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Shore fishes of the Marquesas Islands, an updated checklist with new records and new percentage of endemic species

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Abstract: Expedition Pakaihi I Te Moana was conducted in 2011 to the Marquesas Islands, lying between 07°50’ S and 10°35’ S latitude and 138°25’ W and 140°50’ W longitude. The expedition combined extensive collections and visual censuses of the shore fish fauna. A total of 74 species are added as new records for the Marquesas Islands; the coastal fish fauna of the Marquesas Islands is increased from 415 to 495 species and the number of endemic species is increased from 48 to 68 species. This increases the percentage of species-level endemism for the Marquesas Islands to 13.7%, ranking as the third highest region of endemism for coral reef fishes in the Indo-Pacific. Only two other peripheral regions, the Hawai’ian Islands and Easter Island, have higher values.

Key words: Coral reef fishes; endemism; tropical reefs; species distribution; biodiversity, hotspot.

INTRODUCTION

Tropical reefs represent a high priority for conservation action among marine ecosystems (Roberts et al. 2002). They are known to host some of the most diverse communities in the world with nearly 6,500 species of coral reef fishes (Kulbicki et al. 2013), a diversity that reaches its maximum in the Indo-Malay-Philippine archipelago (Bellwood and Hughes 2001; Roberts et al. 2002; Mora et al. 2003; Reaka et al. 2008; Bellwood and Meyer 2009; Hubert et al. 2012), while peripheral areas of the Indo-Pacific basin host high percentages of endemism. Percentages of endemism change as our knowledge of the reef fish fauna improves and may also vary according to the sizes of the regions considered. The highest percentages of endemism for reef fish in the Indo-Pacific are: 1) Hawai’i with 25% endemism according to Randall (2007); 2) Easter Island with 21.7% (Randall and Cea 2011); 3) Red Sea third with 13.6% (Eschmeyer et al. 2010). The census of biodiversity constitutes the primary basis for conservation efforts and the establishment of protection measures, as indicated for instance by IUCN red lists. Endemism is often perceived as an important characteristic in species conservation (e.g., Parravicini et al. 2014). Although extensive databases for coral reef fishes are being developed with more accurate taxonomy and geographical distributions (e.g., Randall 2005, 2007; Randall and Cea 2011; Kulbicki et al. 2013), our knowledge of the reef fish fauna still has major gaps due to the isolation of some remote regions or the technical difficulty of studying the reef fish fauna in certain regions of the world. The Marquesas Islands are a prime example. Located in Northeastern French Polynesia between 07°50’ S and 10°35’ S latitude and 138°25’ W and 140°50’ W longitude, they are geographically isolated. To the east, the closest islands are the Galapagos (5 300 km), to the north-west they are 2,200 km from the Line Islands and 3,500 km from Hawai’i. The closest island is in the Tuamotu archipelago some 500 km away. The South Equatorial Current, flowing between 04° N and 17° S from east to west (Wyrtki and Kilonsky 1984; Bonjean and Lagerloef 2002; Gaither et al. 2010), seems to constitute a hydrographical barrier to dispersal leading to the genetic differentiation of some Marquesan populations of otherwise widespread species (Planes and Fauvelot 2002; Winters et al. 2010;
Gaither et al. 2010). In addition to the isolation of the Marquesas, their environmental conditions are unique compared to the remainder of French Polynesia. The high islands are not surrounded by lagoons, and coral cover is minimal compared with other parts of French Polynesia. Sea temperatures are unusually variable (26–30°C) for a locality this close to the equator (Randall and Earle 2000) and upwelling of cold enriched waters leads to a general low coral cover and major production of phyto- and zooplankton (Martinez and Maamaatuiahatapu 2004). All these features give to the archipelago its uniqueness not only within the French Polynesian landscape, but also among Pacific tropical reefs. Selection processes in such a contrasting environment have already been highlighted as a driver of speciation for a Marquesan endemic reef fish species (Gaither et al. 2015).

In 2000, Randall and Earle identified the archipelago as a major hotspot of endemism with 11.6% endemic fish species (Randall and Earle 2000) with only a relatively small portion of the islands having been explored. The present work is based on a compilation of all previous fish records in addition to a preliminary reef fish survey on one island (Mohotani) in 2008 and to the first reef fish survey, which explored all islands of the archipelago in 2011 (expedition Pakai I Te Moana – Nov. 2011).

MATERIALS AND METHODS
Sampling was carried out in 2008 in Mohotani and in 2011 for the first time at every island in the Marquesas (Clark Bank, Motu One, Hatutaa, Eiao, Motu Iti, Nuku-Hiva, Ua-Huka, Ua-Pou, Fatu-Huku, Hiva-Oa, Tahuata, Fatu-Hiva; Figure 1) during a three-week expedition in 2011, aboard the M.V. Braveheart. A diversity of habitats was explored with shallow and deep air dives (down to 50–55 m) for a total of 54 sampled sites. Extensive collections and visual censuses were combined to establish the species composition of shore fishes of the Marquesas Islands. The complementarity of these sampling methods (Williams et al. 2006) allowed us to target different components of the ichthyofauna. Rotenone (powdered root of the Derris plant) allowed us to sample the cryptic and small fish fauna while spear guns and visual censuses allowed us to sample and record larger specimens of species not susceptible to rotenone collecting.

Fishes were identified using identification keys and taxonomic references (Randall 2005; Bacchet et al. 2006) and representative specimens of all species collected were photographed while they had their fresh coloration, sampled for tissues, labeled, and preserved as voucher specimens for the sequences made for a COI Barcode library. Voucher specimens were preserved in 10% formalin (3.7% formaldehyde solution) and later transferred into 75% ethanol. Preserved specimens were cataloged into the fish collection at the Museum Support Center, National Museum of Natural History, Smithsonian Institution, Suitland, Maryland, USA. Underwater visual censuses and underwater photographs allowed us to complete the list of new records. Nomenclature follows Randall (2005) and we followed recent taxonomic changes tracked using the
RESULTS

A total of 495 shore fish species in 72 families is reported from Marquesan waters (Table 1) with 74 species reported as new geographic records for the archipelago. Muraenidae (42 species), Labridae (36), Gobiidae (33), Acanthuridae (26) and Serranidae (22) constitute the 5 most speciose families. Among the 495 species, 68 are reported as endemic to the Marquesas Islands, raising the percentage of endemism for the species, 68 are reported as endemic to the Marquesas Islands, to 13.7%. Randall and Earle (2000) reported from Marquesan waters (Table 1) with 74 undescribed new species collected during the oceanographic campaign have since been described and are endemic to the Marquesas: 1 - Trachinocephalus sp. reported as Trachinocephalus myops, is currently being described by Polenco et al.; 2 - Macrophyrynodon pakoko Delrieu-Trottin, Williams & Planes, 2014 was originally reported as an unusual looking Macrophyrynodon melaeagris (Valenciennes, 1839); 3 - Blemiella sp. reported as Blemiella gibbifrons (Quoy & Gaimard, 1824) is under study by Delrieu-Trottin, Williams and Planes; 4 - Istiblemius sp. reported as Istiblemius edentulus is under study by J.T Williams; 5 - Pseudogramma sp. reported as Pseudogramma polyacantha (Bleeker, 1856); 6 - Cymolutes sp. reported as Cymolutes torquatus with distinct color pattern for the Marquesan populations; 7 - Cantherines nukuhiva Randall, 2011 reported in Randall and Earle (2000) as Cantherines pardalis (Rüppell, 1837).

Due to recent taxonomic updates and revisions of several families, several species and records reported in Randall and Earle (2000) are here reported differently in this checklist: we report Aetobatus ocellatus (Kuhl, 1823) instead of A. narinari (Euphrasen, 1790) that is now restricted to the Atlantic. We report Albula argentea (Forster, 1801) instead of A. forsteri (Valenciennes, 1846), which is now a synonym. Kyphosus ocyurus (Jordan & Gilbert, 1882) was recorded as Sectator ocyurus (Jordan & Gilbert, 1882), which was transferred to Kyphosus (Knudsen and Clements 2013). Centropyge fisheri (Snyder, 1904) was reported as C. flavicauda Fraser-Brunner, 1933, which is a synonym. Bodiamus busellatus Gomon, 2006 replaces B. bilunulatus (Lacepède, 1802) in the Marquesas (Gomon 2006). Halichoeres claudia Randall & Rocha, 2009 was formerly reported as H. ornatissimus (Garrett, 1863) which is now restricted to Hawaii (Randall and Rocha 2009). Chlorurus spilurus (Forsskål, 1775) was previously reported as C. sordidus (Forsskål 1775). The Pacific populations previously reported as C. sordidus belong to the distinct species C. spilurus (Randall 2007; Choat et al. 2012). Randall and Myers (2002) found that the Pacific goatfish populations previously reported as Parupeneus bifasciatus (Lacepède, 1801) were an undescribed species that they named P. insularis Randall & Myers, 2002. We therefore report P. insularis instead of P. bifasciatus. Rhabdoblennius rhadbotracelhus (Fowler & Ball, 1924) was reported as R. ellipes (Jordan & Starks, 1906), which is considered now as a synonym. Fusigobius duospilus Hoese & Reader, 1985 were previously reported as Coryphopterus duospilus (Hoese & Reader, 1985). Acanthurus nigros Günther, 1861 was reported as Acanthurus nigros Valenciennes, 1835. Acanthurus nigros is now restricted to Hawaii (DiBattista et al. 2011; Randall et al. 2011). Acanthurus nigros...
Table 1. Checklist of the Marquesan shorefish fauna. New records based on captured specimens are designated by an asterisk (*), new records based on underwater visual census are designated by a superscript (1) while records based on the Catalog of Fishes are designated by a superscript (2). Records not counted in total number of species are designated by a superscript (3). Figure numbers in bold refer to photographs in this paper.

| Family or Species | Distribution   |
|-------------------|----------------|
| Carcharhinidae    |                |
| Carcharhinus albimarginatus (Rüppell, 1837) | Non-Endemic |
| Carcharhinus ambylyrhynchos (Bleekeer, 1856) | Non-Endemic |
| Carcharhinus falciformis (Müller & Henle, 1839) | Non-Endemic |
| Carcharhinus limbatus (Müller & Henle, 1839) | Non-Endemic |
| Carcharhinus melanopterus (Quoy & Gaimard, 1824) | Non-Endemic |
| Galeocerdo cuvier (Péron & Lesueur, 1822) | Non-Endemic |
| Negaprion acutidens (Rüppell, 1837) | Non-Endemic |
| Triacodon obesus (Rüppell, 1837) | Non-Endemic |
| Family or Species | Distribution   |
| Neotrygon kuhlii (Kuhl 1823) | Non-Endemic |
| *Gymnothorax fuscomaculatus (Schultz, 1953) [USNM 408496] | Non-Endemic |
| *Gymnothorax gracilicauda Jenkins, 1903 | Non-Endemic |

| Family or Species | Distribution   |
|-------------------|----------------|
| Sphyridae          |                |
| Sphyra lewini (Griffith & Smith, 1834) | Non-Endemic |
| Sphyma mokarrani (Rüppell, 1837) | Non-Endemic |

| Family or Species | Distribution   |
|-------------------|----------------|
| Dasyatidae        |                |
| Himantura fai Jordan & Seale, 1906 | Non-Endemic |
| Taeniura meyenii (Müller & Henle, 1841) | Non-Endemic |
| Myliobatidae      |                |
| Myliobatis californicus (Kuhl 1823) | Non-Endemic |

| Family or Species | Distribution   |
|-------------------|----------------|
| Mobulidae         |                |
| *Manta alfredi (Krefft, 1868) | Non-Endemic |
| Manta birostris (Wallbaum 1792) | Non-Endemic |

| Family or Species | Distribution   |
|-------------------|----------------|
| Megalopidae       |                |
| Megalops cyprinoides (Brousseton, 1752) | Non-Endemic |

| Family or Species | Distribution   |
|-------------------|----------------|
| Albulidae         |                |
| Albula argentea (Forster, 1801) | Non-Endemic |
| Albula glossodonta (Forsskål, 1775) | Non-Endemic |

| Family or Species | Distribution   |
|-------------------|----------------|
| Chondidae         |                |
| Chanos chanos (Forsskål, 1775) | Non-Endemic |

| Family or Species | Distribution   |
|-------------------|----------------|
| Muraenidae        |                |
| Anarchias leucurus (Snyder, 1904) | Non-Endemic |
| Anarchias seychellensis Smith, 1962 | Non-Endemic |
| *Anarchias sp. [USNM 408488] | Endemic |
| Echidna leucotaenia (Schultz, 1943) | Non-Endemic |
| Echidna nebulosa (Ah, 1789) | Non-Endemic |
| Echidna polyzona (Richardson, 1844) | Non-Endemic |
| Echidna unicolor Schultz, 1953 | Non-Endemic |
| Enchelycore bayeri (Schultz, 1953) | Non-Endemic |
| Enchelycore bikinisensis (Schultz, 1953) | Non-Endemic |
| Enchelycore pardalis (Temminck & Schlegel, 1846) | Non-Endemic |
| Enchelycore schismatophrynhus (Bleekeer, 1853) | Non-Endemic |
| Enchelycore canina (Quoy & Gaimard, 1824) | Non-Endemic |
| Gymnomuraena zebrata (Shaw, 1797) | Non-Endemic |
| Gymnothorax breedi Mccosker & Randall, 1977 | Non-Endemic |
| Gymnothorax bunoensis (Bleekeer, 1857) | Non-Endemic |
| *Gymnothorax eurostus (Abbott, 1860) | Non-Endemic |
| Gymnothorax flavomarginatus (Rüppell, 1830) | Non-Endemic |
| *Gymnothorax formosus Bleeker, 1864 [USNM 409651] | Non-Endemic |
| *Gymnothorax fuscomaculatus (Schultz, 1953) [USNM 408496] | Non-Endemic |
| Gymnothorax gracilicauda Jenkins, 1903 | Non-Endemic |

| Family or Species | Distribution   |
|-------------------|----------------|
| Congridae         |                |
| Ariosoma multivertebratum Karmovskaya, 2004 | Endemic |
| Conger cinereus cinereus Rüppell, 1828 | Non-Endemic |
| *Gnathophis sp. [USNM 409314, USNM 409315, USNM 409316] | Non-Endemic |
| *Gorgasia galzini Castle & Randall, 1999 [USNM 409324, USNM 409325, USNM 397394, USNM 405348, USNM 397906, USNM 409711] | Non-Endemic |
| Gorgasia sp. | Endemic |
| Heterocogner lentigonosus Böhke & Randall, 1981 | Non-Endemic |

| Family or Species | Distribution   |
|-------------------|----------------|
| Ophichthidae      |                |
| Apterichthus mosei Jordan & Snyder, 1901 | Non-Endemic |
| Apterichthus myri Mccosker & Hibino, 2015 | Non-Endemic |
| *Apterichthus sp. [USNM 409323] | Endemic |
| Brachysemopsis crocodilinus (Bennett, 1831) | Non-Endemic |
| *Callechelys marmorata (Bleekeer, 1854) [USNM 409326, USNM 409713] | Endemic |
| Callechelys randalli Mccosker, 1998 | Endemic |
| Carhinus xenarchus Günther, 1870 | Non-Endemic |
| Ichthyopus vulturis (Weber & de Beaufort, 1816) | Non-Endemic |
| Lamnastoma orientalis (McClelland, 1844) | Non-Endemic |
| Leuronax semicinctus (Lay & Bennett, 1839) | Non-Endemic |
| Myctophichthys calathinus (Boddaert 1781) | Non-Endemic |
| Myctophichthys maculosus (Cuvier, 1816) | Non-Endemic |
| Phasemona cooperae Palmer, 1970 | Non-Endemic |
| Phyllophichthys xenoanthus Gosline, 1951 | Non-Endemic |
| Schultzia johnstonensis (Schultz & Woods, 1949) | Non-Endemic |
| *Myophis microchir (Bleekeer 1864) [USNM 409322, USNM 409715] | Non-Endemic |
| Xestochilus nebulosus (Smith, 1962) | Non-Endemic |
| Yinkaia moorei McCosker, 2006 | Non-Endemic |

| Family or Species | Distribution   |
|-------------------|----------------|
| Clupeidae         |                |
| Sardinella marquesensis Berry & Whitehead, 1968 | Endemic |

| Family or Species | Distribution   |
|-------------------|----------------|
| Saurida gracilis (Quoy & Gaimard, 1824) | Non-Endemic |
| *Saurida nebulosa Valenciennes, 1850 [USNM 409129, USNM 411412] | Non-Endemic |
| *Symodus binotatus Schultz, 1953 [USNM 409126, USNM 409321, USNM 411375, USNM 412475, USNM 411376] | Non-Endemic |
| Symodus jacksonii Russell & Cressey, 1978 | Non-Endemic |

Continued
Table 1. Continued.

| Family or Species                      | Distribution |
|----------------------------------------|--------------|
| Synodus variegatus (Lacepède, 1803)    | Non-Endemic  |
| Trachinocirrhites sp.                  | Endemic      |

**Antennariidae**

| Antennarius nanus [USNM 409202, USNM 409252, USNM 409498, USNM 412034] | Non-Endemic |
| Antennarius striatus [USNM 399893, USNM 409507] | Non-Endemic |

**Ophidiidae**

| Ophidion exul [USNM 409285, USNM 409320] | Non-Endemic |

| Carapidae | Non-Endemic |
|-----------|-------------|
| Carapinus | Non-Endemic |

| Belonidae | Non-Endemic |
|-----------|-------------|
| Platyeleotis argulus playtyma [Bennett, 1832] | Non-Endemic |

**Hemirhamphidae**

| Hemirhamphus depuoporous Lay & Bennett, 1839 | Non-Endemic |
| Hyperhampus acutus acutus [Günther, 1872] | Non-Endemic |

**Holocentridae**

| Myripristis violacea [USNM 409335] | Non-Endemic |

**Priacanthidae**

| Pseudanthias oumati [Randall & Pyle, 2001] | Endemic |
|---------------------------------------------|--------|

**Dactyloptoridae**

| Epinephelus macrochir [USNM 412001] | Non-Endemic |
|-------------------------------------|-------------|
| Family or Species | Distribution |
|------------------|--------------|
| Lutjanus haneri (Forsskål, 1775) | Non-Endemic |
| Cirrhitidae | |
| Cirrhichthys oxycephalus (Bleeker, 1855) | Non-Endemic |
| Cirrhipinnus pinnulatus (Forster in Bloch & Schneider, 1801) | Non-Endemic |
| Gypincirrhites polyactis (Bleeker, 1875) | Non-Endemic |
| *Oxyincirrhites typus Bleeker, 1857 | Non-Endemic |
| Paracirrhites forsteri (Bloch & Schneider, 1801) | Non-Endemic |
| Paracirrhites hemisculus (Günther, 1874) | Non-Endemic |
| Paracirrhites xanthus Randall, 1963 | Non-Endemic |
| Apogonidae | |
| Apogon caudicinctus Randall & Smith, 1988 | Non-Endemic |
| Apogon lativittatus Randall, 2001 | Endemic |
| Apogon marquesensis Greenfield, 2001 | Endemic |
| Apogonichthys ocellatus (Weber, 1913) | Non-Endemic |
| *Apogonichthys pernix Bleeker, 1854 [USNM 409402, USNM 409406] | Non-Endemic |
| Cheilodipterus quinquelineatus Cuvier, 1828 | Non-Endemic |
| Fowleria marromota (Allee & Macleay, 1876) | Non-Endemic |
| Gymnogobius sp. | Endemic |
| *Gymnogobius uropilus Lachner, 1953 [USNM 409278, USNM 409380, USNM 409381, USNM 405632] | Non-Endemic |
| *Gymnogobius vanderbilti (Fowler [1938] [USNM 404821, USNM 407188] | Non-Endemic |
| Lachneretus phasrmaticus Fraser & Struhsaker, 1991 | Non-Endemic |
| Ostorhinchus apogonoides (Bleeker, 1856) | Non-Endemic |
| Ostorhinchus rotundatus (Randall, 2001) [Figure 4] | Endemic |
| Ostorhinchus sinuus (Randall, 2001) [Figure 5] | Endemic |
| Pristipogon kagai (Bleeker, 1856) | Non-Endemic |
| Pristipogon tenuirostris (Bennett, 1836) | Endemic |
| Pseudamia sp. | Non-Endemic |
| *Pseudamia gracilicauda (Lachner, 1953) [USNM 409275, USNM 410701] | Non-Endemic |
| Pseudamia phasma Randall, 2001 | Endemic |
| Zapagoevermanni (Jordan & Snyder, 1904) | Non-Endemic |
| Malacanthidae | |
| Malacanthus brevirostris Guichenot, 1858 | Non-Endemic |
| Echeneidae | |
| Echeneis naucrates Linnaeus, 1758 | Non-Endemic |
| Remora remora (Linnaeus, 1758) | Non-Endemic |
| Remora remora (Linnaeus, 1758) | Non-Endemic |
| Remora remora (Linnaeus, 1758) | Non-Endemic |
| Carangidae | |
| Alecitis ciliaris (Bloch, 1787) | Non-Endemic |
| Carangoides orthogrammus (Jordan & Gilbert, 1881) | Non-Endemic |
| Caranx ignobilis (Forsskål, 1775) | Non-Endemic |
| Caranx lugubris Poey, 1860 | Non-Endemic |
| Caranx melampygus (Cuvier, 1833) | Non-Endemic |
| Caranx papuensis Alleyne & Macleay, 1876 | Non-Endemic |
| Caranx sexfasciatus Quoy & Gaimard, 1825 | Non-Endemic |
| Decapterus macarellus (Valenciennes, 1833) | Non-Endemic |
| Elagatis bigarillum (Quoy & Gaimard, 1825) | Non-Endemic |
| Gnorhamnodon speciosus (Forsskål, 1775) | Non-Endemic |
| Scromberoides hyas (Forsskål, 1775) | Non-Endemic |
| *Scromberoides tol (Cuvier, 1832) [USNM 409332] | Non-Endemic |
| Selar cromenophthalmus (Bloch, 1793) | Non-Endemic |
| *Seriola lalandi Valenciennes, 1833 | Non-Endemic |
| *Seriola rivoliana Valenciennes, 1833 | Non-Endemic |
| Trachinotus sp. | Endemic |
| Utaspis secunda (Poey, 1860) | Non-Endemic |
| Lutjanidae | |
| Aethoeus furca (Lacepède, 1801) | Non-Endemic |
| Aprion virescens Valenciennes, 1830 | Non-Endemic |
| Lutjanus bohar (Forsskål, 1775) | Non-Endemic |

Continued
Table 1. Continued.

| Family or Species | Distribution |
|-------------------|--------------|
| *Hemitarichthys thompsonii* Fowler, 1923 [USNM 409368] | Non-Endemic |
| *Hennichius acuminatus* (Linnaeus, 1758) [USNM 409272] | Non-Endemic |

**Pomacanthidae**

| Centropyge fisheri (Snyder, 1904) | Non-Endemic |
| Centropyge flavissima (Cuvier, 1831) | Non-Endemic |
| Centropyge loricula (Günther, 1874) | Non-Endemic |
| *Centropyge nigricolli Woods & Schultz, 1953 [USNM 409156, USNM 409157, USNM 409158] Figure 6* | Non-Endemic |
| *Paracenotropyge multispinosa* (Smith & Radcliffe, 1911) [USNM 409443] Figure 6 | Non-Endemic |

**Pomacentridae**

| Abudeufuda conformis Randall & Earle, 2000 Figure 7 | Endemic |
| Abudeufuda sordidus (Forsskål, 1775) | Non-Endemic |
| Chromis abrupta Randall, 2001 | Endemic |
| Chromis furtiva Randall, 2001 | Endemic |
| Chromis leucura Gilbert, 1905 | Non-Endemic |
| Chromis viridis (Cuvier, 1830) | Non-Endemic |
| Chromis xanthura (Bleeker, 1854) | Non-Endemic |
| Chrysiptera brownriggi (Bennett, 1828) | Non-Endemic |
| Dascyllus aruanus (Linnaeus, 1758) | Non-Endemic |
| Dascyllus straburgi Klauserwitz, 1960 Figure 8 | Endemic |
| Lepidogalaxias tapeinocephalus (Bleeker, 1856) | Non-Endemic |
| Plectroglyphidodon dickii (Liénard, 1839) | Non-Endemic |
| Plectroglyphidodon johnstonianus Fowler & Ball, 1924 | Non-Endemic |
| Plectroglyphidodon lacrymatus (Quoy & Gaimard, 1825) | Non-Endemic |
| Plectroglyphidodon leucouros (Bleeker, 1859) | Non-Endemic |
| Plectroglyphidodon phoenicenuis (Schultz, 1943) | Non-Endemic |
| Plectroglyphidodon sagamii Randall & Earle, 2000 Figure 9 | Endemic |

**Labridae**

| Anampses caeruleopunctatus Ruppell, 1828 | Non-Endemic |
| Anampses melanurus Bleeker, 1857 | Non-Endemic |
| Bodianus busellatus Gomon, 2006 | Non-Endemic |
| Bodianus axillaris (Bennett, 1831) | Non-Endemic |
| *Cheilio inermis* (Forsskål, 1775) | Non-Endemic |
| Cheilinus chlorourus (Bloch, 1791) | Non-Endemic |
| Cheilinus oxycephalus Bleeker, 1853 | Non-Endemic |
| *Cheilinus trilobatus* Lacepède, 1801 [USNM 409210] | Non-Endemic |
| Coris hewetti Randall, 1999 | Endemic |
| Coris marquesensis Randall, 1999 | Endemic |
| Cymolutes sp. | Endemic |
| Gomphosus varius Lacepède, 1801 | Non-Endemic |
| Halichoeres claudia Randall & Rocha, 2009 | Non-Endemic |
| Halichoeres margaritaceus (Valenciennes, 1839) | Non-Endemic |
| Halichoeres melasmopomus Randall, 1980 | Non-Endemic |
| Hemigymnus fasciatus (Bloch, 1792) | Non-Endemic |
| Inisitus auripunctatus Randall, Earle & Robertson, 2002 | Endemic |
| Inisitus pavo (Valenciennes, 1840) | Endemic |
| Labroides bicolor Fowler & Bean, 1928 | Non-Endemic |
| Labroides dimidiatus (Valenciennes, 1839) | Non-Endemic |
| Labroides rubralabiatissimus Randall, 1958 | Non-Endemic |
| Macropharyngodon pavo Delrieu-Trottin, Williams & Planes, 2014 Figure 10 | Endemic |
| Novaculichthys thaxtoni (Lacepède, 1801) | Non-Endemic |
| Oxycheilinus bimaculatus (Valenciennes, 1840) | Non-Endemic |
| Oxycheilinus unifasciatus Streets, 1877 | Non-Endemic |
| Pseudochelina octotenia Jenkins, 1901 | Non-Endemic |
| Pseudechidinae moluccanus (Valenciennes, 1839) | Non-Endemic |
| Pseudojuloides pyrpus Randall & Randall, 1981 Figure 11 | Endemic |

**Callionymidae**

| Callionymus marquesensis Frick, 1989 | Endemic |
| Callionymus simplicicornis Valenciennes, 1837 | Non-Endemic |
| Synchirus ocellatus (Pallas, 1770) | Non-Endemic |

**Gobiidae**

| Amblyeleotris marquesas Mohlmann & Randall, 2002 Figure 15 | Endemic |
| Amblygobius nocturnus (Herre, 1945) | Non-Endemic |
| Bathygobius coecitus (Bennett, 1832) | Non-Endemic |
| Bathygobius coccosensis (Bleeker, 1854) | Non-Endemic |
| Bathygobius coticeps (Steindachner, 1880) | Non-Endemic |
| Bryaninops yongei (Davie & Cohen, 1969) | Non-Endemic |
| Callogobius sp. | Non-Endemic |
| Discordipinna giessingeri/ Hoese & Fourmanoir, 1978 | Endemic |
| Eviota deminuta Tornabene, Ahmadia & Williams, 2013 | Endemic |

Continued
### Table 1. Continued.

| Family or Species | Distribution |
|-------------------|--------------|
| Eviota dorsimaculata | Tornabene, Ahmadia & Williams, 2013 | Endemic |
| Eviota infundata | Smith, 1957 | Non-Endemic |
| Eviota lacrimosa | Tornabene, Ahmadia & Williams, 2013 | Endemic |
| Fusigobius duospilus | Hoese & Reader, 1985 | Non-Endemic |
| *Fusigobius infammaculatus* | Randall, 1994 | USNM 409011, USNM 409012 | Non-Endemic |
| Gnatholepis anjerensis | Bleeker, 1851 | USNM 412070, USNM 412083, USNM 412256, USNM 412257 | Non-Endemic |
| Gnatholepis cauerens | Bleeker, 1853 | Non-Endemic |
| Kelloggeoi triscopusida | Herre, 1935 | Endemic |
| Paragobiodon echiocoelus | Ruppell, 1828 | Non-Endemic |
| Pleurocyia mossambica | Smith, 1959 | Non-Endemic |
| *Prolepis alina* Winterbottom & Burrige, 1993 | USNM 409428, USNM 411129, USNM 4111294 | Non-Endemic |
| Prolepis compita | Winterbottom, 1985 | Non-Endemic |
| Prolepis nocturna | Smith, 1957 | Non-Endemic |
| Prolepis semidoliata | Valenciennes, 1837 | Non-Endemic |
| Prolepis sp. | USNM 409437 | Non-Endemic |
| Prolepis squamogena | Winterbottom & Burrige, 1989 | Non-Endemic |
| *Prolepis triops* Winterbottom & Burrige, 1993 | USNM 409362, USNM 409447, USNM 411059, USNM 411279, USNM 411280, USNM 411281 | Non-Endemic |
| Stonogobiops medon | Hoese & Reader, 1982 | Figure 16 | Non-Endemic |
| Trinma sp. | USNM 409435, USNM 409436, USNM 409438, USNM 409439, USNM 409440 | Non-Endemic |
| Trinma wouss | Winterbottom, 2002 | Non-Endemic |
| *Trinmatom sp.* | USNM 409434 | Endemic |
| Valenciennes helingden | Bleeker, 1858 | Non-Endemic |
| Valenciennes strigata | Broussonet, 1782 | Non-Endemic |
| Vanderhorstia ornatissima | Smith, 1959 | Non-Endemic |

### Xenithidae

*Xenithorus polyzonatus* (Klunzinger, 1871) | USNM 409131, USNM 409132, USNM 411054, USNM 412524, USNM 412525, USNM 412526 | Non-Endemic |

### Microdesmidae

Gunnellichthys monostigma | Smith, 1958 | Non-Endemic |
| Nematolepis magnifica | Fowler, 1938 | Non-Endemic |
| Ptereleotris heteroptera | Bleeker, 1855 | Non-Endemic |
| Ptereleotris melanopogon | Randall & Hoese, 1985 | Figure 17 | Endemic |
| Ptereleotris zebra | Fowler, 1938 | Non-Endemic |

### Sphyraenidae

*Sphyraena barracuda* (Edwards, 1771) | Non-Endemic |
| *Sphyraena forsteri* Cuvier, 1829 | Non-Endemic |
| *Sphyraena helleri* Jenkins, 1901 | Non-Endemic |
| *Sphyraena genie* Klunzinger, 1870 | Non-Endemic |

### Gymnolidae

Promethichthys prometheus | Cuvier, 1832 | Non-Endemic |

### Scombridae

Acantochybius solandri | Cuvier, 1831 | Non-Endemic |
| Euthynnus affinis | Cantor, 1849 | Non-Endemic |
| Gymnosarda unicolor | Ruppell, 1838 | Non-Endemic |

### Zanclidae

Zanclus cornutus | Linnaeus, 1758 | Non-Endemic |

### Acanthuridae

Acantlinus achilles | Shaw, 1803 | Non-Endemic |
| *Acantlinus blochi* | Valenciennes 1835 | USNM 409483 | Non-Endemic |
| Acantlinus guttarius | Forster, 1801 | Non-Endemic |
| *Acantlinus leucopareius* Jenkins, 1903 | Non-Endemic |
| Acantlinus linearis | Linnaeus, 1758 | Non-Endemic |
| Acantlinus muta | Cuvier, 1829 | Non-Endemic |
| Acantlinus nigriscus | Linnaeus, 1758 | Non-Endemic |
| Acantlinus nigros | 1861 | Non-Endemic |
| *Acantlinus nubius* (Fowler & Bean, 1929) | USNM 409451 | Non-Endemic |

### Family or Species | Distribution
---|---
Acantlinus pyroferus | Kittlitz, 1834 | Non-Endemic
Acantlinus reversus | Randall & Earle, 1999 | Endemic
Acantlinus thompsoni | Fowler, 1923 | Non-Endemic
Acantlinus triostegus | Linnaeus, 1758 | Non-Endemic
Acantlinus xanthopterus | Valenciennes, 1835 | Non-Endemic
Ctenochaetus flavicauda | Fowler, 1938 | Non-Endemic
Ctenochaetus hawaiiensis | Randall, 1955 | Endemic
Ctenochaetus marginalis | Valenciennes, 1835 | Non-Endemic
Naso annulatus | Quoy & Gaimard, 1823 | Non-Endemic
Naso brachynectus | Quoy & Gaimard, 1823 | Non-Endemic
Naso brevirostris | Valenciennes, 1835 | Non-Endemic
Naso hexacanthus | Bleeker, 1853 | Non-Endemic
Naso lituratus | Bloch & Schneider, 1801 | Non-Endemic
Naso unicornis | Forsskål, 1775 | Non-Endemic
Naso vlamini | Valenciennes, 1835 | Non-Endemic
Zebrasoma velifer | Bloch, 1979 | Non-Endemic
Zebrasoma nostratum | Günther, 1873 | Non-Endemic

### Siganidae

Siganus argenteus | Quoy & Gaimard, 1823 | Non-Endemic

### Bothidae

Amoglossus sp. | Endemic |
Bothus mancus | Broussonet, 1782 | Non-Endemic |
Bothus pantherinus | Ruppell, 1830 | Endemic |
Engyprosopon marquisensis | Amaoka & Séret, 2005 | Endemic |

### Samaridae

Samariscus triacanthus | Woods, 1666 | Non-Endemic

### Soleidae

Asieragogodes lateralis | Randall, 2005 | Endemic

### Balistidae

Balistapus undulatus | Park, 1797 | Non-Endemic |
Balistes polylepis | Steindachner, 1877 | Non-Endemic |
Balistoides viridescens | Bloch & Schneider, 1801 | Non-Endemic |
Melichthys niger | Bloch, 1786 | Non-Endemic |
Melichthys vidua | Solander, 1844 | Non-Endemic |
Odorus niger | Ruppell, 1829 | Non-Endemic |
Rhinecanthus aculeatus | Linnaeus, 1758 | Non-Endemic |
Rhinecanthus rectangulus | Bloch & Schneider, 1801 | Non-Endemic |
Sufflamen bursa | Bloch & Schneider, 1801 | Non-Endemic |
Sufflamen fraenatus | Lateille, 1804 | Non-Endemic |
*Zanichthys auramarginatus* | Bennett, 1832 | USNM 409459 | Non-Endemic |
Xanthichthys caeruleolineatus | Linnaeus, 1758 | Non-Endemic |

### Monacanthidae

Aluterus scriptus | Osbeck, 1765 | Non-Endemic |
Cantherines dumerilii | Holland, 1854 | Non-Endemic |
Cantherhines nukuhiva Randall, 2011 | Figure 18 | Endemic |
Pervagor marginalis | Hutchins, 1986 | Figure 19 | Endemic |

### Ostraciidae

Lactoria cornuta | Linnaeus, 1758 | Non-Endemic |
Opraricus cubensis | Linnaeus, 1758 | Non-Endemic |
Ostracion meleagris | Bloch & Schneider, 1801 | Non-Endemic |
Ostracion whiteleyi | Fowler, 1931 | Non-Endemic |

### Tetraodontidae

Arthron hispidus | Linnaeus, 1758 | Non-Endemic |
Arthron meleagris | Bloch & Schneider, 1801 | Non-Endemic |
Arthron stellatus | Bloch & Schneider, 1801 | Non-Endemic |
Canthigaster ambonensis | Bleeker, 1865 | Endemic |
*Canthigaster criobe* Williams, Delrieu-Trottin & Planes, 2012 | USNM 409168 | Figure 20 | Endemic |
Canthigaster janthineptera | Bleeker, 1855 | Non-Endemic |
Canthigaster marquiscensis | Allen & Randall, 1977 | Figure 21 | Endemic |

### Diodontidae

Diodon hystrix | Linnaeus, 1758 | Non-Endemic |
triostegus (Linnaeus, 1758) was reported as *Acanthurus triostegus marquesensis* Schultz & Woods, 1948, which is now a synonym. *Coelonotus argulus* (Peters, 1855) was reported as *Microphis argulus* (Peters, 1855), which is now a synonym. The reports of *Apterichtus flavicaudus* (Snyder, 1904) and *A. moseri* (Jordan & Snyder, 1901) were based on misidentifications of *A. mysi* McCosker & Hibino, 2015 and *A. klazingai* (Weber, 1913) (J.E. McCosker, personal communication). *Apterichtus moseri* is now restricted to Japan while *A. flavicaudus* is restricted to Hawaii, Midway Island, and possibly Australia and Seychelles (McCosker and Hibino 2015). For Mugilidae, we followed Durand et al. (2012) and report *Planiliza macrolepis* (Smith, 1846) instead of *Chelon macrolepis* (Smith, 1846); *Planiliza melinopterus* (Valenciennes, 1836) instead of *Chelon melinopterus* (Valenciennes, 1836); *Planiliza alata* (Steindachner, 1892) instead of *Liza alata* (Steindachner, 1892); *Osteomugil engeli* (Bleeker, 1858) instead of *Moolgarda engeli* (Bleeker, 1858); *Crenimugil seheli* (Forsskål, 1775) instead of *Moolgarda seheli* (Forsskål, 1775).

Gobiidae (11 endemic species), Labridae (7), Pomacentridae (7), Serranidae (6), Apogonidae (6) and Blenniidae (6) are the families that possess the highest number of endemic species and among the highest percentage of endemism with respectively 33.3%, 20.0%, 33.3%, 27.3%, 30.0% and 31.6%. They are only surpassed by Clupeidae and Soleidae that have a single
Figure 7. Two endemic species to the Marquesas Islands: *Chromis flavapicis* (black) and *Abudelfuf conformis* (striped). *Chaetodon trichrous* (half black, half white and yellow tail) is endemic to French Polynesia. Photo: Yann Hubert

Figure 8. *Dascyllus strasburgi* finding shelter in a *Pocillopora* sp. colony. Photo: Yann Hubert.

Figure 9. *Plectroglyphidodon sagmarius*. Photo: Yann Hubert.

Figure 10. *Macropharyngodon pakoko* (male, 72 mm SL). Photo: Jeffrey T. Williams.

Figure 11. *Pseudojuloides pyrius* (32 mm SL). Photo: Jeffrey T. Williams.
represented species endemic from the Marquesas (100% of endemism), and Congridae, Bothidae, Chlopsidae, Pempheridae (50%), all of them represented by no more than six species in total in the Marquesas. Among the five most speciose families; the percentage of endemism observed is uneven with 5.0% for Muraenidae, 20.0% for Labridae, 33.3% for Gobiidae, 3.9% for Acanthuridae and 27.3% for Serranidae.

DISCUSSION

Percentage of endemism is dependant on our level of knowledge of the locality in question but also of the surrounding islands and archipelagos. While remote places like Hawaii tend to lose percentage of endemism due to new records of widespread fishes in their waters, the Marquesas constitutes one of the rare places where both the number of widespread and endemic fishes have grown despite continuous explorations of islands around it; with 10% of endemism in 1976, 1978 (Randall 1976, 1998); 11.6% in 2000 (Randall and Earle 2000), 12.3% (8.3% identified endemics + 4% unidentified) in 2007 (Kulbicki 2007), while Williams et al. (2013) evoked 12.9% of endemism based on a preliminary analysis of the collection presented in this study.

Fifteen years ago, the Marquesas were reported to be one of the few hotspots of endemism in the Indo-Pacific for shore reef fishes (Randall and Earle 2000). This percentage is presently at its highest level ever with 13.7%. This census of the Marquesan fish biodiversity constitutes a baseline that is essential to ensure the future protection of these islands. A plan to set up a
Marine Protected Area is in progress for the Marquesas Islands. Our study highlights the uniqueness of the Marquesan reef fish fauna and emphasizes the necessity to preserve the reef fish fauna of the archipelago, possessing the third highest percentage of endemism in the Indo-Pacific.

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