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Rediscovery of the holotype of the Tongue Sole, *Cynoglossus dollfusi* (Chabanaud, 1931): Its impact on Red Sea records for *C. sealarki* Regan, 1908, *C. lingua* Hamilton, 1822, and *C. zanzibarensis* Norman, 1939, and on the taxonomic status of *C. cleopatridis* Chabanaud, 1949 (Pisces: Pleuronectiformes: Cynoglossidae)

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Abstract.—Considerable confusion has surrounded the identity of the nominal species, *Paraplagusia dollfusi* Chabanaud, 1931, known only from two specimens: the holotype, collected in Gulf of Suez, Red Sea, and a second, non-type specimen (reported with the trinomial *Cynoglossus (Trulla) dollfusi*) captured in the Suez Canal, Red Sea. No catalogue number, illustration or photograph of the type specimen accompanied the original description, which also lacked critical information to confidently assign this species to a genus or to diagnose it from previously described tongue soles possessing similar attributes. Both the type and non-type specimen have been reported as lost for over 40 yr, further confounding attempts to resolve questions regarding the identity and status of this nominal species. During its history, *C. dollfusi* has been considered as a junior subjective synonym of *C. sealarki* Regan, 1908, a senior subjective synonym of *C. cleopatridis* Chabanaud, 1949, and has been misidentified as *C. zanzibarensis* Norman, 1939. The trinomial, *Cynoglossus (Trulla) dollfusi*, has also been considered as a second nominal species. Recently, specimens currently curated in the same jar in the fish collection of the Muséum National d’Histoire Naturelle (Paris) and identified as *C. zanzibarensis* collected in the Red Sea were determined to be the missing holotype of *P. dollfusi* Chabanaud, 1931 and the second-known specimen of *C. dollfusi*. Their sizes, as well as their meristic and morphometric features, agree with those provided in the original description of the holotype of *C. dollfusi* and for those in the account of the second specimen. Rediscovery of the holotype confirms the validity of this species. Based on the holotype and non-type specimen and information from the literature, *C. dollfusi* is redescribed and diagnosed from other Indo-West Pacific species of the genus. Information from these two specimens also provides the necessary data to resolve historical problems regarding the identity and taxonomic placement of this species. Additionally, this new information resolves Red Sea distributional records for three other species of *Cynoglossus*. Conclusions from the present study indicate: **a)** Chabanaud erred in placing his nominal species *dollfusi* in the genus *Paraplagusia*. New data allow confident assignment of this species to *Cynoglossus*. **b)** The hypothesis that two nominal species are represented by the names *P. dollfusi* and *Cynoglossus (Trulla) dollfusi* is unsupported. *Cynoglossus (Trulla) dollfusi* is a new combination reflecting transfer of *dollfusi* from *Paraplagusia* to *Cynoglossus*. **c)** The hypothesis that *C. dollfusi* (Chabanaud, 1931) is a junior subjective synonym of *C. sealarki* is not supported by the data. These two species differ significantly to warrant

recognizing both as valid. **d)** *C. dollfusi* has erroneously been considered the senior synonym of *C. cleopatridis* Chabanaud, 1949, a nominal species known only from a damaged holotype also collected in the Red Sea. *Cynoglossus dollfusi* was redescribed in a global revision of the genus based mostly on information from the holotype of *C. cleopatridis*, a decision that significantly changed the species concept of *C. dollfusi* from that intended in the original description. **e)** The hypothesis that *C. cleopatridis* Chabanaud, 1949 is a junior subjective synonym of *C. dollfusi* (Chabanaud, 1931) is rejected. The holotype of *C. cleopatridis* differs sufficiently in several meristic and morphometric features to demonstrate that *C. dollfusi* and *C. cleopatridis* are distinct species. **f)** Additional specimens are needed to more completely understand the nominal species, *C. cleopatridis*. **g)** The specimen thought to voucher *C. lingua* Hamilton, 1822 from the Red Sea was misidentified. It later became the holotype of *C. cleopatridis*, a species quite distinct from *C. lingua*. **h)** The list of cynoglossine fishes reported from the Red Sea has been updated. Red Sea records of *P. dollfusi* Chabanaud, 1931 should be emended to *C. dollfusi* (Chabanaud, 1931). The only specimens thought to voucher Red Sea records for *C. sealarki*, *C. zanzibarensis*, and *C. lingua* were all misidentified. Therefore, these species are removed from the list of tongue soles occurring in the Red Sea.

Keywords: Tonguefish, flatfish, Cynoglossidae, nomenclature, species concept, Red Sea fishes

Chabanaud (1931) described the tongue sole, *Paraplagusia dollfusi*, based on a single specimen (125 mm TL) collected by R. M. Ph. Dollfus in 1928 in the Gulf of Suez, Red Sea. No illustration, photograph or catalogue number was provided for this specimen. Chabanaud diagnosed this new species from several others of the genus *Paraplagusia* Bleeker, 1865, but did not compare his specimen with any species then assigned to *Cynoglossus* Hamilton, 1822. Whereas the original description of *P. dollfusi* contains information important to the systematics of this species, overall, the information therein is insufficient to confidently assign this species to either *Paraplagusia* or *Cynoglossus*, as several apomorphic features important for identifying tongue soles of these genera were not included in this account.

In 1937, Gruvel & Chabanaud, using the trinomial *Cynoglossus (Trulla) dollfusi*, reported on a specimen of tongue sole collected near the Red Sea entrance to the Suez Canal. Although not explicitly stated in their work, they considered their specimen to be conspecific with the type specimen of *P. dollfusi* (see Chabanaud 1947, Munroe & Kong 2016). The brief descriptive account of this second, non-type specimen provided limited information regarding meristic and morphometric features of the specimen, as well as some comments on its coloration. Gruvel & Chabanaud (1937) also included an illustration of the whole specimen, and two other illustrations highlighting features of its scales. The illustration of the whole specimen (reproduced herein as Fig. 1) is poor (see criticism by Chabanaud 1947, and comments in Munroe & Kong 2016), and ambiguous with respect to certain anatomical details important for confi-

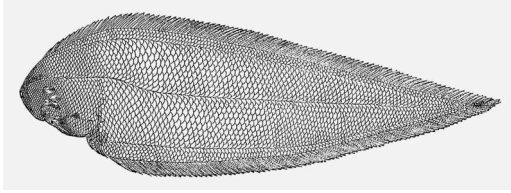


Fig. 1. Illustration reproduced from Gruvel & Chabanaud (1937) of the non-type specimen of *Cynoglossus dollfusi* (Chabanaud, 1931) collected at the entrance to the Suez Canal.

dently diagnosing this nominal species from other species of *Cynoglossus*. No discussion or rationale was provided by Gruvel & Chabanaud to justify transfer of this nominal species to *Cynoglossus*, nor did these authors distinguish this species from others then assigned to *Cynoglossus* (Munroe & Kong 2016).

In 1947, Chabanaud redescribed both the holotype of *C. dollfusi* and the second specimen (identified as *Cynoglossus (Trulla) dollfusi* in Gruvel & Chabanaud 1937). In this work, though, Chabanaud placed *Cynoglossus (Trulla) dollfusi* into the synonymy of *Cynoglossus sealarki* Regan, 1908, a species then known from only four specimens taken in depths over 123 fathoms on Saya de Malha Bank, Indian Ocean (Regan 1908). In his redescription, Chabanaud provided some additional meristic and morphometric information for both specimens, as well as descriptions of their coloration. Again, no catalogue numbers, photographs, or illustrations of these specimens were provided, and no rationale provided justifying the transfer of his nominal species, *P. dollfusi*, to *Cynoglossus*. Nor did Chabanaud provide any discussion to indicate why he thought his nominal species was conspecific with *C. sealarki*. This taxonomic determination (*C. dollfusi* = *C. sealarki*) was reiterated in another of his papers (Chabanaud 1954), again without comment or discussion on the rationale for this taxonomic reassessment.

Both the type specimen of *P. dollfusi* and the non-type specimen of *Cynoglossus (Trulla) dollfusi* have been reported as lost for at least 40 yr (Menon 1977, Dor 1984, Desoutter et al. 2001, Eschmeyer et al. 2016, Munroe & Kong 2016). Attempts by Desoutter & Munroe in the 1990s to locate these specimens at the Muséum National d'Histoire Naturelle (MNHN) were unsuccessful, and a recent (10 November 2016) search of the online ichthyology collection database at MNHN also failed to locate these specimens. As mentioned in Munroe & Kong (2016), other than Chabanaud, and perhaps Gruvel, none of the other authors (Fowler 1956, Menon 1977, Dor 1984, Goren & Dor 1994, Desoutter et al. 2001, Golani & Bogorodsky 2010) writing about this species have directly examined these specimens.

Considerable confusion has surrounded the names appearing in the original description of *Paraplagusia dollfusi* and in the descriptive account of *Cynoglossus (Trulla) dollfusi* since these names were first published (Desoutter et al. 2001, Eschmeyer et al. 2016, Munroe & Kong 2016). Desoutter et al. (2001) and Eschmeyer et al. (2016) discussed some of the confusion regarding the status and identity of this nominal species, as did Munroe & Kong (2016) in their detailed treatment of historical literature involving these names. The inability to directly examine the type or second specimen has undoubtedly contributed to different interpretations presented by various authors regarding whether one or two species were represented by these names. This confusion was discussed and status of these names was resolved (Munroe & Kong 2016), but only limited discussion was presented regarding the status of the nominal species involved.

In addition to nomenclatural confusion, concomitant changes in generic assignment and species concept have also occurred throughout the historical literature dealing with name changes applied to *P. dollfusi*. For example, shortly after *P. dollfusi* was

described and diagnosed from other species of *Paraplagusia*, Gruvel & Chabanaud (1937) transferred this nominal species to *Cynoglossus* based on their study of the second specimen. Chabanaud (1947, 1954) also considered *P. dollfusi* Chabanaud, 1931 as a member of *Cynoglossus*. However, in these works, he no longer regarded *P. dollfusi* as valid, instead, concluding it was a junior subjective synonym of *C. sealarki* Regan, 1908. In other studies, Fowler (1956) and Desoutter et al. (2001) considered *P. dollfusi* as a nominal species distinct from the '*C. (Trulla) dollfusi*' discussed in Gruvel & Chabanaud (1937). Menon (1977), in his worldwide revision of *Cynoglossus*, treated *P. dollfusi* Chabanaud, 1931 and '*C. (Trulla) dollfusi*' discussed in Gruvel & Chabanaud (1937) as conspecifics, with *Cynoglossus* regarded as the proper generic placement for this taxon. In that same work, though, Menon (1977) also considered *C. cleopatridis* Chabanaud, 1949 to be a junior subjective synonym of *C. dollfusi*. He also proceeded to redescribe *C. dollfusi* (now sensu Menon 1977) based nearly entirely on features of the holotype of *C. cleopatridis*, a nominal species quite distinct from *C. dollfusi* (see discussion below). In so doing, Menon (1977) changed the species concept of *C. dollfusi* completely from that originally reported by Chabanaud (1931) and Gruvel & Chabanaud (1937). Menon (1977), without comment or justification, also placed the specimen that had been identified as *C. lingua* Hamilton, 1822 in Gruvel & Chabanaud (1937) into the synonymy of *C. dollfusi*, an action that further complicated understanding the species concept of *C. dollfusi*.

Dor (1984), in his checklist of fishes from the Red Sea, recognized *C. dollfusi* (Chabanaud, 1931) as a valid species. However, he also considered the name, *Cynoglossus (Trulla) dollfusi* appearing in Gruvel & Chabanaud (1937), to represent another species and one distinct from *C. dollfusi* (Chabanaud, 1931). Dor (1984)

also followed Menon's (1977) hypothesis in considering *C. cleopatridis* as a junior subjective synonym of *C. dollfusi* (Chabanaud, 1931). In their checklist of fishes of the Red Sea, Goren & Dor (1994) recognized *C. dollfusi* (Chabanaud, 1931) as valid, but did not mention *Cynoglossus (Trulla) dollfusi*, nor did they mention *C. cleopatridis*. Both Dor (1984) and Goren & Dor (1994) recognized *C. sealarki* as another valid species occurring in this region based on reports of this species in Chabanaud (1947, 1954). In their annotated checklist of the fishes of the Red Sea, Golani & Bogorodsky (2010) included *C. dollfusi* (Chabanaud, 1931) as one of the tongue soles occurring there, but no mention was made either of *Cynoglossus (Trulla) dollfusi* or *C. cleopatridis* Chabanaud, 1949. Golani & Bogorodsky (2010) also noted that the reported occurrence of *C. sealarki* from the Red Sea was based on Chabanaud's (1947) record and for which there were no supporting voucher specimens.

In their type catalogue of flatfishes in the Muséum National d'Histoire Naturelle (Paris), Desoutter et al. (2001) recognized both *Paraplagusia dollfusi* Chabanaud, 1931 and *Cynoglossus (Trulla) dollfusi* Chabanaud, in Gruvel & Chabanaud 1937 as valid species. They also stated that it was likely that *P. dollfusi* should be transferred to *Cynoglossus*, but further work was needed to make this determination.

Munroe & Kong (2016) resolved nomenclatural issues for the two specimens upon which the names *P. dollfusi* and *Cynoglossus (Trulla) dollfusi* are based and resolved the nomenclatural issue of whether one or two species were represented in these studies. Some issues regarding the species concept of *C. dollfusi* were briefly discussed in Munroe & Kong (2016). However, the historical literature contains considerable confusion regarding the identity, status and species concept of the nominal species associated with these

names. Changes and challenges to the original species concept of *C. dollfusi* (Chabanaud 1931) contained within alternative hypotheses proposed by subsequent authors (Gruvel & Chabanaud 1937, Chabanaud 1947, 1954, Fowler 1956, Menon 1977, Desoutter et al. 2001, Eschmeyer et al. 2016, Munroe & Kong 2016) have not been adequately addressed. Also evident from the historical literature is that questions remain regarding the identity and status of this nominal species, especially in light of the fact that it has not been adequately diagnosed from congeners to support its recognition as a valid species.

Only two papers (Dor 1984, Goren & Dor 1994) cite the works of Chabanaud (1947, 1954) wherein Chabanaud proposed that *C. dollfusi* is a junior subjective synonym of *C. sealarki*. Neither of these studies, or in fact any other study, have scrutinized this hypothesis proposed by Chabanaud (1947, 1954). Additionally, no one has assessed hypotheses proposed by Menon (1977) that *C. cleopatrdis* is a junior subjective synonym of *C. dollfusi*, or, if the specimen reported as *C. lingua* by Gruvel & Chabanaud (1937) is, as Menon concluded, *C. dollfusi*.

Significant to discussions and conclusions derived in the present study regarding the species concept of *C. dollfusi* are two specimens (MNHN 1950–0077 and 1950–0078) curated in the same jar in the Muséum National d'Histoire Naturelle (Paris). These are labeled as having been collected in 1928 in the Red Sea by R. Ph. Dollfus and identified in 1950 as *C. zanzibarensis* Norman, 1939 by Chabanaud (R. Causse, person. comm.). Based on their size, meristic and morphometric features, these specimens are almost certainly those that Chabanaud (1947, 1954) examined and identified as *C. sealarki*. If this is correct, then these specimens are the long-lost holotype and non-type specimen of *C. dollfusi* in Chabanaud (1931) and Gruvel & Chabanaud (1937), respectively.

Recognition of these specimens as the holotype and second-known specimen of *C. dollfusi* provides the first opportunity in over 60 years to re-examine their features and to assess both the status and species concept of the nominal species, *C. dollfusi*.

Purposes of this paper are to redescribe the nominal species, *C. dollfusi* (Chabanaud, 1931), based on: 1) information gleaned from original descriptive accounts of the type (Chabanaud 1931) and non-type specimen (Gruvel & Chabanaud 1937); 2) from additional information in redescrptions of these specimens in Chabanaud (1947); and 3) by incorporating data retrieved from direct examination of these specimens. With this refined species concept, *C. dollfusi* (Chabanaud, 1931) will then be diagnosed from congeners, especially those (*C. sealarki* and *C. cleopatrdis*) previously considered as synonyms. This compilation will form the basis for discussing historical changes in the literature regarding the species concept of *C. dollfusi*. Summarized information will then be used to test the validity of the various hypotheses proposed by previous authors (Chabanaud 1947, Fowler 1956, Menon 1977, Desoutter et al. 2001) regarding the species concept of *C. dollfusi*. Finally, results will clarify important questions concerning the validity of Red Sea records for three other species, *C. sealarki*, *C. lingua*, and *C. zanzibarensis*; species that have become entangled in the confused history of *C. dollfusi*.

Materials and Methods

Specimens examined in this study are catalogued and deposited in fish collections of the Museum National d'Histoire Naturelle, Paris (MNHN) and British Museum of Natural History (BMNH). Specimens (MNHN 1950–0077, MNHN 1950–0078) currently identified as *C. zanzibarensis* were examined by the author in 1997. Additional details about their mor-

phology were examined for the author in 2015 & 2016 by J.M. Díaz de Astarloa (pers. comm.).

Select meristic features were counted directly from the specimens and methods for counting meristic features generally follow those listed in Menon (1977), except counts of the number of diagonal scale rows between dorsal and middle lateral lines were made on the ocular side in the region corresponding to maximum body depth of the specimen. Counts of caudal-fin rays included all fin rays supported by elements of the caudal skeleton (epural, hypurals, parhypural) following Norman (1928) and Menon (1977). Species of *Cynoglossus* have 1–3 lateral lines located on the ocular side, with most having either 2 or 3 (Günther 1862, Norman 1928, Menon 1977). A midlateral line, present in all species of the genus, is positioned along the length of the body extending from the posterior region of the head and continuing posteriorly onto the middle caudal-fin rays. Species with multiple ocular-side lateral lines always have a dorsal lateral line extending posteriorly for variable distances along the dorsal margin of the body several scale rows ventral to the dorsal-fin base, and in some species this lateral line exits onto the dorsal fin at a distance (variable, but usually species specific) from the posterior end of this fin. Some species of *Cynoglossus* have a third, ventral lateral line beginning on, or just posterior, to the abdominal cavity, and extending posteriorly along the ventral margin of the body before exiting onto the anal fin at a distance (variable, usually species specific) from the posterior end of this fin. Lateral-line scales (LLsc) were counted on the middle lateral line beginning with the scale located directly dorsal to the dorsal margin of the gill opening, and ending with the scale at, or partially overlying, the posterior end of the hypural plate (usually detected as flexure point at base of caudal fin).

Data presented in Table 1 demonstrate variation in the published literature for counts and measurements of the holotype and non-type specimen of *C. dollfusi*. Counts reported in Chabanaud (1931, 1947, 1954) and Gruvel & Chabanaud (1937) were made through their direct external examination of the specimens, as none of these studies report taking data from radiographs. Variation observed in the counts reported in these different studies reflects the inaccuracy and difficulty of making reliable counts (especially for dorsal- and anal-fin rays) directly from specimens of tongue soles.

Morphometric features reported for the present study were measured following methods presented in Menon (1977), except: Snout length (SNL) –recorded as horizontal distance from anterior tip of snout to anterior rim of orbit of lower eye; and, Eye diameter (ED) –horizontal distance between anterior and posterior margins of the eyeball of the lower eye. All measurements were made using dial or digital calipers to one-tenth of a millimeter. All measurements were made on the ocular side, except for body depth (BD) and caudal-fin length (CFL). Measurements in text and tables are presented as percentages of Standard length (SL) or Head length (HL).

Ovaries and testes of cynoglossid tongue soles differ in shape and size, so the sex of individuals can easily be determined macroscopically either through dissection or by shining light through the body wall (Wang et al. 2016). Maturity stage of females was determined based on morphological changes in the ovaries as they mature (see Wang et al. 2016 for more detailed description). Immature females have a small, triangular-shaped ovary with slight posterior elongation. As the female matures, the ovary grows longer and wider with obvious posterior elongation. In mature females, ova are usually evident through the ovarian wall. Because of these physical changes, maturity stage for fe-

Table 1.—Comparisons of meristic and morphometric information for the holotype and second-known (non-type) specimen of *Cynoglossus dollfusii* (Chabanaud, 1931) reported in three different studies, and for the holotype of *Cynoglossus cleopatriidis* Chabanaud, 1949. Abbreviations defined in text. (NA = not available; dashes indicate data not reported).

| Character | <i>Paraphagusia dollfusii</i> holotype, Chabanaud (1931) | ¹ <i>C. dollfusii</i> holotype, Identified as <i>C. zanzibarensis</i> , Chabanaud (1947) | ² <i>C. dollfusii</i> holotype, Identified as <i>C. zanzibarensis</i> , MNHN 1950-0077 | ³ <i>C. dollfusii</i> 2 nd specimen, Identified as <i>C. searaki</i> , Chabanaud (1947) | ³ <i>C. dollfusii</i> 2 nd specimen, Identified as <i>C. zanzibarensis</i> , MNHN 1950-0078 | <i>Cynoglossus cleopatriidis</i> holotype, Chabanaud 1949b) |
|---------------------------|--|---|---|---|---|---|
| Total length | 125 | 125 | 120 | 132 | 128 | — |
| Standard length | 116* | 117 | 114 | 122 | 123 | ca. 132 |
| Dorsal-fin rays | 106 | 107 | — | 105 | — | 115+ |
| Anal-fin rays | 85 | 85 | — | 84 | — | 85+ |
| Caudal-fin rays | 8 | 7 | NA | 8 | 8 | NA |
| Pelvic-fin rays | — | 4 | 4 | 4 | 4 | — |
| Vertebrae | — | — | — | — | — | — |
| Lateral-line scales | 70 | ca.70 | ca. 71 | ca. 65 | — | 70+ |
| Pelvic fins | — | — | 1 | — | 1 | 1 |
| Scales between LLs | 12 | 9 | — | 11-12 | 8 | 12 |
| OS nostrils | 1 | — | 1 | — | 1 | 2 |
| OS LLs | 2 | 3 | — | 1 on drawing 3 on drawing? | 3 | 2 |
| BD (percent SL) | 23.8 | 24 | 24.9 | 27 | 26.5 | ca. 24 |
| HL (percent SL) | 17.2 | 18 | 18.1 | 17 | 18.4 | ca. 18 |
| ED (percent HL) | 14.3 | 13 | 10.2 | 14 | 19.9 | 12 |
| Interorbital (percent HL) | — | 4.5 | 3.5 | 4.7 | 2.3 | — |
| SNL (percent HL) | — | 36 | 26.1 | 33 | 26.2 | — |
| CFL (percent HL) | — | 36 | 29.6 | 47 | 23.4 | — |

¹ Holotype of *C. dollfusii* was incorrectly identified by Chabanaud (1947) as the second-known specimen of *C. dollfusii* (see text for details).

² According to MNHN catalogue records, identified as *C. zanzibarensis* in 1950 by Chabanaud. Specimen data provided by J.M. Diaz de Astarloa (2016).

³ Second-known specimen of *C. dollfusii* was incorrectly identified by Chabanaud (1947) as the Holotype of *Cynoglossus dollfusii* (Chabanaud, 1931) (see text for details).

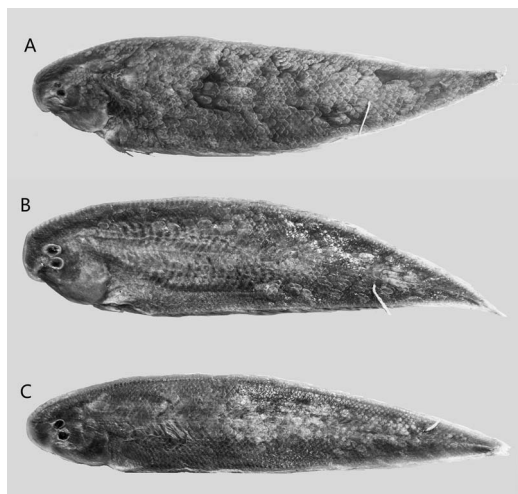


Fig. 2. Ocular-side view of three specimens of *Cynoglossus*. A, *Cynoglossus dollfusi* (Chabanaud, 1931), Holotype, MNHN 1950-0077, female, 112 mm SL, Gulf of Suez. B, Non-type specimen of *Cynoglossus dollfusi* (Chabanaud, 1931), MNHN 1950-0078, female, 122 mm SL, entrance to Suez Canal. C, Ocular-side view of the holotype of *Cynoglossus cleopatridis* Chabanaud, 1949, MNHN 1949-24, ca. 132 mm SL, Gulf of Suez. Photographs by J. M. Diaz de Astarloa.

males can be estimated macroscopically by examining size and extent of posterior elongation, as well as detecting the presence of ova in the gonad.

Translations of French language publications of Chabanaud were made by the author, and any errors in translation are solely his responsibility. Translation of scientific content, especially the idiosyncratic anatomical terminology Chabanaud incorporated in his publications, was greatly improved with use of the indispensable “French-English glossary of terms in Chabanaud’s published works on Pleuronectiformes” constructed by Chanet & Desoutter-Méniger (2008).

Data used in comparing features of *C. dollfusi* against that for other species, when not specifically indicated by direct citation, were taken from Norman (1928), Menon (1977), Li & Wang (1995), Munroe (2001, in press), and Wang et al. (2016). The status of many nominal species regarded as

synonyms by Menon (1977) needs further evaluation (Munroe, pers. comm.; Lee & Munroe, pers. comm.). Many of these nominal species, especially smaller-sized species, may be resurrected from synonymy when they are examined in more detail. Given this possibility, all nominal species of *Cynoglossus* [not just species currently recognized as valid by Menon (1977)] sharing meristic and morphometric features similar to those of *C. dollfusi* were compared and diagnosed from *C. dollfusi*.

Systematics

Cynoglossus dollfusi (Chabanaud, 1931) Figs. 1–2; Table 1

Paraplagusia dollfusi Chabanaud, 1931:303 (unique holotype, 125 mm TL; description with select meristic and morphometric features; no catalogue number, no illustration; diagnosed from species of *Paraplagusia*; Gulf of Suez, Red Sea). Chabanaud 1954:466 (considered synonym of *C. sealarki*). Fowler 1956:182 (brief description based entirely on that of Chabanaud 1931; Gulf of Suez; distinguished from *Paraplagusia bilineata*). Menon 1977:54 (listed in synonymy; incorrect type locality; incorrect size; type unavailable). Desoutter et al. 2001:349 (valid species; type, 125 mm TL, considered lost; corrected some conclusions of Menon (1977); likely belongs in *Cynoglossus*). Munroe & Kong 2016:13 (discussion of nomenclatural history and status; generic assignment; status of type).

Cynoglossus (Trulla) dollfusi. Gruvel & Chabanaud 1937:8 (second-known specimen, 133 mm TL; entrance to Suez Canal, Red Sea; transferred species to *Cynoglossus*; brief description of non-type specimen with select meristic characters, coloration; black and white illustrations of whole specimen and scales). Munroe & Kong

- 2016:11 (discussion of nomenclatural status; not description of new species; discussed generic re-assignment).
- Cynoglossus dollfusi* (Chabanaud, 1931). Chabanaud 1939:30 (included in world checklist of flatfishes; authorship attributed to Chabanaud, 1930; Red Sea). Menon 1977:55 (listed in synonymy; incorrect size; incorrectly reported that Gruvel & Chabanaud's (1937) description of this specimen was redescription of holotype of *Paraplagusia dollfusi*; redescribed *C. dollfusi* based almost entirely on holotype of *C. cleopatridis*; Suez Canal, Red Sea). Dor 1984:271 (listed, checklist of fishes of Red Sea; synonymy; no type material available). Goren & Dor 1994:72 (listed, checklist of fishes of Red Sea). Golani & Bogorodsky 2010:53 (listed, checklist of fishes of Red Sea). Munroe & Kong 2016:14 (discussed historical literature concerning nomenclature; recognized as new combination for *Paraplagusia dollfusi* Chabanaud, 1931).
- Cynoglossus sealarki* (not of Regan, 1908). Chabanaud 1947:156 (re-identified holotype and non-type specimen of *C. dollfusi* as *C. sealarki*; brief descriptions of each specimen; transfer of *Paraplagusia dollfusi* to *Cynoglossus*). Chabanaud 1954:466 (listed as one of six species of *Cynoglossus* known from Red Sea). Golani & Bogorodsky 2010:84 (doubtful occurrence in Red Sea based on Chabanaud (1947); no specimens to voucher Red Sea record).
- Trulla dollfusi* Chabanaud, in Gruvel & Chabanaud 1937:183. Fowler 1956:183 (second-known specimen of *C. dollfusi* considered species distinct from *Paraplagusia dollfusi*; elevation of subgenus to generic rank; in key; brief description with outline drawing of specimen (133 mm TL); species account based entirely on that in Gruvel & Chabanaud 1937; Suez Canal, Red Sea). Menon 1977:54 (in synonymy). Dor 1984:271 (synonym of *Cynoglossus dollfusi* (Chabanaud, 1931); listed, checklist of fishes of Red Sea). Munroe & Kong 2016:15 (discussed re-assignment to *Trulla*; discussed Fowler's taxonomic conclusions regarding specimens previously identified as *C. dollfusi*).
- Cynoglossus cleopatridis* (not of Chabanaud, 1949). Menon 1977:54 (considered junior subjective synonym of *C. dollfusi*; redescription of *C. dollfusi* based mostly on holotype of *C. cleopatridis*; Suez Canal, Red Sea). Dor 1984:271 (junior subjective synonym of *C. dollfusi* (Chabanaud, 1931); listed, checklist of fishes of Red Sea; catalogue number listed for holotype of *C. cleopatridis*; Gulf of Suez).
- '*Cynoglossus (Trulla) dollfusi*' Gruvel & Chabanaud, 1937:8. Dor 1984:271 (considered nominal species distinct from *Paraplagusia dollfusi*; listed as junior subjective synonym of *C. dollfusi* (Chabanaud, 1931); in checklist of fishes of Red Sea; no type material). Desoutter et al. 2001:348 (considered as valid species based on 133 mm TL specimen; specimen considered lost; discussed nomenclature). Munroe & Kong 2016:19 (discussed generic re-assignment; recognized trinomial as new combination for *Paraplagusia dollfusi* not description of new species; nomenclatural history; comments on holotype).
- Cynoglossus dollfusi* Chabanaud, 1937. Chabanaud 1954:466 (listed in footnote; synonym of *Paraplagusia dollfusi* Chabanaud, 1931).
- Cynoglossus dollfusi* (sensu Menon 1977, not of Chabanaud, 1931). Menon 1977:54 (description based mostly on holotype of *C. cleopatridis*).
- Cynoglossus lingua* (not of Hamilton, 1822). Menon 1977:54 (listed in synonymy of *C. dollfusi* without comment or justification; based on specimen in Gruvel & Chabanaud (1937)). Desoutter et al. 2001:330 (recognized this

specimen as holotype of *C. cleopatri-dis*).

Holotype.—MNHN 1950-0077 (originally 125 mm TL, 116 mm SL; currently 120 mm TL, 114 mm SL), adult female, Gulf of Suez, Red Sea, 28°54'–28°49'N, 32°44'–32°47'E, collected at Station 11 by R. M. Ph. Dollfus, 1928.

Non-type specimen.—MNHN 1950-0078 (133 mm TL, 124 mm SL; currently 128 mm TL, 123 mm SL), adult female, Suez Canal, Red Sea.

Diagnosis.—*Cynoglossus dollfusi*, a small species of *Cynoglossus* (reaching to ca. 124 mm SL), is distinguished from congeners by the following combination of characters: three ocular-side lateral lines; no lateral lines on blind side; eight caudal-fin rays; one ocular-side nostril; one pelvic fin; 100–106 dorsal-fin rays; 84–85 anal-fin rays; 67–70 lateral line scales; 11–12 scales between middle and dorsal lateral lines; no scales on blind side of dorsal- and anal-fin rays; eyes subcontiguous, separated by narrow interorbital space; short rostral hook barely reaching vertical at anterior margin of lower eye; posterior angle of mouth reaching beyond vertical through middle of lower eye; mouth angle located slightly closer to anterior margin of snout than to posterior margin of opercle; ctenoid scales on both sides of body, those on blind side only weakly ctenoid; ocular-side color reddish-yellow with numerous, irregular, darker blotches on posterior margin of scales forming a series of 12–15 interrupted, longitudinal stripes; posterior tips of pores of all lateral-line scales (including those in dorsal, middle, ventral, cephalodorsal and mandibulo-opercular lateral lines) conspicuously black; ocular sides of dorsal, anal and caudal fins generally whitish with one or more short, longitudinal, dark-brown lines.

Description.—Based on Chabanaud (1931, 1947), Gruvel & Chabanaud (1937) and re-examination of MNHN 1950-0077 and MNHN 1950-0078. Values

for holotype listed first, followed by those for non-type specimen reported in Gruvel & Chabanaud (1937). Data for meristic features as reported in several different studies of these specimens are summarized in Table 1. Dorsal-fin rays 106 (100). Anal-fin rays 85 (84). Caudal-fin rays eight (according to Chabanaud 1931) (holotype reported as having seven caudal-fin rays according to Chabanaud 1947). Scales in midlateral lateral line 70 (67). Scales between midlateral and dorsal lateral lines 12 (11).

Data for morphometric features summarized in Table 1. Body moderately elongate (Fig. 2A, B), laterally compressed, maximum depth (23.8–27.0% of SL) located between anus and midpoint of body, with gradual taper anterior and posterior to this point. Head length 17.2–18.0% of SL. Snout obtusely pointed, short (SNL 33–36% of HL), with short rostral hook extending posteriorly only to point about equal with vertical through anterior margin of lower eye. Eye diameter 13.0–14.3% of HL; eyes unequal in position, upper eye slightly in advance of lower (posterior margin of orbit of upper eye reaching vertical through middle of lower eye); interorbital space narrow (4.5–4.7% of HL), covered with 1–3 scales. Ocular-side anterior nostril tubular, situated anterior to anterior margin of lower eye and dorsal to midpoint of upper lip; no posterior nostril on ocular side; two nostrils on blind side of snout. Mouth subterminal, ocular-side mouth cleft slightly curved; jaws extending posteriorly to point between verticals through middle and posterior margin of pupil of lower eye; ocular-side lower jaw with prominent dermal ridge on its posterior half. Interior angle of mouth extending posteriorly to vertical through middle of lower eye, and located closer to snout tip than to posterior margin of gill cover. Ocular-side lips smooth, without fringes or dermal flaps. Posterior margin of operculum deeply indented dorsal to midpoint; ventral oper-

cular lobe much wider than dorsal lobe (Fig. 2A).

Dorsal-, anal- and caudal-fin rays soft, unbranched. No scales on blind side of dorsal- and anal-fin rays. Only blind-side pelvic fin present with 4 rays, located ventral to preopercular angle; posterior-most pelvic-fin ray with strong membranous connection to first (anterior-most) anal-fin ray.

Three lateral lines on ocular side; middle lateral line nearly straight along its length from vertical at posterior margin of opercle to tip of caudal fin; dorsal and ventral lateral lines undulating slightly and extending posteriorly along dorsal and ventral contours of body, but not reaching posterior end of body. Exact point where dorsal and ventral lateral lines leave body not indicated by Chabanaud (1931) or Gruvel & Chabanaud (1937), nor can this be determined from the specimens because they are missing too many scales. No lateral lines on blind side.

Scales small, ctenoid on both sides of body, including those on lateral lines and head; blind-side scales weakly ctenoid.

Coloration of specimens preserved in alcohol (from Gruvel & Chabanaud 1937; Chabanaud 1947).—Ocular-side background color of head and body uniformly reddish-brown; ocular side of body also with small darkly-pigmented blotches forming series of several, interrupted, longitudinal stripes. Gruvel & Chabanaud described the blind side as uniformly yellowish-white. Ocular sides of dorsal, anal, and caudal fins with series of darkly-pigmented blotches on both fin rays and their connecting membranes. After long-term preservation, these specimens are now uniformly brown without such distinctive patterning (Fig. 2A, B).

Size.—A small species known from two adult specimens, both mature females, measuring 125 and 133 mm TL.

Comparisons with species from the western Indian Ocean (comparative data from Munroe, in press; Munroe pers. comm.; in

addition to cited literature).—*Cynoglossus dollfusi*, among nominal species of *Cynoglossus*, is one of a small number of nominal species in the genus with the unique combination of three ocular-side lateral lines, eight caudal-fin rays, one pelvic fin, and a single ocular-side nostril. Among nominal species of *Cynoglossus*, five others, *C. sealarki*, *C. zanzibarensis*, *C. itinus* (Snyder, 1909), *C. microphthalmus* (von Bonde, 1922), and *C. capensis* (Kaup, 1858), have the combination of a single ocular-side nostril and three ocular-side lateral lines (Munroe, in press). Most of these species also possess some combination of meristic features that overlap those that characterize *C. dollfusi*. Of these five species, *C. sealarki* and *C. zanzibarensis* feature two pelvic fins (versus one in *C. dollfusi*), whereas the other three have a single pelvic fin. *Cynoglossus sealarki* is known from four specimens taken in deepwater (>123 fathoms) on the Saya de Malha Bank, western Indian Ocean (Regan 1908; Menon 1977; Munroe, in press), and *C. zanzibarensis* is a commercially important tongue sole occurring from Zanzibar, Tanzania and Kenya to South Africa and Namibia. Reports of both species from the Red Sea are based on misidentified specimens (see below). *Cynoglossus sealarki* is most morphologically similar to *C. dollfusi*, sharing many more features in common than do the other species mentioned above. These species have similar numbers of scales between ocular-side middle and dorsal lateral lines (11–12 versus 10–12 in *C. sealarki*), and low counts of lateral-line scales (67–70 versus 64–70 in *C. sealarki*). *Cynoglossus dollfusi* differs significantly from both *C. sealarki* and *C. zanzibarensis* in having only a single pelvic fin (versus two in these others) and in its counts for caudal-fin rays (eight versus 10), dorsal-fin rays (105–107 versus 108–116 in *C. sealarki* and 116–121 in *C. zanzibarensis*), and anal-fin rays (84–85 versus 92–96 in *C. sealarki* and 94–99 in *C. zanzibarensis*).

Cynoglossus dollfusi also has a larger eye (ED 13–14% of HL) versus that (ED 9–13% of HL) in *C. sealarki*. Other nonoverlapping meristic features that differentiate *C. dollfusi* from *C. zanzibarensis* include counts of lateral-line scales (67–70 versus 72–76 in *C. zanzibarensis*) and number of scales between lateral lines (11–12 versus 13–15 in *C. zanzibarensis*). *Cynoglossus dollfusi* does not have scales on the blind side of its dorsal- and anal-fin rays, whereas both *C. sealarki* and *C. zanzibarensis* have scales on the blind side of their dorsal- and anal-fin rays. Both *C. sealarki*, with four syntypes measuring 165–180 mm SL (Munroe, in press), and *C. zanzibarensis*, which reaches to 320 mm SL, attain much larger sizes than that observed for *C. dollfusi*, which appears to be a small-sized species because the two known specimens, measuring only 116 and 124 mm SL, respectively, are both adult females (Chabanaud 1947).

Of the remaining species of *Cynoglossus* characterized in having a single ocular-side nostril, *C. dollfusi* differs from *C. capensis* (Namibia to KwaZulu-Natal) and *C. microphthalmus* (Natal, South Africa) in several features including: eight caudal-fin rays (versus 10), and in its lower counts of lateral-line scales (67–70 versus 79 and 86–104 in *C. microphthalmus* and *C. capensis*, respectively).

Some features of *C. dollfusi* (three lateral lines, eight caudal-fin rays, one ocular-side nostril) are also reminiscent of characters found in *C. itinus* (coastal seas of Japan and Southeast Asia; Snyder 1909; Ochiai 1963; Menon 1977; Shen 1983, 1993; with some specimens collected in the western Indian Ocean also tentatively identified as this species by Munroe, in press). *Cynoglossus dollfusi* differs from *C. itinus* in having a lower count of lateral-line scales (67–70 versus 71–78), and in having the longitudinal series of narrow, interrupted, pigmented blotches on the ocular side (according to Gruvel & Chabanaud 1937) that are absent in *C. itinus*.

Comparisons with other species (comparative data from Munroe unpubl., in addition to cited literature).—*Cynoglossus praecisus* Alcock, 1890 (from off India; considered synonym of *C. brachycephalus* Bleeker by Norman 1928) also has a single ocular-side nostril, but *C. dollfusi* differs from this species in having three versus two ocular-side lateral lines, with the dorsal lateral line of *C. praecisus* incomplete, ending about mid-length of body and not exiting onto dorsal-fin rays). This nominal species also differs from *C. dollfusi* by its uniformly sepia-brown ocular-side pigmentation and higher count of dorsal-fin rays (112).

Two other species, *C. maccullochi* Norman, 1926 (east coast of Queensland, Australia) and *C. nanhaiensis* Wang et al., 2016 (South China Sea), have three ocular-side lateral lines, eight caudal-fin rays, and other similarities in meristic features to those observed in *C. dollfusi*. *Cynoglossus dollfusi* differs from both species in possessing only a single ocular-side nostril (versus two ocular-side nostrils). *Cynoglossus dollfusi* may also differ in its color pattern from that of *C. maccullochi*. *Cynoglossus dollfusi* is reported as having small, darkly-pigmented blotches forming a series of several, interrupted, longitudinal stripes on the ocular side of the body (see Gruvel & Chabanaud 1937, Chabanaud 1947) versus some freckling and diffuse blotches present, but not forming conspicuous longitudinal stripes, in *C. maccullochi*. The dorsal, anal, and caudal fins of *C. dollfusi* were described as having a series of darkly-pigmented blotches on both fin rays and their connecting membranes, whereas the fin pigmentation is much lighter in color and most of the pigment is on the fin rays and less so on connecting membranes in *C. maccullochi*. More recently-collected specimens of *C. dollfusi* are needed to confirm if differences in color pattern are diagnostic for identifying these species.

Five other nominal species of *Cynoglossus*, including *C. ochiaii* Yokogawa et al.,

2008 (off Japan and Taiwan), *C. kopsii* (Bleeker, 1851) (the Indo-Malay region), the nominal species, *C. melanopterus* Shen, 1969¹ from Taiwan, *C. carpenteri* Alcock, 1889 from the Persian Gulf and off India (Menon 1977) and *C. versicolor* Alcock, 1890 from off India, share the combination of three ocular-side lateral lines and some morphometric and meristic features similar to those observed in *C. dollfusi*. *Cynoglossus dollfusi* differs significantly from all of these species in having one ocular-side nostril and eight caudal-fin rays (versus two ocular-side nostrils and 10 caudal-fin rays in these others). *Cynoglossus dollfusi* differs further from *C. ochiaii* in having interrupted longitudinal pigmented blotches on its ocular side (versus *C. ochiaii* with uniformly light- to dark-brown ocular-side coloration). *Cynoglossus dollfusi* also has a more slender body (BD 23.8–27.0% of SL) than that of *C. ochiaii* (27.9–32.2% of SL), and the diameter of its lower eye is also smaller (ED 14.0–14.3% of SL) than that (ED 13.4–16.5%, \bar{x} = 14.8% of HL) of most *C. ochiaii*. *Cynoglossus dollfusi* also differs from *C. kopsii* in having a long and continuous ventral lateral line (versus ventral lateral line absent or incomplete in *C. kopsii*), and *C. dollfusi* possesses more scales on the middle lateral line and in diagonal scale rows between dorsal and middle lateral lines (ca. 65–70 and 11–12 versus 55 and 9, respectively, in *C. kopsii*).

Three other nominal species also sharing features in common with those observed in *C. dollfusi* include *C. brachycephalus* (Bleeker, 1870) [regarded as a synonym of *C. kopsii* by Menon (1977)], *C. versicolor* [regarded as a synonym of *C. kopsii* by Menon (1977)], and *C. sibogae* Weber,

1913 [regarded as a synonym of *C. brachycephalus* (Bleeker, 1870) by Norman (1928), and as a synonym of *C. kopsii* by Menon (1977)]. *Cynoglossus dollfusi* differs from *C. brachycephalus* (western Pacific Ocean) in having three ocular-side lateral lines and 11–12 scales between middle and dorsal lateral lines (compared with two ocular-side lateral lines and eight scales rows between middle and dorsal lateral lines in *C. brachycephalus*). Also, the ocular-side pigmentation (reddish-brown with longitudinal series of pigmented blotches) of *C. dollfusi* is different from that of *C. brachycephalus* (brownish-green and diffused with small dark spots), and *C. dollfusi* has fewer anal-fin rays (85 versus 90) and more lateral-line scales (ca. 65–70 versus 60) compared with similar features found in *C. brachycephalus*.

Cynoglossus versicolor (off India and Thailand; Alcock 1890; Punpoka 1964) was originally described as having two lateral lines with 12 scales between them, and one ocular-side nostril. However, Norman (1928) re-examined the holotype and observed a second ocular-side nostril and an incomplete, third (ventral) lateral line on this specimen. *Cynoglossus dollfusi* differs from this nominal species in having one (versus two) ocular-side nostril, eight versus 10 caudal-fin rays, and slightly lower counts of dorsal-fin rays (105–107 versus 114) and lateral-line scales (ca. 65–70 versus 74 in *C. versicolor*). The ocular-side coloration of *C. versicolor*, described (Alcock 1890) as yellowish-brown and profusely marbled with dark brown, is also different than that reported for *C. dollfusi* by Gruvel & Chabanaud (1937).

Cynoglossus dollfusi differs from *C. sibogae*, a nominal species collected off Indonesia and recognized as valid by Li & Wang (1995) and Munroe (2000), in having three ocular-side lateral lines separated by 11–12 rows of scales, more (ca. 65–70) lateral-line scales, one ocular-side nostril, and eight caudal-fin rays (versus *C. sibogae* with two ocular-side lateral lines

¹ According to Eschmeyer et al. (2016), the specific epithet of this species is not valid due to homonymy with *C. melanopterus* (Bleeker, 1851). Also, *C. melanopterus* Shen was regarded as a synonym of *C. nigropinnatus* Ochiai, 1959 by Ochiai 1963, and as a synonym of *C. kopsii* by Menon (1977).

separated by 10 scales, 60 lateral-line scales, two ocular-side nostrils, and 10 caudal-fin rays). *Cynoglossus dollfusi* has reddish-brown background pigmentation on the ocular side with longitudinal series of darker pigmented blotches, whereas that of *C. sibogae* is coffee-brown with darker, irregular spots on its scales.

Eight other nominal species of *Cynoglossus* share some combination of characters, such as numbers of ocular-side lateral lines and/or similar counts of caudal-fin rays, with those observed in *C. dollfusi*. These include: *C. abbreviatus* (Gray, 1834), *C. acutirostris* Norman, 1939, *C. gracilis* Günther, 1873 (including *Areliscus hollandi* Jordan & Metz, 1913 & *C. microps* Steindachner, 1897 as synonyms), *C. microlepis* (Bleeker, 1851), *C. trigrammus* Günther, 1862, and *C. xiphoideus* Günther, 1862. All of these species have much higher, and non-overlapping, meristic features compared with those of *C. dollfusi*, including numbers of dorsal-fin rays (114–137), anal-fin rays (90–108), total vertebrae (55–64), lateral-line scales (94–150), and scales between middle and dorsal lateral lines (17–26) (compare with values for *C. dollfusi* in Table 1).

Remarks.—Chabanaud (1931) described *P. dollfusi* based on a single specimen measuring 125 mm TL. This specimen was reported to have 106 dorsal-fin rays, 85 anal-fin rays, eight caudal-fin rays, 70 lateral-line scales, 12 scales between “the two ocular-side lateral lines,” a single ocular-side nostril, and two blind-side nostrils. No mention was made in this description regarding the number of pelvic fins possessed by this specimen; however, in his description of the genus *Paraplagusia*, Chabanaud indicated that members of this genus possessed only a single pelvic fin. Chabanaud further described *P. dollfusi* as having a wide and regularly rounded anterior margin of the head, with large, subcontiguous eyes separated from each other by a very narrow, scaly space whose width hardly exceeded one-sixth of

the eye diameter. The eyes were described as being subequal in position with the anterior margin of the ventral eye slightly in front of a line through the center of the dorsal eye. Chabanaud also noted that no fringes appeared on the ocular-side lower lip. Although lacking a photograph or illustration, or a museum catalogue number, the specimen was, however, clearly identified as the ‘Type’ specimen of this species (Chabanaud 1931). Features of this holotype closely match those of the specimen catalogued as MNHN 1950–0077 (Fig. 2A; Table 1).

In the original description of *P. dollfusi*, Chabanaud (1931) never explicitly stated the actual number of lateral lines possessed by the type specimen, although he did make three statements strongly suggesting that the type specimen had two lateral lines (see Munroe & Kong 2016). In particular, he described this specimen as having 12 scales between “the two lateral lines.” We know definitely from the redescription provided by Chabanaud (1947) that the holotype has three ocular-side lateral lines. Based on recent observations of the holotype (MNHN 1950–0077), this feature is not readily apparent because it has lost many of its scales (Fig. 2A; Table 1).

The only descriptive information provided for the second, non-type specimen in Gruvel & Chabanaud (1937) are the following meristic features: 11 scales between the two lateral lines, 100 dorsal-fin rays, 84 anal-fin rays, four pelvic fin rays, and 67 lateral-line scales. From the illustration accompanying this report (herein reproduced as Fig. 1), it appears that the specimen has a single ocular-side nostril, one pelvic fin, and three ocular-side lateral lines. Information from Gruvel & Chabanaud (1937) and from Chabanaud (1947) confirms that this specimen has three lateral lines. Recent observation of the specimen (MNHN 1950–0078) reveals it has a single pelvic fin.

Gruvel & Chabanaud (1937) used the trinomial, *Cynoglossus (Trulla) dollfusi*,

when reporting on the second specimen, but they never explicitly stated that this trinomial was a replacement name for *Paraplagusia dollfusi*. Further complicating matters is that they never discussed Chabanaud's (1931) original paper. A confusing reference to this earlier paper does follow the trinomial they listed. Munroe & Kong (2016) detailed evidence that Gruvel & Chabanaud (1937) were reporting on a second specimen and that they (Gruvel & Chabanaud) used this trinomial to indicate their decision to re-assign *Paraplagusia dollfusi* to *Cynoglossus (Trulla)*.

These first papers on *C. dollfusi* were followed by two others wherein Chabanaud (1947, 1954) redescribed these two specimens as *Cynoglossus sealarki* Regan, 1908. In the first short paper, Chabanaud (1947) reported examining two female specimens (132 mm TL and 125 mm TL) commenting that both were collected by R. Ph. Dollfus in 1928, at Station XI, in the Gulf of Suez, Red Sea. Yet again, no catalogue numbers, illustrations or photographs were provided for these specimens. Each specimen was briefly described and only in the short (two sentences), final paragraph was it revealed that one of these specimens was the holotype of *C. dollfusi*, and that the second specimen was that reported by Gruvel & Chabanaud (1937). Chabanaud (1947) also noted in this work that these specimens represented the first recorded occurrences of *C. sealarki* in the Red Sea.

Chabanaud's (1947) redescription contains additional meristic data, morphometric features (Table 1) and coloration than that contained in the original description of *P. dollfusi* and in the report of Gruvel & Chabanaud (1937). Most importantly, the redescription confirms that both specimens have three ocular-side lateral lines. Because these specimens had lost many of their scales, Chabanaud (1947) estimated lateral-line scale counts of 70 and 65 for the holotype of *C. dollfusi* and non-type

specimen, respectively. These counts are similar to those reported in the original description and in Gruvel & Chabanaud (1937), respectively (see Table 1). In the redescription, the non-type specimen is also reported to have 11–12 scales between middle and dorsal lateral lines, which is consistent with the count (11) appearing in Gruvel & Chabanaud (1937). The holotype of *C. dollfusi* was estimated to have only 9 scales between the lateral lines. This scale count differs significantly from that (12) reported in the original description.

In Chabanaud's redescription, the holotype was reported to have 107 dorsal-fin rays, 85 anal-fin rays, and seven caudal-fin rays. Comparisons of counts for dorsal- and anal-fin rays made in the original description and in the redescription are nearly identical for dorsal-fin rays, and are exactly the same for anal-fin rays (Table 1). However, counts for caudal-fin rays for the holotype of *C. dollfusi* are different. Chabanaud (1931) reported eight caudal-fin rays for the holotype, and Gruvel & Chabanaud (1937) did not report the number of caudal-fin rays for the second specimen. In Chabanaud (1947), he estimated that the holotype had seven caudal-fin rays, and the non-type specimen had 8.

More recent examination (Table 1; Fig. 2A, B; and Díaz de Astarloa, person. comm.) of these two specimens reveals that both have lost many of their scales, especially the non-type specimen (MNHN 1950–0078). Only the holotype has enough scales remaining to be able to determine the number of lateral lines (3), and to estimate the number of lateral-line scales (ca. 71). Evident from the photograph of MNHN 1950–0077 (Fig. 2A), at least 11 scales are present between the middle and dorsal lateral lines. The non-type (Fig. 2B) has lost too many scales to accurately determine the number of lateral lines, number of scale rows between lateral lines, or the number of lateral-line scales. The non-type specimen has eight caudal-fin rays, in contrast, the caudal fin of the

holotype is damaged and the number of caudal-fin rays cannot be accurately determined. Both specimens have a single pelvic fin with four fin rays.

Information reported by Chabanaud (1947) regarding capture location of the second specimen of *C. dollfusi*, as well as the total lengths he listed for the holotype and the second specimen, are both incorrect. Sizes reported for the two specimens are reversed. According to Chabanaud (1931), the holotype of *C. dollfusi* is 125 mm TL; Gruvel & Chabanaud (1937) reported that their specimen measured 133 mm TL. Additionally, and contrary to Chabanaud (1947), the holotype of *C. dollfusi* was the only one of these two specimens collected in the Gulf of Suez, the other was taken in the entrance to the Suez Canal (see Gruvel & Chabanaud 1937).

Chabanaud (1947) provided no justification as to why he concluded that his nominal species, *C. dollfusi*, was a junior subjective synonym of *C. sealarki* Regan, 1908. In a later paper, Chabanaud (1954) reported on the species of *Cynoglossus* known from the Red Sea in which he included *C. sealarki* among six species known from this area. Again he noted, this time in a footnote, that *Paraplagusia dollfusi* Chabanaud, 1931 was the same species as *C. dollfusi* from Gruvel & Chabanaud 1937.

Cynoglossus sealarki is known from four specimens taken in deepwater on the Saya de Malha Bank, western Indian Ocean (Regan 1908; Menon 1977; Munroe, in press), approximately 4900 km distance from the capture location of Chabanaud's specimens. From the comparisons section above, it is evident that *C. dollfusi* shares many features in common with *C. sealarki*, including: a single (anterior) ocular-side nostril; three ocular-side lateral lines; 11–12 scales between ocular-side middle and dorsal lateral lines; and *C. sealarki* also has a low count (65–70) for scales in the middle lateral line. These species differ in that *C. sealarki* has two pelvic fins, whereas *C.*

dollfusi has only a single pelvic fin, although this feature is not mentioned in the various papers that examined these species (Regan 1908, Chabanaud 1931; Gruvel & Chabanaud 1937; Chabanaud 1947). Even in his 1947 paper where he re-identified the two specimens of *C. dollfusi* as *C. sealarki*, Chabanaud never mentioned that both specimens have only a single pelvic fin.

Two years later, Chabanaud (1949a) authored another paper noting that a small number of species of *Cynoglossus*, including *C. sealarki*, have an ocular-side pelvic fin in addition to the blind-side pelvic fin. Chabanaud based his conclusions about *C. sealarki* on four specimens included in his summary. No catalogue numbers were provided for the specimens he included, so it is unknown what specimens he examined, but it seems likely that these were the four syntypes of *C. sealarki*. Curiously, the two specimens of *C. dollfusi* that Chabanaud (1947) had re-identified as *C. sealarki*, and which do not have an ocular-side pelvic fin, were not among those discussed in that study.

Based on descriptions and information contained within the four papers discussed above, it cannot be determined whether the holotype and the second specimen of *C. dollfusi* have an ocular-side pelvic fin. However, examination of MNHN 1950–0077 and MNHN 1950–0078 reveals that both specimens do not have an ocular-side pelvic fin (Díaz de Astarloa, pers. comm.).

Discussion.—Following the description of *C. dollfusi* by Chabanaud, considerable confusion surrounded the concept of this species. Due to taxonomic re-assignments based on misidentification of specimens, unorthodox taxonomic procedures, and ambiguous writing, the taxonomic status and geographic distribution of four other nominal species of tongue soles, *C. sealarki*, *C. zanzibarensis*, *C. cleopatridis* and *C. lingua*, became entangled in the nomenclatural and taxonomic history of *C. dollfusi*. For example, purported Red Sea

occurrences of *C. sealarki* and *C. zanzibarensis* are based on misidentifications of the two specimens of *C. dollfusi*. In contrast, purported occurrence in the Red Sea of *C. lingua* is based on a specimen misidentified by Gruvel & Chabanaud (1937) as *C. lingua*, and which later became the holotype of *C. cleopatridis*. A profound complication regarding the species concept of *C. dollfusi* happened with Menon's (1977) taxonomic decisions that erroneously placed this misidentified specimen into the synonymy of *C. dollfusi* and with his erroneous proposal that *C. cleopatridis* Chabanaud, 1949 was the junior subjective synonym of *C. dollfusi* (Chabanaud, 1931). The following sections provide detailed discussion regarding the validity of conclusions of previous authors in their treatment of *C. dollfusi* (Chabanaud, 1931).

Chabanaud's (1931) species concept of Paraplagusia dollfusi.—In the paper describing *P. dollfusi*, Chabanaud (1931) also provided a brief description of the genus *Paraplagusia* Bleeker, 1865 wherein he modified the concept of the genus from that of Bleeker. Among external morphological features that he included as diagnostic that are in agreement with those of Bleeker (1865) were: the possession of a prolonged rostral hook; a single ocular-side nostril; eight caudal-fin rays; presence of more than one lateral line on the ocular side; and absence of a lateral line on the blind side of the body. One important defining character shared by all members of *Paraplagusia*, which is notably absent from the list of characters presented in Chabanaud's (1931) redescription, is the presence of labial papillae (fringes) on the ocular-side lips. This feature has long been recognized as a distinctive character for species now assigned to *Paraplagusia* (Günther 1862, Bleeker 1865, Norman 1928, Ochiai 1963, Menon 1980), and in contemporary studies (Chapleau 1988, Chapleau et al. 1991, Chapleau & Renaud 1993, Munroe 2001, Munroe, in press) is

one of the synapomorphies defining this genus. By excluding labial papillae on the ocular-side lips, Chabanaud, whether intentional or not, modified the concept of the genus *Paraplagusia* Bleeker to accommodate *P. dollfusi*.

Using this modified definition of *Paraplagusia*, Chabanaud (1931) then concluded that he had a new species, which he described as *P. dollfusi*. As discussed above, Chabanaud did not explicitly state the actual number of lateral lines, but included three statements strongly suggesting that the type specimen had two lateral lines. Firstly, he described this specimen as having 12 scales between “the two lateral lines (emphasis mine).” The definite article “the” suggests that this specimen had only two lateral lines. Secondly, Chabanaud distinguished his new species from *P. bilineata* (Bloch, 1787) and *P. blochi* (Bleeker, 1851) [now referred to as *P. bleekeri* Kottelat, 2013], two species that feature two ocular-side lateral lines. And, thirdly, following these comparisons, Chabanaud then compared *P. dollfusi* with two other nominal species, *P. macrocephala* Bleeker, 1865 and *P. guttata* (Macleay, 1878). He noted that *P. macrocephala* could easily be distinguished from *P. dollfusi* in possessing a lateral line on the blind side, whereas *P. guttata* possesses three ocular-side lateral lines. This latter statement again implies that he thought the type of *P. dollfusi* had only two lateral lines. Nowhere in the original description of *P. dollfusi* did Chabanaud compare his nominal species with any species assigned to other genera or subgenera of the Cynoglossinae.

In contrast to conclusions regarding his generic placement of *P. dollfusi*, Chabanaud (1931) noted that it had a short rostral hook and that there were no labial papillae on the ocular-side lower lip (also evident in Fig. 2A). These two important characters distinguish species of *Cynoglossus* from those of *Paraplagusia* (Günther 1862, Bleeker 1865, Norman 1928, Menon

1977, 1980, Chapleau 1988). Because *C. dollfusi* possesses a short rostral hook and does not have labial papillae on its ocular-side lower lip, the correct placement of this species is in *Cynoglossus*.

Gruvel & Chabanaud's (1937) concept of Cynoglossus dollfusi.—In Gruvel & Chabanaud's paper on the fishes of the Suez Canal (1937:8), they provide a brief description of a tongue sole, *Cynoglossus (Trulla) Dollfusi* [sic] Chabanaud. Since the name *Cynoglossus (Trulla) dollfusi* doesn't appear in Chabanaud (1931), nor does it appear in any of the other Chabanaud literature cited in Gruvel & Chabanaud (1937), its occurrence in this 1937 publication represents first use of this combination. No explanation is provided in Gruvel & Chabanaud (1937) concerning their reasons this particular trinomial was chosen. Nevertheless, apparent in the account is that these authors are referring to *Paraplagusia dollfusi* (see detailed discussion in Munroe & Kong 2016). Further evidence that they refer to a previously described species is also provided in a footnote where Gruvel & Chabanaud (1937) mention that the pigmentation had been omitted in the description of this species. This is confirmed by examining the original description of *P. dollfusi*.

This specimen measured 133 mm TL, and the only descriptive information provided was the following meristic features: 11 scales between “the two lateral lines,” 100 dorsal-fin rays, 84 anal-fin rays, 4 pelvic-fin rays, and 67 lateral-line scales. From the illustration (reproduced herein as Fig. 1), it appears that only one ocular-side nostril is present.

Notably absent from their description are the following important diagnostic features helpful in identifying species of cynoglossine tongue soles: a count of caudal-fin rays, numbers of ocular-side nostrils and pelvic fins, whether labial papillae were present or absent on the lower lip, and the lack of any morphometric data. Gruvel & Chabanaud did provide

a brief description of the specimen's coloration, as well as a black and white illustration of the specimen, possibly indicating that it had three ocular-side lateral lines (see Fig. 1). However, they are unclear in how many ocular-side lateral lines this specimen possessed. Nothing in the descriptive account of *Cynoglossus (Trulla) dollfusi* clarifies this question, as again, these authors report the number of scales “between **the** two lateral lines (emphasis mine),” implying the specimen had only two lateral lines. The accompanying illustration of this specimen (see Fig. 1) depicts three longitudinal lines where lateral lines typically are located on species of *Cynoglossus*. That these lines are indeed lateral lines cannot be determined with confidence because the illustration is not adequate to make this determination.² The two lines that overlie the dorsal- and anal-fin pterygiophores could equally indicate flexure points between epaxial and hypaxial musculature and musculature of the dorsal- and anal-fin pterygiophores, respectively.

Both in the original description (Chabanaud 1931) and in the description of the second specimen by Gruvel & Chabanaud (1937), ambiguity exists regarding the number of lateral lines present on *C. dollfusi*. The text of both articles implies the species has two lateral lines, however, in Gruvel & Chabanaud (1937) the illustration (Fig. 1) of the second specimen is confusing as it possibly indicates this specimen may have three lateral lines. This conflict prevents drawing definitive conclusions from these literature accounts regarding the number of lateral lines (2 or 3) present on these two specimens of *C. dollfusi*.

Munroe & Kong (2016) provided detailed evidence to show that only a single species is represented by the names, *Para-*

² Even Chabanaud (1947), in a footnote of a paper redescribing this specimen, commented that the quality of this illustration is sub-standard.

plagusia dollfusi and *Cynoglossus (Trulla) dollfusi*. This information, although not clearly indicated in Gruvel & Chabanaud (1937), was available (though never highlighted or discussed in detail) in brief comments made in the later publications of Chabanaud (1947, 1954), wherein he redescribed the specimens referenced by these names and indicated that these specimens were conspecifics. Information in Chabanaud (1947, 1954) and discussion in Munroe & Kong (2016) resolved questions concerning how many species were described in Chabanaud (1931) and Gruvel & Chabanaud (1937).

Hypothesis that Cynoglossus sealarki Regan is the senior synonym of C. dollfusi (Chabanaud).—In 1947, Chabanaud authored a short paper reporting on *Cynoglossus sealarki* Regan, 1908 new to the Red Sea. Likely, due to shared similarities, Chabanaud regarded *C. sealarki* and *C. dollfusi* as conspecifics, with *C. sealarki* having priority. However, *C. dollfusi* differs significantly from *C. sealarki* in several important aspects. Most notably, as reported by Chabanaud (1947), the two specimens of *C. dollfusi* have seven and eight caudal-fin rays, respectively, whereas *C. sealarki* has 10 caudal-fin rays (Regan 1908, Menon 1977, Munroe, in press). Comparisons of these species also reveal that *C. dollfusi* has lower counts for dorsal- and anal-fin rays, lacks scales on the blind side of the dorsal- and anal-fin rays, and has a larger eye compared to similar features of *C. sealarki*. *Cynoglossus dollfusi* is also a smaller species (see more detailed information in comparison section above). Considering the morphological differences between Chabanaud's (1947) specimens of *C. dollfusi* and those of *C. sealarki*, it is evident that two distinct species are represented by these specimens. Therefore, Chabanaud's hypothesis that *C. dollfusi* is conspecific with *C. sealarki* is rejected.

Hypothesis that two distinct nominal species were described in Chabanaud (1931) and Gruvel & Chabanaud (1937).—Fowler

(1956) was first to propose that two species were represented in the accounts of *Paraplagusia dollfusi* in Chabanaud (1931) and *Cynoglossus (Trulla) dollfusi* in Gruvel & Chabanaud (1937). In his account of *P. dollfusi*, Fowler based his brief redescription on the original description provided by Chabanaud (1931). Fowler proposed that this nominal species had two lateral lines ("scales between 2 lateral lines"), similar wording to that first appearing in the original description of *P. dollfusi*. Additionally, Fowler also compared this nominal species only with *P. bilineata* (Bloch), a species featuring two lateral lines.

In his description of what he considered to be a valid species, *Trulla dollfusi* (= *Cynoglossus (Trulla) dollfusi*), Fowler (1956) specifically mentions that he did not examine this specimen, but based his conclusions on the description and figures in Gruvel & Chabanaud (1937). Fowler's concept, then, of this purported nominal species, *Trulla dollfusi*, is the same as that presented in Gruvel & Chabanaud (1937) for *Cynoglossus (Trulla) dollfusi*. Other authors (Dor 1984; Desoutter et al. 2001) also thought two species were described in Chabanaud (1931) and Gruvel & Chabanaud (1937).

Fowler (1956) appeared unaware of the two papers by Chabanaud (1947, 1954) in which Chabanaud not only regarded *P. dollfusi* to be conspecific with *C. dollfusi*, but where he also considered his nominal species, *P. dollfusi*, as the junior subjective synonym of *C. sealarki*. Fowler neither references these Chabanaud papers in either of the synonymies he constructed for these nominal taxa or in discussions appearing in his accounts for these two species; nor does he list *C. sealarki* among cynoglossid tonguefishes occurring in the Red Sea and Southern Arabian Gulf.

Munroe & Kong (2016) discussed in detail the evidence proving that only one species of tongue sole is represented by the names *Paraplagusia dollfusi* and *Cynoglossus (Trulla) dollfusi*. Therefore, the hypoth-

esis proposed by Fowler (1956) and others (Desoutter et al. 2001) that a second species had been described in Gruvel & Chabanaud (1937) is rejected.

Hypothesis that Cynoglossus cleopatriidis Chabanaud, 1949 is a junior synonym of C. dollfusi (Chabanaud, 1931).—The next taxonomic work to consider *C. dollfusi* (Chabanaud) is Menon (1977) in his global revision of the genus *Cynoglossus*. Menon (1977) further complicated issues regarding the nomenclature and definition of the nominal species, *Paraplagusia dollfusi*, with two decisions that significantly impacted the species concept of *C. dollfusi* (Chabanaud). The first of these was to regard *C. cleopatriidis* Chabanaud, 1949 as a junior subjective synonym of *C. dollfusi*. The second occurred when he based his redescription of *C. dollfusi* (Chabanaud) on data taken almost entirely (except for count of caudal-fin rays) from the holotype of *C. cleopatriidis*.

Cynoglossus cleopatriidis (Fig. 2C) is a nominal species described by Chabanaud (1949b) from a single specimen (MNHN 1949–24) collected in the Gulf of Suez by R. Dollfus in 1928. Desoutter et al. (2001) listed the capture location as Station 11 (28°49'N, 32°44'E, 25–30 m depth). This appears to be the same capture location as that of the holotype of *C. dollfusi*. Prior to its capture, the specimen that later became the holotype of *C. cleopatriidis* had lost its caudal fin and had the posterior end of the body regenerated after this injury. Chabanaud (1949b) indicated in the original description of *C. cleopatriidis* that because the holotype was damaged, counts for some meristic features (lateral-line scales, dorsal-fin rays, anal-fin rays) had to be approximated, while data for other important diagnostic features (number of caudal-fin rays and total vertebrae) were unavailable (see Table 2). He also acknowledged that other morphometric features traditionally expressed as proportions of standard length could only be approximated. Yet again, no figure or

photograph accompanied this description.

In a short paper published the following year, Chabanaud (1950) redescribed the holotype of *C. cleopatriidis*, providing some additional information to that presented in his original description (Table 2). Most of the redescription is basically the same information as that in the original description, except that now Chabanaud provides the sex and maturity stage of the specimen (female, immature), reports the Standard Length as a non-approximated value, and, accordingly, also reports morphometric features, expressed as proportions of the Standard Length, as non-approximated values (Table 2). Additionally, the count for dorsal-fin rays (115) is not approximated, whereas the count for anal-fin rays (87 + 2?) is still approximated. Again, no figure of the holotype accompanies this redescription.

In his treatment of the nominal species, *C. dollfusi* (Chabanaud, 1931), Menon's (1977) concept of this species becomes even more convoluted than that appearing in earlier studies. Menon reports information from the two earliest papers (Chabanaud 1931, Gruvel & Chabanaud 1937), but Menon's information is replete with mistakes and misinterpretations. For example, he lists (p. 55) the type locality for *P. dollfusi* as the Suez Canal, but Chabanaud (1931) listed capture of the type specimen in the Gulf of Suez. Menon incorrectly stated that Gruvel & Chabanaud (1937) redescribed *C. dollfusi* based on the type specimen despite indications in Gruvel & Chabanaud (1937) that they were reporting additional information from a second specimen of the species. Menon focused attention only on the non-type specimen reported in Gruvel & Chabanaud (1937), and largely ignored information about the holotype in Chabanaud (1931). It is inexplicable why Menon failed to report or discuss any of the data for the holotype of *C. dollfusi*, which was easily available.

Table 2.—Selected meristic and morphometric features for a specimen from the Red Sea identified as *Cynoglossus lingua* by Gruvel & Chabanaud (1937), for the holotype (MNHN 1949-24) of *C. cleopatridis* (based on Chabanaud 1949b, 1950), and for specimens of *C. lingua* Hamilton (based on Menon 1977). Abbreviations defined in text. NA= not available; dashes indicate data not reported.

| Character | " <i>C. lingua</i> " Red Sea specimen identified by Gruvel and Chabanaud (1937) | <i>C. cleopatridis</i> holotype Chabanaud (1949b) | <i>C. cleopatridis</i> holotype Chabanaud (1950) | <i>C. cleopatridis</i> holotype this study | <i>C. lingua</i> (after Menon 1977) |
|--------------------|---|---|--|--|-------------------------------------|
| SL | ca. 132 | ca. 132 | 132 | — | 214-345 |
| Dorsal-fin rays | 115+ | 115+ | 115 | ca. 115 | 126-138 |
| Anal-fin rays | 85+ | 85+ | 87(+2?) | 88+ | 97-114 |
| Caudal-fin rays | NA | NA | NA | NA | 10 |
| Pelvic-fin rays | — | — | 4 | 4 | 4 |
| Vertebrae | — | — | — | ca. 56 | 57-66 |
| LL scales | 72+ | 70+ | 78 | — | 90-101 |
| Pelvic fins | 1 | 1 | 1 | 1 | 1 |
| Scales between LLs | 12 | 12 | 12 | 12 | 11-12 |
| OS nostrils | 2 | 2 | 2 | 2 | 2 |
| OS LL | 2 | 2 | 2 | 2 | 2 |
| BD (percent SL) | ca. 24 | ca. 24 | 21 | — | 17.2-21.7 |
| HL (percent SL) | ca. 18 | ca. 18 | 17 | — | 21.2-25.8 |
| ED (percent HL) | 12 | 12 | 12 | — | 5.3-8.5 |
| OS scale type | — | ctenoid | ctenoid | ctenoid | ctenoid |
| BS scale type | — | cycloid | cycloid | cycloid | cycloid |
| LL scale type | — | — | ctenoid | ctenoid | cycloid |

Information in Menon (1977) about the second specimen of *C. dollfusi*, reported in Gruvel & Chabanaud (1937), is also incorrect. He incorrectly listed the length of this specimen as 33 mm TL (likely a typographical error as the actual length reported in the description is 133 mm TL). Menon indicated that Chabanaud reported that *C. dollfusi* had 3 lateral lines, but Menon doesn't provide any supporting evidence to document how he arrived at this conclusion. Contrary to this conclusion by Menon, and as stated above, neither Chabanaud (1931) nor Gruvel & Chabanaud (1937) explicitly state the number of lateral lines for these specimens. The figure in Gruvel & Chabanaud (1937) was discussed in Munroe & Kong (2016; and discussion above) as difficult to definitely conclude that these lines are lateral lines.

Menon (1977) also missed Chabanaud's later papers (1947, 1954), wherein Chabanaud synonymized *C. dollfusi* with *C. sealarki*. In Menon's study, *C. dollfusi* is not listed in the synonymy for *C. sealarki*,

nor does he mention *C. sealarki* anywhere in his redescription of *C. dollfusi*.

Why Menon was so convinced that the two nominal species, *C. dollfusi* and *C. cleopatridis*, were synonyms, and why he chose in his redescription of *C. dollfusi* not to use most of the available information contained in the original description of the holotype, or that in Gruvel & Chabanaud (1937), is unknown. Apparently, Menon believed that his redescription of *C. dollfusi*, based mostly on information from the damaged holotype of *C. cleopatridis*, adequately represented the species described by Chabanaud (1931). To the contrary, the impact of Menon's actions was to change the species concept of *C. dollfusi* from that originally conceived by Chabanaud to that mostly incorporating the features of *C. cleopatridis*. Other authors (Dor 1984, Goren & Dor 1994) followed Menon's conclusions and also included *C. cleopatridis* in synonymies of *C. (Trulla) dollfusi* in their checklists of the fishes from the Red Sea, whereas Desoutter et al. (2001:331) reserved their decision

on the status of *C. cleopatridis* pending results of a generic revision of *Cynoglossus*. Citing Desoutter et al. (2001), Eschmeyer et al. (2016) also reported that the status of this nominal species was uncertain and had been confused with “the two taxa named *dollfusi*” by Chabanaud.

Menon likely concluded that *C. cleopatridis* was a synonym of *C. dollfusi* because, as he states, he examined the holotype of *C. cleopatridis* and “found it to conform well in all respects, including the number of scales between the upper and middle lateral lines, with the description of *C. dollfusi* except for the absence of any trace of the ventral lateral line on the ocular side.” Menon believed that the number of ocular-side lateral lines was too variable within a species to be a reliable character to distinguish species in the genus, so he regarded the differences in the number of lateral lines between the holotype of *C. dollfusi* (3 lateral lines) and the holotype of *C. cleopatridis* (2 lateral lines) as unimportant to diagnose these as distinct species. Instead, Menon placed undue emphasis on the number of scale rows between the middle and dorsal lateral lines as one of the most important diagnostic characters for differentiating nominal species of *Cynoglossus*. Thus, similarities in scale rows between lateral lines (11–12 versus 12) in *C. dollfusi* and *C. cleopatridis* and his over-weighted reliance on this feature were the most important reasons Menon concluded these two nominal taxa were the same species.

When other features of these two nominal species are compared more closely, this similarity in scale counts between lateral lines is only one of a few meristic features they share. Menon reported that the holotype of *C. cleopatridis* has 70 scales in the lateral line, which is the same as that reported for the holotype of *C. dollfusi* (Table 1). However, Chabanaud (1949b) had noted earlier that the number of lateral-line scales in the holotype of *C. cleopatridis* could only be approximated

(estimated at 70+) because the caudal region of the body had been regenerated and many “normal” scales had been replaced by smaller scales. My examination of the holotype of *C. cleopatridis* indicated approximately 68+ scales present in the midlateral line anterior to the regenerated caudal region. Thus, any similarity between these two nominal species in counts of lateral-line scales may only be an artifact caused by damage to the caudal region of the holotype of *C. cleopatridis*. Likely, scale counts for *C. cleopatridis* will range higher than this when additional (and undamaged) specimens are found.

The only meristic data that Menon reported in his redescription of *C. dollfusi* that is based on an actual specimen of *C. dollfusi* is his count of eight caudal-fin rays. This is consistent with counts reported by Chabanaud (1931, 1947). Menon’s count for caudal-fin rays for *C. dollfusi* had to be based on the original description of *Paraplagusia dollfusi* by Chabanaud. Since Menon did not cite the Chabanaud (1947) redescription of the holotype, this count could not have come from that source. Nor could this count have been based on the descriptive account of *C. cleopatridis*, because the holotype lacks a caudal fin (Chabanaud 1949b, 1950; Table 2); the number of caudal-fin rays for *C. cleopatridis* is unknown.

Despite lacking information for number of caudal-fin rays, an important diagnostic character for distinguishing members of the genus *Cynoglossus*, *C. cleopatridis* can easily be diagnosed from *C. dollfusi* in having 2 (versus 3) ocular-side lateral lines, two ocular-side nostrils (versus one in *C. dollfusi*), and in having higher counts of dorsal-fin rays (115+ versus 100–106 in *C. dollfusi*). These differences were all ignored by Menon (1977) in his decision to consider these two nominal species as synonyms. Based on these substantial differences, the hypothesis proposed by Menon (1977) that *C. dollfusi* (Chabanaud,

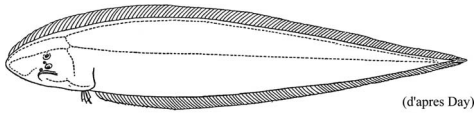


Fig. 3. Ocular-side view of a specimen of *Cynoglossus lingua* Hamilton reproduced from Gruvel & Chabanaud (1937).

1931) is the senior synonym of *C. cleopatridis* Chabanaud, 1949 is rejected.

The validity of the record of Cynoglossus lingua from the Red Sea.—In their paper on the fishes of the Suez Canal, Gruvel & Chabanaud (1937) provided a brief description of a damaged specimen (no catalogue number provided) measuring approximately 135 mm TL that had been collected by Dollfus in the Suez Canal. Only incomplete meristic and morphometric information could be attained from this specimen. Despite the limitations of a damaged specimen, Gruvel & Chabanaud nevertheless determined that the specimen they examined was *C. lingua*. Accompanying their description is a figure of a specimen of *C. lingua* (herein reproduced as Fig. 3). However, this figure was not that of their damaged tongue sole from the Red Sea collected by Dollfus, rather, it is a drawing of a specimen modified from an illustration appearing in an earlier work by Francis Day (source not specified, but see discussion below).

Not only did Gruvel & Chabanaud identify their specimen as *C. lingua*, they further noted that their specimen was different enough from *C. lingua* of other regions to suggest that it may represent a subspecies distinct from these other populations. This statement has relevance to another taxonomic decision made by Chabanaud about this specimen in his later studies (1949b, 1950; see below).

Other studies have reported widespread distribution for *C. lingua*, ranging from the Malay Archipelago, Thailand, Viet Nam, to the seas and estuaries of India and Pakistan (records summarized in Menon 1977). The study by Gruvel & Chabanaud

(1937) represents the basis for the first record of *C. lingua* from the Red Sea, and this specimen is the only voucher from the Red Sea. Other studies and online databases listing a Red Sea record for *C. lingua* based on Gruvel & Chabanaud (1937) include that of Chabanaud (1939) in his world checklist of flatfishes, and later in his list of tongue soles known from the Red Sea (Chabanaud 1954). Fowler (1956) and Dor (1984) also listed a Red Sea record for *C. lingua* based on Gruvel & Chabanaud (1937), as did Goren & Dor (1994) and Golani & Bogorodsky (2010) in later checklists of fishes from the Red Sea. Munroe (2001), in his account for *C. lingua*, also listed the Red Sea as part of the geographic distribution of this species based on the record originally appearing in Gruvel & Chabanaud (1937). The *Catalogue of Fishes* (Eschmeyer et al. 2016) and *FishBase* (Froese & Pauly 2016) list *C. lingua* from the Red Sea based on Dor (1984) and Munroe (2001). Important to note is that none of the studies published after Gruvel & Chabanaud (1937) ever included additional specimens of *C. lingua*. Therefore, all reports of *C. lingua* from the Red Sea are based on that single specimen identified by Gruvel & Chabanaud (1937).

Unfortunately, the specimen vouchering this Red Sea record for *C. lingua* had been thought lost for several decades after it was first reported. No lot containing this specimen was included among tonguefishes catalogued at MNHN under the name *C. lingua*. None of the authors subsequent to Gruvel & Chabanaud (1937), except for Chabanaud (1939), appear to have actually examined this specimen. All reports were based solely on the single previously published source of information.

In his revision of *Cynoglossus*, Menon (1977) also listed Gruvel & Chabanaud's report (1937) for this specimen, but not as *C. lingua*. Rather, he placed this citation in the synonymy he constructed for *C. dollfusi*. Menon did not comment or discuss his reasons to support this deci-

sion, but obviously he believed that Gruvel & Chabanaud (1937) had misidentified their specimen because he excludes this specimen in his account of *C. lingua*, including the purported occurrence of *C. lingua* in the Red Sea based on this record. Nowhere in his revision does Menon disclose why he chose to exclude the Gruvel & Chabanaud (1937) record for *C. lingua* from the Red Sea. Given the differences in opinions of Gruvel & Chabanaud (1937) and Menon (1977) regarding the occurrence of *C. lingua* in the Red Sea, is there a record and/or a specimen to voucher its occurrence in the Red Sea?

Based on the descriptive account by Gruvel & Chabanaud (1937), the specimen identified as *C. lingua* is damaged (“mutilée”) in its caudal region and missing its caudal fin and posterior sections of the anal fin, and perhaps also the posteriormost part of its dorsal fin. It has membranous tissue regenerated over the area where the caudal fin would normally occur and this replaces the missing caudal fin and missing parts of the dorsal and anal fins. Consequently, most meristic features of this specimen were approximated and, due to its condition, only limited reliable morphometric information could be obtained from the specimen.

The illustration (see Fig. 3) accompanying the description of this specimen that Gruvel & Chabanaud identified as *C. lingua* is definitely that of a specimen of *C. lingua*, but it is not that of the damaged specimen collected in the Red Sea examined by Gruvel & Chabanaud. Rather, this drawing depicts another specimen without defects. The footnote in the lower right-hand corner of the illustration of *C. lingua* in Gruvel & Chabanaud reveals “d’après Day” indicating this drawing is based on an illustration of a specimen of *C. lingua* that had appeared in an earlier work by Day. Gruvel & Chabanaud provided no citation to indicate in which of Day’s works the illustration first appeared. It appears to have been modified from that of

C. lingua in figure 1 of Plate XCVI in Day’s (1878) *The Fishes of India*, which, according to Day, was likely based on a specimen from the Calcutta region.

It seems reasonable that Gruvel & Chabanaud chose this illustration because, unlike their specimen, the illustrated specimen is intact. This decision is unintentionally misleading, and gives unjustified support to their claim that their specimen was *C. lingua*. Furthermore, with loss of the actual Red Sea specimen, subsequent researchers have had to rely more heavily on this illustration and this reliance became a self-fulfilling justification of the species record.

Desoutter et al. (2001:330) were first to recognize that the specimen from the Red Sea identified as *C. lingua* in Gruvel & Chabanaud (1937) had been misidentified and that this same specimen later became the holotype (MNHN 1949–0024) of *C. cleopatridis*. Curiously, no mention was made in either of two Chabanaud studies (1949b, 1950) dealing with *C. cleopatridis* that the holotype of *C. cleopatridis* is the same specimen as that he had previously identified as *C. lingua* in Gruvel & Chabanaud (1937). Yet, review of the descriptions of the specimen identified as *C. lingua* by Gruvel & Chabanaud (1937) and that of *C. cleopatridis* by Chabanaud (1949b, 1950) reveals many similarities between these specimens (Table 2) including their size (132 mm TL and 132 mm approximated SL), the fact that both are missing their caudal fins and have regenerated caudal regions, both have similar approximated counts for dorsal-fin rays (115+), anal-fin rays (85+ or 86+), lateral-line scale counts (72+, 70+), both have two ocular-side lateral lines with 11–12 scales between them, two ocular-side nostrils, a single pelvic fin, and both specimens have ctenoid scales on both sides of the body.

Of interest is that in the original description of *C. cleopatridis*, Chabanaud (1949b) compared his new species with specimens identified as *C. lingua*, but he

never referred to the holotype of *C. cleopatridis* as the specimen from the Red Sea that he and Gruvel had previously identified as *C. lingua*, nor does he mention this specimen in the synonymy accompanying the description of *C. cleopatridis*. Without definitive proof (museum catalogue number, or figures and/or illustrations to compare specimens), it cannot be stated with absolute certainty that these two accounts are based on the same specimen. However, their similarities (size, meristic and morphometric features, and the nearly identical damaged caudal regions) leave little doubt that these two accounts are based on the same specimen and are not a result of coincidence. Why Chabanaud (1949b, 1950) never referred to his earlier report of this specimen where he identified it as *C. lingua*, and why he never corrected the false report of *C. lingua* from the Red Sea based on his misidentification of this specimen, is perplexing.

A remaining unanswered question is whether or not *C. cleopatridis* is a species distinct from *C. lingua*. In the original description (Chabanaud 1949b) and redescription (Chabanaud 1950) of *C. cleopatridis*, Chabanaud remarked that his new species was close to *C. lingua*, but that it could be distinguished by many differences including: shape of the snout (shorter and more broadly rounded in *C. cleopatridis* versus longer and more pointed in *C. lingua*), shorter head (17% of SL versus 20–22% of HL in *C. lingua*), larger eye (12% of HL versus 7–9% HL in *C. lingua*), and by its lower meristic features,³ such as counts for lateral-line scales (ca. 80 versus 93–110), and by counts of dorsal- (115+ versus 124–147) and anal-fin rays (ca. 89 versus 105–116 in *C. lingua*). Another important distinction between these species, as noted by Chabanaud (1950), is that the pore arrangement of the lateral-line

scales in *C. cleopatridis* is simple (simple opening in center of posterior margin of scale), whereas lateral-line scales of *C. lingua* are diverticulate, with pores located at the end of short tubes that alternatively open towards one side of the scale and then the other [description and illustration of this arrangement of these lateral-line pores appear in Menon (1977)].

The conclusion of the present investigation is that the record of *C. lingua* from the Red Sea is unfounded. Reports of this species are based on Gruvel & Chabanaud's (1937) brief description of a damaged specimen that was later (Chabanaud 1949b) re-identified and described as another nominal species, *C. cleopatridis*, a species clearly distinguished from *C. lingua* by many morphological traits (Chabanaud 1949b, 1950; Table 2). The illustration accompanying the purported first report of a specimen of *C. lingua* from the Red Sea in Gruvel & Chabanaud (1937) also does not voucher this species from the Red Sea as the fish depicted is that of a specimen of *C. lingua* from India. Based on these findings, *C. lingua* is removed from the list of known species of tongue soles occurring in the Red Sea.

Validity of records for C. zanzibarensis from the Red Sea.—The holotype of *C. dollfusi* and the second-known specimen, long thought to be lost, have been found. These specimens, currently identified in the MNHN collection as *C. zanzibarensis*, are curated in the same jar and have the catalogue numbers MNHN 1950–0077 and MNHN 1950–0078, respectively. According to Museum records (R. Causse, pers. comm.), these specimens were identified as *C. zanzibarensis* by Chabanaud in 1950, just three years following his redescription of these specimens as *C. sealarki*. However, similarities in size, as well as their meristic and morphometric features (Table 1), agree with those provided for *C. dollfusi* in the original description (Chabanaud 1931) and in Gruvel & Chabanaud (1937). Because the only records for *C.*

³ Values for *C. lingua* in Chabanaud (1949b) include those reported for this species by Norman (1928).

zanzibarensis from the Red Sea are those based on misidentifications of these two specimens of *C. dollfusi*, this species (*C. zanzibarensis*) is also removed from the list of tongue soles occurring in the Red Sea.

Conclusions

Various hypotheses regarding the status of *C. dollfusi* proposed over time resulted in changes in the identity and taxonomic status of this nominal species. These changes also altered the species concept applied to this taxon. Taxonomic re-assignments based on misidentification of the two known specimens of *C. dollfusi*, together with the unorthodox taxonomic procedures accompanied by the ambiguous writing in Chabanaud (1931, 1947) and Menon (1977), also contributed to the confusing nomenclatural and taxonomic history. Chabanaud (1931, 1937, 1947) changed his opinion no less than three different times regarding the generic placement and/or the status and identity of *C. dollfusi*. Other authors, including Fowler (1956) and Desoutter et al. (2001) also confounded issues regarding the identity of this species. Menon's work (1977), in particular, further confused the status and radically changed the species concept of *C. dollfusi*. Additionally, and resulting from this confusion, the taxonomic status and information on the geographic distribution of four other nominal species of tongue soles, *C. sealarki*, *C. zanzibarensis*, *C. cleopatridis* and *C. lingua*, become entangled in the nomenclatural and taxonomic history of *C. dollfusi*.

Evidence provided in this study support rejection of all alternative hypotheses concerning the species concept of this taxon. Additionally, while working through information in studies proposing different hypotheses about the status of *C. dollfusi*, specimens vouchering the only Red Sea records for four different nominal species of *Cynoglossus* were found or identified. Some

specimens were thought to be long-lost, and thus, have been unavailable to investigators researching distributional records of these species in the Red Sea. Re-identifications of these specimens resolve long-standing questions concerning the identity of specimens upon which these Red Sea distributional records are based.

Major findings of the present study are summarized below.

- 1) Chabanaud (1931) erred in placing his nominal species *dollfusi* in the genus *Paraplagusia*. Sufficient data are available from the original description, subsequent studies (Gruvel & Chabanaud 1937; Chabanaud 1947), and from examination of the specimens (see Figs. 1–3) to confidently assign this species to *Cynoglossus*. Red Sea records of *Paraplagusia dollfusi* Chabanaud, 1931 should be emended to list this species as *C. dollfusi* (Chabanaud, 1931).
- 2) Gruvel & Chabanaud (1937) were correct in transferring *P. dollfusi* Chabanaud, 1931 to *Cynoglossus*.
- 3) The hypothesis proposed by Chabanaud (1947, 1954) that *C. dollfusi* (Chabanaud, 1931) is a junior subjective synonym of *C. sealarki* Regan, 1908 is not supported by the data. These two nominal species differ significantly in a number of morphological characteristics to warrant recognizing both as valid species (see comparisons above).
- 4) Red Sea records for *C. sealarki* are based only on the two specimens of *C. dollfusi* appearing in Chabanaud (1931) and Gruvel & Chabanaud (1937), respectively. With the taxonomic decision to recognize *C. dollfusi* as a valid species distinct from *C. sealarki*, no voucher specimens are known for *C. sealarki* from the Red Sea. Therefore, *C. sealarki* is removed from the list of cynoglossine fishes reported from the Red Sea.

- 5) The hypothesis originally proposed by Fowler (1956) and later by Menon (1977), Dor (1984), and Desoutter et al. (2001) that two nominal species are represented by the names *P. dollfusi* Chabanaud, 1931 and *Cynoglossus (Trulla) dollfusi* appearing in Gruvel & Chabanaud (1937) is not supported by the data. Both names refer to the same nominal species (Chabanaud 1947, Munroe & Kong 2016). The name *Cynoglossus (Trulla) dollfusi* appearing in Gruvel & Chabanaud (1937) is a new combination that reflects transfer of *dollfusi* from *Paraplagusia* to *Cynoglossus* (Chabanaud 1947, 1954; Munroe & Kong 2016). It was never proposed as the name for a new taxon.
- 6) Menon's (1977) conclusion that *C. cleopatridis* Chabanaud, 1949 is a junior subjective synonym of *C. dollfusi* (Chabanaud, 1931) is not supported by the data. Sufficient differences exist between these two nominal species to demonstrate that they are distinct. *Cynoglossus dollfusi* is easily diagnosed from *C. cleopatridis* by differences in number of ocular-side lateral lines (three versus two), in having only one ocular-side nostril (versus two in *C. cleopatridis*), and in having lower counts of dorsal-fin rays (100–106 versus 115+ in *C. cleopatridis*).
- 7) The holotype of *P. dollfusi* Chabanaud, 1931 and the second-known specimen of *C. dollfusi* as reported in Gruvel & Chabanaud (1937), long thought to be lost, have been found. These specimens, currently identified in the MNHN collection as *C. zanzibarensis*, are curated in the same jar and have the catalogue numbers MNHN 1950–0077 and MNHN 1950–0078. Their sizes, as well as their meristic and morphometric features, agree with those provided in the original description of *C. dollfusi* (Chabanaud 1931) and in the account of the specimen reported in Gruvel & Chabanaud (1937).
- 8) Because the only Red Sea records for *C. zanzibarensis* are based on these two specimens of *C. dollfusi*, *C. zanzibarensis* is also removed from the list of tongue soles occurring in the Red Sea.
- 9) Gruvel & Chabanaud (1937) reported *C. lingua* from the Red Sea based on a specimen that later (Chabanaud 1949b) became the holotype of *C. cleopatridis*. Distinct morphological differences distinguish *C. lingua* and *C. cleopatridis* as different species. With the taxonomic decision to recognize *C. cleopatridis* as a valid species distinct from *C. lingua*, no voucher specimens are known for *C. lingua* from the Red Sea. Therefore, *C. lingua* is removed from the list of cynoglossine fishes reported from the Red Sea.
- 10) The nominal species, *C. cleopatridis* Chabanaud, 1949, is distinct from *C. dollfusi*, but additional specimens are needed before a better understanding of this taxon can be attained.

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