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SHORT NOTE

First sighting of a live hourglass dolphin (*Lagenorhynchus cruciger*) in inland waters of southern Chile

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Abstract The hourglass dolphin (*Lagenorhynchus cruciger*) has a circumpolar distribution in the Southern Ocean, and although are regularly found south of the Antarctic Polar Front, localized concentrations have also been documented all in pelagic waters around the southern tip of South America, the Falkland Islands, and the South Georgia Islands. On March 8, 2013, a group of three Peales dolphins and other single individual that was different in color and pattern were sighted in Parry fjord, Tierra del Fuego Island. This atypical individual was identified as an hourglass dolphin, based on the combination of unique characteristics of this species. Although the animal sighted is more likely a vagrant than a migrant to inland waters of southern Chile, it is even more uncertain what biological and/or physical properties were determinants. Seasonal shift in environmental conditions within Drake Passage, thermoregulation, or prey availability have been previously suggested as potential factors in the movements of hourglass dolphin to north of Polar Front.

Keywords *Lagenorhynchus cruciger* · Vagrant · Chile · South America

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Introduction

The hourglass dolphin *Lagenorhynchus cruciger* (Quoy and Gaimard 1824) is one of the three dolphin species regarded as truly Antarctic (Boyd 2002). These dolphins are primarily oceanic, and although are regularly found south of the Antarctic Polar Front (Kasamatsu et al. 1988; Brownell and Donahue 1999), several sightings have also been made near islands or banks to the north of Polar Front (Goodall 1997). In South America, localized concentrations have been documented around the southern tip of South America, the Falkland Islands, and the South Georgia Islands (Goodall 1997; Aguayo-Lobo et al. 1998; Dellabianca et al. 2012). The northernmost records of distribution do not exceed 36°14′S in the southwestern South Atlantic (Nichols 1908) and 33°40′S in the southeastern South Pacific (Clarke 1962), although this last record may have been a sighting of dusky dolphins, since all the three southern species were lumped under *L. cruciger* by some authors at that time (Goodall et al. 1997).

The southern Chile is characterized by a particular system of fjords and channels. One of the most important channels is the Magellan Strait, natural passages connecting two oceans, the Pacific and the Atlantic. Oceanographically, the system of fjords and channels of southern Chile is unique, composed of waters from three oceans: the Pacific, Atlantic, and the Southern Ocean (Panella et al. 1991; Antezana 1999). The presence of constructions, thresholds, and notable bathymetric features in this area give rise to the formation of a series of micro-basins, which interrupt the continuity of the circulation between the open ocean and inland waterways (Antezana 1999; Valdenegro and Silva 2003). Because of these characteristics, marine biota of southern Chile is representative for its high diversity and heterogeneity in types of marine and coastal

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habitats that support a wide variety of algae, invertebrates, and vertebrate species. Among marine mammal species, this area shelters two otariid species, two otter species, and several cetacean species (Aguayo-Lobo et al. 1998; Torres et al. 2000). In the last taxonomic group, Peale's dolphin (*Lagenorynchus australis*), Chilean dolphin (*Cephalorhynchus eutropia*), and Commerson's dolphin (*C. commersonii commersonii*) are the most typical dolphins sighted in this complex area of fjords and channels of southern Chile. Here, we document the first sighting of a live hourglass dolphin in inland waters of the South America.

Materials and methods

The sighting was recorded by two of us, the captain (AG) and crew (SG) of the L/M Cabo Tamar I, during a tourist voyage from Punta Arenas City to Seno Almirantazgo, Tierra del Fuego Island. Non-scientific crews are often aboard in those trips; however, both captain and crew have experience in the cetacean sightings, and therefore, the sighting used in this note was based on the logbook annotations and one photograph taken by the captain. Based on the review of these photograph, the first author made the species identification.

Results and discussion

On the March 8, 2013, during a tourist voyage aboard the L/M Cabo Tamar I that travelled from Punta Arenas City to the Almirantazgo Sound, the captain (AG) and crew (SG) saw at 07:45 am in Parry fjord (~54°27′18″S, 69°10′57″W) a group of three Peale's dolphins and another single individual that was different in color and pattern. Viewing conditions were optimal (e.g., undisturbed sea surface), and the single dolphin was observed for approximately 20 min from a distance of less than 15 m off the starboard side of the boat. During these sighting, only one photograph was taken. Two years later, the photograph was shown to the first author (JA), who identified this atypical dolphin as hourglass dolphin, based on the combination of unique characteristics of this species. The main characteristics which allowed us to distinguish it from other small odontocetes were: (1) black or dark coloration broken by two elongated lateral white areas that covers most of the tail stock in a wedge shape; (2) the beak and dorsal and pectoral fins were black and the ventral region white; and (3) the black middle patch extends to the base of the pectoral fin and then up under the eye (Fig. 1). We have previously seen this species in the Drake Passage, but never in inland waters of southern Chile, despite the fact that we had all seen other substantially 'black-and-white' cetacean species within these waters, such as Commerson's, Peale's, and Chilean dolphin. In light of the optimal viewing conditions and experience with similar species, we are confident of our identification of this distinctive species.

The Magellan Strait as well as some adjacent channels, including Almirantazgo Sound, is regularly visited by tourist voyage and/or scientific survey. In fact, Almirantazgo Sound is visited by two tourist vessels to week from September to April of each year, and marine mammal surveys are concentrated mainly between November and March (e.g., Acevedo et al. 2011; Arata et al. 2014), and non-atypical dolphin such as hourglass dolphin have been reported. To our knowledge, the occurrence of hourglass dolphins within the fjords and channels of the southern tip of South America was previously documented only through a stranded individual in the Magellan Strait (Gazitúa et al. 1999), and therefore the sighting reported here is the first live individual sighted in inland waters of South America. Likewise, although the hourglass dolphin was not observed interacting with the group of Peale's dolphins, the proximity of that group does not exclude such interaction. Hourglass dolphins have been seen in close company with other cetacean species, such as fin whale (*Balaenoptera physalus*), sei whale (*B. borealis*), Antarctic minke whale (*B. bonaerensis*), beaked whales (*Berardius arnuxii* and *Hyperoodon planifrons*), pilot whales (*Globicephala melas*), and southern right whale dolphins (*Lissodelphis peronii*) (Clarke 1962; Fraser 1964; Leatherwood and Reeves 1983; Lichter 1992).

Within its oceanic known range, hourglass dolphin has been associated with some physiographic (e.g., bathymetry) and oceanographic characteristics (e.g., sea surface temperatures (SST) and fronts) (Gaskin 1968; Miyazaki and Kato 1988; Santora 2012). However, two groups in relation to the environment conditions can be identified in the south-west Atlantic and Southern Oceans, one occurring in shallow coastal waters and the other occurring in deeper and colder waters further offshore (Dellabianca et al. 2012). The group of shallow waters was characterized by SST of 7.4 °C, depth mean of 176 m, and in or close to areas of high productivity (3 mg m^{-3}). The area where the hourglass dolphin was sighted in Parry fjord has similar characteristics with depths ranging between 92 and 260 m, SST ~ 10 °C, and chl-*a* ranging between 1.88 and 3.09 mg m^{-3} (SST and chl-*a* extracted from satellite images MODIS-Aqua Level 3, of 8-day composite and 4-km binned product offered from Ocean Color Web).

The south–north movements of hourglass dolphin remain unclear, and their occurrence in waters to north of the Polar Front appear to be seasonal during the summer seasons. It may be due in part to a seasonal phenological shift in environmental conditions within Drake Passage,

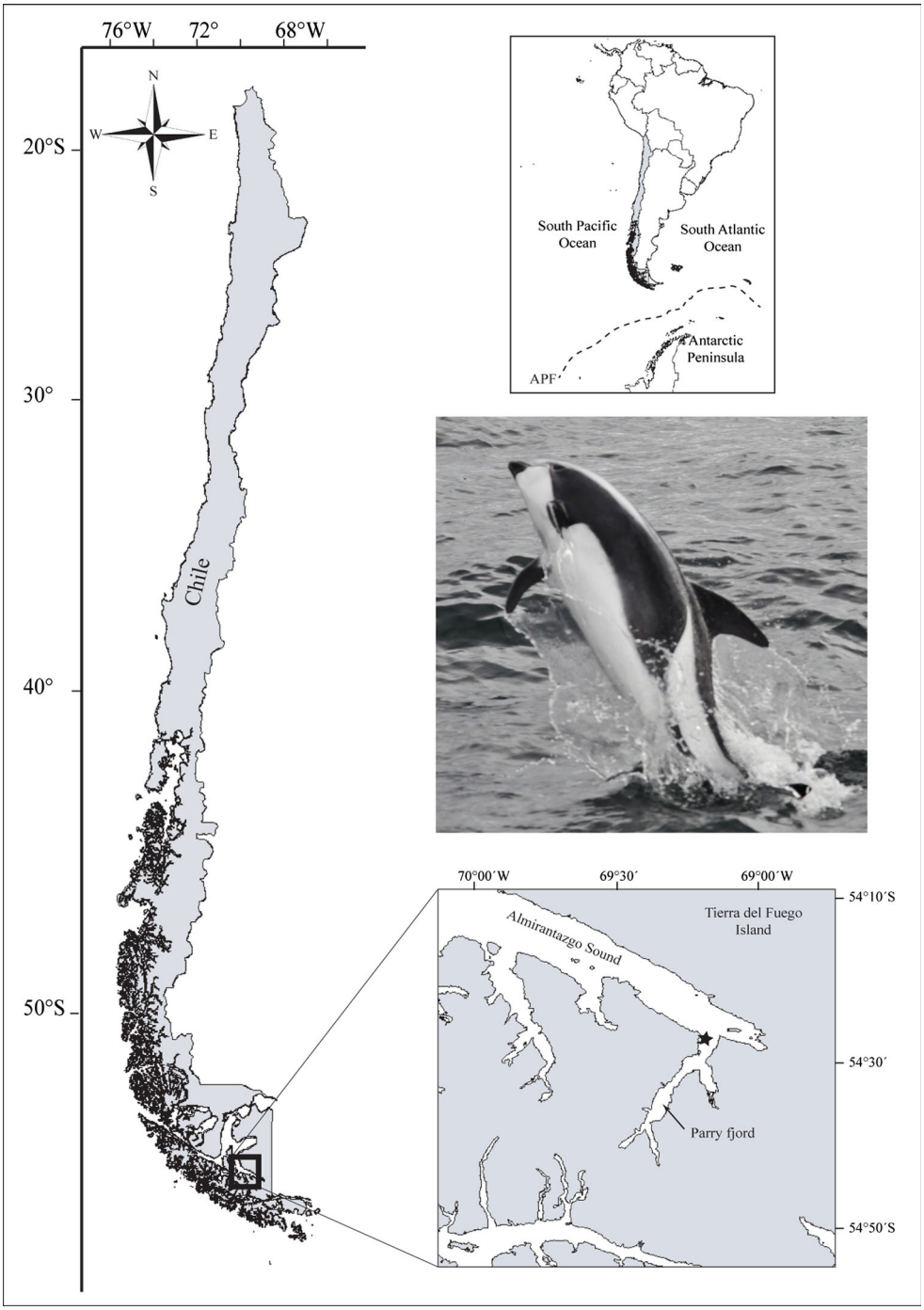

Fig. 1 Location and photograph of the hourglass dolphin sighted in Almirantazgo Sound, Chile. Antarctic Polar Front (APF) is noted with *dotted lines*. Photograph taken by Alejandro González

thermoregulation or prey availability (e.g., migration to optimal forage areas) (Kasamatsu and Joyce 1995; Santora 2012). Although the animal sighted is more likely a vagrant than a migrant to inland waters of southern tip of South America, it is even more uncertain the route travelled from the open sea to Parry fjord and what biological and physical properties were determinants. Oceanographic features are an important determinant of distribution and abundance of prey species for marine mammals. Potential local prey items in Almirantazgo Sound are lobster krill *Munida gregaria* and the Fuegian sprat *Sprattus fuegensis*, which are abundant food sources in these channels (Tapella et al. 2002; Mujica 2006). In fact, Almirantazgo Sound is an important feeding area for only known inland colony of black-browed albatrosses established in the same sound (Arata et al. 2014). Although dietary information for hourglass dolphins is scarce, stomach contents of a few specimens stranded in the eastern coast of southern South

America indicated that fish, squids, and crustaceans are common prey (Goodall et al. 1997; Fernández et al. 2003). More research focused on habitat use, and prey species are required to provide more information on habitat preference of this species in water to the north of Polar Front and potential transit to inland waters of South America.

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