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# A review of the Caribbean hamlets (Serranidae, *Hypoplectrus*) with description of two new species

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## Abstract

Thirteen species of the Western Atlantic genus *Hypoplectrus* (Serranidae) are currently recognized, two of which are described as new. *Hypoplectrus maya* n. sp. (Maya hamlet) is restricted to the coastal lagoon of the Meso-American Barrier Reef system in Belize. It is a solid iridescent blue, lacks nose spots and lacks black margins on fins. *Hypoplectrus randallorum* n. sp. (Tan hamlet) is found widely in the central and western Caribbean. Its color varies from light brown to tan and it has spots on the nose, at the base of the pectoral fin and occasionally on the upper part of the caudal peduncle. All identified species of *Hypoplectrus* are illustrated in live coloration along with examples of color variations in *H. nigricans* and *H. unicolor.* A historical review of *Hypoplectrus* is included with a discussion of issues concerning their taxonomy.

## Introduction

The hamlets are small (max about 20cm SL) reef fishes found throughout the Caribbean (Randall 1968, Domeier 1994, Heemstra *et al*. 2002, Aguilar-Perera & Gonzalez-Salas 2010, Holt *et al*. 2010). They are predatory fish that feed on small crustaceans and tiny fishes (Randall 1967, Whiteman *et al*. 2007, Holt *et al*. 2008). Hamlets are simultaneous hermaphrodites, which broadcast spawn in the water column (Barlow 1975, Fisher 1980a, 1981, 1987; Lobel & Neudecker 1985). Individual fish maintain pair bonds and the paired fish exchange positions between mating bouts whereby they take turns spawning as male or female. Mating hamlets produce a unique sound while gametes are dispersed which may help to synchronize spawning (Lobel 1992, 2002). The fish also produce a very low amplitude pre-mating sound. Preliminary acoustic field recordings suggest that different hamlet species possibly produce different pre-mating sound patterns, although this has yet to be statistically validated (Lobel 1992).

On any given coral reef location in the tropical western Atlantic ocean, several hamlet species are typically sympatric, maintaining reproductive isolation with occasional hybridization (Barlow 1975, Fisher 1980a, 1981, Lobel and Neudecker 1985, Domeier 1994, Puebla *et al*. 2007). These fishes are intriguing both because of their hermaphroditic behavior as well as the possibility of their exhibiting sympatric speciation (e.g. Fisher 1980b, 1987; Charnov 1982, Rocha & Bowen 2008, Salzburger 2008). It has been proposed that the hamlets have evolved as aggressive mimics of non-predatory reef fishes (Randall & Randall 1960, Thresher 1978, Fisher 1980b, Randall 2005). This scenario of mimicry driving the evolution of hamlet species was reviewed by Puebla (2009).

Defining the species in the genus *Hypoplectrus* has been a classic taxonomic problem in ichthyology for decades. No clear morphological or meristic characters delineate the hamlet "species" except color patterns (Randall 1968, Fisher 1980b, Domeier 1994). Color pattern and geographic distribution appear to be reliable characters for defining the hamlet species (Randall 1968, Heemstra *et al*. 2002, Aguilar-Perera 2003, Puebla *et al*. 2007, Aguilar-Perera & Gonzalez-Salas 2010, Holt *et al*. 2010). Hamlets display strong mating preference for individuals of the same color pattern. However, the boundaries of the species as defined by color are confounded by occasional mixed matings and hybrids (Barlow 1975, Fisher 1980b, Rao & Lakshmi 1999). The results of these mixed mating are offspring with mixed coloration (Domeier 1984, Whiteman *et al*. 2007). Mating between same colored (i.e. species) hamlets produce offspring of the same color pattern as the parents (Domeier 1994). The difficulty of defining the hamlet species flock is similar to that found for African rift-lake cichlids (Puebla 2009). In this regard, the

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importance of using behavior for aiding in the definition of "evolutionary significant units" (Stauffer *et al*. 1995, 2002) is noteworthy. As in cichlids, the hamlet species flock is recently evolved with one estimate placing divergence at about 400,000 years ago (McCartney *et al*. 2003). Available evidence suggests that hamlets maintain segregation by behavioral mating preferences for like-colored mates. This behavior plus the biogeography of species distributions combined with recent genetic data supports the designation as species for the hamlet lineages defined by distinct color patterns (Domeier 1994, Heemstra *et al*. 2002, Ramon *et al*. 2003, McCartney *et al*. 2003, Puebla *et al*. 2007, 2009; Aguilar-Perera & Gonzalez-Salas 2010, Holt *et al*. 2010). Coloration coupled with biogeography has been used to similarly characterize the enigmatic species complexes in many other reef fishes (e.g Springer 1988, Randall and Bruce 1983, Randall & Edwards 1984, Randall & Pyle 2001a,b; Greenfield & Randall 2008, Baldwin *et al*. 2011).

Two new hamlet species are described in this paper based on color and biogeographic distribution. The "Tan" hamlet has been recognized in the literature for decades (Randall & Randall 1960, Thresher 1978, Graves & Rosenblatt 1980, Domeier 1994, Heemstra *et al*. 2002, Aguilar-Perera & Gonzalez-Salas 2010, Holt *et al*. 2010). It has a broad distribution including the Florida Keys, Puerto Rico, West Indies and Belize (Aguilar-Perera & Gonzalez-Salas 2010, Holt *et al*. 2010). The "Maya" hamlet was found in Belize by the author in 1993. It was probably the fish observed in Belize at Laughing Bird Cay by Domeier (1994), who reported it as *H. gemma*. Smith *et al*. (2003) referred to it as an undescribed species and reported on its distribution in the Pelican Cays, Belize. The Maya hamlet is known only from Belize. Both the "Tan" and the "Maya" hamlets were included in the taxonomic review by Heemstra *et al*. 2002 (as *Hypoplectrus* sp. "tan" and *Hypoplectrus* species "Belize", respectively).

## Material and Methods

Type specimens of the new species of *Hypoplectrus* and additional specimens used for comparison have been deposited in the Museum of Comparative Zoology, Harvard University (MCZ) and the Bishop Museum (BPBM), Honolulu, HI.

Lengths of specimens are given as standard length (SL), measured from the median anterior point of the upper lip to the base of the caudal fin (posterior end of the hypural plate); body depth is measured at the origin of pelvic fins and body width at the axil of the pectoral fins (as viewed from the ventral side); head length (HL) is taken from the median anterior point of the upper lip to the posterior end of the opercular membrane; orbit diameter is the greatest fleshy diameter, and interorbital width the least fleshy width; snout length is measured from the median anterior point of the upper lip to the nearest fleshy edge of the orbit; upper-jaw length from the same anterior point to the posterior end of the maxilla; caudal-peduncle depth is the least depth, and caudal-peduncle length the horizontal distance between verticals at the rear base of the anal fin and the caudal-fin base; lengths of spines and rays are measured to their extreme bases; caudal- and pectoral-fin lengths are the lengths of the longest ray; pelvic-fin length is measured from the base of the pelvic spine to the tip of the longest soft ray.

Data in parentheses in the descriptions apply to paratypes. Morphometric data in the descriptions are given as percentages of the standard length with range from minimum to maximum in parentheses.

X-rays were used for meristic counts and were prepared by Andrew Williston, Dept of Fishes, Museum of Comparative Zoology, Harvard University. All photographs of live fishes were photographed underwater in their habitat by the author.

**Comparative material**:
Specimens collected from Discovery Bay, Jamaica, July 1990, P. S. Lobel: n=4 *H. puella*, n=4 *H. indigo*, n=1 *H. nigricans*, n=1 *H. guttavarius*, n=2 *H. unicolor*. Specimens collected from Discovery Bay, Jamaica, April 1991, P. S. Lobel: n=6 *H. puella*. Specimens collected from Conch reef, Key Largo, Florida, Feb. 1992, P. S. Lobel: n=3 *H. gemma* & n=1 *H. puella*. Specimens collected from Glovers Atoll, Belize, July 1999, P. S. Lobel, L. K. Lobel & J. E. Randall; n=9 *H. nigricans*; n=2 *H. indigo*, n=1 *H.puella*, n=7 *H.unicolor*. Specimens collected from the Pelican Cays, Belize, July 1999, P. S. Lobel, L. K. Lobel & J. E. Randall; n=4 *H. puella*, n=1 *H. aberrans*.

Genetic sequence data for several of the type specimens and for specimens used for comparative material are deposited in GenBank and are available on the NIH Nucleotide database (http://www.ncbi.nlm.nih.gov/nuccore/).

The genetic data for these specimens were generated and reported by Ramon *et al*. 2003 (Accession numbers AY262168–AY262254). Voucher specimens are deposited in the MZC and are listed in Table 1 which shows the MCZ number and corresponding GenBank number.

**TABLE 1.** Comparative specimens deposited in the MCZ, Harvard and GenBank.

| MCZ number | GenBank | species | location | date |
|---|---|---|---|---|
| 169216 | AY262238 | *H. gemma* | Florida | Feb-92 |
| 169217 | AY262180 | *H. puella* | Florida | Feb-92 |
| 169218 | AY262239 | *H. gemma* | Florida | Feb-92 |
| 169219 | AY262240 | *H. gemma* | Florida | Feb-92 |
| 169231 | AY262204 | *H. nigricans* | Glovers Atoll, Belize | Jul-99 |
| 169232 | AY262205 | *H. nigricans* | Glovers Atoll, Belize | Jul-99 |
| 169233 | AY262192 | *H. indigo* | Glovers Atoll, Belize | Jul-99 |
| 169236 | AY262193 | *H. indigo* | Glovers Atoll, Belize | Jul-99 |
| 169237 | AY262186 | *H. puella* | Glovers Atoll, Belize | Jul-99 |
| 169238 | AY262230 | *H. unicolor* | Glovers Atoll, Belize | Jul-99 |
| 169239 | AY262231 | *H. unicolor* | Glovers Atoll, Belize | Jul-99 |
| 169240 | AY262233 | *H. unicolor* | Glovers Atoll, Belize | Jul-99 |
| 169241 | AY262234 | *H. unicolor* | Glovers Atoll, Belize | Jul-99 |
| 169242 | AY262206 | *H. nigricans* | Glovers Atoll, Belize | Jul-99 |
| 169243 | AY262207 | *H. nigricans* | Glovers Atoll, Belize | Jul-99 |
| 169244 | AY262208 | *H. nigricans* | Glovers Atoll, Belize | Jul-99 |
| 169245 | AY262209 | *H. nigricans* | Glovers Atoll, Belize | Jul-99 |
| 169246 | AY262210 | *H. nigricans* | Glovers Atoll, Belize | Jul-99 |
| 169247 | AY262211 | *H. nigricans* | Glovers Atoll, Belize | Jul-99 |
| 169248 | AY262212 | *H. nigricans* | Glovers Atoll, Belize | Jul-99 |
| 169249 | AY262235 | *H. unicolor* | Glovers Atoll, Belize | Jul-99 |
| 169206 | AY262168 | *H. puella* | Jamaica | 7-Jul-90 |
| 169207 | AY262169 | *H. puella* | Jamaica | 7-Jul-90 |
| 169208 | AY262170 | *H. puella* | Jamaica | 7-Jul-90 |
| 169209 | AY262171 | *H. puella* | Jamaica | 7-Jul-90 |
| 169210 | AY262187 | *H. indigo* | Jamaica | 7-Jul-90 |
| 169211 | AY262188 | *H. indigo* | Jamaica | 7-Jul-90 |
| 169212 | AY262189 | *H. indigo* | Jamaica | 7-Jul-90 |
| 169213 | AY262190 | *H. indigo* | Jamaica | 7-Jul-90 |
| 169234 | AY262199 | *H. nigricans* | Jamaica | 7-Jul-90 |
| 169235 | AY262194 | *H. guttavarius* | Jamaica | 7-Jul-90 |
| 169214 | AY262213 | *H. unicolor* | Jamaica | 7-Jul-90 |
| 169215 | AY262214 | *H. unicolor* | Jamaica | 7-Jul-90 |
| 169220 | AY262172 | *H. puella* | Jamaica | 14-17April-91 |
| 169221 | AY262173 | *H. puella* | Jamaica | 14-17April-91 |
| 169222 | AY262174 | *H. puella* | Jamaica | 14-17April-91 |
| 169223 | AY262175 | *H. puella* | Jamaica | 14-17April-91 |
| 169226 | AY262176 | *H. puella* | Jamaica | 14-17April-91 |
| 169228 | AY262177 | *H. puella* | Jamaica | 14-17April-91 |
| 169205 | AY262182 | *H. puella* | Pelican Cayes, Belize | Jul-99 |
| 169229 | AY262203 | *H. nigricans* | Pelican Cayes, Belize | Jul-99 |
| 169230 | AY262197 | *H. aberrans* | Pelican Cayes, Belize | Jul-99 |

***Hypolectrus maya,* n. sp.**
(Figs. 1, 2; Tables 2, 3)

*Hypoplectrus* sp "Belize" Heemstra *et al*. 2002: page 1368.
*Hypoplectrus* sp Smith *et al*. 2003 (Pelican Cays, Belize)

**Holotype:** MCZ 169196, 86.2 mm SL, Tunicate Cove, Pelican Cays, 7 Dec. 1997, $16^0$ 39.6' N, $88^0$ 11.1'W, 3m depth, reef and seagrass, spear, P. S. Lobel.

**Paratypes:** MCZ 169194**,** 73.5 mm SL, Tunicate Cove, Pelican Cays, 9 Dec. 2001, 3m depth, reef and seagrass, spear, P. S. Lobel; MCZ 169195**,** 87.2 mm SL, Tunicate Cove, Pelican Cays, 9 Dec. 2001, 3m depth, reef and seagrass, spear, P. S. Lobel; MCZ 16919**7,** 70.0 mm SL, Tunicate Cove, Pelican Cays, 9 Dec. 2001, 3m depth, reef and seagrass, spear, P. S. Lobel; MCZ 169198**,** 86.0 mm SL, Tunicate Cove, Pelican Cays, 7 July 1999, 3m depth, reef and seagrass, spear, P. S. Lobel and J. E. Randall (GenBank AY262250);. MCZ 169199**,** 82.9 mm SL, Tunicate Cove, Pelican Cays, 7 July 1999, 3m depth, reef and seagrass, spear, P. S. Lobel and J. E. Randall (GenBank AY262251). MCZ 169200, 68.1mm SL, Tunicate Cove, Pelican Cays, 10 November 1994, 3m depth, reef and seagrass, spear, P. S. Lobel, photographed underwater (GenBank AY262249). MCZ 169201, 94.4 mm SL, collected with holotype. MCZ 169202, 57.6 mm SL, Tunicate Cove, Pelican Cays, 26 March 1997, 3m depth, reef and seagrass, spear, P. S. Lobel and J. E. Randall.

**FIGURE 1.** *Hypoplectrus maya*, paratype MCZ 169200, 68.1mm SL, Tunicate Cove, Pelican Cays, 10 November 1994, 3m depth, reef and seagrass.

**Diagnosis:** *H. maya* can be distinguished from congeners by its solid deep iridescent blue color and lack of black margins on fins (Figs. 1, 2). The only other similarly colored hamlet is the blue hamlet, *H. gemma*, from Florida and the Yucatan; it is distinguished by having dark black upper and lower margins on the caudal fin (Fig. 3).

**Description:** Dorsal X, 14 or 15; anal III, 6 or 7; dorsal and anal soft rays branched, the last to base; pectoral rays 13 or 14; pelvic I, 5; branched caudal rays 18 (17–20); vertebrae 23 (one specimen with 22), mouth terminal; tongue truncate.

The following morphometrics are given as percentages of the standard length (range, min–max): body depth 42.2% SL (40.2–44.0); body compressed, width 16.5 (14.5–19.4); head length 37.7 (35.9–39.9); snout length 11.6 (10.0–12.8); orbit diameter 9.1 (7.7–10.1); interorbital width 8.5 (7.3–9.8); upper jaw length 17.7 (16.6–18.8); caudal–peduncle depth 13.9 (12.3–16.1); caudal–peduncle length 17.4 (11.7–22.7); predorsal length 40.6 (20.5–47.3); preanal length 25.7 (21.0–35.4); prepelvic length 41.6 (36.9–46.4); base of dorsal fin 56.2 (52.5–59.2); longest dor-

sal spine 15.8 (14.3–17.0); base of anal fin 18.5 (13.7–22.6); longest anal spine 14.2 (13.3–14.7); longest anal ray 18.3 (16.2–9.8); caudal fin length 20.7 (14.2–26.6); pectoral fin length 28.9 (25.6–34.4); pelvic fin length 22.8 (20.6–24.3).

**FIGURE 2.** *Hypoplectrus maya*, Tunicate Cove, Pelican Cays, Belize.

**TABLE 2.** Proportional measurements of Hypoplectrus maya as percentage of SL. Listed by MCZ number.

| Specimen | 169196 Holotype | 169202 Paratype | 169200 Paratype | 169197 Paratype | 169194 Paratype | 169199 Paratype | 169198 Paratype | 169195 Paratype | 169201 Paratype |
|---|---|---|---|---|---|---|---|---|---|
| SL, mm | 86.2 | 57.6 | 68.1 | 70.0 | 73.5 | 82.9 | 86.0 | 87.2 | 94.4 |
| Body depth | 41.9 | 43.6 | 40.2 | 42.9 | 42.4 | 40.7 | 42.1 | 44.0 | 42.3 |
| Body width | 17.9 | 16.9 | 14.6 | 15.8 | 16.1 | 14.5 | 17.0 | 19.4 | 16.3 |
| Head length | 36.1 | 39.9 | 37.9 | 36.9 | 38.2 | 37.1 | 38.6 | 38.2 | 35.9 |
| Snout length | 11.5 | 11.7 | 10.0 | 12.1 | 10.9 | 12.5 | 11.9 | 11.2 | 12.8 |
| Orbit diameter | 7.7 | 10.1 | 9.7 | 8.2 | 8.4 | 9.7 | 9.8 | 8.6 | 9.5 |
| Interorbital width | 7.9 | 9.8 | 7.3 | 7.9 | 8.9 | 9.3 | 8.5 | 8.5 | 8.4 |
| Upper-jaw length | 16.6 | 18.8 | 17.2 | 18.4 | 17.2 | 17.5 | 18.3 | 18.1 | 16.6 |
| Caudal peduncle depth | 14.4 | 16.1 | 14.6 | 14.1 | 12.8 | 12.3 | 13.1 | 15.0 | 12.6 |
| Caudal peduncle length | 17.6 | 13.6 | 11.7 | 22.7 | 22.5 | 18.3 | 18.4 | 19.2 | 13.0 |
| Predorsal length | 40.8 | 47.3 | 44.5 | 46.0 | 20.5 | 40.3 | 41.5 | 43.4 | 41.5 |
| Preanal length | 21.0 | 24.4 | 21.1 | 21.8 | 23.5 | 35.4 | 30.6 | 25.1 | 28.5 |
| Prepelvic length | 46.4 | 41.3 | 40.6 | 42.4 | 38.2 | 36.9 | 39.4 | 43.4 | 45.6 |
| Base of dorsal fin | 55.9 | 53.0 | 58.0 | 56.8 | 59.2 | 52.9 | 58.5 | 58.7 | 52.5 |
| Longest dorsal Spine | 14.3 | 16.4 | 17.0 | 16.6 | 14.9 | 15.9 | 16.5 | 15.0 | 15.4 |
| Base of anal fin | 18.9 | 18.3 | 19.1 | 20.5 | 18.6 | 13.7 | 18.9 | 22.6 | 16.0 |
| Longest anal Spine | 14.1 | damage | damage | 14.1 | 14.1 | 14.7 | 14.6 | 14.4 | 13.3 |
| Longest anal Ray | 18.5 | 19.8 | damage | 18.5 | 19.2 | 19.0 | 18.5 | 16.2 | 17.0 |
| Caudal fin length | 14.2 | 23.5 | 20.2 | 21.5 | 16.5 | 21.2 | 23.9 | 18.7 | 26.6 |
| Pectoral fin length | 28.3 | 34.4 | 26.6 | 26.7 | 28.8 | 25.6 | 31.5 | 28.8 | 29.6 |
| Pelvic fin length | 23.4 | 24.3 | 24.3 | 20.9 | 22.9 | 20.6 | 23.8 | 22.5 | 22.7 |

The following characteristics are similar for all *Hypoplectrus* species. Body deep, compressed, the depth contained 2.1 to 2.4 times in standard length; dorsal fin with 10 spines and 14 to 16 soft rays, the interspinous fin membranes not incised or notched; no elongate dorsal spines; lateral-line scales 48 to 54; gradually arched anteriorly;

gill rakers on first arch moderately long and slender, 6 to 8 on upper limb and 11 to 15 on lower limb; 7 branchiostegal rays; vertebrae 10 + 14; caudal fin truncate and moderately concave; pectoral fins elongated and rounded; pelvic fins rounded; pelvic fins reach to or beyond anus; upper jaw moderately protrusile; no scaly flap of skin joining upper part of pectoral-fin base to body; soft dorsal and anal fins mostly naked; jaw teeth distinct, small canines; vomer and palatines with villiform teeth arranged in rows; supramaxilla absent; teeth fixed (not depressible); posterior process of premaxilla broad and near tip of alveolar ramus; preopercle is angular and not expanded posteriorly, with serrae along the ventral and posterior margins and several small antrose serrae on the ventral margin near the angle; nostrils closer to the eye than to jaw; scales cover all body except that the snout and preorbital region is naked; scale type ctenoid.

Larval development of *Hypoplectrus* is described and illustrated in Richards 2006.

**TABLE 3.** Meristic data for *Hypoplectrus maya.* Listed by MCZ number.

| | **169196 Holotype** | **169202 Paratype** | **169200 Paratype** | **169197 Paratype** | **169194 Paratype** | **169199 Paratype** | **169198 Paratype** | **169195 Paratype** | **169201 Paratype** |
|---|---|---|---|---|---|---|---|---|---|
| Dorsal | X 15 | X 14 | X 15 | X 15 | X 15 | X 14 | X 15 | X 14 | X 15 |
| Anal | III 7 | III 7 | III 7 | III 6 | III 7 | III 6 | III 7 | III 7 | III 7 |
| Caudal | 18 | 18 | 17 | 20 | 18 | 18 | 19 | 17 | 17 |
| Pelvic | I 5 | I 5 | I 5 | I 5 | I 5 | I 5 | I 5 | I 5 | I 5 |
| Pectoral | 14 | 14 | 13 | 14 | 14 | 14 | 14 | 14 | 13 |
| Vertebrae | 23 | 23 | 22 | 23 | 23 | 23 | 23 | 23 | des |

**Coloration Live:** Body a solid deep iridescent blue, darker above the lateral line. The pelvic, dorsal and anal fins are blue. Pectoral fin is clear. Caudal fin margin is blue and the rest is tinted blue (Figs 1, 2).

**Coloration Preserved:** Color in alcohol pale brown to blackish. Pectoral fin clear, other fins are opaque tan (Fig. 4).

**Etymology:** This species is named with the dual purpose to honor the Maya people of Belize and the author's daughter, Maya Rose Lobel.

**Remarks:** The Maya hamlet was discovered in 1993 in Belize in the Pelican Cays. I have documented its occurrence from the South Water Marine Reserve area at Wee Wee Cay southward throughout the Pelican Cays and to the Sapodilla Cays at the southern most margin of the Meso-Amercian Barrier Reef (MABR). The inner barrier reef system contains several fish and other species found only or predominately in the complex geography of mangrove cays and coral reefs (Smith *et al*. 2003, Lobel *et al*. 2009). We have not observed it on the ocean side of the MABR or at Glovers and Lighthouse Atolls. However, a single specimen of the Maya hamlet was found and collected by B. Birmingham in 2010 on the ocean side of the MABR off Alligator Cay (17°10.849'N 088° 2.978'W). This specimen and tissue samples are in the Neotropical Fish Collection at the Smithsonian Tropical Research Institute in Panama (O. Puebla pers. comm.).

The other similarly colored hamlet is *H. gemma*; it is distinguished by having dark upper and lower margins on the caudal fin (Figure 3). The Florida Blue hamlet, *H. gemma,* has for many years only been known from Florida. Recently, it was found in the Alacranes Reef platform off the northern Yucatan Penninsula, Mexico (Aguilar-Perera & Tuz-Sulub 2010). Domeier (1994) noted finding *H. gemma* in Belize at Laughing Bird Cay but we suspect that he actually observed *H. maya*.

One hypothesis for hamlet evolution is that they are aggressive mimics of other fishes (review by Puebla 2009). One possible model species for *H. maya* could be the pomacentrid fish, *Chromis cyanea,* which does occur in the same habitat but is rare there. *H. maya* is often found among the mangrove roots that grow over shallow seagrass beds. Growing on the roots is the bright blue tunicate, *Clavelina puerto-secensis*, which can be quite abundant in this habitat. The colors of *H. maya* and the tunicate are quite similar and perhaps another possibility is that this hamlet has evolved camouflage coloration against this tunicate. This would confer an advantage when ambushing small prey. *H. maya* has been observed (personal observation) on several occasions attacking small silversides (*Jenkinsia lamprotaenia*) which form diurnal aggregations among the mangrove roots.

**FIGURE 3.** *Hypoplectrus gemma*, Conch Reef, Florida Keys.

**FIGURE 4.** *Hypoplectrus maya*, holotype MCZ 169196, preserved specimen.

***Hypoplectrus randallorum* n. sp.**
(Figs. 5, 6; Tables 4, 5)

*Hypoplectrus* sp "tan", Randall & Randall 1960, Thresher 1978, Domeier 1994
*Hypoplectrus* sp "tan", Heemstra *et al*. 2002: page 1368.

**Holotype:** MCZ 169250, 80.6 mm SL, Carrie Bow Cay, Belize, ridge east of cay at $16^0$ 48.2' N, $88^0$ 4.5'W, 18 m depth, reef, spear, 6 June 1993, J. E. Randall.

**Paratypes:** BPBM 35766, 70.9 mm SL, collected, with holotype**.** MCZ 169203 91.4 mm SL, Glovers Atoll, 10 m depth, ocean side reef, spear, 21 July 1999, P. S. Lobel and J. E. Randall (GenBank AY262253). MCZ 169204, 70.9 mm SL collected with MCZ 169203, (GenBank AY262252).

**Diagnosis:** The tan hamlet is distinguished from its congeners by coloration. Its body is uniformly light brown to tan colored. It possesses distinct nose spots, a spot at the base of the pectoral fin and a caudal peduncle spot.

**Description:** Dorsal X, 15; anal III, 7; dorsal and anal soft rays branched, the last to base; pectoral rays 14; pelvic I,5; branched caudal rays 17 or 18; vertebrae 23 or 24.

The following morphometrics are given as percentages of the standard length (range, min–max): body depth 45.6% SL (44.2–47.0); body compressed, width 16.6 (16.0–17.8); head length 39.8 (38.5–41.5); snout length 11.3 (10.3–12.2); orbit diameter 10.0 (9.6–10.4); interorbital width 8.9 (7.6–11.0); upper jaw length 17.7 (16.2–18.9);

caudal-peduncle depth 14.0 (13.6–14.2); caudal-peduncle length 11.8 (9.9–13.8); predorsal length 43.3 (42.4–46.4); preanal length 22.1 (16.8–26.9); prepelvic length 42.8 (40.7–44.9); base of dorsal fin 55.4 (49.8–57.7); longest dorsal spine 16.7 (16.1–17.3); base of anal fin 18.8 (16.5–20.7); longest anal spine 14.6 (13.9–15.6); longest anal ray 18.2 (15.3–20.4); caudal fin length 22.8 (21.4–25.9); pectoral fin length 32.1 (31.9–32.4); pelvic fin length 25.9 (22.4–28.6).

**FIGURE 5.** *Hypoplectrus randallorum*, paratype: MCZ 169203, 91.4 mm SL, Glovers Atoll, 10 m depth, ocean side reef, spear, 21 July 1999, P. S. Lobel and J. E. Randall.

**FIGURE 6.** *Hypoplectrus randallorum*, Belize.

Other characteristics similar to congeners as described above.

**Coloration Live:** Trunk dark to light brown, head more tan colored. The belly, fins and head can sometimes have a faintly yellowish hue. Pectoral fins clear. Distinct nose spots present on nasal area, a dark spot present at base of pectoral fin and a dark spot present on the upper part of caudal peduncle. The size and intensity of spots can vary (Figs. 5, 6).

**Coloration Preserved:** Uniformly light brown color. Caudal fin is clear and other fins are pigmented. Spots on nose, pectoral fin base and upper part of caudal peduncle remain visible in preservative (Fig. 7).

**Etymology:** Named in honor of Helen and John E. Randall, who first recognized the tan hamlet as a possible new species in their 1960 paper. The ending *"orum"* refers to "of man (men) and woman (women)". J. E. Randall collected the holotype.

**Remarks:** The "Tan Hamlet" has long been recognized as "another hamlet" by Randall & Randall 1960, Thresher 1978, Domeier 1994, Heemstra *et al.* 2002, Ramon *et al.* 2003, Aguilar-Perera 2004, Nelson 2004, Williams *et al.* 2006, Aguilar-Perera & Gonzalez-Salas 2010, Holt *et al.* 2010, Kells & Carpenter 2011). It is wide-

spread in the western Caribbean from the West Indies to Central America (Heemstra *et al*. 2002, Aguilar-Perera & Gonzalez-Salas 2010, Holt *et al*. 2010). Although its body coloration can sometimes be dark, *H. randallorum* differs from the black hamlet by having nose spots. There are several variants of the black hamlet, *H. nigricans* that differ in the coloration of their fins and slightly in some body proportions (Aguilar-Perera 2004). Puebla *et al*. (2008) proposed, based on DNA data, that *H. nigricans* may actually represent several different lineages that have independently evolved from an ancestral *H. puella* stock during multiple evolutionary events. Three different color variants of *H. nigricans* that have been described by Aguilar-Perera (2004) are shown in Fig. 7.

**FIGURE 7.** *Hypoplectrus randallorum*. Holotype MCZ 169250, preserved specimen.

**TABLE 4.** Proportional measurements of *Hypoplectrus randallorum.* Listed by MCZ and BPBM number

| | 169250 | BPBM 35766 | 169203 | 169204 |
|---|---|---|---|---|
| **Specimen** | **Holotype** | **Paratype** | **Paratype** | **Paratype** |
| SL, mm | 80.6 | 70.9 | 91.4 | 71.86 |
| Body depth | 45.4 | 46.0 | 47.0 | 44.2 |
| Body width | 16.0 | 16.1 | 17.8 | 16.6 |
| Head length | 40.3 | 39.1 | 41.5 | 38.5 |
| Snout length | 12.2 | 10.6 | 12.2 | 10.3 |
| Orbit diameter | 10.2 | 10.4 | 9.8 | 9.6 |
| Interorbital width | 8.2 | 8.7 | 11.0 | 7.6 |
| Upper-jaw length | 18.0 | 17.6 | 18.9 | 16.2 |
| Caudal peduncle depth | 13.6 | 13.9 | 14.2 | 14.2 |
| Caudal peduncle length | 11.5 | 13.8 | 11.9 | 20.1 |
| Predorsal length | 42.4 | 42.5 | 46.4 | 46.0 |
| Preanal length | 25.5 | 16.8 | 26.9 | 19.1 |
| Prepelvic length | 40.7 | 41.8 | 43.6 | 44.9 |
| Base of dorsal fin | 56.7 | 57.7 | 57.3 | 49.8 |
| Longest dorsal Spine | 16.4 | 17.2 | 16.1 | 17.3 |
| Base of anal fin | 19.4 | 20.7 | 18.7 | 16.5 |
| Longest anal spine | 14.7 | 14.2 | 13.9 | 15.6 |
| Longest anal ray | 20.4 | 18.7 | 18.2 | 15.3 |
| Caudal fin length | 21.6 | 21.4 | 25.9 | 22.1 |
| Pectoral fin length | 32.1 | 31.9 | 32.2 | 32.4 |
| Pelvic fin length | 26.7 | 28.6 | 25.8 | 22.4 |

**TABLE 5. Meristic data for *Hypoplectrus randallorum.* Listed by MCZ and BPBM number.**

| Specimen | 169250 **Holotype** | BPBM 35766 **Paratype** | 169203 **Paratype** | 169204 **Paratype** |
|---|---|---|---|---|
| Dorsal | X 15 | X 15 | X 15 | X 15 |
| Anal | III 7 | III 7 | III 7 | III 7 |
| Caudal | 17 | 17 | 18 | 17 |
| Pelvic | I 5 | I 5 | I 5 | I 5 |
| Pectoral | 14 | 14 | 14 | 13 |
| Vertebrae | 23 | 24 | 23 | n/a |

**Ecology:** Hamlets are predators of small benthic shrimp, crabs, mysids, stomatopods and tiny fishes (Randall 1967). In one study (Randall 1967), fishes constituted between 10 to 44.2% of hamlet's food items with *H. nigricans* having the highest percentage of fishes in its diet. One specimen of *H. randallorum* (70.2 mm SL) collected 8 July 1990 on reefs off the Discovery Bay Marine Laboratory in Jamaica had a freshly consumed cleaner goby, *Elacatinus evelynae* (16.5 mm SL) in its stomach content (personal observation). I have also observed hamlets attack and consume *Elacatinus* spp in Belize both in the field and in an aquarium. Randall (1967) reported that a Nassau grouper, *Epinephalus guttatus* had eaten one *H. puella*.

## Discussion

Walbaum (1792) described the first hamlet species, *H. unicolor*, as a member of the genus *Perca*. Cuvier (1828) described *H. puella* and *H. chlorurus* and reclassified them into the genus *Plectropoma.* Poey, working primarily in Cuban waters, described *H. indigo* (Poey 1851), *H. gummigutta* (Poey 1851), *H. nigricans* (Poey 1852), and *H. guttavarius* (Poey 1852). In 1861, Gill defined the new genus *Hypoplectrus* for these fishes but did not add any new species. Soon after, Poey described *H. aberrans* (Poey 1868) and *H. maculiferus* (Poey 1871). Goode and Bean (1882) descibed *H. gemma* from Florida. The most recent description of a new *Hypoplectrus* was *H. providencianus* by Acero & Garzon-Ferreira (1994). These eleven species are currently defined by color pattern (Heemstra *et al*. 2002). Seven of these species are found in US and Mexico waters and were listed by Nelson *et al*. 2004 as valid species. This decision reversed the earlier position from the 1980 edition of the "Common and scientific names of fishes from the United States, Canada and Mexico" (Nelson *et al*. 1980) in which all *Hypoplectrus* species were considered as one species under the oldest name, *H. unicolor.* The 1980 consolidation of species was based mainly on early isozyme analyses, which did not reveal any difference among the color morphs (Graves & Rosenblatt 1980). That hamlets were possibly color variants of a single species was initially suggested by the first underwater observations of their mating behavior, which indicated that the different species would occasionally hybridize (Barlow 1975). The decision by Nelson *et al.* (2004, page 227) for a reversal back to recognizing the color-morphs as species was substantially based upon the behavioral study by Domeier (1994). Domeier demonstrated experimentally that the color forms breed true and that mixed mating produced hybrid color mixes. It has been widely observed that hamlets mate assortatively by color-pattern and that hybrid matings are rare (Fisher 1980a,b, Lobel & Neudecker 1985, Lobel 1992, Domeier 1994, Thresher 1978, Whiteman & Gage 2007, Barieto & McCarthy 2007, Puebla *et al*. 2007).

While early genetic data did not separate species (Graves and Rosenblatt 1980), recent data suggest some degree of genetic isolation between geographically separated populations although this is not an absolute pattern (Ramon *et al*. 2003, Garcia-Machado *et al*. 2004, McCartney *et al*. 2003, Puebla *et al*. 2008, 2009). The recent genetic data also suggest some sorting by color, however, the species are recently diverged and therefore very similar genetically. Two of the hamlets separate distinctly from congeners genetically: *H. indigo* (McCartney *et al*. 2003, Ramon *et al*. 2003) and *H. gummigutta* (Puebla *et al*. in press). *H. gemma* is distinct from *H. puella* (Barretto & McCartney 2007). *H. nigricans* sorts into multiple lineages based on fin coloration and morphology (Aguilar-Perera 2004). Divisions in *H. nigricans* are supported by genetic variability as well (Puebla *et al*. 2008). Rare hybridization occurs and this obscures genetic distinctiveness between the species (Domeier 1994, Ramon *et al*.

2003, Puella *et al*. 2008). Thus, the current genetic data suggests multiple lineages of hamlets sorted by coloration although the genetic differences are small. The same type of systematic problem is evident for other fishes as well, particularly the African rift-lake cichlids (Puebla 2009). The consensus of biologists who have examined the issue of the hamlet flock is that the application of species terminology to describe these fishes by color is consistent with current taxonomic practices (Randall 1968, Fisher 1980, Domeier 1994, Acero & Garzon-Ferrera 1994, Heemstra *et al*. 2002, McCartney *et al*. 2003, Aguilar-Perera 2003, 2004; Garcia-Machado *et al*. 2004, McEachran & Fechhelm 2005, Puebla *et al*. 2007, 2008; Whiteman *et al*. 2007, Aguilar-Perera & Gonzalez-Salas 2010, Holt *et al*. 2010).

The recognized species of hamlets now totals 13. These are *H. aberrans* (Fig. 10), *H. chlorurus* (Fig. 11), *H. gemma* ( Fig. 3), *H. gummigutta* (Fig. 12), *H. guttavarius* (Fig 13), *H. indigo* (Fig 14), *H. maya* ( Fig. 1,2), *H. nigricans* (Fig. 8), *H. maculiferus* ( Fig. 15), *H. puella* (Fig. 16), *H. providencianus* (Fig. 17), *H. randallorum* ( Fig. 5, 6), and *H. unicolor* ( Fig. 9). There are some other hamlet color-morphs which vary, too subtlely to be clearly distinguished at this time. There are 4 variants of *H. puella* (Thresher 1978), 2 variants of *H. unicolor* (Domeier 1994), 3 variants of *H. chlorurus* (Domeier 1994), 2 variants of *H. aberrans* (Domeier 1994), and 3 variants of *H. nigricans* (Fig. 7, Aguilar-Perera 2004). Individuals of *H. unicolor* are occasionally observed that have a double caudal spot but this represents individual variation and is not a fixed trait in a population (Fig. 9, Williams *et al*. 2008). A taxonomic key to the species including the two new species described herein is in Heemstra *et al*. 2002. Maps of the hamlet species distributions are in Heemstra *et al*. 2002, Aguilar-Perera & Gonzalez-Salas 2010 and Holt *et al*. 2010. These distributions should be considered with some caution as the databases contain errors (Robertson 2008). A map of the distributions for *H. maya* and *H. randallorum* is shown in Figure 18. I defined the tan hamlet, *H. randallorum*, as having nose spots and a spot at the base of the pectoral fin which was also recognized by Randall and Randall 1960 and by Domeier 1994. There is the other light tan colored hamlet (Figure 8b), which was shown in photographs and referred to as "tan hamlet" by Williams *et al*. 2008 and Holt *et al*. 2010. Puebla *et al*. (in press) referred to this one as the "tan type 2". As mentioned above, this "tan type 2" (Figure 8b) is one of the morphs in the *H. nigicans* complex and this clade will require further research in order to define its taxonomy.


**FIGURE 8.** Color variations in *H. nigricans*. The notable difference is the coloration of the pectoral fin. A) Jamaica, B) Jamaica, C) Belize.

**FIGURE 9.** A mated pair showing the normal *H. unicolor* spot pattern on the caudal peduncle (lower right) and an individual with the double spot (upper). This was a mating pair, Discovery Bay, Jamaica.

**FIGURE 10.** *H. aberrans*, Jamaica.

**FIGURE 11**. *H. chlorurus*, St. Croix.

**FIGURE 12.** *H. gummigutta*, Jamaica.

**FIGURE 13.** *H. guttavarius*, Jamaica.

**FIGURE 14.** *H. indigo*, Belize.

**FIGURE 15.** *H. maculiferus*, St Barth's.

**FIGURE 16.** *H. puella*, Belize.

**FIGURE 17.** *H. providencianus*, Jamaica.

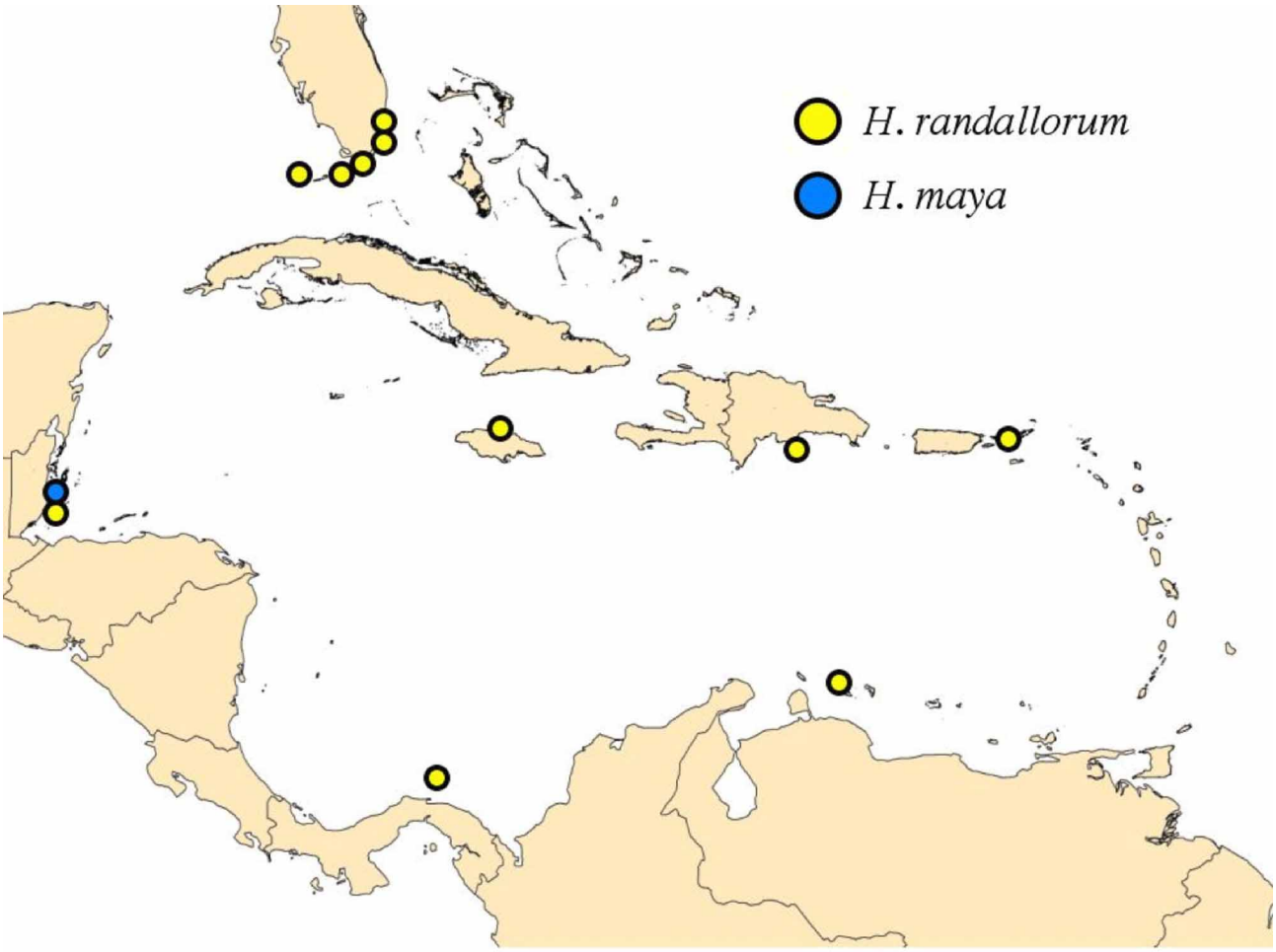


**FIGURE 18.** Distribution of the Maya hamlet, *Hypoplectrus maya*, and the Tan hamlet, *H. randallorum*. Based on photographic and sight records in Randall & Randall 1960, Domeier 1994, Ramon *et al.* 2003, Lobel *et al.* 2009, Puebla *et al.* in press and from www.fishdb.co.uk photos # 1084 and 1204. The Tan hamlet will likely be found in other locations but must be distinguished from the "tan type 2".

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