

# Range extension and re-description of *Synagrops argyreus* (Perciformes, Acropomatidae)

by

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**Abstract.** – Since its first description by Gilbert and Cramer (1897) (originally as *Melanostoma argyreum*), *Synagrops argyreus* was considered to be endemic to Hawaii. New data from the southern Indian Ocean in the Madagascar Channel and the Coral and Tasman Seas reveal a considerable wider geographical distribution of the species, adding to the growing number of pseudo-oceanic species with a wide distribution pattern in the Indo-Pacific.

**Résumé.** – Extension de l'aire de répartition et re-description de *Synagrops argyreus* (Acropomatidae, Perciformes).

Depuis sa première description par Gilbert et Cramer (1897) comme *Melanostoma argyreum*, *Synagrops argyreus* a été considérée être endémique de Hawaii. De nouvelles données du sud de l'océan Indien, dans le canal du Mozambique, et des mers de Corail et de Tasmanie révèlent que la répartition géographique de l'espèce est en réalité considérablement plus large. Cette espèce vient s'ajouter au nombre croissant d'espèces pseudo-océaniques à large distribution dans la région Indo-Pacifique.

## Key words

Acropomatidae  
*Synagrops argyreus*  
South Indian Ocean  
Range extension

Gilbert and Cramer (1897) described *Melanostoma argyreum* from off the Hawaiian Islands (now *Synagrops argyreus* following *Synagrops* Günther, 1887 as substitute for

*Melanostoma* Döderlein, 1883, preoccupied by *Melanostoma* Schiner, 1860 in Diptera; see Eschmeyer, 2015). Until now this species has been regarded as a Hawaiian endemic (Mundy, 2005). Prokofiev (2005) reported a capture of a previously unknown *Synagrops* species from SW Pacific and tentatively identified it as *S. cf. pellucidus* (Alcock, 1889), but indicated at the same time that it may belong to a separate species. In the process of an ongoing review of the genera and species assigned to the family Acropomatidae sensu Johnson (1984) we re-examined the species currently placed in the genus *Synagrops* and being characterized by the presence of two spines, seven branched anal-fin rays and a serrated pelvic-fin spine, for elucidation of the status of those SW Pacific specimens. Although their difference from *S. pellucidus* (and *S. adeni* Kotthaus, 1970) was confirmed, we somewhat surprisingly found that they represent the same species as the hitherto assumed endemic Hawaiian *S. argyreus*. Furthermore, we found an additional specimen of the same species from the SW Indian Ocean. These records considerably extend the known distribution range of *S. argyreus*. The aim of the current paper is the re-description of *Synagrops argyreus*, a comparison of the Hawaiian

and Southern Hemisphere populations and a discussion of its distribution.

## MATERIAL AND METHODS

Counts and measurements follow Hubbs and Lagler (1958). Terminology of otoliths follows Koken (1891) with amendments by Weiler (1942) and Schwarzhans (1978). The synonymy listing does not include the references cited by Mundy (2005).

Institutional abbreviations follow Eschmeyer (2015).

## Comparative material studied

*Synagrops adeni* Kotthaus, 1970. - Holotype ZMH 5055 (SL 53 mm); paratypes ZMH 5056-1, 5056-2 (SL 60-61 mm), 12°25'N, 43°54.5'E, Meteor station 54, 68-70 m, 02.12.1964; paratypes ZMH 5057-1, 5057-2 (SL 55-67 mm), 01°18'N, 41°56'E, Meteor station 158, 243-177 m, 15.01.1965; BMNH 1939.5.24.880-891 (5 specimens SL 64-66), Murray expedition station 16, Gulf of Aden, 186 m, 21 Sep. 1933 (contains six further specimens, which have not been measured), formerly misidentified as *S. philippinensis*.

*Synagrops pellucidus* (Alcock, 1889): BMNH 1890.7.31.13-15 (3 spms, SL 69-85 mm), 18°30'N, 84°36'E, 183 m; ZMH 8717 (SL 65 mm), 09°40'N, 75°38.3'E, Meteor

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station 189, 210-138 m, 10 Feb. 1965, originally described by Kotthaus as a paratype of *S. adeni*.

*Synagrops philippinensis* (Günther, 1880): syntypes BMNH 1879.5.14.167 (4 spms SL 63-74 mm), Philippines, Challenger station 201, 07°03'N-121°48'E, 82-102 fathoms, 26 Oct. 1874 (contains a further poorly preserved fish of 41 mm SL, which has not been measured).

Note: A revision of the species of the genus *Synagrops* is subject of an ongoing review by the authors. For the purpose of this study we have used only type specimens and specimens from close to the type-areas of the individual species mentioned above for comparison and distinction from *S. argyreus*.

***Synagrops argyreus* (Gilbert & Cramer, 1897)**

Figs 1, 2A, 3A, 4, 5D-F

syn. *Melanostoma argyreum*: Gilbert & Cramer, 1897: 416, pl. XXXIX, fig. 3 (original description; 21°12'N, 157°49'W).

syn. *Synagrops argyreus*: Schultz, 1940: 419 (key, synonymy); Carpenter, 1999: 2437 (check-list); Mundy, 2005: 337 (synonymy, distribution); Randall, 2007: 184 (Hawaii).

syn. *Synagrops adeni* (non Kotthaus, 1970): Rivaton and Bourret, 1999: based on otoliths, pl. 149, figs 5-12 (New Caledonia).

syn. *Synagrops* cf. *pellucidus* (non Alcock, 1889): Prokofiev, 2005: 717, figs a-f (SW Coral and Tasman seas).

**Material examined**

12 specimens: BPBM 23852, 2 spms SL 120-122 mm, Hawaii, off Molokai, 21°11'N, 157°25'W, 168-194 m, R/V *Townsend Cromwell* cruise 35, station 36, 8 Apr. 1968; 4 spms BPBM 23839, SL 97-199 mm, Hawaii, off Molokai,

21°10'N, 157°25'W, 172 m, R/V *Townsend Cromwell* cruise 35, station 33, 7 Apr. 1968; ZMUC P44272, 1 spm SL 122 mm, Indian Ocean, Madagascar Channel, 22°19'S, 43°06'E, 330-335 m, R/V *Vityaz-II* cruise 17, station 2644, 2. Dec. 1988; ZMMGU-P 13269, 4 spms SL 122-183 mm, 19°58'S, 151°32'E, R/V *Lira* cruise, 15 Jun. 1965; ZMMGU-P 15338, 1 spm SL 141 mm, 35°41'S, 173°05'E, 11 Sep. 1968.

**Diagnosis**

A species of *Synagrops* sensu lato lacking basioccipital fossa, otophysic connection and posterior openings of myodome, with two spined and 7 branched anal-fin rays, only pelvic-fin spine serrated along its outer edge, postero-ventral angle of maxillary plate extending backward and downward (Fig. 2A), teeth on vomer and palatines mostly granular, 2-3 longitudinal crests on preopercular lobe (Fig. 3A), pseudobranch very large, with 28-38 elements, total gill-rakers 12-15 on outer row of first arch, pectoral fin moderately long, 22.5-24.6% SL.

**Description**

Counts and measurements are given in table I. Body moderately elongate, compressed, covered with rather large, deciduous cycloid scales. Head moderately large; inter-orbital space convex; cheeks and opercular bones scaly. Mouth large, oblique; lower jaw slightly projecting. Maxillary reaching below mid-orbit to slightly behind of it. A single long and thin supramaxillary. Posterior edge of maxillary deeply concave with posterodorsal and posteroventral angles sharp and posteroventral angle extended backward and downward resulting in an obliquely truncated posterior rim of the maxillary. Premaxillary with a pair of canines near symphysis and an additional much smaller canine-like tooth inward from the main canine tooth on each side (rarely



Figure 1. - *Synagrops argyreus*. A: Hawaiian Is., SL 97 mm, BPBM 23852; B: Tasman Sea, SL 137 mm, ZMMGU 15338.

Table I. - Selected measurements and counts of the members of the *pellucidus*-group of the genus *Synagrops* sensu lato.

Character	<i>S. argyreus</i>			<i>S. adeni</i>		<i>S. pellucidus</i>		<i>S. philippinensis</i>
	BPBM 23852 & 23839 (n = 6)	ZMMGU 13269 & 15338 (n = 5)	ZMUC P44272 (n = 1)	ZMH 5055 (holotype)	ZMH 5056 & 5057 (paratypes, n = 4)	BMNH 1939.5.24.880-891 (n = 5)	BMNH 1890.7.31.13-15 (n = 3)	BMNH 1879.5.14.167 (syntypes, n = 4)
Hawaii	97-122	S. Coral and Tasman Seas	Madagascar Chanel	Gulf of Aden	Gulf of Aden and off southern Somalia	Gulf of Aden	Bay of Bengal	Philippines: Sulu Sea
SL, mm	34.3-36.1%	122-183	122	53	55-67	64-65	65-85	63-74
Head length (in % of SL)	23.6-26.2%	32.6-34.4%	36.2%	40.3%	37.0-41.5%	38.9-44.7%	38.5-40.4%	33.7-37.1%
Greatest body depth (in % of SL)	9.3-10.3%	23.9-27.5%	24.4%	24.9%	26.4-30.5%	24.5-26.8%	26.1-27.5%	26.7-30.9%
Least caudal peduncle depth (in % of SL)	36.3-39.2%	10.2-10.8%	10.0%	9.4%	9.5-10.5%	9.4-10.6%	8.7-9.1%	10.3-12.6%
Distance from snout to 1 <sup>st</sup> dorsal-fin origin (in % of SL)	63.5-67.2%	36.5-40.3%	36.7%	37.7%	37.4-39.5%	38.3-41.6%	39.6-41.0%	38.8-42.3%
Distance from snout to 2 <sup>nd</sup> dorsal-fin origin (in % of SL)	34.0-36.0%	58.8-65.3%	63.7%	62.8%	64.8-66.7%	61.1-65.8%	63.0-65.6%	64.5-67.4%
Distance from snout to pelvic-fin origin (in % of SL)	65.7-68.5%	32.3-37.0%	37.0%	35.8%	35.7-44.5%	35.5-41.4%	36.6-43.9%	41.3-43.0%
Distance from snout to anal-fin origin (in % of SL)	22.6-24.6%	63.0-69.8%	65.6%	64.3%	64.3-69.3%	60.9-66.6%	64.0-70.1%	67.3-72.1%
Pectoral fin length (in % of SL)	20.8-25.0%	22.5-24.3%	23.2%	30.6%	28.0-29.5%	26.9-29.5%	27.0-27.4%	21.6-23.7%
Caudal fin length (in % of SL)	8.3-8.9%	8.6-11.2%	8.6%	8.3%	19.8-22.5%	13.5-16.6%	13.5-16.6%	10.0-10.7%
Snout length (in % of SL)	10.2-10.7%	9.3-10.8%	10.1%	10.9%	10.6-12.2%	11.4-12.2%	10.4-11.3%	10.8-12.0%
Horizontal orbital diameter (in % of SL)	8.7-9.0%	7.4-8.8%	9.0%	9.4%	8.5-9.7%	9.2-10.6	8.2-9.0%	9.2-9.7%
Bony interorbital width (in % of SL)	IX	IX	IX	IX	IX	IX	IX	VIII-IX
First dorsal fin rays	I+9	I+8 or 9	I+9	I+10	I+9-10	I+9	I+9	I+8-9
Second dorsal fin rays	II+7	II+6-7	II+6	II+7	II+7	II+7	II+7	II+7
Anal fin rays								

Table I. - Continued.

Character	<i>S. argyreus</i>			<i>S. adeni</i>			<i>S. pellucidus</i>		<i>S. philippinensis</i>
	BPBM 23852 & 23839 (n = 6)	ZMMGU 13269 & 15338 (n = 5)	ZMUC P44272 (n = 1)	ZMH 5055 (holotype)	ZMH 5056 & 5057 (paratypes, n = 4)	BMMH 1939.5.24.880-891 (n = 5)	BMMH 1890.7.31.13-15 (n = 3)	ZMH 8717 (n = 1)	BMMH 1879.5.14.167 (syntypes, n = 4)
	Hawaii	S. Coral and Tasman Seas	Madagascar Chanel	Gulf of Aden	Gulf of Aden and off southern Somalia	Gulf of Aden	Bay of Bengal	Laccadive Sea	Philippines: Sulu Sea
Pectoral fin rays	I+14-15	I+14-15	I+13-14	I+14	I+14-16	I+14-16	I+14-16	I+16	I+14-15
Pelvic fin rays	I+5	I+5	I+5	I+5	I+5	I+5	I+5	I+5	I+5
Developed gill rakers: upper + lower = total	1-3 + 11-13 = 13-15	2 + 10-11 = 12-13	2 + 12 = 14	5 + 18 = 23	4-5 + 17-18 = 22-24	3-4 + 20-21 = 23-24	3-4 + 15-17 = 18-21	4 + 16 = 20	2-3 + 13-15 = 15-17
Pseudobranchial filaments	28-33	32-38	30-32	16	15-20	16-18	18-23	22	18-23
Number of denticles of preopercular ridge	2-4	3-5	5/6	3/4	3-6	2-4	3-4	4	2-4
Scales (pockets) in lateral line	about 30	about 28-30	-	27/29	-	-	24?-27	-	about 22

absent), followed posteriorly by a wide band of minute cha-grin-like teeth. Dentary with a pair of canines and a band of minute conical teeth near symphysis, followed posteriorly by a row of several small conical teeth and two to four enlarged canine-like teeth on each side. Vomer with a V-shaped patch of granular teeth, followed posteriorly by 1-4 (usually 2 or 3) enlarged conical teeth on each side. Palatines with 1-3 rows of granular teeth, teeth of the innermost row sometimes somewhat enlarged. Preopercle with outer edges of ventral branch and preopercular lobe finely serrated; preopercular lobe with 2-3 weak longitudinal crests; inner edge of preopercle with 2-6 denticles (their counts are usually different on the right and left sides in one fish). Sub- and interopercle with smooth outer edge. Opercle with 2 weak and short, flat spines. Pseudobranch very large and wide with 28 to 38 elements.

Dorsal fins completely divided and widely spaced (interdorsal distance roughly equal to the eye diameter or slightly smaller); fourth dorsal-fin spine longest. Three predorsals, predorsal formula /0+0/0+2/. Anal fin originates behind the level of the second dorsal-fin origin. Proximal-middle radial of first anal-fin pterygiophore is narrow and almost straight, wedge-shaped, lacking a groove at anterior edge. Pectoral fin reaching far before a level of the second dorsal-fin origin. Pelvic fins inserted below the level of the pectoral-fin base or just anterior to it. Pelvic-fin spine serrated along its outer edge; all other fin spines smooth. Caudal fin forked. Anus situated near origin of anal fin. Vertebrae 10 + 25.

Otoliths (Fig. 5D-F) slender, elongate, thin, up to about 10 mm length. Otolith length to otolith height = 1.85-2.0; otolith height to otolith thickness about 4.5. Outline with well-developed rostrum and symmetrical angular posterior tip. Dorsal rim with broad, obtuse mediodorsal angle and distinct postdorsal angle close to posterior rim; no or only weak excisura and antirostrum. Ventral rim deepest slightly in front of its middle, below collum of sulcus. Dorsal and posterior rims crenulated to various degrees; ventral rim mostly smooth. Inner face slightly convex with slightly suprmedian positioned sulcus. Sulcus rather shallow, with narrow, long cauda and wide, shallow ostium. Cauda length to ostium length = 1.05-1.15; ostium width to cauda width = 2.1-2.4. Ostium opening anterior-dorsally along otolith rim between rostrum and antirostrum, filled with well-defined colliculum. Cauda tapering, slightly bent at its tip, terminating close to posterior tip of otolith, with poorly defined colliculum. Dorsal depression wide; ventral furrow distinct, close to ventral rim of otolith anteriorly and bending away from it backwards towards tip of cauda. Outer face slightly concave, with fine radial furrows.

Preserved fishes are medium brown to pale with edges of scale pockets infuscated; mouth and branchial cavity dark; peritoneum dark, stomach pale.



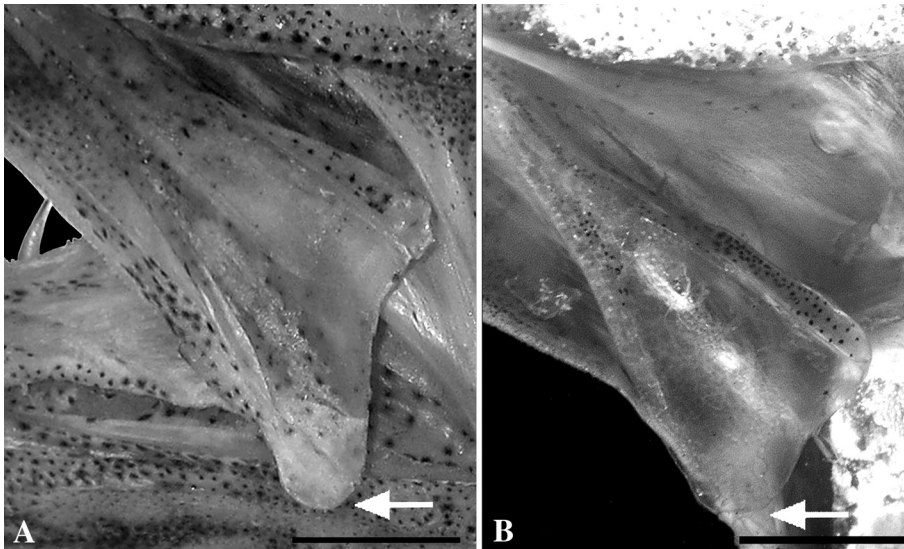


Figure 2. - Posterior plate of maxillary in *Synagrops argyreus*, ZMMGU 15338, SL 137 mm (A) and *S. pellucidus*, BMNH 1890.7.31, SL 85 mm (B). Posteroventral angle of maxillary indicated by arrow. Scale bar = 5 mm.

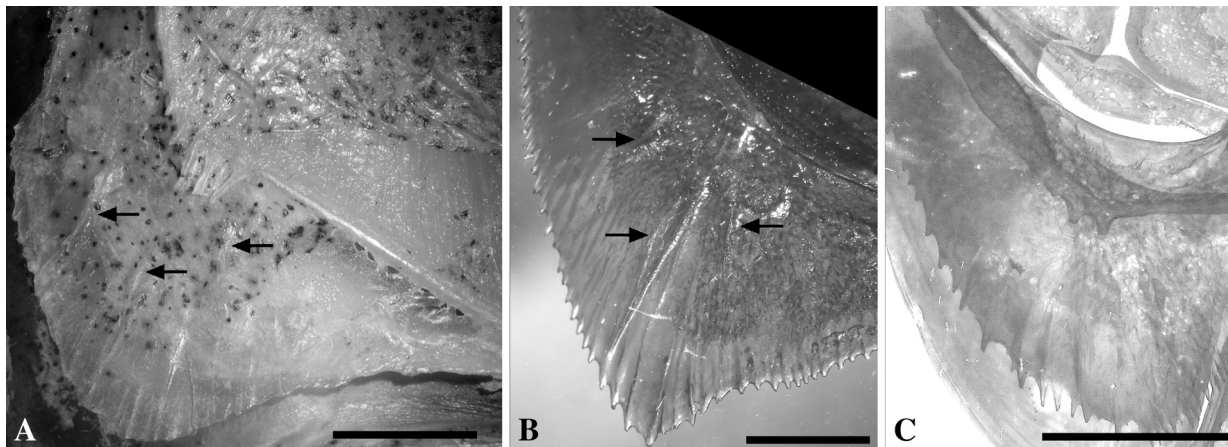


Figure 3. - Preopercular lobe in three *Synagrops* species. A: *S. argyreus*, ZMMGU 15338, SL 137 mm; B: *S. japonicus*, IORAS uncat., SL 140 mm, cleared and stained, Madagascar Ridge; C: *S. aff. philippinensis*, IORAS uncat., SL 50 mm, cleared and stained, Vietnam: Nha Trang. Creasts on preopercular lobe indicated by arrows. Scale bar = 5 mm.

### DISCUSSION

In the original description of *S. argyreus*, Gilbert and Cramer (1897: 417) compared this species with *S. japonicus* only. In the review of the genus, Schultz (1940: 416) indicated the similarities between *S. argyreus* and *S. philippinensis* and noted a single difference between these species: a presence or absence of the longitudinal keels on the preopercular lobe. Although we confirm this character (Fig. 3A-C) as a real difference between these species, it is not helped for separation of *S. argyreus* from the other closely related species (including *S. pellucidus* listed by Schultz (1940) within the synonyms of *S. philippinensis*), as most of the *Synagrops* species possess such keels. There are no subsequent comparative-morphological treatments of *S. argyreus*, which was believed to be a Hawaiian endemic (Mochizuki, 1989: 83; Mundy, 2005: 337; Randall, 2007: 184).

However, all morphological and meristic characters of the fishes studied from Hawaii, the SW Indian and the SW Pacific Oceans fall well within a narrow range of variability (see table I) and we therefore suggest all of these specimens to represent *Synagrops argyreus* despite their origin from such widely separated geographic realms (Fig. 4). This conclusion is further supported by the study of their otoliths (Fig. 5D-F), which includes otoliths from Hawaii (Fig. 5D), the Madagascar Channel (Fig. 5F) and specimens figured by Rivaton and Bourret (1999) from New Caledonia under the name *S. adeni* (Fig. 5E), which we tentatively include in the synonymy of *S. argyreus* despite the fact that the voucher specimens were not available for our study. Otoliths of *S. argyreus* are distinctly more elongate than those of *S. adeni* (Fig. 5A) and *S. pellucidus* (Fig. 5B). A similarly elongate fossil otolith from the Early Pliocene from the Caribbean of Venezuela has been figured as *Parascombrops* aff.

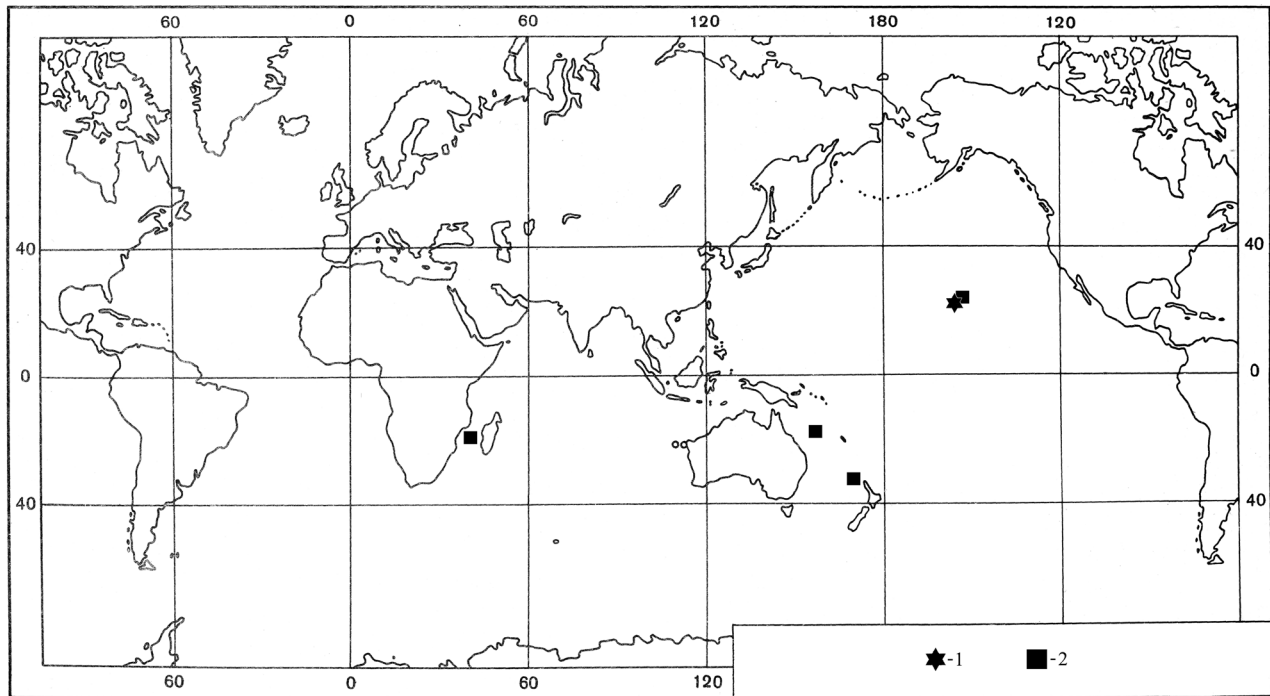


Figure 4. - Distribution of *Synagrops argyreus* as currently known (1, location of holotype; 2, locations of studied specimens).

Table II. - Diagnostic characters of the *pellucidus*-group of the genus *Synagrops* sensu lato.

Character	<i>S. adeni</i>	<i>S. argyreus</i>	<i>S. pellucidus</i>	<i>S. philippinensis</i>
Developed gill-rakers	22-24	12-15	18-21	15-17
Pseudobranchial filaments	15-20	28-38	18-23	18-23
Dentition on palatines	Mostly conical in 1-2 rows	Mostly granular in 1-3 rows	Mostly granular in 1-2 rows	Mostly granular in 1-2 rows
Postero-ventral angle of maxillary plate	Not extended (as in Fig. 2B)	Extended (as in Fig. 2A)	Not extended (as in Fig. 2B)	Not extended (as in Fig. 2B)
Longitudinal crests on peopercular lobe	Present	Present	Present	Absent
Pectoral fin length % of SL	28.0-30.6	22.5-24.6	27.0-29.7	21.6-23.7
Otolith length: height	1.55-1.65	1.85-2.00	1.65	Not known

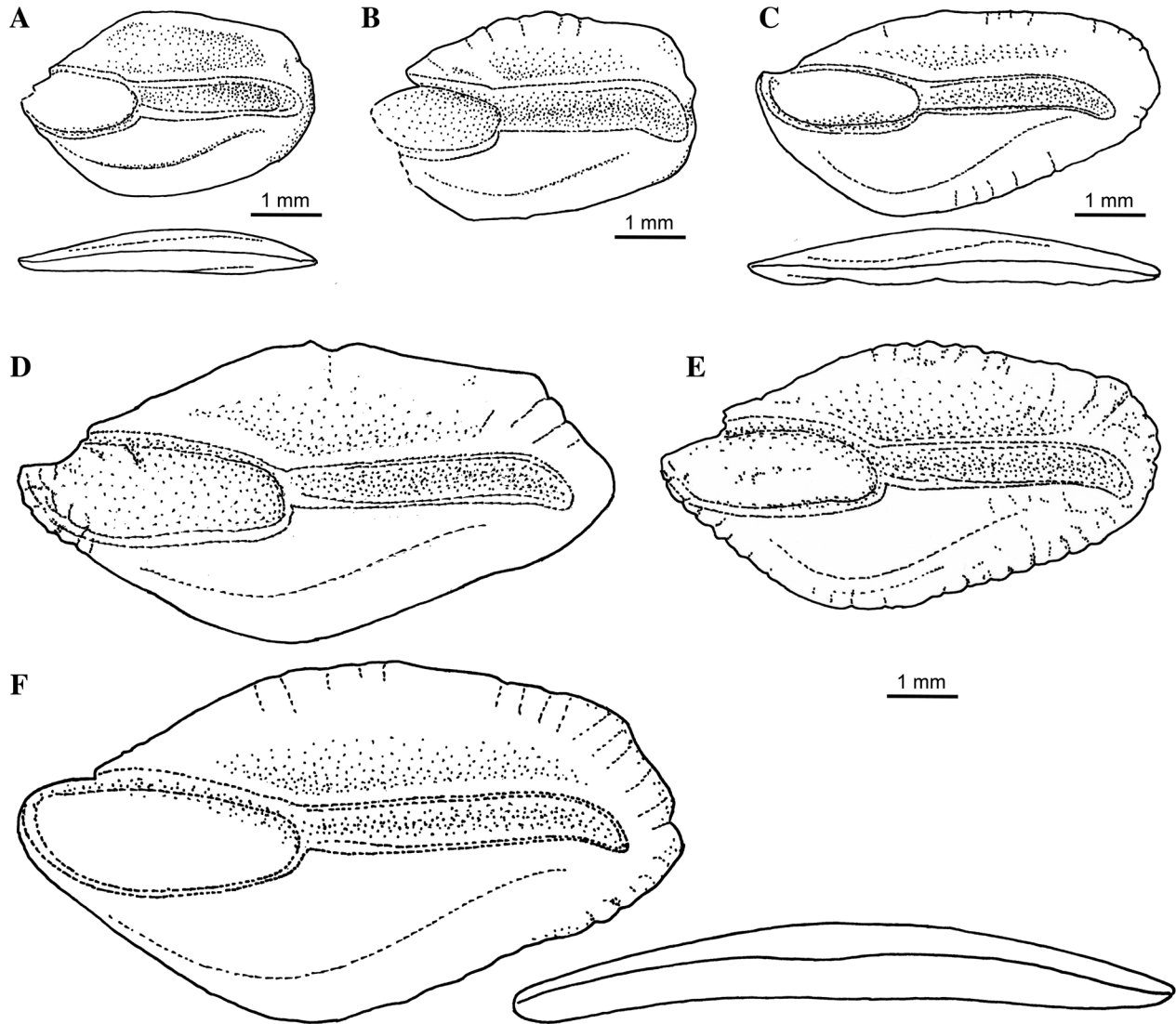
*argyreus* by Nolf (2013) (plate 211). Such record would further expand the now recognized distribution, but the otolith figured suggests the specimen to rather represent *S. trispinosus* Mochizuki & Sano, 1984 (Fig. 5C), a well-known Caribbean species, because of its low mediodorsal and the much expanded postdorsal rim.

**Comparison**

Up to now, 14 nominal species are classified within *Synagrops* (Eschmeyer, 2015): *S. adeni* Kotthaus, 1970 (NW Indian Ocean) (considered a synonym of *S. pellucidus* by Mochizuki (1989) but herein being resurrected as a valid species following a comparison of the types), *S. analis* (Katayama, 1957) (off Japan); *S. argyreus* (Gilbert & Cramer, 1897) (Hawaiian Islands); *S. bellus* (Goode & Bean, 1896) (Atlantic); *S. japonicus* (Döderlein, 1883) (Indo-West Pacific); *S. malayanus* Weber, 1913 [a synonym of *S. philippinensis*

according to Schultz (1940), Katayama (1960), and Mochizuki (1989)]; *S. microlepis* Norman, 1935 (Eastern Atlantic); *S. natalensis* Gilchrist, 1922 [a synonym of *S. japonicus* according to Schultz (1940), Katayama (1960) and Heemstra (1986)]; *S. pellucidus* (Alcock, 1889) (Bay of Bengal); *S. philippinensis* (Günther, 1880) (widely recorded from the Andaman Sea and the Indo-Australian Archipelago to Japan and Taiwan, but subject to ongoing revision); *S. pseudomicrolepis* Schultz, 1940 (Western Atlantic); *S. serratospinosus* Smith et Radcliffe, 1912 (Western Pacific); *S. spinosus* Schultz, 1940 (Western Atlantic and Western Pacific), and *S. trispinosus* Mochizuki & Sano, 1984 (Western Atlantic).

We provisionally group these taxa in five groups: *japonicus*-group (*S. bellus* and *S. japonicus*) having an otophysic connection, a basioccipital fossa and a myodome opened posteriorly (all these features are absent in the rest of species), otoliths with nearly flat ventral and high dorsal rims



Figures 5. - Otoliths (a = inner face, b = view from ventral). **A:** *Synagrops adeni* BMNH 1939.5.24.880-891, Gulf of Aden; **B:** *Synagrops pellucidus* BMNH 1890.7.31.13-15, Bay of Bengal; **C:** *Synagrops trispinosus* USNM 407771, 16°04'N-87°14'W; **D-F:** *Synagrops argyreus*, **D:** LACM (coll. Fitch), Oahu, Hawaii, **E:** refigured from Rivaton and Bourret (1999), New Caledonia, **F:** ZMUC 44272, 22°19'S-43°06'E.

and with an anteriorly declined sulcus with a small, triangular ostium, all fin-spines non-serrated, anal fin with two spines and usually seven branched rays; *microlepis*-group (*S. microlepis* and *S. pseudomicrolepis*) with all fin-spines non-serrated, two spines and usually 8-9 branched rays in anal fin (vs. 7 in all the other *Synagrops*); *pellucidus*-group (*S. adeni*, *S. argyreus*, *S. pellucidus* and *S. philippinensis*) having pelvic-fin spine serrated along its outer edge, two spines and seven branched anal-fin rays; *spinosus*-group (*S. serratospinosus* and *S. spinosus*) having serrated spines in the vertical fins (vs. smooth in all the other species), and *trispinosus*-group (*S. analis* and *S. trispinosus*) having three

anal-fin spines (vs. two in all the other species). This grouping corresponds well to the one presented by Mochizuki (1989), who however had the *pellucidus*- and the *spinosus*-groups united in one group, which also contained *S. analis* from our *trispinosus*-group.

Apparently the generic name *Synagrops* sensu stricto should be restricted to the *japonicus*-group only, while the members of the *pellucidus*-, *spinosus*- and *trispinosus*-groups should be separated in the genus *Parascombrops* Alcock, 1889, and the members of the *microlepis*-group probably qualify for a separate genus. This however is subject to our ongoing research of the genus.



Differentiation of the species of the *pellucidus*-group (including *S. argyreus*) is summarized in table II. *Synagrops argyreus* is easily distinguished from all other members of the group by the high number of pseudobranchial filaments, the relatively low number of developed gill rakers, the shape of the maxillary plate (Fig. 2A, B); the moderate length of the pectoral fin and the slender otoliths (Fig. 5A-F). It also seems to be the largest member of this group attaining a size of at least 183 mm SL. We are not aware of any specimens larger than 105 mm SL of the other species within this group.

### Distribution

*Synagrops argyreus* is not endemic to Hawaii, but instead shows a, possibly, discontinuous distribution from the Madagascar Channel to the Tasman and Coral Seas and to Hawaii. It may still have an even wider distribution in the Western Pacific than currently known. As *Synagrops* is one of the most poorly studied groups of deep-water percoids, it is probable that this species could be misidentified in some well-collected areas or could be expected in yet insufficiently sampled areas. So far, Hawaii seems to be the most remote peripheral part of the distribution of this species. It must also be noted that possibly discontinuous distribution patterns off Hawaii and in the southwestern Pacific and Indian Oceans is also found in a number of other pseudoceanic or bathyben-  
thic fishes such as for instance *Hymenocephalus aterrimus* Gilbert, 1905 and *Hymenogadus gracilis* (Gilbert & Hubbs, 1920) (see Schwarzhans, 2014), or *Diaphus adenomus* Gilbert, 1905 (see Braga *et al.*, 2008) and *D. watasei* Jordan & Starks, 1904 (see Schwarzhans, 2013). These patterns also include records from off Japan or in the Caribbean at times; and, according to personal information by T. Iwamoto, there may be more pseudoceanic or bathyben-  
thic fishes with such disjunctive distribution patterns. However in the light of possible sampling biases we consider speculations for the reason as premature for the time being.

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