CHAPTER 137

LUTJANIDAE: Snappers

The family Lutjanidae (snappers) includes approximately 125 species in 21 genera within five subfamilies worldwide (Nelson 1994). Snappers are primarily associated with demersal habitats of continental and insular shelves in tropical and warm temperate areas, with some species occupying estuaries, especially as juveniles, and fresh water (Anderson 1987, 2003). The lutjanids are one of the most economically important group of fishes in the western central North Atlantic (WCNA) where three subfamilies are represented: Lutjaninae (Lutjanus, Ocyurus, and Rhomboplites, 13 species), Etelinae (Etelis and Pristipomoides, 4 species), and Apistinae (Apistus, 1 species) (Johnson 1980). They are somewhat fusiform in shape reaching maximum sizes of 23 to 160 cm. Characteristic morphological traits of WCNA species include: large terminal mouth; maxilla slips under the lachrymal (cheek); no pores under chin; jaw teeth conical with well developed canines present in some species but never molars; vomer and palatine teeth usually present; 7 branchiostegal rays; single dorsal fin with 10 to 12 spines and 9 to 15 rays, deeply notched in Etelis only; anal fin with 3 spines and 7 to 9 rays; 24 vertebrae. The validity of the genus Ocyurus has been recently questioned by researchers citing morphological, biochemical and genetic evidence of strong similarities between O. chrysurus and Lutjanus species (Domeier & Clark 1992; Loftus 1992; Chow & Welsh 1992; Sarver et al. 1996). In the absence of a recent comprehensive cladistic revision of these genera, we follow Nelson (1994) and refer to the monotypic genus Ocyurus.

Snappers can show substantial geographic variability in reproduction (Grimes 1987; Garcia-Cagide et al. 2001) and spawning aggregations have been reported for seven species of WCNA Lutjanus (Carter & Perrine 1994; Domeier & Colin 1997; Claro & Lindeman 2003). Larval abundances offshore are generally relatively low (Powles 1977; Richards et al. 1993; Limouzy-Paris et al. 1994). Settlement sizes among WCNA Lutjanus species range from 10 to 20 mm with planktonic duration estimates ranging between ca. 20-35 days (Lindeman et al. 2000; Allman & Grimes 2002; Tzeng et al. 2003). Once initiated, metamorphosis and settlement appear to occur rapidly.

Snappers are gonochoristic, oviparous fishes that spawn spherical, pelagic, 0.7 to 0.9 mm eggs with a narrow perivitelline space, unsegmented yolk and a single, 0.1 to 0.2 mm oil globule located at the anterior end of the yolk sac. Newly hatched snapper larvae of WCNA species range from 2.0 to 2.5 mm in SL with unpigmented eyes and undifferentiated mouthparts. Larvae are elongate (body depth /SL < 20%) until ~ 3.5 mm just prior to notochord flexion when they begin to become deeper bodied (body depth/SL to 35-43%) with growth. Gut coils shortly after hatching and when fully coiled has a triangular shape. Gas bladder is small and located above anterior part of gut. Head is large and moderately compressed; mouth is moderate to large with villiform teeth in both jaws. Eyes are round. Gill membranes are free from isthmus. Preopercle has many spines, largest at angle of the bone and serrated only in Rhomboplites. Head spines are usually present on: supraocular, posttemporal, supracleithral, subperocular (may be late to form). Postcleithral spine and small interopercular spine always present, at least at some stage. Large pelvic spine is often serrated; first ray often as long or longer than spine. First dorsal spine short, second dorsal and remaining spines moderate to extremely long, serrations can vary among species. Second dorsal spine is the longest. Canine teeth form early in Lutjanus - one each at anterior end of premaxilla and dentary. Scales may form as early as 6 mm in etelines and by 10 mm in lutjanines. Lightly pigmented but usually with ventral tail pigment that may coalesce. Urostyle and caudal peduncle often pigmented. Pelvic spines and rays may be pigmented, portions of dorsal-fin peduncle usually pigmented. Pigment on mid-brain and over gut; pigment often on cleithral symphysis.

Preflexion snapper larvae may be confused with other percoid families with 22-26 myomeres, but
their compressed body and early appearance of preopercular, pelvic and dorsal spines and absence of a supraoccipital crest are helpful diagnostic characters. Families that can be confused with lutjanids in Gulf of Mexico collections at small sizes (prefixion and flexion) include the Apogonidae, Blenniidae, Carangidae, Gobiidae, Gobiidae, Haemulidae, Pomacentridae, Scombridae, Serranidae (all subfamilies) and Sparidae. Potential for confusion also exists with the beryciform family Melampidae. The regularly spaced series of postanal ventral melanophores is one of the primary causes of confusion with blenniids, gobiids, gobiids, haemulids, pomacentrids, scombrids, serranids and sparids. Early developing fin spines contribute to confusion with serranids, apogonids and melampidae and early preopercular spines may cause confusion with carangids. Sequence of fin development allows separation of lutjanids from blenniids, haemulids, pomacentrids and sparids, taxa in which soft dorsal and anal fin elements develop before spinous dorsal and pelvic spines and/or hypural plates begin forming before dorsal and pelvic fin development. Close examination of the head area will reveal a medial cranial crest in carangids, one sparid and certain apogonids. Myomere counts will distinguish lutjanids (24) from blenniids (28-43) and scombrids (31-65). Gerreids are distinguished by the prominent ascending process of the premaxilla and gobiids by the prominent gas bladder and its more posterior position. Antheine and epinepheline serranids are distinguished from lutjanids by the presence of enlarged and often ornamented head spines and spine-bearing dorsal and pelvic fin spines. Additionally, in antheines, the interopercular spine is elongate and usually ornamented. Grammistines are distinguished by greatly elongate, delicate dorsal spines (also in apsiline larvae of the Indo-Pacific) and serranines by the lack of elongate dorsal and pelvic spines. Lutjanids develop an elongate 2nd first dorsal fin spine while melampidae develop an elongate 3rd dorsal spine. The third anal spine of lutjanids first develops as a ray-like element, as does the ultimate dorsal spine.

Species identification among early life stages of lutjanids occurring in the WCNA remains difficult due to very similar meristics and morphology, and rapid ontogenetic changes occurring within short size intervals in some species. In addition, larval information is limited or absent for 7 of 11 species of Lutjanus, 2 of 3 species of Pristipomoides and species of both Etelis and Apsilus (Table Lutjanidae 1). Published larval descriptions are available for six species: Rhomboplites aurorubens (Laroche 1977); Lutjanus griseus (Richards & Saksena 1980); L. synagris and L. analis (Clarke et al. 1997); L. campechanus (Rabalais et al. 1980; Collins et al. 1980; Drass et al. 2000) and O. chrysurus (Riley et al. 1995; Clarke et al. 1997). Larvae of Apsilus dentatus, the only member of the subfamily Apsilinae represented in the WCNA, should be separable from late stage larvae and juveniles of most co-occurring lutjanids by a low dorsal soft ray count of 10, rarely 9 (Leis & Lee, 1994; Table Lutjanidae 2). Etelineae snappers are represented by Etelis oculatus and three species of Pristipomoides of which only the larvae of P. aquilonaris have been described in series (Leis & Lee, 1994). Differences in pigmentation at or near the insertion of the dorsal and anal fins may be diagnostic for Pristipomoides species. The larvae of these taxa should be separable from Lutjaninae larvae by body shape and spine structure; eteline larvae are more slender with weaker median fin spines than lutjanine larvae (Leis & Lee, 1994). An array of characters aid separation of larvae at the subfamily or generic level (Table Lutjanidae 3). The lower dorsal fin count of etelines (X,11) will further serve to distinguish larvae in which all dorsal fin element counts can be made from lutjanines whose dorsal complement in WCNA species is X-XII,12-14 (Leis & Lee 1994). Characters that can, in combination, help identify lutjanine larvae once dorsal and pelvic spines have begun to develop include; dorsal fin meristics; smooth preopercle angle spine (serrated only in R. aurorubens); presence of pigment on the anterior visceral mass (AVM) (absent only in R. aurorubens); presence and location of pigment in the dorsal and pelvic fins; relative body depth at flexion; length of first pelvic fin ray relative to pelvic spine length; and absence of serrations on
the dorsal fin spines, only in *L. campechanus* (Drass et al. 2000).

Identification of metamorphosing and early juvenile snappers can be problematic. Useful characters for identification of early demersal stages of lutjanine snappers include: meristics (dorsal spines, X or XII; dorsal rays, 12,13 or 14); presence and location of dorsolateral spot; other lateral body pigmentation (vertical bands); body depth and fin pigmentation. Early juveniles of *Apsilus dentatus* have distinctive blue lateral pigment and black margins on the caudal fin (Thresher 1980). Early juvenile stages of the four eteline species are poorly known. Diagnoses should be possible in some cases based on dorsal fin ray, gill raker, and scale counts (Table Lutjanidae 2).

Table Lutjanidae 1. Status of developmental descriptions of western Atlantic lutjanids. + : described; empty cell : unknown. PrF: preflexion larvae, 2-5 mm; PoF: postflexion larvae, 5-10 mm; Ej: early juvenile, 10-25 mm; J: juvenile, 25-70+ mm SL. Field : field-caught specimens; Rear: specimens laboratory-reared from eggs.

<table>
<thead>
<tr>
<th>Species; Common Name</th>
<th>PrF Field</th>
<th>PrF Rear</th>
<th>PoF Field</th>
<th>PoF Rear</th>
<th>Ej Field</th>
<th>Ej Rear</th>
<th>J Field</th>
<th>J Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>A. dentatus</em>; Black Snapper</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td><em>E. oculatus</em>; Queen Snapper</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td><em>L. analytis</em>; Mutton Snapper</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><em>L. apodus</em>; Schoolmaster</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><em>L. buccanella</em>; Blackfin Snapper</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><em>L. campechanus</em>; Gulf Red &quot;</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><em>L. cyanopterus</em>; Cubera Snapper</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><em>L. griseus</em>; Gray Snapper</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><em>L. jocu</em>; Dog Snapper</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><em>L. mahogoni</em>; Mahogany Snapper</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><em>L. purpureus</em>; Carib. Red Snapper</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><em>L. synagris</em>; Lane Snapper</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><em>L. vivanus</em>; Silk Snapper</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><em>O. chrysurus</em>; Yellowtail Snapper</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><em>P. aquilonaris</em>; Wenchman</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><em>P. freema ni</em>; Yelloweye Wenchman</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><em>P. macroptthalmus</em>; Cardinal &quot;</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><em>R. aurorubens</em>; Vermillion Snapper</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
Table Lutjanidae 2. Meristic characters of the Lutjanidae. Data from Rivas (1966), Miller & Jorgensen (1973), Anderson (1987), Leis & Lee (1994), Leiby (pers. comm.). In all species, vertebrae 10+14; caudal 9+8; branchiostegals 7; procurent caudal ray spur absent; supraneurals 3, hypurals 3-5; opurals 3; uroneurals 2. Gill raker counts from first arch include rudiments and primarily follow Anderson (pers. comm.). ( ) = uncommon/rare count.

<table>
<thead>
<tr>
<th>Species</th>
<th>First Dorsal</th>
<th>Second Dorsal</th>
<th>Anal</th>
<th>Pectoral</th>
<th>Gill Rakers</th>
<th>Lateral Line Scales</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Apsilus dentatus</em></td>
<td>X</td>
<td>10(9)</td>
<td>III,8</td>
<td>15-16</td>
<td>7-8+15-16=22-24</td>
<td>58-63</td>
</tr>
<tr>
<td><em>Etelis oculatus</em></td>
<td>X</td>
<td>11(10)</td>
<td>III,8</td>
<td>15-17</td>
<td>7-11+14-18=23-28</td>
<td>47-50</td>
</tr>
<tr>
<td><strong>Lutjanus</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>L. analis</em></td>
<td>X</td>
<td>14(13-15)</td>
<td>III,(7)8</td>
<td>16(15-17)</td>
<td>6-8+12-13=18-21</td>
<td>(46)47-51(53)</td>
</tr>
<tr>
<td><em>L. apodus</em></td>
<td>X</td>
<td>14</td>
<td>III,8(7-9)</td>
<td>16-18</td>
<td>5-7+11-15=17-22</td>
<td>(39)40-43(44)</td>
</tr>
<tr>
<td><em>L. buccanella</em></td>
<td>X</td>
<td>14</td>
<td>III,7-8</td>
<td>17(14-18)</td>
<td>7-9+17-18=25-27</td>
<td>47-50</td>
</tr>
<tr>
<td><em>L. campechanus</em></td>
<td>X</td>
<td>14</td>
<td>III,8-9</td>
<td>17(15-18)</td>
<td>6+14=20</td>
<td>(46)47-49(50)</td>
</tr>
<tr>
<td><em>L. cyanopterus</em></td>
<td>X</td>
<td>14</td>
<td>III,7-9</td>
<td>16-18</td>
<td>5-7+11-14=17-21</td>
<td>45-47</td>
</tr>
<tr>
<td><em>L. griseus</em></td>
<td>X</td>
<td>14</td>
<td>III,7-9</td>
<td>15-17</td>
<td>6-8+12-14=18-22</td>
<td>43-47</td>
</tr>
<tr>
<td><em>L. jocu</em></td>
<td>X</td>
<td>14</td>
<td>III,8(7-9)</td>
<td>16-17</td>
<td>6-8+12-14=19-21</td>
<td>(45)46-48(49)</td>
</tr>
<tr>
<td><em>L. mahogoni</em></td>
<td>X</td>
<td>12(11-13)</td>
<td>III,8</td>
<td>14-15</td>
<td>7-8+15-17=22-25</td>
<td>47-49</td>
</tr>
<tr>
<td><em>L. synagris</em></td>
<td>X</td>
<td>12(11-13)</td>
<td>III,8</td>
<td>15-16</td>
<td>6-7+12-15=18-22</td>
<td>47-50</td>
</tr>
<tr>
<td><em>L. purpureus</em></td>
<td>X</td>
<td>14(13-15)</td>
<td>III,8(7-9)</td>
<td>17</td>
<td>7+16=23</td>
<td>(49)50-51(53)</td>
</tr>
<tr>
<td><em>L. vivanus</em></td>
<td>X</td>
<td>14(13)</td>
<td>III,8(7-9)</td>
<td>17(16-18)</td>
<td>7-8+16-17=22-25</td>
<td>(49)50-51(53)</td>
</tr>
<tr>
<td><strong>Ocyurus chrysurus</strong></td>
<td>X (IX-XI)</td>
<td>12-13(14)</td>
<td>III,(8)9</td>
<td>15-16(17)</td>
<td>9-11+21-23=30-34</td>
<td>46-49</td>
</tr>
<tr>
<td><strong>Pristipomoides</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>P. aquilonaris</em></td>
<td>X</td>
<td>10-11</td>
<td>III,7-8</td>
<td>15-17</td>
<td>7-10+13-23=19-32</td>
<td>47-52</td>
</tr>
<tr>
<td><em>P. fremani</em></td>
<td>X</td>
<td>11(10)</td>
<td>III,8</td>
<td>15-17</td>
<td>8-10+19-23=28-32</td>
<td>47-52</td>
</tr>
<tr>
<td><em>P. macrophthalmus</em></td>
<td>X</td>
<td>11</td>
<td>III,8</td>
<td>15-17</td>
<td>6-8+13-17=19-25</td>
<td>54-57</td>
</tr>
<tr>
<td><strong>Rhomboptilus aurorubens</strong></td>
<td>XII</td>
<td>11(10-12)</td>
<td>III,8(9)</td>
<td>17-18(16-19)</td>
<td>8-10+19-21(22)</td>
<td>(46)47-51(52)</td>
</tr>
</tbody>
</table>
Table Lutjanidae 3. Characters useful in distinguishing larvae of western central North Atlantic (WCNA) lutjanid genera. Based on Drass et al. (2000) and Leis and Lee (1994). Characters given for *Apsilus* (undescribed in the Atlantic) are tentative and based on Indo-Pacific Apsilinae.

<table>
<thead>
<tr>
<th>Characters</th>
<th><em>Etelis</em></th>
<th><em>Pristipomoides</em></th>
<th><em>Rhomboplites</em></th>
<th><em>Lutjanus &amp; Ocyurus</em></th>
<th><em>Apsilus</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>External ornamentation on fin spines</td>
<td>None</td>
<td>None</td>
<td>Yes, <em>Dsp</em> serrate, *P&lt;sub&gt;2&lt;/sub&gt;*sp serrate</td>
<td>Yes, <em>Dsp</em> serrate in most species *P&lt;sub&gt;2&lt;/sub&gt;*sp serrate</td>
<td>None</td>
</tr>
<tr>
<td>Fin spine internal structure</td>
<td>None</td>
<td>Yes, intensity and initial appearance varies with species</td>
<td>None</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>Preopercle angle spine</td>
<td>Non-serrate</td>
<td>Non-serrate</td>
<td>Serrate</td>
<td>Non-serrate in WCNA species</td>
<td>Non-serrate</td>
</tr>
<tr>
<td>Relative length <em>Dsp&lt;sub&gt;2&lt;/sub&gt;</em> and *P&lt;sub&gt;2&lt;/sub&gt;*sp</td>
<td><em>Dsp&lt;sub&gt;2&lt;/sub&gt;</em> &gt; *P&lt;sub&gt;2&lt;/sub&gt;*sp</td>
<td><em>Dsp&lt;sub&gt;2&lt;/sub&gt;</em> &gt; *P&lt;sub&gt;2&lt;/sub&gt;*sp until &gt; 5 mm than equal</td>
<td>Approximately equal</td>
<td><em>Dsp&lt;sub&gt;2&lt;/sub&gt;</em> long, *P&lt;sub&gt;2&lt;/sub&gt;*sp long</td>
<td><em>Dsp&lt;sub&gt;2&lt;/sub&gt;</em> &gt; *P&lt;sub&gt;2&lt;/sub&gt;*sp</td>
</tr>
<tr>
<td>Relative length <em>Dsp&lt;sub&gt;2&lt;/sub&gt;</em> and <em>Dsp&lt;sub&gt;3&lt;/sub&gt;</em></td>
<td><em>Dsp&lt;sub&gt;2&lt;/sub&gt;</em> &gt; <em>Dsp&lt;sub&gt;3&lt;/sub&gt;</em> until 40 mm</td>
<td>Varies among spp; <em>Dsp&lt;sub&gt;2&lt;/sub&gt;</em> slightly longer than <em>Dsp&lt;sub&gt;3&lt;/sub&gt;</em> becoming equal @ 6-15 mm</td>
<td><em>Dsp&lt;sub&gt;2&lt;/sub&gt;</em> slightly longer</td>
<td><em>Dsp&lt;sub&gt;2&lt;/sub&gt;</em> &gt; <em>Dsp&lt;sub&gt;3&lt;/sub&gt;</em></td>
<td><em>Dsp&lt;sub&gt;2&lt;/sub&gt;</em> &gt; <em>Dsp&lt;sub&gt;3&lt;/sub&gt;</em></td>
</tr>
<tr>
<td>Size at scale formation</td>
<td>Before 7 mm</td>
<td>Varies with species (6.5-9 mm)</td>
<td>&gt; 14 mm SL</td>
<td>Variable (7-12 mm)</td>
<td>8-9 mm</td>
</tr>
<tr>
<td>Ventral pigment on tail</td>
<td>Initially 1-2 melanophores, reducing to none between 4-6.5 mm</td>
<td>3-5 melanophores reducing to one at A fin insertion and occasionally a second small one at mid-peduncle</td>
<td>Many, reducing to 2-3 (see figures)</td>
<td>Many reducing to a variable number</td>
<td>&gt; 9 melanophores, to 1 at A insertion &amp; 1-2 on peduncle</td>
</tr>
<tr>
<td>Dorsal pigment on tail</td>
<td>None</td>
<td>1 to several melanophores at D fin insertion before flexion complete, more anteriorly &amp; posteriorly with growth</td>
<td>Present &gt; 4.5 mm</td>
<td>Species- and size-dependent</td>
<td>1 to several melanophores at D fin insertion</td>
</tr>
<tr>
<td>Pigment on cleithral symphysis</td>
<td>Yes, disappears after about 7 mm</td>
<td>Yes but variable</td>
<td>Yes</td>
<td>Usually, species dependant</td>
<td>No</td>
</tr>
<tr>
<td>Pigment on lower jaw</td>
<td>Yes but variable</td>
<td>Yes but variable</td>
<td>No</td>
<td>No in some species.</td>
<td>Yes or no</td>
</tr>
<tr>
<td>Internal pigment at point of notochord flexure</td>
<td>No</td>
<td>Yes, from 5-6 mm</td>
<td>Yes, from 5-6 mm</td>
<td>Yes, from 5-6 mm</td>
<td>Yes</td>
</tr>
<tr>
<td>Pigment on forebrain</td>
<td>Yes, from 4.5-5.5 mm (absent until 7 mm in Indo-Pacific spp.)</td>
<td>Yes by 5 mm in <em>P. aquilonaris</em></td>
<td>No</td>
<td>Yes species and size dependent</td>
<td>&gt;15 mm</td>
</tr>
<tr>
<td>Pigment on fin spines and/or fin membranes</td>
<td>Yes on <em>Dsp&lt;sub&gt;2&lt;/sub&gt;</em> and *P&lt;sub&gt;2&lt;/sub&gt;*sp</td>
<td>Yes on <em>Dsp&lt;sub&gt;2&lt;/sub&gt;</em> (on *P&lt;sub&gt;2&lt;/sub&gt;*sp in <em>P. freemani</em>)</td>
<td>On <em>Dsp&lt;sub&gt;2&lt;/sub&gt;</em> and <em>P&lt;sub&gt;2&lt;/sub&gt;</em> but membrane with pigment usually lost</td>
<td>On <em>Dsp&lt;sub&gt;1&lt;/sub&gt;</em> &amp; *P&lt;sub&gt;2&lt;/sub&gt;*sp membrane in some species</td>
<td>Melanophores in posterior groove of <em>Dsp&lt;sub&gt;2&lt;/sub&gt;</em> and *P&lt;sub&gt;2&lt;/sub&gt;*sp</td>
</tr>
</tbody>
</table>
**LUTJANIDAE**

**Etelis oculatus** (Valenciennes 1828)

**MERISTICS**

<table>
<thead>
<tr>
<th>Vertebræ</th>
<th>Precaudal:</th>
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<tr>
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<tr>
<td></td>
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<td></td>
<td>First Dorsal Fin:</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Second Dorsal Fin:</td>
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<td></td>
<td>Anal Fin:</td>
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<td>Gill Rakers:</td>
<td>7-11+14-18=23-28</td>
<td></td>
</tr>
<tr>
<td>Lateral Line Scales:</td>
<td>47-50</td>
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</tbody>
</table>

**LIFE HISTORY**

Range: Bermuda, Florida, Bahamas, Gulf of Mexico, and Caribbean to Brazil.
Habitat: Rocky ledges between 60-450 m.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning: Season: Warmer months?
Area: Throughout range.
Mode: Multiple batches.

**LITERATURE**


**EARLY LIFE HISTORY DESCRIPTION**

**EGGS:** Unknown.

**LARVAE:**
Head Spination: all smooth.
Length at Flexion: ca. 3.6 to 4.0 mm.
Sequence of Fin Development: D₁ & P₂, A & D₂ & C, P₁.
Pigmentation: Prefixion- On midbrain, gas bladder over gut, ethalral symphysis; sometimes on lower jaw; 3-4 ventrally on tail reducing to none; over developing hypurals; on Dsp2 and on elongate first P₁ ray. Flexion- Increasing over head and trunk; variable on lower jaw; 1 to none ventrally on tail; over developing hypurals; on Dsp2 and on elongate first P₂ ray.
Diagnostic characters: Most likely to be confused with *Pristipomoides* but *Etelis* lacks dorsal tail pigment. Ventral tail pigment is present in *Etelis* at < 5 mm but is lost with growth. Dsp2 is longer in *Etelis* than in *P. aquilonaris*. *Etelis* has pigment on the Dsp2 & 3 and P₁ spine and first ray. *P. aquilonaris* has pigment at the distal edge of the fin membrane between Dsp 2, 3 & 4 and distally on the first P₁ ray. Distinguished from lutjanine snappers by slender body; weak (delicate) median fin spines; lower total dorsal element count, 21 vs. 22-24; earlier formation of midbrain pigment; earlier formation of scales.

**EARLY JUVENILES:**
Settlement Size: ca. 25 mm?
Pigment: No dorsal caudal pigment; no lower jaw pigment. Pale pink/red, typically darker on dorsum.
Diagnostic Characters: Scales on maxilla (>40 mm); penultimate dorsal spine < ultimate. 11 dorsal rays. Deep habitats.

**ILLUSTRATIONS**

A) D. Drass drawing, field-collected, SML 72958; B) M. Greene drawing, field collected; C) Leis & Lee (1994), field-collected, MCZ 82540 (Scales shown only along lateral line).
**LUTJANIDAE**

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**Lutjanus analis (Cuvier 1828)**

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### MERISTICS

<table>
<thead>
<tr>
<th>Trait</th>
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<td>Gill Rakers:</td>
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<tr>
<td>Lateral Line Scales:</td>
<td>(46)47-51(53)</td>
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</tbody>
</table>

### LIFE HISTORY

**Range:** Mass. (rare N. of North Carolina), Florida and northeastern & southern Gulf of Mexico, Bahamas, & Caribbean to Brazil; unclear if established in Bermuda.

**Habitat:** Shallow vegetation to deep sand flats or reefs (ca. 80 m).

**ELH Pattern:** Oviparous; pelagic eggs & larvae.

**Spawning**
- **Season:** March–Sept., peaks in May & June.
- **Area:** Throughout range.
- **Mode:** Multiple batches.

**Migration:** Can occur annually for spawning aggregation.

**Size/Age at First Maturity:** ca. 38-41 cm FL; 5-6 years.

**Longevity:** 8 to 14 years.

### LITERATURE


### ILLUSTRATIONS


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### EARLY LIFE HISTORY DESCRIPTION

**EGGS:** From lab-reared specimens.

**No. of Oil Globules:** single at anterior end of yolk in yolk sac larvae.

**Oil Globule Diameter:** 0.13-0.22 mm (yolk sac larvae).

**Hatch Size:** 2.2-2.5 mm.

**LARVAE:** From lab-reared specimens.

**Head Spination:** Preopercle spines appear by 3 mm, 2-4 and 5-8 spines are present by flexion on the anterior and posterior preop. margins, respectively.

**Length at Flexion:** ca. 4.4 mm.

**Sequence of Fin Development:** D1 & P2, C, A & D2, P1

**Pigmentation:** in preflexion larvae usually 16-17 (range 13-23) melanophores ventrally on tail with enlarged melanophore 3/4 distance from anus to notochord tip; spot ventral to notochord flexure.

**Diagnostic Characters:** In yolk sac & early preflexion larvae a gap is present in ventral melanophore series posteriorly on tail as is an enlarged melanophore; presence of AVM pigment; no serrations on preopercle angle spine; no pigment on isthmus in branchial chamber until postflexion; longest P1 ray is 2x P2 spine length; in larvae with ≥ 5 D spines D1 & P2 spines are serrated; pigment ventral to notochord flexure by ca. 6 mm.

### EARLY JUVENILES:

**Settlement Size:** 10-15 mm SL.

**Pigment:** >5 green/brown lateral bands & transparent fins. At 22 mm SL, >5 thin yellow lateral stripes.

**Dorsolateral spot centered over lateral line, can shift dorsal with growth.

**Diagnostic Characters:** Similar to *L. synagris* but has 14 D rays, wavy lateral yellow stripes, & darker lateral bands.
LUTJANIDAE

Lutjanus apodus (Walbaum 1792)

MERISTICs

VertebrAEs
Precaudal: 10
Caudal: 14
Total: 24
First Dorsal Fin: X
Second Dorsal Fin: 14
Anal Fin: III, 8
Pectoral Fin: 16-17
Gill Rakers: 5-7+11-15=17-22
Lateral Line Scales: 40-45

lIFE hISTORY

Range: Mass. (rare N. of North Carolina), Bermuda, Florida, northeastern and southern Gulf of Mexico, Bahamas, & Caribbean to Brazil.
Habitat: Shallow vegetation and rocky areas to shelf reefs, to ca. 50 m.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
Season: Potentially over much of the year.
Area: Throughout range.
Mode: Multiple batches.
Size/Age at First Maturity: ca. 25 cm FL.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

LARVAE: Unknown.

EARLY JUVENILES:
Settlement Size: ca. 15 mm SL.
Pigment: Faint to moderately dark bands change to yellow with growth. Oblique black stripe often through eye.
Diagnostic Characters: Similar to L. griseus but no serrations on D, A & P2 spines. Dorsolateral scale rows parallel below D2; Lateral bands present. P1 yellow at 25 mm SL. D & A yellow by 35 mm SL. P1 longer than in L. griseus. No dorsolateral spot.

ILLUSTRATIONS

Lindeman (1997), field-collected; UF 103605.

LITERATURE

LUTJANIDAE

**MERISTICS**

Vertebrae
- Premaxillaries: 10
- Caudal: 14
- Total: 24
- First Dorsal Fin: X
- Second Dorsal Fin: 14
- Anal Fin: (II)III,7-8(9)
- Pectoral Fin: (14)16-17(18)
- Gill Rakers: 7-9+17-18(19)=25-27
- Lateral Line Scales: (47)48-49(50)

**LIFE HISTORY**

Range: Mass. (rare N. of North Carolina), Bermuda, Florida, Bahamas, Gulf of Mexico, & Caribbean to Brazil.

Habitat: Reefs & ledges (5-230 m).

ELH Pattern: Oviparous; pelagic eggs & larvae.

Spawning
- Season: Throughout yr, spring & late summer peaks.
- Area: Throughout range.
- Mode: Multiple batches.

Size/Age at First Maturity: ca. 21-30 cm FL.

**EARLY LIFE HISTORY DESCRIPTION**

**EGGS:** Unknown.

**LARVAE:** Unknown.

**EARLY JUVENILES:**

Settlement Size: 15-20 mm SL.

Pigment: Yellow stripe extending from dorsal lobe of C to below middle of D₂.

Diagnostic Characters: Dorsal yellow pigment posteriorly. Dark black spot on P₁ axil in older juveniles. No dorsolateral spot.

**ILLUSTRATIONS**

Lindeman 1997, field-collected; UF 103609.

**LITERATURE**

**LUTJANIDAE**

**Lutjanus campechanus (Poey 1860)**

**MERISTICS**

<table>
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<th>Value</th>
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<td>Lateral Line Scales:</td>
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</table>

**LIFE HISTORY**

Range: North Carolina to FL Keys & Gulf of Mexico.

Habitat: Shallow sand/mud bottoms to deep rocky areas (<190 m).

EHL Pattern: Oviparous; pelagic eggs & larvae.

Spawning:

Season: Late spring through fall, peaks in warmer months.

Area: Throughout range.

Mode: Multiple batches.

Migration: May occur annually for spawning aggregations.

Size/Age at First Maturity: ca. 23-35 cm FL

Longevity: ca. 50 yrs.

**LITERATURE**


**EARLY LIFE HISTORY DESCRIPTION**

**EGGS:**

Diameter: 0.72-0.85 mm.

No. of Oil Globules: one.

Oil Globule Diameter: 0.11-0.19 mm.

Yolk: Clear, homogenous.

Hatch Size: 1.9-2.2 mm.

Incubation: 20-27 hr at 23-25°C.

**LARVAE:**

Head Spination: Preopercle, opercle, posttemporal, ca. 7 on supracleithrum; no serrations on head spines.

Length at Flexion: 3.8 mm.

Sequence of Fin Development: D₁ & P₂, A & D₂, C, P₁.

Pigmentation: 13 ventral tail melanophores <4 mm; > 4 mm, 2 ventral tail melanophores (sometimes 1 external, 1 internal) & see next section.

Diagnostic Characters: In yolksac & early preflexion larvae a gap is present in ventral melanophore series posteriorly on tail & no enlarged melanophore is present; presence of AVM pigment; no serrations on preopercle angle spine; no pigment on isthmus in branchial chamber until postflexion; body depth of flexion larvae between 34-36% of body length; longest P₂ ray is 2x P₂ spine length; in larvae with > 5 D spines, D₁ spines are not serrated but P₂ spine is serrated; no pigment spot ventral to notochord flexure or internal series along notochord; pigment in D₁ first appears in membrane behind Dsp 2 with further pigment developing only late in flexion or in postflexion; A membrane pigment at ≥ 12 mm; P₂ pigment associated with first ray.

**EARLY JUVENILES:**

Settlement Size: ca. 15-25 mm SL.

Pigment: Dorsolateral spot and dorsal bands present.

Diagnostic Characters: Usually 9 A rays. Pale body with large dorsolateral spot placed approx 2/3 dorsal to lateral line. L. vivanus with yellow iris by 50 mm SL.

**ILLUSTRATIONS**

A-L: Drass et al. (2000), lab-reared.
LUTJANIDAE  

*Lutjanus cyanopterus* (Cuvier 1828)

**MERISTICS**

<table>
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<th>Value</th>
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<tbody>
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<tr>
<td>First Dorsal Fin:</td>
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<td>Second Dorsal Fin:</td>
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<tr>
<td>Anal Fin:</td>
<td>III,7-8</td>
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<td>Pectoral Fin:</td>
<td>16-18</td>
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<td>Gill Rakers:</td>
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</tr>
<tr>
<td>Lateral Line Scales:</td>
<td>45-47</td>
</tr>
</tbody>
</table>

**LIFE HISTORY**

Range: North Florida (occasionally to Nova Scotia), Bermuda, Bahamas & Caribbean to Brazil (uncommon in Gulf of Mexico).

Habitat: Shallow vegetation to deep reefs to ca. 100 m.

ELH Pattern: Oviparous; pelagic eggs & larvae.

Spawning

- Season: June through Sept.
- Area: Throughout range.
- Mode: Multiple batches.

Migration: Can occur annually for spawning aggregations.

**EARLY LIFE HISTORY DESCRIPTION**

EGGS: Unknown.

LARVAE: Unknown.

**EARLY JUVENILES:**

Settlement Size: ca. 15-20 mm SL.

Diagnostic Characters: Similar to *L. griseus*, but oblique dorsolateral scale rows & dorsal bands present by at least 40 mm. Vomerine tooth patch without posterior extension. Shallower body than *L. griseus*. Infrequent in relative occurrence.

**ILLUSTRATIONS**

Lindeman (1997), field-collected; UF 61711

**LITERATURE**

LUTJANIDAE

Lutjanus cyanopterus (Cuvier 1828)

42.8 mm SL
LUTJANIDAE

**MERISTICS**

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<td>Second Dorsal Fin</td>
<td>14</td>
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<tr>
<td>Anal Fin</td>
<td>III,7-9</td>
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<td>15-17</td>
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<tr>
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</tr>
<tr>
<td>Lateral Line Scales</td>
<td>43-47</td>
</tr>
</tbody>
</table>

**LIFE HISTORY**

Range: Mass. (rare N. of North Carolina), Bermuda, Florida, Bahamas, Gulf of Mexico, & Caribbean to Brazil.

Habitat: Shallow vegetated areas to shelf reefs.

ELH Pattern: Ovivorous; pelagic eggs & larvae.

Spawning
- Season: Summer through fall, August peak in some areas.
- Area: Throughout range.
- Mode: Multiple batches.
- Migration: May occur annually for spawning.
- Size/age at First Maturity: 18-21 cm FL; 2 years.
- Longevity: 6 to 25 years (estimation methods vary greatly).

**LITERATURE**


**ILLUSTRATIONS**

A, F) original by J. Javech, lab-reared; B-E, G-H) Richards & Saksena (1980), lab-reared.

**EARLY LIFE HISTORY DESCRIPTION**

**EGGS:** From lab-reared specimens.
- Diameter: 0.70-0.85 mm.
- No. of Oil Globules: one.
- Oil Globule Diameter: 0.12-0.18 mm.
- Yolk: Clear, homogenous.

**LARVAE:** From lab-reared specimens.
- Head Spination: Older larvae show no serrations on supraorbital, preopercle, and opercle spines.
- Length at Flexion: ca. 4-5 mm.
- Sequence of Fin Development: Dp 1, Pp 1, A & Dp 2, C, Pp 1
- Pigmentation: Many melanophores along ventral tail midline; cleithral symphysis; midbrain and pelvic pigmented; urostyle spot, D membrane, & opercle ca. 6 mm; caudal peduncle, forebrain, D fin notch ca. 7 mm.

Diagnostic characters: In yolksac & early preflexion larvae no enlarged melanophore present in ventral melanophore series posteriorly on tail; presence of AVM pigments; no serrations on preopercle angle spine; body depth of flexion larvae on 34-36% of body length; longest Pp ray = Pp spine length; in larvae with ≥ 5 D spines, Dp 1 & Pp 2 spines are serrated; no pigment ventral to notochord flexure or internal series along notochord; pigment in Dp 1 first appears low in membrane at the base of Dsp 2 and/or 3 with further development distally & posteriorly; A membrane pigment by 7 mm; Pp 2 pigment associated with spine by 6 mm; no pigment dorsally on caudal peduncle in postflexion. Late larvae have serrations on D, Pp & A spines & variable pigmentation that can range from dense lateral melanophores to discrete bars to little pigment except for the caudal peduncle.

**EARLY JUVENILES:**

Settlement Size: 10-15 mm SL

Diagnostic Characters: Serrations on Pp 2 spine, Dsp 1-6 and A spine from at least 10 mm. By 15 mm, serrations are greatly reduced & may or may not be apparent (serrations retained longest in anteriormost spines). Dorso-lateral scale rows wavy below D 2, parallel below D 1.
**LUTJANIDAE**

**MERISTICS**

<table>
<thead>
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<th>Value</th>
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<td>(13)14</td>
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<td>III,8(7-9)</td>
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<td>Lateral Line Scales:</td>
<td>(45)46-48(49)</td>
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**LIFE HISTORY**

Range: Mass. (rare N. of North Carolina), Florida, Gulf of Mexico, Bahamas, & Caribbean to Brazil.
Habitat: Shallow vegetated areas to deep reefs.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning:
- Season: Year-round, with locally variable peaks in warmer months.
- Area: Throughout range.
- Mode: Multiple batches.
Migration: Can occur annually for spawning aggregations.
Size/Age at First Maturity: ca. 32 cm FL; 5-6 years.
Longevity: ca. 21 years.

**EARLY LIFE HISTORY DESCRIPTION**

**EGGS:** Unknown.

**LARVAE:** Unknown.

**EARLY JUVENILES:**
Settlement Size: ca. 15 mm SL
Pigment: Pale laterally (possibly pale-green), yellow P₂ fins. Oblique eye stripe often present.
Diagnostic Characters: Small dorsal scales, 8-9 above lateral line. Pale triangle pattern below eye can appear by 60 mm SL. May appear pale green laterally. No bands, stripes, or dorsolateral spot.

**ILLUSTRATIONS**
Lindeman 1997, field-collected; UF 103604.

**LITERATURE**
Lutjanus jocu (Bloch & Schneider 1801)
LUTJANIDAE

Lutjanus mahogoni (Cuvier 1828)

MERISTICS

Vertebrae
  Precaudal: 10
  Caudal: 14
  Total: 24
First Dorsal Fin:
  X
Second Dorsal Fin: (11)12
Anal Fin: III,8
Pectoral Fin: 14-15
Gill Rakers: 7-8+15-17=22-25
Lateral Line Scales: 47-49

LIFE HISTORY

Range: North Carolina, Florida, Bahamas, Gulf of Mexico, & Caribbean to Venezuela.
Habitat: Shallow clear-water areas to intermediate depth reefs.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
  Season: Summer & early fall.
  Area: Throughout range.
  Mode: Multiple batches.

LITERATURE


EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

LARVAE: Unknown.

EARLY JUVENILES:
Settlement Size: ca. 15 mm SL.
Pigment: Pale with pink/red pigment on distal portions of median fins. Dorsolateral spot present.
Diagnostic Characters: 12 D2 rays (shared with L. synagris & O. chrysurus). Enlarged, upcurved spine on preopercle margin. Large eye. Dorsolateral spot centered on or slightly dorsad of lateral line.

ILLUSTRATIONS

Lindeman 1997, field-collected; UF 103605.
Lutjanidae

LUTJANIDAE

Lutjanus mahogoni (Cuvier 1828)

17.8 mm SL
LUTJANIDAE

**Lutjanus purpureus** (Poey 1866)

**MERISTICS**

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<td>Lateral Line Scales</td>
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</table>

**LIFE HISTORY**

Range: Caribbean to Brazil, occur rarely in southeast U.S. & Cuba.

Habitat: Intermediate sand areas to deep ledges, ca. 30-160 m.

ELH Pattern: Oviparous; pelagic eggs & larvae.

Spawning

Season: Year round with local peaks.

Area: Throughout range.

Mode: Multiple batches.

Size/Age at First Maturity: 42 cm FL.

Longevity: ca. 19 years.

**EARLY LIFE HISTORY DESCRIPTION**

**EGGS:** Unknown.

**LARVAE:** Unknown.

**EARLY JUVENILES:**

Settlement Size: 15-20 mm SL?

Pigment: Pale laterally, dorsolateral spot present.

Diagnostic Characters: Similar to *L. campechicus*

...but usually 8 A rays, more gill rakers, dorsolateral spot centered on lateral line & little overlap in geographic range. Similar to *L. vivanus* but iris not yellow, no occasional lateral bars, C fin more emarginate.

**ILLUSTRATIONS**

Lindeman 1997, field-collected; USNM 290051.

**LITERATURE**

Rivas 1966, Anderson 1967, Robins & Ray 1986,
Anderson 2003.
**LUTJANIDAE**

**Lutjanus synagris** (Linnaeus 1758)

**MERISTICS**

Vertebrae
- Precaudal: 10
- Caudal: 14
- Total: 24
- First Dorsal Fin: X
- Second Dorsal Fin: 12(13)
- Anal Fin: III,8(9)
- Pectoral Fin: 15-16
- Gill Rakers: 6-7+(11)13-14(15)=18-22
- Lateral Line Scales: 47-50

**LIFE HISTORY**

Range: Mass. (rare N. of North Carolina), Bermuda, Florida, Bahamas, Gulf of Mexico, & Caribbean to Brazil.

Habitat: Shallow vegetated areas to deep reefs.

ELH Pattern: Ovivorous; pelagic eggs & larvae.

Spawning
- Season: Year round, peaks in spring & summer.
- Area: Throughout range.
- Mode: Multiple batches.

Migration: Can occur annually for spawning aggregations.

Size/Age at First Maturity: 18-20 cm FL; 2 years.

Longevity: 5 to 10 years.

**LITERATURE**


**ILLUSTRATIONS**

A-K) original J. Javech drawings, lab-reared; 1) original J. Javech drawing, field-collected; M) Lindeman 1997, field-collected, UF 105601.

**EARLY LIFE HISTORY DESCRIPTION**

EGGS: From lab-reared specimens.
- Diameter: 0.65-0.80 mm.
- No. of Oil Globules: Usually one at anterior end of yolksac larvae.
- Oil Globule Diameter: 0.13-0.22 mm.
- Yolk: Clear, homogenous.
- Hatch Size: 2.0-2.2 mm.
- Incubation: 23 hr at 26°C, 19 hr at 28°C.
- Pigment: Possibly many dorsolateral melanophores from optic lobes to caudal region at hatching.

LARVAE: From lab-reared specimens.

Head Spination: Preopercle spines appear by 3 mm, 2-4 & 5-8 spines are present by flexion on the anterior & posterior preop. margins, respectively.

Length at Flexion: by 4.7 mm.

Sequence of Fin Development: D₁ & P₂, A & D₂, C, P₁.

Pigmentation: in preflexion larvae usually 19-21 (range 15-25) melanophores ventrally on tail with enlarged melanophore 3/4 distance from anus to notochord tip.

Diagnostic Characters: In yolksac & early preflexion larvae no gap is present in ventral melanophore series posteriorly on tail but an enlarged melanophore is present; presence of AVM pigment; no serrations on preopercle angle spine; no pigment on isthmus in branchial chamber until postflexion; longest P₂ ray is 2× P₁ spine length; in larvae with ≥ 5 D spines D₁ & P₁ spines are serrated; no pigment spot ventral to notochord flexure; series of melanophores develop internally over notochord by ca. 6 mm; pigment in D₁ first appears in membrane behind Dsp 2 increasing posteriorly behind successive spines during flexion; pigment in D₂ at ca. 6 mm prior to fin ray formation is complete; A membrane pigment by ca. 10 mm; P₁ pigment associated with first ray.

**EARLY JUVENILES:**

Settlement Size: 10-15 mm SL.

Pigment: Pale at settlement with D₁ & D₂ tinged red & P₂ tinged yellow. Pale bands can be present. By ca. 22 mm, thin yellow lateral stripes appear. Dorsolateral spot, centered or dorsal to lateral line, by 10-15 mm.

Diagnostic Characters: 12 dorsal rays (seen only in O. chrysurus & L. mahogoni, all other Lutjanus spp. with 14). Pigment in L. analis similar, but wavy lateral stripes & darker bands.
LUTJANIDAE

Lutjanus synagris (Linnaeus 1758)

A  2.4 mm NL
B  2.3 mm NL
C  2.3 mm NL
D  3.3 mm NL
E  3.9 mm NL
F  4.6 mm NL
G  5.0 mm SL
H  5.8 mm SL
I  6.6 mm SL
J  8.7 mm SL
K  9.7 mm SL
L  13.5 mm SL
M  21.3 mm SL
LUTJANIDAE

Lutjanus vivanus (Cuvier 1828)

MERISTICS

Vertebrae
Precaudal: 10
Caudal: 14
Total: 24
First Dorsal Fin: X(XI)
Second Dorsal Fin: 14(13)
Anal Fin: III,8(7-9)
Pectoral Fin: 17
Gill Rakers: (6)7-8(9)+16-17=22-25
Lateral Line Scales: (47)48-50

EARLY LIFE HISTORY

Range: North Carolina, Bermuda, Florida, Bahamas, Gulf of Mexico, & Caribbean to Brazil.
Habitat: Between 60-240 m.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
Season: Apparently year round, with local peaks.
Area: Throughout range.
Mode: Multiple batches.
Size/Age at First Maturity: ca. 30-31 cm FL; 5 years.

LITERATURE

Rivas 1970, Robins & Ray 1986, Grimes 1987,

EGGS: Unknown.

LARVAE: Unknown.

EARLY JUVENILES:
Settlement Size: ca.15-20 mm (?).
Pigment: Pale red/pink laterally. Dorsolateral spot present.
Diagnostic Characters: Iris bright yellow in larger specimens. May show red or white lateral bars.
Dorsolateral spot centered over lateral line. Lunate C fin. Deep habitats.

ILLUSTRATIONS

Lindeman 1997, field-collected; UF 78919.
Lutjanidae

LUTJANIDAE

*Lutjanus vivanus* (Cuvier 1828)

53.5 mm SL
### LUTJANIDAE

**Ocyurus chrysurus (Bloch 1791)**

#### MERISTICS

<table>
<thead>
<tr>
<th>Classification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertebrae</td>
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<tr>
<td>Precaudal</td>
<td>10</td>
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<tr>
<td>Caudal</td>
<td>14</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
</tr>
<tr>
<td>First Dorsal Fin</td>
<td>X(IX-XI)</td>
</tr>
<tr>
<td>Second Dorsal Fin</td>
<td>12-13(14)</td>
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<tr>
<td>Anal Fin</td>
<td>III(8)</td>
</tr>
<tr>
<td>Pectoral Fin</td>
<td>15-16(17)</td>
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<tr>
<td>Gill Rakers</td>
<td>9-11+21-23=30-34</td>
</tr>
<tr>
<td>Lateral Line Scales</td>
<td>46-49</td>
</tr>
</tbody>
</table>

#### LIFE HISTORY

**Range:** Mass. (rare N. of North Carolina), Bermuda, Florida, Bahamas, Gulf of Mexico, and Caribbean to Brazil

**Habitat:** Shallow vegetation to deep sand flats or reefs (typically less than 70 m)

**ELH Pattern:** Oviparous; pelagic eggs and larvae

**Spawning:**
- **Season:** Throughout year, with local peaks
- **Area:** Throughout range
- **Mode:** Multiple batches

**Size/Age at First Maturity:** ca. 13-17 cm FL; 2 years

**Longevity:** ca. 4-14 years

#### EARLY LIFE HISTORY DESCRIPTION

**EGGS:** From lab-reared specimens.
- Diameter: 0.90-0.96 mm, 2-3 hr post-fertilization.
- No. of Oil Globules: single at anterior end of yolksac larvae.

**Oil Globule Diameter:** 0.13-0.22 mm (yolksac larvae).

**Hatch Size:** 2.0-2.4 mm.

**Incubation:** 22-24 hr at 27°C.

**Pigment:** Small series of chromatophores on embryo surface.

**Diagnostic Characters:** Egg diameter exceeds other described species.

#### LARVAE:

**From lab-reared specimens.**

**Head Spination:** Preopercle spines appear by 3 mm, 2-4 & 5-8 spines are present by flexion on the anterior & posterior preop. margins, respectively.

**Length at Flexion:** ca. 4.5 mm.

**Sequence of Fin Development:** D₁ & P₂, A & D₂, C, P₁.

**Pigmentation:** 14-16(13-19) melanophores along ventral tail midline.

**Diagnostic Characters:** In yolksac & early preflexion larvae, no gap & no enlarged melanophore is present in ventral melanophore series on tail; no serrations on preopercle angle spine; no pigment on isthmus in branchial chamber; longest P₂ ray = P₂ spine length; in larvae with ≥ 5 D spines D₁ & P₂ spines are serrated; no pigment spot ventral to notochord flexure & no internal series of melanophores along notochord; series of melanophores develop internally over notochord by ca. 6 mm; pigment in D₁ first appears in membrane behind Dsp 2 with further pigment developing posteriorly only late in flexion or in postflexion; pigment between Dsp 1 & 2 develops in preflexion; entire P₂ fin membrane pigmented.

#### EARLY JUVENILES:

**Settlement Size:** ca. 10-15 mm SL.

**Pigment:** Midlateral yellow stripe appears immediately after settlement. Pale background. No dorsolateral spot.

**Diagnostic Characters:** Body-length midlateral yellow stripe. Combination of low dorsal ray and often high anal ray counts. Low body depth.

#### LITERATURE


#### ILLUSTRATIONS

A-J) original J. Javech drawings, lab-reared.
Lutjanidae

**LUTJANIDAE**

*Ocyurus chrysurus* (Bloch 1791)

A. 3.1 mm NL

B. 3.0 mm NL

C. 2.9 mm NL

D. 4.0 mm NL

E. 4.0 mm NL

F. 4.4 mm NL

G. 5.2 mm NL

H. 6.3 mm SL

I. 7.5 mm SL

J. 11.6 mm SL
**LUTJANIDAE**

**PRISTIPOMOIDES AQUILONARIS (Goode & Bean 1896)**

**MERISTICS**

<table>
<thead>
<tr>
<th>Vertebræ</th>
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<tbody>
<tr>
<td>Precaudal</td>
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</tr>
<tr>
<td>Caudal</td>
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</tr>
<tr>
<td>Total</td>
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</tr>
<tr>
<td>First Dorsal Fin:</td>
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<tr>
<td>Second Dorsal Fin:</td>
<td>7-9+16-20=24-28</td>
</tr>
<tr>
<td>Anal Fin:</td>
<td>III,7-8</td>
</tr>
<tr>
<td>Pectoral Fin:</td>
<td>15-17</td>
</tr>
</tbody>
</table>

**LIFE HISTORY**

Range: Mass. (rare N. of North Carolina), Florida, Bahamas, Gulf of Mexico, & Caribbean to Brazil.

Habitat: Deep reefs and sand areas on slopes to ca. 490 m.

ELH Pattern: Oviparous; pelagic eggs & larvae.

Spawning:
- Area: Throughout area.
- Mode: Multiple batches.

**LITERATURE**


**EARLY LIFE HISTORY DESCRIPTION**

**EGGS:** Unknown.

**LARVAE:**

Head Spination: High number on preopercle, subopercle forms early.

Length at Flexion: ca. 4.5-5 mm.

Sequence of Fin Development: D₁ & P₁, A & D₂, C, P₁.

Length of Fin Development: Dsp² never longer than pelvic spine; frothy internal structure appears at ca. 7 mm, strong by 8.5 mm.

Pigmentation: Cluster of melanophores on posterior D base; on forebrain (ca. 5 mm), tip lower jaw, on ocellar symphysis until ca. 9 mm, urostyle from ca. 7 mm, no pigment on base of P₁ or on P₂ spine.

Pigment on caudal rays from 10.5 mm and along D₂ base from ca. 10 mm.

Diagnostic Characters: Frothy internal structure of fin spines; early occurrence of pigment on forebrain (ca. 5 mm). Most likely confused with *Etelis* but *Pristipomoides* has both dorsal & ventral pigment on tail. Dsp² is shorter in *P. aequilinaris* than in *Etelis*. *P. aequilinaris* has pigment at the distal edge of the fin membrane between Dsp 2, 3 & 4 & distally on the first P₂ ray. *Etelis* has pigment on the Dsp² & 3, & P₂ spine & first ray. Distinguished from lutjanid snappers by slender body; weak (delicate) median fin spines; lower total dorsal element count, 21 vs. 22-24; early formation of pigment on midbrain; early formation of scales.

**EARLY JUVENILES:**

Settlement Size: ca. 25 mm?

Pigment: Melanophores clustered at D₂ base.

Pale pink/red dorsally.

Diagnostic Characters: No dorsolateral spot. Deeper habitats. *P. freemanii* more elongate with more gill rakers. *P. macropirhalus* with more lateral line scales.

**ILLUSTRATIONS**

A-C, F) J. Javech drawings, field-collected; D-E, G-H) Leis & Lee 1994, field-collected. (Scales shown in G & H only along lateral line).
**LUTJANIDAE**  
*Pristipomoides fremani* Anderson 1966

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### MERISTICS

<table>
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<th>Character</th>
<th>Value</th>
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<td>Vertebræ</td>
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<tr>
<td>Caudal</td>
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</tr>
<tr>
<td>Total</td>
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</tr>
<tr>
<td>First Dorsal Fin:</td>
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</tr>
<tr>
<td>Second Dorsal Fin:</td>
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</tr>
<tr>
<td>Anal Fin:</td>
<td>III,8</td>
</tr>
<tr>
<td>Pectoral Fin:</td>
<td>15-17</td>
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<tr>
<td>Gill Rakers:</td>
<td>8-10+16-23=28-32</td>
</tr>
</tbody>
</table>

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### LIFE HISTORY

Range: Poorly known: southeast U.S., northern South America, Barbados, Brazil, Uruguay.  
Habitat: ca. 85-220 m.  
ELH Pattern: Oviparous; pelagic eggs & larvae.  
Spawning  
Area: Throughout range.  
Mode: Multiple batch or?  

---

### EARLY LIFE HISTORY DESCRIPTION

**EGGS:** Unknown.  

**LARVAE:**  
Leis & Lee (1994) found 1 specimen (11.1 mm) tentatively assigned to this species.  
Pigment: Melanophores on forebrain, tip of lower jaw, urostyle, P₂ spines; pigment absent from cleithral symphysis, P₁ base, or along D base.  
Diagnostic Characters: Fin spines moderate; P₂ spine > Dsp₂; moderate internal structure in fin spines; high number spines on outer border of pre- opercle; meristics. Distinguished from lutjanine snappers by: slender body; weak (delicate) median fin spines; lower total D element count, 21 vs. 22-24.  

**EARLY JUVENILES:** Unknown.  

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### ILLUSTRATIONS

A) Leis & Lee 1994, field-collected. (Scales shown only along lateral line).  

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**LITERATURE**

Pristipomoides fremani Anderson 1966

11.1 mm SL
LUTJANIDAE

**MERISTICS**

<table>
<thead>
<tr>
<th>Vertebræ</th>
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</tr>
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<tbody>
<tr>
<td>Precaudal</td>
<td>14</td>
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<tr>
<td>Caudal</td>
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</tr>
<tr>
<td>Total</td>
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</tr>
<tr>
<td>First Dorsal Fin:</td>
<td>11(10-12)</td>
</tr>
<tr>
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<td>17-18(16-19)</td>
</tr>
<tr>
<td>Anal Fin:</td>
<td>III,8(9)</td>
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<td>Pectoral Fin:</td>
<td>8-10+19-21(22)</td>
</tr>
<tr>
<td>Gill Rakers:</td>
<td>(46)47-51(52)</td>
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</tbody>
</table>

**LIFE HISTORY**

Range: North Carolina, Florida, Bermuda, Bahamas, Gulf of Mexico, & Caribbean to Brazil.
Habitat: Outer shelf and slope hard bottom habitats.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
Season: Throughout year, peaks in warmer months?
Area: Throughout area.
Mode: Multiple batches.
Size/Age at First Maturity: 14-17 cm FL.

**LITERATURE**


**EARLY LIFE HISTORY DESCRIPTION**

**EGGS:** Unknown.

**LARVAE:**
Head Spination: Supraorbitals, posttemporal, supracleithrum, 2 rows of preopercle & opercle; preopercular spine serrated.
Length at Flexion: ca. 4.7-5 mm.
Sequence of Fin Development: D₁, P₂, C, A, D₂, P₁.
Pigmentation: 13 ventral tail melanophores coalescing to 2 or 3 by ca. 5 mm; urostyle spot ca. 5 mm; dorsal caudal peduncle pigmented ca. 6.9 mm; mid-brain & pectoral symphysis pigmented; opercle & additional ventral tail melanophores ca. 7 mm.

Diagnostic Characters: In yolk sac & early preflexion larvae, a gap is present in ventral melanophore series posteriorly on tail but no enlarged melanophore is present; pigment on sterohyoidius muscle of isthmus inside the branchial chamber by ca. 3 to 3.5 mm; no AVM pigment; preopercle angle spine serrated by ca.3 to 3.5 mm; longest P₂ ray is 2× P₂ spine length; D₁ & P₂ spines are highly serrated; no pigment spot ventral to notochord flexure; pigment present in D₁ behind Dsp 2 when fin membrane is intact; A membrane pigment at ≥ 12 mm; P₁ pigment associated with first ray.

**EARLY JUVENILES:**
Settlement Size: ca. 20 mm?
Pigment: Pale pink/red dorsally, may show thin yellow stripes later.

**ILLUSTRATIONS**
