

Apristurus nakayai sp. nov., a new species of deepwater catshark (Chondrichthyes: Pentanchidae) from New Caledonia

by

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ABSTRACT. - A new species of deepwater catshark (Pentanchidae) is described based on a single adult male measuring 676 mm TL that was collected at a depth of 953-1022 m on the Coriolis Bank off western New Caledonia in the southwestern Pacific Ocean. Within the genus *Apristurus*, the species belongs to the *brunneus* group whose members share a higher spiral valve count and the upper labial furrows are longer than the lower furrows. *Apristurus nakayai* sp. nov. differs from its congeners of the *brunneus* group through a combination of the following characters: shiny white iris on fresh specimen (unique among the genus); brownish black colouration; short distance from pectoral-fin tip to pelvic-fin origin, subequal to internarial width; cloaca located well anterior to the midpoint of the total length; pectoral fins large, width about 2.7 times pectoral fin tip to pelvic fin origin; long anal-fin base, longer than distance between dorsal fin insertions; first dorsal fin located well behind pelvic-fin insertion; first dorsal fin markedly smaller than second dorsal fin; very long caudal-fin terminal lobe, its length more than twice its height; no denticles in the mouth; very short pyloric stomach; intestinal spiral valves 16; monospondylous vertebrae 36; precaudal diplospondylous vertebrae 37. DNA barcoding from the COI sequence reveal high genetic distances with its Australasian congeners.

RÉSUMÉ. - *Apristurus nakayai* sp. nov., une nouvelle espèce d'holbiche de profondeur (Chondrichthyes: Pentanchidae) de Nouvelle-Calédonie.

Une nouvelle espèce d'holbiche de profondeur (Pentanchidae) est décrite à partir d'un spécimen unique mâle adulte mesurant 676 mm LT, collecté entre 953 et 1022 m de profondeur sur le banc du Coriolis, au large de l'ouest de la Nouvelle-Calédonie, dans le sud-ouest de l'océan Pacifique. Au sein du genre *Apristurus*, l'espèce appartient au groupe *brunneus* dont les membres présentent un plus grand nombre de tours de valvules spirales et des sillons labiaux supérieurs plus longs que les inférieurs. *Apristurus nakayai* sp. nov. diffère de ses congénères par les caractères suivants : iris blanc brillant sur le spécimen frais (unique au sein du genre), coloration marron-noirâtre; courte distance entre l'extrémité des pectorales et l'origine des pelviennes, subégale à l'espace entre les narines ; cloaque situé nettement en arrière du milieu de la longueur totale ; grandes nageoires pectorales, largeur environ 2,7 fois la distance entre l'extrémité des pectorales et l'origine des pelviennes ; base de la nageoire anale longue, plus longue que la distance entre les insertions des nageoires dorsales ; première nageoire dorsale située nettement en arrière de l'insertion des nageoires pelviennes ; première nageoire dorsale nettement plus petite que la deuxième ; très long lobe terminal de la nageoire caudale, sa longueur plus de deux fois sa hauteur ; absence de denticules dans la bouche ; estomac pylorique très court ; 16 valvules spirales à l'intestin ; 36 vertèbres monospondyles ; 37 vertèbres diplospondyles précaudales. Le barcode ADN de la séquence COI révèle des distances génétiques élevées avec ses congénères austral-asiatiques.

Key words. - Chondrichthyes - Pentanchidae - *Apristurus nakayai* - New Caledonia - New species - DNA barcode.

The genus *Apristurus* Garman, 1913 belongs to the family Pentanchidae, which was recently resurrected based on molecular and morphological phylogenetic studies, and which showed that the family Scyliorhinidae was paraphyletic (Maisey, 1984; Winchell *et al.*, 2004; Iglésias *et al.*, 2005a). Pentanchids (i.e. *Apristurus*, *Asymbolus*, *Bythaelurus*, *Cephalurus*, *Galeus*, *Halaaelurus*, *Haploblepharus*, *Holohalaelurus*, *Parmaturus* and *Pentanchus*) differ from scyliorhinids *sensu stricto* (i.e. *Atelomyxerus*, *Aulohalaelurus*, *Cephaloscyllium*, *Poroderma* and *Schroederichthys*) by the absence of supraorbital crests on the chondrocranium (Compagno, 1988). The genus *Apristurus* comprises a group of deepwater catsharks, inhabiting continental slopes and submarine elevations at depths of 500 to 2100 m in all oceans except polar waters. The genus contains 35 recognised species and is one of the most diverse genera of living sharks.

Global development of deepwater commercial fisheries and recent deepwater scientific investigations revealed the presence of many unknown deepwater chondrichthyan species. As a consequence, more than 100 new species of chondrichthyans have been described in the last two decades in the Australian region, which has greatly increased the known chondrichthyan fauna in this region (Last, 2007; Last *et al.*, 2008a, 2008b; Last and Stevens, 2009). Ten members of the genus *Apristurus* are currently known from the Australasian region (southeastern Indian Ocean and southwestern Pacific Ocean) off Australia, New Zealand or New Caledonia: *A. albisoma* Nakaya & Séret, 1999, *A. amplexus* Sasahara, Sato & Nakaya, 2008, *A. australis* Sato, Nakaya & Yorosu, 2008, *A. bucephalus* White, Last & Pogonoski, 2008, *A. exsanguis* Sato, Nakaya & Stewart, 1999, *A. longicephalus* Nakaya, 1975, *A. melanoasper* Iglésias, Nakaya

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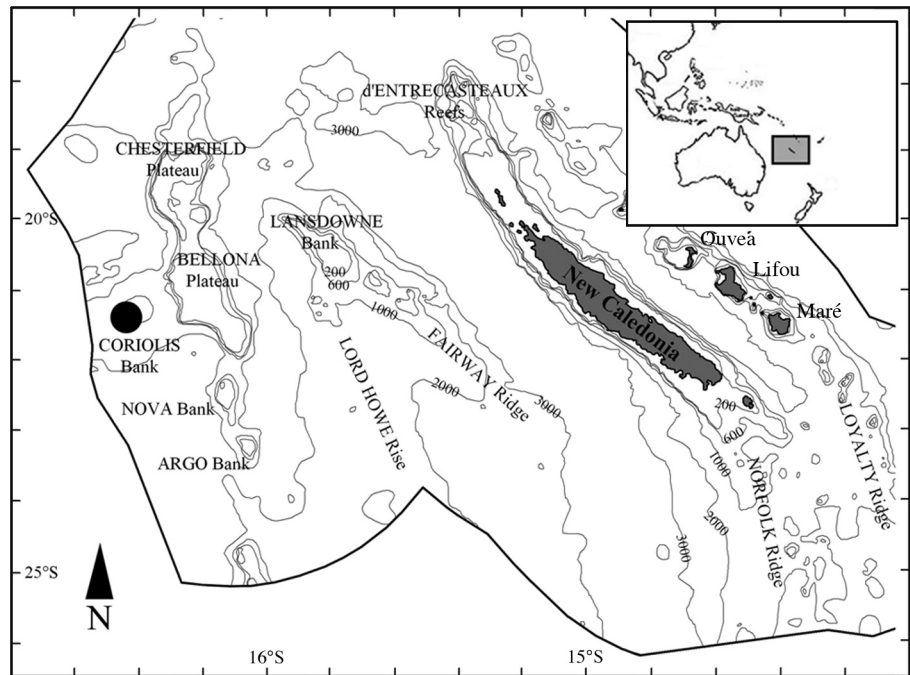


Figure 1. - Capture locality (black circle) of *Aristurus nakayai* sp. nov. holotype in the EEZ of New Caledonia, southwestern Pacific Ocean.

& Stehmann, 2004, *A. pinguis* Deng, Xiong & Zhan, 1983, *A. platyrhynchus* (Tanaka, 1909) and *A. cf. sinensis* Chu & Hu, 1981. Five of these (*A. albisoma*, *A. amplexus*, *A. australis*, *A. bucephalus* and *A. exsanguis*) have been recently described from this region and the five others (*A. longicephalus*, *A. melanoasper*, *A. pinguis*, *A. platyrhynchus* and *A. cf. sinensis*) have been newly recorded (Last and Stevens, 1994, 2009; Iglésias *et al.*, 2005b; Kawachi *et al.*, 2008; Nakaya *et al.*, 2008b). Some questions still exist within the genus and *A. cf. sinensis* from this region may represent a complex of various species (Last and Stevens, 2009; Iglésias, pers. obs.).

Based on morphology Nakaya and Sato (1999) distinguished three species groups within *Aristurus* (i.e. *brunneus*, *longicephalus* and *spongiceps* groups). Later these phenetic groups were recognised as monophyletic by morphological and molecular inferences (Sato, 2000; Iglésias *et al.*, 2005a). One of them, the *brunneus* group, is characterised by higher spiral valve counts (12-23), upper labial furrows longer than lower furrows, and discontinuous supraorbital sensory canals. The *brunneus* group include 19 species worldwide among which only four are currently known in the Australasian area, i.e. *A. exsanguis*, *A. melanoasper*, *A. platyrhynchus* and *A. cf. sinensis*.

From 3 December 2001 to 18 December 2002, the commercial trawler *Opéra* investigated the fishery potential of the deep waters in the Exclusive Economic Zone (EEZ) of New Caledonia. A total of 172 stations (123 bottom trawling and 49 pelagic trawling) were sampled during the 21 cruises, representing a total of 221 days at sea. This survey provided

223 preserved specimens belonging to 42 chondrichthyan species (Iglésias *et al.*, unpubl. data). During these missions, 106 specimens of *Aristurus* have been preserved and six species have been distinguished based on morphology and DNA barcoding: *Aristurus albisoma* (9 specimens), *A. longicephalus* (50 specimens), *A. melanoasper* (4 specimens), *A. pinguis* (1 specimen), *A. platyrhynchus* (14 specimens), *A. cf. sinensis* (27 specimens), and a single specimen of an undescribed species. Herein, I describe this latter specimen as a new species and compare it with all known species of the *brunneus* group from the region.

METHODS

Collection

The *Aristurus* specimen was collected on 23 April 2002 during trawl surveys conducted in the EEZ of New Caledonia with the commercial trawler *Opéra* from the ship's manager "Armement calédonien à la Pêche". The specimen was collected at station 030 (Fig. 1) during the cruise "Opéra-08" with a bottom trawl net measuring 11 m horizontally and 3 m vertically, and with a 4 cm mesh. Station numbers (stn) indicated for the comparative materials refer to the 2001-2002 cruises of the trawler *Opéra* in the EEZ of New Caledonia.

Morphological analyses

The methodology for the morphological description of the specimen (morphometric and meristic characters, matu-

Table I. - Morphometrics of *Apristurus nakayai* sp. nov., holotype MNHN 2003-1983, expressed in mm and as a percentage of total length. (*) measurements recorded on fresh specimen are annotated when significantly different from measurements on fixed specimen.

#	Term	Holotype		#	Term	Holotype	
		Fixed (Fresh*)	% TL			Fixed (Fresh*)	% TL
1	Total length (mm)	659 (676)	-	39	P1-P2 origins	108 (120)	16.4 (17.8)
2	PreD2-insertion length	450	68.3	40	P1-P2 insertions	108	16.4
3	PreD2-origin length	405	61.5	41	P2-anal space	54 (59)	8.2 (8.7)
4	PreD1-insertion length	344	52.2	42	P2-anal origins	94	14.3
5	PreD1-origin length	314	47.6	43	D1 length	47.5	7.2
6	PreP1 length	133 (135)	20.2 (20.0)	44	D1 base length	31.5	4.8
7	PreP2 length	245	37.2	45	D1 height	9.5	1.4
8	Pre-vent length	266 (280)	40.4 (41.4)	46	D1 free lobe length	17.5	2.7
9	Preanal length	340 (350)	51.6 (51.8)	47	D2 length	64.5	9.8
10	Precaudal length	452	68.6	48	D2 base length	43.5	6.6
11	Pre-branchial length	105	15.9	49	D2 height	14.5	2.2
12	Pre-spiracular length	80	12.1	50	D2 free lobe length	22	3.3
13	Pre-orbital length	56	8.5	51	P1 base length	57	8.6
14	Pre-outer nostril length	28	4.2	52	P1 anterior margin	81.5	12.4
15	Pre-inner nostril length	43	6.5	53	P1 posterior margin	51	7.7
16	Pre-oral length	51	7.7	54	P1 inner margin	30	4.6
17	Head length	134	20.3	55	P1 width	59	9.0
18	Head height	46 (58)	7.0 (8.6)	56	P2 anterior margin	24	3.6
19	Head width (mouth corners)	66	10.0	57	P2 length	59	9.0
20	Head width (max)	70	10.6	58	P2 base length	50	7.6
21	Mouth width	45	6.8	59	P2 posterior margin	41	6.2
22	Mouth length	16	2.4	60	P2 inner margin	22	3.3
23	Internarial width	22	3.3	61	Anal base length (ceratotrichia)	115	17.5
24	Upper labial furrow length	20.5	3.1	62	Anal base length (muscle)	125	19.0
25	Lower labial furrow length	14	2.1	63	Anal anterior margin	53	8.0
26	Orbit length	21	3.2	64	Anal posterior margin	72	10.9
27	Orbit height	7	1.1	65	Anal height (muscle)	27	4.1
28	Nostril length	20	3.0	66	Anal inner margin	5	0.8
29	Nostril-mouth space	11	1.7	67	Caudal peduncle height	31.5	4.8
30	Interorbital width	35	5.3	68	Caudal length	211	32.0
31	1st gill height	8.5	1.3	69	Caudal height	53	8.0
32	3rd gill height	11	1.7	70	Caudal preventral margin	69	10.5
33	5th gill height	10	1.5	71	Caudal postventral margin	108	16.4
34	D1-D2 space	62	9.4	72	Caudal terminal lobe height	19	2.9
35	D1-D2 origins	92	14.0	73	Caudal terminal lobe length	42	6.4
36	D1-D2 insertions	107	16.2	74	Clasper outer length	33	5.0
37	P1-P2 space	59	9.0	75	Clasper inner length	59	9.0
38	P1 tip to P2 origin	22	3.3				

rity stage) follows Nakaya *et al.* (2008b). Denticles, from the upper lateral side of the trunk above pelvic fins, were photographed by scanning electron microscope (SEM). Clasper terminology follows Compagno (1988). Digestive tract terminology follows Nakaya (1991). Liver terminology is adapted from Gans and Parsons (1964). The voucher specimen was fixed in 4% formalin and then preserved in

80% ethanol and deposited in the collection of the Muséum national d'Histoire naturelle of Paris (MNHN).

Molecular analyses

A muscle tissue sample (no. BPS-0187) was taken from the fresh specimen and stored frozen in 80% ethanol. DNA was extracted according to the modified CTAB method

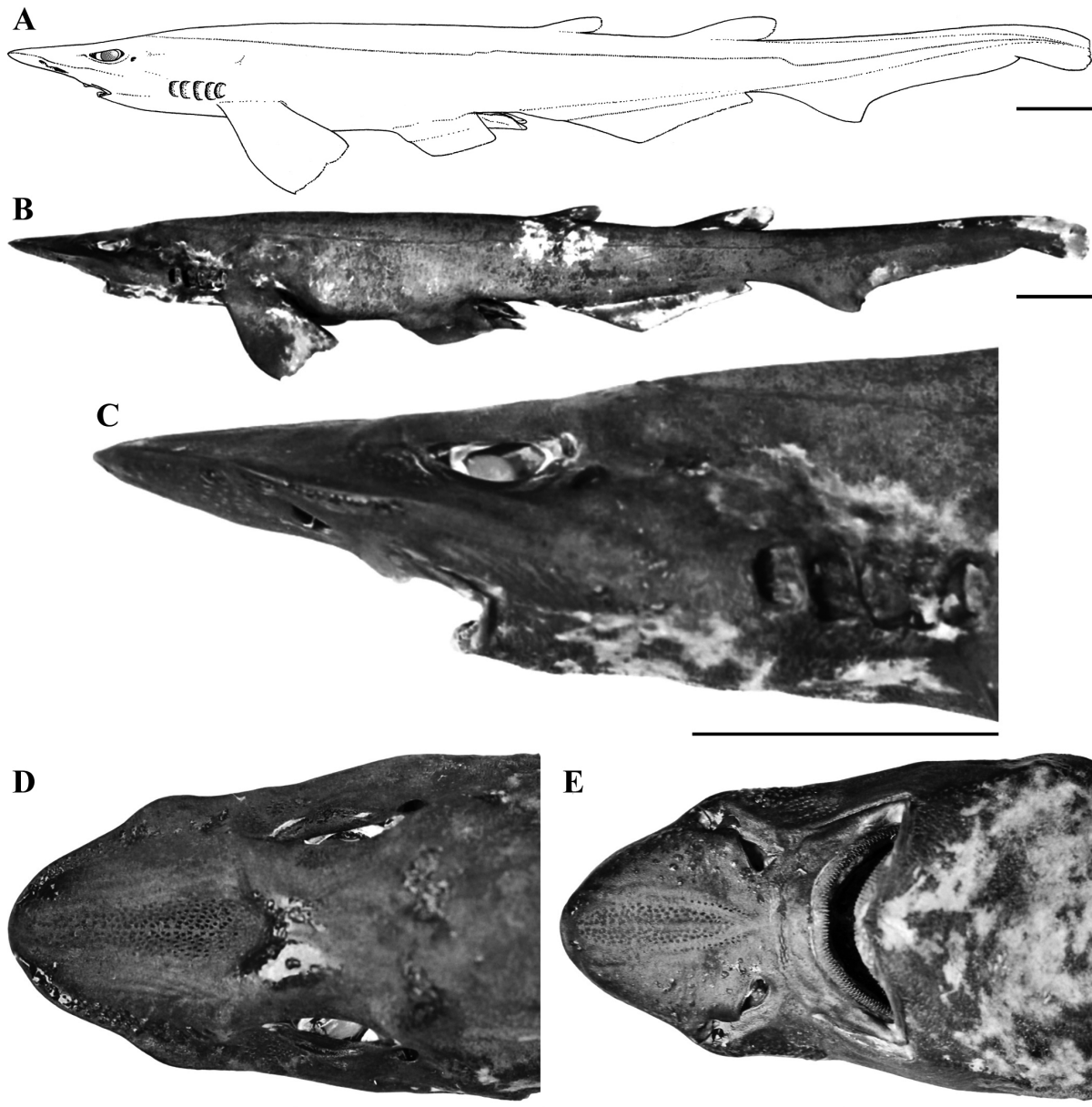


Figure 2. - *Apristurus nakayai* sp. nov., holotype MNHN 2003-1983, adult male, 676 mm TL (fresh). **A**: Lateral view (drawing); **B**: Lateral view (photograph); **C**: Lateral view of head; **D**: Dorsal view of head; **E**: Ventral view of head. Scale bars = 5 cm.

(Jones, 1953). Homologous fragments of 655 base pairs (bp) of the cytochrome oxidase subunit 1 (COI) mitochondrial gene were amplified by polymerase chain reaction (PCR) using the TripleMaster[®] PCR System (Eppendorf; <http://www.eppendorfna.com>) according to the manufacturer's instructions. The fragments were obtained with the PCR primer pair: S083 [5'-TCTACYAACCACAAAGAYATCG-GCAC-3']/R084 (Iglésias and Lévy-Hartmann, 2012). PCR thermal cycling conditions were as follows: pre-denaturation 94°C for 2 min, 45 cycles of denaturation at 94°C for 1 min, annealing at 54°C for 1 min, and extension at 72°C

for 3 min. At the end of the electrophoresis, the bands of gel containing the PCR products were excised and purified using the QIAquick gel extraction kit (Qiagen; <http://www.qiagen.com>). Sequencing reactions were performed in the two directions using a BigDye Terminator v3.1 cycle sequencing kit (Applied Biosystems; <http://www.appliedbiosystems.com>) and each primers S083 and R084. The thermocycles were: pre-denaturation at 96°C for 2 min, 40 cycles of denaturation at 96°C for 0.5 min, annealing at 50°C for 0.5 min, and extension at 60°C for 4 min. PCR and sequencing reactions were carried out on a TGradient thermocycler (Biom-

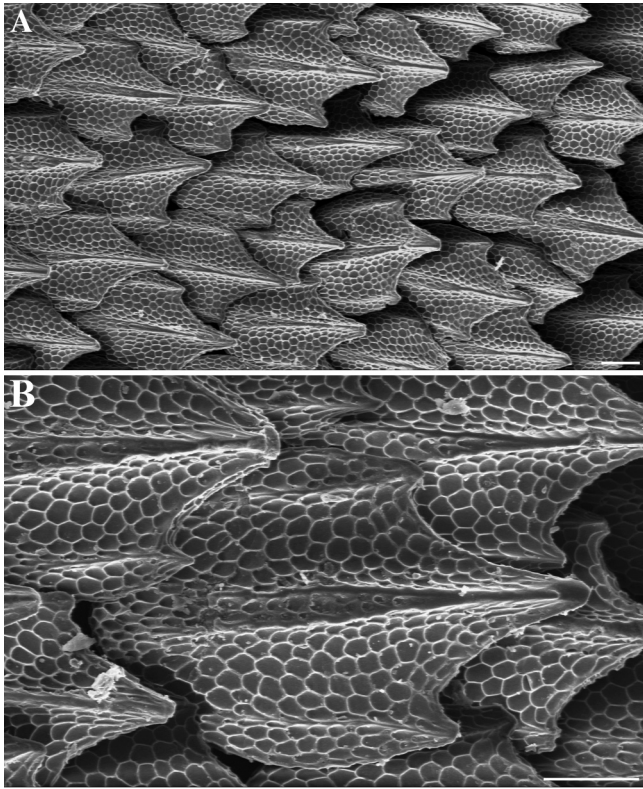


Figure 3. - Denticles of the flank of *Apristurus nakayai* sp. nov., holotype MNHN 2003-1983, adult male, 676 mm TL. **A**: Arrangement of denticles; **B**: Detail of denticle ornamentations. Scale bars = 100 μ m.

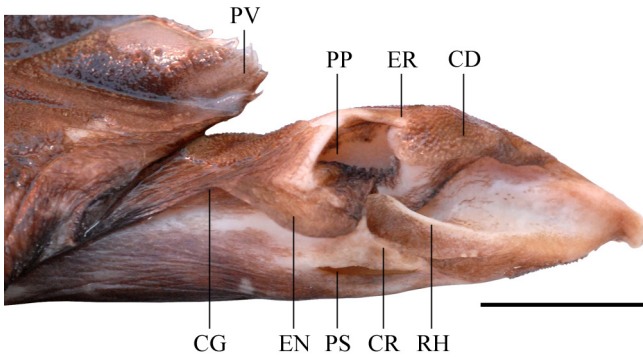


Figure 4. - Dorsal view, partially expanded, of the right clasper of *Apristurus nakayai* sp. nov., holotype MNHN 2003-1983, adult male, 676 mm TL. CD = clasper denticles; CG = clasper groove; CR = cover rhipidion; EN = envelope; ER = exorhipidion; PP = pseudopera; PS = pseudosiphon; PV = pelvic fin; RH = rhipidion. Scale bar = 1 cm.

etra; <http://www.biometra.com>). Sequencing was performed on an ABI PRISM TM 310 genetic analyser (Applied Biosystems). Corrections to electropherograms were performed using Sequencher v.4.2 (Gene Codes Corporation;

Figure 5. - Internal organs of *Apristurus nakayai* sp. nov., holotype MNHN 2003-1983, adult male, 676 mm TL. **A**: Ventral view of digestive tract. CS = cardiac stomach; DU = duodenum; IN = valvular intestine; PS = pyloric stomach; RE = rectal gland; SP = spleen. **B**: Ventral view of liver. AL = additional right lobe; LL = left lobe; RL = right lobe. Scale bar = 5 cm.

www.genecodes.com). The COI sequence is deposited in GenBank (<http://www.ncbi.nlm.nih.gov/genbank>) under the Accession KC157668 and in the BOLD Systems (<http://www.boldsystems.org>) under the Process ID CNCC001-12, where it is part of the project “*Apristurus nakayai* new species” (CNCC). To facilitate comparison with other barcode sequences and the NJ trees provided by the BOLD Systems, the obtained sequence was used to query the BOLD “identify specimen” tool using the complete database of “All Barcode Records.” The interspecific genetic distance was computed using DNA barcodes obtained for specimens of all other known Australasian congeners of the *brunneus* group. The comparative sequences were obtained for two specimens of *A. exsanguis*, four specimens of *A. melanoasper*, four specimens of *A. platyrhynchus*, 11 specimens of *A. cf. sinensis* from New Caledonia and two specimens of *A. cf. sinensis* from New Zealand (See “Comparative material” section for details of specimens used). The distance was calculated using *MEGA* version 5 (Tamura *et al.*, 2011) with the Kimura 2-parameter (K2P) distance model (Kimura, 1980).

***Apristurus nakayai* sp. nov.**
(Figs 1-5; Tab. I); Milk-eye catshark

Synonym

Apristurus sp. 2. Iglésias *et al.* (2005a): Fig. 2, Tab. I.

Material examined

Holotype. - MNHN 2003-1983, tissue sample BPS-0187, adult male 676 mm TL (fresh), 798.1 g, Coriolis Bank, west of the Exclusive Economic Zone of New Caledonia, 21°25.1'–21°28.2'S, 157°50.5'–158°06.1'E, 953–1,022 m, 23 Apr. 2002.

Diagnosis

A medium-sized species of *Apristurus* of the *brunneus* group with the following combination of characters: shiny white iris on fresh specimen; brownish black colouration; short interspace from P1 free rear tip to P2 origin, subequal to internarial width; midpoint of the total length located well behind cloaca; pectoral fins large, width about 2.7 times P1 tip-P2 origin; long anal-fin base, longer than D1 insertion-D2 insertions; first dorsal fin located well behind pelvic-fin insertion; first dorsal fin markedly smaller than second one; long caudal fin terminal lobe, its length more than twice its height; no denticles in the mouth; very short pyloric stomach; intestinal spiral valves 16; monospondylous vertebrae 36; precaudal diplospondylous vertebrae 37.

Description of holotype

Proportional measurements are given in table I.

Body slender, cylindrical anterior of pelvic fins (Fig. 2A, B); posterior part of body compressed laterally. Abdomen narrow; P1 free rear tip to P2 origin subequal to internarial width. Midpoint of the total length located between D1 origin and anal fin origin, well behind cloaca. Head dorsoventrally flattened (Fig. 2C-E). Snout relatively long, tip rounded. Nostril expanding obliquely inward from snout edges; nostril length subequal to internarial width and orbit length. Mouth arched; mouth width about 2.8 times mouth length. Upper labial furrows long, about 1.5 times lower furrows. Subocular fold present but not well developed. Spiracle small, located just behind eye and below horizontal axis of eye. Five small gill slits; 5th gill slit situated above pectoral-fin origin. First angled deviation of lateral line above P2 insertion and well in front of first dorsal fin.

Pectoral fins large, broad; width about 2.7 times P1 free rear tip to P2 origin. Pelvic fin small, P2 length equal to P1-P2 space. Anal fin long; anal-fin base length (ceratotrichia) longer than D1 origin-D2 origin and D1 insertion-D2 insertion. First dorsal fin located well behind pelvic-fin insertion; small, its height subequal to 2/3 second dorsal fin. Anterior margin of dorsal fins slightly rounded. Second dorsal-fin length subequal to D1-D2 space. Second dorsal-

fin insertion slightly anterior to anal-fin insertion. Caudal fin long, its length four times its height. Caudal terminal lobe very long, its length more than twice its height.

Teeth minute and numerous on both jaws, each with a long central cusp, flanked by a pair of smaller lateral cusps and very occasionally additional minute lateral cusps. Teeth with some very thin striae on cusps. Tooth rows: 38 + 41 = 79 on upper jaw and 35 + 37 = 72 on lower jaw. No naked space at symphysis of upper jaw. Naked space present at symphysis of lower jaw.

Denticles (Fig. 3) small, about 0.35 x 0.5 mm, overlapping each other, tricuspid, central cusp enlarged with strong median ridge; lateral cusps short, weakly pointed, with weak ridges; outer surface of denticles completely structured by reticulations. No modified denticles on dorsal margin of caudal fin. Denticles partially present around gill openings and on gill septa, but absent from palate and tongue. Denticles removed easily = deciduous denticles (white markings on body and head, Fig. 2B-E).

Clasper (Fig. 4) short and robust, tapering toward tip; ventral and outer sides densely covered by denticles; dorsal surface naked except for outer posterior half of exorhipidion. Inner margin of exorhipidion with modified denticles into tricuspid clasper hooks. Clasper groove covered by rhipidion except for posterior one third. Pseudosiphon distinct as a narrow deep groove.

Monospondylous vertebrae 36; precaudal diplospondylous vertebrae 37. Digestive tract (Fig. 5A) with a very short pyloric stomach joint to a moderately developed duodenum; valvular intestine with thin wall and 16 intestinal spiral valves. Liver (Fig. 5B), 171 mm long and weight 66.0 g, with left and right lobes subequal in size, fused for 2/3 of their anterior part and with a small additional right lobe present anteriorly. Testis, 58 mm long and weight 7.1 g. Stomach content: 10.0 g of probable fully digested bony fishes.

Colour: When fresh: body and fins uniformly brownish black; skin white where denticles are removed. Peritoneum grey. Palate and tongue dark. Iris shiny white on fresh specimen. Body colour in alcohol slightly less dark.

Size

Only known specimen the adult male holotype of 676 mm TL (fresh).

Molecular sequences

DNA barcoding: Cytochrome oxidase subunit 1 of the holotype was sequenced (655 bp) and submitted to GenBank (Accession number KC157668) and to BOLD Systems (Process ID CNCC001-12).

A 1501 bp mitochondrial DNA sequence including partial 12S rRNA gene, complete Valine tRNA gene and partial 16S rRNA gene (GenBank Accession AY462163) was previously obtained for the holotype of *Apristurus nakayai* (under

the name *Apristurus* sp. 2) and used for molecular phylogenetics (Iglésias *et al.*, 2005a).

Distribution

Known only from the Coriolis Bank off western New Caledonia, southwestern Pacific Ocean, 21°25.1'-21°28.2'S, 157°50.5'-158°06.1'E, in 953-1,022 m depth (Fig. 1).

Etymology

The epithet *nakayai*, is in honour of the Japanese ichthyologist Kazuhiro Nakaya that dedicate his research to the taxonomy of this genus, describing eight species of *Apristurus* and revising the genus worldwide (Nakaya, 2009). Vernacular English name “Milk-eye catshark” and French name “Holbiche à iris blanc” refer to the white iris of the species, unique among *Apristurus*.

DISCUSSION

Seven species of *Apristurus* were encountered during the cruise “Opéra-08”. The station 030 was particularly rich in *Apristurus* diversity as the single known specimen of *Apristurus nakayai* was found in the same shot with 11 other specimens belonging to five other species: one *A. albisoma*, two *A. longicephalus* (yet studied by Iglésias *et al.*, 2005b), two *A. melanoasper* (yet studied by Nakaya *et al.*, 2008a), one *A. platyrhynchus* and five *A. cf. sinensis*. The single known specimen of *Bathyraja leucomelanos* recently described by Iglésias and Lévy-Hartmann (2012), and one specimen of *Etmopterus lucifer* and three specimens of the poorly known *Etmopterus pseudosqualiolus*, previously used in molecular phylogenetic analyses (Straube *et al.*, 2010), were also found at the station 030.

Apristurus platyrhynchus is morphologically the closest species to *A. nakayai*. According to measurements and meristic counts provided by Kawachi *et al.* (2008), *A. platyrhynchus* mostly differs from *A. nakayai* with the following measurements: pre-branchial length longer for *A. platyrhynchus* than for *A. nakayai* (16.3-20.6 vs 15.9% TL); mouth wider (width 7.1-10.3 vs 6.8% TL); nostril longer (length 3.2-5.2 vs 3.0% TL); D1 origin-D2 origin shorter (10.4-12.8 vs 14.0% TL); D1 insertion-D2 insertion shorter (11.5-15.2 vs 16.2% TL); P2 longer (length 9.7-13.3 vs 9.0% TL). Morphological observations on the comparative materials reveal the second dorsal-fin insertion is located well in front of the anal-fin insertion, with a distance equal or larger than the anal inner margin, in *A. platyrhynchus* whereas it is located slightly in front of the anal-fin insertion in the holotype of *A. nakayai*. Denticles are present on palate and occasionally on tongue for specimens of *A. platyrhynchus* larger than 500 mm, whereas denticles are absent in the mouth of *A. nakayai*. The liver of *A. platyrhynchus* has a smaller left

lobe than right lobe whereas lobes are subequal in size for *A. nakayai*. On the liver of *A. nakayai*, the small additional right lobe present anteriorly is a character shared by the others species of the *brunneus* group.

The DNA barcode of *A. nakayai* reveals high genetic distances with its Australasian congeners belonging to the *brunneus* group, i.e. 11.1% with *A. exsanguis*, 11.3% with *A. melanoasper*, 11.4% with *A. cf. sinensis* from New Zealand, 11.9% with *A. platyrhynchus* and 12.4% with *A. cf. sinensis* from New Caledonia. Among the 172 specimens of *Apristurus* with barcode sequences available on BOLD Systems (query on 8 Aug. 2012) representing 18 named species and several unnamed species, a specimen recorded as *A. brunneus* appears as the closest relative to *A. nakayai* with 90.72% of similarity. According to molecular phylogenetics of Iglésias *et al.* (2005a), *Apristurus* sp. 2 (= *A. nakayai*) is supported as member of the *brunneus* group. Phylogenetic relationships with all others Australasian congeners, *Apristurus* sp. 3 and sp. 4 (= *A. cf. sinensis* from New Zealand and New Caledonia respectively), *Apristurus* sp. 5 (= *A. platyrhynchus*) and *Apristurus* sp. 6 (= *A. melanoasper* from New Caledonia), is as follows: (*A. exsanguis* (*A. nakayai* ((*A. cf. sinensis* + *A. platyrhynchus*) *A. melanoasper*))) and reveal no close relationship between *A. nakayai* and one of these species.

Key to Australasian *Apristurus* of the *brunneus* group

- 1a.** First dorsal fin equal to or only slightly smaller than second dorsal fin. 2
- 1b.** First dorsal fin much smaller than second dorsal fin . . . 3
- 2a.** Blackish colouration; 19-23 spiral valves; rough skin *A. melanoasper*
- 2b.** Pale colouration; 12-15 spiral valves; smooth skin *A. exsanguis*
- 3a.** Interspace from P1 tip to P2 origin larger than internarial width; cloaca located at about mid-body; D1 origin located above pelvic-fin insertion; 18-23 spiral valves *A. cf. sinensis*
- 3b.** Interspace from P1 tip to P2 origin, subequal to internarial width; cloaca located well anterior to mid-body; D1 origin located well behind pelvic-fin insertion; 15-20 spiral valves 4
- 4a.** Precaudal diplospondylous vertebrae: 39-45; D2 insertion well in front of anal-fin insertion; denticles in the mouth (specimens larger than 50 cm TL); left lobe of liver smaller than right lobe; pale brown colouration; black iris (fresh specimen) *A. platyrhynchus*
- 4b.** Precaudal diplospondylous vertebrae: 37; D2 insertion just in front of anal-fin insertion; no denticles in the mouth; left and right lobes of liver subequal; blackish brown colouration; white iris (fresh specimen) *A. nakayai*

Comparative material

(* = specimens which DNA barcode were used to compute interspecific genetic distances).

Apristurus exsanguis Sato, Nakaya & Stewart, 1999. - From New Zealand, 3 specimens: MNHN 2003-0550*, mature female 610 mm TL; MNHN 2003-0551*, mature male 840 mm TL; MNHN 2003-0552 immature female 360 mm TL.

Apristurus melanoasper Iglésias, Nakaya & Stehmann, 2004. - From New Caledonia, 4 specimens: MNHN 2003-1979*, immature male, 287 mm TL, stn 016; MNHN 2003-1980*, immature male, 373 mm TL, stn 026; MNHN 2003-1981*, mature male, 641 mm TL, stn 030; MNHN 2003-1982*, maturing male, 548 mm TL, stn 030.

Apristurus platyrhynchus (Tanaka, 1909). - From New Caledonia, 14 specimens: MNHN 2003-1965*, mature male, 742 mm TL, stn 009; MNHN 2003-1966, mature male, 694 mm TL, stn 017; MNHN 2003-1967*, mature male, 758 mm TL, stn 020; MNHN 2003-1968, immature female, 490 mm TL, stn 025; MNHN 2003-1969, immature female, 464 mm TL, stn 025; MNHN 2003-1970, immature female, 333 mm TL, stn 025; MNHN 2003-1971, immature male, 341 mm TL, stn 028; MNHN 2003-1972*, mature male, 740 mm TL, stn 029; MNHN 2003-1973, immature male, 485 mm TL, stn 029; MNHN 2003-1974, immature female, 516 mm TL, stn 029; MNHN 2003-1975, immature female, 528 mm TL, stn 030; MNHN 2003-1976*, immature female, 549 mm TL, stn 031; MNHN 2003-1977, mature male, 685 mm TL, stn 031; MNHN 2003-1978, immature female, 551 mm TL, stn 031.

Apristurus cf. *sinensis* Chu & Hu, 1981. - From New Caledonia, 27 specimens: MNHN 2003-1940*, immature female, 488 mm TL, stn 008; MNHN 2003-1941*, mature male, 561 mm TL, stn 008; MNHN 2003-1942*, maturing male, 565 mm TL, stn 008; MNHN 2003-1943*, immature male, 464 mm TL, stn 008; MNHN 2003-1944*, immature female, 431 mm TL, stn 010; MNHN 2003-1945*, immature male, 450 mm TL, stn 010; MNHN 2003-1946*, maturing male, 541 mm TL, stn 008; MNHN 2003-1947*, mature male, 542 mm TL, stn 008; MNHN 2003-1948, mature female, 608 mm TL, stn 025; MNHN 2003-1949, maturing male, 510 mm TL, stn 026; MNHN 2003-1950, mature female, 610 mm TL, stn 028; MNHN 2003-1951, mature male, 557 mm TL, stn 029; MNHN 2003-1952, immature male, 572 mm TL, stn 030; MNHN 2003-1953, mature male, 610 mm TL, stn 030; MNHN 2003-1954, mature male, 607 mm TL, stn 030; MNHN 2003-1955, immature female, 524 mm TL, stn 030; MNHN 2003-1956, mature male, 587 mm TL, stn 030; MNHN 2003-1957, mature male, 567 mm TL, stn 031; MNHN 2003-1958, immature female, 535 mm TL, stn 031; MNHN 2003-1959, immature male, 521 mm TL, stn 031; MNHN 2003-1960, immature male, 546 mm TL, stn 031; MNHN 2003-1961, immature female, 468 mm TL, stn 029; MNHN 2003-1962, maturing female, 517 mm TL, stn 031; MNHN 2003-1963, immature female, 519 mm TL, stn 032; MNHN 2003-1964*, mature female with 2 egg cases, 629 mm TL, stn 033; MNHN 2005-2770*, mature female with 2 egg cases, 613 mm TL, stn 047; MNHN 2005-2769*, immature female, 349 mm TL, stn 072. From

New Zealand, 2 specimens: MNHN 2003-0553*, mature male, 760 mm TL; MNHN 2003-0554*, mature female, 730 mm TL.

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