

A preliminary review of skin conditions and other body anomalies observed on humpback whales (*Megaptera novaeangliae*) from Ecuador

CRISTINA CASTRO, GREGORY KAUFMAN AND DANIELA MALDINI

Pacific Whale Foundation, Barrio Luis Gencón, Puerto López, Ecuador.

Contact e-mail: cristinacastro@pacificwhale.org

ABSTRACT

We present a preliminary review of skin conditions and other anomalies observed on humpback whales from 1996 until 2009 from Ecuador. Forty-five cases were chosen for their level of severity. There were 20 cases of skin conditions and 31 cases of body anomalies in our sample. Six had more than one case in your body. This paper reviews multiple anomalies and skin diseases cases and their suspected etiologies, which could contribute to better knowledge and understanding of certain diseases and abnormalities in cetaceans and their environment.

INTRODUCTION

Southern Hemisphere humpback whales (*Megaptera novaeangliae*) migrate from Antarctic feeding grounds to tropical breeding grounds (Matthews, 1937). Breeding stock G (BS-G) humpback whales migrate from the west of the Antarctic Peninsula and Magellan Strait in Chile during the austral summer to waters off Ecuador and Colombia during the austral winter (Stevick *et al.* 2004, Acevedo *et al.* 2007; Florez-Gonzalez *et al.* 1998; Scheidat *et al.* 2000; Felix and Haase 2001). In recent years, BS-G humpback whales have been found further north, off Panama, Costa Rica and Peru (Acevedo and Smultea 1995; Florez-Gonzalez *et al.* 1998, Rassmusen *et al.* 2007; Castro *et al.* 2007b; Pacheco *et al.* 2009).

Since 1950, skin anomalies and diseases have been reported in cetaceans, with a variety of skin diseases reported in small odontocetes (Simpson *et al.*, 1958; Slijper, 1962; Greenwood *et al.*, 1974; Van Bressemer *et al.*, 2008). In recent years, skin lesions have been reported in mysticetes (Pettis *et al.*, 2004; Brownell *et al.*, 2007; Castro *et al.*, 2008a; Bertelotti and Varisco, 2008). Castro *et al.* (2008) reported on the presence of skin diseases of Latin-American humpback whales. Cetacean skin diseases may be related to anthropogenic factors such as chemical water contamination, ships collisions, fishing net interactions, and climate change (Alava *et al.*, 2005; Castro *et al.*, 2008a; Van Bressemer *et al.* 2008).

This paper reviews multiple skin anomalies and diseases cases and their suspected etiologies, as part of the comprehensive study of humpback whales off Ecuador.

MATERIALS AND METHODS

Study area

Off the coast of Ecuador, the Machalilla National Park extends from 01° 00' S to 01° 16' S, limited to the west by Isla de la Plata (81° 06' W) with an approximate length of 25 nautical miles and a maximum width of 20 nm (40 km.).

Data collection

Boat-based photo-identification of humpback whales was conducted daily, weather permitting during the months of June to September. Surveys departed from Puerto Lopez and covered the area around Isla de la Plata. Surveys were conducted on board of whale-watching vessels. Observers monitored the water for the presence of humpback whales. When a whale was encountered, GPS position, pod size, pod composition, behavior and acoustic data were collected. Digital photographs of the left and right views of the lateral body, ventral surface of the tail flukes and genital areas (when presented) were obtained using Canon D10, D20 and D30 cameras equipped with motor drives and 100-300 mm lenses. Other data collected consisted of audio tape recordings, and focal follows of individual animals.

Data analysis

Humpback whale fluke images taken between 1997 and - 2009 were analyzed for the presence of skin conditions (i.e., pigmentation anomalies, skin lesions, parasitic infection) or body anomalies (i.e., deformities, possible tumors, miscellaneous traumata). Subsequently, we evaluated the quality of the picture based on its focus and image clarity to decide whether to include or exclude the image from further analysis.

At this point, photographs of the same individual whale were grouped together to represent a clinical case (anomalies observed) and each case was treated as a single entity (some cases being represented by multiple photos and some by only one) and assigned a case number. We then classified the photos that passed our image quality criteria based on the severity of the condition observed. Each case was classified according to severity as mild, moderate or severe (acute). Conditions were considered severe when they were active and ulcerated, were or had caused an irreversible abnormality in the body or were present in more than two body areas. Conditions were considered moderate when the skin lesion or abnormality body were or had caused an irreversible abnormality in the body, but it was not serious. Only cases classified as moderate or severe (acute) were considered for further analysis.

The remaining cases were classified as either (a) skin conditions or (b) body anomalies.

The skin conditions were classified as:

- 1) pigmentation anomalies which consisted of areas of either hypo- or hyperpigmentation anywhere on the body of the whale (Figure 2);
- 2) skin lesions
 - a. whitish velvety lesions
 - b. irregular whitish lesions (Figure 2)
 - c. irregular whitish rounded lesions
 - d. Irregular whitish stippled lesions
 - e. Red granulomatous tissue
 - f. Vesicular lesions
 - g. Lobomycosis -like disease (LLD) (Figure 1)
 - h. Ulcerated lesions (Figure 1)

3) Parasitic Infections

The body anomalies were classified as:

- 1) Deformities (Figure 2)
- 2) Possible tumors (Figure 1 and 2)
- 3) Miscellaneous traumata
- 4) Other conditions

Although we tried to hypothesize on the possible etiologies causing the condition, we emphasize the fact that, without proper clinical tests, the exact cause of the condition cannot be determined.

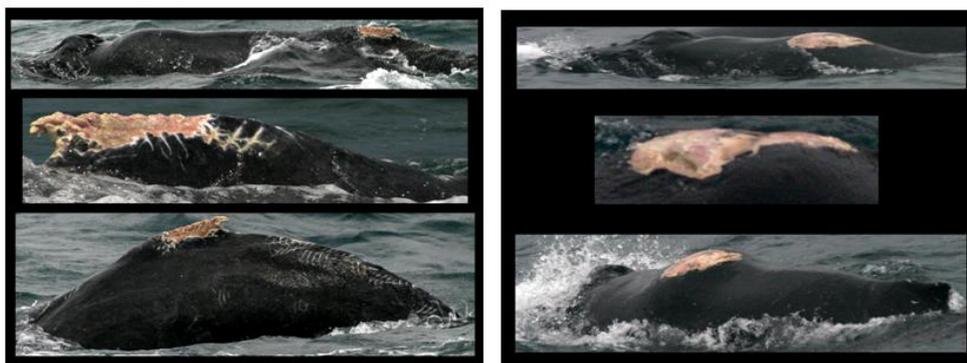


Figure 1- LEFT Possible Lobomycosis like disease (LLD) in the dorsal fin and tumor on the back. RIGHT tumor behind of the blowhole and possible Lobomycosis like disease (LLD)

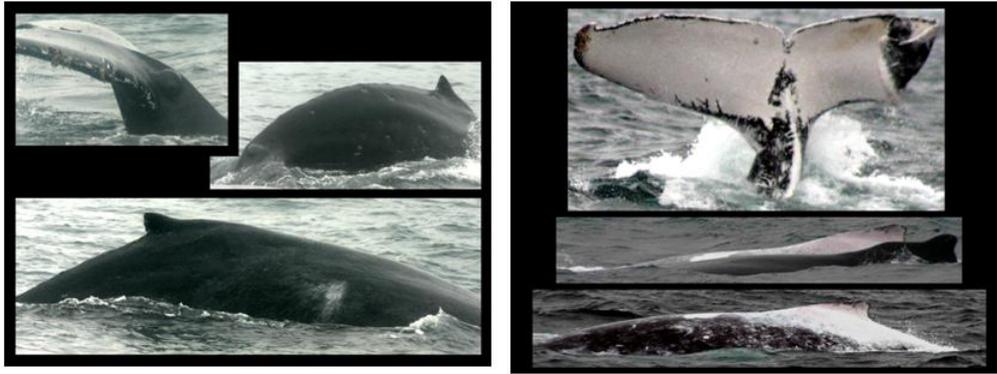


Figure 2- LEFT The body anomalies note possible tumor in the peduncle with irregular whitish lesion. RIGHT Deformities in the tail, hypo pigmentation.

RESULTS

Between 1997 and 2009, 8,000 humpback whale photographs were analyzed. There were 160 cases with some anomalies that passed all or our screening criteria for photo quality and that showed the presence of a skin conditions. These photographs were further analyzed to select only photographs that presented moderate and acute conditions leaving 45 cases with 70 photographs in the analysis: 31 moderate and 14 acute conditions were present. There were 20 cases of skin conditions (Table 1), 31 cases of body anomalies (Table 2) in our sample. In six cases the same whale presented two or more anomalies. The majority of the conditions were either possible tumors (12%) or Lobomycosis-like skin lesion (10%). Conditions could be found on all parts of the body and some individuals had multiple conditions.

Table 1 : Summary of skin condition cases found in the study

Type	No. Cases	Case No.	Notes
Pigmentation Anomalies	1	Case 34	Hypo-pigmentation
Skin lesions			
whitish velvety lesions	1	Case 15	
irregular whitish lesions	1	Case 14	
irregular whitish rounded lesions	3	Cases 16, 23, 29	
Irregular whitish stippled lesions	3	Cases 98, 142, 146	
Red granulomatous tissue	1	Case 141	
Vesicular lesions	1	Case 16	
Lobomycosis -like disease (LLD)	5	Cases 1, 20, 124, 128, 141	
Ulcerated lesions	2	Cases 6, 64	
Parasitic Infections	2	Cases 161, 163	

Table 2 - Summary of body anomalies cases found in the study

Type	No. Cases	Case No.
Deformities	5	Cases 4, 10, 27, 33, 34
Possible Tumors	6	Cases 20, 26, 28, 29 124, 128
Miscellaneous Traumata	19	Cases 2,3, 7, 8, 9, 11, 12, 37, 45, 51, 61, 81, 83, 86, 97, 114, 116, 162, 164
Other Conditions	1	Case 29

DISCUSSION

There was only one case (Case 34) of hypo-pigmentation (70% white body) in our sample and it was considered severe. The hypo – pigmentation could be observed extending from the dorsal fin to the lateral body, and in several parts of the head and tail. The whale also presented a congenital malformation of the tail. This case was also reported by Castro *et al* (2008).

Velvety White Lesions

White velvety lesions have been previously reported in eight individual whales from Abrolhos Bank, Brazil and in one case in the Gulf of Conquive, Colombia, by Castro *et al.* (2007). Case 15 from this study was also included in that report. According to Van Bresseem *et al.* (2007), the whitish lesions with a velvety appearance are often associated with unrelated wounds, scars and tooth rakes. These have been observed in *T. truncatus* from Paracas Bay, Ecuador, *S. guanensis* from Sepetiba Bay, Ecuador and in *Pseudorca crassidens* stranded in Santa Elena, Ecuador (Van Bresseem *et al.* 2007).

Irregular Whitish Lesions

The unusual pigmentation patterns with irregular whitish marks on the ventral flukes observed in one individual adult (Case #14).

Stripped and Rounded Lesions

Stripped and rounded lesions are similar in appearance and may have a similar etiology. These lesions are accompanied by unusual white marks, similar to burns that have easily spread and show great skin deterioration. Off Colombia, a humpback whale was observed with at least four whitish wounds with a deep, dark center, sometimes on the back, or below the dorsal fin, where the anterior part of the dorsal fin seems whitish (Castro *et al.*, 2008).

Ecuadorian village residents frequently display white marks, similar to the ones observed on the whale's skin. This condition is known as *Tinea versicolor*, and is a long-term chronic fungal infection that is not painful, but spreads with time, depending on climatic factors. Coastal contamination could be a contributing factor: off all coastal Ecuadorian communities sewage regularly flows directly into the rivers and the ocean.

Red Granulomatous Tissue

Red granulomatous tissue may have two etiologies. The reddish coloration of the tissue is likely of algal origin and diatom patches are common on the skin of cetaceans (Van Bresseem *et al.*, 2008). Case 141 in our study involves a calf photographed on July, 14, 2008. Tooth rakes can be observed in the fluke, possibly caused by a predator, and its cutting edges are covered by a red granulomatous tissue. The granulomatous tissue is difficult to diagnose and could be the beginning of a lobomycosis case.

Vesicular Lesions

Only one animal (Case 16) was observed with vesicular lesions. The lesions appeared active with raised skin and white marks, similar to burns. This lesion type could be related to climate change (sun exposure) or some water pollutant. There has also been other cases of vesicular lesions described in *T. truncatus* associated to *Aeromonas hydrophila* or *Calicivirus 1* (Van Bresseem, *et al.*, 2007) perhaps resulting from water pollutants.

Possible Lobomycosis- like disease (LLD)

According to Van Bresseem *et al.* (2008), lobomycosis is a chronic fungal infection of the skin, endemic in rural regions of South and Central America, and affects both humans and dolphins equally. Cases observed on dolphins in Colombia, Ecuador and Brazil were in waters close to mangroves and places of low salinity (Van Bresseem *et al.*, 2008). Cases reported on humpback whales have been observed in areas facing the Machalilla Park.

A possible reason for this problem could be the absence of water treatment and the direct sewage disposal into the sea. It is quite likely that the various chemical pollutants affect the immune system of inshore dolphins as described in cetaceans elsewhere (Aguilar and Borrel, 1994; Jepson *et al.*, 1999; Smyth *et al.*, 2000). Cities also discharge untreated wastewater directly into the estuary and oceans. In general, Ecuadorian coast have very basic sewer systems, with no drains mitigation systems in place. Septic wells are commonplace. These wells are bottomless concrete holes where all the sewage filters

directly into the ground and can contaminate underwater sources. Surrounding areas known to contain high levels of fecal coliforms, indicative of organic contamination and considered a major health threat to humans. Whitish to slightly pink, verrucous lesions, often pronounced, that may ulcerate and evoke lobomycosis were observed in free-ranging inshore *T. truncatus* and *S. guianensis* from Colombia, Ecuador, Peru and Brazil (Migaki *et al.*, 1971). In our study, we observed five cases of these lesions in humpback whales (Cases 1, 20, 124, 128 and 141). The first two cases involved both a mother and her calf observed on September 21, 2006. The mother had a big depression on the back, in front of the dorsal fin, possibly caused by a ship strike or some predator. Most of the wound had been invaded by a fungus possibly of the species that causes lobomycosis. On the calf's upper dorsal fin, predator marks appear, and the same pink tissue was observed on the wounds.

Ulcerated Lesions

Well defined ulcers have been observed in several regions of the body: Case 6 was an adult whale with a deep wound on the right side of its body, and a vertebral column deformity possibly caused by a ship strike. Case 1 was observed with tooth rakes on its back, and ulcerated lesions on its dorsal fin: most of the skin had disappeared exposing underlying tissues similar to those seen in *T. truncatus* from Peru (Van Bressem comm. pers.). Case 54 had a fresh open wound in the fluke, also it was observed with the right lobe of the fluke absent.

Parasitic Infestation

There were two cases of humpback whales observed with a possible invasion of whale lice (Case 161 and 163). In August, 2001, a whale observed in the the Bajo de Cantagallo had 70% of its body covered (Case 161). In October, 2010, the Turistic Operator Palo Santo reported a humpback at Drake Bay, La Plata Island with 80% of its body displaying a reddish coloration (Caso 163). We propose this color is a result of colonization of lesions by whale lice (Osmond & Kaufman, 1998). Although reasons for the invasion are unknown, there are records of a humpback whale that was close (traveling together) to the other lice-encrusted whale in 2001, and was not infected with the parasite. This same whale was observed on four more occasions (between 2001 – 2008), and it has shown no signs of lice infestation.

Deformities

Five possible cases of severely considered congenital malformations were observed. Two cases observed in the dorsal fin (case 4 and 33), two cases observed in the fluke (Case 34 and 10) and one case observed in the back of the body, behind the blowhole (Case 27). Case 4 (16 July 2008) has superficial scratches on left flank before dorsal, whitish scars or lesions on left flank below dorsal, linear whitish marks on right side of dorsal, and whitish marks on right flank behind dorsal; the animal looks thin, and has a possible deformation. Case 33, known as “dragon” by the locals, has a normal fluke, but its dorsal fin is divided as crests (levels) along its back, similar to the mythical animal. Case 34 represents a whale with hypo-pigmentation; its tail is rolled up on the right side. In Case 10, the right fluke is bent laterally, and has small lumps on the top. Case 27 has a deformation behind the blowhole.

Possible Tumors

Abnormal growth of a tissue mass, possibly a tumour was observed once off Brazil and twice off Ecuador (Castro *et al.* 2008). Four new cases of humpback whales with tumours were observed (cases 128, 26, 28 and 29). The tumours have been observed in the head area (case 20, 124) but in most of the cases, these have been recorded at the basal part of the fluke (case 128, 26, 28 and 29). On each of the six observed cases in Ecuador, the causes are unknown.

Miscellaneous traumata

Some of the miscellaneous traumata encountered suggested tissue damage with the presence of abrasions or lacerations (open wounds) as well as wounds partially or completely healed, from miscellaneous origins. Castro *et al.* (2008) recorded 30 cases in Brazil, nine individuals in Ecuador and one in Colombia. Here we reported 19 cases in Ecuador with different etiologies.

In some cases, we speculate lesions are likely caused by predators, such as orca whales or sharks, due to clear rake shaped and V marks and the observation of the loss of body parts such as the fluke (Cases 51, 81, 114 and 116), or both fluke's ends (Cases 61, 83, 86, 97).

Other cases are associated with apparent boat collisions. The damage from these interactions has been observed on different regions of the body: on the fluke (Cases 8, 9 and 45), on the dorsal fin (Cases 3, 7 and 164) and two cases on the lateral part of the body (Cases 11 and 2).

Disseminated bulla

We only have one case (Case 29) a white spotted, with bulla with and tumors.

A large percentage of cutaneous wounds, scars and other traumas observed in the total of the studied population were likely related to net entanglements and to a lesser extent to boat collisions. Some observed diseases, such as lobomycosis (5,10%) and certain whitish lesions may be related to water pollution. These are diseases that were previously reported in humans, are now being observed on whales which may be the result of non-treated sewage discharge directly to the sea. Whales may be affected due to their close proximity to the coast, an area considered important for reproduction. Blisters similar to burnings have been observed and may be related to climate change and exposure to UV rays. This research presents a fair number of cases with tumors, observed both on calves and adults. The cause of these tumors or tumor-like anomalies is unknown.

Our findings suggest the primary causes of BS G humpback whale skin anomalies and diseases are likely due to anthropogenic effects, with boat collisions and water contamination being of most concern.

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REFERENCES

Acevedo, J., Rasmussen, K., Félix, F., Castro, C., Aguayo-Lobo, A., Haase, B., Scheidat, M., Olavaria, C. Forestell, P., Acuña, P., Kaufman, G. and Pastene, L. A. 2005. Further information on the migratory destination of humpback whales of the Magellan Strait feeding ground. Paper SC/57/SH10, presented to the 57th Scientific Committee of the International Whaling Commission, Ulsan, Korea, May-June 2005.

Acevedo A, Smultea A (1995) First records of humpback whales including calves at Golfo Dulce and Isla Del Coco, Costa Rica, suggesting geographical overlap of Northern and Southern Hemisphere populations. Mar. Mamm. Sci. 11:554-560. Alava 2005

Aguilar A., Borrell A. 1994. Abnormally high polychlorinated biphenyl levels in striped dolphins (*Stenella coeruleoalba*) affected by the 1990-1992 Mediterranean epizootic. Sci. Total Environ. 154(2-3):237-247.

Bertellotti, M. and Varisco, A. 2008. Skin lesions in southern right whales off the coast of Valdes Peninsula, Argentina. Paper SC60DW***

Brownell, R. L. Jr., Carlson, C.A., Galletti Vernazzani, B. and Cabrera, E. 2007. Skin lesions on blue whales off Southern Chile: possible conservation implications? Paper SC/59/SH21 presented to the IWC Scientific Committee, May 2007 (unpublished).

Castro, C., Groch, K., Marcondes, M., Van Bresse, M. and Van Waerebeek, K. 2008a. Miscellaneous skin lesions of unknown aetiology in humpback whales *Megaptera novaeangliae* from south america. Paper SC/60/DW18 presented to the IWC Scientific Committee, May 2008 (unpublished).

- Castro C., Forestell ., Kaufman G., Scheidat M., Gibson, Q. and Ferina D. 2008b. Photo-Identification of Humpback Whales, *Megaptera Novaeangliae*, in the Puerto Lopez part of Machalilla National Park on the Ecuadorian Coast – South America: 1996 To 2007. Paper SC/60/SH18 presented to the IWC Scientific Committee, May 2008 (unpublished).
- Félix F And Haase B (2001) The humpback whale off the coast of Ecuador, population parameters and behavior. *Revista de Biología Marina y Oceanografía* 36:61–74.
- Flórez-González, L., Capella, J., Haase, B., Bravo, G.A., Félix, F. and Gerrodette, T. 1998. Changes in winter destinations and the northernmost record of southeastern Pacific humpback whales. *Mar. Mamm. Sci.* 14(1):189-196.
- Forestell, P., Paton, D., Hodda P. and G. Kaufman. 2001. Observations of a hypo-pigmented humpback whale, *Megaptera novaeangliae*, off east coast Australia: 1991-2000. *Memoirs of the Queensland Museum.* 437-450.
- Greenwood, A.G., Harrison, R.J. and Whitting, H.W. 1974. Functional and pathological aspects of the skin of marine mammals. In: R.J. Harrison (ed) *Functional anatomy of marine mammals.* Academic Press, New York, pp 73-110.
- Mathews. 1937. The humpback whale, *Megaptera nodosa*. *Discovery Rep.*, 17: 7-92.
- Osmond, D & G. Kaufman. 1998. A Heavily Parasitized Humpback Whale (*Megaptera novaeangliae*) *Marine Mammal Science*, 14(1): 146-149 (January 1998).
- Pacheco, A., Silva S. & Alcorta B. 2009. Winter Distribution And Group Composition Of Humpback Whales (*Megaptera Novaeangliae*) Off Northern Peru. *Lat. Am. J. Aquat. Mamm.* 7(1-2): 33-38, December 2009.
- Pettis, H.M., Rolland, R.M., Hamilton, P.K., Brault, S., Knowlton, A.R. and Kraus, S.D. 2004. Visual health assessment of North Atlantic right whales (*Eubalaena glacialis*) using photographs. *Can J Zool* 82: 8–19 .
- Rasmussen, K., Palacios, D.M., Calambokidis, J., Saborio, M.T., Rosa, L.D., Secchi, E.R., Steiger, G.H., Allen J.M. and Stone, G.S. 2007. Southern Hemisphere humpback whales wintering off Central America: insights from water temperature into the longest mammalian migration. *Biol. Lett.*, 3(3):302-305, doi: 10.1098/rsbl.2007.0067.
- Scheidat, M., Castro, C., Denkinger, J., González, J. and Adelung, D. 2000. A breeding area for humpback whales (*Megaptera novaeangliae*) off Ecuador. *J. Cetacean Res. Manage.* 2(3):165-171.
- Slijper, EJ (1962) *Whales.* Hutchinson, London.
- Simpson, C.F., Wood, F.G. and Young F. 1958. Cutaneous lesions on a porpoise with Erisipelas. *JAVMA* 133: 558-560.
- Stevick, P., Aguayo, A., Allen, J., Avila, I.C., Capella, J., Castro, C., Chater, K., Engel, M.H., Félix, F., Flórez-González, L., Freitas, A., Haase, B., Llano, M., Lodi, L., Muñoz, E., Olavarría, C., Secchi, E., Scheidat, M. and Siciliano, S. 2004. A note on the migrations of individually identified humpback whales between the Antarctic Peninsula and South America. *Journal of Cetacean Research and Management* 6(2):109-113.
- Van Vressem, M-F, Van Waerebeek, K., Flach, L., Reyes, J.C., de Oliveira Santos, M.C., Siciliano, S., Echegaray, M., Viddi, F., Felix, F., Crespo, E., Sanino, G.P., Avila, I.C., Freijia, N. & Castro, C., 2008a. Skin diseases in cetaceans. Paper SC/60/DW8 presented to the IWC Scientific Committee, May 2008 (unpublished) .
- Van Bresseem, M.-F., Van Waerebeek, K., Reyes, J.C., Félix, F., Echegaray, M., Siciliano, S., Di Benedetto, A.P., Flach, L., Viddi, F., Avila, I.C., Herrera, J.C., Tobón, I.C., Bolaños, J., Moreno, I.B., Ott, P.H., Sanino, G.P., Castineira, E., Montes, D., Crespo, E., Flores, PAC, Haase, B., Mendonça de Souza, S.M.F., Laeta, M. and Fragosó, A.B. 2007a. A preliminary overview of skin and skeletal diseases and traumata in small cetaceans from South American waters. *LAJAM* 6.