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Short Communication

**First record of *Hydrolagus melanophasma* James, Ebert, Long & Didier, 2009
(Chondrichthyes, Chimaeriformes, Holocephali) from the
southeastern Pacific Ocean**

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ABSTRACT. The eastern Pacific black ghost shark, *Hydrolagus melanophasma* is reported from deep waters off Chile and is described from specimens collected off Valdivia at depths of 1150 to 1720 m. This species is distinguished from all other members of the genus by its large, curved dorsal fin spine, which extends beyond the dorsal fin apex; a second dorsal fin of uniform height along the caudal peduncle; large pectoral fins extending beyond the pelvic fin insertion; and a uniform black color of the body. Catch records of this species in Chile suggest a discontinuous distribution along the continental slope of the eastern Pacific Ocean, restricted to the Middle America and Atacama trenches. These observations elevate the number of chimaeroid fishes inhabiting Chile to five species.

Keywords: chimera, *Hydrolagus melanophasma*, zoogeography, cartilaginous fishes, Chile, southeastern Pacific.

**Primer registro de *Hydrolagus melanophasma* James, Ebert, Long & Didier, 2009
(Chondrichthyes, Chimaeriformes, Holocephali) en el Océano Pacífico suroriental**

RESUMEN. La quimera negra del Pacífico este, *Hydrolagus melanophasma* es reportada desde aguas profundas frente a Chile y se describe a partir de especímenes colectados en Valdivia en profundidades ente 1150 y 1720 m. Esta especie se diferencia de los otros miembros del género por su larga y curvada espina dorsal, la cual se extiende más allá del ápice de la aleta dorsal; presenta una segunda aleta dorsal de altura uniforme a lo largo del pedúnculo caudal; grandes aletas pectorales que se proyectan sobre la inserción de las aletas pélvicas, además de su coloración negra uniforme en el cuerpo. Los registros de captura de esta especie en Chile sugieren una distribución discontinua a lo largo del talud continental del océano Pacífico este, restringido a las fosas oceánicas de Atacama y Mesoamérica. Estas observaciones aumentan a cinco el número de especies de peces Chimaeriformes que habitan aguas chilenas

Palabras clave: quimera, *Hydrolagus melanophasma*, zoogeografía, peces cartilaginosos, Chile, Pacífico suroriental.

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Three families of chimaerid fishes (Chimaera: Holocephali) are currently recognized with at least 43 extant species (Didier, 2008). The Family Callorhynchidae with three species restricted to the Southern Hemisphere is the least numerous. The Family Rhinochimaeridae known as "longsnout" or "long-nosed" chimaera, contains three genera and eight species distributed discontinuously in the great oceans. The Family Chimaeridae, with two genera distin-

guished by the presence, in *Chimaera*, or absence, in *Hydrolagus*, of an anal fin. The *Chimaera* genus contains 11 extant species, and *Hydrolagus* contains 21 valid species to date (Eschmeyer & Fricke, 2010). Fourteen of the *Hydrolagus* species are known to occur in the Pacific Ocean, of which ten have a distribution restricted to the western Pacific (Didier, 2004; Andrade & Pequeño, 2006; Barnett *et al.*, 2006; Quaranta *et al.*, 2006). In the eastern Pacific by

comparison only six species of *Hydrolagus* has been reported: two possibly endemic to the Galapagos Islands; two restricted to the coast of Chile and Peru, and two inhabiting the north Pacific off the coast of Mexico and California (Didier, 2008).

In Chile, the number of holocephalans has increased from one, prior to 1950, to four in the present. The first species described for Chile was the elephantfish *Callorhynchus callorhynchus* (Linnaeus, 1758) by Philippi (1893). The bigeye chimaera *Hydrolagus macro-phthalmus* De Buen, 1959; was described from the continental slope of central Chile and the Pacific spookfish *Rhinochimaera pacifica* (Mitsukuri, 1895), was reported by Pequeño (1989) from the deep continental slope in central Chile. Recently Andrade & Pequeño (2006) reported the pale ghost shark *Hydrolagus pallidus* Hardy & Stehmann, 1990; from the Juan Fernández seamounts (*ca.* 33°S, 77°W) in the bycatch of the orange roughy *Hoplostethus atlanticus* Collett, 1889, trawl fishery.

Despite the increased fishing effort in the last 20 years, distribution patterns of chimaerid fishes in the southeastern Pacific are poorly known. Along the Chilean coast are caught as bycatch in trawl, coastal gill-nets or longline fisheries; but its capture never is reported or landed (Lamilla *et al.*, 2008) with exception of the artisanal, coastal gillnet fishery targeting *C. callorhynchus* (Cubillos *et al.*, 2009).

In June 2009, three chimaerid fishes, one male and two females, were incidentally caught during commercial bottom longline fishery targeting the Patagonian toothfish (*Dissostichus eleginoides* Smitt, 1898) on board L/M Pamela II. Seventeen hauls were made during the cruise, but chimaeroid fishes were caught in three separate occasions along with 121 specimens of eleven elasmobranch species (Lamilla *et al.*, 2010). Additionally, four specimens were bycatch from one haul by the same vessel during November 2009, as indicated in Table 1.

Chimaeridae (Didier, 2004). 30 body measurements and eight head lateral-line canals measu-

rements were taken point to point using a dial caliper (0.01 mm) or measuring tape (1 mm). Definition of measurements and their acronyms are based on Compagno *et al.* (1990), Didier & Nakaya (1999) and Didier & Séret (2002): total length (TL), precaudal length (PCL), body length (BDL), snout-vent length (SVL), trunk length (TRL), head length (HDL), pre-orbit length (POR), pre-narial length (PRN), pre-orbital length (POB), eye length (EYL), eye height (EYH), pre-first dorsal length (PD1), pre-second dorsal length (PD2), length of first dorsal fin base (D1B), dorsal spine height (DSA), maximum height of first dorsal fin (D1H), maximum height of second dorsal fin (D2H), interdorsal space (IDS), dorsal caudal margin length (CDM), maximum height of dorsal lobe of caudal fin (CDH), total caudal length (CTL), ventral caudal margin (CVM), maximum height of ventral lobe of caudal fin (CVH), caudal peduncle height (CPH), pectoral fin anterior margin (P1A), posterior base of pectoral fin to anterior base of pelvic fin (P2P), pelvic-caudal space (PCA), origin of first dorsal fin to origin of pectoral fin (D1P1), origin of first dorsal fin to origin of pelvic fin (D1P2), origin of second dorsal fin to origin of pelvic fin (D2P2). In the lateral-line canals of head: distance from anterior oronasal fold to center of nasal canal (ONC), length of the rostral canal (LRC), length of the nasal canal measured as a straight line distance from right to left side (LNC), distance between infraorbital and angular canal measured as the straight line distance from junction of the oral and infraorbital canal to the junction of the oral and angular canal (IOA), distance between preopercular canal and main trunk canal measured from their junction with the infraorbital canal (OTM), distance between main trunk canal and supratemporal canal measured from their junctions with the infraorbital and postorbital canals, respectively (OCL), length of supratemporal canal measured across the head from its junctions with the postorbital canal (STL), distance from anterior base of spine to the center of the supratemporal canal (SPS).

Table 1. Geographical position of captured specimens.

Tabla 1. Ubicación geográfica de los especímenes capturados.

Date	GPS Position		Depth (m)	Specimen
19-06-2009	39°52'20"S	74°18'10"W	1280	IZUA-PM 4007
22-06-2009	40°02'27"S	74°24'30"W	1150	IZUA-PM 4010
23-06-2009	40°07'23"S	74°24'29"W	1720	IZUA-PM 4011
04-11-2009	39°51'35"S	74°22'42"W	1528	Four mature males

Sexual maturity in males was determined by its secondary sexual characteristics (Didier, 2004) such as, the emergence of the frontal tenaculum, hardened pelvic claspers and denticles present on frontal tenaculum, prepelvic tenacula and pelvic claspers. Females were considered mature when vitellogenic (yellow) ovarian follicles or distended oviductal openings were present (Ebert, 2003). Specimens were fixed in 10% formaldehyde, stored in 70% ethanol and deposited at the Ichthyology Collection (IZUA-PM) belonging to the Universidad Austral de Chile (UACH) and contrasted with descriptions provided by James *et al.* (2009). For comparison purposes, the specimen described by Andrade & Pequeño (2006) identified as *H. pallidus* (PM-IZUA 2341), was examined due to similarities in its external morphology.

All chimaerid fishes were assigned to the genus *Hydrolagus* on the basis of a ventral caudal fin that was not deeply indented at its origin to form a separate anal fin. All specimens were consistent with the diagnosis for *H. melanophasma* (Fig. 1), according James *et al.* (2009). The shape and arrangement of the lateral-line canals of the head; the slightly curved spine of the first dorsal fin, serrated in the posterior margin and greater than the height of the fin; the uniform height of the second dorsal fin; the size of pectoral fins extending beyond insertion of pelvic fins;

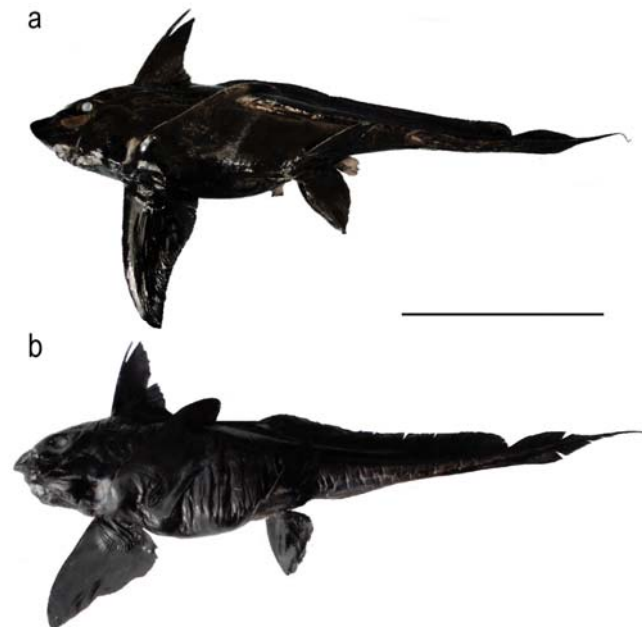


Figure 1. *Hydrolagus melanophasma*. a) Male 1175 mm TL (IZUA-PM 4007), b) female 1277 mm TL (IZUA-PM 4011). Scale bar represents 250 mm.

Figura 1. *Hydrolagus melanophasma*. a) Macho de 1175 mm TL (IZUA-PM 4007), b) hembra de 1277 mm TL (IZUA-PM 4011). La barra de escala representa 250 mm.

the tridentate clasper which forks about a quarter of the total length and a black uniform coloration which differentiates this species from others described in the region.

Freshly-caught specimens had a uniform dark purple-black body coloration that turned pale after fixation, darker on ventral part of snout, head and trunk. Paired and unpaired fins were black even after fixation. Morphometric measurements are presented in Table 2 and are expressed as percentage of body length (BDL).

Hydrolagus melanophasma is characterized by large-bodied specimens (adults BDL > 705 mm) with a blunt snout that continues the line from the orbit to the tip of the snout; eyes of moderate size, length 19.5% of head length. Snout-vent length is short, 64.6% BDL, slightly bigger than the pelvic-caudal space, 58.2% BDL. Pectoral-pelvic space, 36% BDL, is one-half snout-vent length. Skin firm and robust, not deciduous as in some *Hydrolagus* (Didier, 2002, 2008). Pectoral fins large, triangular, anterior margin 41.3% BDL that extends to or beyond pelvic fin insertion. Straight anterior margin of pelvic fins and posterior margin strongly convex. First dorsal fin preceded by prominent, slightly curved dorsal spine attached to the first dorsal fin; dorsal fin spine long, 28.5% BDL, larger than first dorsal fin apex. Posterior edge of spine serrated for last 6.3% of spine length. Dorsal spine and first dorsal fin overlap with the second dorsal fin when laid flat. First dorsal fin triangular, base short 20.9% BDL with concave posterior margin. Second dorsal fin long and uniform in height throughout body. Depth of second dorsal fin, 4.5% BDL, is greater than depth of dorsal lobe of caudal fin, 3.0% BDL. There is no measurable separation between insertion of the second dorsal fin and the origin of the caudal fin dorsal lobe. Depth of dorsal and ventral caudal fin lobes is nearly equal. Ventral lobe of caudal fin extends beyond the insertion of the dorsal lobe of caudal fin. No anal fin.

Tridentate claspers present in mature males along with frontal tenaculum and prepelvic tenacula. Claspers forked and extend beyond distal edge of pelvic fins. The prepelvic tenacula have four to five denticles along the medial edge. Frontal tenaculum with indistinct rows of 32 pointed, needle-like denticles.

The head lateral line canals are open grooves with wide dilation on the snout. There is a distinct space between the preopercular and oral canals where they branch separately from the infraorbital canal (Fig. 2). The preopercular canal is discontinuous after it branches from the oral or infraorbital before breaking into consecutively smaller pieces. Lateral line canal measurements are presented in Table 3. Trunk lateral

Table 2. Body measurements expressed as percentage of the body length (% BDL) for examined material of *Hydrolagus melanophasma*. † Original measurements of Andrade & Pequeño (2006); * measurement not indicated.

Tabla 2. Medidas corporales expresadas como porcentaje de la longitud del cuerpo (BDL%) para el material examinado de *Hydrolagus melanophasma*. † Mediciones originales de Andrade & Pequeño (2006), * medida no indicada.

Sex	<i>H. melanophasma</i>	<i>H. pallidus</i>	IZUA-PM 4007	IZUA-PM 4010	IZUA-PM 4011
	James <i>et al.</i> (2009)	IZUA-PM 2341†			
BDL (mm)	577 – 631	660	705	733	918
TL	155.6 – 160.5	129.8	166.7	162.9	138.9
PCL	121.9 – 126.9	115.8	127.7	130.6	121.8
SVL	56.9 – 60.1	*	64.7	73.1	56.1
TRL	35.5 – 37.3	*	31.9	34.7	35.1
HDL	25.0 – 29.5	29.8	27.7	30.6	21.8
POR	10.6 – 11.5	16.3	14.5	13.4	8.3
PRN	7.1 – 8.2	12.6	11.2	11.9	7.1
POB	13.2 – 13.7	17.7	11.8	14.2	10.5
EYL	6.5	6.7	5.4	7.1	5.7
EYH	4.1 – 4.4	4.7	4.4	4.6	3.7
PD1	27.4 – 27.7	28.6	29.1	27.3	26.7
PD2	47.4 – 47.8	86.0	44.3	48.3	53.4
D1B	13.9 – 15.3	13.2	20.9	18.4	16.9
DSA	25.9	*	28.5	29.9	17.6
D1H	19.0 – 19.5	*	24.5	25.2	18.1
D2H	4.0 – 4.1	4.6	4.5	4.8	5.8
IDS	6.4 – 9.0	*	3.0	10.6	5.4
CDM	20.5 – 23.1	16.1	20.1	22.5	18.5
CDH	2.0 – 3.3	3.0	3.0	2.9	2.4
CTL	33.3 – 34.5	*	40.7	31.1	30.5
CVM	26.0 – 28.8	32.1	34.2	39.0	43.6
CVH	2.4 – 2.9	2.6	2.7	2.5	2.8
CPH	2,4	2.6	3.8	2.9	2.4
P1A	38.5 – 40.9	37.7	41.3	41.5	32.0
P2P	29.8 – 32.2	19.3	36.0	40.2	38.6
PCA	57.9 – 60.1	*	58.2	50.2	51.2
D1P1	16.4 – 19.6	*	21.0	22.1	19.2
D1P2	39.5 – 42.5	*	46.1	48.4	41.0
D2P2	20.3 – 24.6	*	30.5	31.2	27.2

line extends the length of the body from junction with post-orbital to whip-like filament and is generally straight with no regular undulations.

Chimaerid fishes, especially species of *Hydrolagus*, are often difficult to distinguish because they look very similar and their geographic range often overlaps. The morphological characteristics of *H. melanophasma* clearly differentiate it from two other

species of this genus occurring in the southeastern Pacific. The combination of characters, such as body colouration, length and serrations of dorsal spine, and lateral-line canals of the head; constitute useful means for a quick and easy distinction among *Hydrolagus* species.

Hydrolagus macrophthalmus differs from the *H. melanophasma* by a number of characters being most

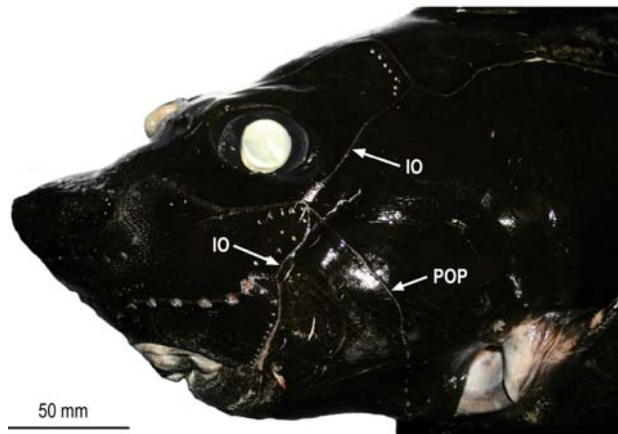


Figure 2. Head lateral line canals of *Hydrolagus melanophasma* (IZUA-PM 4007) showing the preopercular (POP), oral (O) and infraorbital (IO) canals.

Figura 2. Canales de la línea lateral de la cabeza de *Hydrolagus melanophasma* (IZUA-PM 4007) indicando los canales preopercular (POP), oral (O) e infraorbital (IO).

conspicuous, such as (a) the length of the dorsal spine, usually shorter or equal than length of the first dorsal fin; (b) larger eyes, 30% HDL; (c) preopercular and oral canals shares a short common branch from the infraorbital canal; and its (d) pale brown body coloration. *H. melanophasma* differs slightly from the *H. pallidus* specimen reported from Juan Fernandez seamounts; by its pale-gray coloration and morphometrics (Table 2). Observations on the head lateral line canals and measurement of precaudal (PCL), pre-second dorsal (PD2), pre-oral (POR) length and the

space between the pectoral and pelvic fins (P2P); considerably exceed the size range of the *H. melanophasma* original description and our observations.

H. pallidus was reported to island slopes of north-east Atlantic (Hardy & Stehmann, 1990) but this geographical divergence, its unusual discrepancy in distribution and the fact that no additional specimens of *H. pallidus* have been caught or reported from the Pacific allows us to recognize that the first assignment was inadequate. The only specimen (IZUA-PM 2341) reported by Andrade & Pequeño (2005), by its color and morphometrics, could correspond to the pointy-nose blue chimaera *Hydrolagus trolli* Didier & Séret, 2002 (D. Didier *comm. pers.*); described from the southwestern Pacific. Recent observations of *H. trolli*, from deep seamounts around Hawaii and off southern coast of California, raise questions about the species designation by Andrade & Pequeño (2005), which needs to be revised and supported by a comparative analysis to argue species identification.

Based on direct observations, we confirm the presence of *H. melanophasma* is confirmed for first time in the south Pacific Ocean. The eastern Pacific black ghost shark, *H. melanophasma*, was described from southern California (USA), along the Pacific coast of Baja California (Mexico) and into the Gulf California. Capture records of *H. melanophasma* in the southeastern Pacific from Caldera (25°S) (J. Lamilla *unpublished data*) to Valdivia (40°S) suggests a continuous distribution along the deep continental slope of the southeastern Pacific ocean, restricted to the Middle America and Atacama oceanic trenches.

Table 3. Morphometric measurements expressed as a proportion of head length (% HDL) of the head lateral line canals of *Hydrolagus melanophasma*.

Tabla 3. Mediciones morfométricas expresadas como proporción de la longitud de la cabeza (HDM%), de los canales de la línea lateral de la cabeza de *Hydrolagus melanophasma*.

	<i>H. melanophasma</i> James <i>et al.</i> (2009)	IZUA-PM 4007	IZUA-PM 4010	IZUA-PM 4011
HDL (mm)	170	195	224	200
ONC	8.2	11.3	9.4	12.5
LRC	3.8	5.1	5.8	6.5
LNC	26.0	23.6	29.5	31.5
IOA	14.9	14.4	12.9	16.0
OTM	30.6	30.3	28.1	30.0
OCL	11.1	12.3	11.2	14.0
STL	14.5	23.6	22.3	27.0
SPS	16.9	14.9	18.3	15.0

The identification of *H. melanophasma* from Chilean waters increases the known Chimaeroid fish species of Chile to five: *Hydrolagus macrophthalmus* (Pequeño, 1989), *H. cf. trolli* (as *H. pallidus* in Andrade & Pequeño, 2005), *H. melanophasma* (as *H. affinis* in Lamilla & Bustamante, 2005), *Callorhynchus callorhynchus* and *Rhinochimaera pacifica* (Pequeño, 1989).

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