Short Note

New Record of Atypical Coloration in a Gray Whale Calf (*Eschrichtius robustus*) in Laguna Ojo de Liebre, Baja California Sur, Mexico

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Eastern gray whales (Eschrichtius robustus) migrate during late autumn/early winter along the eastern Pacific coast to breeding grounds on the west coast of the Baja California Peninsula, Mexico (Swartz et al., 2006). Some calves are born during the southward migration, but most are born in lagoons on the west coast of Baja California at four main sites: (1) Laguna Ojo de Liebre, (2) Laguna San Ignacio, (3) Laguna Guerrero Negro, and (4) Bahía Magdalena-Almejas (Jones & Swartz, 2002; Hoyt, 2005). The first three lagoons are part of the Vizcaíno Biosphere Reserve and are listed internationally as a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site. The largest salt producer in the world, Exportadora de Sal (ESSA), is located in the same area, which has been committed to the conservation of the environment for more than 25 y. ESSA has collaborated with the Comisión Nacional de Áreas Naturales Protegidas (CONANP; National Commission of Natural Protected Areas) and other important institutions in studies of the abundance, transit and residence time of gray whales in the Ojo de Liebre, San Ignacio, and Guerrero Negro lagoons (CONANP, 2016).

On 17 February 2017, at approximately 1040 h, a whale calf of an atypical white color was observed during the recording of environmental parameters within Laguna Ojo de Liebre from a boat owned by ESSA that was sailing between the coordinates 27° 38.885 N, 114° 05.278 W and 27° 41.707 N, 114° 05.130 W (points 1 and 2, respectively, in Figure 1). This gray whale calf was observed in the company of its mother, which showed the normal gray coloration characteristic of this species (Figure 2a). Based on information collected by ESSA-CONANP workers, the calf was first

observed on 7 February 2017, and it was estimated to be approximately 3 wks old at that time (J. Rivera, pers. comm., 17 February 2017).

The calf was called "Costalito de Sal" ("Little Salt Sack") because the CONANP workers who had first observed it had thought it was a floating salt sack (CONANP, 2017). It had a length of approximately 4.5 m, and its body coloration was predominantly white with a series of black spots of irregular size on both sides of the body, apparently with a greater number on the right side. The spots were larger and lower density towards the anterior part of the calf's body and so small as to appear as tiny freckles in the posterior dorsal part (Figure 2b-e). Although we do not have a photograph that allows us to observe in detail the coloration of the eye, it was possible to observe a pink-red coloration of the epithelium inside the blowhole and nasal plugs (Figure 2a & b), which are usually dark gray even in gray whales of a similar age or size (Berta et al., 2015), becoming pink only toward the caudoventral portion of the nasal passage. This unusual coloration has been observed in other Mysticeti cetaceans-for example, the southern right whale (Eubalaena australis; Buono et al., 2015).

We obtained a photographic record and filmed three short videos from which some data of the calf's appearance and behavior could be obtained. (These videos are available on the "Supplementary Material" page of the *Aquatic Mammals* website: www.aquaticmammalsjournal.org/index.php? option=com_content&view=article&id=10& Itemid=147.) We observed the calf for approximately 15 min in the company of its mother; during that time, the animal surfaced to breathe approximately 12 times, with a mode of 17 s



Figure 1. Costalito de Sal site observation. The macro location of Laguna Ojo de Liebre on the western coast of the Baja California Peninsula is shown in the upper left corner. The calf was observed between Points 1 and 2; other points are indicated as reference.

between blows, an average of 37 s, a minimum of 8 s, and a maximum of 87 s. Most of the time, it was observed swimming on the right side of its mother, although it appeared on the left side as well. Both mother and calf continued to swim throughout the filming time. During our observation, another mother-calf was recorded, and they had no unusual reaction to the color of Costalito de Sal. The environmental parameters of the water of the observation site are shown in Table 1. We collected information at both points 1 and 2 at the surface and bottom, but no significant differences were observed, so we present integrated values for the water column and averages for the area only as additional information for the records of this whale.

Our observation represents the second record of an atypical coloration of a gray whale in Laguna Ojo de Liebre after "Galón de Leche" ("Milk Gallon") was observed for the first time during the 2008-2009 season; and again 6 y later, during the 2015-2016 season, as a mother with a calf that presented the typical gray whale coloration (CONANP, 2016). In addition, during the 2002-2003 season, Jones (2003a, 2003b) published a blog entry referring to a sighting of a "pure white whale calf" during a whale-watching trip in Laguna Ojo de Liebre. However, there is uncertainty regarding whether this was Galón de Leche as a calf since there is no other record or photograph of it. For this reason, we are unable to say whether Costalito de Sal is the second or third record of a whale with atypical coloration in Laguna Ojo de Liebre. Although there are many blog posts on social networks and notices on the official CONANP website, to our knowledge, this is the first scientific report about this calf.

Although there are few such reports, the scientific literature contains some well-documented records of cetaceans with hypomelanism; for example, Hain & Leatherwood (1982) reported 13 records of individual cetaceans with atypical white coloration. Another study presented by Fertl et al. (1999) and updated by Fertl et al. (2004) reported 11 species of dolphins, ten whales (seven Mysticeti and three Odontoceti), and two porpoises, thus adding 23 records of cetacean species with anomalously white individuals.

Regarding gray whales, a study by Goebel & Dahlheim (1979) conducted in the Bering Sea documented two gray whales with atypical coloration, one with a large white spot on the dorsal side and the other with a completely white dorsal area. In addition, Fertl et al. (1999) cited two personal

communications of sightings of gray whales with atypical coloration: the first in Oregon in 1994 and the second in Laguna Ojo de Liebre in 1996.

The coloration of organisms in nature is a useful model for studying the genetic mechanisms that determine the phenotype and is closely related to the predator-prey relationship (Hoekstra, 2006). In this sense, we believe that the main effects of a more conspicuous coloration may be the possibility of an increased vulnerability to predation, the possibility of abnormal communication and behavioral patterns between these individuals



Figure 2. Costalito de Sal, a gray whale calf (*Eschrichtius robustus*) of atypical coloration in Laguna Ojo de Liebre, Baja California Sur, Mexico. (A) Mother and calf anterior dorsal view—note that the mother is a typical gray-colored animal; (B) calf dorsal view showing large black spots on the anterior right side and a pink-red coloration of the epithelium inside the blowhole; (C) calf right posterior side showing irregular small black spots; (D) calf left side showing irregular black spots towards the back; (E) calf right-side detail showing three central medium-sized black spots; and (F) mother and calf left posterior dorsal view.

Parameter	Point 1	Point 2	Average values
Temperature (°C)	18.56	18.65	18.61
pH	8.32	8.30	8.31
Fluorometry-Chlorophyll (µg/L)	1.64	1.35	1.50
Turbidity (NTU)	4.67	4.09	4.38
Salinity (UPS)	37.86	37.82	37.84
Dissolved O ₂ (mg/L)	5.46	5.51	5.48
Maximum depth (m)	10.20	10.69	10.45

 Table 1. Environmental parameters recorded at the observation site of Costalito de Sal at Laguna Ojo de Liebre, 17 February 2017. Information was collected with a Conductivity, Temperature, and Depth Multiparameter, RBR brand (CTD RBR), specific to coastal zones.

and their counterparts, and the possibility of a decrease in the capacity to retain solar heat. None of these effects seem to have been manifested for the organisms recorded, however.

For example, noting that the previous records of atypically colored whales were all adult whales (Goebel & Dahlheim, 1979; Hain &Leatherwood, 1982; Fertl et al., 1999, 2004; CONANP, 2016), this suggests that at least some atypically colored whales survive to adulthood and that perhaps their survival chance could be comparable to that of individuals of the typical gray color.

Regarding the possible effects on communication and behavior, based on our observations of Costalito de Sal, the mother's recognition of the calf did not present any abnormal behavior, and the mother-calf relationship followed the characteristic patterns: they were observed swimming together, with the mother supporting the calf in its breathing, and they occupied a protected breeding area in Laguna Ojo de Liebre. Regarding the heat retention via solar radiation that is necessary when the whales inhabit the polar zones, the white color does not appear to be a disadvantage for these individuals since recorded hypomelanic individuals have reached the adult stage. However, there is a lack of more detailed research on the survival rate throughout their entire life cycle.

Considering the information to date, we know with certainty that at least two gray whale individuals with atypical coloration have been recorded in Laguna Ojo de Liebre. The first was Galón de Leche, a female which had reproductive success and was observed with her own calf, which showed the normal coloration of the species. The other was a calf called Costalito de Sal, the subject of this note. We hope our work will support future research that helps to clarify the mechanisms involved in the heritability of abnormal skin coloration in wild populations.

Unfortunately, during the language editing process of this article, it was published in the local press that the leucistic whale calf known as Costalito de Sal had been found dead in an advanced state of decomposition at the site known as "Carros Viejos" (Figure 1) in the Ojo de Liebre lagoon near the mouth of the same lagoon. The newspaper also indicated that the calf showed evidence of shark attack, recording bites on tongue, tail, and fins. Despite this being the first record of a dead leucistic calf, the hypotheses about survival expectations with respect to organisms of normal coloration remains practically unchanged since two whales (calves and adults) on average die every year from shark predation throughout their range; and to date, in addition to Costalito de Sal, another adult whale death from shark predation was recorded at a nearby beach (Medina, 2017).

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