

# ***Astyanax altiparanae* Garutti & Britski, 2000 (Osteichthyes, Characidae) in the Iguaçu River basin**

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**ABSTRACT.** Garutti (1995) made a revision of some *Astyanax* (Osteichthyes, Characidae) species and the species called *tambuí* from the upper Paraná River basin, formerly identified as *Astyanax bimaculatus*, was considered new. Garutti & Britski (2000) later described it as *Astyanax altiparanae* (Pisces, Characiformes). However, they did not analyze specimens from the Iguaçu River basin at that time. The Iguaçu River, affluent to the Paraná River, has a high degree of endemism in its ichthyofauna because of the geographic isolation caused by the falls near its mouth. Thus, there were still many doubts regarding the specific status of the population from the Iguaçu River basin, also called *A. bimaculatus* before Garutti's studies. To verify if the population from the Iguaçu River belongs to the *A. altiparanae* species, we compared specimens from both basins and concluded that they belong to the same species, widening their geographic distribution.

**Key words:** *Astyanax altiparanae*, geographic distribution, Iguaçu River, upper Paraná River basin, Characidae, Tetragonopterinae.

**RESUMO. Comentários sobre a distribuição geográfica de *Astyanax altiparanae* Garutti & Britski, 2000 (Osteichthyes, Characidae) na bacia do rio Iguaçu.** Garutti (1995) fez a revisão de algumas espécies de *Astyanax* (Osteichthyes, Characidae) e aquela, conhecida como "tambuí" na bacia do alto rio Paraná, anteriormente identificada como *Astyanax bimaculatus*, foi considerada nova e posteriormente descrita por Garutti & Britski (2000) como *Astyanax altiparanae* (Pisces, Characiformes). Naquela oportunidade, entretanto, não foram analisados exemplares da bacia do rio Iguaçu. Esse afluente do rio Paraná apresenta um alto grau de endemismo em sua ictiofauna devido ao isolamento geográfico causado pelas cataratas situadas próximo à sua foz. No entanto, muitas dúvidas relacionadas ao status específico da população da bacia do Iguaçu, também chamada de *A. bimaculatus* antes dos trabalhos de Garutti, permaneceram. Com o escopo de verificar se a população do Iguaçu era da espécie *A. altiparanae*, comparamos espécimes das duas bacias e concluímos que elas pertencem à mesma espécie, sendo, portanto, sua distribuição geográfica ampliada.

**Palavras-chave:** *Astyanax altiparanae*, distribuição geográfica, rio Iguaçu, bacia do alto rio Paraná, Characidae, Tetragonopterinae.

## **Introduction**

Garutti (1995) made a revision of some *Astyanax* Baird and Girard, 1854 species that possess a black horizontal ovate spot, two brown vertical bars on the humeral region, a longzege black spot on the caudal peduncle, continued to the tip of the middle caudal rays, from the upper Paraná River, São Francisco and Amazonas basins. In that study, he assumed that the species from the upper Paraná River basin, formerly identified as *Astyanax bimaculatus* (Linnaeus, 1758), was a new species. Later on, Garutti and Britski (2000) described that new species as *Astyanax altiparanae*. However, they did not analyze specimens

from the Iguaçu River. This river is an affluent on the left bank of the Paraná River and has several high water falls near its mouth. Thus, the most important feature of the Iguaçu River is a high degree of endemism of its ichthyofauna due to its geographic isolation caused by the Iguaçu falls (Garavello *et al.*, 1997). Consequently, there were still doubts regarding the specific status of the population from the Iguaçu River basin, also called *A. bimaculatus* before Garutti's studies.

It is noteworthy that *Astyanax* species are common and widespread in both basins. Nevertheless, except for this species, all other *Astyanax* species that occur in the Iguaçu River basin

are endemic, and all the others from the upper Paraná River basin are absent in the Iguazu River.

With the aim of verifying if the population from the Iguazu River basin is the same species now called *A. altiparanae*, we analyzed and compared fishes from that basin with the original description of *A. altiparanae*.

### Material and methods

Counts and measurements based on Garutti (1995) were taken from 37 specimens from the Iguazu River basin (4 from the Segredo Reservoir, 19 from the Caxias Reservoir and 14 from the Jordão Reservoir). The data are presented as percentages of standard length, head length and body height.

One lot from the Paranaíba River sub-basin, also included in the original description of *Astyanax altiparanae*, was used only for comparative purposes.

**Material examined** (all from the Iguazu River basin, Paraná State, Brazil). -NUP583 (14 ex.) Jordão Reservoir, between Reserva do Iguazu and Foz do Jordão cities (about 25°45'S/52°10'W), viii.1995 to v.1999, col. Copel; -NUP1313 (19 ex.) córrego Vorá, affluent of the Caxias Reservoir, Três Barras do Paraná town (about 25°30'S/53°25'W), 23.i.2000, col. Copel; -NUP1314 (4 ex.), Segredo Reservoir, between Mangueirinha and Reserva do Iguazu cities (about 25°45'-25°58'S/51°30'-52°05'W), iii.1993 to ii.1995, col. Copel.

**Comparative material** (upper Paraná River basin, state of Goiás, Brazil). -NUP1214 (28 ex.), Corumbá Reservoir, between Caldas Novas, Corumbá, Pires do Rio and Ipameri cities (about 17°-18°S/48°W), iii.1996 to ii.2000, col. Nupélia.

### Results and discussion

Morphometric and meristic data of *Astyanax altiparanae* from the upper Paraná River basin based on Garutti and Britski (2000), and from the Iguazu River basin are presented in Table 1.

All the ranges of data from the Iguazu River basin population are enclosed in the ranges of the upper Paraná River basin population measured by Garutti and Britski (2000). These authors (*op. cit.*) examined thousands of specimens, effecting wider ranges than our 37 specimens.

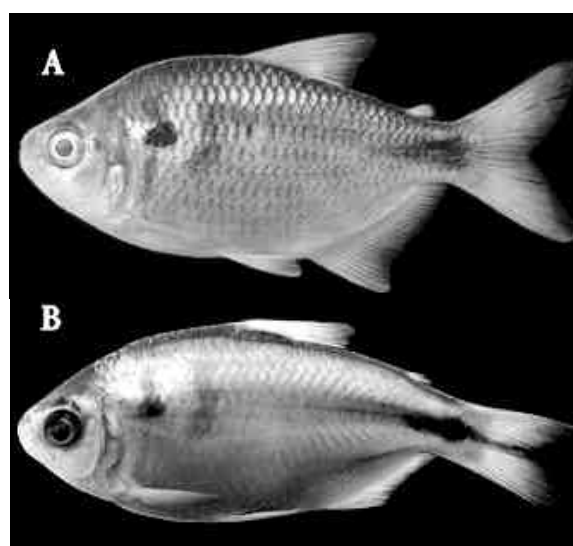
The color patterns of the specimens from both populations are very similar, as shown in Figure 1.

Based on morphological characters, we could not find any differences between the two populations analyzed. Thus, we conclude that they belong to the same species (*A. altiparanae*) that, thus, has a wider

geographic distribution, now including the Iguazu River basin in addition to the upper Paraná River basin.

**Table 1.** Descriptive morphometrics and meristics of *Astyanax altiparanae*. Data from Paraná River basin specimens based on Garutti and Britski (2000), including holotype, type-series and additional material (ranges are given for all measured specimens). SD = standard deviation

|                                   | Paraná River basin | Iguazu River basin (N=37) |       |       |
|-----------------------------------|--------------------|---------------------------|-------|-------|
|                                   | Range              | Range                     | Mean  | SD    |
| Standard length (mm)              | 28.6-139.4         | 55.5-99.5                 | 67.9  | 11.5  |
| <b>Morphometrics</b>              |                    |                           |       |       |
| <i>Percent of standard length</i> |                    |                           |       |       |
| Head length                       | 22.6-33.2          | 22.6-28.7                 | 26.4  | 1.4   |
| Body height                       | 33.6-54.7          | 40.4-46.6                 | 43.0  | 1.4   |
| Caudal peduncle height            | 9.9-15.2           | 10.0-13.1                 | 11.4  | 0.8   |
| Predorsal length                  | 41.7-62.2          | 50.1-56.6                 | 53.8  | 1.6   |
| Precanus length                   | 55.8-80.1          | 56.3-64.5                 | 60.2  | 1.6   |
| Dorsal-fin to pectoral-fin        | 36.2-61.9          | 40.3-46.3                 | 42.7  | 1.6   |
| Dorsal-fin to anus                | 25.0-54.3          | 41.8-48.3                 | 44.5  | 1.4   |
| Adipose-fin to anus               | 32.0-46.4          | 34.8-41.8                 | 38.3  | 1.7   |
| Dorsal-fin to adipose             | 33.3-48.3          | 34.7-41.2                 | 38.2  | 1.5   |
| <i>Percent of head length</i>     |                    |                           |       |       |
| Head height                       | 98.9-117.9         | 98.8-112.9                | 101.6 | 3.2   |
| Eye diameter                      | 21.4-43.7          | 28.8-39.3                 | 36.1  | 2.1   |
| Interorbital width                | 30.5-52.7          | 35.5-45.7                 | 39.6  | 2.4   |
| Percent of body height            |                    |                           |       |       |
| Caudal-peduncle height            | 22.5-39.8          | 23.5-30.1                 | 26.6  | 1.7   |
| <b>Meristics</b>                  |                    |                           |       |       |
| Premaxillary teeth                | 5                  | 5                         | 5     | ----- |
| Large dentary teeth               | 4                  | 4                         | 4     | ----- |
| Small dentary teeth               | 4-12               | 6-8                       | 7     | 0.9   |
| Cusps of premaxillary teeth       | 5-7                | 5-6                       | 5.6   | 0.5   |
| Dorsal-fin rays                   | 12                 | 11-12                     | 11.9  | 0.3   |
| Pectoral-fin rays                 | 12-13              | 10-12                     | 10.7  | 0.6   |
| Pelvic-fin rays                   | 8-9                | 8-9                       | 8.8   | 0.4   |
| Anal-fin rays                     | 22-34              | 26-28                     | 26.8  | 0.7   |
| Caudal-fin rays                   | 19                 | 19                        | 19    | ----- |
| Lateral line scales               | 33-41              | 35-37                     | 36    | 0.6   |
| Scale rows above lateral line     | 6-8                | 6-7                       | 6.7   | 0.3   |
| Scale rows below lateral line     | 4-8                | 5-6½                      | 6.0   | 0.4   |



**Figure 1.** *Astyanax altiparanae*, NUP1313, 74.7mm SL, Iguazu River basin (A) and NUP1214, 69.1mm SL, Corumbá River basin (B)

Prioli (2001), using RAPD markers, analyzed this same subject and corroborated our results while adding that the Iguaçu River population had a high intrapopulation genetic diversity. In this study, the author (*op. cit.*) suggests some hypothesis to explain the existence of this species there. Nevertheless, nothing is conclusive and we do not know if it is a consequence of human introduction or common ancestor. We fear that it can not be understood any more. However, it makes us realize the great importance of studying and preserving the ichthyofauna from the Iguaçu River, yet so misunderstood and unknown. It is worse because species distribution along this river is not uniform (Garavello *et al.*, 1997) and there are many hydroelectric power plants in this basin. They are geographic barriers preventing the spread of the Iguaçu River ichthyofauna.

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