Morphological variability of *Ocyurus chrysurus* in coral reefs of Guadeloupe (Lesser Antilles)

Variabilidad morfológica de *Ocyurus chrysurus* en los arrecifes coralinos de Guadeloupe (Antillas Menores)

Variabilité morphologique chez *Ocyurus chrysurus* dans les récifs coralliens de Guadeloupe (Petites Antilles)

MEHDI BOUDAULT1,[2], LÉA VIGNAUD1,[2], SÉBASTIEN CORDONNIER[1], BRUNO FRÉDÉRICH[3], CHARLOTTE R. DROMARD[1,2], DAVID LECCHINI[4]

[1]*UMR BOREA, Université des Antilles, MNHN, Sorbonne Université, Université de Caen Normandie, CNRS, IRD, BP 592, 97157 Pointe-à-Pitre, Guadeloupe, mehdi.boudault@outlook.fr*

[2] *Laboratoire d'Excellence "CORAIL", 66100 Perpignan, France*

[3] *Laboratoire d'écologie évolutive, FOCUS, Université de Liège, Belgium*

[4]*PSL Université de Paris, EPHE-UPVD-CNRS, IRD,BP UAR 3278 CRIOBE, 98729 Moorea, French Polynesia*

EXTENDED ABSTRACT

The morphology of reef fishes is mostly related to the way a species feeds (inferior, superior or terminal mouth, head shape, volume of the oral cavity, dental equipment, jaw power, etc) but also influences their swimming and hunting abilities (undulation or oscillation, number and rigidity of fins, mimicry, etc). Changes in body shape during ontogeny have many advantages: promote reproduction or better defense, increase predator deterrence or diversity of accessible prey. This growth also brings many disadvantages such as higher vulnerability, larger food needs, impossibility of hunting in some reef cavities… The tool used to quantify these variations in shape during ontogeny, also called "ontogenetic trajectories", is called allometry by geometric morphometry (Bookstein, 1992).

Firstly, this quantification allows the identification of even slight morphological differences or similarities between individuals, and secondly, help to understand the ecology of the species when these laboratory observations are combined with naturalistic observations. These approaches define the ecomorphology science. Studies of this kind have been carried out in large numbers on herbivorous and omnivorous fish species in the Pacific region, but few have been carried out in the Caribbean and even fewer on carnivorous species in the Lesser Antilles. The objective of this study is therefore to start a project of morphometric analyses on the reef fish species from Guadeloupe. This study focused on shape differences between the ontogenetic stages (post-larval, juvenile and adult) of Ocyurus chrysurus. To do so, post-larval individuals were sampled in the Petit Cul-de-Sac Marin area using two types of traps: a crest net and a light-trap "CARE" (Collected by Artificial Reef Ecofriendly), monthly during the week of the new moon, which corresponds to the peak of colonization on the reefs (Dufour and Galzin, 1993). Juvenile individuals were sampled in the Grand and Petit Cul-de-Sac Marin areas, using a seine net and dip nets. Adult individuals were caught in fish pots and recovered from local fishermen.

For post-larval and juvenile individuals, a euthanasia protocol with eugenol diluted in seawater was followed after each sampling. All individuals were then photographed in lateral view, the body fixed and the fins extended with entomologist pins, in order to visualize precise points on the body of each individual such as the insertion of the fins. The images obtained were processed using the geometric morphometry software suite "TPS". Twelve landmarks (LMs) were placed on each image to account for the overall shape of each specimen. These landmarks were the same for all individuals of the same species, whatever their developmental stage (Figure 1). A principal component analysis was applied on the shape variables, which allowed the realization of deformation grids and the visualization of the evolution of the body shape during ontogeny.

Shape differences between ontogenetic stages (post-larvae, juveniles, and adults) were tested using F-tests based on a bootstrap procedure (TwoGroup8 software). This test indicated significant differences and also reported a Procrustean distance value, which is a value directly proportional to the existing shape difference between the average shape of two groups (here: two ontogenetic stages). As results, the deformation grids allowed a visualization of the ontogenetic trajectories taken by the body of *Ocyurus chrysurus* during its growth, from the youngest (post-larval) to the oldest (adult) stages in this study (Figure 2). From these grids, we noticed that during the growth of *Ocyurus chrysurus*, the anterior insertion of the dorsal fin becomes more posterior (LM 3) and this same fin lengthens. The anal (LM 8), pelvic (LM 9) and pectoral (LMs 10 and 11) fins become more anterior. The distance between the pelvic and pectoral fins is reduced. Conversely, the distance between the anal and pelvic fins becomes greater. The posterior part of the fish (LMs 4,5,6 and 7) does not move along an antero-posterior axis but aligns itself along a dorso-ventral axis. Contrary to the global trend observed in reef fish, in *Ocyurus chrysurus*, the body shape is significantly more different between the juvenile and adult stages than between the post-larval and juvenile stages. The juvenile life stage of this species is characterized by an association with seagrass beds

environment, such as others Lutjanidae like *Lutjanus griseus* (Garcia et al., 2003; Radford et al., 2011). As adults, yellowtail snapper (*O. chrysurus*) definitely moves closer to the reefs and becomes a large predator, feeding on shrimp, crabs but also fish (Bortone and Williams, 1986). This radical variation in its diet certainly requires great changes in its morphology, especially between the juvenile and adult stages as observed in this study.

KEYWORDS: reef fishes, morphology, ontogenetic trajectories, nutrition

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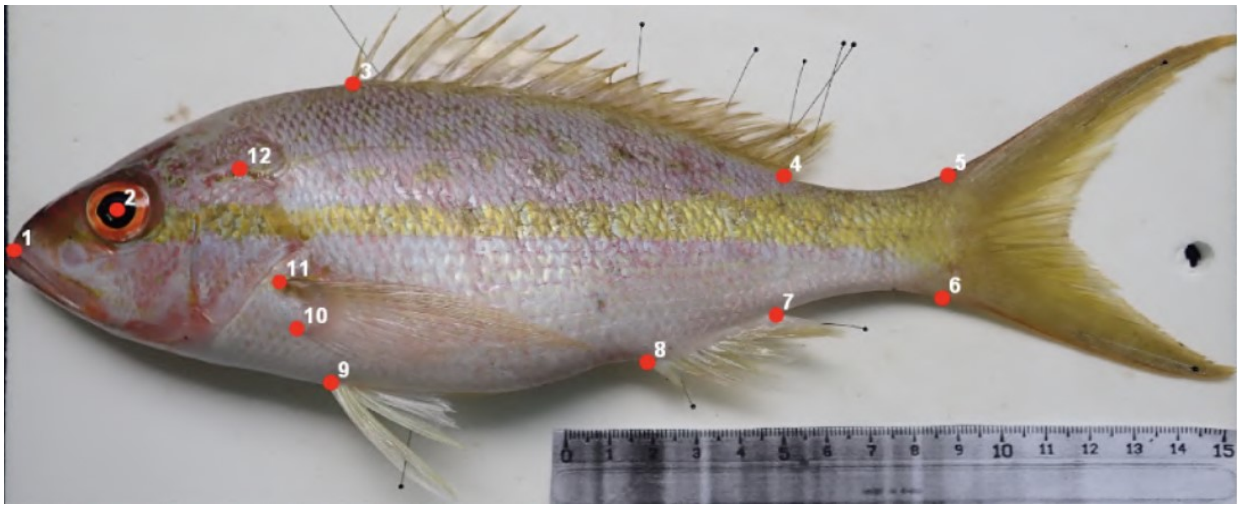

Figure 1. *Ocyurus chrysurus* at adult stage and location of the twelve LMs

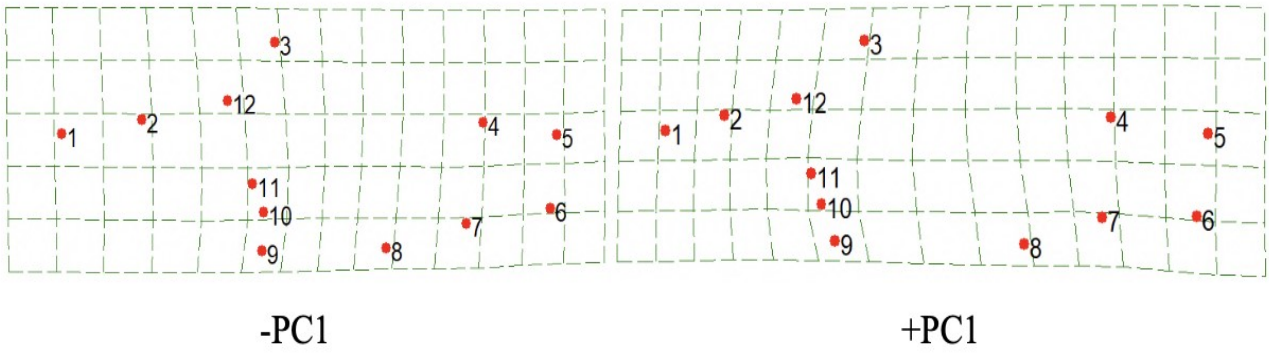

Figure 2. Deformation grids of post larvae (-PC1) and adults (+PC1) groups of *Ocyurus chrysurus*