

Cirrhilabrus beauperryi, a new wrasse (Pisces: Labridae) from Melanesia

Gerald R. Allen¹, Joshua Drew^{2,3} and Paul Barber²

- 1) Department of Aquatic Zoology, Western Australian Museum, Locked Bag 49, Welshpool DC, Perth, Western Australia 6986. Email: tropical_reef@bigpond.com
- 2) Boston University Marine Program, 5 Cummington Street, Boston, MA 02215, USA
- 3) Marine Biological Laboratory, 7 MBL Street, Woods Hole, MA 02543, USA

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Abstract

Cirrhilabrus beauperryi is described from eight specimens, 49.0–85.1 mm SL, collected at Milne Bay Province, Papua New Guinea. Field observations also reveal its occurrence at the Bismarck Archipelago (New Britain, New Ireland, and Manus), Madang (Papua New Guinea), and Solomon Islands. The new species is closely related to and has frequently been confused with *C. punctatus* from Fiji, Tonga, New Caledonia, eastern Australia and southern Papua New Guinea. The two species are clearly separable on the basis of colour pattern. Terminal-phase individuals of *C. beauperryi* are generally purplish grading to blue ventrally and greenish or yellowish brown dorsally with a broad purple stripe along the basal half of the otherwise pale yellow dorsal fin. In contrast, terminal-phase *C. punctatus* are generally reddish brown to dark grey on the upper two-thirds of the head and body and abruptly white below with broad black stripes along the base of mainly red dorsal and anal fins. They also differ noticeably with respect to the colouration on the base of the pectoral fins: in *C. beauperryi* it is mainly violet with a narrow, inconspicuous purple bar; that of *C. punctatus* is prominently marked with a broad black bar. The pectoral-base marking is also useful for distinguishing initial-phase fish. The terminal phase of *C. beauperryi* also exhibits a unique median head profile characterised by a rounded forehead and concave interorbital region. DNA analysis reveals the two species are genetically distinct.

Zusammenfassung

Cirrhilabrus beauperryi wird anhand von acht Exemplaren mit 49,0 bis 85,1 mm SL beschrieben, die bei der Provinz Milne Bay von Papua-Neuguinea gefangen wurden. Freilandbeobachtungen belegen zusätzlich ihr Vorkommen am Bismarck-Archipel (Neu-Britannien, Neu-Irland und Manus), bei Madang (Papua-Neuguinea) und an den Salomon-Inseln. Die neue Art ist nahe verwandt mit *C. punctatus* von den Fidschis, Tonga, Neu-Kaledonien, Ost-Australien und vom südlichen Papua-Neuguinea und wurde auch oft damit verwechselt. Dem Farbmuster nach lassen sich die beiden Arten aber klar trennen. Die ausgewachsenen Individuen von *C. beauperryi* zeigen allgemein auf der Bauchseite eine purpurfarbene Farbe, die zu Blau übergeht, und

auf der Rückenseite ein grünliches oder gelbliches Braun mit einem breiten purpurnen Streifen an der basalen Hälfte der ansonsten blassgelben Rückenflosse. Im Gegensatz dazu ist *C. punctatus* im voll erwachsenen Stadium allgemein rötlich braun bis dunkelgrau an den oberen zwei Dritteln von Kopf und Rumpf und übergangslos weiß an der Unterseite und zeigt breite schwarze Streifen an der Basis der hauptsächlich roten Rücken- und Afterflossen. Auffällige Unterschiede zeigen sich auch bei der Farbe der Brustflossenbasis: Bei *C. beauperryi* ist sie hauptsächlich violett mit einem schmalen, unauffälligen purpurnen Streifen; bei *C. punctatus* ist der Bereich durch einen breiten schwarzen Streifen markiert. Die Zeichnung der Brustflossenbasis eignet sich auch zur Unterscheidung früherer Stadien. Im ausgewachsenen Stadium zeigt *C. beauperryi* außerdem ein unverkennbares Kopfprofil, das durch eine rundliche Stirn und eine konkave Interorbitalregion gekennzeichnet ist. Die DNA-Analyse bestätigt, dass es sich um zwei getrennte Arten handelt.

Résumé

Cirrhilabrus beauperryi est décrit sur base de huit spécimens, de 49,0 à 85,1 mm de LS, collectés dans la province de Milne Bay, Papouasie-Nouvelle-Guinée. Des observations de terrain révèlent aussi sa présence dans l'Archipel de Bismarck (Nouvelle-Bretagne, Nouvelle-Irlande et Manus), à Madang (Papouasie-Nouvelle-Guinée) et les îles Salomon. La nouvelle espèce est très proche et a souvent été confondu avec *C. punctatus* de Fidji, Tonga, Nouvelle-Calédonie, Australie orientale et du sud de la Papouasie-Nouvelle-Guinée. Les deux espèces se distinguent aisément par leur patron de coloration. Les individus en phase terminale de *C. beauperryi* sont généralement pourpres à bleus du côté du ventre et brun verdâtre à jaunâtre du côté du dos avec une large ligne pourpre le long de la moitié de la base de la dorsale, elle-même jaune pâle. En contraste, les *C. punctatus* en phase terminale sont généralement brun rougeâtre à gris foncé sur les deux tiers supérieurs de la tête et du corps et abruptement blancs en dessous avec de larges lignes noires le long de la base de la dorsale et de l'anale principalement rouges. Elle diffèrent nettement aussi par la coloration à la base des pectorales : chez *C. beauperryi*, surtout violette avec une fine barre discrète, chez *C. punctatus*, cette base est marquée nettement d'une large barre noire. Cette marque de la base de la pectorale con-

vient aussi pour distinguer les poissons en phase initiale. La phase terminale de *C. beauperryi* montre également un profil médian unique de la tête, caractérisé par un front arrondi et une région interorbitale concave. L'analyse de l'ADN révèle que les deux espèces se distinguent génétiquement.

Sommario

Cirrhilabrus beauperryi è descritto sulla base di otto esemplari di 49.0-85.1 mm SL, raccolti nella provincia di Milne Bay, Papua Nuova Guinea. Osservazioni in natura rivelano che la specie è presente anche nell'Arcipelago Bismarck (Nuova Britannia, Nuova Irlanda e Manus), Madang (Papua Nuova Guinea) e Isole Salomone. *Cirrhilabrus beauperryi* è strettamente imparentato con *C. punctatus* presente a Fiji, Tonga, Nuova Caledonia, Australia orientale e Papua Nuova Guinea meridionale e per questo le due specie sono state in passato confuse. Tuttavia, esse sono facilmente distinguibili sulla base della colorazione. Individui in fase terminale di *C. beauperryi* sono generalmente di un colore violaceo che sfuma ventralmente nel blu e nel verdastro o bruno-giallastro dorsalmente, con un'ampia stria porpora lungo la metà inferiore della pinna dorsale che per il resto è di colore giallo pallido. Al contrario, la fase terminale di *C. punctatus* è generalmente da bruno-rossastra a grigio scuro sui due terzi superiori della testa e del corpo e bruscamente bianca al di sotto, con un'ampia stria nera lungo la base delle pinne dorsale e anale principalmente di colore rosso. Le due specie differiscono notevolmente anche per la colorazione alla base della pettorale: in *C. beauperryi* è principalmente violetta con una sottile, quasi invisibile barra purpurea; quella di *C. punctatus* è ben marcata da un'ampia stria nera. Il disegno della base della pettorale è anche utile per distinguere le fasi iniziali delle due specie. Inoltre, la fase terminale di *C. beauperryi* mostra un singolare profilo mediano del capo caratterizzato da una fronte arrotondata e una regione interorbitale concava. L'analisi del DNA rivela che le due specie sono geneticamente distinte.

INTRODUCTION

The labrid genus *Cirrhilabrus* Temminck and Schlegel 1845 contains small, colourful, sexually dimorphic fishes inhabiting mainly rubble bottoms on Indo-west Pacific coral reefs. Parenti & Randall (2000) summarised the 36 known species. An additional nine species have been described since then (Allen 2000, 2006; Senou & Hirata 2000; Randall & Pyle 2001; Randall & Nagareda 2002; Allen et al. 2003; Allen & Erdmann 2006). In addition, we provisionally follow Kuitert (2002) in recognising *C. lyukyuensis* Ishigawa, 1904 as valid rather than a junior synonym of *C. cyanopleura* (Bleeker, 1851). This genus, one of the largest in the family, now contains 46 species (Table I), nearly all of which were illustrated by Kuitert (2002). Remarkably, all except six species were

described after 1974. The widespread use of SCUBA diving gear by scientists has permitted observations and collections of these relatively deep-dwelling fishes. Although some species are common on shallow reefs at depths less than 10 m, many are restricted to depths in excess of 20 to 30 m. Unlike many Indo-Pacific labrids that exhibit broad geographic distributions, *Cirrhilabrus* species are commonly confined to specific regions, often consisting of discrete archipelagos.

The present paper describes a new species that was collected by the first author during fish surveys of eastern Papua New Guinea. Initially it was believed to be a colour variant of *C. punctatus* Randall & Kuitert, 1989. The latter species, which ranges widely from Tonga and Fiji to eastern Australia is also present in Papua New Guinea, but is apparently restricted to coastal reefs immediately east of Port Moresby and the two species exhibit allopatric distributions. Comparisons of the two species revealed numerous colour pattern differences in both initial and terminal phases. These differences were further confirmed by genetic analysis undertaken by the second and third authors.

MATERIALS AND METHODS

Counts and proportions are given for the holotype followed by the range of values (if different than the holotype) for the paratypes in parentheses. Counts of fin spines are given in Roman numerals and soft rays in Arabic. Pectoral-ray counts include the rudimentary upper ray. The lateral line is interrupted; the count of the anterior part is given first, followed by a plus sign and the peduncular part. Only lateral-line scales with tubes are counted. All the tubed scales of the peduncular part are counted, even though one is usually located posterior to the base of the caudal fin. The lateral-line scale and gill raker counts for the holotype includes the count for the left side followed by "/" and count for the right side. The number of scales in the rows on the cheek is counted from where they commence below the front of the orbit to behind the centre of the orbit. Gill-raker counts include all rudiments. Because it may be difficult to determine which raker is at the angle, only the total gill-raker count is given.

Lengths of specimens are given as standard length (SL) except estimates of total length (TL) of fishes photographed underwater; this is the straight-line measurement from the front of the upper lip to the base of the caudal fin (end of hypural plate). Measurements in Table I are given as percentages of the

Table I. Chronological listing of the valid species of the genus *Cirrhilabrus* and their general distributions.

Species	Distribution
1. <i>C. cyanopleura</i> (Bleeker, 1851)	Andaman Sea to Bali
2. <i>C. solorensis</i> Bleeker, 1853	Indonesia
3. <i>C. temminckii</i> Bleeker, 1853	S Japan to W Australia
4. <i>C. jordani</i> Snyder, 1904	Hawaiian Islands
5. <i>C. lyukyuensis</i> Ishigawa, 1904	S Japan to Indonesia
6. <i>C. exquisitus</i> Smith, 1957	Indo-Pacific
7. <i>C. blatteus</i> Springer & Randall, 1974	Red Sea
8. <i>C. rubriventralis</i> Springer & Randall, 1974	Red Sea
9. <i>C. filamentosus</i> (Klausewitz, 1976)	Indonesia
10. <i>C. melanomarginatus</i> Randall & Shen, 1978	Taiwan, Philippines, S China Sea
11. <i>C. rubripinnis</i> Randall & Carpenter, 1980	Sabah, Philippines
12. <i>C. flavidorsalis</i> Randall & Carpenter, 1980	Philippines & E Indonesia
13. <i>C. lubbocki</i> Randall & Carpenter, 1980	Philippines, Indonesia
14. <i>C. laboutei</i> Randall & Lubbock, 1982	SW Pacific
15. <i>C. lineatus</i> Randall & Lubbock, 1982	SW Pacific
16. <i>C. roseafascia</i> Randall & Lubbock, 1982	SW Pacific
17. <i>C. rubrisquamis</i> Randall & Emery, 1983	Maldives, Chagos Archipelago
18. <i>C. sanguineus</i> Cornic, 1987	Mauritius
19. <i>C. balteatus</i> Randall, 1988	Marshall Islands
20. <i>C. johnsoni</i> Randall, 1988	Marshall & Caroline Islands
21. <i>C. luteovittatus</i> Randall, 1988	Marshall & Caroline Islands
22. <i>C. rhomboidalis</i> Randall, 1988	Marshall & Caroline Islands
23. <i>C. scottorum</i> Randall & Pyle, 1989	Coral Sea to Pitcairn Island
24. <i>C. punctatus</i> Randall & Kuitert, 1989	Fiji and Tonga to E Australia
25. <i>C. lunatus</i> Randall & Masuda, 1991	S Japan
26. <i>C. lanceolatus</i> Randall & Masuda, 1991	S Japan
27. <i>C. katherinae</i> Randall, 1992	Japan, Mariana & Caroline Islands
28. <i>C. rubrimarginatus</i> Randall, 1992	Ryukyu Islands to Fiji-Tonga
29. <i>C. randalli</i> Allen, 1995	NW Shelf of Australia
30. <i>C. condei</i> Allen & Randall, 1996	New Guinea
31. <i>C. pylei</i> Allen & Randall, 1996	New Guinea
32. <i>C. walindi</i> Allen & Randall, 1996	N Papua New Guinea
33. <i>C. adornatus</i> Randall & Kunzmann, 1998	Sumatra
34. <i>C. aurantidorsalis</i> Allen & Kuitert, 1999	Tomini Bay, Indonesia
35. <i>C. tonozukai</i> Allen & Kuitert, 1999	E Indonesia
36. <i>C. morrisoni</i> Allen, 1999	Timor Sea
37. <i>C. joanallena</i> Allen, 2000	NW Sumatra
38. <i>C. katoi</i> Senou & Hirata, 2000	Japan
39. <i>C. claire</i> Randall & Pyle, 2001	Cook Islands
40. <i>C. earlei</i> Randall & Pyle, 2001	W Caroline Islands
41. <i>C. walshi</i> Randall & Pyle, 2001	Coral Sea to Samoa
42. <i>C. bathyphilus</i> Randall & Nagareda, 2002	Coral Sea
43. <i>C. marjorie</i> Allen, Randall & Carlson, 2003	Fiji
44. <i>C. brunneus</i> Allen, 2006	Sabah and Philippines
45. <i>C. cenderawasih</i> Allen, 2006	Cenderawasih Bay, W New Guinea
46. <i>C. beauperryi</i> Allen, Drew & Barber, 2008	Papua New Guinea and Solomon Islands

standard length. Head length (HL) is the distance from the front of the upper lip to the posterior end of the opercular membrane. Body depth is the greatest depth to the base of the dorsal fin (adjusting for any malformation of the abdomen due to preservation). Body width is measured just poste-

rior to the opercular flap. Snout length is taken from the front of the upper lip to the fleshy edge of the orbit (if the upper jaw is protruded, it is pressed back to the nonprotractile position before the measurement is taken; the same is true of SL and head length measurements). Orbit diameter is the great-

est fleshy diameter. Interorbital width is the least bony width. Caudal peduncle depth is the least depth. Caudal peduncle length is the horizontal measurement between verticals at the rear base of the anal fin and the caudal-fin base. Measurements of fin spines and rays are taken to the extreme base of these elements. Pectoral-fin length is taken from the tip of the longest ray to the base of this ray. Pelvic-fin length is measured from the base of the spine to the tip of the longest ray.

Type specimens are deposited at the Australian Museum, Sydney (AMS), Western Australian Museum, Perth (WAM), and the Bernice P. Bishop Museum, Honolulu (BPBM).

Genetic data were collected from 10 specimens of *C. punctatus* from Fiji and six specimens of the new taxon from Milne Bay, Papua New Guinea. The specimens were collected with a multi-prong spear and fixed in 95% EtOH. Mitochondrial DNA was extracted using a 10% Chelex solution (Walsh et al. 1991). A portion of the mitochondrial control region was amplified via PCR using the primers CRA & CRE (Lee et al. 1995) and the following thermocycler parameters: initial denature at 94 °C for 4 min and then 40 cycles of 94 °C (30 s), denaturing at 50 °C (30 s), annealing, and 72 °C (40 s) followed by a final extension step of 3 min at 72 °C. A segment of the control region of *Coris julis* (Linnaeus, 1758) was used as an outgroup (Hanel et al. 2002).

Each PCR product was cleaned using a digestion of 5U shrimp alkaline phosphatase and 5U exonuclease for 30 min at 37 °C, followed by 15 min at 80 °C. This cleaned double-stranded product was then directly sequenced using Big Dye 3.0 terminator chemistry (Applied Biosystems) using the PCR primers and manufacturer protocols. Sequencing products were cleaned via isopropanol precipitation and visualized on an ABI377 automated sequencer (Applied Biosystems). Forward and reverse sequences for each region were reconciled and compiled in Sequencher (Gene Codes) with subsequent alignment by eye.

Two methods were used to generate phylogenetic reconstructions: maximum likelihood using PAUP 3.0 (Swofford, 2002) and MR BAYES 3.2 (Ronquist & Huelsenbeck 2003). The HKY+G model of evolution was utilised for the likelihood analysis. This model assumes different rates of transitions and transversions as well as different nucleotide frequencies and was chosen as the appropriate model of evolution as determined by Modeltest 3.06 (Posada & Crandall 1998).

Heuristic searches were performed for the likelihood reconstruction using 100 random taxon addition replicates with tree bisection and reconnection (TBR) branch swapping. Bootstrap support was determined using 100 bootstrap replicates, each using 10 random taxon addition replicates with TBR branch swapping. For the Bayesian analysis we used a Markov Chain Monte Carlo approach with four chains and heating set to 0.6. Analyses were run for 1000000 generations with an initial burn-in of 250000 generations. After 1000000 generations the resulting phylogeny was checked for convergence using the AWTY program (Wilgenbusch et al. 2004). Phylogenetic reconstructions were performed in parallel on a Beowulf cluster housed at the Marine Biological Laboratory, Woods Hole, Massachusetts.

Cirrhilabrus beauperryi n. sp.

Beau's Wrasse

(Figs 1-4, Tables II-III)

Holotype: WAM P.32933-001, male, 85.1 mm SL, Kwato Island, 10°37.024'S 150°38.029'E, Milne Bay Province, Papua New Guinea, 6-10 m depth, spear, G. R. Allen, 3 December 2003.

Paratypes: AMS I.44570-001, 2 specimens 65.8-76.8 mm SL, collected with holotype; BPBM 36969, 3 specimens, 49.0-52.0 mm SL, Normanby Island, off north end of Gallow's Point, 10°15'24"S 151°10'18"E, D'Entrecasteaux Islands, Papua New Guinea, 11.5 m depth, fence net and hand net, J. L. Earle and R. L. Pyle, 11 December 1995; WAM P.31732-001, 66.3 mm SL, Rossel Island, approximately 11°18'S 155°00'E, Milne Bay Province, Papua New Guinea, 10-12 m depth, spear, G. R. Allen, 18 June 2000; WAM P.32933-002, 62.2 mm SL, collected with holotype.

Diagnosis: Dorsal rays XI,9; anal rays III,9; pectoral rays 15; lateral-line scales 14-17 + 6-9; median predorsal scales 6; horizontal scale rows on cheek below eye 2; gill rakers 17-20; body depth 3.0-3.1 in SL; head length 3.1-3.3 in SL; snout length 3.6-4.0 in head; median head profile of adult male slightly concave at interorbital; caudal fin rounded; pelvic fins of males elongate and filamentous, reaching level of posterior half of anal fin; diagnostic live colour pattern features of terminal phase (male) includes a general purplish body, grading to blue ventrally and greenish or yellowish

brown dorsally, with a broad purple stripe along the basal half of the otherwise pale yellow dorsal fin, and a thin purple bar across the violet-coloured pectoral-fin base; initial phase mainly dull purplish red with a small blackish spot on dorsal portion of caudal peduncle.

Description: Dorsal rays XI,9; anal rays III,9; dorsal and anal soft rays branched except first and

second rays of dorsal fin and first ray of anal fin; the last dorsal and anal soft rays branched to base; pectoral rays 15, the upper two unbranched; pelvic rays I,5; principal caudal rays 13, the upper and lower rays unbranched; upper and lower procurrent caudal rays 3 (3-4); lateral-line 14 + 9/17 + 8 (15-17 + 6-9); scales above lateral line to origin of dorsal fin 2; scales below lateral line to anus 6;



Fig. 1. Underwater photograph of terminal phase (male) *Cirrhilabrus beauperryi* in courtship display, approximately 115 mm TL, 15 m depth, Milne Bay Province, Papua New Guinea. Photo by G. R. Allen.



Fig. 2. Underwater photograph of terminal phase (male) *Cirrhilabrus beauperryi*, approximately 100 mm TL, 25 m depth, New Georgia, Solomon Islands showing pronounced concavity of dorsal head profile. Photo by G. R. Allen.

median predorsal scales 6; median preventral scales 7; transverse scale rows on cheek 2, the upper row with 9 (7-9) and the lower row with 9 (7-10) scales; circumpeduncular scales 16; gill rakers 19/18 (17-20).

Body moderately elongate, the depth 3.1 (3.0-3.1) in SL; body compressed, the width 2.1 (2.1-2.3) in depth; dorsal profile of head rounded on nape of adult male, the interorbital distinctly concave medially; head profile nearly straight in initial-phase fish, becoming slightly convex on nape; head length 3.3 (3.1-3.3) in SL; snout moderately

pointed, its length 4.0 (3.6-3.9) in head; orbit diameter 4.9 (3.9-4.4) in head; interorbital space slightly convex medially, strongly convex laterally, the least bony width 4.1 (3.6-4.1) in head; caudal-peduncle depth 2.1 (2.0-2.1) in head; caudal-peduncle length 2.1 (1.7-2.3) in head.

Mouth terminal and oblique, forming an angle of about 30 degrees to horizontal axis of body; mouth small, the maxilla just reaching a vertical at posterior nostril, the upper-jaw length 4.6 (4.1-4.7) in head; dentition of holotype typical of the genus with three pairs of canine teeth anteriorly at sides



Fig. 3. Underwater photograph of initial phase (female) *Cirrhilabrus beauperryi*, approximately 60 mm TL, 10 m depth, Milne Bay Province, Papua New Guinea. Photo by G. R. Allen.



Fig. 4. *Cirrhilabrus beauperryi*, male holotype, 85.1 mm SL, Milne Bay Province, Papua New Guinea. Photo by G. R. Allen.

Table II. Proportional measurements of type specimens of *Cirrhilabrus beauperryi* expressed as percentage of the standard length.

	Holotype WAM P.32933	Paratype AMS I.44570	Paratype AMS I.44570	Paratype WAM P.32933	Paratype WAM P.31732
Sex	male	male	female	female	female
Standard length (mm)	85.1	76.8	65.8	62.2	66.3
Body depth	32.0	31.8	33.1	33.0	33.0
Body width	15.5	15.1	15.0	15.0	14.5
Head length	30.6	29.9	31.6	31.4	32.6
Snout length	7.6	8.3	8.2	8.5	8.4
Eye diameter	6.2	6.8	7.6	8.0	7.8
Interorbital width	7.5	7.9	8.4	8.7	8.0
Upper jaw	6.6	6.4	7.6	7.6	7.1
Depth of caudal peduncle	14.6	15.1	16.0	15.9	15.2
Length of caudal peduncle	14.6	17.6	14.9	15.4	14.2
Predorsal distance	30.7	29.4	32.7	33.9	30.3
Preanal distance	59.7	60.2	63.2	58.8	61.8
Prepelvic distance	32.4	32.4	32.1	33.8	36.5
Length of dorsal fin base	58.8	57.0	55.0	57.2	57.5
1st dorsal spine	7.4	7.9	7.4	7.1	7.7
Last dorsal spine	13.2	12.4	13.2	13.3	13.6
Longest soft dorsal ray	20.1	18.2	18.1	16.7	17.0
Length of anal fin base	27.8	25.7	26.0	25.4	24.0
1 st anal spine	4.8	5.9	5.3	5.9	5.4
2 nd anal spine	6.9	7.4	8.2	9.2	8.7
3 rd anal spine	9.8	10.0	9.9	10.6	11.5
Longest soft anal ray	18.8	19.1	18.4	17.5	18.3
Caudal fin length	23.6	24.5	26.6	25.4	26.5
Pectoral fin length	23.5	22.7	24.5	24.0	24.7
Pelvic fin spine length	11.6	11.1	12.6	12.9	12.2
Pelvic fin length	49.6	47.8	43.8	26.8	39.8

of upper jaw, the first forward-projecting, the next two strongly recurved and outcurved, the third much the longest; an irregular row of very small conical teeth medial to upper canines; side of upper jaw with about 18-20 small conical teeth; lower jaw with a single pair of forward-projecting canines and a row of very small conical teeth in the symphyseal gap; side of lower jaw with a row of about 20 small conical teeth, decreasing in size posteriorly; gill rakers small, the longest on first branchial arch less than half length of longest gill filaments.

Posterior margin of preoperculum with 35 (26-42) very fine serrae; margins of posterior and ventral edges of preoperculum free to about level of middle of pupil; anterior nostril small and inconspicuous, in a short membranous tube with a posterior flap, located anterior to upper edge of eye nearly one-half distance to front of upper lip; aperture of posterior nostril much larger than any head pores, without elevated rim, located posterior and

slightly dorsal to anterior nostril on a vertical with anterior, bony edge of orbit; pores of cephalic lateralis system adjacent to ventroposterior half of orbit 16; a series of 8 pores along margin of preoperculum linking with 3 on mandible to front of chin; a series of 12 pores from above upper edge of preoperculum passing dorsal to orbit and ending in front of anterior nostril; a series of 9 pores on each side of head from first lateral-line scale to front of scaled part of nape, plus 3 mid-interorbital pores.

Scales cycloid; head scaled except snout, interorbital space, and ventrally; lowermost of two transverse rows of scales below eye larger than upper; naked flange of ventral edge of preoperculum about half height of lower row of scales; base of dorsal and anal fins with a row of large elongate scales, one per membrane (except first scale which covers membranes of first and second spines), the longest about two-thirds spine length (basal scales progressively shorter posteriorly on membranes of soft portion of fin); peduncular lateral-line scales

Table III. Counts of pectoral rays, gill rakers, and anterior lateral-line scales of *Cirrhilabrus beauperryi* and *C. punctatus*. Counts for *C. punctatus* from Randall & Kuitert (1989). Counts recorded on both sides of *C. beauperryi* specimens.

Species	Pectoral rays				Gill rakers				
	14	15	16		16	17	18	19	20
<i>C. beauperryi</i>		16				1	6	5	4
<i>C. punctatus</i>	3	51	3		1	15	24	15	2
Anterior lateral-line scales									
Species	14	15	16	17	18				
<i>C. beauperryi</i>	1	2	9	4					
<i>C. punctatus</i>			18	37	2				

followed by one slightly larger pored scale (included in lateral-line count) on base of caudal fin with a slightly posterior scale above and below, these three scales followed by a vertical row of three enormous scales, the middle one overlapping the ones above and below, reaching two-thirds distance to central, posterior margin of fin; pectoral fins scaleless; pelvic fins with a median ventral process of two elongate scales, the more pointed posterior scale about two-thirds length of pelvic spine; slender axillary scale of each pelvic fin extending about one-third to one-half length of pelvic spine.

Origin of dorsal fin above third lateral-line scale; first dorsal spine 4.1 (3.8-4.4) in head; remaining dorsal spines progressively longer, the last 2.3 (2.3-2.4) in head; interspinous membranes of dorsal fin extending above spine tips, supported by the terminal cirrus projecting upward from just behind each spine tip; penultimate dorsal soft ray the longest, 1.5 (1.6-1.9) in head; origin of anal fin on a vertical with base of penultimate dorsal spine; first anal spine 6.3 (5.1-6.0) in head; second anal spine 4.4 (3.4-4.0) in head; third anal spine 3.1 (2.8-3.2) in head; penultimate anal soft rays longest, 1.5 (1.6-1.9) in head; caudal fin rounded, its length 1.3 (1.2) in head; third and fourth pectoral rays longest, 1.3 in head; origin of pelvic fins below pectoral-fin base; pelvic-fin length 2.0 (2.1-3.7) in SL, the pelvic-fin tips extending well past mid-point of anal-fin base in adult males when depressed; length of pelvic-fin spine 2.6 (2.4-2.7) in head.

Colour in life (from underwater digital photographs, Figs 1-2): terminal phase generally purple over middle portion of head and body grading to blue ventrally with 2-3 small blue spots (middle part of body) or irregular bars (ventral portion of

body) on each scale; upper portion of head (above level of eye), nape and back variable, ranging from highly contrasting light pink or yellowish tan (during courtship) to dull greenish or yellowish brown, frequently a combination of these colours with tan area on upper head and dull greenish brown or yellowish brown on back extending to below anterior portion of soft-dorsal fin; pupil rimmed with relatively broad zone of yellow with narrower outer margin of deep purple; vertically elongate scales on basal half of dorsal fin purple with row of blue spots or dashes near the outer margin of purple area, remainder of fin largely yellowish with narrow bright blue margin; soft portion of dorsal fin with scattered blue spots or faint blue horizontal lines; caudal-fin membrane slightly yellowish covered with numerous bright blue spots, with narrow bright blue outer margin, the fin rays purple; anal fin mainly greenish brown with yellow suffusion and scattered bright blue spots, a bluish band covering about basal one-third of fin, and narrow bright blue outer margin; pelvic fins mainly bluish except purple on first 2-3 soft rays including elongate filamentous extension; pectoral fins translucent with narrow pinkish area at base.

Courting males (Fig. 1) exhibit exaggerated neon-blue spotting on the body and fins and frequently possess a broad area of light yellowish tan extending from the upper rear corner of the eye to the region above the pectoral fin. They are also capable of quickly “switching” on 1-2 rectangular pink or reddish markings on the basal half of the dorsal fin.

Initial-phase fish (Fig. 3) mainly dull purplish red with yellowish fin membranes and purple fin rays; a purple band along base of dorsal fin and narrow purplish bar at base of pectoral fin; usually a small blackish spot on dorsal portion of caudal peduncle present to about 60-65 mm SL; small juveniles (< about 30 mm SL) with white spot on tip of snout.

Colour in alcohol (Fig. 4): after four years of preservation, male holotype mainly purplish brown with 1-3 faint blue spots on most body scales; snout, interorbital, cheek, and nape tan, slightly lighter than rest of body; median fins purplish blue basally and pale tan on outer portion; pelvic fins dusky purple; pectoral fins semi-translucent with narrow blackish bar across base.

Paratypes brown on upper two-thirds of head and body, whitish below; small (< half pupil size) black spot on dorsal half of caudal peduncle; dorsal fin purplish on basal half and whitish on outer portion, a diffuse blackish spot on first two dorsal spines;



Fig. 5. Underwater photographs of *Cirrhilabrus punctatus*, adult males, approximately 120 mm TL, Port Moresby, Papua New Guinea (upper) and courtship colouration at Fiji (lower). Photos by G. R. Allen.

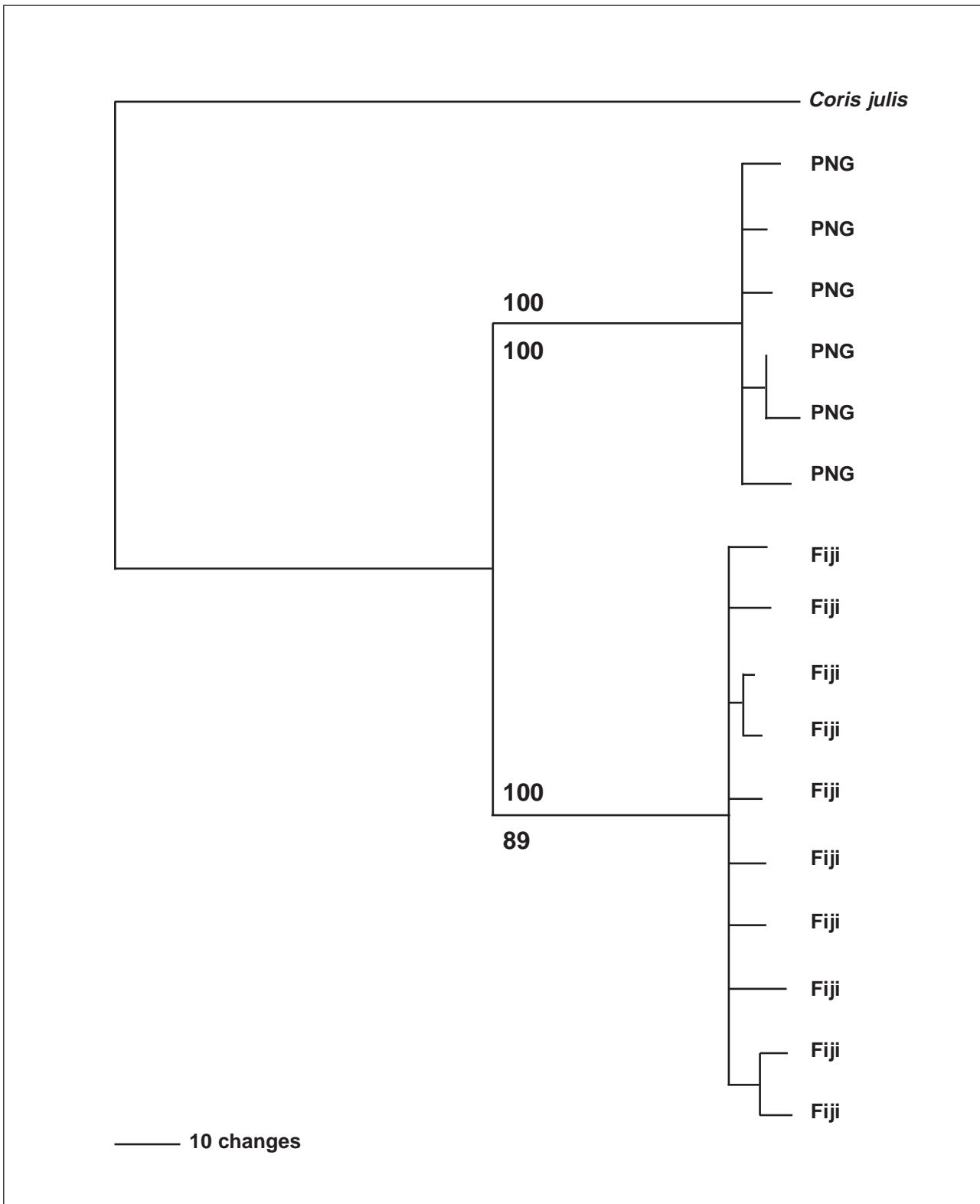


Fig. 6. Bayesian reconstruction of phylogenetic relationships of the mitochondrial control region for *Cirrhilabrus beauperryi* (Papua New Guinea) and *C. punctatus* (Fiji). Posterior probabilities after 1000000 generations appear above the nodes. Maximum likelihood bootstrap support values after 100 replicates appear below the nodes.

caudal and anal fins bluish, grading to whitish on outer edge, with faint indication of pale spotting; pelvic fins dusky purple; pectoral fins semi-translucent with narrow blackish bar across base.

Remarks: *Cirrhilabrus beauperryi* was previously confused with *C. punctatus* (Fig. 5) from eastern Australia, Lord Howe Island, southern Papua New Guinea, Coral Sea, New Caledonia, Fiji, and Tonga. For example, Kuitert (2002, fig. C on page 25) illustrated a specimen from Milne Bay, Papua New Guinea. Although generally similar in morphology, meristics (e.g. Table III), ecology, and behaviour, the two species are readily separable on the basis of colour differences. The adult male of the new species also exhibits a distinctive head profile, consisting of a notably convex forehead and slightly concave interorbital (Fig. 2). In contrast, the head profile of *C. punctatus* and other members of the genus are evenly rounded to slightly convex. Other diagnostic features of the adult male include a purplish body that grades to blue ventrally, a noticeably pale forehead, a narrow purple bar across the violet-coloured pectoral-fin base, and a broad purple to blue basal stripe with uneven margins on the dorsal and anal fins, a broad yellowish outer dorsal fin, and a mainly purple caudal fin with numerous small blue spots. Contrasting characters of male *C. punctatus* include a reddish brown to dark grey body that abruptly becomes white ventrally, a uniformly coloured forehead that blends with the body colouration, a prominent broad, blackish bar across the pectoral-fin base, a black stripe covering the basal half of dorsal and anal fins, becoming red on the outer portion, and a dull greenish yellow caudal fin with relatively few blue spots. Initial-phase (female) individuals also exhibit substantial colour differences. *Cirrhilabrus beauperryi* is generally dull purplish red with faint blue spots on the body, a blue belly, broad purplish stripe at the base of the dorsal fin, and narrow inconspicuous purple bar across the pectoral-fin base. The initial phase of *C. punctatus* is generally brighter red with prominent blue spotting, a white to pinkish belly, predominately red dorsal and anal fins, and a broad black bar across the pectoral-fin base. Small juveniles (< about 30 mm SL) of both species possess a white snout tip, a feature that is apparent in the juvenile stage of numerous *Cirrhilabrus*.

Randall & Kuitert (1996) reported a range of values between 8.1 to 9.3 percent of the SL for the first dorsal-spine length of *C. punctatus* in comparison to 7.1 to 7.9 reported in the present description of *C. beauperryi*.

However, we have examined 15 specimens of *C. punctatus*, 78.3 to 97.5 mm SL, including two paratypes (USNM 238840 from Tonga), and the range of values for the first dorsal-spine length completely overlaps those of *C. beauperryi*.

The type specimens were collected at Milne Bay Province, Papua New Guinea. However, recent underwater surveys by the first author confirmed its presence at the Solomon Islands and other locations in Papua New Guinea including the Bismarck Archipelago (New Britain, New Ireland, and Manus) and vicinity of Madang. It is one of the most common labrids encountered on reefs of the Solomon Islands and Milne Bay Province. It occurs on lagoon and outer reefs in areas exposed to periodic strong current at depths of about 5 to 30 m. The species apparently feeds on zooplankton a short distance above the bottom, which is typical for the genus.

Genetic results: We were successful in resolving a 520 base pair segment of the control region, of which 362 bases were variable and 155 were phylogenetically informative. Base composition was A 33%, C 21%, G 16%, and T 29%, which is typical for fish control region studies (Lee et al. 1995). Intra-clade pairwise genetic difference ranged from 0.009 to 0.031 within the Fijian populations and 0.009 to 0.027 in the populations from Papua New Guinea; inter-clade difference between the two groups was an order of magnitude greater, ranging between 0.154 and 0.176. Both the likelihood and Bayesian analyses resolved two clades that demonstrate a reciprocally monophyletic relationship (Fig. 6).

While extensive efforts to generate data from the nuclear genome were unsuccessful, we feel that the topology of this tree is evidence for genetic isolation. Genetic data have a high level of type II error – that is high levels of false negatives. Therefore the evidence of reduction of gene flow from the mitochondrial gene, especially considering the ratio of intra- to inter-clade distance supports our hypothesis of separate evolutionary origins for these two groups.

Etymology: This species is named *beauperryi* in honour of Beau Perry on the occasion of his birthday. This name honours the request of his parents, Claire and Noel Perry, who have generously supported Conservation International, a leading non-governmental organization dedicated to preserving global biodiversity.

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REFERENCES

- ALLEN, G. R., 2000. Description of a new wrasse (Pisces: Labridae: *Cirrhilabrus*) from northern Sumatra, Indonesia. *aqua, Journal of Ichthyology and Aquatic Biology* **4** (2): 45-50.
- ALLEN, G. R., 2006. *Cirrhilabrus brunneus*, a new wrasse (Pisces: Labridae) from northeastern Kalimantan, Indonesia. *aqua, Journal of Ichthyology and Aquatic Biology* **11** (1): 1-4.
- ALLEN, G. R. & ERDMANN, M. V. 2006. *Cirrhilabrus cenderawasih*, a new wrasse (Pisces: Labridae) from Papua, Indonesia. *aqua, Journal of Ichthyology and Aquatic Biology* **11** (3): 125-131.
- ALLEN, G. R., RANDALL, J. E. & CARLSON, B. A. 2003. *Cirrhilabrus marjorie*, a new wrasse (Pisces: Labridae) from Fiji. *aqua, Journal of Ichthyology and Aquatic Biology* **7** (3): 103-112.
- HANEL, R., WESTNEAT, M. W. & STURMBAUER, C. 2002. Phylogenetic relationships, evolution of broodcare behaviour, and geographic speciation in the wrasse tribe Labrini. *Journal of Molecular Evolution* **55**: 776-689.
- KUITER, R. H. 2002. *Fairy and rainbow wrasses and their relatives*. TMC Publishing, Chorleywood, U.K., 208 pp.
- LEE, W. J., HOWELL, W. H., & KOCHER, T. D. 1995. Structure and evolution of teleost mitochondrial control regions. *Journal of Molecular Evolution* **41**: 54-66.
- PARENTI, P. & RANDALL, J. E. 2000. An annotated checklist of the species of the labroid fish families Labridae and Scaridae. *Ichthyological Bulletin, J. L. B. Smith Institute of Ichthyology* **68**: 1-97.
- POSADA, D. & CRANDALL, K. A. 1998. Modeltest: testing the model of DNA substitution. *Bioinformatics* **14**: 817-818.
- RANDALL, J. E. & KUITER, R. H. 1989. *Cirrhilabrus punctatus*, a new species of labroid fish from the southwestern Pacific. *Revue française d'Aquariologie* **16** (2): 43-50.
- RANDALL, J. E. & NAGAREDA, B. H. 2002. *Cirrhilabrus bathyphilus*, a new deep-dwelling labrid fish from the Coral Sea. *Cybium* **26** (2): 123-127.
- RANDALL, J. E. & PYLE, R. L. 2001. Three new species of labrid fishes of the genus *Cirrhilabrus* from islands of the tropical Pacific. *aqua, Journal of Ichthyology and Aquatic Biology* **4** (3): 89-98.
- RONQUIST, F. & HULSENBECK, J. P. 2003. MRBAYES 3: Bayesian phylogenetic inference under mixed models. *Bioinformatics* **19**: 1572-1574.
- SENOU, H. & HIRATA, T. 2000. A new labrid fish, *Cirrhilabrus katoi*, from southern Japan. *Ichthyological Research* **4** (1): 89-93.
- SWOFFORD, D. L. 2002. PAUP. Phylogenetic analysis using parsimony (and other methods), version 4.0b10. Sinauer, Sunderland MA.
- WALSH, P. S., METZGER, D. A. & HIGUCHI, R. 1991. Chelex-100 as a medium for simple extraction of DNA for PCR based typing from forensic material. *Biotechniques* **10**: 506-513.
- WILGENBUSCH, J. C., WARREN, D. L. & SWOFFORD, D. L. 2004. AWTY: A system for graphical exploration of MCMC convergence in a Bayesian phylogenetic inference available at http://king2.scs.fsu.edu/CEBProjects/awty/awty_start.php.