

**PRELIMINARY RESULTS ON THE MORPHOLOGICAL CHARACTERISATION
OF NATURAL POPULATIONS AND CULTURED STRAINS OF *CLARIAS* SPECIES
(SILURIFORMES, CLARIIDAE) FROM VIETNAM**

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Abstract

A morphometric analysis of wild and cultured *Clarias* specimens originating from Vietnam indicated the presence of three species: *C. batrachus*, *C. macrocephalus* and *C. gariepinus*. The latter is an African species that has been introduced for fish culture purposes. The status of a fourth species, *C. fuscus*, previously reported from the northern part of the country, could not be clarified yet as no material could be examined. This is the subject of forthcoming research.

INTRODUCTION

Three *Clarias* species have been reported in literature as naturally occurring in Vietnam: *C. batrachus* (Linnaeus, 1758), *C. macrocephalus* Günther, 1864 and *C. fuscus* (Lacépède, 1803) (Ha-Dinh-Duc, 1982). The former two species are widespread, while the latter has only been reported from the North of the country. A fourth species, *C. gariepinus* (Burchell, 1822) naturally occurs in Africa and has been introduced to Vietnam for fish culture purposes, in particular hybridisation with *C. macrocephalus*. Identification of these species in the field is sometimes problematic and there is some doubt on the correctness of their specific identification.

As part of an overall systematic revision of the south-east Asian *Clarias* species, this paper presents preliminary results of the morphometric analysis of *Clarias* specimens collected in Vietnam.

MATERIAL AND METHODS

Hundred and eight specimens originating from Vietnam have been examined. They were tentatively identified when collected and included the following species: *Clarias batrachus*,

C. macrocephalus and *C. gariepinus* and the hybrid between *C. gariepinus* x *C. macrocephalus*. All specimens of *C. batrachus* (N=34) and *C. macrocephalus* (N=35) were collected from the wild. For each species, about half of them were bought at Can Tho market and the others at Thu Duc and Binh Chanh markets (Ho Chi Minh City area). The *C. gariepinus* (N=24) and hybrid (N=15) specimens were obtained respectively from three different fish farms. In total 73 fish were correctly preserved and were used for a detailed morphometric analysis. The material is deposited in the collection of the Musée Royal de l'Afrique Centrale, Tervuren, Belgium. The four syntypes of *Clarias macrocephalus* housed in the collections of the British Museum (Natural History) London, have also been examined.

On each specimen 30 point-to-point measurements were taken using dial calliper. Measurements follow Teugels (1986). They include (Figure 1): 1) Total length (TL); 2) Standard length (SL); 3) Maximum body depth (MBD); 4) Caudal peduncle depth (CPD); 5) Head length (HL); 6) Head width (HW); 7) Snout Length (SNL); 8) Interorbital distance (IOW); 9) Eye diameter (ED); 10) Nasal barbel length (NBL); 11) Maxillary barbel length (MBL); 12) Inner mandibular barbel length (IMBL); 13) Outer mandibular barbel length (OMBL); 14) Occipital

process length (OPL); 15) Occipital process width (OPW); 16) Frontal fontanel length (FFL); 17) Frontal fontanel width (FFW); 18) Premaxillary toothplate width (PMW); 19) Vomerine toothplate width (VMW); 20) Predorsal distance (PDL); 21) Preanal distance (PAL); 22) Prepelvic distance (PPL); 23) Prepectoral distance (PPEL); 24) Dorsal fin length (DFL); 25) Distance between occipital process and dorsal fin origin (OPDF); 26) Pectoral spine length (PESL); 27) Pectoral fin length (PEFL); 28) Pelvic fin length (PFL); 29) Anal fin length (AFL); 30) Caudal fin length (CFL). For each specimen, the number of gill rakers on the first branchial arch has been counted. Using radiographs the following six meristic counts were made on each specimen: 1) Number of dorsal fin rays; 2) Number of anal fin rays; 3) Number of vertebrae; 4) Number of abdominal vertebrae; 5) Number of caudal vertebrae. Finally a number of special morphological observations were noted on each specimen: shape of the occipital process; shape of the frontal fontanel; serrations on the pectoral spine.

The data obtained were introduced in a database for subsequent factor analysis. Principal component analysis (PCA) was done using the STATISTICA (StatSoft Inc.) package (versions 3.1 for analysis and 4.5 for graphs). Measurements are log transformed before the PCA was run on the covariance matrix. An independent PCA was run on the correlation matrix for the untransformed meristic count data.

RESULTS

A comparison between natural populations originating from the Can Tho and Ho Chi Minh City areas for both *Clarias batrachus* and *C. macrocephalus* did not enable to distinguish them. Therefore, all specimens of each species were subsequently considered as one group for further analysis.

It should be noted however that in a PCA of all the *C. macrocephalus* specimens examined, the

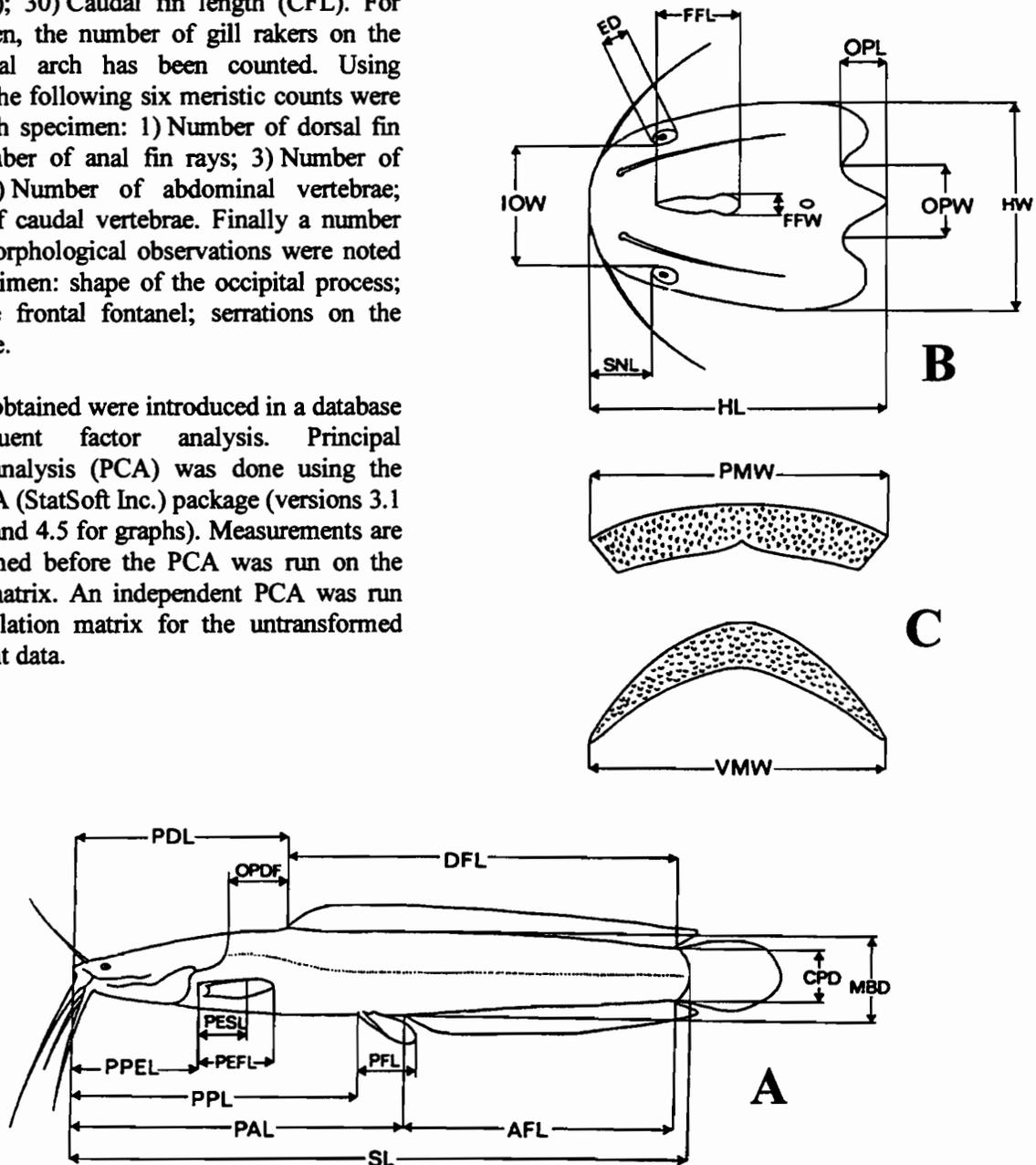


Figure 1: Measurement taken on the body (A), the head (B) and the toothplates (C)
For abbreviations see text.

type material, originally described from Thailand, was, at least in part, distantly set from the other specimens. Two of the types are small-sized (168-174 mm Standard Length) and have a reduced (18) number of gill rakers on the first branchial arch, while the others are large-sized (266-267 mm SL) and show 32-33 gill rakers on the first arch. The former has a pointed occipital process while in the latter it is extremely rounded. Comparison between the type material and equally sized specimens indicated that the small-sized *C. macrocephalus* types differ significantly. Therefore it is most likely that the type material of *C. macrocephalus* in fact includes two different species. Ongoing research on *Clarias* specimens from Thailand, the type locality of *C. macrocephalus* will clarify this.

Figure 2 illustrates the plot of a PCA for 23 log-transformed metric variables (excluding total length, standard length, nasal, maxillary, inner and outer mandibular barbel length and caudal fin length) for all specimens examined of *C. batrachus* and *C. macrocephalus*.

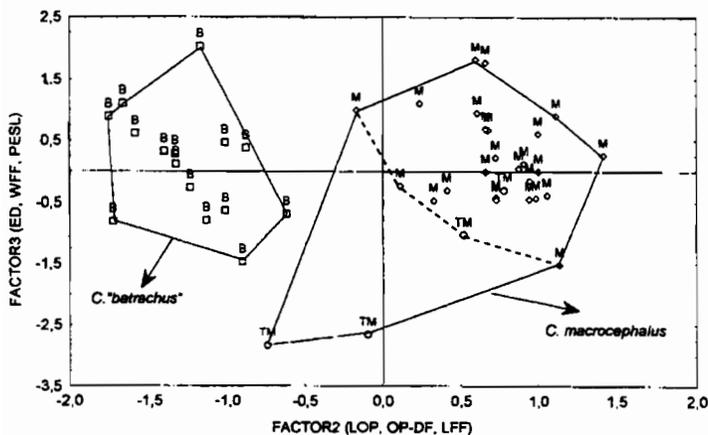


Figure 2: Plot of a Principal Component Analysis using 23 log transformed metric variables for *Clarias* species occurring in Vietnam. B = *C. batrachus*, M = *C. macrocephalus*, TM = Syntypes of *C. macrocephalus*. Stippled line: excluding the two aberrant syntypes of *C. macrocephalus*.

All specimens of *C. batrachus* are situated on the negative part of the second factor while all but three (only one if the aberrant type specimens are excluded) *C. macrocephalus* are located on the positive part of the second factor. The second factor is merely defined by (in decreasing importance) the length of the occipital process, the distance between the occipital process and the dorsal fin origin and the length of the frontal fontanel. These characters easily enable to distinguish both species (Fig. 3).

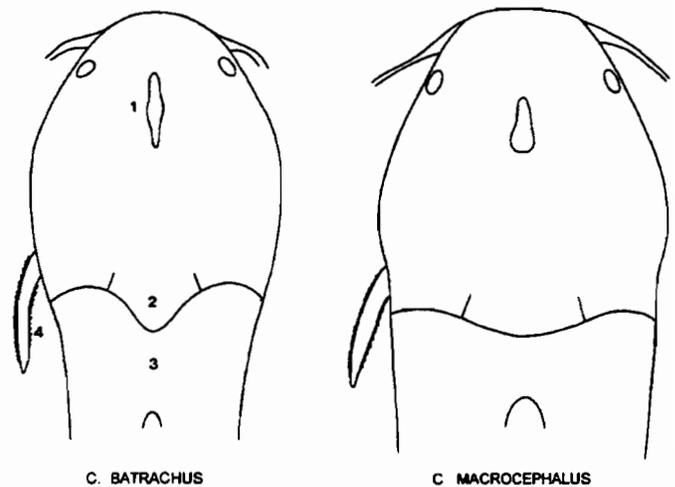


Figure 3: Most striking external morphological differences between *Clarias batrachus* and *C. macrocephalus*. 1. Frontal fontanel shape; 2. Occipital process shape; 3. Distance between occipital process and dorsal fin origin; 4. Inner pectoral spine serrations.

Figure 4 illustrates the number of gill rakers in function of the standard length for the different *Clarias* species found in Vietnam as well as for the hybrid between *C. gariepinus* x *C. macrocephalus*. *Clarias gariepinus* is distinguished from all the others by its numerous gill rakers. The hybrid *C. gariepinus* x *C. macrocephalus* has an intermediate number of gill rakers between that of the two parental species. *Clarias batrachus* has the lowest gill raker number.

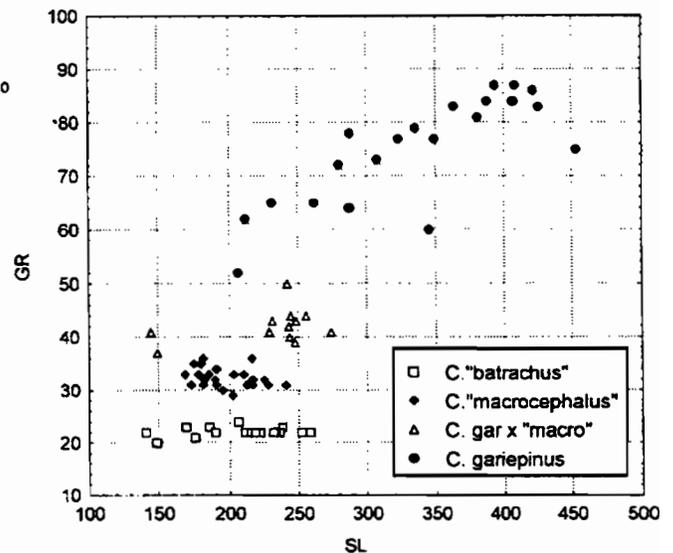


Figure 4: Number of gill rakers on the first branchial arch in function of the standard length (mm) for the different *Clarias* species from Vietnam and the hybrid between *C. gariepinus* x *C. macrocephalus*.

Figure 5 shows the plot of a PCA for 23 log-transformed metric variables (excluding total length, standard length, nasal, maxillary, inner and outer mandibular barbel length and caudal fin length) for all specimens examined from Vietnam.

Clarias batrachus and *C. macrocephalus* are distantly set (*cf. supra*). *Clarias gariepinus* and *C. macrocephalus* partly overlap and their hybrids are superposed with the two parental species. Note that there is hardly any overlap between *C. gariepinus* and *C. batrachus*, two species for which the artificial hybridisation was unsuccessful.

DISCUSSION

The results obtained so far are still preliminary and incomplete. No specimens of *Clarias fuscus* have been examined so far, but a shipment is expected in the near future. A recently sent collection has not been examined so far.

Nevertheless the results show interesting data. The type material of *Clarias macrocephalus* apparently includes two species. The two small specimens do not correspond to the currently accepted definition of this species (rounded

occipital process; relatively high number of gill rakers; ...).

The real status of these specimens is presently being examined.

No morphometrical differences have been observed between natural populations of both *Clarias batrachus* and *C. macrocephalus* from the two locations studied in the South of Vietnam. No striking differences were found between *C. gariepinus* cultured in Vietnam and *C. gariepinus* naturally occurring in Africa. Finally, the hybrid between *C. gariepinus* x *C. macrocephalus* shows an external morphology which is intermediate between that of the parental species.

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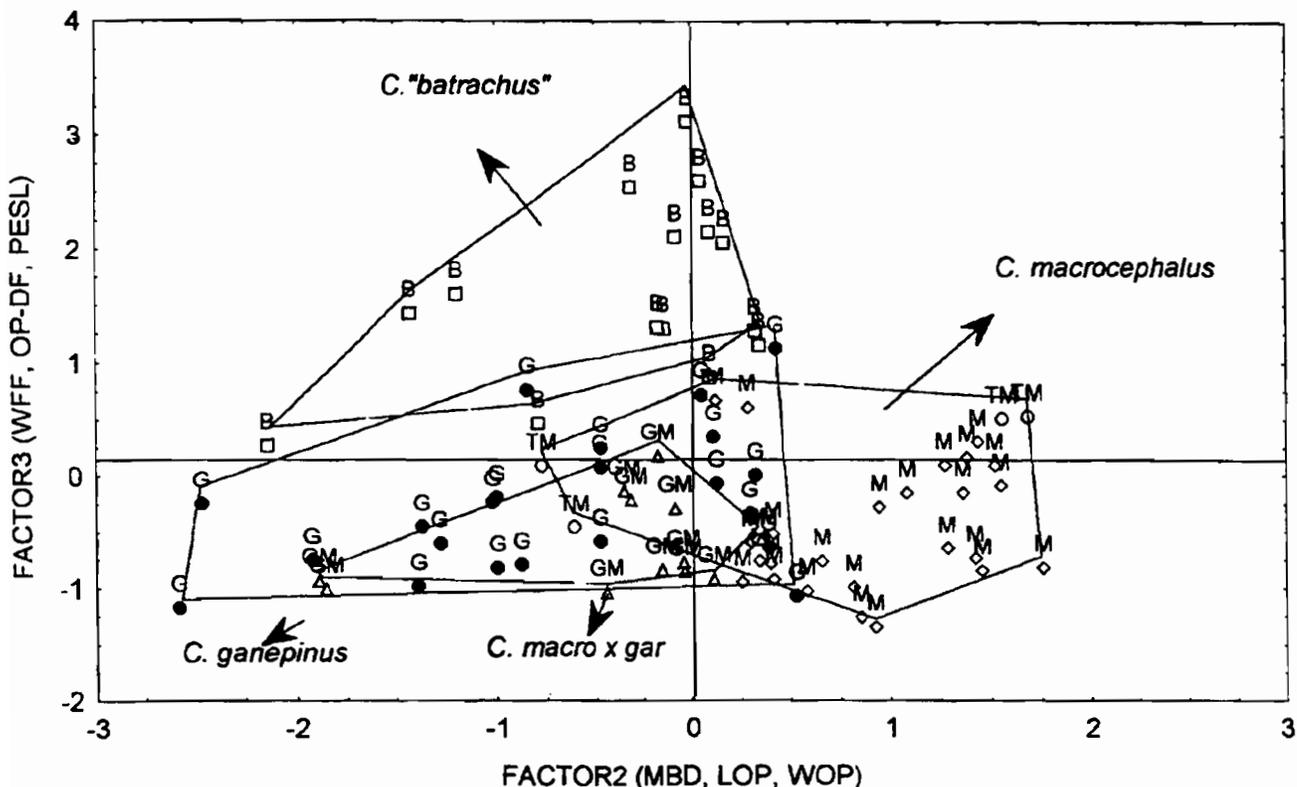


Figure 5: Plot of a Principal Component Analysis using 23 log transformed metric variables for *Clarias* species occurring in Vietnam. B = *C. batrachus*, M = *C. macrocephalus*, TM = Syntypes of *C. macrocephalus*, G = *C. gariepinus*, GM = *C. gariepinus* x *C. macrocephalus*.

THE BIOLOGICAL DIVERSITY AND AQUACULTURE OF CLARIID AND PANGASIID CATFISHES IN SOUTH-EAST ASIA



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