

## Natural mortality of puffadder shysharks due to Cape fur seals and black-backed kelp gulls at Seal Island, South Africa

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Natural mortality of puffadder shysharks *Haploblepharus edwardsii* due to two species of marine tetrapod, the Cape fur seal *Arctocephalus pusillus pusillus* and the black-backed kelp gull *Larus dominicanis vetula*, is reported. These data constitute the first multiple observations of natural mortality of any cartilaginous fish due to object play or kleptoparasitism by marine tetrapods. Evidence of range extension of the puffadder shyshark to False Bay, South Africa is presented.

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Key words: *Haploblepharus edwardsii*; kleptoparasitism; natural mortality; object play; puffadder shyshark; range extension.

### INTRODUCTION

The puffadder shyshark *Haploblepharus edwardsii* (Voigt) is a regionally abundant, small (total length,  $L_T = 60$  cm), bottom-dwelling catshark (Scyliorhinidae) endemic to South Africa (Compagno *et al.*, 1989). Its range extends from Natal (30°40' E; 28°40' S) to Cape Agulhas (20°00' E; 34°52' S) (Compagno *et al.*, 1989). The IUCN status of this species is 'lower risk, near threatened', based on its limited range lying wholly within heavily fished and potentially degraded inshore waters (Compagno & Krose, 2000).

Natural mortality in the puffadder shyshark due to object play or kleptoparasitism by two species of marine tetrapod, the Cape fur seal *Arctocephalus pusillus pusillus* and the black-backed kelp gull *Larus dominicanis vetula*, was investigated in the present study. Range extension of the puffadder shyshark to False Bay, South Africa was also examined.

### MATERIALS AND METHODS

Puffadder shysharks were observed opportunistically during July and August 2002 at Seal Island (centred at *c.* 18°35'00" E; 35°8'6" S) in False Bay, South Africa. Seal Island is a rocky outcrop, *c.* 800 m long by 50 m wide, located near the head of False Bay. The

island features a broad, flat shelf along much of its east side, ranging from 0 to 12 m deep. Shelf substratum was examined with a pole camera and found to consist of dark metamorphic rock thickly overgrown by short red and green algae.

The island was circumnavigated by boat 4–10 m from shore and systematically searched with the naked eye, using binoculars, and through telephoto lenses *c.* 2 h after sunrise, allowing opportunistic observation of juvenile puffadder shysharks that had been captured by Cape fur seals or black-backed kelp gulls. Locations and times of puffadder shyshark captures were mapped on field data forms and further observations recorded into a dictaphone.

## RESULTS

Eighteen cases of puffadder shyshark capture by Cape fur seals or black-backed kelp gulls were recorded and documented during 15 days between 15 July and 10 August 2002 (Table I). Captures took place along the entire eastern side of Seal Island. Initial capture was by juvenile Cape fur seals in 17 (94.4%) cases, and by a juvenile black-backed kelp gull in one (5.6%) case. In the latter,

TABLE I. Summary of 18 captures of puffadder shysharks by juvenile Cape fur seals and black-backed kelp gulls (kelp gulls) at Seal Island, South Africa in 2002

Date	Time (hours)	Captor & class	Conclusion	Remarks
22 July	1103	Cape fur seal	→juvenile kelp gull→kelp gull	Consumed by kelp gull
	1105	Cape fur seal	Lost	
5 Aug	1006	Cape fur seal	Killed	Head chewed off by Cape fur seal
6 Aug	0902	Cape fur seal	Lost	20 cm TL shark
	0905	Cape fur seal	Lost	16 cm TL shark
	0916	Cape fur seal	Lost	16 cm TL shark
7 Aug	1002	Cape fur seal	Lost	
	1005	Cape fur seal	Killed	Head chewed off by Cape fur seal
	1009	Cape fur seal	Lost	
8 Aug	1015	Cape fur seal	Killed	Head chewed off by Cape fur seal
	1036	Cape fur seal	Lost	
	1037	Kelp gull	Lost	Mobbed by other kelp gull, washed into sea
10 Aug	1038	Cape fur seal	Lost	
	0853	Cape fur seal	→kelp gull	Consumed by kelp gull; 25 cm $L_T$ shark
	0853	Cape fur seal	Lost	
	0908	Cape fur seal	Lost	
	0908	Cape fur seal	Lost	
	0912	Cape fur seal	→kelp gull	Consumed by kelp gull

→, transfer of a puffadder shyshark to the tetrapod indicated to the right.

it is likely that the black-backed kelp gull obtained the puffadder shyshark from a Cape fur seal or found it injured or dead, floating at the water surface.

In 13 of 17 (76.5%) cases in which juvenile Cape fur seals were observed to capture puffadder shysharks, the seals lost the fish. Typically, the Cape fur seals captured puffadder shysharks from the subtidal shelf, surfaced with them (Fig. 1), and either repeatedly tossed them or returned with them to the shore, where they were repeatedly tossed 'head-over-tail' (Fig. 2), or abandoned. On shore, tossing of puffadder shysharks by Cape fur seals was often interspersed with bouts of displacement behaviour, such as scratching, grooming, or brief sunning. In three cases (17.6%), displacement behaviour or abandonment of puffadder shysharks allowed black-backed kelp gulls opportunity to abscond with the fish, which were usually consumed promptly, head-first (Fig. 3). Such 'piracy' was observed on three occasions (Table I).

Juvenile Cape fur seals typically remained in the water and used their molars and carnassial teeth to macerate the heads of captured puffadder shysharks. Torn off pieces of fish were apparently eaten, but consumption of an entire fish by a Cape fur seal was not observed.

In six out of 18 cases (33.3%), the puffadder shyshark was killed, either beheaded by a Cape fur seal or consumed by a black-backed kelp gull.

The observations and photographs presented here constitute the first reports of puffadder shysharks from False Bay, a westward range extension of *c.* 150 km.



FIG. 1. Capture of *Haploblepharus edwardsii* by a juvenile *Arctocephalus pusillus pusillus* at Seal Island, South Africa. Note the variegated colour pattern with dark-margined dorsal saddles which are dotted with small white dots (Compagno, 1984).



FIG. 2. Tossing of a *Haploblepharus edwardsii* by a juvenile *Arctocephalus pusillus pusillus*. Note the blunt snout, continuous nasal curtain, broadly triangular pectoral fins, origin of first dorsal fin posterior to rear margins of pelvic fins, presence of an anal fin, caudal fin with low caudal thrust angle and weakly developed lower lobe of the fish.



FIG. 3. Head-first consumption of a *Haploblepharus edwardsii* by an adult *Larus dominicanis vetula*.

## DISCUSSION

The data presented here constitute the first repeated (multiple) observations of natural mortality of any cartilaginous fish due to object play or scavenging by marine tetrapods. The rate of puffadder shyshark mortality reported (six in 15 days) provides a minimum estimated total annual mortality of *c.* 146. The overall significance of this mortality is difficult to assess due to a lack of data on population size and dynamics of puffadder shysharks around Seal Island as well as a lack of adequate life-history data on this species. In addition, observations of puffadder shyshark captures and mortalities were largely limited to opportunistic observations of <30 min each day.

In this study, juvenile Cape fur seals were observed capturing puffadder shysharks. Neonate pups may be unable to dive with sufficient proficiency to capture puffadder shysharks and their deciduous teeth may be unsuited to secure purchase on the fish. Although the heads were 'chewed off' three of 17 (17.6%) seal-captured sharks, in no case was a Cape fur seal observed to actually consume a puffadder shyshark. The energetic, highly repetitive tossing of puffadder shysharks by Cape fur seals is consistent with object play behaviour (Fagan, 1981). It is likely that the pale, wriggling fish are visually conspicuous against the dark underwater substratum at Seal Island, making them inviting targets for inquisitive and playful juvenile Cape fur seals.

When readily accessible, black-backed kelp gulls feed on puffadder shysharks. Black-backed kelp gulls seem dependent upon Cape fur seals to retrieve the fish from the subtidal shelf and are quick to seize opportunities to steal them from the Cape fur seals and each other. In no case was a black-backed kelp gull observed to capture a puffadder shyshark from the bottom near Seal Island. In contesting ownership of a puffadder shyshark, a definite size or age-related peck order (Dewsbury, 1978) exists between juvenile and adult black-backed kelp gulls at Seal Island, with the former consistently submissive to the latter. Since adult birds almost invariably consume the puffadder shysharks they steal from Cape fur seals or juvenile conspecifics, their behaviour can properly be categorized as kleptoparasitism or food piracy (Shealer, 2002).

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