An Annotated Key to the Genus *Hemichromis* Peters 1958.

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INTRODUCTION

Peters (1858) erected the genus *Hemichromis* (Type species: *Hemichromis fasciatus*) for a superficially *Chromis* (i. e., *Cichlasoma* Swainson)-like cichlid of West African provenance. The fish was characterized by notably protrusible jaws and buccal dentition consisting of a complete row of unicuspid teeth in both jaws and an incomplete inner row of identically shaped teeth in the upper jaw. The presence of anteriorly placed pseudocanines in the outer tooth row of both jaws was emphasized in the original description. Guichenot, in Dumeril (1861) described a new genus, *Chromichthys* (Type species: *Chromichthys elongatus*) for a similar fish from Gabon. Guichenot distinguished his genus from *Hemichromis* by its lack of an incomplete inner row of teeth in the upper jaw.

Gill (1862) monographed the genus *Hemichromis*, synonymizing the two genera on the grounds that Guichenot and Dumeril had overlooked the presence of an incomplete inner tooth row of jaw teeth in their material. He then described two additional species, *H. auritus*, from the Gabon River in the country of the same name, and *H. bimaculatus*. Although a smaller mouth, less protractile jaws and different color pattern clearly differentiated the latter species from other representatives of the genus, Gill justified its generic placement on the grounds of similar buccal dentition. Although it has been suggested (Thys, 1968) that *H. bimaculatus* warrants a separate genus, most subsequent workers (Regan, 1922; Loiselle, 1979a; Greenwood, 1985) have accepted the monophyly of *Hemichromis*.

Subsequent authors, placing greater emphasis on the unicuspid character of the jaw teeth than on their arrangement, ascribed many more species to the genus than are currently recognized. This proliferation of species was followed by Boulenger's drastic revision (1915) of the genus. *Hemichromis* Peters *sensu* Boulenger was restricted to cichlids with clearly cycloid scales, a single complete row of teeth in each jaw and an otherwise variably disposed array of inner teeth which in their aggregate did not comprise a complete row in either. Subsequent workers (Regan, 1922; Trewavas, 1973; Loiselle, 1979a; Greenwood, 1985) while identifying additional defining characteristics, have accepted the validity of Boulenger's overview. On the basis of a superficial analysis of material drawn primarily from the collections of the British Museum of Natural History, Boulenger then placed all of the nominal species comprised within his new definition of *Hemichromis* in synonymy with either *H. fasciatus* or *H. bimaculatus*.

Boulenger's concept of *Hemichromis* was not questioned until behavioral scientists and fisheries biologists accumulated sufficient experience with living animals to conclude that the nomen *H. fasciatus* was being applied to two quite distinctive entities that differed significantly in details of their breeding coloration and in their life history characteristics. Burchard and Wickler (1965) cogently summarized data supporting this position and proposed referring to the two taxa in question as *H. fasciatus*-A and *H. fasciatus*-B pending clarification of their species-level taxonomy. By the late 1960's, aquarists in both Europe and the United States had come to suspect that the nomen *H. bimaculatus* was being similarly applied to a number of biologically distinct animals of Nigerian and Zairean provenance, a conclusion formally expressed by Payne and Trewavas (1976).

In 1979, I published a revision of the genus *Hemichromis*. This study, based upon an extensive series of specimens drawn from the collections of eleven Museums in Europe, the United States and South Africa and my field experience in West Africa, redefined *H. fasciatus* and *H. bimaculatus*, rehabilitated *H. elongatus*, *H. guttatus* and *H. letourneauxi*, extended the limits of the genus to include the poorly known Zairean species *Pelmatochromis cerasogaster*, and described four new species, *H. paynei*, *H. cristatus*, *H., stellifer* and *H. lifalili*. Since the publication of that revision, most of these species have at least episodically been available to aquarists in North America or Europe. The problem of correctly identifying *Hemichromis* species has thus grown more acute with the passage of time.

Published as a series of independant papers (Loiselle, 1979a-d), this revision did not include a comprehensive key to the genus. This has complicated the task of identifying preserved *Hemichromis* material. Nor was the problem of identifying living *Hemichromis* made any easier by lack of life color data for several species. Notwithstanding subsequent publication of life color information for several species (Linke and Staeck, 1980; Loiselle, 1985; Loiselle and Eckstein, 1988), such data have yet to be published for a number of others. This paper addresses both of these shortcomings, with the aim of producing a diagnostic tool of use to museum workers and aquarists alike.

REFLECTIONS ON METHODOLOGY

Keys are traditionally written to permit museum workers to accurately identify preserved organisms collected from the wild. They thus rely heavily upon characteristics that remain unaltered in preserved material. In the case of fish, these include distinctive anatomical features, proportional measurements and counts of serially repeated elements such as scales and fin rays. As patterns of black pigmentation are reasonably stable in properly prepared material, these elements of the color pattern are sometimes recognized as useful. However, ichthyologists are often reluctant to place strong reliance upon color pattern as a diagnostic feature in the identification of fishes.

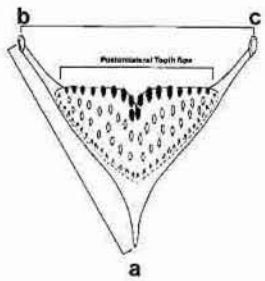
This reluctance in no way reflects upon the validity of color pattern as a taxonomic characteristic. Recent work on the cichlids of Lake Victoria and Malawi (Greenwood, 1980; Greenwood and Barel, 1978; Ribbink *et al.*, 1983), for example, make the point that differences in male breeding dress are of great value in correctly identifying very closely related haplochromines. Problems arise in part from the unavoidable fact that in much type material collected prior to the turn of the century, color pat-

tern data are unavailable because even melanophore patterns are often severely faded. Of equal importance is the fact that these patterns can change with both the age and behavioral state of individual animals. It is thus not always clear precisely what the color differences present in a series of preserved specimens signify. This is not to say that coloration cannot be a useful diagnostic characteristic. The problem is rather that one must have a greater knowledge of an animal's biology than is often available from preserved specimens in order to interpret this information correctly.

Aquarists and those researchers who study living cichlids are confronted with another set of problems when they seek to identify an unfamiliar cichlid. Their reluctance to sacrifice living animals precludes the use all but superficial anatomical characters in the diagnostic exercise. While proportional measurements can be taken without seriously traumatizing living fish, these ratios, commonly expressed as X of standard length, are often significantly different in wild-caught and captive-reared individuals of the same species. Greater abundance of food and restrictions on activity often cause captive individuals to display growth patterns quite different from those of their wild counterparts. (Kullander, 1980).

However, neither does willingness to sacrifice a fish guarantee accurate identification. The common practice of maintaining captive cichlids over a fairly coarse substratum often reduces the value of another important diagnostic feature, the shape of teeth, both those of the jaws and on the lower pharyngeal bone. Regardless of their feeding pattern in nature, captive cichlids often spend a great deal of time rooting through the substratum in search of food. When the substratum in question is coarse, this behavior abrades the crowns of the teeth and can significantly alter their form, *e. g.*, conical teeth assume a truncate form, while clearly bicuspid teeth can have the minor cusp worn down to a steeply angled shoulder.

These considerations complicate the task of generating a universally useful key to the species of *Hemichromis*. It is a relatively simple matter to write a key that works reliably for wild-caught museum specimens. However, such an instrument may not always suffice to identify captive-reared animals and will be almost useless to someone who needs to identify live fish. What follows is an attempt to amplify the scope of a traditional key, based upon more or less accessible anatomical features, by adding information on life colors generally unavailable from preserved material. Such information is bracketed in boldface following the statement describing characteristics useful in the identification of preserved material. Anatomical data for the key and aposite illustrations are taken from Loiselle (1979a-d). Life color data are drawn from personal observations of hemichromine cichlids. The reader willing to avail himself of all these diagnostic features should be able to accurately identify any naturally occurring *Hemichromis* phenotype to species.



KEY

1. Two or more complete rows of teeth in each jaw; 28 - 34 teeth along the posterior margin of the lower pharyngeal bone (See Fig. 1. for placement of these teeth on the bone.); color pattern based on a series of narrow dark lateral bars [**irridescent blue-bordered rectangular black spot present between the tenth and fourteenth spines of the dorsal fin; soft dorsal and caudal marked with unbroken metallic blue interradial streaks** (Fig 2)].....*Hemichromis cerasogaster* (Boulenger 1899)

- A single complete row of teeth in each jaw; 16 - 24 teeth along the posterior margin of the lower pharyngeal bone; color pattern dominated by 1-5 round to ovoid black spots on the flanks **[metallic blue spangling rather than unbroken interradial streaks variably present in the soft dorsal and caudal]**.....2

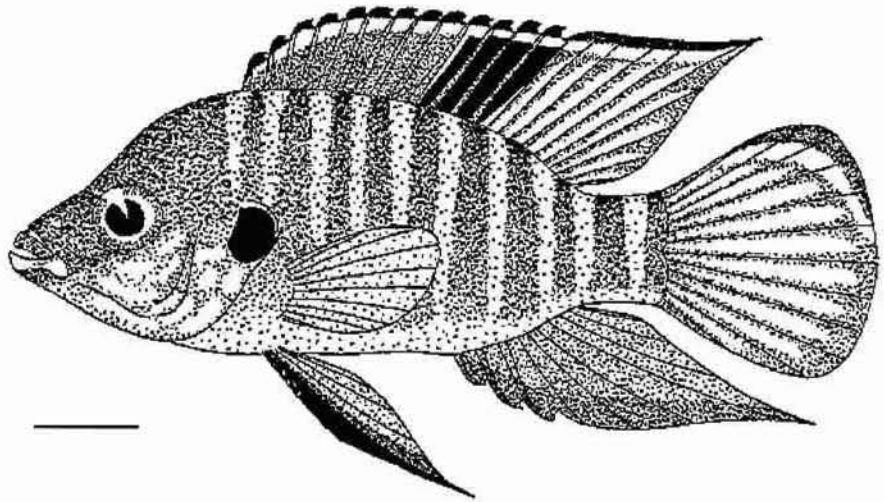


Figure 2

Diagrammatic representation of the color pattern of a male *Hemichromis cerasogaster* [67.5 mm SL, Ipeke, Lac Maji Ndombe, Zaire]. The light streaks between the rays of the soft dorsal and caudal fins are metallic blue in living animals.

Figure 1 (Left) Lower pharyngeal bone of *Hemichromis fasciatus* [125.0 mm SL, Brewerville, Liberia] showing the position of the posterolateral tooth row and defining two diagnostically useful measurements.

2. Lower jaw strongly prominent; pseudocanine teeth present anteriorly in both jaws; color pattern based on 5 large black spots disposed along the midlateral line [**head and vertical fins devoid of metallic blue spangling**].....3

- Lower jaw only slightly prominent or both jaws equal in length; pseudocanines absent; a single black spot present on the midportion of the flanks **[metallic blue spangling variably present on the head and in the vertical fins]**.....5

3. Posterior margin of the tooth-bearing area of the lower pharyngeal bone deeply indented, giving it the shape of a Y (Fig. 3b.); faint dark midlateral band visible even in specimens > 5.0 cm SL **[lower third of the head and flanks bright red in adults]** .....*Hemichromis frempongi* Loiselle 1979

- Posterior margin of the tooth-bearing area of the lower pharyngeal bone straight or slightly convex, giving it a triangular appearance (Fig. 3a.); no trace of dark midlateral band in specimens > 5.0 cm SL.....4

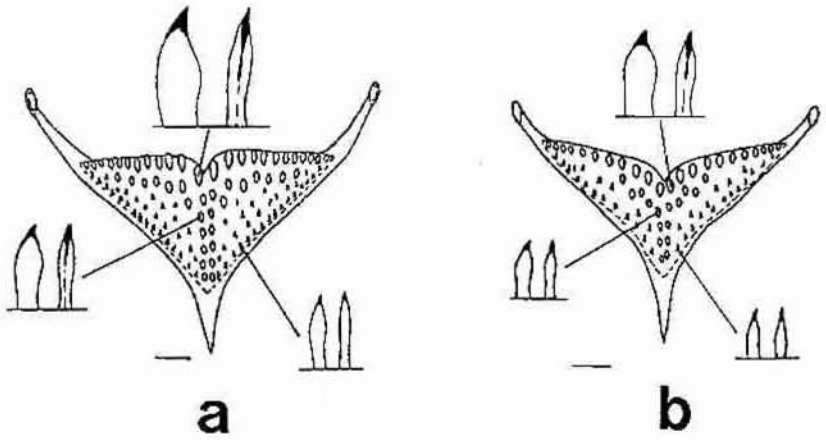


Figure 3 Paired lower pharyngeal bones and associated dentition of (a) *Hemichromis elongatus* [100.5 mm SL, Lubilaye River, Zaire] and (b) *Hemichromis frempongi* [86.0 mm SL, Abono, Lake Bosumptwi, Ghana], showing diagnostic differences in the shape of their tooth-bearing areas. [Scale: 1.0 mm]

4. Eighteen to 20 (mode: 18) teeth along the posterior margin of the lower pharyngeal bone; flank scales devoid of light spots; intercalary black dots present between the major maculae in specimens 10.0 cm SL or larger **[throat, breast and venter orange-red in individuals 7.5 cm SL or larger; color pattern of adults behaviorally invariant]** .....*Hemichromis fasciatus* Peters 1858

- Twenty-two - 24 (mode: 24) teeth along the posterior margin of the lower pharyngeal bone; each scale along the lower half of the flanks marked with a lighter spot; intercalary black dots never present between the major maculae **[each scale along the lower two thirds of the flanks marked with a metallic golden-green dot; rows of metallic dots separated by narrow red stripes in individuals > 5.0 cm SL; throat, breast and venter black in aggressive or sexually active adults]** .....*Hemichromis elongatus* (Guichenot 1861)

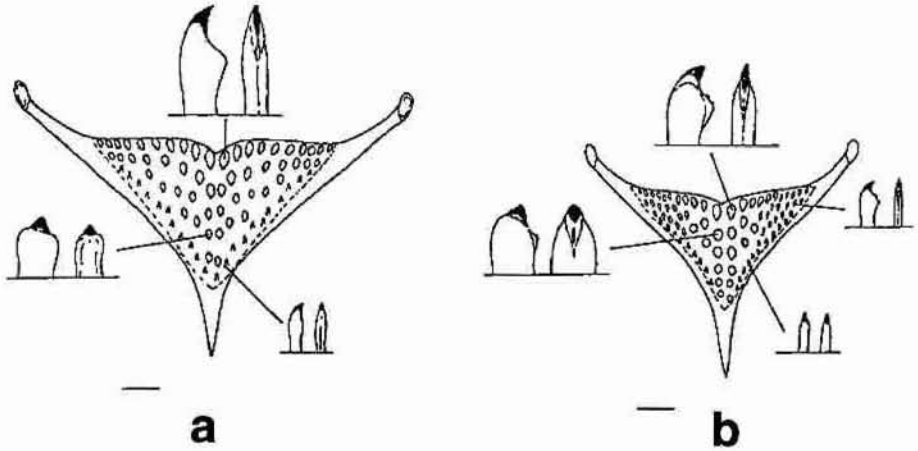


Figure 4 Paired lower pharyngeal bones and associated dentition of (a) *Hemichromis bimaculatus* [72.0 mm SL, Gibi Mountains, Liberia] and (b) *Hemichromis paynei* [71.5 mm SL, Lake Kwarko, Sierra Leone] showing diagnostic differences in their shape. [Scale: 1.0 mm].

5. Lower pharyngeal bone distance BC much greater than AB (Figs. 1 and 4a.) [body almost totally devoid of metallic blue or gold spangling] .....
.....*Hemichromis bimaculatus* Gill 1862

- Lower pharyngeal bone distance BC approximately equal to or less than AB **[metallic blue or gold spangling variably present on the body]** 6

6. Posterolateral teeth of the lower pharyngeal bone with a triserrate minor cusp (Fig. 5a.) **[cheeks and gill covers golden yellow or a broad golden yellow band extends from the rear margin of the eye to the edge of the operculum in sexually active individuals]** 7

- Posterolateral teeth of the lower pharyngeal bone with a biserrate or unserrated minor cusp (Fig. 5b & c.) **[golden yellow coloration absent from the head]**.....8

7. All lower pharyngeal teeth blade-like (See Fig. 5a. for basic shape.); 18 - 20 (mode: 18) teeth present along the posterior margin of the lower pharyngeal bone; clearly ocellated median spot bissected by the midlateral line (Fig. 6a.) **[metallic blue or gold spangles present in a midlateral band three to five scale rows deep; cheeks and gill covers golden yellow in both sexually quiescent and breeding individuals]** (See photo).....*Hemichromis cristatus* Loiselle 1979

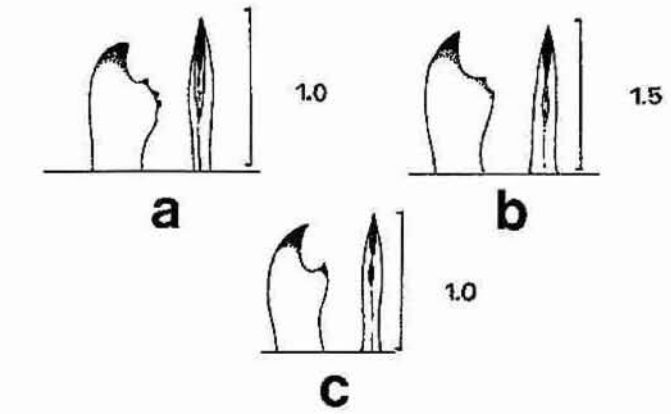
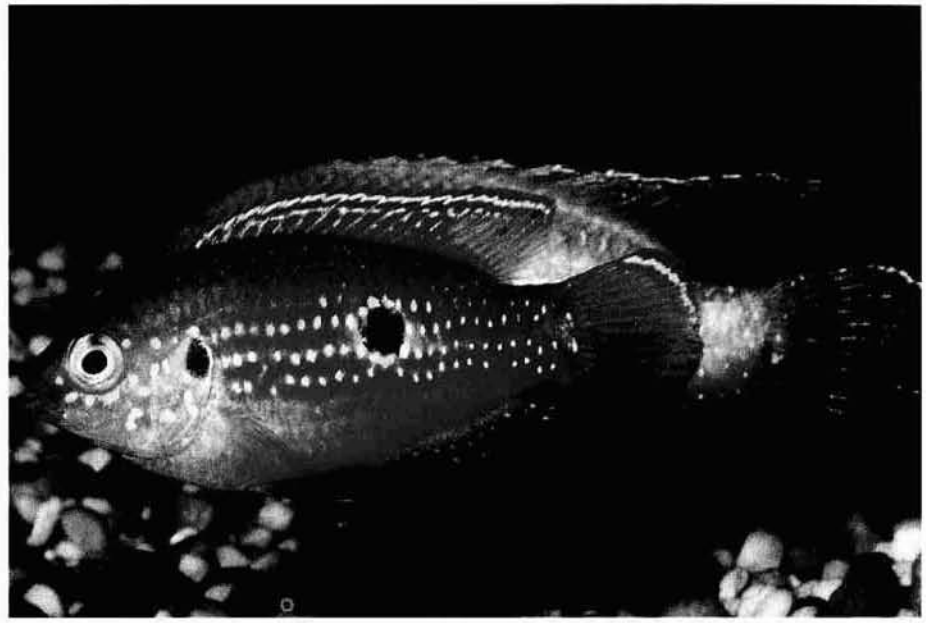
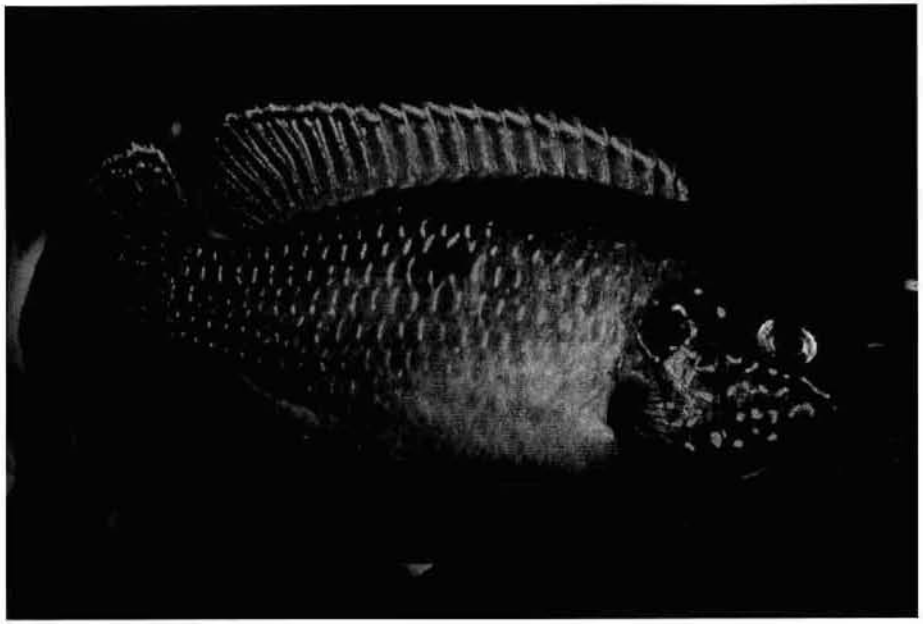


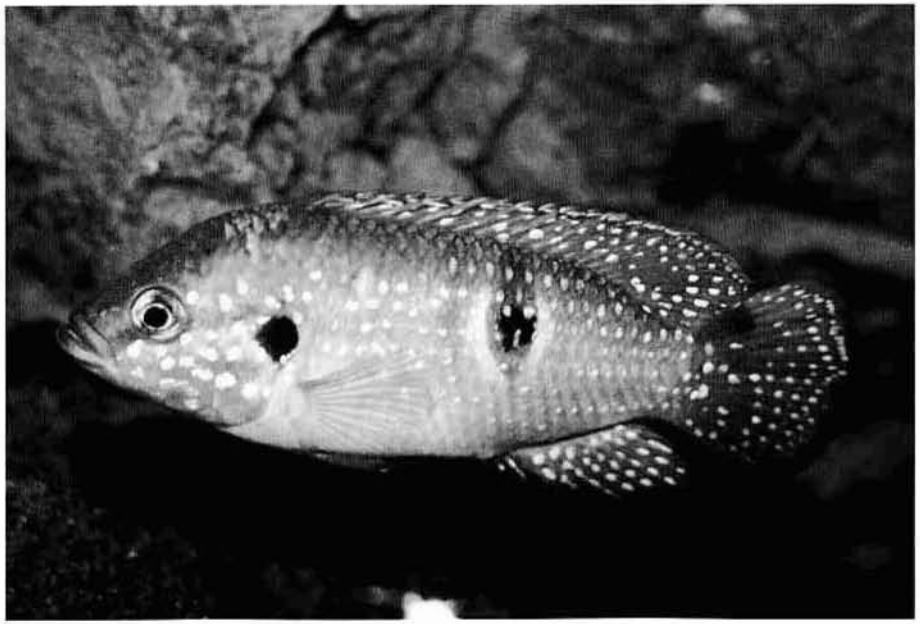
Figure 5. Individual teeth from the posterolateral row of the lower pharyngeal bones of (a) *Hemichromis cristatus* [triserrate or crested minor cusp], (b) *Hemichromis stellifer* [biserrate minor cusp] and (c) *Hemichromis guttatus* [unserrated minor cusp.].

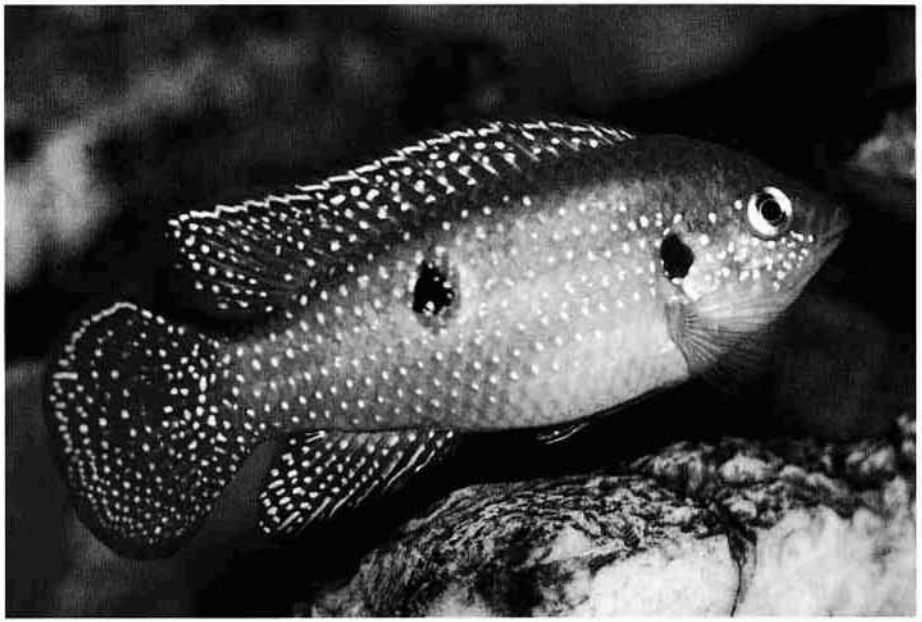


Top: Wild-caught *Hemichromis cristatus* from the Ogba River, Nigeria [female in the foreground]. Note the discrete rows of iridescent spangles on the flanks. **Bottom:** Wild-caught *Hemichromis paynei* from the vicinity of Robert's Field, Liberia. The light, metallic yellow postorbital band is particularly evident in sexually active individuals such as this ripe female. P.V. Loiselle photos.

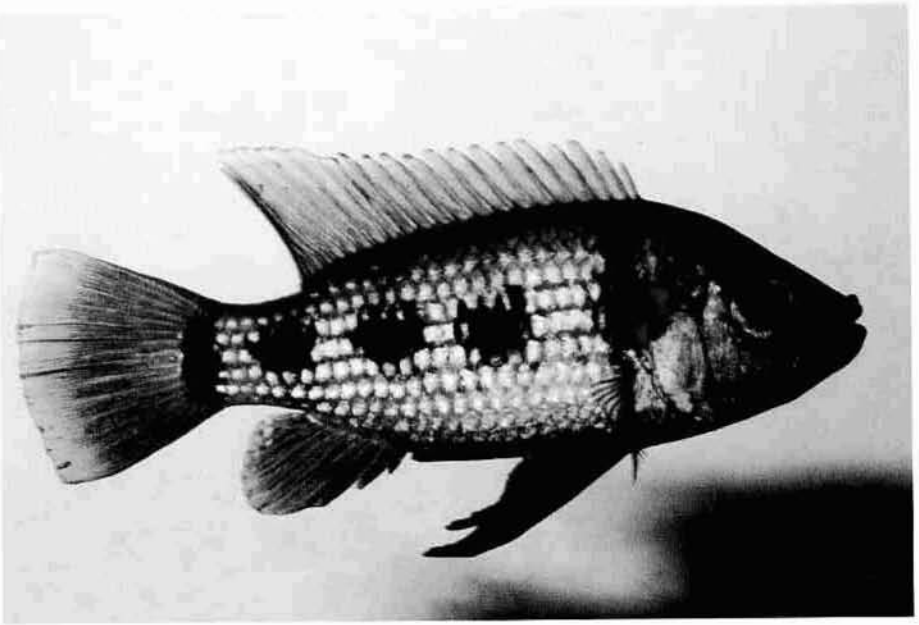


Top: Wild-caught *Hemichromis stellifer* from the vicinity of Kinshasa, Zaire. Note the presence of iridescent scale edges rather than discrete iridescent spangles on the flanks. **Bottom:** Aquarium-bred (F_3) descendent of *Hemichromis guttatus* collected from the Lagune de Lome, Togo. Note the shape of the median spot and the presence of numerous, discrete iridescent spangles on the flanks of this sexually quiescent male.





Top: Wild-caught *Hemichromis lifalili* from the Malembo (Stanley) Pool, Zaire. Note the shape and position of the ocellated median spot and the abundance of iridescent spangles on the flanks and vertical fins. P.V. Loiselle photo.
Bottom: *Hemichromis* cf. *cristatus* from Western Ghana. "Bleher Jewel Fish". P.V. Loiselle photo.



Top: *Hemichromis elongatus*, female. P.V. Loiselle photo.
Bottom: *Hemichromis fasciatus*, female, St. Paul's basin, Liberia. P.V. Loiselle photo.

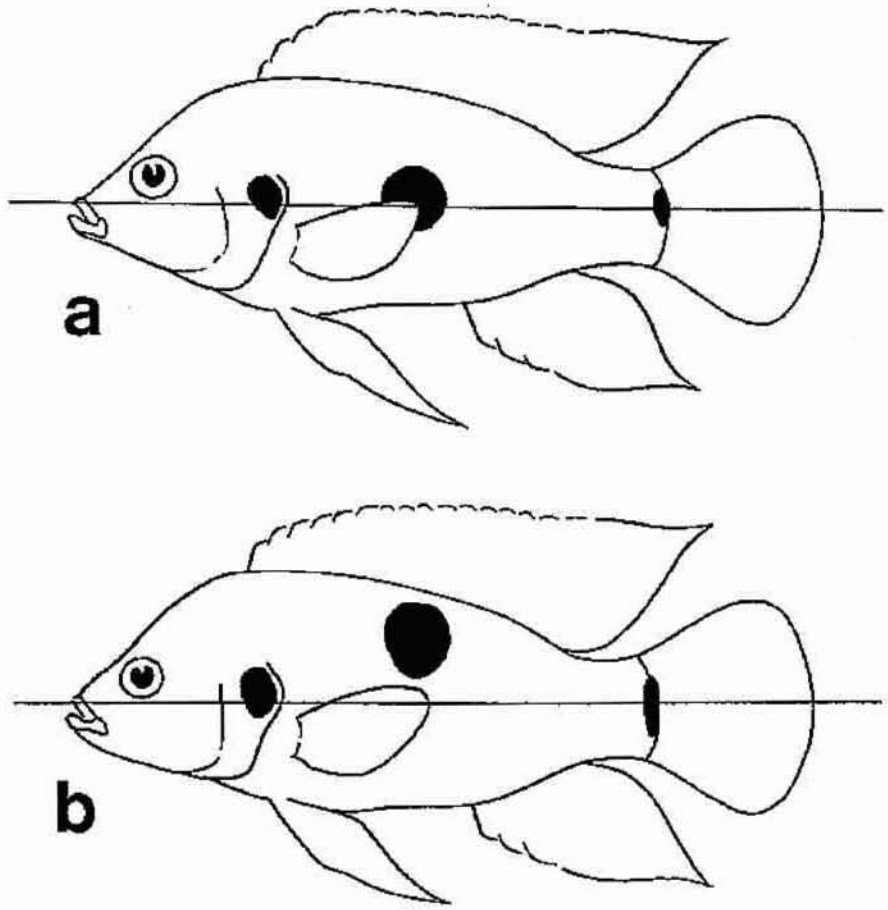


Figure 6. Position of the median spot relative to the midlateral line in (a) *Hemichromis cristatus* and (b) *Hemichromis paynei.*

- Median teeth of the lower pharyngeal bone enlarged, bulbous (Fig. 4b.); 22 - 24 (mode: 22) teeth along the posterior margin of the lower pharyngeal bone; unocellated median spot located entirely above the midlateral line (Fig. 6b.) **[very sparse metallic blue or gold spangling stochastically distributed on the flanks; golden yellow band extends from the posterior margin of the eye to edge of the operculum in sexually active individuals]**
(See Photo)] ..... *Hemichromis paynei* Loiselle 1979

8. Posterior margin of the tooth-bearing area of the lower pharyngeal bone indented, giving it a Y-shaped appearance (Fig. 7a.); all teeth along the posterior margin of the lower pharyngeal bone slender and blade-like **[each scale of the flanks with metallic blue edging; flanks devoid of discrete metallic spangles; dark blotch variably present in the spiny dorsal fin]** (See Photo)
..... *Hemichromis stellifer* Loiselle 1979

- Posterior margin of the tooth-bearing area of the lower pharyngeal bone straight or slightly convex, giving it a triangular appearance (Fig. 7b.); teeth along the posterior margin of the lower pharyngeal bone progressively more robust as one moves inwards from the outer margin of the dentigerous area **[metallic spangling present as a pattern of discrete spots on the flanks; scales devoid of metallic edging; no dark blotch in the spiny dorsal fin]** (See Photo)..... 9

9. Posterolateral teeth of the lower pharyngeal bone bicuspid, with a well-developed unserrated minor cusp evident in both median and posterolateral teeth (Fig. 7b.); median teeth somewhat bulbous, but never molariform; 22 - 24 (mode: 22) teeth along the posterior margin of the lower pharyngeal bone; lens-shaped median spot unequally bissected by the midlateral line
(See Photo.) ..... *Hemichromis guttatus* Gunther 1862

- Minor cusp in the posterolateral teeth of the lower pharyngeal bone reduced to an angled shoulder (Fig. 8a & b.); median teeth molariform, sometimes massively so; round or roughly oval median spot located entirely above the midlateral line
..... 10

10. Minor cusp of the innermost pharyngeal teeth of the posterolateral tooth row weakly biserrate (Fig. 8b.); 16 - 20 (mode: 18) teeth along the posterior margin of the lower pharyngeal bone; 6 - 9 narrow (one scale row wide) irregular vertical bars usually present on the flanks of preserved and stressed living individuals; **[males and females with an extensive pattern of metallic spangling on the flanks and vertical fins; dorsum rusty brown in sexually active males]** (See Photo).
..... *Hemichromis lifalili* Loiselle 1979

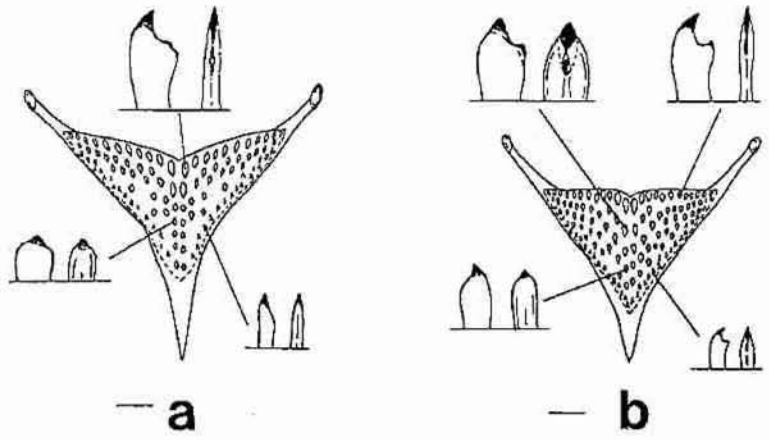


Figure 7. Paired lower pharyngeal bones and associated dentition of (a) *Hemichromis stellifer* [72.0 mm SL, Zaire River at Brazzaville, Congo Republic] and (b) *Hemichromis guttatus* [61.0 mm SL, Abo, southern Nigeria] showing diagnostic differences in the shape of their tooth-bearing areas. [Sale: 1.0 mm].

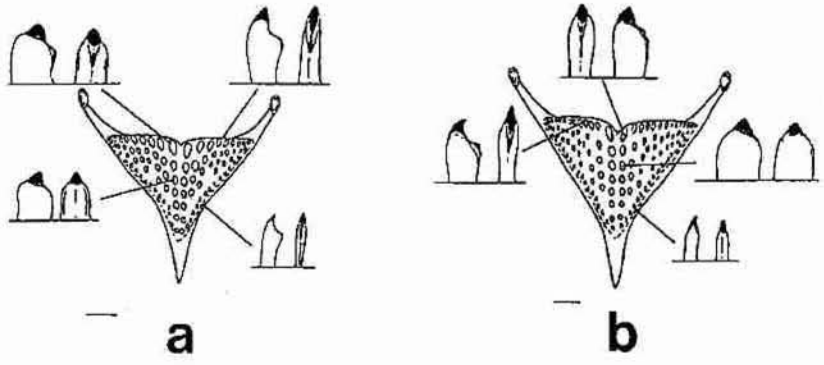


Figure 8. Paired lower pharyngeal bones and associated dentition of (a) *Hemichromis stellifer* [72.0 mm SL, Zaire River at Brazzaville, Congo Republic] and (b) *Hemichromis guttatus* [61.0 mm SL, Abo, southern Nigeria] showing diagnostic differences in the shape of their tooth-bearing areas. [Sale: 1.0 mm].

- Minor cusp of the innermost pharyngeal teeth of the posterolateral tooth row devoid of serrations (Fig. 8a.); 20 - 22 (mode: 20) teeth along the posterior margin of the lower pharyngeal bone; 5 - 7 broad (> one scale row wide) indistinct bars usually present on the flanks of preserved and stressed living individuals; **[pattern of metallic spangling on the flanks and vertical fins sparse in males and virtually absent in females; dorsum olive green in sexually active males]**
....*Hemichromis letourneauxi* Sauvage 1880

DISCUSSION

With the exception of *Hemichromis frempongi*, endemic to Bosumptwi, a crater lake in central Ghana, and *H. cerasogaster*, endemic to Lake Maji Ndombe (= Lac Leopold II) in east central Zaire, all species of the genus have, at one time or another, been imported as aquarium fish. Of the two large species, *H. elongatus* (*Hemichromis fasciatus* B *sensu* Burchard and Wickler) is far and away the more generally available. Wild fish are often exported from Nigeria and less frequently from Zaire, under such trade names as "five-spot cichlid," "five-star general" and *"Pelmatochromis annectans."* The fact that the sympatrically occurring *H. fasciatus (Hemichromis fasciatus* A *sensu* Burchard and Wickler) is absent from the preferred habitats of such staple Nigerian export items as reedfish, African butterflyfish, red-eyed tetras and the various *pelvicachromis* species may explain why it appears so seldom in shipments from Lagos. Crain and Loiselle (1984) have illustrated and discussed the aquarium husbandry of *Hemichromis elongatus*.

The range of the true *H. bimaculatus* extends from Liberia to Guinee. This area lies outside the main foci of tropical fish exportation from West Africa. Thus although aquarists and ichthyologists alike have long misapplied its name to many other red jewel fishes, this distinctive, long-snouted species did not make its aquarium debut until the mid 1970's, essentially as a by-product of killifish collecting expeditions mounted to Sierra Leone by European aquarists. Tank-bred fish can be had on a limited basis in Germany, but *H. bimaculatus* has not to date been available to North American aquarists. Excellent color photos of this species are available in Linke and Staeck (1980); those interested in information on it's husbandry are referred to the A.C.A.'s English translation of their book.

As the distributions of *H. paynei* and *H. bimaculatus* overlap, it is not surprising that the two species appeared on the aquarium scene at about the same time. The earliest published photo of this species I have encountered appears in Roloff (1977). Unlike its long-snouted congener, *H. paynei* is available on both sides of the Atlantic, although the European stocks are of Liberian provenance. For fuller information on the North American debut of this species, see Loiselle (1985). See Richter (1984) for color illustrations of the Sierra Leonia population of *H. paynei*. Good photos of the Liberian fish and information on husbandry and breeding can be found in Loiselle and Eckstein (1988).

Exported from Nigeria under the trade name "forest jewel fish," *H. cristatus* made its European aquarium debut in the mid-1960's and was definitely available … presented by Linke and Staeck (1980) suggest that its English common name accurately reflects this species' habitat preferences. *Hemichromis cristatus* as presently understood has been reported from coastal streams in Nigeria (collecting locality of the holotype), from extreme southwestern Ghana and from Guinee. This represents a truly remarkable east-west distribution, bridging as it does the two major barriers to the dispersal of forest-associated West African fishes, the Togo-Dahomey gap and the so-called Bouale-V in Cote d'Ivoire. However, no information is available on the life colors or natural history of either the Ghanaian or the Guinean populations of *Hemichromis cristatus*. The possibility that they represent distinct and to date undescribed species rather than mere outriders of *H. cristatus* thus cannot be dismissed out of hand. For color photos of the Nigerian population and data on husbandry and breeding, see Wolinski and Loiselle (1988).

The most commonly available of the red jewel fishes is *H. guttatus*, native to coastal rivers from Cameroun to eastern Cote d'Ivoire exclusive of the Volta, Komoe, Bandama and Sassandra basins. First representative of the genus to be imported as an ornamental fish, it made its aquarium debut in 1911 in a shipment of Nigerian fishes sent to Germany. The many articles purporting to deal with *H. bimaculatus* in both the aquaristic and scientific literature prior to 1979 invariably refer to *H. guttatus*. A catatechnic color form of East European origin characterized by vivid red coloration and an extensive pattern of metallic spangling in both sexes appears on the basis of morphological evidence to have been derived from *H. guttatus* through selective breeding. An excellent color photograph of this fish is to be found on the cover American edition of Fryer and Iles (1972). These fish have been sold under the trade names "*H. bimaculatus* type II" and forest jewel fish". In the last case, this has resulted in confusion with the quite different *H. cristatus*. The nomen *H. lifalili* has also been misapplied to these fish.

Hemichromis stellifer is found in coastal rivers from southern Cameroun to Zaire. It occurs sympatrically with *H. lifalili* in the lower Zaire River basin and in consequence has been episodically exported from Kinshasa since the mid-1950's. It is the only representative of this group of species that does not develop an intense orange-red base coloration when sexually active. This fact, together with its metallic blue scale edging, gives living animals an overall blue appearance. I suspect the so-called "blue jewel fish', a recently introduced aquarium strain whose trenchant anatomical characteristics do not fit any known representative of the genus, may be a hybrid of *H. stellifer* and one of the other red jewel fishes. Photographs of *H. stellifer* have also been misrepresented as *H. cerasogaster* in the European aquarium literature, e. g., Linke (1985).

Hemichromis lifalili is the only red jewel fish present in the northern and central Zaire basin, but occurs together with *H. stellifer* in the stretch of the drainage that runs from the Stanley Pool to the sea. It has been in the hobby as long as *H. stellifer* and as it is by far the more colorful of the two species, it predominates in shipments of wild jewel fish from Kinshasa. *Hemichromis lifalili* is produced commercially in Florida, fish farmers regarding it as merely a more colorful form of *H. guttatus*, which they in turn persistently mislabel as *H. bimaculatus* on

their price lists. European aquarists have confused *H. lifalili* with the catatechnic color form of *H. guttatus* usually known as '*H. bimaculatus* type II". Its round, clearly ocellated median spot which lies entirely above the midlateral line, and extensive pattern of metallic spangling, clearly differentiates living specimens of *H. lifalili* from *H. guttatus* of any description, or, for that matter, any of the other species of the genus currently available to aquarists.

Hemichromis letourneauxi is the northern and eastern outrider of the genus. It occurs in Lake Turkana (= Rudolph) and the Nile River below Murchison Falls, in oases throughout the Sahara, in Lake Chad and its inflowing streams and in the Niger, Volta, Komoe, Bandama, Sassandra, Gambia and Senegal Rivers in West Africa. The very infrequently imported single specimens that have reached the United States have been of Nigerian provenance. *Hemichromis guttatus* is the most common red jewel fish in the coastal region of Nigeria, but there are apparently transitional zones between scrub forest and savannah biotopes where it coexists with *H. letourneauxi*. As specimens of the Nile population have recently been brought into Germany, it should only be a matter of time before captive-bred specimens of this interesting cichlid become more widely available. This species has the most molariform dentition of any *Hemichromis*, a feature that simplifies the identification of preserved material. The most useful diagnostic feature of living individuals is the combination of an unocellated median spot located entirely above the midlateral line, a sparse pattern of metallic spangling and a distinct, olive-green dorsum. Regrettably, the photographs of this species in Linke and Staeck (1980) are of subadult individuals and do not do justice to its vivid coloration.

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The Teachers

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This morning I'm changing water in the old 55 under the open window of my bedroom and waiting for the sun. I've noticed for the first time in a long time the small sign I put on the bottom of the front glass ten years ago. It says "Channel 55." I can't recall the lost ghost who put it there. He's gone now. But I remember every generation of fishes which passed through this tank. Whatever hopeful hunger that wry sign once concealed has been partially satisfied, I think. I've watched this tank a lot. It's been a window on nature. It's been my classroom.

Now the sun is coming over the ridge. Birds celebrate in the bushes behind the house. Breezes mix with the sweet smell of algae from the aquarium. Holding one end of the siphon tube in a bucket and one end in the tank, I watch a school of four-inch *Rasbora caudimaculata* and *Rasbora kalochroma* frolic in the current from the siphon like children at recess. I direct the flow of water to a spot where a sunbeam enters the tank so I can watch *Rasbora* bodies glint