

Rapid Communication

Unusual record of the Indo-Pacific pomacentrid *Neopomacentrus cyanomos* (Bleeker, 1856) on coral reefs of the Gulf of Mexico

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Abstract

Neopomacentrus cyanomos (Bleeker, 1856), a common damselfish from the Indo-west Pacific, is reported from the southern Gulf of Mexico based on 134 visual observations and the collection of 15 specimens from coral south of Veracruz, Mexico. It was sighted in schools containing 5 to 30 individuals at depths of 2 to 21 m. The introduction and subsequent colonization of this alien species is probably the result of transport in the ballast water of international ships.

Key words: *Neopomacentrus cyanomos*, alien species, coral reefs, Mexico, Atlantic Ocean

Introduction

Damselfishes of the family Pomacentridae are common circumglobal inhabitants of rock and coral reefs (Allen 1991). There are about 369 species in the family (Eschmeyer and Fricke 2013) distributed mainly on reefs of the Indo-Pacific Ocean, but also well represented in Atlantic marine waters. Fourteen species occur in the Gulf of Mexico (McEachran 2009), including 13 recorded on coral reefs in the vicinity of Veracruz, Mexico (Vargas Hernández et al. 2002; Pérez-España and Vargas-Hernández 2008; Rangel-Ávalos et al. 2008; Abarca-Arenas et al. 2012; González-Gándara et al. 2012, 2013).

The regal demoiselle *Neopomacentrus cyanomos* (Bleeker, 1856) is an abundant species, ranging widely in the Indo-west-Pacific region from East Africa and the Red Sea to Australia, Vanuatu, and New Caledonia, northward to Japan. It inhabits inshore and offshore coral reefs; also in harbors and protected outer reef slopes and current prone areas. It is frequently seen in aggregations at depths of 5–18 m (Allen and Erdmann 2012). This small (to about 90 mm total length) pomacentrid is characterized by an ovate to

elongate, laterally compressed body, overall black to brown coloration with a large black spot on the operculum, and a yellow (occasionally white) spot at the end of the dorsal fin base (Allen 1991; Randall et al. 1997). Surprisingly, it was recently sighted underwater and collected from coral reefs south of Veracruz, Mexico, and this record from well beyond its known geographic distribution is reported herein.

Methods

A total of 134 underwater visual censuses were made on the coral reefs south of Veracruz, Mexico, (Figure 1) from June to September 2013. We captured 15 specimens from 20 to 54 mm in standard length with a hand net. The fish were preserved in absolute ethyl alcohol and were deposited and cataloged in the fish collection of the Universidad Veracruzana under catalog numbers: VER-PEC-01653; VER-PEC-01657; VER-PEC-01672; VER-PEC-01684; VER-PEC-01738; VER-PEC-01990; VER-PEC-02180; VER-PEC-02181; VER-PEC-02182; VER-PEC-02183; VER-PEC-02184; VER-PEC-02185; VER-PEC-02186; VER-PEC-02213; and VER-PEC-

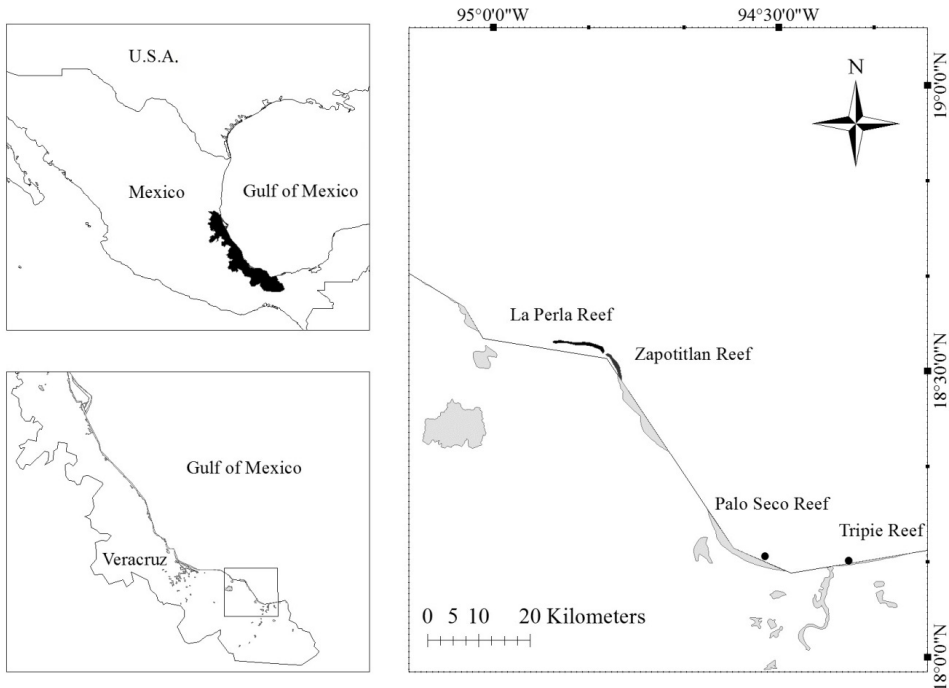


Figure 1. Record locations of regal demoiselle *Neopomacentrus cyanomos* on coral south of Veracruz, Gulf of México (see Appendix 1 for localities).

02318 (Appendix 1). Specimens were measured with a digital caliper to the nearest millimeter and were taxonomically identified following Allen (1991, 2001)

Results

Neopomacentrus cyanomos was sighted in 43 of 134 visual censuses. It was observed in aggregations that included from 5 to 30 fish, although occasionally only one specimen was recorded. The depth of the sightings ranged from 2 to 21 m, but they were more common on deeper reefs such as Palo Seco and Tripie (Figure 1). They were sometimes associated with *Chromis scotti* Emery, 1968 and haemulid juveniles.

Description of collected specimens

Neopomacentrus cyanomos is characterized by slender ovate body, moderately compressed, its depth 2.2 to 2.6 in SL; head length 2.9 to 3.8 in SL; snout length 3.9 to 7.0 in head length; pectoral fin length 3.8 to 4.7 in SL; pelvic fin length 3.2 to 4.7 in SL. Dorsal fin XIII, 11-12; anal fin II, 11-12; pectoral fin 17; caudal fin



Figure 2. *Neopomacentrus cyanomos* catalog number: VER-PEC-02183 captured on coral south of Veracruz, Gulf of México. Scale bar 10 mm. Photograph by Vicencio de la Cruz Francisco.

strong forked, lateral line scales 17 to 18; suborbital edge covered by scales (Figure 2).

Fresh coloration: Dark brown body with large black spot on upper edge of operculum; white spot at end of dorsal fin; base of caudal fin dark brown with white outer half.

Discussion

In recent years, human activities have increased the number of non-native species introductions worldwide (Ruiz et al. 1997). The family Pomacentridae (170 species) comprise an important percentage of the aquarium trade imports to the USA (Rhyne et al. 2012). Non-native pomacentrids have been reported from Hawaii and the Mediterranean Sea (Coles et al. 2002; Kalogirou et al. 2012). The regal demoiselle, *N. cyanomos*, is the first non-native pomacentrid recorded in the Gulf of Mexico.

The vector for the presence of *N. cyanomos* in the Gulf of Mexico is most likely the result of heavy marine traffic in Coatzacoalcos Port, where an average of 44 ships docking per month (SCT 2013) was recorded in 2012. Many of these ships originate from international ports, including some in the Indo-Pacific region, and these could be the vectors. Members of the families Pomacentridae, Chetodontidae, Kyphosidae, and others have a tendency to shelter under large vessels (Occhipinti-Ambrogi et al. 2011). It is conceivable that larvae or small juveniles of reef fish such as *N. cyanomos* could be transported in the ballast water of the vessels as was suggested for the Indo-Pacific sergeant major, *Abudefduf vaigiensis* (Quoy and Gaimard, 1825), the Western Atlantic sergeant major *A. saxatilis* (Linnaeus, 1758), and some of the other species recorded in the Mediterranean Sea (Vacchi and Chiantiore 2000; Wonham et al. 2000; Azurro et al. 2013).

The establishment of regal demoiselle in the Gulf of Mexico should be expected to have negative impacts on native biodiversity that could impinge economic interests (fisheries) and ecosystem health. Our field observations suggest that regal demoiselle is replacing *Chromis multilineata* (Guichenot, 1853) on the coral reefs south of Veracruz. The tolerance of lower salinity by non-native pomacentrid (Setu et al. 2010) appears to confer an advantage to colonize the region of high freshwater drainage of the Papaloapan and Coatzacoalcos rivers. The ecological consequences of the presence of *N. cyanomos* on coral reefs of Veracruz, requires further study.

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References

- Abarca-Arenas LG, Cruz N, Franco-López J, González-Gándara C, Silva-López G (2012) Distribution and biogeographical notes of the coastal fish fauna of Veracruz, Mexico. In: Thangadurai D, Busso CA, Abarca-Arenas LG, Jayabalan S (eds), *Frontiers in Biodiversity Studies*. International Publishing House, New Delhi, India, pp 190–212
- Allen GR (1991) Damselfishes of the World. Melle, Germany, 271 pp
- Allen GR (2001) Pomacentridae In: Carpenter KE, Niem VH (eds), *FAO species identification guide for fishery purposes. The living marine resources of the Western Central Pacific. Volume 5. Bony fishes part 3 (Menidae to Pomacentridae)*. Rome, pp 3337–3356
- Allen GR, Erdmann MV (2012) Reef Fishes of the East Indies. Volumes I-III. Tropical Reef Research, Perth Australia, 1292 pp
- Azzurro E, Broglio E, Maynou F, Bariche M (2013) Citizen science detects the undetected: the case of *Abudefduf saxatilis* from the Mediterranean Sea. *Management of Biological Invasions* 4: 167–170, <http://dx.doi.org/10.3391/mbi.2013.4.2.10>
- Coles SL, DeFelice RC, Eldredge LG (2002) Nonindigenous marine species at Waikiki and Hawai'i Kai, O'ahu, Hawai'i. Final Report prepared for the David and Lucile Packard Foundation. Bernice Pauahi Bishop Museum Hawai'i Biological Survey. Bishop Museum Technical Rep. No. 25, 245 pp
- Eschmeyer WN, Fricke R (2013) Catalog of Fishes electronic version, <http://research.calacademy.org/ichthyology/catalog/fishcatmain.asp> (Accessed 15 October 2013)
- González-Gándara C, de la Cruz Francisco V, Salas Pérez JJ, Domínguez Barradas C (2012) Lista de los peces de Tuxpan, Veracruz, México. *UDO Agrícola* 12(3): 675–689
- González-Gándara C, Lozano-Vilano ML, de la Cruz Francisco V, Domínguez Barradas C (2013) Peces del sistema arrecifal Lobos-Tuxpan, Veracruz, México. *Universidad y Ciencia* 29(2): 191–208
- Kalogirou S, Azzurro E, Bariche M (2012) The Ongoing Shift of Mediterranean Coastal Fish Assemblages and the Spread of Non-Indigenous Species. *InTech*: 263–280
- McEachran JD (2009) Fishes (Vertebrata: Pisces) of the Gulf of Mexico. In: Felder DL, Camp DK (eds), *Gulf of Mexico Origin, Waters and Biota. Vol 1, Biodiversity*. Texas A and M University Press, Corpus Christi, USA, pp 1223–1316
- Occhipinti-Ambrogi A, Marchini A, Cantone G, Castelli A, Chimenz C, Cormaci M, Frogliola C, Furnari G, Gambi MC, Giaccone G, Giangrande A, Gravili C, Mastrototaro F, Mazziotti C, Orsi-Relini L, Piraino S (2011) Alien species along the Italian coasts: an overview. *Biological Invasions* 13: 215–237, <http://dx.doi.org/10.1007/s10530-010-9803-y>
- Pérez-España H, Vargas-Hernández JM (2008) Caracterización ecológica y monitoreo del Parque Nacional Sistema Arrecifal Veracruzano: Primera Etapa. Universidad Veracruzana. Centro de Ecología y Pesquerías Informe final SNIB-CONABIO proyecto No. DM002. México

- Randall JE, Allen GR, Steene RC (1997) Fishes of the Great Barrier Reef and Coral Sea. 2nd ed. University of Hawaii Press, Honolulu, Hawaii, 557 pp
- Rangel-Ávalos MA, Jordan LKB, Walter BK, William DS, Carvajal-Hinojosa E, Spieler RE (2008) Fish and Coral Reef Communities of the Parque Nacional Sistema Arrecifal Veracruzano (Veracruz Coral Reef System National Park) Veracruz, México: Preliminary Results. Proceedings of the 60th Annual Gulf and Caribbean Fisheries Institute. Punta Cana, Dominican Republic, November 5-10, 2007. Punta Cana, Dominican Republic, pp 427–435
- Rhyne AL, Tlusty MF, Schofield PJ, Kaufman L, Morris JA Jr., Bruckner AW (2012) Revealing the appetite of the marine aquarium fish trade: The volume and biodiversity of fish imported into the United States. *PLoS ONE* 7(5): e35808, <http://dx.doi.org/10.1371/journal.pone.0035808>
- Ruiz GM, Carlton JT, Grosholz ED, Hines AH (1997) Global invasions of marine and estuarine habitats by non-indigenous species: mechanisms, extent, and consequences. *American Zoologist* 37: 621–632
- SCT (2013) Administración Portuaria Integral de Coatzacoalcos S. A. de C. V. <http://www.puertocoatzacoalcos.com.mx> (Accessed 15 October 2013)
- Setu SK, Ajith Kumar TT, Balasubramanian T, Dabbagh AR, Keshavars M (2010) Breeding and Rearing of Regal Damselfish *Neopomacentrus cyanomos* (Bleeker, 1856): The Role of Green Water in Larval Survival. *World Journal of Fish and Marine Sciences* 2(6): 551–557
- Vacchi M, Chiantiore M (2000) *Abudefduf vaigiensis* (Quoy and Guinnard, 1825) a tropical damselfish in the Mediterranean Sea. *Biologia Marina Mediterranea* 7(1): 841–843
- Vargas-Hernández JM, Nava-Martínez G, Román-Vives MA (2002) Peces del sistema arrecifal veracruzano. In: Guzmán-Amaya P, Quiroga-Brahms C, Díaz-Luna C, Fuentes-Castellanos D, Contreras CM, Silva-López G (eds), La pesca en Veracruz y sus perspectivas de desarrollo. Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación. Instituto Nacional de la Pesca y Universidad Veracruzana. Xalapa, México, pp 17–29
- Wonham MJ, Carlton JT, Ruiz GM, Smith LD (2000) Fish and ships: relating dispersal frequency to success in biological invasions. *Marine Biology* 136: 1111–1121, <http://dx.doi.org/10.1007/s002270000303>

Appendix 1. Records of *Neopomacentrus cyanomos* from coral south of Veracruz, Gulf of Mexico.

Location	Coordinates		Catalogue number	Colector	Record date	Standard length (mm)
	Latitude	Longitude				
Tripie reef	18°10'06.9"	94°22'40.5"	VER-PEC-01653	De la Cruz Francisco V.	13/06/2013	20
Tripie reef	18°10'06.9"	94°22'40.5"	VER-PEC-01657	De la Cruz Francisco V.	13/06/2013	53
Tripie reef	18°10'06.9"	94°22'40.5"	VER-PEC-01672	Morales Barragán A. M.	13/06/2013	25
Tripie reef	18°10'06.9"	94°22'40.5"	VER-PEC-01684	Morales Barragán A. M.	13/06/2013	20
Palo Seco reef	18°10'32.6"	94°31'29.7"	VER-PEC-01738	De la Cruz Francisco V.	15/06/2013	53
Tripie reef	18°10'33.6"	94°22'03"	VER-PEC-01990	De la Cruz Francisco V.	13/08/2013	29
Zapotitlan reef	18°29'12.7"	94°46'33"	VER-PEC-02180	De la Cruz Francisco V.	05/09/2013	25
Zapotitlan reef	18°29'12.7"	94°46'33"	VER-PEC-02181	De la Cruz Francisco V.	05/09/2013	41
Zapotitlan reef	18°29'12.7"	94°46'33"	VER-PEC-02182	De la Cruz Francisco V.	05/09/2013	27
Zapotitlan reef	18°29'12.7"	94°46'33"	VER-PEC-02183	De la Cruz Francisco V.	05/09/2013	46
Zapotitlan reef	18°29'12.7"	94°46'33"	VER-PEC-02184	De la Cruz Francisco V.	05/09/2013	39
Zapotitlan reef	18°29'12.7"	94°46'33"	VER-PEC-02185	De la Cruz Francisco V.	05/09/2013	48
Zapotitlan reef	18°29'12.7"	94°46'33"	VER-PEC-02186	De la Cruz Francisco V.	05/09/2013	42
Zapotitlan reef	18°29'12.7"	94°46'33"	VER-PEC-02213	Escárcega Quiroga A. P.	05/09/2013	54
Zapotitlan reef	18°30'57.4"	94°46'54.8"	VER-PEC-02318	Escárcega Quiroga A. P.	06/09/2013	28