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Xyrichtys victori, a New Species of Razorfish from the Galápagos Islands (Teleostei: Labridae)

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The razorfish Xyrichtys victori is described from specimens collected in 1990 in the Galápagos Islands. Males of this species are distinctive in color, being bright blue-green, and remarkable for having patterns of black markings that differ substantially from one individual to another. Large groups of X. victori are found on open sandbeds in association with colonies of the endemic Galápagos garden eel, Taenioconger klausewitzi.

THE Galápagos Islands are widely known for their unique terrestrial animals, yet they also harbor an unusual assemblage of fish species. Although the majority of Galápagos shorefishes are widespread eastern Pacific species, there are representatives from both the western Pacific coral reef fauna and the temperate Peruvian coastal fauna. There is also a prominent group of endemic forms. Of the estimated 306 species of shorefish and nearshore pelagics, nearly 17% are considered to be endemic (McCosker and Rosenblatt, 1984). On an expedition to the Galápagos Islands in April 1990, we collected 13 species of wrasses (Labridae), including three razorfishes. One of the razorfishes is quite distinctive and is described here as *Xyrichtys victori.* It is the only endemic labrid species known from the Galápagos.

Most species of razorfishes have been united in the genus *Xyrichtys* Cuvier, formerly *Hemipteronotus* Lacépède (Randall, 1965). The diagnostic characters of this genus are described by Randall (1965). Most razorfishes are very compressed and deep bodied, with a sharp keel-like forehead, which becomes almost vertical in profile in the adult. These fishes typically live in open sandy areas near reefs, where their unusual body form is well adapted for diving into sand. The taxonomy and distribution of the Indo-Pacific razorfishes is not well known, probably because they can be difficult to find and capture. Most species are similar in both form and meristics and can usually be differentiated only by color pattern or the placement of markings (e.g., Masuda et al., 1984). *Xyrichtys victori* is remarkable in that males are iridescent blue-

TABLE I. PROPORTIONAL MEASUREMENTS OF TYPE SPECIMENS OF *Xyrichtys victori* (IN THOUSANDTHS OF SL.)

	Holotype	Paratypes			
	USNM	USNM	USNM	GAS	BPBM
	316910	316911	316911	76100	34760
Standard length (mm)	135	134	117	100	42.5
Body depth	366	399	340	337	311
Body width	121	117	107	120	92
Head length	301	301	305	296	313
Snout length	84	96	85	88	73
Eye diameter	52	51	57	50	66
Bony interorbital	53	60	60	54	49
Caudal peduncle depth	147	147	144	147	139
Caudal peduncle length	114	99	103	97	92
Predorsal length	180	175	171	180	179
Prepelvic length	274	277	249	260	259
Preanal length	396	374	385	345	426
1st dorsal spine	70	84	68	73	61
2nd dorsal spine	82	93	75	80	71
Longest dorsal spine	84	104	80	90	73
Longest dorsal ray	119	127	119	116	106
1st anal spine	37	45	42	40	33
2nd anal spine	56	67	63	63	54
3rd anal spine	90	104	79	85	73
Longest anal ray	121	119	115	127	113
Pelvic spine	63	78	63	72	87
Dorsal fin base	667	702	705	685	706
Anal fin base	396	374	385	345	426
Pectoral-fin length	210	229	222	197	181
Pelvic-fin length	148	162	150	157	136
Caudal-fin length	175	196	189	195	228

green with many large black spots over the body which can very greatly between individuals. This degree of individual variation is very uncommon among marine fishes. *Xyrichtys victori* is presently known only from the islands of Marchena and Baltra in the Galápagos Islands.

METHODS

Methods of counts and measurements follow Randall and Kuiter (1982). All fish lengths are standard length (SL). In the following description, data in parentheses refer to paratypes. Ratios of morphometrics include only paratypes over 40 mm in length. Proportional measurements are expressed as thousandths of standard length. Institutional abbreviations are as listed in Leviton et al. (1985).

Xyrichtys victori n. sp.

Figs. 1-2; Table 1

Holotype.-USNM 316910, 135 mm, male, Gá-Islands, Marchena Island, east side off Punta Espejo, 12 m, sand bottom, spear, B. Victor and G. Wellington, 10 April 1990.

Paratypes.-The following specimens were collected from the same locality as the holotype unless otherwise indicated: USNM 316911, three specimens, 134 mm male, 117 mm female, 35.7 mm juvenile; CAS 76100, four specimens, 139 mm and 121 mm males, 100 mm female, 29.2 mm juvenile; LACM 45136-1, two specimens, 132 mm and 133 mm males; LACM 45137-1, two specimens, 27.7 mm and 22.6 mm juveniles, Galápagos Islands, east end of channel between North Seymour and Baltra Islands, 5 m, sand bottom, hand-net, B. Victor and G. Wellington, 7 April 1990; BPBM 34760, four specimens, 122 mm and 124 mm males, 42.5 mm female, 20.9 mm juvenile; WAM P.30177-001, three specimens, 139 mm and 133 mm males, 31.0 mm juvenile.

Diagnosis.—A species of *Xyrichtys* with dorsal-fin rays IX, 12; anal-fin rays III, 12; greatest body lapagos depth 2.50-3.22 in SL; first dorsal spine flexi-

Fig. 1. *Xyrichtys victori*, holotype, male, USNM 316910, 135 mm (top).

Fig. 2. *Xyrichtys victori*, paratype, female, USNM 316911, 117 mm (bottom).

ble, second pungent; first two dorsal spines not elongated or separated from remainder of fin; distance between second and third dorsal spine about same as that between first and second spines; males iridescent dark blue-green, a wash of darker blue over dorsal body and head, and on operculum; males with variable pattern of black markings on the body ranging in size from

a single melanophore to a solidly blackened scale; females reddish-orange over body and base of caudal fin; edges of scales paler than centers in both sexes.

Description.—Dorsal-fin rays IX, 12; anal-fin III, 12; pectoral-fin rays 12; pelvic-fin rays I, 5; principal caudal rays 14 (median 12 branched); lateral line interrupted, anterior portion with 20 pored scales (19-20), posterior portion with five pored scales; scales above first lateral-line scale to origin of dorsal fin 3 (3-4); scales below lateral line to origin of anal fin 8 (8-9); circumpeduncular scales 19 (19-20); gill rakers 21 (2022); branchiostegal rays 6; vertebrae 25.

Body relatively deep, strongly compressed (Table I); depth 2.73 (2.50-3.22) in SL, width 3.03 (2.81-3.41) in depth; anterior profile of head steeply sloped in adults with the eye placed high on the head; head length 3.33 (3.20-3.38) in SL; snout length 3.56 (3.13-4.29) in head; orbit diameter 5.80 (4.75-5.92) in head; interorbital space convex and sharply angular, width 5.64 (4.99-6.33) in head.

Mouth small, terminal, gape almost horizontal; lips smooth, lower lip broader than upper, with ventral flap; tongue short, rounded. Gill membranes broadly attached to isthmus. Pair of enlarged, recurved canine teeth set anteriorly in both jaws followed by a row of close-set small canine teeth less than one-third length of large teeth. Nostrils small, placed anterior to lower edge of eye, anterior nostril at end of small tube; posterior nostril obliquely above and behind anterior nostril, partially covered by a small flap. Lower margin of preopercle free to anterior edge of orbit; upper margin free to about half eye diameter below orbit in males.

Head naked except for nape, small patch of two or more scales on upper part of opercle, and short diagonal row of scales along lower posterior border of the orbit; skin around eye and down along keel of anterior profile pleated with linear ridges. Lateral line interrupted anterior, upper portion arched anteriorly becoming almost horizontal and following dorsal body contour closer to the dorsum than to the midline; short, lower, posterior portion with five pored scales along midline.

Origin of dorsal fin above upper end of gill opening; dorsal spines progressively longer posteriorly, first spine 4.32 (3.61-5.11) in head, last 3.59 (2.89-4.29) in head. First dorsal spine flexible, second pungent; first two spines not elongated or separated from the remainder of fin, gap between second and third spines about same as between first two spines (all specimens including juveniles). Origin of anal fin below base of first dorsal segmented ray; first spine small, 8.12 (6.73-9.43) in head; third spine longest, 3.32 (2.89-4.29) in head; caudal fin slightly rounded, length 1.72 (1.37-1.72) in head; pectoral fins relatively short, rounded, length 1.43 (1.32-1.73) in head, third ray longest, uppermost ray rudimentary, next to uppermost unbranched; pelvic fins short, typically reaching about half way to anus, somewhat farther in largest males, length 2.03 (1.86-2.29) in head.

Color in life.—Males iridescent dark blue-green, wash of darker blue over dorsal body and head, as well as on operculum; midbody more greenish blue, color lighter anteriorly on the body just behind operculum; edges of scales paler than centers; iris blue-green; fins dark blue except for pectoral fin which is unpigmented; variable pattern of black markings on body ranging in size from single melanophore to solidly blackened scale (Fig. 3).

Females reddish orange over body and base of caudal fin; other fins unpigmented; edges of scales paler than centers; lighter red anteriorly on body, becoming white along ventral abdomen with red spot at center of each scale; operculum darker red, with light red bar over preopercle; cheek dark purple-red: snout, including mouth and lips, white anterior to vertical line through anterior edge of orbit; iris shiny gold.

The color of juveniles (less than 40 mm) was variable, ranging from sandy white with virtually no stripe to yellowish-brown with a dark eye-width stripe of black traversing the upper body from above the eye to the upper third of the caudal-fin base, and with up to five barlike extensions of melanophores toward the base of the dorsal fin. In these darker individuals there was also a parallel white stripe adjacent to and below the dark strip.

Color in alcohol.—Males uniformly brown except for darker-brown dorsal, anal, caudal, and pelvic fins and several solid black markings on body scales arranged in various patterns; cheek area below eye paler brown. Females uniformly pale whitish yellow with brown patch under the eye. Some larger females have a speckling of small melanophores on the body around the base of the spinous dorsal fin posteriorly and along the bases of most of the segmented-ray portions of the dorsal, caudal, and anal fins, as well as on the lower flank and on the nape around

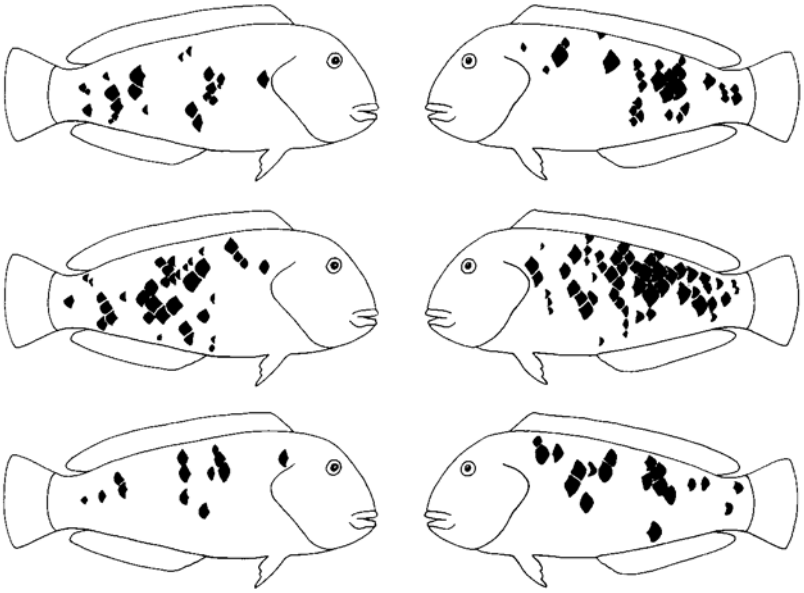

Fig. 3. The pattern of markings on three male *Xyrichtys victori*; both right and left sides are shown for each individual.

the origin of the dorsal fin. A dark spot is variably present on the upper margin of the opercle and a line of spots variably present from the snout to the eye. Juveniles range from white with virtually no stripe to yellowish brown with a black eye-width stripe traversing the upper body from above the eye to the upper third of the caudal fin base, and with up to five barlike extensions of melanophores toward the base of the dorsal fin.

Etymology.—*Xyrichtys victori* is named for Benjamin Victor, the codiscoverer of this new species, in recognition of his work on the population biology and ecology of labrid fishes.

Ecology.—Adult X. *victori* are found in large groups within colonies of the endemic Galápagos garden eel, *Taenioconger klausewitzi*. Colonies occur on sandbeds, usually below 10 m. Juvenile X. *victori* are not associated with adults, but congregate in shallower water over open sandy areas. The behavior of these juvenile razorfishes is unusual; rather than being closely associated with the substratum or with objects in the sand, they freely swam up to a meter off the bottom. Occasional juveniles were observed on shallow patches of sand in areas with strong currents, where they remained close to the substratum.

A majority of the adult colonies were comprised of the smaller red-phase fish, although the large blue-green individuals were common. Because all of the large fish were blue-green and all smaller individuals were in the red-phase, it is almost certain that this species, like most other labrids, is a protogynous hermaphrodite. The smaller color-phase is typically female, and the larger, more colorful phase are males that probably changed from females after reaching a certain size.

DISCUSSION

The most distinctive feature of X. *victori* is the conspicuous individual variation in the pattern of black spots on the body of males (Fig. 3). Clark (1983) noted a lesser degree of variation among males of X. *pentadactylus* in the Red Sea, where individuals could be identified by the number of red spots in a line behind the eye (from one to eight). Conspicuous variation in markings between individuals is uncommon among marine fishes, which are known more for the constancy of their complex, and often species-specific, color patterns. Another species with even more individual variation than X. *victori* is, curiously, another labrid found in the Galápagos Islands (and Perú), *Bodianus eclancheri*. This species is multicolored with every possible combination of orange, white, and black

patterns present in the local population. It is difficult to explain this degree of variation because there is no correlation between coloration and body size or sex (Warner, 1978; Hoffman, 1980).

The individual variation in X. *victori* is limited to males, and, because there is strong competition among males, there may be selection for being individually recognizable by one's neighbors. In those razorfish mating systems that have been described (Clark, 1983; Nemtzov, 1985; Victor, 1987a), males defend fixed territories and harems against other males who defend adjacent territories. Territorial boundaries remain relatively fixed from week to week. Within such a social system, the opportunity to be recognized as the owner of the territory by neighbors could confer an advantage on a resident male by eliminating constant challenges and confrontations. Confirmation of such a selective advantage would require experimental manipulations in the field.

The biogeography of razorfishes in the eastern Pacific is not well known. Three species of razorfishes were collected during the present expedition to the Galapagos Islands: the new X. *victori*, juveniles of another undetermined *Xyrichtys* species, and the rockmover, *Novaculichthys taeniourus.* The rockmover razorfish is a widespread Indo-Pacific species known to range throughout the eastern Pacific region. The juveniles of the undetermined species are black and have elongated (but not separated) first and second dorsal spines and do not fit the description of any known eastern Pacific razorfish (Thomson et al., 1979). Their identity will have to await the collection of adults. *Xyrichtys victori* appears to be the only endemic labrid in the Galapagos Islands. The Galapagos are known to have a large proportion of endemic shorefish species (McCosker and Rosenblatt, 1984), although labrids were originally considered to be one of the few prominent shorefish families not to have an endemic representative (Rosenblatt and Walker, 1963). Interestingly, Rosenblatt and Walker (1963) explained this observation by correctly assuming that labrids have a long larval life (and presumably, therefore, a wide dispersal ability), although at the time there was no evidence for it. Now it is known that most labrids in the eastern Pacific do have long planktonic larval durations, which could account for the broad geographic range of most labrid species in this region (Victor, 1986). It is, however, difficult to reconcile the apparently restricted range of X. *victori* with the evidence not only that razorfishes generally have long planktonic larval durations (Victor, 1986) but that larvae of *Xyrichtys* have been captured in open ocean plankton nets 400 km east of the Galapagos Islands (Victor, 1987b). I counted the daily otolith increments from two small juvenile X. *victori*, 23 mm and 25 mm SL, and found the length of their planktonic larval durations to be 72 and 69 days, respectively. Compared to several widely distributed species of *Xyrichtys*, this larval duration is about average (Victor, 1986). Clearly, the factors that determine the distribution of shorefishes in this region remain to be elucidated.

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