Status of the eastern Pacific agujon needlefish  
*Tylosurus pacificus* (Steindachner, 1876)  
(Beloniformes: Belonidae)

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**Abstract:** *Tylosurus pacificus* (Steindachner, 1876) is confirmed to have full species rank based on: 1) sympatry with *T. acus melanotus* at Isla Gorgona and in Panamá; 2) level of morphological differentiation in numbers of vertebrae, dorsal and anal fin rays; and 3) level of mtDNA differentiation. The eastern Pacific agujon needlefish is found from the Gulf of California, Mexico, to Peru, including the Galápagos Islands.

**Key words:** Belonidae, *Tylosurus*, needlefish, eastern tropical Pacific

Two of the five recognized species of *Tylosurus* have worldwide distributions (Parin 1967, Collette and Parin 1970): *T. crocodilus* (Peron and LeSueur 1821) and *T. acus* (Lacepède 1803). *Tylosurus acus* is a slim, graceful species with many vertebrae, more dorsal and anal fin rays, and shorter dorsal and anal fin lobes, pectoral and pelvic fins compared to the heavier, stocky *T. crocodilus*. Both species have been considered polytypic with the subspecies in the eastern tropical Pacific differing from other subspecies of each species in having significantly fewer vertebrae and fin rays. For example, *T. c. crocodilus* from the western Atlantic through the Indo-West Pacific has 79-86 vertebrae compared to 67-72 in eastern Pacific *T. crocodilus fodiator* Jordan & Gilbert, 1882. Western Atlantic *T. a. acus* have 90-95 vertebrae while eastern Pacific *T. acus pacificus* have only 74-80 vertebrae (Table 1).

The Indo-West Pacific subspecies, *T. acus melanotus* (Bleeker 1851), ranges from the Indian Ocean through the western and central Pacific Ocean to several offshore islands in the eastern Pacific: Revillagigedo, Clipperton, and Cocos (Collette 1995). This subspecies is replaced along the eastern Pacific coast of the Americas from the Gulf of California to Peru by *T. a. pacificus* (Steindachner 1876). The taxonomic status of the eastern Pacific subspecies was called into question when specimens that agreed in numbers of dorsal and anal fin-rays with the Indo-West Pacific *T. acus melanotus* were collected along with specimens with low fin-ray counts characteristic of *T. acus pacificus* at Isla Gorgona, on the Pacific coast of Colom-
Regression equations and other statistics were computed for 10 morphometric characters against body length for *T. pacificus* and Pacific specimens of *T. acus melanotus*. Analysis of covariance tests for differences of slopes and intercepts were performed as for Atlantic subspecies (Collette and Parin, 1970:table 15). Only F values greater than those of P = 0.999 were considered significant to make this information comparable with that presented for Atlantic populations of *T. acus*.

**Tylosurus pacificus** (Steindachner, 1876)
Belone pacifica Steindachner, 1876:93 (original description, Panamá and Acapulco).


*Tylosurus acus melanotus* (not of Bleeker, 1850). Grove and Lavenberg, 1997:268 (description is of *T. pacificus*).

**Diagnosis:** A species of *Tylosurus* with dorsal-fin rays 21-23 (x 21.7, Table 1); anal fin-rays 18-21 (x 19.6); pectoral fin-rays 11-14; vertebrae 74-80 (x 77.2); predorsal scales 303-405.

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Fig. 1. *Tylosurus acus melanotus*, USNM 362835, Panamá City market, 675 mm Body Length, with ventral keel on lower jaw. Photograph by D. Ross Robertson.
Comparisons: *Tylosurus pacificus* is completely separated from all populations of *T. acus* in vertebral number (74-80 vs. 82-96) and from Pacific *T. acus melanotus* in numbers of dorsal (21-23, rarely 24 vs. 24-27) and anal (18-21 vs. 22-24) fin-rays. It is much less distinct morphometrically than meristically from *T. acus melanotus*. Using the unusually high value of 0.999 as Collette and Parin (1970) did, only one of the analyses of covariance of regressions of 10 morphological characters (intercepts of orbit length) was significantly different between west-central Pacific *T. acus melanotus* and eastern Pacific
<table>
<thead>
<tr>
<th>Subspecies</th>
<th>Dorsal rays</th>
<th>Anal rays</th>
<th>Average</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>T. a. aurea - Western Atlantic</td>
<td>17</td>
<td>19</td>
<td>23</td>
<td>8</td>
</tr>
<tr>
<td>T. a. imperialis - Gulf of Guinea</td>
<td>7</td>
<td>12</td>
<td>17</td>
<td>3</td>
</tr>
<tr>
<td>T. a. nigrofuscus</td>
<td>13</td>
<td>13</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>T. p. pescador</td>
<td>20</td>
<td>23</td>
<td>23</td>
<td>4</td>
</tr>
<tr>
<td>T. p. pacificus</td>
<td>25</td>
<td>26</td>
<td>25</td>
<td>9</td>
</tr>
<tr>
<td>T. p. egeri</td>
<td>27</td>
<td>27</td>
<td>27</td>
<td>6</td>
</tr>
</tbody>
</table>

**TABLE I.** Number of dorsal and anal fin rays and vertebrae in T. a. aurea and subspecies of T. p. pacificus.
### TABLE 2

Comparison of regression equations and F values based on analysis of variance for slopes and y-intercepts of morphometric characters for *T. niloticus* and *T. aethiopicus*. *p* = significant at 95% level. **p** = significant at 99.5% level.

<table>
<thead>
<tr>
<th>Character</th>
<th><em>T. niloticus</em></th>
<th><em>T. aethiopicus</em></th>
<th>F value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head depth</td>
<td>0.068X + 0.002</td>
<td>0.069X + 0.009</td>
<td>3.97</td>
</tr>
<tr>
<td>Pectoral fin length</td>
<td>0.097X + 0.333</td>
<td>0.096X + 0.331</td>
<td>11.71**</td>
</tr>
<tr>
<td>Premaxilla</td>
<td>0.062X + 0.136</td>
<td>0.062X + 0.146</td>
<td>4.47</td>
</tr>
<tr>
<td>Interorbital</td>
<td>0.093X + 0.366</td>
<td>0.093X + 0.366</td>
<td>0.53</td>
</tr>
<tr>
<td>Pelvic fin length</td>
<td>0.092X + 0.381</td>
<td>0.092X + 0.381</td>
<td>0.52</td>
</tr>
<tr>
<td>Postorbital</td>
<td>0.061X + 0.366</td>
<td>0.061X + 0.366</td>
<td>0.18</td>
</tr>
<tr>
<td>Head width</td>
<td>0.109X + 1.425</td>
<td>0.109X + 1.425</td>
<td>9.57*</td>
</tr>
</tbody>
</table>
T. pacificus (Table 2). Conversely, there were 2-7 significant morphometric differences between the three Atlantic subspecies of T. acus (Collette and Parin, 1970:table 15).

While Banford et al. (in review) focused on relationships of American and eastern Atlantic species of the needlefish genera Strongylura and Tylosurus, we examined mtDNA from specimens of all five recognized subspecies of Tylosurus acus and both subspecies of T. crocodilus. Two major clades of Tylosurus acus were found, Atlantic and Indo-Pacific, with significant genetic differentiation in each major area. We defer full consideration of the systematic implications of this until a later, more comprehensive study and wish to focus on differences between T. acus melanotus and T. acus pacificus (Fig. 2). The eastern Pacific sympatric pair of T. a. pacificus and T. a. melanotus had a Kimura 2-parameter (K2p, Kimura, 1980) genetic distance of 0.018 for 1652 base pairs (bp) of the mtDNA protein-coding genes (ATPase 8, 6 and cyt b); while trans-Pacific differentiation in each major area. We defer full consideration of the systematic implications of this until a later, more comprehensive study and wish to focus on differences between T. acus melanotus and T. acus pacificus (Fig. 2). The eastern Pacific sympatric pair of T. a. pacificus and T. a. melanotus had a Kimura 2-parameter (K2p, Kimura, 1980) genetic distance of 0.018 for 1652 base pairs (bp) of the mtDNA protein-coding genes (ATPase 8, 6 and cyt b); while trans-Pacific distance within T. a. melanotus from Panamá and Philippines was only 0.006. The two subspecies clustered separately in phenetic (Fig. 2) and parsimony analyses.

Size: Maximum known size 640 mm body length (from posterior margin of opercle to caudal base), about 900 mm SL.

Range: Known from the Gulf of California south to Cabo Blanco, Peru including one record from the Galápagos Islands. Replaced in islands off the coast of Central America (Tres Marias Is., Revillagigedos Is., and Cocos Is.) by T. acus melanotus.

Material examined. Tylosurus pacificus. Forty specimens (26.8-640 mm body length) from 29 collections arranged north to south by country. Mexico: LACM 8802 (5, 456-550); Gulf of California, Bahia Las Palmas; R. Cannon; 19 Oct. 1959. LACM 8993-3 (1, 302); 35 mi. SW Mazatlan; S. Giacolone; Jan.-Feb. 1967. CAS-SU 14975 (1, 311); Gulf of Tehuantepec, 50 mi. SW Champaco; P. Sánchez et al.; June 1943. UCLA W59-249 (1, 504); Gulf of California, Bahia Las Palmas; B. Walker; 17 Oct. 1959. SIO H-53-121-23A(1, 640); Baja California Sur, Bahía Almejas, 23°24.6’ N, 111°43.4’ W; L.D. Berner et al.; 15 July 1953. CAS uncat. (1, 115); Baja California, 26°53’ N, 112°16.5’ W; A.S. Loukashkin; 8 Sept. 1958. USNM 268821 (1, 577); Sonora, Choya Bay; M. González; 1969. SIO 61-251-23A (1, 450); Gulf of California, Bahia Las Palmas, 29°38.75’ N, 109°40.5’ W; 19 June 1961. SIO 62-61-23A (1, 450); Isabel I., 21°52’ N, 105°45’ W; F.H. Berry; 24 Aug. 1961. Guatemala: CAS-SU 39317 (1, 296); San Gerónimo. Costa Rica: LACM 8801 (1, 335); 6 mi. off Uvita Bay; 14 Feb. 1955. UCLA W49-463 (1, 112); 10 mi. W Quepas Point; M/V Renown; 26-27 Oct. 1949. SIO 66-82-23A(1, 120); 8°27’N, 84°27’W; Papaguero Exped.; 9 July 1965. USNM 306879 (5, 26.8-38.5); Gulf of Nicoya, Pta. Mordes; W. Szelistowski; 15 June 1989. Panamá: USNM 79639 (1, 430); Panamá market; S.E. Meek and S.F. Hildebrand; 17 May 1911. UCLA W51-243 (1, 90.3); Hannibel Bank; R.C. Wilson; 1 Nov. 1951. USNM 226604 (1, 76.3); Chame Point; Tweedlie. AMNH 15982 (1, 106); off Panamá; Mandel. USNM 211321 (2, 324-338); Canal Zone, Naos I.; H. Wright; 30 July 1967. CAS-SU 12806 (1, 378); Panamá; C.H. Gilbert. USNM 76822 (1, 339); Taboga I. USNM 29300 (1, 495); Panamá. USNM 200575 (1, 66.5); Chame Pt.; Tweedlie. USNM 128562 (1, 85.2); Taboga Point; S.F. Hildebrand; 31 Mar. 1957. UCLA W54-325 (1, 282); mouth of río Anton; Clemens; 28 Apr. 1954. Colombia: FMNH 59418 (1, 286); Tumaco; Henn and Wilson. Ecuador: UMMZ 191023 (1, 307); La Libertad; Velerro III; 17-20 Jan. 1933. Galápagos Islands: ANSP 70251 (1, 241); Galápagos; 5th Vanderbilt Expedition; holotype of Strongylura galapagensis Fowler. Peru: USNM 203529-31 (3, 302-316); off Cabo Blanco, 4°14’ S, 81°21’ W; Bruun Cr. 15.; 12 April 1966.


Remarks: We support Franke and Acero’s (1992) suggestion to elevate Tylosurus pacificus to full species rank based on: 1) sympatry of both forms at Isla Gorgona and in Panamá (Fig. 1 and Banford, pers. obs.); 2) strong level of morphological differentiation in numbers of vertebrae, dorsal and anal fin rays; and 3) strong level of mtDNA differentiation. The larger question of what taxonomic rank to attribute to the other subspecies of Tylosurus acus will be addressed in subsequent publications.
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REFERENCES


