

SPATIAL DISTRIBUTION OF DIFFERENT AGE GROUPS OF HUMPBACK WHALES ALONG THE ECUADORIAN COAST

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ABSTRACT

Humpback whales are present along the Ecuadorian coast between June and October for breeding. In 1996 a total of 50 whale watching trips were made from Puerto López and Puerto Cayo, on the central coast of Ecuador (01°25'S, 80°50'W). A total of 108 sightings were documented, of which 61 were positioned with a GPS and used for this analysis. Within the study area of approximately 500km², whales exhibited an unevenly distributed and concentrated at three sites: 1) around La Plata Island (36km offshore); 2) a shallow platform called Bajo de Cantagallo (15km offshore) and 3) a strip of coastal waters just north-west of Puerto Cayo. Group size ranged between 1 and 11 individuals ($X=2.47$, $SD=1.56$), while most groups consisted of 2 individuals (46%). The largest groups were found around La Plata Island ($X=2.79$, $SD=1.22$), where one single animal was recorded only once (5%). At Bajo de Cantagallo single animals were seen more frequently (44%) while Puerto Cayo was the location where most calves were recorded. Around La Plata Is. and the Bajo de Cantagallo all adult groups were found most commonly (67% and 75% respectively), while in Puerto Cayo most of the groups contained calves (67%). The distribution of females with a calf was strongly related to water depth; 80% of the positioned groups containing calves ($n=10$) occurred in water of less than 20m deep. All data suggests that in this breeding area, humpback whales are using different sites for different activities, e.g. socialising, nursing, etc.).

INTRODUCTION

Every year humpback whales (*Megaptera novaeangliae*) are present along the Ecuadorian and Colombian coasts during the austral winter (June-October). They belong to one of the six southern hemisphere stocks and migrate along the South American west coast between their feeding grounds in Antarctic and their reproduction grounds in tropical waters (Dawbin, 1966). In spite of the fact that this south-eastern Pacific population was heavily exploited since the end of the last century in Antarctic and to a lesser extend along the west coast of South America (Chapman, 1974; Clarke, 1980), it continues to be one of the least known southern stocks.

With the goal of determining the current status of this subpopulation, in 1991 a long-term study began on the central coast of Ecuador. Initially, the research effort was low but increased steadily every year, producing important information on behaviour, movements, reproduction rate, group structure, etc.. The effort has also identified 150 different whales by utilising the coloration pattern on the ventral side of their flukes (Haase and Félix, 1993; Félix and Haase, 1996a; 1996b).

The study area covers approximately 500km² and is located in the triangle formed by two coastal villages (Puerto López and Puerto Cayo) and La Plata Island (01°24''S,

80°55'W) (Figure 1). Part of the study area is located inside the Machalilla National Park.

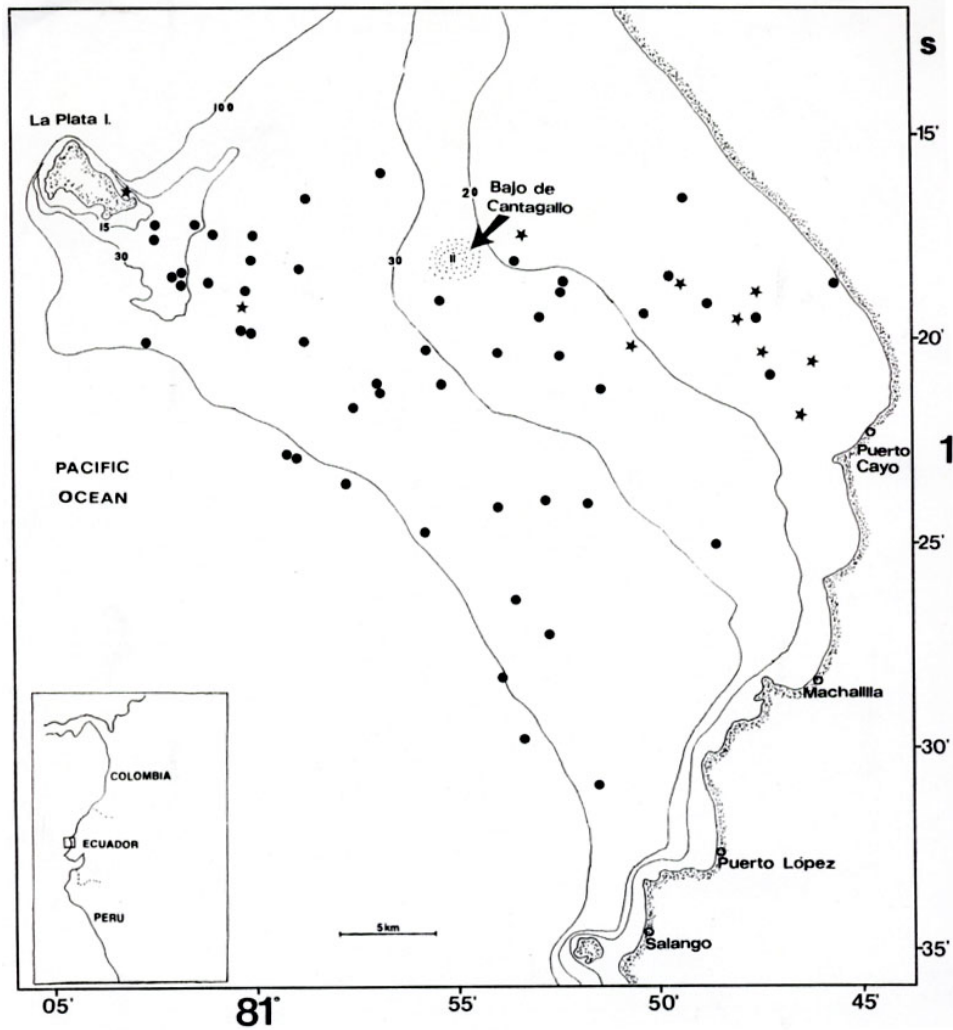


Figure 1. The study area. Black dots indicate the exact sighting positions. Stars indicate the locations where groups containing a calf were sighted.

METHODS

Between 25th May and 28th September 1996, 50 research trips were carried out aboard commercial whale watching boats from Puerto López and Puerto Cayo (25km apart). The trips generally headed north-west towards La Plata Island, located at approximately 30km from the coast. Usually, a small shallow platform named Bajo de Cantagallo crossed halfway en route (Figure 1). The total navigation time accounted for 253 hours, of which 53 hours were spent with the animals. A total of 256 whales were sighted in 108 different groups. The observation times were between 5 and 160 minutes ($X=31$ minutes).

When whales were sighted, the boat approached in a discrete manner in order to get a closer look. During the observations, information on group size, composition,

behaviour, etc., was documented. Exact positions were obtained through a GPS for 56% of the sightings (n=61) and only these data were used for the present analysis. According to their relative size, whales were referred to as adults, subadults or calves. To describe their composition, groups were divided in six age categories (Table 2).

RESULTS

Sighting Distribution. Although whales were sighted anywhere in the study area, three locations containing the majority of sightings: 1) around La Plata Island, 2) around the Bajo de Cantagallo and 3) the north-western coastal waters off Puerto Cayo. Along the Puerto López-La Plata Island route, sighting density was nearly constant until reaching within 8km around the island; there the sighting rate increased three times as compared to the rest of the route. Likewise, observations at Bajo de Cantagallo (6km around) exhibited a higher rate than on the rest of the route. Along the Puerto Cayo-Bajo de Cantagallo route, a more homogeneous distribution of sightings was obtained; most sightings were done between 5-10km off the coast in a northwester direction. Sightings then decreased, but some 16-18km off shore increased again around the Bajo de Cantagallo (Figure 1).

Group Size. Group size ranged between 1 and 11 individuals (X=2.47, SD=1.56) with two being the modal size (46%). Table 1 shows the group size in respect to the observation site. Groups found around La Plata Island were the largest on the average, groups containing 3 or more individuals accounting for 47% of the total groups observed and only once (5%) a single whale was recorded here. In contrast, at Bajo de Cantagallo groups size was the smallest and single individuals formed 44% of the total sightings. In both cases, however, the difference in group size average was not statistically significant (ANOVA $F_{1,59}=1.2$ and 1.1 , $P>0.05$). In Puerto Cayo groups were smaller than average and 56% of the groups contained two individuals (Table 1).

Table 1. Group size per observation site and group mean size. Sightings positioned with a GPS (n=61).

GROUP SIZE (whales)	SIGHTING SITE								TOTAL	
	LA PLATA IS.		B. CANTAGALLO		PUERTO CAYO		OTHER		n	%
	n	%	n	%	n	%	n	%		
1	1	5	4	44	2	22	7	29	14	23
2	9	47	3	33	5	56	11	46	28	46
3	6	32	1	11	2	22	2	8	11	18
4	2	10	1	11			2	8	5	8
5	0	0					1	4	1	2
>5	1	5					1	4	2	3

GROUP SIZE (average)	2.79, SD=1.22	1.94, SD=1.06	2.05, SD=0.68	2.52, SD=2.05	2.47, SD=1.56
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Group Composition. Table 2 shows group composition with respect to the observation site. Clearly, the all adult class was the most abundant in the study area (overall 56%), except near Puerto Cayo, where the mother-calf (MC) class dominated (44%). The latter (MC) was the second most abundant overall class (17%). Subadults were evenly recorded either alone, either with adults in the entire study area. The distribution of females accompanying a calf was highly related with water depth; 80% of the groups containing calves (n=10) occurred where the depth was 20m or less (see figure 1).

Table 2. Group composition per observation site. Only sightings positioned with a GPS (n=36) were considered. A= all adults, S= all subadults, AS= adults and subadults, MC= mother with calf, ME= mother with calf and escort, M+= mother with calf, escort and others.

AGE CLASS	SIGHTING SITE				TOTAL	
	LA PLATA IS.	B. CANTAGALLO	PUERTO CAYO	OTHER	n	%
A	6	6	2	6	20	56
S		1	1	1	3	8
AS	1			2	3	8
MC	1	1	4		6	17
ME	1		1	1	3	8
M+			1		1	3

DISCUSSION

Although the number of sightings for a detailed statistical analysis are insufficient, our results indicate that whales are not randomly distributed in the study area. There were three sites where whales were particularly abundant, with a different class prevailing in each site. Around La Plata Island the groups were the largest and were formed mainly by adult animals. Around the Bajo de Cantagallo group size was the smallest and single adult whales were the predominant class. Off Puerto Cayo, whales were found closer to shore, more evenly distributed and there was a higher number of mothers with calves. The data suggest that whales are using different sites for different activities, e.g. La Plata Island seems to be an area for meeting and socialising, the Bajo de Cantagallo is preferred by single adult whales, likely singers, and Puerto Cayo is an important zone for nursing. Differences in distribution of group sizes and in the concentration of calves in particular area has also been reported in humpback whales breeding in Hawaii (Mobley and Herman, 1984).

Depth seems to be a major factor in producing the age-class distribution pattern and is more evident in the groups of females with calves. Along the Ecuadorian coast these groups concentrate in waters of 20m deep or less, close to shore, where they would be protected from predators such as sharks and orcas. Flórez (1991) also reported that mothers with calves were observed mainly in shallow waters and in protected beaches on the east side of Gorgona Island, Colombia.

Because the whale watching industry has been growing steadily in the area since 1994 (see Félix et al., 1994; Félix and Haase, 1996a; 1986b), our findings are providing new elements to local authorities for appropriate management of this population.

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