

FIRST RECORD OF HERMAPHRODITISM IN THE BERING SKATE,
BATHYRAJA INTERRUPTA

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Key words: Bering Skate, *Bathyraja interrupta*, hermaphroditism, Gulf of Alaska

The occurrence of hermaphroditism, defined as the existence of both male and female reproductive organs in a single individual, is considered rare and by definition abnormal among most cartilaginous fishes (Atz 1964). Although normal hermaphroditism is known to occur in 5 orders of teleosts (Atz 1964), only *Apristurus longicephalus*, a deepwater scyliorhinid shark, is considered a normal rudimentary hermaphrodite among the chondrichthyans (Iglésias and others 2005). Furthermore, most records of hermaphroditism in cartilaginous fishes have been reported on sharks, especially in the families Carcharhinidae, Centrophoridae, Etmopteridae, Heterodontidae, Scyliorhinidae, and Somniosidae (King 1966; Capapé and others 1979; Irvine 2004; Jones and others 2005). Reports of batoids exhibiting hermaphroditic development are rarer, especially in skates (Quignard and Capapé 1972; Capapé 1974; Templeman 1987; Matta 2006).

Skates (Rajidae and Arhynchobatidae) have received greater attention in Alaskan waters because of their frequency as bycatch and the development of a targeted fishery in 2003 for some of the larger species (Ebert and others 2007; Ormseth and Matta 2007). Given the concern about the increasing take of skates, a broad-ranging study was initiated in 2002 by researchers at the Pacific Shark Research Center, Moss Landing Marine Laboratories (PSRC-MLML) to investigate the life history of several Alaskan species of skates. Aspects of this larger study included the age, growth, reproductive biology, and feeding ecology of these demersal fishes. Throughout the course of this study, over 5000 skates have been collected from fishery landings and during survey cruises conducted by the Alaska Fisheries Science Center

(National Marine Fisheries Service) and by the Alaska Department of Fish and Game (ADFG) in the eastern Bering Sea and Gulf of Alaska.

A hermaphroditic skate was collected by trawl net on 24 May 2006 at a depth of 166 m during the annual Kamishak Bay survey cruise conducted by ADFG in the western Gulf of Alaska (6534742 N, 495157 E, UTM Zone 5, Datum NAD 27). The specimen externally appeared to be a juvenile male based on the stage of clasper development, and did not possess other male secondary sex characteristics such as alar and malar hooks or indented pectoral fins. However, its internal organs were those of an adult, reproductively active female. This skate had a single scapular thorn on each shoulder, 3 prominent nuchal thorns, 7 reduced mid-dorsal thorns, 23 tail thorns, and an interdorsal thorn (Fig. 1). The sandpapery dorsal surface was mostly a uniform gray-brown with scattered small dark spots. The smooth ventral surface was cream colored, with a brownish gray blotch around the cloaca. Morphology and color of the hermaphroditic skate were consistent with that of the Bering Skate, *Bathyraja interrupta*. The Bering Skate is sometimes placed in the genus *Rhinoraja* (Compagno 2005; Ebert and Compagno 2007), however this distinction is currently unresolved (McEachran and Aschliman 2004).

The Bering Skate is endemic to the North Pacific, ranging from the Bering Sea and Gulf of Alaska southward to California, although records of this species south of Alaskan waters may be that of 1 or more different species (Ebert 2003; Stevenson and others 2007). It has a depth range of 26 to 1050 m (Stevenson and others 2007), but in the Gulf of Alaska occurs between 37 and 566 m (Stevenson and others 2008). This is one of the more commonly encountered skates of the 14 described species