 3. Topside view with representative side-view schematics of a *Mola alexandrini* (estimated 1 m total length) exhibiting 'Evade' behaviours during an orca pass (white arrows denote sunfish turning, black arrows indicate approximate position of the orca's head). Time elapsed indicated in seconds. As an orca approaches (Image 1), the molid quickly 'Pivots' to its left into a 'Head-up' position (Image 2), then immediately turns to the right as the orca passes underneath (Images 3 and 4, respectively), resulting in the molid facing in the opposite direction to the orca (Image 5), ready for 'Head-up' and 'Clavus-to-orca' as the orca turns and approaches again (Image 6). Frames from video by Stormy, Whale Watch Western Australia (Interaction Aus-2020, Table 1), reprinted with permission. Illustrations by LAF.

Table 3 and on Figs. 1 and 4), at times even causing the ventral area to protrude out of the water as the orca passed underneath. The molids would right themselves from this position by simply reversing the 'Head-up', 'Ventral-up' action (not shown here), or right themselves through a side-way twist-like motion (Fig. 4).

Sustained orca interest

During moments of physical interactions, where the orca either nudged the molid, pushed it, or otherwise exhibited sustained interest by maintaining very close proximity, molid behaviours would typically include 'frantic' movements. Specifically, the

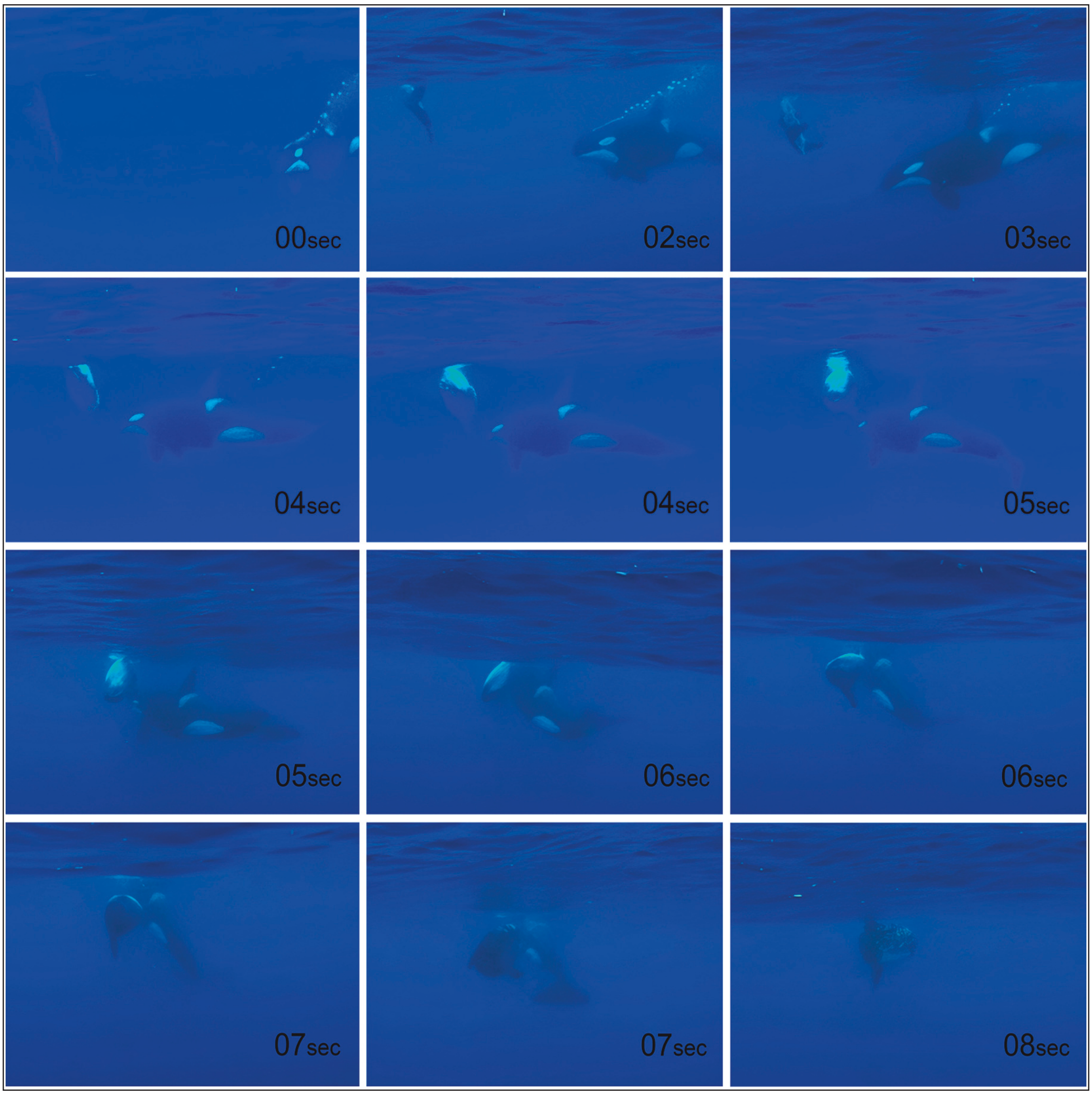

Figure 4. Underwater view of a *Mola alexandrini* (estimated 1 – 1.2 m total length) exhibiting 'Evade' behaviours during an orca pass. Time elapsed indicated in seconds. Prior to the orca approach, the molid is stationary at the sea surface (Image 1). As the orca approaches closer, it assumes the 'Seek-surface' and 'Clavus-to-orca' positions (Images 2 and 3). As the orca gets closer, it assumes the 'Head-up' position (Image 4), directly continuing into the 'Ventral-up' position (Images 5 and 6). From here the molid rights itself by reversing the 'Head-up'-'Ventral-up' movements, with a slight sideways twist (Images 7-12). Frames from video by Mazdak Radjainia, New Zealand (Interaction NZ-2013, Table 1), reprinted with permission.

molids would position themselves flat against the sea surface and spin rapidly around the mid-axis (‘Spin’) and/or thrash with one or both of the powerful dorsal and anal fins (‘Thrash’) (*v* in Table 3 and on Figs. 1, 5, 6). When in an upright position, the molids would also use the dorsal fin to ‘Thrash’ against the sea surface. These behaviours appeared to be attempts to dissuade the orca from making physical contact, although we cannot discount that they may simply reflect ‘panic’. However, in at least one instance an orca clearly recoiled during a ‘Thrash’ (Fig. 6), providing the molid with an opportunity to then rapidly move forwards and achieve ‘Clavus-to-orca’. These actions were therefore – regardless of the intention on behalf of the molid – included here as ‘Evade’ behaviours.

During some close, sustained interactions with orca, the molids would exhibit an unexpected level

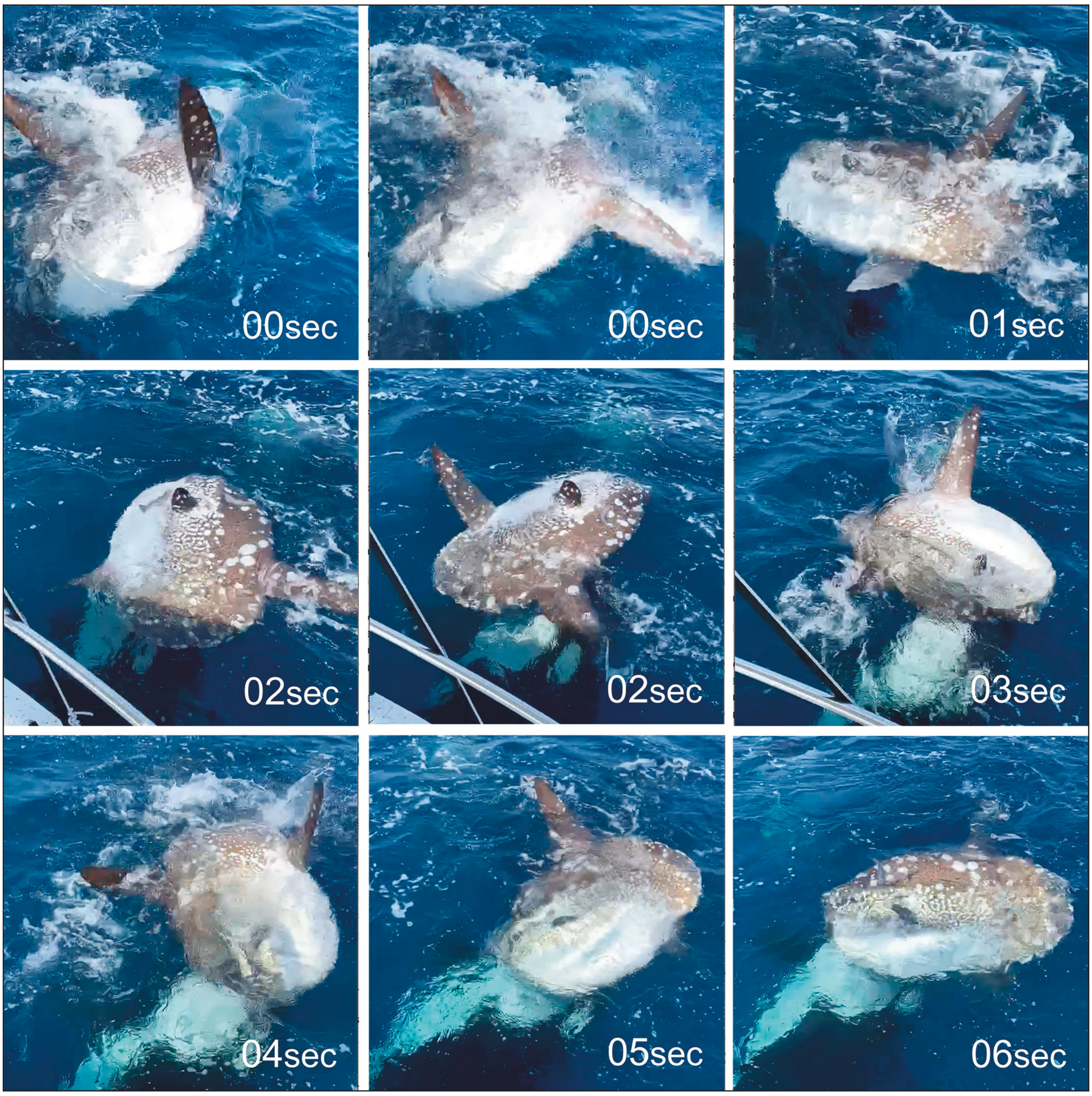

Figure 5. Top-side view of a *Mola alexandrini* (estimated 1.5 – 2 m total length) exhibiting ‘Evade’ behaviours during sustained orca interest. Time elapsed indicated in seconds. The molid spins rapidly around its central axis (‘Spin’) while thrashing with its powerful dorsal and anal fins (‘Thrash’), as the orca maintains its position underneath. Frames from video by Cristobal Alvarez (Interaction Mex-2020, Table 1), reprinted with permission.

Figure 6. Top-side view of a *Mola alexandrini* (estimated at 1.5 – 2 m total length) exhibiting the 'Evade' behaviour 'Thrash'. As the orca approaches (upper two images), the molid thrashes with its dorsal fin, causing the orca to recoil (lower two images) and vocalise. Regardless of the intention of the molid, this then provided it with an opportunity to quickly move forwards, past the orca, and achieve the 'Evade' behaviour 'Clavus-to-orca' (not shown). Frames extracted within one second of each other from video by Cristobal Alvarez (Interaction Mex-2020, Table 1), reprinted with permission.

of agility, reacting to the orca with a variety of movements in quick succession, seemingly to attempt to evade physical contact by the orca. One such example is shown in Fig. 7.

Breach

Two different videos showed molids emerging partially from the water (Table 1), indicating they were breaching ('Breach'; *vii* in Table 3 and on Fig. 1) . Both videos were recorded from a top-side perspective, rendering the exact context unclear, i.e., if the molids were pushed from below by the orca. However, the brief video from Interaction SA-19 showed a molid breaching in front of two travelling orca, and frame-by-frame analysis of the relative positions strongly suggested that, while the orca were in very close proximity to the molid, they were too far behind to physically touch it, and could not have pushed it out of the water (Fig. 8).

Close vessel proximity

Finally, we used the term 'Shelter' to describe observations where the molids appeared to use the side of the vessel to shelter from orca (*viii* in Table 3 and on Fig.1). Naturally, as all the observations were made from vessels, any proximity may have been purely coincidental. However, in one interaction, the molid appeared to actively seek the side of the vessel (Fig. 9), and another interaction, where similar behaviour was documented (Fig. 2), the interaction was described by the observers as: "*They* [i.e., the orca] *began to push him* [i.e., the molid] *closer to us and within sight of the boat, little Sunfish tried to swim towards us for a distraction but* *each time the Orca pushed him back."* (Whale Watch Australia, 2020). A third interaction showed extensive, close interactions up against the hull of the vessel (Fig. 7), however, in this case it was unclear if the molid had actively positioned itself near the vessel, if it had been herded there by the orca, or if the proximity was purely coincidental.

We have included 'Shelter' here as a tentative 'Evade' behaviour, although we acknowledge it may not always be deliberate on behalf of the

Figure 7. Top-side view of a *Mola alexandrini* (estimated at 1.5 – 2 m total length), performing a series of 'Evade' maneuverers in quick succession in reaction to the approach of two orca cooperatively hunting [see also Visser et al. (2023)]. Time elapsed indicated in seconds. The molid first exhibits 'Head-up' (Image 1), then immediately 'Pivots' seemingly to avoid physical contact by the orca (Images 3, 4). The molid then rolls backwards into 'Ventral-up' (Image 5), then immediately continues the backwards motion with a side-way twist (Images 6 – 8) to right itself, ending up side-ways to the orca, which is moving forwards (Image 9). The molid immediately twists its backend upwards and sideways over the head of the orca (Images 10 – 14), clearing the orca (Image 15), ending in 'Ventral-up' (Image 16). The molid immediately rights itself with a side-way twist (Images 17, 18), then 'Thrashes' directly onto the second orca, which is now approaching (Images 19, 20). Frames extracted from video by Cristobal Alvarez (Interaction Mex-2020, Table 1), reprinted with permission.

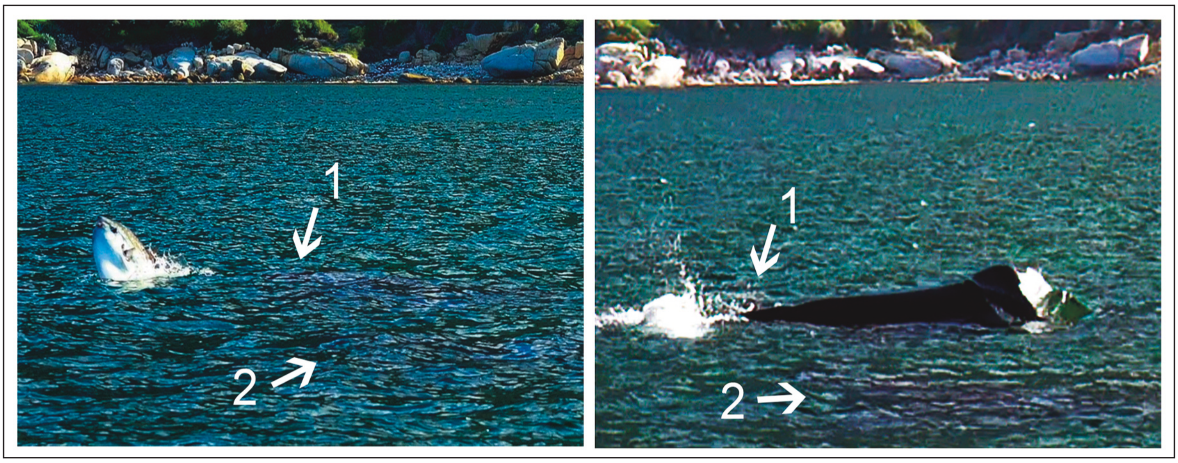

Figure 8. Top-side view of a *Mola* sp. (likely *M. mola*) (estimated 1.5 m total length) exhibiting the 'Evade' behaviour 'Breach' in front of two orca travelling underwater. The arrows indicate the approximate location of each orca's head, i.e., neither was within range of the molid at the moment of breaching, indicating the molid was not pushed out of the water by the orca. Note the dorsal fin of orca #1 is collapsed to the left side. Frames extracted within one second of each other from video by David Hurwitz (Interaction SA-2019, Table 1), reprinted with permission.

molid, and could even potentially be detrimental if the molid gets 'trapped' between the vessel and the orca. We consider 'Shelter' to be achieved when the molid is within one orca body length of the vessel, as at this point the orca's ability to manoeuvre and approach at the surface is limited by the physical presence of the vessel. However, importantly, for inclusion into this category of behaviour, the molid needs to have assumed this position itself without having been herded there by orca.

DISCUSSION

The observations described here revealed unexcepted levels of molid agility during interactions with orca. Although the traditional view of molids as slow and cumbersome swimmers has been disproved (Cartamil & Lowe, 2004; Watanabe & Davenport, 2021), the variety of manoeuvres and quick reactions to orca were still surprising to us. The observations do, however, corroborate descriptions of captive molids as "…*surprisingly agile and can swim backwards away from unknown foreign objects*" by Howard et al. (2020).

It is in some ways also surprising that the molid manoeuvres described here have gone unnoticed as all but one of the reviewed videos are available online. One explanation may be a possible predisposition by observers to interpret orca-molid interactions based on the assumption of molid sluggishness, so that any molid movement is perceived as a result of physical pushing by orca. A social media comment to Interaction Mex-2009 exemplifies this: "*Sunfish tend to not react to any kind of pain or trauma and won't even make an attempt to escape predators, its like watching a cabbage get chopped up*". The findings of our study strongly suggest otherwise; careful frame-by-frame video analysis, tracking molid and orca positions relative to one another, corroborated that the molids drive the movements themselves, that they certainly react to orca, and appear to make concerted efforts to evade them. They are of course not always successful (Visser et al., 2023), but this is a fate they have in common with a large variety of other taxa, which also fall prey to orca (e.g., Ford, 2019; Visser et al., 2023).

The observed molid behaviours appeared to be attempts to evade physical contact, and/or keep the head and ventral area away from the orca, and/or present the clavus to them. Due to the unusual molid locomotor system powered by the dorsal and anal fins, rather than movement of a caudal fin (Watanabe & Sato, 2008; Watanabe & Davenport, 2021), sunfish can survive with large parts of the clavus missing (e.g., Nyegaard et al., 2019). The

'Evade' behaviours may have evolved to present the least vulnerable body part to the threat, while keeping the head and ventral area away, where an orca bite would presumably be fatal.

It is not clear from the videos if the 'Evade' behaviours overall increase the chance of survival for molids when targeted by orca, as many interactions still conclude with the demise of the molid (Visser et al., 2023). However, similar 'Evade' behaviours were seen in both *M. alexandrini* and *M. mola*, as well as in *M. alexandrini* from different ocean basins. This suggests the behaviours are not learnt, but have evolved in at least two species of *Mola*, and presumably play a role in decreasing the risk of falling prey to orca.

One could speculate that a more effective reaction to the presence of orca would be for molids to dive rapidly to great depths. Molids have been recorded to dive to over 1,100 m (Chang et al., 2021; Thys et al., 2017), and while orca can dive to similar depths (Towers et al., 2019) they are restricted in their need to breathe air. Abrupt, deep diving has indeed been recorded during telemetry studies on *M. mola*, and has been suggested to be a reaction to predators (Cartamil & Lowe, 2004). Similarly, rare video of Lamalera whale hunters in Indonesia shows an attempt by a *M. alexandrini* harpooned at the surface to dive straight down (Palička, 2016). It is therefore puzzling why the molids on the reviewed videos did not attempt to dive. It is possible they had already failed in such an attempt and were now 'trapped' by the orca in surface waters, and/or that escape attempts were yet to come. It is also possible the behaviour of the molids and/or the orca may have been influenced by the presence of humans – an important factor to consider in observational studies.

Overall, further studies are needed to better understand orca-molid interactions and how they escalate (e.g., Visser et al., 2023), as well as how molids react to other predators and overall decrease the risk of predation. Regardless, the observed behaviours described herein illustrate that molids react to orca with apparent evasive manoeuvres, that they possess notable levels of agility and quick reaction times, and that they are far from sluggish creatures.

ACKNOWLEDGEMENTS

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Figure 9. Top-side view of a *Mola mola* (estimated 2 m total length) appearing to actively position itself in close proximity to the vessel ('Shelter') with the head angled upwards at the surface ('Seek-surface'), and the clavus facing outwards towards the orca ('Clavus-to-orca'). Arrow indicates the mouth (i.e., front end) of the molid. Still images extracted within 17 seconds of each other from video by Michael Van den berg, Mexico (Interaction Mex-2009, Table 1), reprinted under YouTube fair use guidelines.

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