Regular paper

Review of *Giuris* (Teleostei: Eleotridae) from Indo-Pacific islands, with description of three new species

by

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Abstract. – *Giuris* species from the Indo-Pacific area are reviewed. Eight species are recognized including three new species. These are described using genetic and morphomeristic approaches. The species differ by a high percentage of divergence in partial *COI* gene (495 bp) and by several characters including the number of pectoral fin rays, the number of scales in transverse forward series, the number of scales around the eye, the interorbital length, and the body depth at first dorsal fin and at anus.

Résumé. – Révision du genre *Giuris* (Teleostei : Eleotridae) de la région Indo-Pacifique, avec description de trois espèces nouvelles.

Des collections de spécimens de *Giuris* provenant de la région Indo-Pacifique ont été étudiées. Huit espèces ont été répertoriées dont trois nouvelles. Celles-ci sont décrites en utilisant des approches génétiques et morphoméristiques. Elles diffèrent par un fort pourcentage de divergence au niveau du gène *COI* partiel (495 pb) et par plusieurs caractères incluant, principalement, le nombre de rayons aux nageoires pectorales, le nombre d'écailles en série transverse antérieure et le nombre d'écailles autour de l'œil, la largeur interorbitaire, la hauteur du corps à la première nageoire dorsale et la hauteur du corps à l'anus.

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Giuris Sauvage, 1880 species are colourful freshwater eleotrids found in insular habitats of the tropical Indian and Pacific oceans. They generally inhabit coastal streams from estuaries to lower parts of rivers, or in lakes, usually in bank vegetation and in shelters over rocky or gravel bottoms. Many species have been described between 1937 and 1938. Recently, Keith *et al*. (2020) in their paper about Indonesian *Giuris*, revalidated *G. tolsoni* (Bleeker, 1854) and described a new species from the Pacific, bringing the number of valid species to three (*Giuris margaritaceus* Valenciennes *in* Cuvier & Valenciennes, 1837; *Giuris tolsoni* (Bleeker, 1854) and *Giuris viator* Keith, Mennesson, Lord & Hubert, 2020). Nevertheless, the genus has never been reviewed on its entire distribution area.

Many surveys of tropical island rivers organised by the MNHN have been carried out in the Indian, Central and West Pacific Ocean during the last 20 years and many *Giuris* specimens have been collected, particularly in the Comoros, Solomon Islands, West New Britain (Papua New Guinea), Vanuatu and New Caledonia.

The purpose of this paper is to review *Giuris* species from these areas using, when possible, genetic and morphometric approaches.

METHODS

Sample collection

The fish used for the study were collected from Indian and Pacific island freshwater streams or studied from various museum collections (see further). Collected specimens were sampled using a DEKA 3000 electrofishing system (Gerätebau, Marsberg, Germany). Following the annex IV of the directive 2010/63/EU, fish were either euthanised using an overdose of clove oil (10%), or a piece of fin was taken while the fish was anaesthetised. In the case of anaesthetization, the fish was then awakened in clear water before it was released. Entire fish or fin clips were stored and preserved

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in 95% ethanol for molecular analysis. Seventy-two *Giuris* specimens were studied. Species, specimens and localities sampled are listed in table I.

Material examined

Specimens were compared to type specimens from Museum collections (MNHN: Muséum national d'Histoire naturelle, Paris; RMNH: Rijksmuseum van Natuurlijke Historie, Leiden; ANSP: The Academy of Natural Sciences of Drexel University, formerly the Academy of Natural Sciences of Philadelphia; AMS: Australian Museum of Sydney). These are:

Giuris margaritaceus (Valenciennes, 1837). Holotype: MNHN A-1575. Vanikoro Island, Santa Cruz Islands, southwestern Pacific. [synonyms: *Eleotris aporos*, Bleeker 1854; Syntypes: (4) RMNH 5178 (2 of 6); Sindangole; Halmahera (not Ternate), Moluccas, Indonesia. *Eleotris hoedtii* Bleeker, 1854; Holotype: RMNH 5180 (largest of 17); Ambon Island, Moluccas, Indonesia. *Ophiocara aporos guentheri*, Koumans, 1937; Holotype: RMNH 11422; Palau Islands, western Pacific. *Eleotris (Giuris) vanicolensis* Sauvage, 1880; Holotype: MNHN A-1675; Vanikoro Island, Santa Cruz Islands, southwestern Pacific].

Eleotris aporocephalus Macleay, 1884. Syntype: AMS A.17837 Lillesmere Lagoon, Burdekin River, Queensland, Australia.

Table I. – Species, specimens and localities sampled.

MNHN numbers	Tag numbers	Species	Archipelagoes	Islands	Rivers	Date	Collectors	COI
2019-0237	6932	*Giuris viator*	Solomon	Kolobangara	Vanga	18/11/15	Keith *et al*.	
2016-0229	4	*Giuris viator*	Solomon	Kolobangara	Zamba	9/11/15	Keith *et al*.	
2016-0229	5	*Giuris viator*	Solomon	Kolobangara	Zamba	9/11/15	Keith *et al*.	
2016-0229	6	*Giuris viator*	Solomon	Kolobangara	Zamba	9/11/15	Keith *et al*.	x
2019-0238	6844	*Giuris viator*	New Caledonia	Grande Terre	Fausse Yaté	29/11/18	Charpin	x
2019-0247	12599	*Giuris viator*	New Caledonia	Grande Terre	Kû Bwéné	8/7/19	Charpin	
2007-0107	12677	*Giuris viator*	Vanuatu	Santo	Mamasa	8/11/06	Keith *et al*.	x
2007-0093	12678	*Giuris viator*	Vanuatu	Santo	Péavot	22/11/06	Keith *et al*.	x
2015-0363	12661	*Giuris yahayai* n. sp.	Madagascar		Anpatrana	9/5/10	Diamsoi	
1966-0951	1	*Giuris yahayai* n. sp.	Madagascar		Mararano, Majunga	14/3/61	Kiener & Therezien	
1966-0951	2	*Giuris yahayai* n. sp.	Madagascar		Mararano, Majunga	14/3/61	Kiener & Therezien	
2015-0360	–	*Giuris yahayai* n. sp.	Madagascar		Mahanara	6/7/08	Diamsoi	
2015-0361	–	*Giuris yahayai* n. sp.	Madagascar		Sahana	7/7/08	Diamsoi	
1902-0269	–	*Giuris yahayai* n. sp.	Madagascar			16/3/05	Grandidier	
2006-0602	–	*Giuris yahayai* n. sp.	Comoros	Mohéli	Mjawatché	31/10/05	Keith *et al*.	
2018-0715	12190	*Giuris yahayai* n. sp.	Mayotte		Gouloué	13/11/03	Arda	
2018-0716	6801	*Giuris yahayai* n. sp.	Mayotte		Gouloué	13/11/03	Arda	
2018-0716	12191	*Giuris yahayai* n. sp.	Mayotte		Gouloué	13/11/03	Arda	
2018-0716	12192	*Giuris yahayai* n. sp.	Mayotte		Gouloué	13/11/03	Arda	
2020-0156	14544	*Giuris yahayai* n. sp.	Mayotte		Gouloué	13/11/03	Arda	x
2020-0156	14545	*Giuris yahayai* n. sp.	Mayotte		Gouloué	13/11/03	Arda	x
2020-0156	14546	*Giuris yahayai* n. sp.	Mayotte		Gouloué	13/11/03	Arda	x
2015-0362	–	*Giuris yahayai* n. sp.	Mayotte		Mtsangacheli	12/11/03	Arda	
	JN021219	*Giuris tolsoni*	Philippines	Panay	Hamtic River	12/10/10	J. Quilang, J. Tango	x
	JN021218	*Giuris tolsoni*	Philippines	Panay	Hamtic River	12/10/10	J. Quilang, J. Tango	x
2015-0316	–	*Giuris tolsoni*	Philippines	Panay	Alegre	5/2/15	Gaulke	
2015-0323	–	*Giuris tolsoni*	Philippines	Panay	Alegre	5/2/15	Gaulke	
	KU944837	*Giuris tolsoni*		Taiwan	Toucheng	19/12/12	Ta-Ching Chang	x
2015-0358	1	*Giuris margaritaceus*	Solomon	Choiseul	Pisuku	10/10/14	Keith *et al*.	x
2015-0358	2	*Giuris margaritaceus*	Solomon	Choiseul	Pisuku	10/10/14	Keith *et al*.	
2015-0358	3	*Giuris margaritaceus*	Solomon	Choiseul	Pisuku	10/10/14	Keith *et al*.	
2015-0358	4	*Giuris margaritaceus*	Solomon	Choiseul	Pisuku	10/10/14	Keith *et al*.	
2015-0359	1	*Giuris margaritaceus*	Solomon	Choiseul	Lokasereke	13/10/14	Keith *et al*.	x
2015-0359	2	*Giuris margaritaceus*	Solomon	Choiseul	Lokasereke	13/10/14	Keith *et al*.	
2016-0224	–	*Giuris margaritaceus*	Solomon	Kolobangara	Liva	11/11/15	Keith *et al*.	
2016-0229	1	*Giuris margaritaceus*	Solomon	Kolobangara	Zamba	9/11/15	Keith *et al*.	

Ophiocara aporos rigonis Whitley, 1938. Holotype: AMS IA.5785. Paratypes: AMS IA.5787 (1), IA.5789 (1). Freshwater creek near Rigo, Papua New Guinea.

Eleotris (Giuris) laglaizei Sauvage, 1880. Holotype: MNHN A-1690. Manila, Philippines.

Giuris tolsoni (Bleeker, 1854). Holotype: RMNH 5180 (1 of 17). Near Djunkulon, extreme western Java, Indonesia.

Giuris viator Keith, Mennesson, Lord & Hubert, 2020. *Holotype*. – MNHN 2019-0238, male (122 mm SL), Fausse Yaté, 29 Nov. 2018, New Caledonia, Charpin coll.; tag 6844. *Paratypes*. – MNHN 2007-0093, female (64.5 mm SL), Peavot, Santo Is., Vanuatu, 22 Nov. 2006, Keith, Lord, Kalfatak, Gerbeaux *et al*. coll.; tag 12678. – MNHN 2007-0107, male (35.5 mm SL), Santo Is., Vanuatu, 8 Nov. 2006, Keith, Lord, Kalfatak, Gerbeaux *et al*. coll. – MNHN 2019-0237, male (72.3 mm SL), Kolobangara Is., Solomon Islands, 18 Nov 2015, Keith, Lord, Boseto, Marquet *et al*. coll.; tag 06932. – MNHN 2019-0247, female (128.6 mm SL), Kû Bwéné, New Caledonia, 8 Jul. 2019, Charpin coll.; tag 12599.

Other. – *Giuris tolsoni*: MNHN 2015-0316, Philippines, Panay, Alegre, 5 Feb. 2015. MNHN 2015-0323, Philippines, Panay, Alegre, 5 Feb. 2015. – *Giuris margaritaceus*: MNHN 2015-0358, 4 specimens, Solomon Islands, Choiseul Is., Pisuku, 10 Oct. 2014, Keith, Ebner, Marquet, Boseto *et al*. coll. MNHN 2015-0359, 2 spms, Solomon Islands, Choiseul Is., Lokasereke, 13 Oct. 2014, Keith, Ebner, Marquet, Boseto *et al*. coll. MNHN 2016-0224, Solomon Islands, Koloban-

Table I. – Continued.

MNHN numbers	Tag numbers	Species	Archipelagoes	Islands	Rivers	Date	Collectors	COI
2019-0249	17687	*Giuris margaritaceus*	PNG	New Britain	Ore	25/10/18	Keith *et al*.	x
2019-0249	17688	*Giuris margaritaceus*	PNG	New Britain	Ore	25/10/18	Keith *et al*.	
2019-0239	17779	*Giuris margaritaceus*	PNG	New Britain	Water Lily Hole	23/10/18	Keith *et al*.	x
2019-0246	6846	*Giuris charpini* n. sp.	New Caledonia	Grande Terre	Fausse Yaté	29/11/18	Charpin	x
2019-0246	6847	*Giuris charpini* n. sp.	New Caledonia	Grande Terre	Fausse Yaté	29/11/18	Charpin	
2019-0248	12596	*Giuris charpini* n. sp.	New Caledonia	Grande Terre	Kû Bwéné	8/7/19	Charpin	
2019-0248	12597	*Giuris charpini* n. sp.	New Caledonia	Grande Terre	Kû Bwéné	8/7/19	Charpin	x
2019-0248	12598	*Giuris charpini* n. sp.	New Caledonia	Grande Terre	Kû Bwéné	8/7/19	Charpin	
2019-0250	12600	*Giuris charpini* n. sp.	New Caledonia	Grande Terre	Kû Bwéné	8/7/19	Charpin	
2005-1893	–	*Giuris charpini* n. sp.	Vanuatu	Gaua	Kirilou	18/7/05	Keith *et al*.	x
2011-0125	Ophirouge	*Giuris charpini* n. sp.	Vanuatu	Santo	Jordan	16/7/05	Keith *et al*.	x
2019-0252	002-2016	*Giuris aporocephalus*	PNG	New Britain	Lilimo Lake	2015	Pita Amick	
2019-0252	003-2016	*Giuris aporocephalus*	PNG	New Britain	Lilimo Lake	2015	Pita Amick	
2019-0252	004-2016	*Giuris aporocephalus*	PNG	New Britain	Lilimo Lake	2015	Pita Amick	
2019-0252	005-2016	*Giuris aporocephalus*	PNG	New Britain	Lilimo Lake	2015	Pita Amick	
2019-0245	6826	*Giuris aporocephalus*	PNG	New Britain	Nut Village water Lily hole	23/10/18	Keith *et al*.	x
2019-0245	6828	*Giuris aporocephalus*	PNG	New Britain	Nut Village water Lily hole	23/10/18	Keith *et al*.	x
2019-0245	6829	*Giuris aporocephalus*	PNG	New Britain	Nut Village water Lily hole	23/10/18	Keith *et al*.	
2019-0245	6830	*Giuris aporocephalus*	PNG	New Britain	Nut Village water Lily hole	23/10/18	Keith *et al*.	
2019-0242	17730	*Giuris aporocephalus*	PNG	New Britain	Nut Village water Lily hole	23/10/18	Keith *et al*.	
2019-0243	17731	*Giuris aporocephalus*	PNG	New Britain	Nut Village water Lily hole	23/10/18	Keith *et al*.	
2019-0243	17732	*Giuris aporocephalus*	PNG	New Britain	Nut Village water Lily hole	23/10/18	Keith *et al*.	x
2019-0243	17733	*Giuris aporocephalus*	PNG	New Britain	Nut Village water Lily hole	23/10/18	Keith *et al*.	x
2019-0243	17734	*Giuris aporocephalus*	PNG	New Britain	Nut Village water Lily hole	23/10/18	Keith *et al*.	
2019-0240	6827	*Giuris caussei* n. sp.	PNG	New Britain	Nut Village water Lily hole	23/10/18	Keith *et al*.	
2019-0241	17737	*Giuris caussei* n. sp.	PNG	New Britain	Nut Village water Lily hole	23/10/18	Keith *et al*.	
2018-0719	P-ALE-1	*Giuris laglaizei*	Philippines	Panay	Alegre	2016	–	
2019-0111	14580	*Giuris laglaizei*	Philippines	Luzon	Lac Taal	2019	Gaulke	x
2019-0111	14581	*Giuris laglaizei*	Philippines	Luzon	Lac Taal	2019	Gaulke	
2019-0111	14582	*Giuris laglaizei*	Philippines	Luzon	Lac Taal	2019	Gaulke	
2019-0111	14583	*Giuris laglaizei*	Philippines	Luzon	Lac Taal	2019	Gaulke	x
2020-0147	14592	*Giuris laglaizei*	Philippines	Mindanao	Lac Mainit	2019	Gaulke	x
2020-0147	14593	*Giuris laglaizei*	Philippines	Mindanao	Lac Mainit	2019	Gaulke	
2020-0147	14594	*Giuris laglaizei*	Philippines	Mindanao	Lac Mainit	2019	Gaulke	x
2020-0147	14595	*Giuris laglaizei*	Philippines	Mindanao	Lac Mainit	2019	Gaulke	
2020-0147	14596	*Giuris laglaizei*	Philippines	Mindanao	Lac Mainit	2019	Gaulke	

gara Is., Liva, 11 Nov. 2015 Keith, Lord, Boseto *et al*. coll. MNHN 2016-0229, 1 spm (of 4), Solomon Islands, Kolobangara Is., Zamba, 9 Nov. 2015, Keith, Lord, Marquet, Boseto *et al*. coll. MNHN 2019-0249, 2 spms, Papua New Guinea, New Britain, Ore, 25 Nov. 18, Keith, Lord, Causse, Amick *et al*. coll. MNHN 2019-0239, Papua New Guinea, New Britain, Water Lily Hole, 23 Nov. 18, Keith, Lord, Causse, Amick *et al*. coll. – *Giuris viator*: MNHN 2016-0229, 3 (of 4) spms, Solomon Islands, Kolobangara Is., Zamba, 9 Nov. 2015, Keith, Lord, Marquet, Boseto *et al*. coll.

Morphomeristics

All counts and measurements were taken from the left side. Measurements were taken with dial callipers and are expressed to the nearest tenth of a millimetre.

The size is given in standard length (SL). Abbreviation are as follow: P, Pectoral rays; D, Dorsal rays (D1, first dorsal fin; D2, second dorsal fin); A, Anal rays; D1D2, Distance between the posterior part of the base of D1 and the anterior part of the base of D2 (% SL); PDL, Predorsal length (% SL); PAL, Preanal length (% SL); HL, Head length (% SL); JL, Jaw length (% SL); CPL, Caudal peduncle length (% SL); CPM, Caudal peduncle height (% SL), Pect-L, Pectoral fin length (% SL); BDa, Body depth at anus (% SL); BDD1, Body depth at first dorsal fin (% SL); SDFL, Second dorsal fin length (% SL); AFL, Anal fin length (% SL); CFL, Caudal fin length (% SL); O, Eye diameter (% SL); IO, Interorbital length (% SL); SL, Standard length (SL) (mm).

For scales, abbreviations are as follow: LS, scales in lateral series counted from upper pectora1 base, or anteriormost scale along lateral midline, to central hypural base; PD, predorsal midline counted from scale directly anterior to first dorsal fin insertion to the anteriormost scale; TRB, transverse series back, refers to scales counted from the first scale anterior to second dorsal fin, in a diagonal manner, posteriorly and ventrally to the anal fin base or ventralmost scale; TRF, transverse series forward refers to scales counted from the first scale anterior to second dorsal fin, in a diagonal manner, anteriorly and ventrally to the centre of belly or ventralmost scale; ZZ, zigzag series, refers to scales on the narrowest region of the caudal peduncle counted from the dorsalmost scale to the ventralmost scale in a zigzag (alternating) manner; ENO, number of scales around the eye, counted between the nostrils and the inferior posterior margin of the eye.

Abbreviations for the cephalic sensory pore system follow Akihito (1986).

DNA extraction and amplification of partial cytochrome oxydase I gene (COI)

Total DNA was extracted using Macherey & Nagel NucleoSpin® Tissue kits following the manufacturer's instructions on an Eppendorf EpMotion 5075.

The DNA of a selection of 26 specimens out of the 72 specimens collected and measured in the Indo-Pacific island rivers (Tab. I), and from one specimen used as outgroup (*Hypseleotris compressa*), was amplified for the barcoding fragment of the *COI* gene (495 bp).

The 495 bp long *COI* fragment was amplified with the specific fish primers TelF1 and TelR1 (Dettaï *et al*., 2011). DNA amplification was performed by PCR in a final 20 µL volume containing 5% DMSO, 1 µL of BSA, 0.8 µL of dNTP 6.6 µM, 0.15 µL of Qiagen Taq DNA polymerase, using 2 µL of the buffer provided by the manufacturer, and 0.4 µL of each of the two primers at 10 pM; 1.2 µl of DNA extract was added. After denaturation for 2 min at 94°C, the PCR was run for 55 cycles of (25 s, 94°C; 25 s, 52°C; 55 s, 72°C) on a Bio-Rad C1000 Touch Thermal Cycler. Successful PCRs were selected on ethidium-bromide stained agarose gels. Sanger sequencing was performed in both directions by a commercial company (Eurofins; http://www.eurofins.fr) using the same primers.

The DNA of *G. laglaizei* (Holotype, MNHN A-1690) was amplified with a QIAmp DNA Mini Kit. The DNA was sequenced using shotgun-sequencing libraries with a NEBNext® Ultra™ II DNA Library Prep Kit for Illumina®. Shotgun libraries were then sequenced on an Illumina HiSeq sequencers following manufacturer instructions.

COI gene analysis

Data processing and sequence assembly were done in Geneious 11.1.2 (http://www.geneious.com, Kearse *et al*., 2012). *COI* sequences were aligned with Muscle Alignment. A map to reference was used to find the 495 bp (amplified in Sanger) in the shotgun libraries; the consensus was checked manually (assembly success, coverage assessment, comparison to available *COI* sequences for the same specimen, BLAST searches; Altschul *et al*., 1997) in Geneious.

A phylogenetic tree was performed on the 495 bp alignment using Bayesian inference (MrBayes v.3.2; Ronquist *et al*., 2012). Three models, corresponding to the three-codon positions, computed in PartitionFinder (Lanfear *et al*., 2012) (1st position, HKY + I model; 2nd position, K80 + I model; 3rd position, F81 model) were run for 10 million generations, sampling every 200 generations with two independent runs to access convergence. Run convergence was checked using TRACER v.1.6.0 (Rambaut and Drummond, 2007). Trees were summarised using the 50% majority rule method after discarding the first 25% of the sample as burnin and visualised using FigTree v.1.4.2 (Rambaut, 2007). The sequence of another genera of Eleotridae, *Hypseleotris compressa* was included as outgroup and three sequences of *Giuris* from Genbank (JN021218, JN021219 and JN021218) were added (Tab. I). The percentage of divergence between sequences was calculated with Geneious 11.1.2 software.

Table II. – Pairwise distance matrix (percentage of divergence between *Giuris* paired individuals) based on the 495 bp of the *cytochrome c oxidase subunit* (*COI*).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1 *Giuris viator* MNHN-IC-2016-229.6 Solomon																															
2 *Giuris viator* 6844 New Caledonia	0.2																														
3 *Giuris viator* MNHN-IC-12677 Vanuatu	0.4	0.6																													
4 *Giuris viator* 12678 Vanuatu	0.4	0.6	0																												
5 *Giuris yahayai* 14544 Mayotte	9.5	9.7	9.7	9.7																											
6 *Giuris yahayai* n. sp. 14545 Mayotte	9.7	9.9	9.9	9.9	0.2																										
7 *Giuris yahayai* n. sp. 14546 Mayotte	9.5	9.7	9.7	9.7	0	0.2																									
8 *Giuris tolsoni* JN021218 Philippines	11.7	11.5	11.7	11.7	11.7	11.9	11.7																								
9 *Giuris tolsoni* JN021219 Philippines	11.7	11.5	11.7	11.7	11.7	11.9	11.7	0.8																							
10 *Giuris tolsoni* KU944837 Taiwan	11.7	11.5	11.9	11.9	11.7	11.9	11.7	0.8	0.8																						
11 *Giuris margaritaceus* 2015-0359.1	11.9	11.7	12.3	12.3	12.3	12.5	12.3	5.5	5.9	5.1																					
12 *Giuris margaritaceus* 2015-0358.1	11.9	11.7	12.3	12.3	12.3	12.5	12.3	5.5	5.9	5.1	0.2																				
13 *Giuris margaritaceus* 17779 Papua New Guinea	11.9	11.7	12.3	12.3	12.3	12.5	12.3	5.5	5.9	5.1	0.6	0.4																			
14 *Giuris margaritaceus* 17687 Papua New Guinea	11.7	11.5	12.1	12.1	12.1	12.3	12.1	5.3	5.7	4.8	0.4	0.2	0.2																		
15 *Giuris charpini* n. sp. 12597 New Caledonia	11.7	11.5	11.9	11.9	12.9	13.1	12.9	5.7	6.1	5.7	3	3.2	3.2	3																	
16 *Giuris charpini* n. sp. Ophirouge Vanuatu	11.7	11.5	11.9	11.9	12.9	13.1	12.9	5.7	6.1	5.7	3	3.2	3.2	3	0																
17 *Giuris charpini* n. sp. 2005-1893 Vanuatu	11.7	11.5	11.9	11.9	12.9	13.1	12.9	5.7	6.1	5.7	3	3.2	3.2	3	0	0															
18 *Giuris charpini* n. sp. 6847 New Caledonia	11.7	11.5	11.9	11.9	12.9	13.1	12.9	5.7	6.1	5.7	3	3.2	3.2	3	0	0	0														
19 *Giuris charpini* n. sp. 6846 New Caledonia	11.9	11.7	11.9	11.9	12.7	12.9	12.7	5.7	6.1	6.1	3.4	3.6	3.6	3.4	0.4	0.4	0.4	0.4													
20 *Giuris aporocephalus* 6826 Papua New Guinea	5.7	5.9	5.7	5.7	8.3	8.5	8.3	10.1	10.9	10.5	11.3	11.3	11.3	11.1	11.3	11.3	11.3	11.3	11.5												
21 *Giuris aporocephalus* 6828 Papua New Guinea	5.7	5.9	5.7	5.7	8.3	8.5	8.3	10.1	10.9	10.5	11.3	11.3	11.3	11.1	11.3	11.3	11.3	11.3	11.5	0											
22 *Giuris aporocephalus* 17732 Papua New Guinea	5.7	5.9	5.7	5.7	8.3	8.5	8.3	10.1	10.9	10.5	11.3	11.3	11.3	11.1	11.3	11.3	11.3	11.3	11.5	0	0										
23 *Giuris aporocephalus* 17733 Papua New Guinea	5.7	5.9	5.7	5.7	8.3	8.5	8.3	10.1	10.9	10.5	11.3	11.3	11.3	11.1	11.3	11.3	11.3	11.3	11.5	0	0	0									
24 *Giuris caussei* n. sp. 6827 Papua New Guinea	5.7	5.9	5.7	5.7	7.9	8.1	7.9	10.3	10.3	9.9	10.3	10.3	10.3	10.1	10.3	10.3	10.3	10.3	10.5	2.4	2.4	2.4	2.4								
25 *Giuris caussei* n. sp. 17737 Papua New Guinea	5.5	5.7	5.5	5.5	7.7	7.9	7.7	10.1	10.1	9.7	10.5	10.5	10.5	10.3	10.5	10.5	10.5	10.5	10.7	2.6	2.6	2.6	2.6	0.2							
26 *Giuris laglaizei* 14592 Philippines Mainit Lake	7.1	7.3	7.1	7.1	9.3	9.5	9.3	10.5	11.3	10.9	11.1	11.1	11.1	10.9	11.1	11.1	11.1	11.1	11.3	3	3	3	3	3.4	3.6						
27 *Giuris laglaizei* 14594 Philippines Mainit Lake	7.1	7.3	7.1	7.1	9.3	9.5	9.3	10.5	11.3	10.9	11.1	11.1	11.1	10.9	11.1	11.1	11.1	11.1	11.3	3	3	3	3	3.4	3.6	0					
28 *Giuris laglaizei* 14580 Philippines Taal Lake	6.5	6.7	6.5	6.5	8.7	8.9	8.7	10.7	11.5	11.1	11.1	11.1	11.1	10.9	11.5	11.5	11.5	11.5	11.7	2.8	2.8	2.8	2.8	3.6	3.8	1.4	1.4				
29 *Giuris laglaizei* 14583 Philippines Taal Lake	6.5	6.7	6.5	6.5	8.7	8.9	8.7	10.7	11.5	11.1	11.5	11.5	11.5	11.3	11.5	11.5	11.5	11.5	11.7	2.8	2.8	2.8	2.8	3.6	3.8	1.4	1.4	0.4			
30 *Giuris laglaizei* MNHN-A1690 Holotype Philippines	6.3	6.5	6.3	6.3	8.5	8.7	8.5	10.5	11.3	10.9	11.3	11.3	11.3	11.1	11.3	11.3	11.3	11.3	11.5	2.6	2.6	2.6	2.6	3.4	3.6	1.2	1.2	0.2	0.2		
31 *Hypseleotris compressa* 17753 Papua New Guinea	16.2	16.4	16	16	16.6	16.8	16.6	16.6	16.8	16.8	17.8	17.8	17.6	17.6	18.4	18.4	18.4	18.4	18.4	17	17	17	17	17	16.8	16.4	16.4	16	16	15.8	

RESULTS

Morphomeristics

After examination and measurement of type specimens, the morphological and meristic identification of the recent collected specimens showed that 8 species were represented in our samples. Five of them have been already described: *Giuris margaritaceus* (Valenciennes, 1837) widespread in the Indo-Pacific, *G. tolsoni* (Bleeker, 1854) from Philippines, Taiwan and Indonesia, *G. aporocephalus* (Macleay, 1884) from Australia, Papua New Guinea and the Solomon Islands, *G. viator* Keith, Mennesson, Lord & Hubert (2020) widespread in the Pacific, and *G. laglaizei* (Sauvage, 1880) from the Philippines (Figs 7 to 9). Three are new to science: *G. yahayai* (present paper) from Madagascar and Comoros, *G. charpini* (present paper) from New Caledonia and Vanuatu, and *G. caussei* (present paper) from Papua New Guinea (New Britain) (Figs 2 to 6).

DNA Barcode analysis

A total of 495 bp of the *COI* gene from 27 *Giuris* individuals was obtained (Tab. I), and pairwise distances (percentage of divergence) are presented in table II.

The phylogeny presented two branches separated by 11.4% of divergence (d) (Fig. 1). The first one (A) contains 5 clades. Clade I is composed of specimens collected in Philippines and of the holotype *G. laglaizei* also from Philippines (see redescription in the present work). Therefore, specimens of the clade I belong to the species *G. laglaizei*. The species *G. aporocephalus* is illustrated in the clade II_a with specimens located in Papua New Guinea. Two other specimens from Papua New Guinea are found in the clade II_b and belong to a new species, *G. caussei* (see description in the present work). Specimens from Mayotte belong to a new species, *G. yahayai* (see description in the present work). They are

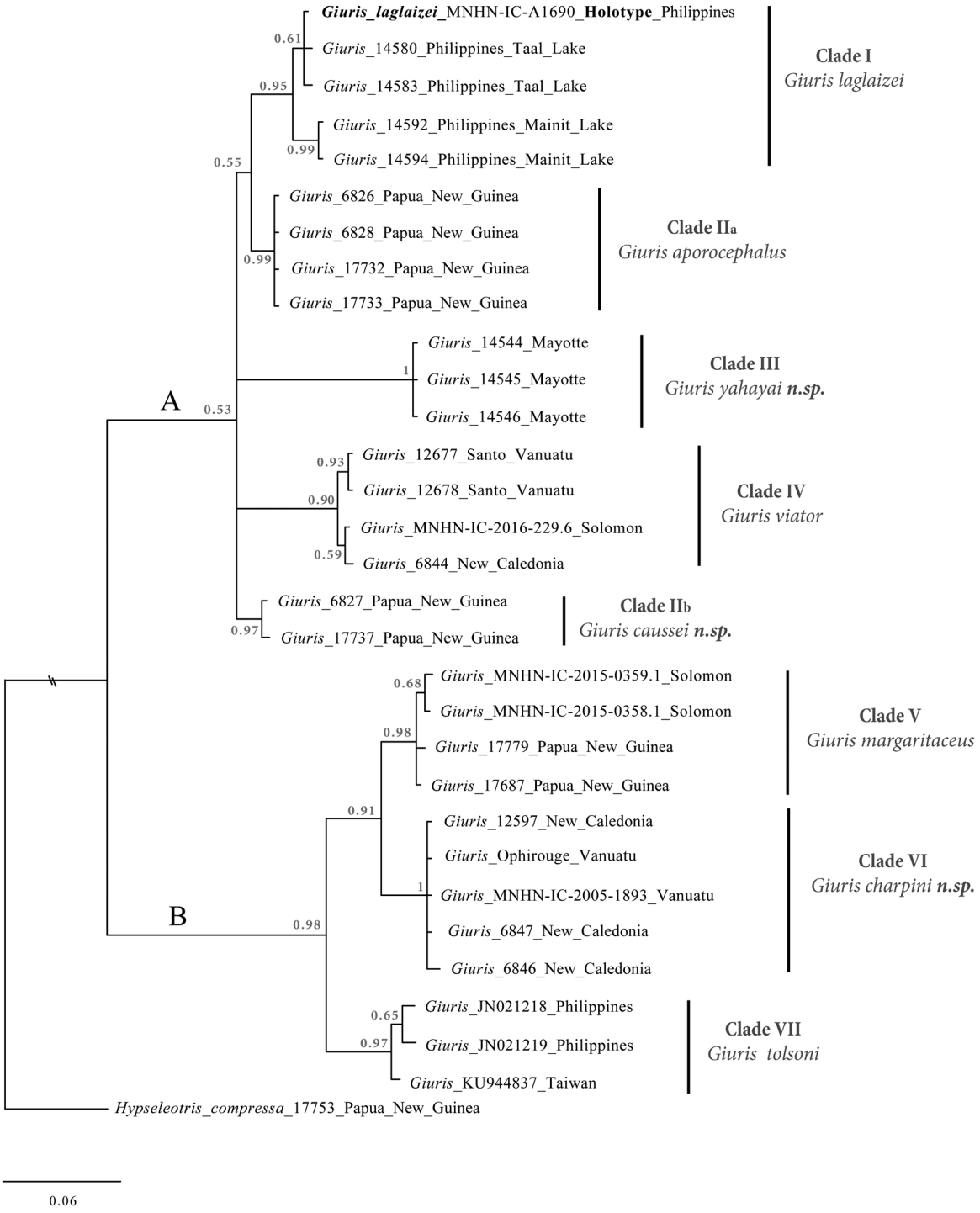

Figure 1. – Bayesian tree of the *cytochrome c oxidase subunit* (*COI* – 495 bp) for sequenced specimens of *Giuris*. Numbers at each node represent posterior probabilities.

observed in clade III only. A high divergence is found between clade III and all the others (7.7 < d < 9.7%). The species *G. viator* is represented in clade IV (with specimens from Vanuatu, the Solomon Islands and New Caledonia) with a high divergence with the other clades (5.6 < d < 12%). The second branch (B) of the tree is composed of 3 clades. The species *G. margaritaceus* found in clade V (with specimens from the Solomon Islands and Papua New Guinea) diverges

from the new species *G. charpini*, clade VI (with specimens from New Caledonia and Vanuatu), with 3.2% (see description in the present work). A divergence of 5.7% is observed between these two clades and *G. tolsoni* from Philippines and Taiwan (Clade VII).

The descriptions of the new species are given thereafter, as is the re-description of *G. laglaizei* and *G. aporocephalus*. A map gives the distribution of all the known species (Fig. 10).

Description of new species

***Giuris yahayai* n. sp. Keith & Mennesson**
(Figs 1-2, 10; Tabs III-IV)

Material examined

Thirteen specimens from Madagascar, Mayotte and Moheli (Comoros), totalling 4 males, 3 juveniles (not measured) and 6 females; size range 38-178 mm SL, largest male 115 mm SL, largest female 178 mm SL.

Holotype. – MNHN 2018-0715, male (115 mm SL), Gouloué, Mayotte Is., Comoros, 13 Nov. 2003, Arda coll.; tag 12190.

Paratypes. – MNHN 2006-0602, 1 male and 1 female (110-130 mm SL), Mjawatché, Mohéli Is., Comoros, 31 Oct. 2005, Keith *et al*. coll. MNHN 1902-0269, 1 female (126 mm SL), Madagascar, Grandidier coll. MNHN 1966-0951, 2 females (161-178 mm SL), Mararano, Marohago, Madagascar, Majunga Prov., Kiener et Therezien coll. MNHN 2015-0362, 1 male (97.5 mm SL), Mtsangacheli, Mayotte Is., Comoros, 12 Nov. 2003, Keith & Arda coll. MNHN 2015-360, 1 juv. (21 mm) Sahana, Madagascar, 7 Jul. 2008, Diamsoi coll. MNHN 2015-0361, 2 juv. (33.3-38 mm) Manahara, Madagascar, 6 Jul. 2008, Diamsoi coll. MNHN 2018-0716, 1 male and 2 females (93.4-113.5 mm SL), Gouloué, Mayotte Is., Comoros, 13 Nov. 2003, Arda coll.; tags 12191, 12192, 06801.

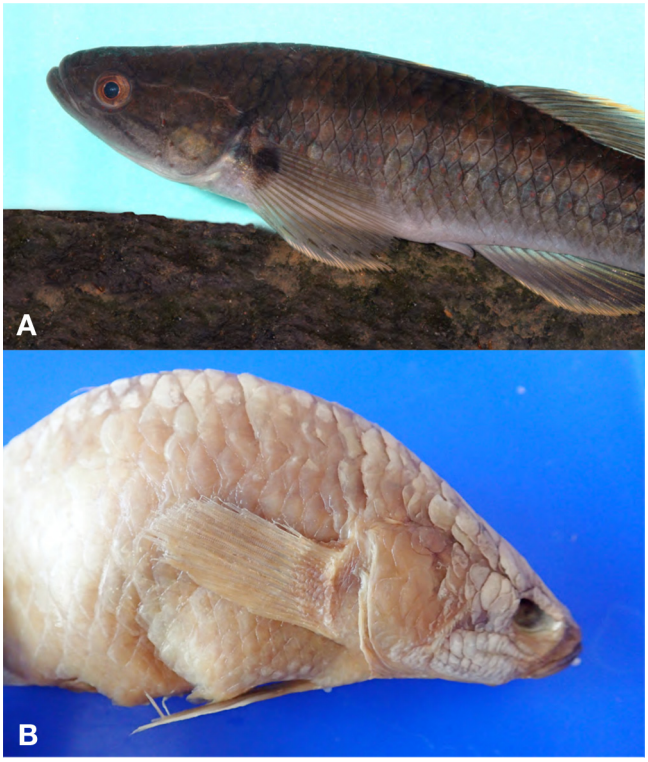

Figure 2. – **A**: *Giuris yahayai* n. sp., male, MNHN 2006-0602, paratype, Mohéli, Comoros; LS 110 mm (Photo P. Keith). **B**: *G. yahayai* n. sp., female, MNHN 1966-0951, paratype, Madagascar (MNHN, Photo P. Keith).

Diagnosis

The new species has 14 pectoral rays, a large body depth at anus (26-36% SL) and at first dorsal fin (26-39% SL), and a great number of scales in transverse forward series (17-20).

Description

The scale and ray counts are given in table III and morphometrics in table IV. Below, the holotype counts are given first, followed in brackets, if different, by the paratypes' counts.

The body is more ovoid than elongated, but the body depth at anus is high 30 (26-36% SL) as at first dorsal fin 34 (26-39% SL), which give a humped look to several specimens, generally the larger ones (Fig. 2B). Caudal peduncle depth 17 (16-20% SL). Predorsal length 46 (44-50% SL) and preanal length 62 (60-68% SL).

The head 32 (31-36% SL) is depressed, the snout is convex. The anterior nostrils are short, not reaching upper margin of upper lip. The mouth and the jaw length (10 (9-12% SL)) are small with inwardly curved teeth set on both jaws and larger on outer row. Posterior end of maxillary extending from to below around anterior margin of eye to 1/3 of the eye. Lips with numerous internal short and generally bifid papillae. Several specimens with numerous external papillae on mentum, snout, inferior lip and between nostrils. Eye small, diameter 5 (4-6% SL) and interorbital length 15 (14-16% SL).

Dorsal fins VI-I,8-9 with no filamentous rays. The first dorsal fin is with second, third and fourth rays longer. Anal fin I,9 directly opposite to the second dorsal fin. The caudal fin is with 15 branched rays and its posterior margin is rounded. Pelvic fins separate, I,5. Pectoral fins 14, with the posterior margin rounded. Lateral scales 29 (29-32), with ctenoid scales on flanks and caudal peduncle. Cycloid scales from snout to top of head and anterior part of D1, on operculum, on base of pectoral fins and on belly extending to anus. Scales of top of head and back bigger than those of belly. Scales in transverse back series 11 (10-12), in transverse forward series 20 (17-20), in predorsal 17 (16-18) and in zigzag

Table III. – Main ray and scale counts in *Giuris*.

	Pectoral rays			Caudal rays			Lateral scales						Predorsal series					
	13	14	15	13	14	15	27	28	29	30	31	32	13	14	15	16	17	18
G. viator		11		3	7			2	3	2	2	1		2	2	6		
G. yahayai n. sp.		10				10			4	4	–	1			1	4	4	1
G. tolsoni		11		5	4	1			5	3	3			1	5	5		
G. margaritaceus		6	6	7	3	1		3	5	3	1				6	3	3	
G. charpini n. sp.	3	5		3	3		2	4	2				2	1	5			
G. aporocephalus		3	15	12	2			7	7	2	1				2	7	6	3
G. caussei n. sp.		1	1	2					2						1	1		
G. laglaisei			7		3	2			2	2	3				1	3	2	

	Transverse backward series					Transverse forward series								
	8	9	10	11	12	11	12	13	14	15	16	17	18	19	20
G. viator			6	3	1				5	5					
G. yahayai n. sp.			2	7	1							6	2	1	1
G. tolsoni			6	5				4	4	2	1				
G. margaritaceus		3	9					6	6						
G. charpini n. sp.		2	5	1				4	4						
G. aporocephalus	2	10	5			4	10	3							
G. caussei n. sp.		2				1	1								
G. laglaisei		2	4	1			1	4	2						

	Zigzag series				ENO									
	7	8	9	10	6	7	8	9	10	11	12	13	14	15
G. viator			5	5					3	4	1	2		
G. yahayai n. sp.	1	7	2							2	3	1	3	1
G. tolsoni		1	9	1	2	4	4	1						
G. margaritaceus			10	2			3	3	4	2				
G. charpini n. sp.		2	6				2	3	3					
G. aporocephalus		11	5	2				3	5	4	1	2	1	
G. caussei n. sp.			2							1	1			
G. laglaisei		5	2		1	3	3							

8 (8-9). 11(11-15) scales around the eye (ENO). 25 vertebrae.

Absence of oculoscapular canal and supratemporals and presence of a short preopercular canal with the pores N' and O'.

Cephalic sensory papillae system developed as described by Akihito *et al*. (1988).

Males with a rounded/triangular urogenital papilla with distal tip rounded. The females have bulbous urogenital papilla with fimbriate projections around distal opening.

Colour in preservation

Male and female slightly similar. Background of body dark brown on the back to clear brown on the flanks. Top and middle of head brownish, inferior part greyish with 3 slim brown stripes radiating from the eye to the cheeks and operculum. Several small brown spots in two or three rows along the longitudinal scales, from pectoral base to hypural base. Belly whitish. The dorsal fins are brown with a white distal stripe. Pectoral, pelvic, caudal and anal fins greyish. Several old specimens entirely whitish (Fig. 2B).

Colour in life

Males. – (Fig. 2A) Male with background of body dark brown on the back to clear brown or greyish on the flanks. Top and middle of head brownish, inferior part greyish with 3 thin dark red stripes radiating from the eye to the cheeks and operculum, the highest one continuing on the pectoral base. Several small red spots in two or three rows along the longitudinal scales, from pectoral base to hypural base and mixing with slight blue or green pattern. Belly whitish. The dorsal fins are brown with a yellow distal stripe. Pectoral fins

Table IV. – Main morphometrics in *Giuris* expressed to the nearest whole percent of standard length.

	Eye Diameter						Interorbital length								Jaw length					
	4	5	6	7	8	9	9	10	11	12	13	14	15	16	8	9	10	11	12	13
G. viator			3	4	3			1	3	2	3	1					6	3	1	
G. yahayai n. sp.	1	7	2									6	2	2		3	1	4	2	
G. tolsoni			3	8			1	3	5	2						2	2	4	3	
G. margaritaceus			7	4	1					5	5	2					8	4		
G. charpini n. sp.		2	4	2						2	4	2					7	1		
G. aporocephalus		4	5	3						2	4	4	2	1		5	7	2		
G. caussei n. sp.	1	–	1								1	–	1				2			
G. laglaisei		6	1					1	4	2					1	1	3	1		

	Caudal peduncle depth								Preanal length											
	13	14	15	16	17	18	19	20	59	60	61	62	63	64	65	66	67	68	69	70
G. viator		3	7						1	–	2	–	2	3	1	1				
G. yahayai n. sp.				3	1	3	1	2		1	–	2	–	4	–	2	–	1		
G. tolsoni	4	5	2						1	2	–		1	2	2	–	2	1		
G. margaritaceus	1	5	5	1					1	1	4	1	2	–	2	1				
G. charpini n. sp.	1	1	4	2					1	–	1	–	1	3	2					
G. aporocephalus	1	6	5	1								1	1	3	5	3	1			
G. caussei n. sp.		1	–	1									1	1						
G. laglaisei		1	2	3	1									1	2	2	–	1	–	1

	Body depth at first dorsal fin origin																				
	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
G. viator		3	2	–	2	3															
G. yahayai n. sp.								1	–	1	1	2	1	–	1	1	–	1	–	–	1
G. tolsoni		6	–	2	1	2															
G. margaritaceus		1	2	3	4	–	2														
G. charpini n. sp.	1	–	–	4	2	–	1														
G. aporocephalus		1	1	4	3	3	2														
G. caussei n. sp.				1	–	–	1														
G. laglaisei				2	2	1	1	–	1												

	Body depth at anus origin																				
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
G. viator						5	1	1	3												
G. yahayai n. sp.											2	–	1	3	2	–	–	–	–	1	1
G. tolsoni	1	1	1	1	3	1	3														
G. margaritaceus					1	2	4	3	2												
G. charpini n. sp.					1	1	2	2	2												
G. aporocephalus					1	1	4	3	2	2	1										
G. caussei n. sp.	1	–	–	–	–	1															
G. laglaisei								1	2	2	1	1									

hyaline with a black dot at the base. Pelvic fins hyaline with a yellow distal margin. The anal fin is brownish with a yellow distal stripe. Caudal fin greyish to hyaline.

Females. – Background of body greyish on the back to top of head. Head with 3 thin red stripes radiating from the eye to the cheeks and operculum, the highest one continuing on the pectoral base. Several small slight red spots in two or three rows along the longitudinal scales, from pectoral base to hypural base and mixing with slight blue or green pattern. Belly whitish to greyish as the lower part of the flanks. The dorsal fins are brown. Pectoral fins hyaline with a black dot at the base. Pelvic and anal fins hyaline. Caudal fin greyish to hyaline.

Ecology

Giuris yahayai occurs in lower parts of coastal streams and ponds connected to rivers, usually in riverbank vegetation and in shelters over rocky or gravel bottoms. It is omnivorous. It is thought to be amphidromous as some other species of the family (Keith *et al*., 2006).

Distribution

Giuris yahayai is currently known from the Comoros archipelago (Mohéli, Mayotte) and Madagascar.

Etymology

The new species is dedicated to our friend and colleague Ibrahim Yahaya from Comoros (CNDRS) in recognition of his work on the fauna of this archipelago.

Comparison

Giuris yahayai differs from the other species sequenced by having a high percentage of divergence in *COI* gene (7.7-13%) (Tab. II) and by a combination of characters including a greater body depth at anus (26-36 *vs*. 16-27% SL) and a greater body depth at first dorsal fin (26-39 *vs*. 19-27% SL), more scales in transverse forward series (17-20 *vs*. 11-16), a greater caudal peduncle depth (16-20 *vs*. 13-17% SL) and by a duller pattern in males.

***Giuris charpini* n. sp. Keith & Mennesson**

(Figs 1, 3, 10; Tabs III-IV)

Material examined

Eight specimens from New Caledonia and Vanuatu, totaling 5 males and 3 females; size range 78-120 mm SL, largest male 120 mm SL, largest female 105 mm SL.

Holotype. – MNHN 2019-0250, 1 male (120 mm SL), Kû Bwéné, New Caledonia, 8 Jul 2019, Charpin coll.; speci 5, tag 12600.

Paratypes. – MNHN 2005-1893, male (114.7 mm SL), Gaua Is., Vanuatu, Kirilou riv., 18 Jul. 2005, Keith *et al*. coll. MNHN 2019-0246, 1 male and 1 female (92.2-102.8 mm SL), Fausse Yaté, 29 Nov. 2018, New Caledonia, Charpin coll.; tags 6847, 6846. MNHN 2011-0125, female (78.2 mm SL), Santo Is., Vanuatu, Jordan riv., 16 Nov. 2005, Keith *et al*. coll. MNHN 2019-0248, 1 female and 2 males (105-120 mm SL), Kû Bwéné, New Caledonia, 8 Jul. 2019, Charpin coll.; tags 12596 to 12598.

Diagnosis

The new species has 13-14 pectorals rays, a medium body depth at anus (20-24% SL), 8-10 scales around the eye, and 13-14 scales in transverse forward series.

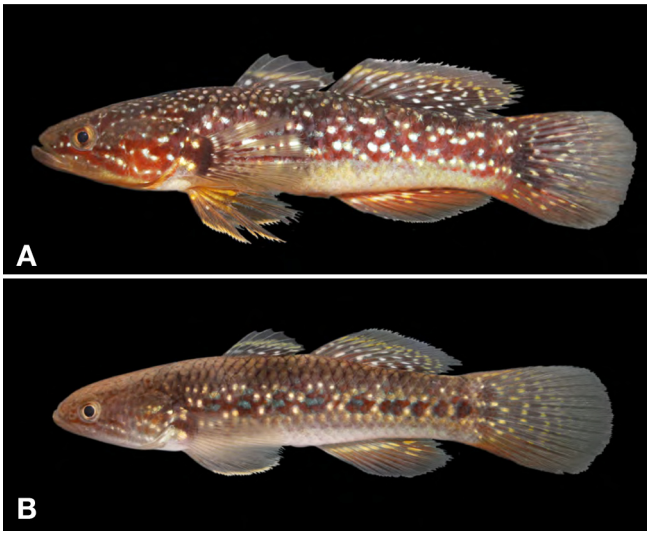

Figure 3. – **A**: *Giuris charpini* n. sp., male; MNHN 2019-0250, holotype, New Caledonia; LS 120 mm (Photo N. Charpin). **B**: *G. charpini* n. sp., female; MNHN 2019-0248, paratype, New Caledonia; LS 105 mm (Photo N. Charpin).

Description

The scale and ray counts are given in table III and morphometrics in table IV. Below, the holotype counts are given first, followed in brackets, if different, by the paratypes' counts.

The body is more ovoid than elongated. The body depth at anus is 23 (20-24% SL), at first dorsal fin 23 (19-25% SL), and the caudal peduncle depth is 16 (13-16% SL). Predorsal length 44 (43-44% SL) and preanal length 64 (59-65% SL).

The head 33 (31-33% SL) is depressed, the snout is convex. The anterior nostrils are short, not reaching upper margin of upper lip. The mouth and jaw length 10 (10-11% SL) are small. Inwardly curved teeth set on both jaws and larger on outer row; caniniform teeth in lower jaw. Posterior end of maxillary extending to below around anterior margin of eye. Lips with numerous internal short papillae. No external papillae on mentum, snout, inferior lip and between nostrils. Eye diameter 5 (5-7% SL) and interorbital length 13 (12-14% SL).

Dorsal fins VI-I,8 with no filamentous rays. The first dorsal fin is with second, third, fourth and fifth rays longer. Anal fin I,8-9 directly opposite to the second dorsal fin. The caudal fin is with 13-14 branched rays and its posterior margin is rounded. Pelvic fins separate, I,5. Pectoral fins 13 (13-14), with the posterior margin rounded. Lateral scales 29 (27-29), with ctenoid scales on flanks and caudal peduncle. Cycloid scales from snout to top of head and anterior part of D1, on operculum, on base of pectoral fins and on belly extending to anus. Scales on top of head and back bigger than those of belly. Scales in transverse back series 10 (9-11), in transverse forward 14 (13-14), in predorsal 15 (13-15) and in zigzag 9 (8-9). 8 (8-10) scales around the eye (ENO). 25 vertebrae.

Absence of oculoscapular canal and supratemporals and presence of a short preopercular canal with the pores N' and O'.

Cephalic sensory papillae system developed as described by Akihito *et al*. (1988).

Males with a rounded/triangular urogenital papilla with distal tip rounded. The females have bulbous urogenital papilla with fimbriate projections around distal opening.

Colour in preservation

Males. – Background of body entirely brownish and covered with numerous greyish spots including the two dorsal and the caudal fins. Three thick brown stripes rows radiate from the eye to the cheeks and operculum. The belly is whitish. The anal fin is brownish at the distal part with a whitish base. The caudal fin is brown. The upper part of the first and second dorsal fins is greyish, with a brownish base with white spots.

Females. – Background of body brownish to beige on the back. Top of head brownish, lateral part greyish with 3 thin brown stripes radiating from the eye to the cheeks and operculum, the upper one continuing on the pectoral base. Several small alternating greyish rounded patches along the flanks from pectoral base to hypural base. Belly whitish. Base of caudal fin with 3 brown spots. The first dorsal fin is greyish with white basal part. Pectoral fins greyish. Pelvic fins greyish as the anal and caudal fins.

Colour in life

Males. – (Fig. 3A) Male with background of body entirely reddish and covered with numerous silver, yellow or bluish spots including the two dorsal and the caudal fins. Three thick red stripes and three spotted silver rows radiate from the eye to the cheeks and operculum, the upper red one continuing on the pectoral base, which is red-brown. The belly is whitish. The anal fin is reddish at the distal part with yellowish to whitish spots at the base. The caudal fin is red-brown with a bright red basal part. The upper part of the first dorsal fin is hyaline, with a median yellow to white line and a reddish base with white spots. The upper part of the second dorsal fin is hyaline, with sometimes a median yellow spotted line, base reddish with white spots and a thin distal white line. The pectoral fin is translucent with a red brown-base followed by a thin white stripe. Pelvic fins are hyaline with a yellow base and a distal white band.

Females. – Two patterns (1) Background of body brownish to red on the back and flanks. Lateral part of head with whitish spots and 3 reddish stripes radiating from the eye to the cheeks and operculum, the upper one continuing on the pectoral base. Nine to ten large alternating reddish to bluish rounded patches along the flanks from pectoral base to hypural base. Numerous whitish spots along midline and around patches. The belly is greyish to whitish. First and second dorsal fins hyaline, with a median yellow to white line and a reddish base with white spots. Pectoral fins hyaline to greyish. Pelvic fins hyaline to greyish with a white distal stripe. The anal fin is reddish with a yellowish basal line. The caudal is red-brown fin with 3-5 brown spots at the base, and numerous yellowish dots along the rays (Fig. 3B). (2) Background of body brownish to beige on the back. Top of head dark brown, lateral part brownish to yellowish with 3 thin red stripes radiating from the eye to the cheeks and operculum, the upper one continuing on the pectoral base. Nine to eleven small alternating brownish to yellowish rounded patches along the flanks from pectoral base to hypural base. Belly whitish to greyish. Base of caudal fin with 3 brown spots. The first dorsal fin is hyaline with a yellow median to basal part as the second dorsal, which has a thin white stripe at the distal tip. Pectoral fins greyish to yellowish. Pelvic fins greyish to yellowish with a thin white stripe at the distal tip. The anal and caudal fins are greyish to yellowish.

Ecology

Giuris charpini occurs in estuaries and lower parts of coastal streams, usually in riverbank vegetation and in shelters over rocky or gravel bottoms. It is omnivorous and feeds on small shrimps, aquatic insects and fish. It is thought to be amphidromous as some other species of the family (Marquet *et al*., 2003; Keith *et al*., 2010).

Distribution

Giuris charpini is known from New Caledonia and Vanuatu.

Etymology

The new species is dedicated to Nicolas Charpin for all his work for the improvement of knowledge and the protection of the freshwater fauna of New Caledonia.

Comparison

Giuris charpini differs from the other species sequenced by having a high percentage of divergence in *COI* gene (3.2-13%) (Tab. II), by having fewer scales in lateral series (27-29 (mean 28) *vs*. 28-32 (Mean > or = 29)) and by the colourful pattern of the male. Moreover it differs from *G. yahayai* (present paper) in having fewer scales in transverse forward series (13-14 *vs*. 17-20), a smaller body depth at anus (20-24 *vs*. 26-36% SL) and a smaller body depth at first dorsal fin (19-25 *vs*. 26-39% SL). It differs from *G. tolsoni* in having more scales around the eye (8-10 *vs*. 6-9), a greater body depth at anus (20-24 *vs*.% SL 16-22) and 13 or 14 pectorals rays *vs*. always 14 rays. It differs from *G. margaritaceus* in having 13-14 pectorals rays *vs*. 14 or 15 rays and fewer scales in zigzag series (8-9 *vs*. 9-10). It differs from *G. viator* in having fewer scales in transverse back series (9-11 *vs*. 11-12), fewer scales around the eye (8-10 *vs*. 10-13) and

13 or 14 pectorals rays *vs*. always 14 rays. It differs from *G. aporocephalus* in having 13-14 pectorals rays *vs*. 15 rays and more scales in transverse forward series (13-14 *vs*. 11-13), and from *G. caussei* (present paper) in having 13-14 pectorals rays *vs*. 14-15 rays and more scales in transverse forward series (13-14 *vs*. 11-12). It differs from *G. laglaizei* in having 13-14 pectorals rays *vs*. always 15 and more scales around the eye (8-10 *vs*. 6-8).

Giuris caussei n. sp. Keith, Mennesson & Lord

(Figs 1, 4, 10; Tables III-IV)

Material examined

Two specimens from New Britain (Papua New Guinea), totalling 1 male and 1 female; size range 60.7-74.3 mm SL.

Holotype. – MNHN 2019-0240, female (74.3 mm SL), Water Lily Hole, Nut, West New Britain, Papua New Guinea, 23 Oct. 2018, Keith, Lord, Causse, Amick *et al*. coll.; tag 6827.

Paratype. – MNHN 2019-0241, male (60.7 mm SL), same data as holotype; tag 17737.

Diagnosis

The new species has always 14-15 pectorals rays, a medium body depth at anus (16-21% SL), a great interorbital length (13-15% SL) and 11-12 scales in transverse forward series.

Description

The scale and ray counts are given in table III and morphometrics in table IV. Below, the holotype counts are given first, followed in brackets, if different, by the paratypes' counts.

The body is more ovoid than elongated. The body depth at anus is 16 (21% SL), at first dorsal fin 25 (22% SL), and the caudal peduncle depth is 16 (14% SL). Predorsal length 50 (% SL) and preanal length 63 (64% SL).

The head 37 (36% SL) is depressed, the snout is convex. The anterior nostrils are short, not reaching upper margin of upper lip. The mouth and the jaw length 10 (% SL) are small. Inwardly curved teeth set on both jaws and larger on outer row. Posterior end of maxillary extending to below around anterior margin of eye. Lips with numerous internal short papillae. Eye diameter 4 (6% SL) and interorbital length 15 (13% SL).

Figure 4. – *Giuris caussei* n. sp., male; MNHN 2019-0241, paratype, New Britain, Papua New Guinea; LS 60.7 mm (MNHN, Photo P. Keith).

Dorsal fins VI-I,8-9 without filamentous rays. The first dorsal fin is with second, third and fourth rays longer. Anal fin I,9 directly opposite to the second dorsal fin. The caudal fin is with 13 branched rays and its posterior margin is rounded. Pelvic fins separate, I,5. Pectoral fins 14 (15), with the posterior margin rounded. Lateral scales 29, with ctenoid scales on flanks and caudal peduncle. Cycloid scales from snout to top of head and anterior part of D1, on operculum, on base of pectoral fins and on belly extending to anus. Scales on top of head and back bigger than those on belly. Scales in transverse back series 9, in transverse forward 12 (11), in predorsal 16 (15) and in zigzag 9. 12 (11) scales around the eye (ENO). 25 vertebrae.

Absence of oculoscapular canal and supratemporals and presence of a short preopercular canal with the pores N' and O'.

Cephalic sensory papillae system developed as described by Akihito *et al*. (1988).

Males with a rounded/triangular urogenital papilla with distal tip rounded. The females have bulbous urogenital papilla with fimbriate projections around distal opening.

Colour in preservation

Males and Females similar. Background of body dark brown to black on the back. Top of head brownish, lateral part brownish to greyish with 3 thin dark stripes radiating from the eye to the cheeks and operculum. Flanks beige to yellowish from pectoral base to hypural base. Belly whitish. The first and second dorsal fins and the anal fin are brownish. Pectoral and pelvic fins greyish to hyaline. Caudal fin brownish to greyish (Fig. 4).

Colour in life

Unknown.

Ecology

The species occurs mainly in the vegetation of ponds and swamps. It is omnivorous. It was found in sympatry with *G. aporocephalus* and *G. margaritaceus*.

Distribution

Giuris caussei is known from Papua New Guinea (New Britain).

Etymology

The new species is dedicated to our friend Romain Causse, from MNHN, for his dedication to ichthyology and the invaluable help he provides both in the field and in the laboratory.

Comparison

Giuris caussei differs from the other species sequenced by having a significant percentage of divergence in *COI* gene (2.5-11.4%) (Tab. II). Moreover it differs from *G. yahayai* by a combination of characters including fewer scales in transverse forward series (11-12 *vs*. 17-20), a smaller body depth at anus (16-21 *vs*. 26-36% SL) and a smaller body depth at first dorsal fin (22-25 *vs*. 26-39% SL). It differs from *G. viator* in having fewer scales in transverse forward series (11-12 *vs*. 14-15) and in transverse backward series (9 *vs*. 10-12). It differs from *G. tolsoni* in having fewer scales in transverse forward series (11-12 *vs*. 13-16), a greater interorbital length (13-15 *vs*. 9-12% SL), and 14-15 pectorals rays *vs*. always 14 rays. It differs from *G. margaritaceus* in having fewer scales in transverse forward series (11-12 *vs*. 13-14) and more scales around the eye (11-12 *vs*. 8-11). It differs from *G. charpini* in having 14-15 pectorals rays *vs*. 13-14 and more scales in transverse forward series (11-12 *vs*. 13-14). It differs from *G. aporocephalus* in having a smaller body depth at anus (16-21 *vs*. 20-25% SL). It differs from *G. laglaizei* in having more scales around the eye (11-12 *vs*. 6-8), a smaller body depth at anus (16-22 *vs*. 23-27% SL) and a greater interorbital length (13-15 *vs*. 10-12% SL).

***Redescription of* Giuris aporocephalus**

***Giuris aporocephalus* (Macleay, 1884)**
(Figs 1, 5, 10; Tabs III-IV)

Ophiocara aporos rigonis Whitley, 1938

Material examined

Syntype. – AMS A.17837, Lillesmere Lagoon, Burdekin River, Queensland, Australia.

Others. – *Ophiocara aporos rigonis,* Whitley, 1938. Holotype: AMS IA.5785. *Paratypes*. – AMS IA.5787 (1), IA.5789 (1). Freshwater creek near Rigo, Papua New Guinea. MNHN 2019-0242, male (92.3 mm SL), Water Lily Hole, Nut, New Britain, Papua New Guinea, 23 Oct. 2018, Keith, Lord, Amick, Causse *et al*. coll.; tag 17730. MNHN 2019-0245, 4 females, same data as MNHN 2019-0242; tags 6826, 6828, 6829, 6830. MNHN 2019-0243, 2 males and 2 females, same data as MNHN 2019-0242; tags 17731, 17732, 17733 &17734. MNHN 2019-0244, male, [extracted from MNHN 2016-229], Kolobangara Is., Zamba riv., Solomon Islands, 9 Nov. 2015, Keith, Lord, Boseto, Marquet *et al*. coll. MNHN 2019-0252, 2 males and 2 females, New Britain, Papua New Guinea, 2015, Amick coll.; tags 6049, 6050, 16801 & 16802.

Diagnosis

The species generally has 15 pectorals rays, a medium body depth at anus (20-26% SL), 11-13 scales in transverse forward series and a specific colourful reddish pattern in mature male and a brownish poorly coloured pattern in female.

Figure 5. – **A**: *Giuris aporocephalus,* male; *in* MNHN 2019-0243 (tag 17734), New Britain, Papua New Guinea; LS 61.3 mm (Photo P. Keith). **B**: *G. aporocephalus,* male; *in* MNHN 2019-0252, New Britain, Papua New Guinea; LS 143 mm (Photo P. Amick). **C**: *G. aporocephalus,* female; *in* MNHN 2019-0252, New Britain, Papua New Guinea; LS 143 mm (Photo P. Amick).

Description

The scale and ray counts are given in table III and morphometrics in table IV.

The body is more ovoid than elongated. The body depth at anus is 21-26% SL, at first dorsal fin 20-25% SL, and the caudal peduncle depth is 13-16% SL. Predorsal length 44-51% SL and preanal length 62-67% SL. Size: up to 22 cm SL.

The head 31-36% SL is depressed, the snout is convex. The anterior nostrils are short, not reaching upper margin of upper lip. The mouth and jaw length 9-11% SL are small. Inwardly curved teeth set on both jaws and larger on outer row. Posterior end of maxillary extending before or to below around anterior margin of eye. Lips with numerous internal short papillae. Eye diameter 4-7% SL and interorbital length 13-16% SL.

Dorsal fins VI-I,8 with no filamentous rays. The first dorsal fin is with second, third and fourth rays longer. Anal fin I,9 directly opposite to the second dorsal fin. The caudal fin is with 13 branched rays and its posterior margin is rounded. Pelvic fins separate, I,5. Pectoral fins mostly 15 (3 specimens with 14), with the posterior margin rounded. Lateral scales 28-30, with ctenoid scales on flanks and caudal peduncle.

Cycloid scales from snout to top of head and anterior part of D1, on operculum, on base of pectoral fins and on belly extending to anus. Scales of top of head and back bigger than those of belly. Scales in transverse back series 8-10, in transverse forward 11-13, in predorsal 15-18 and in zigzag 8-10. Scales around the eye 9-14 (ENO). 25 vertebrae.

Absence of oculoscapular canal and supratemporals and presence of a short preopercular canal with the pores N' and O'.

Cephalic sensory papillae system developed as described by Akihito *et al*. (1988).

Males with a rounded/triangular urogenital papilla with distal tip rounded. The females have bulbous urogenital papilla with fimbriate projections around distal opening.

Colour in preservation

Males. – Background of body dark brown on the back. The flanks are greyish to brownish. Each scale underlined by a dark grey dot. Belly greyish as the isthmus. Top of head brownish, lateral part greyish with 3 dark brown stripes radiating from the eye to the cheeks and operculum. The first and second dorsal fins as the anal, pelvic, pectoral and caudal fins are brownish.

Females. – Background of body brownish to black on the back. Top of head brownish, lateral part greyish with 3 thin brown stripes radiating from the eye to the cheeks and operculum. Flanks greyish from pectoral base to hypural base. Belly whitish. The first and second dorsal fins as the anal fin are brownish. Pectoral and pelvic fins greyish to hyaline. Caudal fin brownish.

Colour in life

Males. – Two patterns. (1) Background of body greyish on the back. A bluish or greenish tinge along midline from the pectoral fin base to the caudal peduncle. The flanks have several, orange to reddish dots from pectoral base to hypural base, giving a certain shine to the fish. Belly whitish. Top of head greyish, lateral part yellowish with 3 dark brown to black stripes radiating from the eye to the cheeks and operculum, the highest continuing on the pectoral base which is yellow. The first and second dorsal fins as the anal fin are greyish with a reddish stripe at the distal part. Pectoral fins greyish to hyaline. Pelvic fins greyish to hyaline with a red distal margin. Caudal fin brownish with reddish base (Fig. 5A). (2) Background of body brownish to orange on the back but colourful on the flanks. Blue along midline from the pectoral fin base to the caudal peduncle. The flanks are orange to reddish and each scale is underlined by a dark red dot. Belly bright yellow or orange as the isthmus. Top of head brownish, lateral part orange to bright red with 3 dark red stripes radiating from the eye to the cheeks and operculum, the highest continuing on the pectoral base which is bright yellow. Lips orange. The first and second dorsal fins as the anal fin are dark red to dark brown with an orange stripe at the distal part and a lighter red one at the base. Pectoral fins brownish. Pelvic fins brown with a red distal margin. Caudal fin brown (Fig. 5B).

Females (Fig. 5C) – Background of body brownish to black on the back. Top of head brownish, lateral part greyish with a yellowish tinge. Three thin brown stripes radiating from the eye to the cheeks and operculum, the upper one continuing on the pectoral base, which is yellow with a black superior spot. Flanks greyish to yellow from pectoral base to hypural base; each scale is underlined by a greyish dot. Belly whitish. The first and second dorsal fins as the anal fin are brownish with a reddish stripe at the distal part. Pectoral fins greyish to hyaline. Pelvic fins greyish to hyaline with a red distal margin. Caudal fin brownish.

Ecology

The species occurs mainly in the vegetation of ponds, lakes, swamps, and in the lower parts of rivers. It is omnivorous and feeds on filamentous algae, small crustaceans and aquatic insects. It was found in sympatry with *G. caussei* (present paper) and *G. margaritaceus*.

Distribution

Giuris aporocephalus is known from Australia, Papua New Guinea and the Solomon Islands.

Comparison

Giuris aporocephalus differs from the other species sequenced by having a significant percentage of divergence in *COI* gene (2.5-11.3%) (Tab. II) and by the colourful pattern of the male. Moreover it differs from *G. yahayai* by a combination of characters including fewer scales in transverse forward series (11-13 *vs*. 17-20), a smaller body depth at anus (20-25 *vs*. 26-36% SL) and a smaller body depth at first dorsal fin (21-25 *vs*. 26-39% SL). It differs from *G. viator* in having always 15 pectorals rays *vs*. always 14 rays, fewer scales in transverse forward series (11-13 *vs*. 14-15) and zigzag series (8-9 *vs*. 9-10). It differs from *G. tolsoni* in having always 15 pectorals rays *vs*. always 14 rays, and a greater interorbital length (13-16 *vs*. 9-12% SL), and fewer scales in transverse forward series (11-13 *vs*. 13-16). It differs from *G. margaritaceus* in having fewer scales in transverse forward series (11-13 *vs*. 13-14) and zigzag series (8-9 *vs*. 9-10), more scales around the eye (10-14 *vs*. 8-11), and always 15 pectorals rays *vs*. 14-15. It differs from *G. charpini* in having always 15 pectorals rays *vs*. 13-14, and more scales in transverse forward series (11-13 *vs*. 13-14). It differs from *G. caussei* in having a greater body depth at anus (21-25 *vs*. 16-21% SL). It differs from *G. laglaizei* in having more scales around the eye (10-14 *vs*. 6-8), fewer scales in transverse back series (8-10 *vs*. 9-11) and a greater interorbital length (13-16 *vs*. 10-12% SL).

***Redescription of* Giuris laglaizei**

***Giuris laglaizei* (Sauvage, 1880)**
(Figs 1, 6, 10; Tabs III-IV)

Hypseleotris agilis Herre, 1927

Material examined

Holotype. – MNHN A-1690, Manila, Philippines.

Others. – MNHN 2019-0111, 4 specimens from Lake Taal, Luzon Is., Philippines; tags 14580 to 14583. MNHN 2018-0719, 1 spm from Alegre River, Panay Is., Philippines. MNHN 2020-0147, 5 spms from Lake Mainit, Mindanao Is., Philippines; tags 14592 to 14596.

Diagnosis

The species has 15 pectorals rays, a small eye diameter (5-6% SL), a small interorbital length (10-12% SL), few scales around the eye (6-8) and a great preanal length (64-70% SL).

Description

The scale and ray counts are given in table III and morphometrics in table IV.

The body is more ovoid than elongated. The body depth at anus is 23-27 (% SL), at first dorsal fin 22-27 (% SL), and the caudal peduncle depth is 14-17 (% SL). Predorsal length 43-47 (% SL) and preanal length 64-70 (% SL). Size: up to 18 cm SL.

The head (30-35% SL) is depressed, the snout is convex. The anterior nostrils are short, not reaching upper margin of upper lip. The mouth and the jaw length (8-11% SL) are small. Inwardly curved teeth set on both jaws and larger on outer row. Posterior end of maxillary not extending to below around anterior margin of eye. Lips with numerous internal short papillae. Eye small, diameter 5-6 (% SL) and interorbital length 10-12 (% SL).

Dorsal fins VI-I,8 without filamentous rays. The first dorsal fin is with, third, fourth and fifth rays longer. Anal fin I,9 directly opposite to the second dorsal fin. The caudal fin is with 14-15 branched rays and its posterior margin is rounded. Pelvic fins separate, I,5. Pectoral fins 15, with the posterior margin rounded. Lateral scales 29-31, with ctenoid scales on flanks and caudal peduncle. Cycloid scales from snout to top of head and anterior part of D1, on operculum, on base of pectoral fins and on belly extending to anus. Scales of top of head and back bigger than those of belly. Scales in transverse back series 9-11, in transverse forward 12-14, in predorsal 15-18 and in zigzag 8-9. 6-8 scales around the eye (ENO). 25 vertebrae.

Absence of oculoscapular canal and supratemporals and presence of a short preopercular canal with the pores N' and O'.

Cephalic sensory papillae system developed as described by Akihito *et al*. (1988).

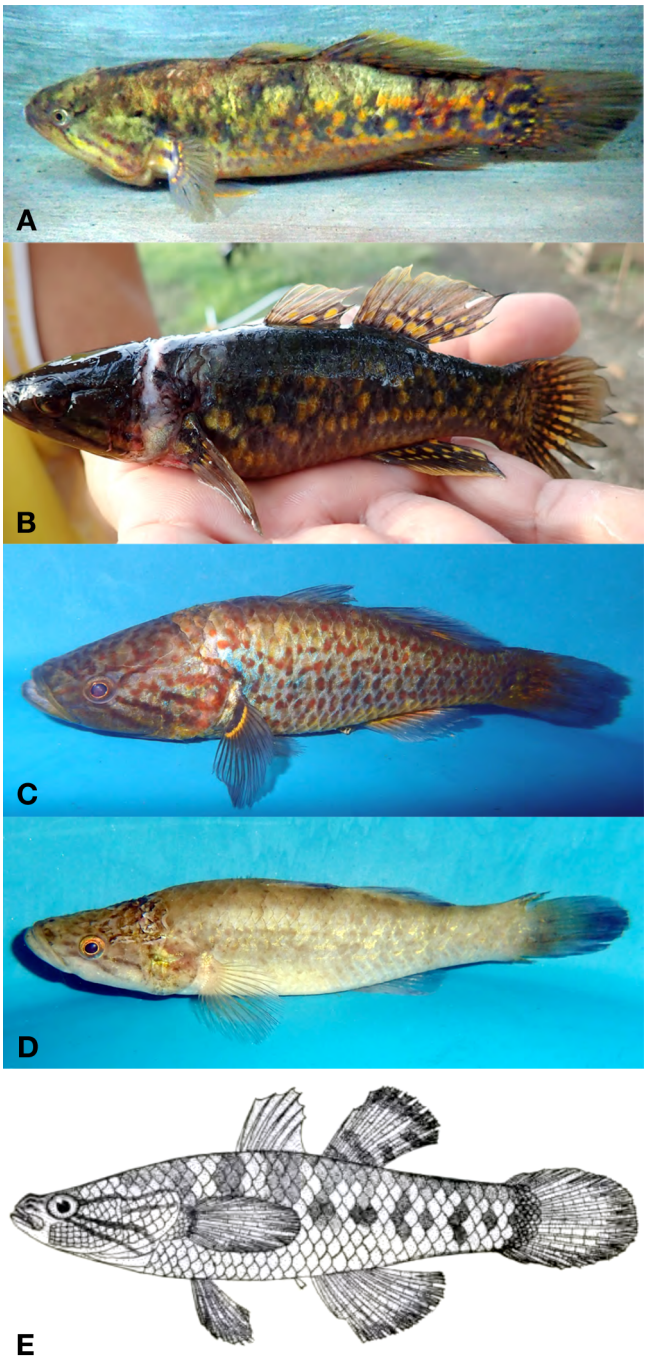

Figure 6. – **A**: *Giuris laglaizei*, male; *in* MNHN 2019-0211, Lake Taal, Philippines (Photo M. Gaulke). **B**: *G. laglaizei*, male; *in* MNHN 2019-0211, Lake Taal, Philippines; LS 140 mm (Photo M. Gaulke). **C**: *G. laglaizei*, male; *in* MNHN 2020-0147, Lake Mainit, Philippines; LS 106 mm (Photo M. Gaulke). **D**: *G. laglaizei*, female; *in* MNHN 2020-0147, Lake Mainit, Philippines; LS 96 mm (Photo M. Gaulke). **E**: *G. agilis*, drawing from Herre (1927).

Figure 7. – *Giuris viator*, male; MNHN 2019-0238, holotype, New Caledonia; LS 122 mm (Photo N. Charpin).

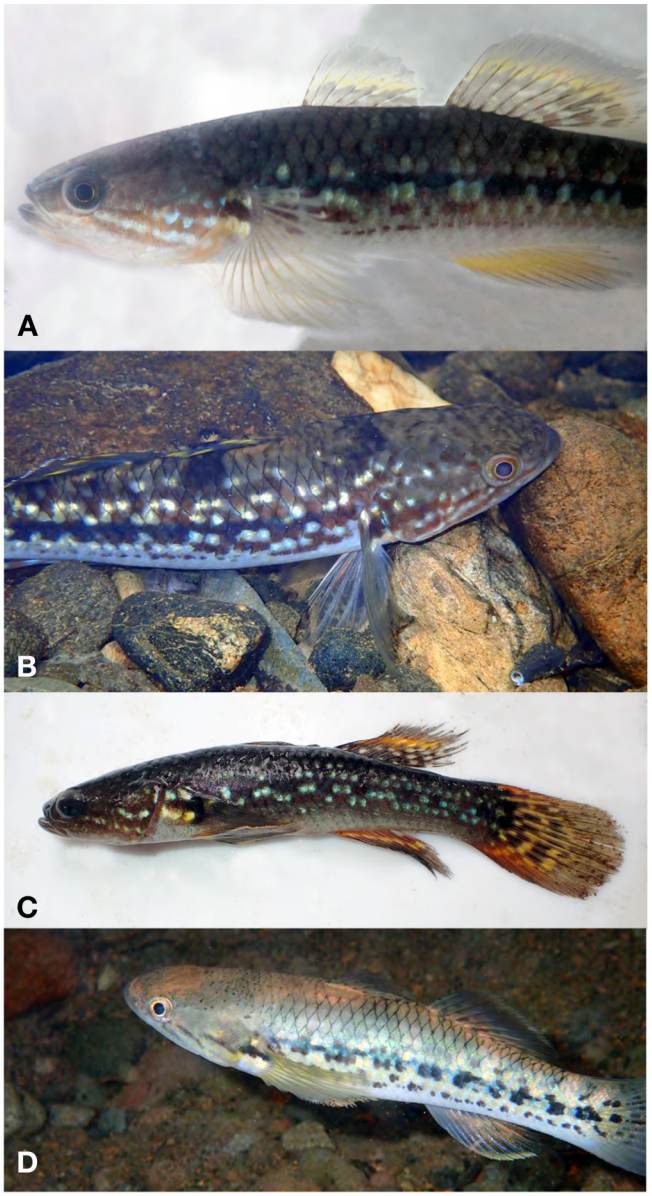

Figure 8. – **A**: *Giuris margaritaceus,* male; Choiseul, Solomon Islands (Photo P. Keith). **B**: *G. margaritaceus,* male; Santa Isabel, Solomon Islands (Photo P. Keith). **C**: *G. margaritaceus,* male; MNHN 2020-0135, New Britain, Papua New Guinea; tag 17729; LS 94 mm (Photo P. Keith). **D**: *G. margaritaceus,* female; Kolobangara, Solomon Islands (Photo C. Lord).

Figure 9. – *Giuris tolsoni,* MNHN 2015-0323; Philippines (MNHN, Photo P. Keith).

Males with a rounded/triangular urogenital papilla with distal tip rounded. The females have bulbous urogenital papilla with fimbriate projections around distal opening.

Colour in preservation

Males. – Background of body dark brown on the back and brown on the flanks. Top of head brownish to dark, lateral part of head with 3 brown stripes radiating from the eye to the cheeks and operculum. The belly is greyish. Flanks with 2 or 3 discontinuous and sinuous longitudinal lines of greyish spots. The first dorsal fin is brownish with several big greyish dots between rays. The second dorsal fin is brownish with several greyish dots between rays. Pectoral fins greyish. Pelvic fins greyish. The anal fin is brownish with two or three rows of greyish dots. Caudal fin brownish to dark with two rows of greyish dots.

Females. – Background of body brownish to greyish on the back. Top of head brownish, lateral part with 3 thin red stripes radiating from the eye to the cheeks and operculum. Flanks with several rows of greyish rounded patches from pectoral base to hypural base. Belly greyish. Caudal, first and second dorsal fins brownish. Pectoral, anal and pelvic fins greyish.

Colour in life

Males. – General pattern colourful and variable, two main patterns were observed: (1) Background of body more or less entirely greenish and orange or bright yellow. Top and lateral part of head greenish to greyish with 3 reddish stripes radiating from the eye to the cheeks and operculum, continuing or not on the pectoral base. The belly is yellowish to orange. About ten bluish rounded patches along the flanks from pectoral base to hypural base. These patches are underlined by more or less orange scales. The first and second dorsal fins are orange to yellowish with several blue dots; the upper part is greyish. Pectoral fins greyish hyaline, base of pectoral rays bright yellow. Pelvic fins hyaline to yellowish with a yellow distal margin. Anal fin greyish to yellowish with several blue dots and a red yellow margin. Caudal fin brownish with 4-5 brown dots at the hypural zone and orange parts at the base (Fig. 6A). (2) Background of body brownish to black on the back to dark yellowish on the flanks. Top of head brownish to black, lateral part of head dark yellowish with 3 brown stripes radiating from the eye to the cheeks and operculum,

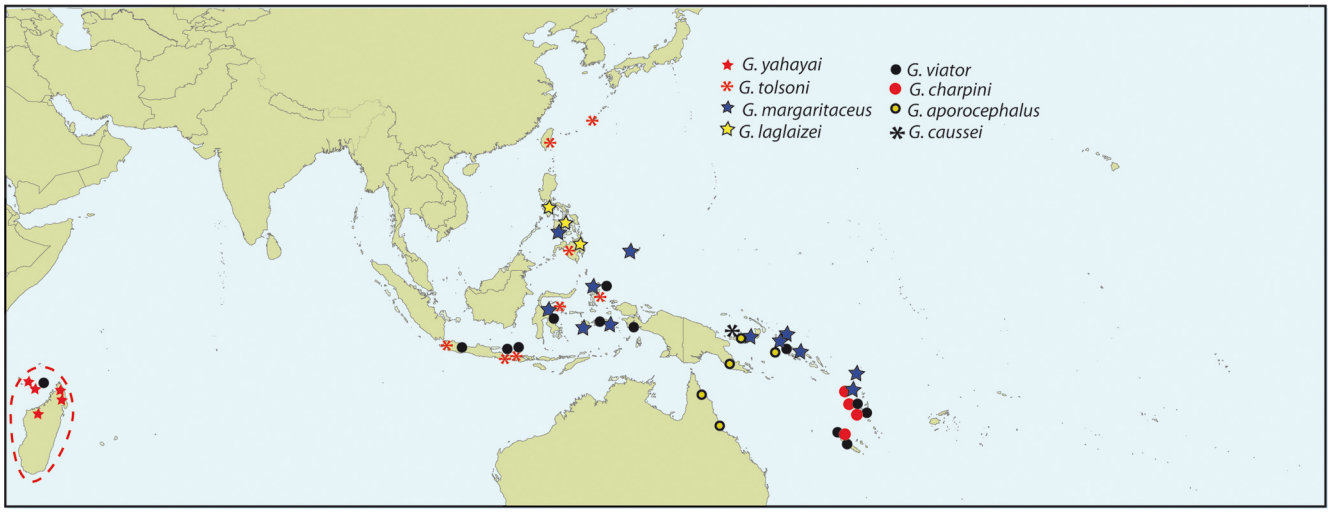

Figure 10. – Distribution of *Giuris* species.

the upper one continuing on the pectoral base. The belly is yellowish to bluish. Flanks with 2 or 3 discontinuous and sinuous longitudinal lines of bright yellow spots. The first and second dorsal fins brownish with several big bright yellow dots between rays and a yellow distal margin. Pectoral fins greyish. Pelvic fins greyish with a red distal margin. The anal fin is brownish to greyish with two or three rows of bright yellow dots and a red distal margin. Caudal fin brownish to dark with two rows of yellow dots (Fig. 6B).

Females. – Background of body brownish to greyish on the back. Top of head brownish, lateral part yellowish with 3 thin red stripes radiating from the eye to the cheeks and operculum. Flanks with nine to eleven alternating bluish and yellowish rounded patches from pectoral base to hypural base. Belly orange to yellowish. Caudal fin brownish with 4-5 yellowish dots at the base. The first dorsal fin is yellowish with several dark blue dots on the last three rays; the upper part is greyish. The second dorsal fin is yellowish with several dark blue dots forming lines, on all rays, from median to basal parts; the upper part is greyish. Pectoral fins greyish to reddish. Pelvic fins yellowish with a red distal margin. The anal fin is yellowish with basal dark stripe underlined by a yellow one.

Ecology

The species occurs in vegetation of ponds, lakes, swamps, and in the lower parts of rivers. It is heavily fished in some lakes like Lake Taal in Luzon. It is omnivorous and feeds on small crustaceans and aquatic insects.

Distribution

The species occurs in several islands of the Philippines (Luzon, Lake Taal; Panay; Mindanao, Lake Mainit).

Comparison

Giuris laglaizei differs from the other species sequenced by having a significant percentage of divergence in *COI* gene (2.8-11.3%) (Tab. II) and by the colourful pattern of the male. Moreover it differs from *G. yahayai* by a combination of characters including fewer scales in transverse forward series (12-14 *vs*. 17-20) and fewer scales around the eye (6-8 *vs*. 11-14), a smaller body depth at anus (23-27 *vs*. 26-36% SL) and a smaller body depth at first dorsal fin (22-27 *vs*. 26-39% SL). It differs from *G. viator* in having 15 pectorals rays *vs*. always 14 rays, fewer scales in transverse forward series (12-14 *vs*. 14-15) and zigzag series (8-9 *vs*. 9-10). It differs from *G. tolsoni* in having 15 pectorals rays *vs*. always 14 rays, a smaller eye diameter (5-6 *vs*. 6-7% SL) and a greater body depth at anus (23-27 *vs*. 16-22% SL). It differs from *G. margaritaceus* in having fewer scales in zigzag series (8-9 *vs*. 9-10), fewer scales around the eye (6-8 *vs*. 8-11), and 15 pectorals rays *vs*. 14-15. It differs from *G. charpini* in having 15 pectorals rays *vs*. 13-14, more scales in lateral series (28-31 *vs*. 27-29) and fewer scales around the eye (6-8 *vs*. 8-10). It differs from *G. aporocephalus* in having fewer scales around the eye (6-8 *vs*. 9-14) and a smaller interorbital length (10-12 *vs*. 13-16% SL). It differs from *G. caussei* in having fewer scales around the eye (6-8 *vs*. 11-12), a greater body depth at anus (23-27 *vs*. 16-22% SL) and a smaller interorbital length (10-12 *vs*. 13-15% SL).

NB. – Several specimens from Lake Mainit (Philippines, Mindanao), type locality of *Hypseleotris agilis* Herre, 1927 (Fig. 6E), were studied here and they are genetically included in the *G. laglaizei* clade. The percentage of divergence in *COI* gene is 1.4% between Lake Taal (Luzon)/Alegre River (Panay) and Lake Mainit (Tab. II) and the specimens of this last locality are a bit different: the specimens are stockier, with a taller body (%Hda 26-31 *vs*. 23-27) and 14-15 pectoral rays *vs*. 15. The colours are also slightly different (see

below and Fig. 6C, D). This may be due to the specific life or trophic conditions in this lake. It could be interesting to verify if the individuals are all or always amphidromous; probably a different ESU.

Life colour in Lake Mainit

Males (Fig. 6C) – background of body light brown on the back to bright beige and bluish on the flanks. Top of head brownish, with lots of rows of medium sized reddish dots, which is very characteristic of this species. Lateral part of head greyish to brownish with generally 4 red stripes radiating from the eye to the cheeks and operculum, the first or two highest continuing on the pectoral base. Along the flanks red to brown scales alternate with bluish to yellow ones with no regular pattern. The hypural part is orange. The first and second dorsal fins are greyish with an orange stripe in the basal part. The belly is yellowish. Pectoral fins hyaline with a basal black part, base of pectoral rays bright yellow. Pelvic fins hyaline. The anal fin is greyish with a hyaline distal part and an orange basal part. Caudal fin hyaline, orange at the base.

Females (Fig. 6D). – background of body greyish to beige on the back to bright beige on the flanks. Top of head beige, lateral part greyish to yellowish on the operculum with 3 brown stripes radiating from the eye to the cheeks and operculum. Belly whitish as lower part of flanks. The first and second dorsal fins are translucent. Pectoral and pelvic fins hyaline. Anal and caudal fins greyish.

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