

**CEPHALOPHOLIS AURANTIA × C. SPILOPARAEA,
A HYBRID SERRANID FISH FROM NEW CALEDONIA**

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ABSTRACT. – A small grouper of the genus *Cephalopholis* caught from 56–62 m depth off New Caledonia is documented as a hybrid of the two wide-ranging Indo-Pacific species *C. aurantia* and *C. spiloparaea* from broad sharing of morphological characters.

KEY WORDS. – Hybrid, serranid fishes, *Cephalopholis*, New Caledonia.

INTRODUCTION

Schwartz (1972) published a compilation of the world literature on hybridization in fishes. Only one paper made reference to a hybrid in the Family Serranidae. Smith (1966) showed that the serranid genus *Menephorus* Poey was based on two hybrids specimens of the western Atlantic serranids *Cephalopholis fulva* and *Paranthias furcifer*. Bostrom et al. (2002) reported on the same hybrid, added DNA evidence and discussed the problem of authors who prefer to place the distinctive genus *Paranthias* in the synonymy of *Cephalopholis* in view of the close genetic relationship (Craig et al., 2001; Craig & Hastings, 2007) – a view not held by the present authors.

Schwartz (2001) compiled 5,464 additional references that treat fish hybrids (thus a total of 9,229 references to 1999). By then, there were 16 more hybrid references for the Serranidae (30 fish families have more than this number). Most of the references concerning hybrid serranids have not been natural hybrids but the result of the propagation of groupers in aquaculture. Tseng & Poon (1983), for example, crossed the groupers *Epinephelus amblycephalus* and *E. akaara* and successfully reared the larvae, and James et al. (1999) produced hybrids of *Epinephelus fuscoguttatus* and *E. polyphkadion*.

The second author recently caught a small grouper of the genus *Cephalopholis* from 56–62 m outside the barrier reef of New Caledonia. He decided, mainly from the colour pattern, that it was *C. spiloparaea* (Valenciennes). He sent

the specimen to the first author for confirmation. From the colour and general morphology, the identification as *C. spiloparaea* seemed correct. However, the specimen has 8 soft anal rays, and *C. spiloparaea* has 9 or 10. After the specimen was compared to those of *C. spiloparaea* and *C. aurantia* (Valenciennes), it was determined to be a hybrid of these two small groupers.

Methods of counting and measuring specimens follow Randall & Heemstra (1991). Proportional measurements are given as ratios of the standard length (SL in mm) or head length (HL in mm), rounded to the nearest 0.05. The character Body Scales in Table 1 refers to the count of scales in longitudinal series on the body from the upper end of the gill opening to the base of the caudal fin.

Cephalopholis aurantia* × *C. spiloparaea
(Fig. 1; Table 1)

MNHN 2006-0256, 127 mm SL, 60 grammes (fresh weight), New Caledonia, outer reef slope, wreck of “Ever Prosperity”, 22°27'30"S 166°21'50"E, 56–62 m, hook and line, J.-L. Justine, 22 Aug.2006.

Diagnosis. – Dorsal rays IX,15; anal rays III,8; pectoral rays 15; pectoral rays 18; lateral-line scales 48; body scales in longitudinal series 105; snout anterior to nostrils naked; maxilla naked; scales ventrally on abdomen cycloid, becoming weakly ctenoid posteriorly; body depth 3.0 in SL; head length 2.4 in SL; snout length 4.0 in HL; eye diameter 4.74 in SL; interorbital width 6.85 in HL; upper jaw length

Table 1. Differentiating characters for *Cephalopholis aurantia*, the hybrid and *C. spiloparaea*.

Character	<i>C. aurantia</i>	Hybrid	<i>C. spiloparaea</i>
Anal soft rays	8–9	8	9–10
Body scales	94–121	105	86–101
Scales on abdomen	ctenoid	cycloid and ctenoid	cycloid
Subopercle, interopercle	Finely serrate	smooth	smooth
Body depth in SL	2.55–2.95	3.0	2.7–3.2
Maxilla ending	below rear of eye	below rear of eye	posterior to eye
Pelvic fins in HL	1.65–2.0	2.05	1.9–2.15

2.0 in HL, the maxilla ending below posterior edge of orbit; ventral margin of preopercle fleshy; edge of subopercle and interopercle finely serrate; caudal-peduncle depth 3.45 in HL; fifth to eighth dorsal spines subequal, 3.4 in HL; second anal spine longest, 2.65 in HL; caudal fin rounded, 1.75 in HL; pectoral fins 1.5 in HL; pelvic fins not reaching anus, 2.05 in HL; colour in alcohol pale yellowish; body with a faint irregular dusky pattern from dark scale centres; interorbital, snout, and front of upper lip with irregular blackish markings; soft portion of dorsal fin with a broad dusky margin; soft portion of anal fin with a narrow blackish margin. Colour when fresh as in Fig. 3.

Evidence for hybridization. – As can be seen from a comparison of Figs. 1–3, the hybrid is clearly closest in colour to *C. spiloparaea*. Table 1 shows its affinity to *C. spiloparaea*



Fig. 1. *Cephalopholis aurantia*, BPBM 32893, 190 mm SL, Maldives Islands. Photo by J.E. Randall.



Fig. 2. *Cephalopholis spiloparaea*, BPBM 13260, 165 mm SL, Pitcairn Islands. Photo by J.E. Randall.

in having a smooth margin of the subopercle and interopercle, a body depth of 3.0 in SL, and short pelvic fins, 2.05 in head length. It is closest to *C. aurantia* in having 8 anal soft rays and the maxilla ending below the rear of the eye. It is intermediate to the two species in its body scale count of 105 and in the scalation of the abdomen.

Remarks. – In one character the hybrid is unlike either *C. aurantia* or *C. spiloparaea*. No scales could be detected on the maxilla. The scales are very small and partially embedded on the two parent species. It is not unusual for hybrids to exhibit a character not found in either parent species.

Cephalopholis aurantia and *C. spiloparaea* are both wide-ranging in the Indo-Pacific region from the east coast of Africa to the islands of French Polynesia (Randall & Heemstra, 1991). *Cephalopholis spiloparaea* is known even farther east to the Pitcairn Islands. *Cephalopholis aurantia* may well occur there too, but no fishing was carried out at these islands in its depth range (generally over 100 m, with one record from 300 m). *Cephalopholis spiloparaea* has been collected from 15 to 108 m, but mostly deeper than 30 m. *Cephalopholis aurantia* reaches larger size, to 225 mm SL, compared to 166 mm for *C. spiloparaea* (Randall & Heemstra, 1991).

The hybrid specimen was collected for the purpose of examining it for parasites on the gills and in the digestive tract. Because it was believed to be *C. spiloparaea*, the gills and viscera were removed for the assay of parasites. The gills had no monogeneans, gnathiid isopod larvae, or adult copepods; only a few larval copepods were found. The digestive tract contained no digeneans or nematodes, but it



Fig. 3. *Cephalopholis aurantia* x *C. spiloparaea*, MNHN 2007-0256, 127 mm, New Caledonia. Photo by J.-L. Justine.

harboured adult pseudophyllidean cestodes, a very rare find (parasitological number MNHN JNC1926).

A tissue sample was saved in ethanol from the hybrid in the hope that a DNA comparison can be made with *C. aurantia* and *C. spiloparaea*. Both of these species are reported from New Caledonia; however, the second author has been unable to obtain any fresh specimens of either species.

ACKNOWLEDGMENTS

We acknowledge the assistance of Géraldine Colli, who participated in the fishing expedition and parasitological survey and Sam Tereua (IRD, Nouméa), captain of the survey vessel, RV CORIS.

LITERATURE CITED

- Bostrom, M. A., B. B. Collette, B. E. Luckhurst, K. S. Reece & J. E. Graves, 2002. Hybridization between two serranids, the coney (*Cephalopholis fulva*) and the creole-fish (*Paranthias furcifer*), at Bermuda. *Fishery Bulletin*, **100**: 651–661.
- Craig, M. T., D. J. Pondella II, J. C. Hafner, & J. P. C. Franck, 2001. On the status of the serranid fish genus *Epinephelus*: evidence for paraphyly based on 16S rDNA sequences. *Molecular Phylogenetics and Evolution*, **19**: 121–130.
- Craig, M. T. & P. A. Hastings, 2007. A molecular phylogeny of the groupers of the subfamily Epinephelinae (Serranidae) with a revised classification of the Epinephelini. *Ichthyological Research* **54**: 1–17.
- James, C. M., S. A. Al-Thobaiti, B. M. Rasem & M. H. Carlos, 1999. Potential of grouper hybrid (*Epinephelus fuscoguttatus* x *E. polphekadion*) for Aquaculture. *Naga, ICLARM Quarterly* **22**: 19–23.
- Randall, J. E. & P. C. Heemstra, 1991. Revision of Indo-Pacific groupers (Perciformes: Serranidae: Epinephelinae), with descriptions of five new species. *Indo-Pacific Fishes*, No. **20**: 1–332.
- Schwartz, F. J., 1972. World literature to fish hybrids, with an analysis by family, species, and hybrid. *Publications of the Gulf Coast Research Laboratory Museum*, No. **3**: 1–328.
- Schwartz, F. J., 2001. Freshwater and marine fish family hybrids: a worldwide changing scene revealed by the scientific literature. *Journal of the Elisha Mitchell Scientific Society* **117**: 62–65.
- Smith, C. L., 1966. *Menephorus* Poey, a serranid genus based on two hybrids of *Cephalopholis fulva* and *Paranthias furcifer*, with comments on the systematic placement of *Paranthias*. *American Museum Novitates*, no. **2276**: 1–11.
- Tseng, W. Y. & C. T. Poon, 1983. Hybridization of *Epinephelus* species. *Aquaculture* **34**: 177–182.