Epinephelus clippertonensis, a New Species of Serranid Fish from the Tropical Eastern Pacific

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Fig. 1. - *Epinephelus clippertonensis*, underwater photograph of adult, approximately 300 mm TL, Clipperton Island in 20 m depth. **G.R. Allen**
Epinephelus clippertonensis, photographie sous-marine d'un adulte, ca 300 mm LT, île Clipperton par 20 m.

Abstract

A new species of grouper, *Epinephelus clippertonensis*, is described from several hundred specimens collected at Clipperton atoll, an isolated reef 1,100 km offshore from Mexico in the tropical Eastern Pacific. It differs from its presumed sister species, *E. labriformis*, which occurs elsewhere throughout the eastern Pacific, in (i) several aspects of its color pattern, (ii) the size and number of scales on the body, (iii) the occurrence of scales on the maxillary, and (iv) the relative interorbital width of large adults.

Introduction

A total of 97 species currently are recognized in *Epinephelus* (**Heemstra** and **Randall** 1993), a circumtropical, serranid genus of moderate to large predatory, benthic reef fishes. These include 19 species from the tropical americas, 8 of which occur in the tropical eastern Pacific, and 11 in the tropical western Atlantic. Two species (*E. itajara*, and *E. mystacinus*) occur in both those regions.

This paper describes a new species of *Epinephelus* that we found at Clipperton Atoll, in the tropical eastern Pacific. Clipperton is the most isolated island in that region (950km from the nearest shoaling reef and 1,100 km from mainland Mexico) and one of the most isolated reefs in the tropics. We collected and photographed that species during a 13 day visit to the island in April 1994, during which we made a detailed analysis of the structure of its fish fauna to assess the level of endemism and its zoogeographic relations (**Allen** and **Robertson** 1994, **Robertson** and **Allen** 1996, **Allen** and **Robertson** 1997).

Materials and Methods

The length given for specimens is standard length (SL); this is the staight-line measurement from the front of the upper lip (with the upper jaw pushed back if protruded) to the base of the caudal fin (end of hypural plate). Head length and snout length are taken from the same anterior point, the former to the posterior end of the the opercular membrane and the latter to the fleshy edge of the orbit. Body depth is the greatest depth from the base of the doral fin, adjusting for any malformation of preservation; body width is the maximum width just posterior to the gill opening. Orbit diameter is the greatest fleshy diameter; the interorbital width is the least fleshy width. Maxilla depth is the greatest depth of the expanded posterior end of the bone plus the supramaxilla. Caudal peduncle depth is the least depth, and caudal peduncle length is the horizontal distance from the posterior of the anal fin base to the caudal-fin base. The lengths of the spines and rays of the median fins are measured to their extreme bases. The pectoral-fin length is the the length of the longest ray; pelvic-fin length is measured from the base of the spine to the tip of the longest ray.

The last dorsal and anal rays, though divided to the base, are counted as one ray. Pectoral-ray counts include the uppermost rudimentary ray. Lateral-line scale counts are made from the upper end of the gill opening to the base of the caudal fin. The longitudinal scale series is the number of diagonal rows of scales counted just above the lateral line to the caudal-fin base. Gill-raker counts are made on the first gill arch and include all rudiments; the raker at the angle is contained in the lower-limb count.

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Data appearing in parentheses in the description refer to the range of values for paratypes. Proportional measurements are given in Table 1 as percentages of the standard length. Many of these same proportions are presented in the text as quotients of larger measurements such as standard length and head length; these are rounded to the nearest 0.5 mm.

Type specimens are deposited at the Los Angeles County Museum (LACM) and National History Museum, Washington, D.C. (USNM).

***Epinephelus clippertonensis*,** new species

Figs 1-3; Table 1

Holotype

USNM 347506, 245 mm SL, Clipperton Island, rotenone in 10-20 m depth, **G. R. Allen** and **D. R. Robertson**, 16-26 April 1994.

Paratypes (all from Clipperton Island) = 312 specimens, 28-340 mm SL

LACM W56-235, 35 specimens, 32-107 mm SL, NE side, 400 yards west of ship wreck, **W.J. Baldwin** and **party**, 20-21 October 1956; LACM W56-238, 44 specimens, 30-120 mm SL, NE side, 1.6 km NW of ship wreck, **W.J. Baldwin** and **party**, 25 October 1956; LACM W56-240, 68 specimens, 28-340 mm SL, SE shore near large rock pinnacle, **W.J. Baldwin** and **party**, 28 October 1956; LACM W58-282, 2 specimens, 41-42 mm SL, **W. J. Baldwin** and **party**, 8 August 1958; LACM W58-283, 54 specimens, 37-145 mm SL, **W. J. Baldwin** and **party**, 9 August 1958; LACM W58-295, 64 specimens, 39-118 mm SL, south shore, midway between coconut grove and rock pinnacle, **W. J. Baldwin** and **party**, 19 August 1958; LACM W58-300, 17 specimens, 29-93 mm SL, small reef pool at west end of island, **W. J. Baldwin** and **party**, 24 August 1958; LACM W58-371, 2 specimens, 78-79 mm SL, NE side of island, **C. Limbaugh**, 16 September 1958; USNM 332389, 26 specimens, 59-91 mm SL, collected with holotype.

Other material examined (80 specimens, 27-325mm SL)

Epinephelus labriformis - **Clarion Island:** USNM 205144, 325 mm SL; USNM 46870, 298 mm SL, USNM 46887, 250 mm SL; USNM 46983, 240 mm SL; USNM 46984, 324 mm SL; USNM 47033, 285 mm SL; USNM 47203, 301 mm SL. **Cocos Island:** USNM 49789, 255 mm SL. **Colombia:** USNM 290553, 2 specimens, 93-108 mm SL. **Galapagos:** USNM 107067, 2 specimens, 67-76 mm SL; USNM 107068, 120 mm SL; USNM 107181, 291 mm SL; USNM 321343, 31 mm SL; USNM 321347, 2 specimens, 27-36 mm SL. **Mexico:** USNM 86254, 109 mm SL; USNM 101014, 249 mm SL; USNM 101057, 279 mm SL; USNM 167146, 4 specimens, 65-102 mm SL; USNM 176143, 143 mm SL; USNM 181290, 30 specimens, 34-142 mm SL; USNM 321342, 46 mm SL, USNM 321344, 138 mm SL; USNM 321350, 39 mm SL. **Panama:** USNM 65693, 91 mm SL; USNM 80266, 2 specimens, 201-229 mm SL; USNM 80267, 2 specimens, 237-302 mm SL; USNM 80282, 193 mm SL; USNM 80283, 240 mm SL; USNM 80284, 244 mm SL; USNM 128501, 2 specimens, 36-45 mm SL; USNM 128768, 3 specimens, 29-60 mm SL; USNM 128770, 212 mm SL; USNM 321341, 38 mm SL; USNM 321345, 189 mm SL; USNM 321346, 185 mm SL; USNM 321348, 46 mm SL; USNM 321349, 53 mm SL. **Peru:** USNM 77627, 174 mm SL; **Soccoro Island:** USNM 107179, 259 mm SL; USNM 46985, 279 mm SL.

Fig. 2. - *Epinephelus clippertonensis*, underwater photograph of adult, approximately 270 mm TL, Clipperton Island in 20 m depth.

Epinephelus clippertonensis, photographie sous-marine d'un adulte, ca 270 mm LT, île Clipperton par 20 m.

Fig. 3. - *Epinephelus clippertonensis*, underwater photograph of adult, approximately 220 mm TL, Clipperton Island in 20 m depth.

Epinephelus clippertonensis, photographie sous-marine d'un adulte, ca 220 mm LT, Clipperton Island par 20 m.

Diagnosis

A species of *Epinephelus* characterized by the following combination of features: dorsal soft rays 15-16; anal soft rays 8; pectoral rays usually 19 (rarely 18); longitudinal scale series about 100-118; lateral-body scales ctenoid with a few auxiliary scales; caudal fin rounded; corner of opercle usually with pair of enlarged serrae; eye large the orbit diameter 5.5-6.0 in head; colour in life pale grey to grey-brown with faint pale spots or blotches scattered on head and body; colour in alcohol mainly plain brown.

Description

Dorsal rays XI,15; anal rays III, 8; pectoral rays 18 (18-20); pelvic rays I,5; principle caudal rays 17; the upper and lower unbranched; procurrent caudal rays 8 ; lateral-line scales 51 (48-51); longitudinal scale series 100 (100-118); scales above lateral line to middle of spinous dorsal fin about 18 (16-18); circumpeduncular scales 50 (46-50); gill rakers 8 + 16 (8-9 + 15-17); branchiostegal rays 7; predorsal bones 2; vertebrate 24.

Body moderately elongate, body depth distinctly less than head length, depth contained 2.8 (2.7-3.0) in SL; body laterally compressed, the maximum width 1.8 (1.7-1.9) in body depth; dorsal profile of head convex; head length 2.2 (2.2-2.5) in SL; eye relatively large, the orbit diameter 5.8 (5.5-6.0) in head; snout 3.7 (3.5-4.2) in head; interorbital space flat, the least width 5.9 (5.8-6.7) in head; suborbital depth 8.7 (8.5-9.0) in head; caudal-peduncle depth 3.4 (3.3-3.8) in head, caudal-peduncle length 2.5 (2.1-2.6).

Mouth large, oblique, forming an angle of about 40° to the horizonal, the maxilla reaches slightly posterior to rear edge of orbit, the upper jaw length 2.2 (2.1-2.3) in head; depth of maxilla about 7.8 (7.8-8.4) in head; a pair of moderately small canine teeth on each side of anterior part of upper and lower jaws (one member of each pair frequently missing), the gap between them across front of upper jaw contained about 2.0 times in orbit diameter; teeth of upper jaw in 6-8 rows, the outer row composed of about 30 fixed teeth on each side; medial inner teeth noticeably longer than others; two rows of teeth along side of lower jaw, the inner row about twice as long as the outer and depressible; inner row of teeth expanding to five or six rows anteriorly in lower jaw, the most medial of which extend into the symphyseal gap as far forward as the canines; villiform teeth in several irregular rows on vomer and palatines, those on vomer forming a V-shape. Tongue moderately slender the tip rounded. Longest gill raker on first gill arch at angle, its length clearly greater than longest gill filaments, 2.2 (2.0-2.5) in orbit diameter; no small bony platelets on side of gill arch. Nostrils small, subequal, in front of centre of eye, and close together; anterior nostril not tubular but with a well-developed membranous flap on its rear margin which extends slightly beyond front edge of posterior nostril.

Opercle with three broad spines, the uppermost small, only slightly above base of middle spine, and difficult to detect; middle and lower spines very large, their tips about equally posterior and closer together than the distance from middle to upper spine; ventral edge of preopercle smooth the posterior margin with 40-52 fine serrae with serrae increasing in size ventrally; margins of subopercle and interopercle usually smooth; opercular membrane pointed, the upper edge staight or slightly convex.

Lateral line slightly arched over pectoral region, paralleling contour of back to straight peduncular part; scales cycloid on head, thorax, abdomen, and antero-dorsally on body, ctenoid elsewhere on body; a few scattered auxiliary scales sometimes present on body; a few small embedded scales on middle section of maxilla; very small scales on the inner half to two-thirds of the median, pectoral, and pelvic fins.

Origin of dorsal fin over fourth lateral-line scale; membranes of spinous portion of dorsal moderately incised; the first dorsal spine about half length of second spine; second dorsal spine contained about 1.2 times in third spine, third or fourth spine longest, 2.7 (2.7-3.3) in head; all dorsal and anal rays branched, the last to base; tips of posterior dorsal soft rays almost reaching a vertical through caudal-fin base; tips of posterior anal soft rays distinctly short of caudal-fin base; fifth or sixth dorsal soft ray longest, 3.1 (2.8-3.3) in head. Origin of anal fin below base of second dorsal soft ray; first anal spine 2.0 (1.9-2.1) in second spine; second anal spine slightly longer than third spine, 4.1 (3.8-4.3) in head; third or fourth anal soft ray longest, 2.5 (2.2-2.6) in head. Caudal fin rounded, 2.1 (1.9-2.1) in head. Pectoral fins not fleshy, the rays branched except the short uppermost and lowermost rays; seventh to ninth pectoral rays longest, 1.8 (1.7-2.0) in head. Origin of pelvic fins slightly behind level of lower pectoral-fin base; pelvic fins not reaching anus, 2.4 (2.1-2.5) in head.

Colour in life: generally pale grey or light grey-brown with white botches, spots, and flecks scattered on head and body (Fig. 1); individual fish are capable of "switching" on a pronunced dark brown background coloration above a line extending from the snout tip to the base of the last dorsal spine (Fig. 2) - thus providing more contrast for the white markings; fins generally pale grey with narrow white margins and spinous dorsal fin with submarginal brown band. Fish occasionally displayed a blotchy camouflage color pattern (Fig. 3) consisting of a darker ground colour and prominent diagonal brown band extending from the snout, through the eye to the rear edge of the preoperculum.

Colour of holotype in alcohol: body and fins entirely dark brown, slightly lighter on breast; margin of caudal fin narrowly white; no dark saddle on caudal peduncle or pale blotches on head and body. Adult paratypes are mainly plain brown, but occasionally some light speckling is evident, especially on the posterior half of the body. Juveniles under 100 mm SL are overall dark brown with horizontal rows of wavy whitish lines, overlaid by the typical larger white blotches and spots (especially noticeable on opercle, breast, and base of pectoral fins). There is also a blackish blotch on the dorsal surface of the caudal peduncle. Fins of juveniles are mainly dark brown, but have a prominent white margin.

Remarks

Our analysis of the fish fauna of Clipperton Island in 1994 revealed 115 species of shorefishes, including roughly equal proportions of species with eastern Pacific and Indo-west Pacific affinities (**Robertson** and **Allen**, 1996, **Allen** and **Robertson** 1997). *E. clippertonensis* is one of nine species or subspecies endemic to Clipperton, all but one of which have eastern Pacific affinities (Table 2, and see **Allen** and **Robertson** 1997).

E. clippertonensis is closely related to *E. labriformis* (Fig. 4). The latter is widespread throughout the remainder of the tropical eastern Pacific, occurring at both the continental limits of the region and the other offshore islands (Revillagigedos, Cocos and Galapagos). The two species are separable on the basis of coloration, interorbital width, and scalation: Preserved adults of *E. labriformis* generally exhibit prominent pale spots and botches on the head and body and a black saddle dorsally on the caudal peduncle, both of which are generally absent in *E. clippertonensis*, although juveniles and subadults possess these markings. Live individuals of the two species have similar color patterns, but the black marking dorsally on the caudal peduncle is distinct in *E. labriformis* (at least in mainland populations) and very faint in *E. clippertonensis* (adults). In life the ground color of the body and fins is is greyish to pale brownish grey in *E. clippertonensis* (Figs 1-3), whereas it is greenish grey in *E. labriformis* (Fig. 4). There is a slight difference with regards to interorbital width between the two species in specimens exceeding about 200 mm SL. In *E. clippertonensis* the interorbital width is approximately equal to the orbit diameter (interorbital fits into orbit 1.0-1.2, usually 1.1), but in *E. labrifomis* the interorbital is usually less than the orbit diameter (fits into orbit 1.1-1.4, usually 1.2-1.4). Scales generally are smaller in *E. clippertonensis* than *E. labriformis*. This difference is manifested in the number of circumpeduncular scales, which range from 46 to 50 in *E. clippertonensis* and 34 to 40 in *E. labriformis*, and the number of scales above the lateral line to the base of the middle dorsal spines (16-18 in *E. clippertonensis vs* 11-12 in *E. labriformis*). Another difference is associated with the anterior portion of the maxillary, which frequently bears a few small embedded scales in *E. clippertonenis*, but is invariably scaleless in *E. labriformis*.

Table 1
Proportional measurements of selected type specimens of *Epinephelus clippertonensis* expressed as percentages of the standard length.
Dimensions relatives de spécimens choisis de *Epinephelus clippertonensis* exprimées en pourcentages de la longueur standard.

	Holotype USNM	Paratype LACM W56-240	Paratype LACM W56-240	Paratype LACM W56-240	Paratype LACM W56-240	Paratype LACM W56-240
Standard length (mm)	245	337	318	300	295	292
Body depth	363	342	336	330	369	363
Head length	445	402	431	433	427	418
Snout length	120	104	104	123	102	106
Orbit diameter	077	074	075	073	071	075
Interorbital width	076	060	069	070	069	065
Upper-jaw length	204	184	195	197	197	192
Upper-jaw width	057	052	053	053	051	051
Caudal-peduncle depth	131	115	116	113	129	116
Caudal-peduncle length	176	178	164	173	203	161
Predorsal length	424	391	418	410	393	394
Preanal length	718	722	745	707	780	716
Prepelvic length	445	412	440	450	434	421
Dorsal-fin base	567	540	531	537	532	534
Longest dorsal spine	163	123	132	160	142	147
Longest dorsal ray	143	131	145	133	142	147
Anal-fin base	159	166	151	160	169	164
Third anal spine	098	086	097	087	088	096
Longest anal ray	180	153	186	170	193	171
Caudal-fin length	216	199	223	217	224	216
Pectoral-fin length	241	205	242	217	227	243
Pelvic-spine length	106	086	088	093	095	086
Pelvic-fin length	188	181	208	193	197	192

Table 2
Species and subspecies of fishes endemic to Clipperton Atoll, tropical eastern Pacific.
Espèces et sous-espèces endémiques de Poissons à Clipperton Atoll, Pacifique oriental tropical et distribution des espèces soeurs.

Family	Clipperton endemic	Sister species (Distribution)
Holocentridae	*Myripristis gildii*	*M. berndti* (Indo-Pacific)
Serranidae	*Epinephelus clippertonensis*	*E. labriformis* (E. Pacific)
Serranidae	*Pseudogramma axelrodi*	*P. thaumasium* (E. Pacific)
Pomacanthidae	*Holacanthus limbaughi*	*H. passer* (E. Pacific)
Pomacentridae	*Stegastes baldwini*	*S. leucoris beebei* (Galapagos & Cocos, E. Pacific)
Labridae	*Thalassoma robertsoni*	*T. lucasanum* (E. Pacific)
Labridae	*Xyrichtys wellingtoni*	*X. perlas*? (E. Pacific)
Blenniidae	*Ophioblennius steindachneri clippertonensis*	*O. steindachneri steindachneri* (E. Pacific)
Gobiidae	*Bathygobius arundelii*	*Bathygobius* spp. (E. Pacific)

Fig. 4. - *Epinephelus labriformis*, underwater photograph of adult, approximately 250 mm TL, Isla Santiago, Galapagos, in 20 m depth.
Epinephelus labriformis, photographie sous-marine d'un adulte, ca 250 mm LT, île Santiago, Galapagos, par 20 m.

Grove and **Lavenberg** (1997) noted variation in the scalation and otolith morphology between populations of *E. labriformis* at Clipperton, the Galapagos and the mainland, which they suggested might represent species-level differences. They also noted that, if in fact three species are eventually recognized, the name *E. labriformis* would be retained for the Galapagos population as that species was first collected there by **Charles Darwin**.

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RÉSUMÉ

Epinephelus clippertonensis n.sp., une nouvelle espèce de Serranidé du Pacifique oriental tropical

Un Mérou d'une espèce inédite est décrit sur plusieurs centaines d'exemplaires (312 paratypes) récoltés à Clipperton Atoll, le récif le plus isolé de la région, à 950 km du récif superficiel le plus proche et 1100 km de la côte mexicaine, dans le Pacifique oriental tropical.

97 espèces sont ordinairement reconnues chez *Epinephelus*, genre circumtropical de Serranidés, prédateurs de tailles moyenne à grande, benthiques et récifaux, dont 19 en Amérique tropicale : 8 d'entre elles présentes dans le Pacifique oriental et 11 dans l'Atlantique occidental, *E. itajara* et *E. mystacinus* appartenant aux deux régions.

La nouvelle espèce s'écarte de son espèce soeur présumée, *E. labriformis,* qui se rencontre partout dans le Pacifique oriental, par divers aspects de son patron de coloration, la taille et le nombre des écailles du corps, la présence d'écailles sur le maxillaire et la largeur interorbitaire relative des grands adultes (340 mm LS).