

Observations of an S-Shaped Posture in Humpback Whales (*Megaptera novaeangliae*)

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Several delphinid species are reported to perform a display described as an S-shaped posture (Madsen & Herman 1980). Some researchers have interpreted this posture in bottlenosed dolphins (*Tursiops truncatus*) as a male precopulatory display (Tavolga & Essapian 1957; Puente & Dewsbury, 1976). Norris *et al.* (1985) interpreted the S-shaped posture of spinner dolphins (*Stenella longirostris*) as agonism and, possibly, shark mimicry.

Although the appearance of this behaviour in humpback whales (*Megaptera novaeangliae*) has been reported on several occasions (Baker *et al.*, 1983; Bauer, 1986; Kaufman & Forestell, 1986), no attempt has been made to assess its function. In humpback whales the S-shaped posture is characterized by upward arching of the tail stock, lowering the flukes, raising the rostrum, and spreading the pectoral flippers (Fig. 1). This posture is held for several seconds, after which the whale resumes activity.

We report here new observational evidence indicating that this behaviour occurs during high intensity, potentially threatening intra- and interspecific interactions. While this posture may simply represent a whale avoiding contact or an intention movement, this does not preclude its function as a signal. We interpret the S-shaped posture as a threat behavior, although a role as a courtship display cannot be ruled out.

Methods

All observations were made from the coastal waters of the islands of Maui and Hawaii from small boats (Zodiac or Boston Whaler, < 6 m) in close proximity to the whales. Individual identification of whales was based on distinctive patterns of coloration and scars on dorsal fins and flukes. We use the terminology of Tyack and Whitehead (1983) to classify the different behavioural roles in surface-active pods. Nuclear animals and individuals in close association with calves are assumed to be female. Other adult whales in these pods are called escorts, and are assumed to be

mature males affiliating with a female for reproductive purposes (Baker & Herman 1984; Mobley & Herman, 1985). The whale in closest proximity to the nuclear animal is called the primary escort, and any other adults in the pod are classified as secondary escorts. Behavior is described using an ethogram developed at the Kewalo Basin Marine Mammal Laboratory over many years of observation (Baker & Herman, 1984; Bauer, 1986).

Results

Between 1983 and 1990 fifteen observations were made of S-shaped postures by humpback whales in Hawaii (Table 1). Table 1 is sorted by the behavioral context in which the S-shaped posture was observed, including the presence of other species, and then by the number of animals in the pod. Sightings 1-12 occurred in contexts usually associated with male-male agonism (Baker & Herman 1984; Tyack & Whitehead, 1983). Sightings 13-15 occurred in contexts that we interpret as threatening, either from the presence of other aggressive cetaceans or intrusion by a diver. The S-shaped posture was performed by adult whales in all but one observation; the one exception (Sighting 9) consisted of a mother, calf and escort. In this observation, the calf displayed the S-shaped posture. The context in which this occurred, however, was similar to the others in that the calf was a member of a pod in which high levels of agonism among escorts was observed. In order to present a complete behavioral context, 4 of the 15 observations are described in more detail below.

Sighting Number 2

Four adults were observed travelling at high speed with short (4 minutes) dive times. Intense surface activity was already seen at the start of our observation. The lead animal was at the farthest right, and was assumed to be a female nuclear animal (Tyack & Whitehead 1983). The primary and secondary escorts trailed the lead animal to the left. The fourth animal remained to the far left and behind of the other three, in dive synchrony but not interacting

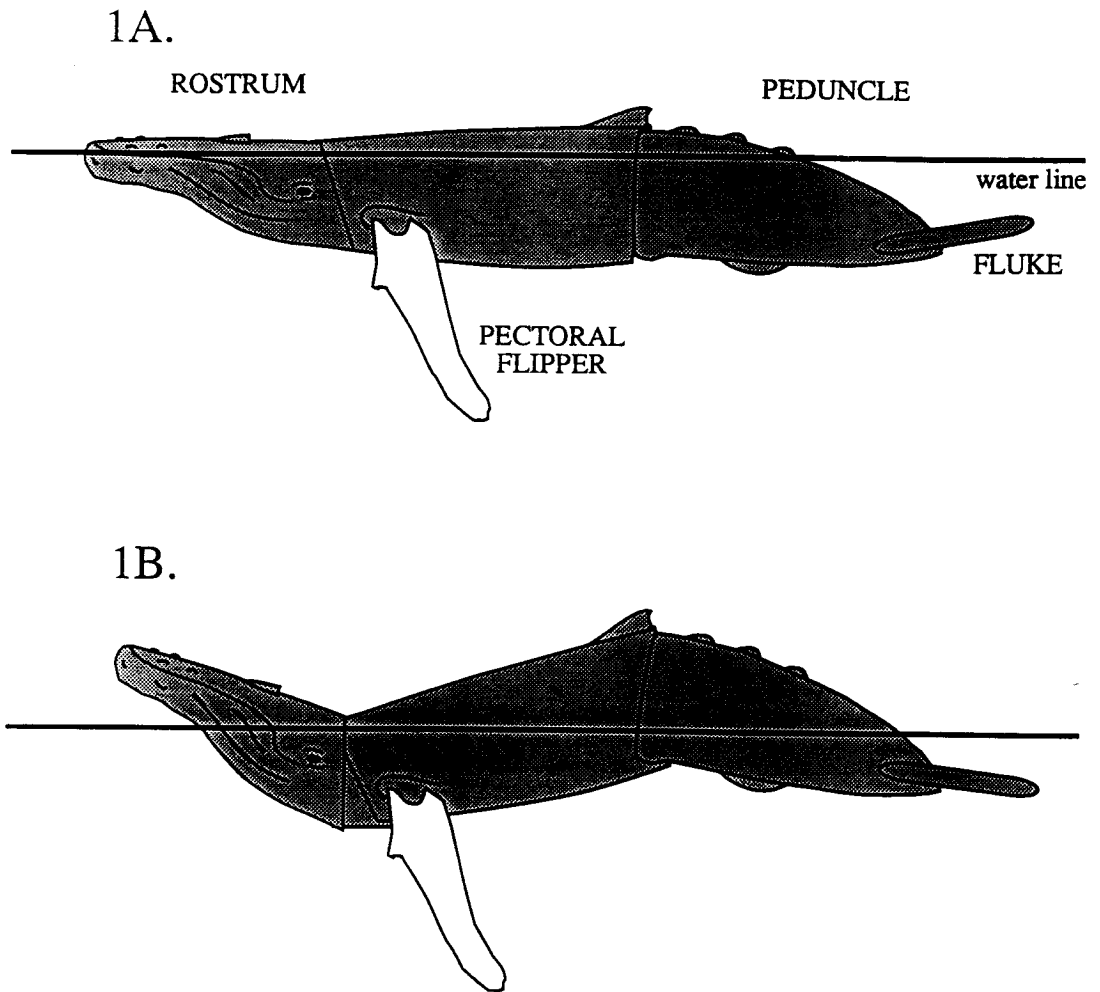


Figure 1. Figure 1A depicts a lateral view of the 'typical' posture assumed by a humpback whale during surfacing. Figure 1B depicts a lateral view of a humpback whale in an S-shaped posture. Notice the exaggerated upward tilt of the rostrum and arching of the back characteristic of the S-shaped posture.

with the other pod members. The primary escort was producing vigorous 'inflated' headlunges (with ventral pleats expanded with water) accompanied by jaw claps. Some headlunges were preceded by underwater blows. The secondary escort was headlunging and jostling the primary escort. After approximately 20 minutes, the primary escort assumed an S-shaped posture directly alongside ('eye-to-eye' with) the secondary escort. We continued observation for another 30 minutes during which the escorts continued to engage in robust agonistic activity.

Sighting Number 7

This pod (mother, calf, and two escorts) displayed intense surface activity, with short dives, frequent underwater blows, and fluke swishes. The primary

escort repeatedly assumed an S-shaped posture. After approximately 30 minutes, this activity culminated in one whale driving its rostrum into the abdominal area of another adult, with both animals knocking against the third adult. (It is probable that the two fighting whales were the escorts, but this could not be determined at the time.) After this there were repeated bouts of jostling between the escorts, head lunges, fluke swishes, jaw-clapping, and S-shaped postures.

Sighting Number 8

A cow, calf and two escorts were observed. The escorts were headlunging, and the primary escort performed several jaw claps. Both escorts attempted to strike each other with lateral fluke lashes, and submerged with peduncle arched and flukes down.

Table 1. Observations of an S-shaped Posture

Pod Composition	Contextual Information	Date	Sighting ¹ Number
Agonism among Pod Members, Adults only			
three adults	agonism, jaw claps, tonal blows	1/28/89	1
four adults	intense agonism, jaw claps	1/26/90	2
four adults	agonism, two whales join pod	2/14/90	3
	tonal blows, melon headed whales ² nearby		
four adults	intense agonism	3/22/90	4
five adults	intense agonism among escorts, S-shaped posture by presumed female ³	1/17/90	5
five adults	agonism, jaw claps, two whales join pod	1/27/90	6
Agonism among Escorts, Pods with Calves			
mother, calf and two escorts	intense agonism among escorts	2/24/83	7
mother, calf and two escorts	agonism among escorts, jaw claps, tonal blows	2/16/88	8
mother, calf and three escorts	S-shaped posture by calf agonism among escorts	3/27/88	9
mother, calf and three escorts	intense agonism among escorts	4/15/88	10
mother, calf and six escorts	intense agonism among escorts	3/20/89	11
mother, calf and six escorts	agonism among escorts, jaw claps, mother made low rumbling sound	2/23/90	12
Pods accompanied by Melon-Headed Whales			
two adults	melon headed whales crowding the humpbacks, humpbacks attempt to strike melon heads	1/16/89	13
two adults	melon headed whales crowding the humpbacks humpbacks attempt to strike melon heads	3/28/89	14
Other observations			
single adult	approach by diver	2/17/83	15

¹sighting number used for reference in text

²melon headed whales (*Pepinocephala electra*), could have also been pygmy killer whales (*Feresa attenuata*) or a mixed herd

³nuclear animal

After approximately 40 minutes the primary escort performed an S-shaped posture after a headlunge. The display was performed across the path of the secondary escort, resembling the orientation of the broadside threat described by Baker and Herman (1984). The primary escort produced two 'tonal' or 'trumpeting' blows (Watkins, 1967) on subsequent surfacings.

Sighting Number 9

A cow, calf, and escort were observed in frequent surface activity, including fluke and flipper slaps and breaches. A single approaching adult displaced the primary escort, who left. After 50 minutes the new primary escort was challenged by another adult, resulting in headlunging and jostling for proximity to the female. The new (third) primary escort displaced

its competitor, after which the calf surfaced with the cow and the calf produced an S-shaped posture.

Discussion

The S-shaped posture was observed under circumstances of intense intraspecific aggressive activity, e.g., headlunges, jostling, striking (Baker & Herman, 1984) and jaw claps. It was also observed in a solitary humpback in response to approach by a diver (Table 1, Sighting 15). In addition to the results described here in Hawaiian waters, Baker *et al.* (1983) described a similar behavior in summer feeding waters in southeast Alaska. A solitary adult humpback produced a series of 'tonal' blows while performing an S-shaped posture, apparently in response to the passage of a large commercial vessel.

The behavior was not seen to be immediately followed by fleeing. The repetition of the behavior was more likely, along with some high level aggressive behavior (such as a head strike), or an approach response. This suggests that the aggressive intent of the display is accompanied by a low probability of escape behavior, consistent with our data showing that in the majority of observations the S-shaped posture was produced by the primary or aggressive secondary escort.

A proximal motivation indicated by the topography of the S-shaped behavior suggests a combination of two intention movements: the raised peduncle—a potential preparation for a tail strike, and the raised head—a potential preparation for a head strike. Both types of aggressive behavior have been noted in humpback whale encounters (e.g., Baker & Herman, 1984). Whether the S-shaped behavior also functions as a courtship display (see Madsen & Herman, 1980) was not immediately obvious from these observations. Although the behavior was observed frequently by escorts (males) in the presence of a potentially receptive female, the behavior seemed to have been directed more at competing males. For example, the behavior frequently occurred behind and/or away from the female, but in close proximity to other escorts.

The observations of an S-shape posture performed by a calf (Sighting 9) and by an adult that may have been female (sighting 5), as well as the occurrence of the behavior by single adults in potentially stressful situations (i.e., in the presence of a diver and in response to a vessel, described above) indicates that it can appear in non-sexual contexts. These examples suggest that it may also be indicative of a more general state than aggression, e.g., high arousal.

Norris *et al.* (1985) proposed that the posture in spinner dolphins represented mimicry of shark behavior, an argument supported by observations of a number of other shark-like characteristics that accompanied the S-shape, such as lateral movements

of the tail and anatomical similarities. However, the S-shaped posture seems to occur to generally to support mimicry as an origin in other species. It is found in gray reef sharks (Johnson & Nelson 1973), bony fish (Ryan & Causey, 1989), and various delphinids (Puate & Dewsbury, 1976), as well as humpback whales. Rather, we would suggest that S-shaped postures have arisen as one of the broad-class of lateral displays (see Chizar, 1978).

We suspect that the relatively infrequent observation of the S-shaped posture in humpback whales is not reflective of its actual frequency, which could be common in agonistic or other highly stressful encounters. The behavior is stereotyped and is readily detected by experienced observers. However, it could be confused with other 'head' behaviors such as headlunges by less experienced observers. Moreover, it occurs in context of high rates of surface activity which may swamp the capabilities of observers. Also, as indicated in Sighting Number 15, the S-shaped posture can be performed underwater and thus is not confined to the surface (unlike most of our observation time). While the S-shaped posture may actually be a rare behavior, we feel that a lack of the appropriate search image by observers may be responsible for the low frequency of reports. We hope that this article will spur increased attentiveness by observers in the future and will lead to clarification of the frequency and function of this behavior.

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