An updated list of the ichthyofauna of Ipanema National Forest, São Paulo, Brazil

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Abstract
The Ipanema National Forest has been thoroughly studied in the last 25 years, and 50 species of fish species (47 native and three invasive) were reported in 2013. Intensive inventory work carried out by us between 2012 and 2017 found 39 additional species distributed in five orders and 13 families. Our study provides new data which may help efforts to preserve the Ipanema National Forest.

Keywords
Conservation unit; freshwater fish; inventory; Sorocaba river basin

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Introduction
Conservation units are important in preservation (Dala-Corte et al. 2009), protecting and delimiting high biodiversity areas that require protection. The reduction of natural habitats by anthropization is one of the main reasons of biodiversity loss, including freshwater fish diversity (Cetra et al. 2010), but conservation units have a central role in providing shelter and on keeping habitat diversity, critical aspects in the survival of species. In Ipanema National Forest, a national conservation unit created in 1992 (Smith and Regalado 2008), various lentic and lotic environments can be found that provide conditions for the maintenance of the ichthyofauna. Although protected areas serve to preserve biodiversity by the preservation of habitats, there is still a lack of information about this conservation area, especially regarding aquatic ecosystems (Casarim et al. 2020).

Smith et al. (2013) provided a preliminary checklist of fish species of Ipanema National Forest based on previous reports by Smith (1999), Smith and Marciano (2000) in particular, as well as studies that were part of the Ipanema National Forest Management Plan in 2003 (Brazil, 2003) and the studies of Smith (2003), Smith et
al. (2007), Smith and Regalado (2008), and Smith et al. (2009). These sources list a total of 50 species distributed in seven orders, 21 families, and 41 genera of fishes living on Ferro Stream and Verde River, in one stretch of the Ipanema River (dam and downstream the dam), in the Hedberg Reservoir, in the Limão and Cobra lagoons and in other lagoons that occur in the conservation unit. The goal of our study was to add to the extensive information on the ichthyofauna of Ipanema National Forest by sampling new locations and recording additional species with experimental fishing techniques and by consulting more recent publications.

Study Site

Ipanema National Forest has an area of 5,180 ha (approximately 23°25’S, 047°37’W at its center). It encompasses the municipalities of Iperó, Araçoiaba da Serra, and Capela do Alto in southeastern São Paulo state, 125 km far from the capital, São Paulo (Fig. 1).

Methods

Samples were collected from 2012 to 2017 in various water bodies using active capture methods: cast nets, trawl nets, hand nets, and a fishing rod with hooks (Table 1). The collections were made under permit from Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio 43596-1). The specimens captured were euthanized in eugenol, fixed in 10% formalin, and preserved in 70% alcohol. Species were identified using available literature, keys, and the help of specialists. Voucher specimens were deposited at the Ichthyology Collection of the Fish Department of the Museu de Zoologia da Universidade de São Paulo (MZUSP) (Appendix) and the Laboratory of Structural and Functional Ecology of Ecosystems of the Universidade Paulista, Sorocaba Campus (LEEF). An extensive bibliographical review was carried out to verify the publication of ichthyological data in Ipanema National Forest since 2013.

Results

In this study, we added 39 species in addition to those already recorded in previous studies, resulting in a total of 89 species for Ipanema National Forest. The 39 species recorded here for the first time are distributed in five orders and 13 families. The taxonomic list of identified species is shown in Table 2, and the newly recorded species are shown in Figure 2. Most of these species belong to the orders Characiformes (23 species) and Siluriformes (10 species). The most diverse families were the Characidae and Loricariidae with 13 and six species, respectively.

Non-native species found in the area are concentrated in lentic habitats (Hedberg reservoir and Cobra

Figure 1. Hydrographic system of Ipanema National Forest and sites sampled.
### Table 1. Stations sampled in Ipanema National Forest.

| Sites       | Locality                      | Geographic coordinates       | Environment | Capture Method                  |
|-------------|-------------------------------|------------------------------|-------------|---------------------------------|
| Ip01        | Ipanema River (downstream)    | 23°22.40' S, 049°38.51' W   | Lotic       | Trawl nets, hand nets           |
| Ip02        | Ipanema River (upstream)      | 23°22.40' S, 049°38.51' W   | Lotic       | Trawl nets, hand nets           |
| Ip03        | Cobra Lagoon                  | 23°26.32' S, 049°35.41' W   | Lentic      | Cast nets, fishing rod with hooks |
| Ip04        | Hedberg Dam (margin)          | 23°25.40' S, 049°35.90' W   | Lentic      | Cast nets, fishing rod with hooks |
| Ip05        | Hedberg Dam (medium)          | 23°25.40' S, 049°35.30' W   | Lentic      | Cast nets, fishing rod with hooks |
| Ip06        | Verde River                   | 23°27.18' S, 049°36.31' W   | Lotic       | Cast nets, fishing rod with hooks |
| Ip07        | Hedberg Dam (flooded area)    | 23°25.48' S, 049°35.55' W   | Lentic      | Cast nets, fishing rod with hooks |
| Ip08        | Hedberg Dam                   | 23°25.46' S, 049°36.54' W   | Lentic      | Cast nets, fishing rod with hooks |
| Ip09        | Limão Lagoon                  | 23°26.23' S, 049°37.30' W   | Lotic       | Trawl nets, hand nets           |
| Ip10        | Ferro Stream                  | 23°26.23' S, 049°37.30' W   | Lotic       | Trawl nets, hand nets           |
| Ip11        | Ferro Stream                  | 23°26.23' S, 049°37.30' W   | Lotic       | Trawl nets, hand nets           |
| Ip12        | Ipanema River (upstream)      | 23°25.38' S, 049°38.51' W   | Lotic       | Trawl nets, hand nets           |
| Ip13        | Ipanema River (upstream)      | 23°25.38' S, 049°38.51' W   | Lotic       | Trawl nets, hand nets           |
| Ip14        | Ipanema River (upstream)      | 23°25.38' S, 049°38.51' W   | Lotic       | Trawl nets, hand nets           |
| Ip15        | Ipanema River (upstream)      | 23°25.38' S, 049°38.51' W   | Lotic       | Trawl nets, hand nets           |
| Ip16        | Ipanema River (upstream)      | 23°25.38' S, 049°38.51' W   | Lotic       | Trawl nets, hand nets           |

### Table 2. Taxonomic list of fish species from the Ipanema National Forest.

| Order, family | Species                                      | Oliveira et al. 2013 | Smith et al. 2013 | New Records | Voucher       |
|---------------|----------------------------------------------|----------------------|-------------------|-------------|---------------|
| CHARACIFORMES | Acestrorhynchus lacustris (Lütken, 1875)     | X                    |                   |             | MZUSP 115236  |
|               | Leporinus friderici (Bloch, 1794)            | X                    |                   |             |               |
|               | Leporinus striatus Kner, 1858                | X                    |                   |             |               |
|               | Megaleporinus obtusidens (Valenciennes, 1837) | X                    |                   |             |               |
|               | Schizodon nasutus Kner, 1858                 | X                    |                   |             |               |
|               | Bryconamericus iheringii (Boulenger, 1887)   | X                    |                   |             | LEEF 110611-4 |
|               | Cheirodon stenodon Eigenmann, 1915           | X                    |                   |             | LEEF 110611-3 |
|               | Hemigrammus marginatus Ellis, 1911           | X                    |                   |             | LEEF 115131, 115139 |
|               | Hyphessobrycon bisusatus Ellis, 1911         | X                    |                   |             | LEEF 115133, 115138, 115162 |
|               | Odontostilbe microcephala Eigenmann, 1907    | X                    |                   |             |               |
|               | Oligosarcus pintoi Campos, 1945              | X                    |                   |             |               |
|               | Piabarchus stramineus (Eisenmann, 1908)      | X                    |                   |             | LEEF 115129, 115155, 115157 |
|               | Piabina argentei Reinhardt, 1867             | X                    |                   |             | LEEF 140122  |
|               | Planaltina britskii Menezes, Weitzman & Burns, 2003 | X                    |                   |             | LEEF 121112  |
|               | Psalidodon anisitsi Eigenmann, 1907           | X                    |                   |             | LEEF 115151  |
|               | Psalidodon beckeri Van & Castro, 2007         | X                    |                   |             | LEEF 115136, 115149 |
|               | Psalidodon fasciatus Cuvier, 1819             | X                    |                   |             | LEEF 130990  |
|               | Psalidodon paranus Eigenmann, 1914           | X                    |                   |             | LEEF 13013   |
|               | Psalidodon egenmaneirosus (Cope, 1894)       | X                    |                   |             | LEEF 115136, 115149 |
|               | Psalidodon schubarti (Britski, 1964)          | X                    |                   |             | LEEF 130990  |
|               | Salminus hilarii Valenciennes, 1850          | X                    | X                  |             | LEEF 13013   |
|               | Serapinus notomelas (Eisenmann, 1915)        | X                    |                   |             | MZUSP 115241  |
| Crenuchidae   | Chacoidium zebrum Eisenmann, 1909            | X                    |                   |             | LEEF 115145, 115164 |
| Curimatidae   | Gephyochus gilli (Eisenmann & Kennedy, 1903) | X                    |                   |             | LEEF 140122  |
|               | Gephyochus modestus (Fernández-Vélez, 1948)  | X                    |                   |             | MZUSP 115235  |
|               | Steindachnerina inculpata (Fernández-Vélez, 1948) | X                    |                   |             | MZUSP 115235  |
| Erythrinidae  | Hoplias malabaricus (Block, 1794)            | X                    |                   |             | LEEF 115143, 115168, MZUSP 115230 |
| Order, family         | Species                                           | Oliveira et al. 2013 | Smith & et al. 2015 | New records | Voucher |
|----------------------|---------------------------------------------------|----------------------|---------------------|-------------|---------|
| Serrasalmidae        | Serrasalmus maculatus Kner, 1858                   | X                    |                     |             |         |
|                      | Piaractus mesopotamica (Holmberg, 1887) †         |                      |                     |             |         |
| Parodontidae         | Aporoidea affinis (Steindachner, 1879)            | X                    |                     |             |         |
|                      | Aporoidea praecoxiae (Eigenmann, 1907)            |                      |                     |             |         |
|                      | Parodon nasus Kner, 1859                          | X                    |                     |             |         |
| Pechliodontidae      | Prichilodus ketulus (Valenciennes, 1837)          | X                    |                     |             |         |
|                      | Prichilodus viroboides Kner, 1859                 | X                    |                     |             |         |
| Trichopteridae       | Triporthus nematus (Kner, 1858) †                | X                    |                     |             |         |
| CYPRINIFORMES         | Cyprinidae                                        |                      |                     |             |         |
|                      | Cyprinus carpio Linnaeus, 1758                    | X                    |                     |             |         |
| GYMNITIFORMES         | Sternopygidae                                     |                      |                     |             |         |
|                      | Eigenmannia aff. wrencsens (Valenciennes, 1836)   | X                    |                     |             |         |
| Gymnotidae           | Gymnatus carpi Linnaeus, 1758                     | X                    |                     |             |         |
|                      | LEEF 115128, 115141                               |                      |                     |             |         |
| SILURIFORMES          | Auchenipteridae                                   |                      |                     |             |         |
|                      | Tatia novai (Ihering, 1930)                       | X                    |                     |             |         |
| Aspredinidae          | Aspredacara larvi Ihering, 1930                   |                      |                     |             |         |
| Callichthyidae        | Corydoras aeneus (Gill, 1858)                     | X                    |                     |             |         |
|                      | Corydoras flavicaudus Ihering, 1911               |                      |                     |             |         |
|                      | Hypostomum littorale (Hancock, 1828)             |                      |                     |             |         |
| Cetopidae            | Cetopsis goioi Kner, 1858                         | X                    |                     |             |         |
| Claridae             | Claris ganeipus (Burchell, 1822) †               |                      |                     |             |         |
| Pimelodidae          | Iheringichthys syi Azpelicueto & Britski, 2012   | X                    |                     |             |         |
|                      | Pimelodus maculatus La Cépede, 1803              | X                    |                     |             |         |
| Heptapteridae         | Imparfinis minini Hausman, 1911                   | X                    |                     |             |         |
|                      | Imparfinos schubarti (Gomes, 1956)                |                      |                     |             |         |
|                      | Pimelodella meeki Eigenmann, 1910                 | X                    |                     |             |         |
|                      | Pimelodella rudolph Miranda-Ribeiro, 1918         | X                    |                     |             |         |
|                      | Rhamdia quelen (Duoy & Gaimard, 1824)             | X                    |                     |             |         |
| Pseudopimelodidae     | Pseudopimelodus manganus (Valenciennes, 1835)     | X                    |                     |             |         |
|                      | Microgalanis garavelloi Shibatta & Benine, 2005   | X                    |                     |             |         |
| Trichomycteriidae     | Cambeva iheringi (Eigenmann, 1917)                | X                    |                     |             |         |
|                      | Paravandellia aasyma Miranda Ribeiro, 1912        | X                    |                     |             |         |
| Loricariidae          | Hisonotus dyrenovacauda (Miranda-Ribeiro, 1918)   | X                    |                     |             |         |
|                      | Hypostomus anostroides (Ihering, 1911)            | X                    |                     |             |         |
|                      | Hypostomus hemannii (Ihering, 1905)               | X                    |                     |             |         |
|                      | Hypostomus marginifer (Regan, 1908)               | X                    |                     |             |         |
|                      | Hypostomus regani (Ihering, 1905)                 | X                    |                     |             |         |
|                      | Hypostomus sp.                                    | X                    |                     |             |         |
|                      | Hypostomus striaticeps (Regan, 1908)              | X                    |                     |             |         |
|                      | Pterygoplichthys amboetelli (Holmberg, 1893) †    | X                    |                     |             |         |
|                      | Rivieriana latrostris (Boulenger, 1900)           | X                    |                     |             |         |
|                      | Rivieriana sp.                                    | X                    |                     |             |         |
Except for *Coptodon rendalli* (Boulenger, 1897), which is widely distributed in the numerous water bodies. The national forest includes species with migratory habits, parental care, and internal fertilization (Table 3). The feeding habits of the species in Ipanema National Forest are predominantly omnivorous and insectivorous. Other features and details of the distribution of species are included in Table 3. The more common species in rivers, including Verde and Ipanema rivers, are *Geophagus brasiliensis* (Quoy & Gaimard, 1824) (cará), *Astyanax lacustris* (Lütken, 1875) and *Psalidodon fasciatus* (Cuvier, 1819) (lambaris), *Cyphocharax modestus* (Fernández-Yépez, 1948) and *Steindachnerina insculpta* (Fernández-Yépez, 1948) (saguirú), *Acestrorhynchus lacustris* (Lütken, 1875) (peixe-cadela), and *Phalloceros harpagos* Lucinda, 2008 (guarú).

**Identification.** Body deep and high; mouth terminal; inner row of premaxilla with 5 teeth, outer row with 4 or 5, dentary with 8–16, no maxillary teeth. Lateral line complete, with 34–36 scales; transversal series above lateral line with 7–7½ scale rows and below with 6–6½ scale rows. Dorsal fin with 10 rays, pectoral fin with 12 or 13 rays, pelvic fin with 9 rays, anal fin with 25–27 rays, and caudal fin with 19 rays. Ground color silvery; one black rounded humeral blotch followed by another vertically elongated humeral blotch to median caudal-fin rays. Yellowish fins (Graça and Pavanelli 2007; Ota et al. 2018).

**Bryconamericus iheringii** (Boulenger, 1887)

**Material examined.** BRAZIL – São Paulo • Iperó, Verde River, 23°26.35′S, 40°35.28′W; 560 m alt.; 12.VI. 2013; W.S. Smith and L. Halcsik leg.; hand nets; LEEF 110611-4 (8 spec., 21.0–230.0 mm SL).

**Identification.** Body high and laterally compressed; premaxilla with two rows of teeth; outer row with three to six teeth; cycloid scales regularly imbricated; lateral line slightly curved; greatest body depth anterior to dorsal fin origin (Tatsumi 2006).

**Cheirodon stenodon Eigenmann, 1915**

**Material examined.** BRAZIL – São Paulo • Iperó, Verde River, 23°27.18′S, 40°35.31′W; 560 m alt.; 11.VI. 2013; W.S. Smith and L. Halcsik leg.; cast nets; LEEF 110611-3 (5 spec., 21.0–22.0 mm SL).

**Identification.** Body elongated; mouth terminal; premaxilla with 5 teeth, dentary with 8–13 and maxilla with 1 tooth. Lateral line incompletely pored, with 30–34 scales; transversal series above lateral line with 4 scale rows and below with 3 scale rows. Dorsal fin with 7 rays, pectoral fin with 7–9, pelvic fin with 7, anal fin with 18–20 rays and caudal fin with 23 rays. Black spot covering only the medial portion of the base of the caudal fin (Castro et al. 2004).

**Hemigrammus marginatus** Ellis, 1911

**Material examined.** BRAZIL – São Paulo • Iperó, Hedberg Dam; 23°25.46′S, 40°35.54′W; 550 m alt.; 12. II.2012; W.S. Smith and L. Halcsik leg.; cast nets; LEEF 15132, 15147, LEEF 115156, LEEF 1115167 (18 spec., 90.0–130.5 mm SL).
Table 3. Fish species occurring in the Ipanema National Forest, with their characteristics according to Cardone et al. (2006), Castro et al. (2004), Gomiero and Goitein (2008), Latini et al. (2016), Marçal (2009), Meschiatti and Arcifa (2009), Oliveira et al. (2013), Shibata and Orsi (2016) and Resende et al. (2016).

| Species | Common name | Feeding habitat | Reproduction |
|---------|-------------|-----------------|--------------|
| Aesthesynchus lacustris | cadela | Piscivorous | External fertilization, without parental care, non-migratory |
| Apareiodon affinis | caniobre | Detritivore | External fertilization, without parental care, non-migratory |
| Apareiodon proconiabre † | caniobre | Detritivore | External fertilization, without parental care, non-migratory |
| Piaractus bocourti | lambir | Omnivorous | External fertilization, without parental care, non-migratory |
| Piaractus fasciatus | lambir do rabo vermelho | Omnivorous | External fertilization, without parental care, non-migratory |
| Astyanax lacustris | lambir | Omnivorous | External fertilization, without parental care, non-migratory |
| Brycon amazonicus † | matrinxá | Omnivorous | External fertilization, parental care, non-migratory |
| Bryconamericus iheringii | peixe-banjo | Detritivore | External fertilization, without parental care, non-migratory |
| Cichla obscura larv ‡ | — | — | — |
| Cymba lateralis | sobe-serra | Insectivorous | External fertilization, without parental care, non-migratory |
| Ctenopoma bojohi | candiru | Insectivorous | External fertilization, without parental care, non-migratory |
| Characidium zebra | caniobre | Insectivorous | External fertilization, without parental care, non-migratory |
| Cheirodon stenodon | pequi | Detritivore | External fertilization, without parental care, non-migratory |
| Cichlasoma paraneense ‡ | acaré | Omnivorous | External fertilization |
| Clarion gaimardii | bagre africano | Omnivorous | External fertilization, without parental care, migratory |
| Cyprinodon reidi | tilapia | Herbivore | External fertilization, without parental care, migratory |
| Corydoras amicus | noquinhá | Omnivorous | External fertilization, without parental care, non-migratory |
| Corydoras flavus | noquinhá | Omnivorous | External fertilization, without parental care, non-migratory |
| Cyphocharax gilli | curimba | Detritivore | External fertilization, without parental care, non-migratory |
| Cyphocharax modestus | saquiro | Ilophaghe | External fertilization, without parental care, non-migratory |
| Cyprinus carpio | carpa | Herbivore / detritivore / zoobenthic | External fertilization, without parental care, non-migratory |
|Eigenmannia aff. virescens † | tuíra | Insectivorous | External fertilization, without parental care, non-migratory |
| Geophagus brasiliensis | curiu | Omnivorous | External fertilization, parental care, non-migratory |
| Gymnotus carapo | tuíra | Carnivore | External fertilization, parental care, non-migratory |
| Hemigrammus maragogus | piaba | Omnivorous | External fertilization, without parental care, non-migratory |
| Hisonotus depressicaudus | limpa-vídeo | Detritivore | External fertilization, without parental care, non-migratory |
| Hypopterus malabaricus | traíra | Carnivore | External fertilization, without parental care, non-migratory |
| Hoploblepharoides littoralis | cabaça | Omnivorous | External fertilization, parental care |
| Hypseleotris brasiliensis | tetra | Herbivore | External fertilization, without parental care |
| Hypsoscephalus bifasciatus | cascudo | Herbivore / detritivore | External fertilization, parental care, non-migratory |
| Hypsoscephalus nigrofasciatus | cascudo | Herbivore / detritivore | External fertilization, parental care, non-migratory |
| Hypsoscephalus nigrofasciatus ‡ | cascudo | Herbivore / detritivore | External fertilization, parental care, non-migratory |
| Hypsoscephalus nigrofasciatus ‡ | acari | Herbivore / detritivore | External fertilization, non-migratory |
| Hypsoscephalus nigrofasciatus ‡ | cascudo | Herbivore / detritivore | External fertilization, without parental care, non-migratory |
| Hypsoscephalus nigrofasciatus ‡ | cascudo-pintado | Herbivore / detritivore | External fertilization, parental care, non-migratory |
| Iheringichthys zély | mandi | Carnivore, Insectivorous | External fertilization, without parental care, non-migratory |
| Imparfinis micrini | bagrinho | Insectivorous | External fertilization, parental care, non-migratory |
| Imparfinis schubarti † | bagrinho | Insectivorous | External fertilization, without parental care, non-migratory |
| Lepomis fridmani | piuca | Omnivorous | External fertilization, parental care, non-migratory |
| Lepomis strinatus † | caniobre | Omnivorous | External fertilization, without parental care, non-migratory |
| Megaleoparodus robustus | piava | Herbivore | External fertilization, without parental care, non-migratory |
| Microglanis garvellooi | bagrinho | Insectivorous | External fertilization, non-migratory |
| Odontostilbus microstilus | peiquinho | Omnivorous | External fertilization, without parental care, non-migratory |
| Pimelodus obtusilabris | peixe-cachorro | Carnivore | External fertilization, without parental care, non-migratory |
| Oreochromis niloticus † | tilapia | Detritivore | External fertilization, parental care, non-migratory |
| Panaequus axyrya | cadiru | Hematopagous | External fertilization, without parental care, non-migratory |
| Parodon nasus | caniobre | Oligophagous | External fertilization, without parental care, non-migratory |
| Phalloceros harpagos | barrigudinho | Detritivore | — |
| Plagioscion stramineus | peiquinho | Omnivorous | External fertilization, without parental care, non-migratory |
| Pimelodus argenteus | piaba | Insectivorous | External fertilization, without parental care, non-migratory |
| Pimelodus maculatus | piaba | Insectivorous | External fertilization, without parental care, non-migratory |
| Planililia laticeps | piaba | — | — |
| Prochilodus reticulatus † | lebiste | Omnivorous | Internal fertilization, without parental care, non-migratory |
| Prochilodus virgatus † | barrigudinho | Omnivorous | Internal fertilization, non-migratory |
| Prochilodus lineatus | curimba | Oligophagous | External fertilization, without parental care, migratory |
| Prochilodus vimboides ‡ | curimba | Oligophagous | External fertilization, without parental care, migratory |
Material examined. BRAZIL – São Paulo • Iperó, Ipapemama River; 23°22.40’S, 049°38.51’W; 560 m alt.; 10.I.2014; W.S. Smith and L. Halcsik leg.; trawl nets; LEEF 115131, LEEF 115139 (15 spec., 10–22.0 mm SL).

Identification. Body elongated; mouth terminal; outer row of premaxilla with 3 teeth, median row with 2 and inner row with 4, dentary with 6 or 7 and maxilla with 2 or 3 teeth. Lateral line complete, with 37–40 pored scales; transverse series above lateral line with 5 or 5½ scales above and below with 3 or 3½ scale rows. Dorsal fin with 10 rays, pectoral fin with 15–17, pelvic fin with 8, anal with 17–21, and caudal fin with 19 rays. Ground color silvery to pale yellow; black humeral spot; black humeral border stripe; black humeral spots lying at the height of the lateral line (Yoshida et al. 2016).

**Piabarchus stramineus** (Eigenmann, 1908)

Material examined. BRAZIL – São Paulo • Iperó, Ipapenama River; 23°22.40’S, 049°38.51’W; 560 m alt.; 08.II.2016; W.S. Smith and L. Halcsik leg.; hand nets; LEEF 115129, LEEF 115155, LEEF 115157 (5 spec., 25.0–37.0 mm SL).

Identification. Body deep; mouth terminal; premaxillary teeth in two rows; lateral line complete with 39–41 scales; dark stripe in caudal-fin; dorsal, pectoral, pelvic, anal, and caudal fins hyaline; adipose fin and margins of caudal-fin lobes yellowish. (Reia et al., 2020).

**Piabina argentea** Reinhardt, 1867

Material examined. BRAZIL – São Paulo • Iperó, Ipanema River; 23°22.40’S, 049°38.51’W; 560 m alt.; 15.VI.2016; W.S. Smith and L. Halcsik leg.; hand nets; LEEF 140122 (12 spec., 23.0–55.0 mm SL).

Identification. Body elongated; mouth terminal; outer row of premaxilla with 2 or 3 teeth, median row with 2 and inner row with 4, dentary with 6 or 7 and maxilla with 2 or 3 teeth. Lateral line complete, with 37–40 pored scales; transversal series above lateral line with 5 or 5½ scales above and below with 3 or 3½ scale rows. Dorsal fin with 10 rays, pectoral fin with 15–17, pelvic fin with 8, anal with 17–21, and caudal fin with 19 rays. Ground color silvery to pale yellow; black humeral spot (Graça and Pavanelli 2007; Ota et al. 2018).

**Planaltina britskii** Menezes, Weitzman & Burns, 2003

Figure 2D

Material examined. BRAZIL – São Paulo • Iperó, Ipanema River; 23°22.40’S, 049°38.51’W; 560 m alt.; 10.II.2012, W.S. Smith and L. Halcsik leg.; trawl nets; LEEF 121112 (11 spec., 250–34.0 mm SL).

Identification. Body elongated; mouth terminal; outer row of premaxilla with 3 teeth, inner row with 4, dentary with 6 or 7 and maxilla with 2 teeth. Lateral line complete, with 37–40 pored scales; transverse series above lateral line with 5 or 5½ scales above and below with 3 or 3½ scale rows. Dorsal fin with 10 rays, pectoral fin with 10–12, pelvic fin with 8, anal with 17–21, and caudal fin with 22 rays. Ground color silvery to pale yellow; dark-brown longitudinal stripe from humeral region to caudal fin, forming spot on base of median rays (Graça and Pavanelli 2007; Ota et al. 2018).

**Psalidodon anisitsi** (Eigenmann, 1907)

Material examined. BRAZIL – São Paulo • Iperó, Verde River, 23°27.18’S, 047°35.31’W; 570 m alt.; 10.II.2012;
Figure 2. Species recorded in the Ipanema National Forest. A. *Acestrorhynchus lacustris* (180 mm), MZUSP 115236. B. *Astyanax lacustris* (100 mm), LEEF 1115167. C. *Hemigrammus marginatus* (18 mm), LEEF 115131. D. *Planaltina britski* (25 mm), LEEF 121112. E. *Psalidodon bockmanni* (65 mm), LEEF 121112. F. *Psalidodon fasciatus* (75 mm), LEEF 13013. G. *Psalidodon paranae* (80 mm), LEEF 115136. H. *Psalidodon cf. schubarti* (75 mm), LEEF 130930. I. *Serrapinus notomelas* (2 cm). J. *Characidium zebra* (25 mm), LEEF 115145. K. *Cyphocarax gillii* (100 mm), LEEF 140731. L. *Steindachnerina insculpta* (86 mm), MZUSP 115238. M. *Hoplias malabaricus* (152 mm), LEEF 115143. N. *Parodon nasus* (90 mm), LEEF 115130. O. *Prochilodus lineatus* (29 cm), MZUSP 115270. P. *Gymnotus carapo* (180 mm), LEEF 115128. Q. *Pimelodella meeki* (55 mm), LEEF 115143. R. *Hypostomus anciroides* (161 mm), LEEF 115146. S. *Pterygoplichthys ambrosettii* (185 mm), LEEF 151581. T. *Rineloricaria latirostris* (70 mm), LEEF 115127. U. *Geophagus brasiliensis* (135 mm), LEEF 115137. V. *Coptodon rendalli* (122 mm), MZUSP 115233. W. *Poecilia reticulata* (20 mm), LEEF 130929. X. *Phalloceros harpagos* (18 mm), LEEF 120804-1. Scale bars = 100 mm.
Psalidodon bockmanni (Vari & Castro, 2007)

Figure 2E

Material examined. BRAZIL – São Paulo • Iperó, Ipanema River; 23°25.38’S, 047°28.36’W; 560 m alt.; 15.VI.2016; W.S. Smith and L. Halcsik leg.; cast nets; LEEF 121112 (5 spec., 45.0–65.0 mm SL).

Identification. Body deep; mouth terminal; inner row of premaxilla with 5 teeth, outer with 4 or 5, dentary with 9–10, and maxilla with 2 teeth. Lateral line complete with 36 or 38 pored scales; transversal series above lateral line with 4 or 4½ scale rows and below with 3 or 3½ scale rows. Dorsal fin with 10, pectoral fin with 15 or 16, pelvic fin with 9, anal fin with 17–23 and caudal fin with 21, total rays. Ground color silvery; dark vertically elongated humeral blotch followed by another similar dark humeral blotch, smaller than the first (Graça and Pavanelli 2007; Ota et al. 2018).

Psalidodon fasciatus (Cuvier, 1819)

Figure 2F

Material examined. BRAZIL – São Paulo • Iperó, Ipanema River; 23°26.23’S, 047°37.51’W; 680 m alt.; 08.II.2016; W.S. Smith and L. Halcsik leg.; cast nets; LEEF 130131 (25 spec., 40.0–80.5 mm SL).

Identification. Body elongated; mouth terminal; inner row of premaxilla with 5 teeth, outer with 4 or 5, dentary with 8–13, and maxilla with one tooth. Lateral line complete with 34–36 pored scales; transverse series above lateral line with 5 or 5½ scale rows and below with 5 scale rows. Dorsal fin with 11 rays, pectoral fin with 15, pelvic fin with 9, anal fin with 24–28, and caudal fin with 19 rays. Ground color silvery; black vertically elongated humeral blotch; Reddish unpaired fins reddish and paired fins hyaline (Graça and Pavanelli 2007; Ota et al. 2018).

Psalidodon paranae (Eigenmann, 1914)

Figure 2G

Material examined. BRAZIL – São Paulo • Iperó, Ferro Stream, 23°25.53’S, 047°37.20’W; 680 m alt.; 07. VII.2017; W.S. Smith and L. Halcsik leg.; cast nets; LEEF 115136, LEEF 115149 (8 spec., 35.0–90.0 mm SL).

Identification. Body elongated; mouth terminal; inner row of premaxilla with 5 teeth, outer with 4 or 5, dentary with 8–13, and maxilla with 1 tooth. Lateral line complete with 38 or 39 pored scales; transversal series above lateral line with 5 or 5½ scale rows and below with 4½ or 5 scale rows. Dorsal fin with 8 rays, pectoral fin with 10 or 12 rays, pelvic fin with 7, anal fin with 19–21 and caudal fin with 19 rays. Ground color silvery; black vertically elongated humeral blotch followed by another similar black humeral blotch, smaller than the first. Fins reddish (Graça and Pavanelli 2007; Ota et al. 2018).

Psalidodon schubarti (Britski, 1964)

Figure 2H

Material examined. BRAZIL – São Paulo • Iperó, Ferro Stream, 23°25.53’S, 047°37.20’W; 680 m alt.; 08.II.2016; W.S. Smith and L. Halcsik leg.; hand nets; LEEF 130930 (7 spec., 43.0–75.0 mm SL).

Identification. Body deep; mouth terminal; inner row of premaxilla with 5 teeth, outer with 3–5, dentary with 10–13, and one maxillary teeth. Lateral line complete, with 31–33 pored scales; transversal series above lateral line with 5–5½ scale rows and below with 4–4½ scale rows. Dorsal fin with 8 rays, pectoral fin with 9 or 11 rays, pelvic fin with 8, anal fin with 15–17, and caudal fin with 20 rays. Ground color pale yellow; dark–brown longitudinal stripe, along middle of body, from humeral spot to median caudal-fin rays; dark-brown humeral spot, transversely elongate. Dorsal and caudal fins yellowish, other fins hyaline (Graça and Pavanelli 2007; Ota et al. 2018).

Family Crenuchidae

Characium zebra Eigenmann, 1909

Figure 2J

Material examined. BRAZIL – São Paulo • Iperó, Ipanema River; 23°22.40’S, 049°38.51’W; 560 m alt.; 10.I.2014; W.S. Smith and L. Halcsik leg.; hand nets; LEEF 115145, LEEF 115164 (3 spec., 21.0–23.0 mm SL).

Identification. Body elongated; mouth terminal; premaxilla with 9 teeth, dentary with 10 or 11 teeth and no maxillary teeth. Lateral line with 32–36 pored scales; transversal series above lateral line with 4½ or 5 scale rows and below with 4 or 4½ scale rows. Dorsal fin with 7 rays, pectoral fin with 14 or 16, pelvic fin with 10, anal fin with 5–7 rays, and caudal fin with 19 rays. Ground color pale yellow; dark-brown longitudinal stripe from humeral spot to caudal peduncle; 8–10 dark brown transversal bars on flank; black spot on the base of median caudal-fin rays; hyaline fins (Batista-Silva et al. 2018).

Family Curimatidae

Cyphocharax gillii (Eigenmann & Kennedy 1903)

Figure 2K

Material examined. BRAZIL – São Paulo • Iperó, Hedberg Dam; 23°25.32’S, 047°35.41’W; 550 m alt.; 15.VI.2015; W.S. Smith and L. Halcsik leg.; cast nets; LEEF 140731 (6 spec., 150.0–170.0 mm SL).

Identification. Body moderately elongate; mouth terminal; premaxilla, dentary and maxilla without teeth. Pored lateral-line scales from supracleithrum to hypural joint 28–33; 2–4 series of pored scales extending beyond hypural joint onto caudal-fin base; color silvery, with a dark spot obvious on the midlateral surface of caudal
peduncle patch of dark pigmentation on midlateral surface of caudal peduncle rotund, not continued anteriorly as thin midlateral stripe (Vari 1992).

**Cyphocharax modestus** (Fernández-Yépez, 1948)

**Material examined.** BRAZIL – São Paulo • Iperó, Verde River; 23°26.35’S, 047°35.28’W; 570 m alt.; 13.VI. 2017; W.S. Smith and L. Halcsik leg.; cast nets; MZUSP 115235 (7 spec., 155.0–180.0 mm SL).

**Identification.** Body deep; mouth terminal; premaxilla, dentary and maxilla without teeth. Lateral line with 35–37 pores; transversal series above lateral line with 6–6½ scale rows and below with 5–6½ scale rows. Dorsal fin with 10 rays, pectoral fin with 10–12, pelvic fin with 10, anal fin with 8–11 and caudal fin with 21 rays. Ground color silvery; dark brown inconspicuous longitudinal band along lateral line to distal margin of median caudal-fin rays, larger on caudal peduncle; hyaline fins (Batista-Silva et al. 2018).

**Steindachnerina insculpta** (Fernández-Yépez, 1948)

**Material examined.** BRAZIL – São Paulo • Iperó, Ipama River; 23°22.40’S, 049°38.51’W; 560 m alt.; 12.I.2012; W.S. Smith and L. Halcsik leg.; hand nets; MZUSP 115238 (6 spec., 80.0–90.0 mm SL).

**Identification.** Body deep; mouth terminal; premaxilla, dentary, and maxilla without teeth; lateral line with 33–35 pores; transversal series above lateral line with 5–5½ scale rows and below with 4½–5½. Dorsal fin with 10 rays, pectoral fin with 12–14, pelvic fin with 13 rays, anal fin with 12–14, and caudal fin with 21 rays. Ground color silvery; black conspicuous longitudinal stripe along lateral line to distal margin of median caudal-fin rays, larger on caudal peduncle; yellowish fins; dorsal-fin black blotch on the base of median rays, sometimes little conspicuous (Batista-Silva et al. 2018).

Family Erythrinidae

**Hoplias malabaricus** (Block, 1794)

**Figure 2M**

**Material examined.** BRAZIL – São Paulo • Iperó, Administração Lagoon; 23°25.46’S, 047°36.02’W; 560 m alt.; 08.II.2016; W.S. Smith and L. Halcsik leg.; cast nets; LEEF 115143, LEEF 115168 (12 spec., 190.0–230.0 mm SL).

**Identification.** Body elongated; mouth subterminal; premaxilla with 4 teeth, maxilla with 1 or 2 and dentary with no teeth; dorsal fin with 10–13 rays, pectoral fin with 11–14 rays, pelvic fin with 7–9, anal fin with 7 or 8 and caudal fin with 18 or 19 rays (Graça and Pavanelli 2007).

Family Parodontidae

**Apareiodon piracicabae** (Eigenmann, 1907)

**Material examined.** BRAZIL – São Paulo • Iperó, Verde River; 23°26.35’S, 047°35.28’W; 570 m alt; 13.VI.2017; W.S. Smith and L. Halcsik leg.; cast nets; LEEF 115160 (5 spec., 65.0–90.0 mm SL).

**Identification.** Body elongated; mouth subterminal; premaxilla with 4 teeth, maxilla with 1 or 2 and dentary with no teeth; dorsal fin with 10–13 rays, pectoral fin with 11–14 rays, pelvic fin with 7–9, anal fin with 7 or 8 and caudal fin with 18 or 19 rays (Graça and Pavanelli 2007).

**Parodon nasus** Kner, 1859

**Figure 2N**

**Material examined.** BRAZIL – São Paulo • Iperó, Ipama River; 23°25.38’S, 047°28.36’W; 560 m alt; 12.II.2012; W.S. Smith and L. Halcsik leg.; trawl nets; LEEF 115130 (11 spec., 65.0–100.0 mm SL).

**Identification.** Body elongated; teeth on the sides of the jaws; jaw with 2 or 3 posterior teeth; mouth subterminal; premaxilla with 4, dentary with 2–4 and maxilla with 2 teeth; from opercle to median caudal-fin rays, black longitudinal band with projections conferring “zigzag” (Graça and Pavanelli 2007).

Family Prochilodontidae

**Prochilodus lineatus** (Valenciennes, 1837)

**Figure 2O**

**Material examined.** BRAZIL – São Paulo • Iperó, Ipama River; 23°22.40’S, 049°38.51’W; 560 m alt; 15.VI.2015; W.S. Smith and L. Halcsik leg.; trawl nets; MZUSP 115270 (14 spec., 180.0–350.0 mm SL).

**Identification.** Body deep; thick and mobile lips, with several series of denticles; lateral line complete, with 44–50 pores; Dorsal fin pale grey; pelvic fin reddish-yellow (Graça and Pavanelli 2007).

Order Gymnotiformes

Family Gymnotidae

**Gymnotus carapo** Linnaeus, 1758

**Figure 2P**

**Material examined.** BRAZIL – São Paulo • Iperó, Verde River; 23°26.35’S, 047°35.28’W; 570 m alt; 10.I.2014; W.S. Smith and L. Halcsik leg.; hand nets; LEEF 115128, LEEF 115141 (4 spec., 120.0–185.0 mm SL).

**Identification.** Body elongated; absent dorsal and ventrals fins; banded stripes; well 2–7 teeth in the most anterior portion of dentary, shaped like an arrowhead; transparent area in the later 10–20% of the anal fin membrane (Ota et al. 2018).

Order Siluriformes

Family Callichthyidae

**Cyphocharax modestus** (Block, 1794)

**Figure 2M**

**Material examined.** BRAZIL – São Paulo • Iperó, Admistração Lagoon; 23°25.46’S, 047°36.02’W; 560 m alt.; 08.II.2016; W.S. Smith and L. Halcsik leg.; cast nets; LEEF 115143, LEEF 115168 (12 spec., 190.0–230.0 mm SL).

**Identification.** Body elongated; mouth terminal; premaxillary with a row of teeth conical or tricuspid in the maxilla; absence of frontal fontanelle and adipose fin; maxillary bone with conical and canine teeth; upper portion of the operculum without conspicuous black spot (Castro et al. 2004).

Family Parodontidae

**Apareiodon piracicabae** (Eigenmann, 1907)

**Material examined.** BRAZIL – São Paulo • Iperó, Verde River; 23°26.35’S, 047°35.28’W; 570 m alt; 13.VI.2017; W.S. Smith and L. Halcsik leg.; cast nets; LEEF 115160 (5 spec., 65.0–90.0 mm SL).

**Identification.** Body elongated; mouth subterminal; premaxilla with 4 teeth, maxilla with 1 or 2 and dentary with no teeth; dorsal fin with 10–13 rays, pectoral fin with 11–14 rays, pelvic fin with 7–9, anal fin with 7 or 8 and caudal fin with 18 or 19 rays (Graça and Pavanelli 2007).
fin with 10 or 12 rays, pelvic fin with 7, anal fin with 5–8 and caudal fin with 20 rays. Beige body color; absence of a humeral spot, brown spots and spots along the body (Thereza 2018).

Family Heptapteridae

Imperistris mirini Haseman 1911

Material examined. BRAZIL – São Paulo • Iperó, Verde River; 23°26.35′S, 047°35.28′W; 570 m alt; 10.II.2012; W.S. Smith and L. Halcsik leg.; trawl nets; MZUSP 115244 (5 spec., 65.0–90.0 mm SL).

Identification. Body elongated; mouth terminal; premaxilla and dentary with several small and villiform teeth. Dorsal fin with 6 rays, pectoral fin with 11 or 12, pelvic fin with 7 and anal fin with 11–14 rays. First dorsal fin ray shorter than the second one; adipose-fin base short, not extending to caudal fin. Ground color beige; few scattered dark browns on body, except on ventral region of head and abdomen; dark brown transversal bars on dorsum; dark brown conspicuous longitudinal stripe along lateral line; yellowish or hyaline fins (Batista-Silva et al. 2018).

Pimelodella meeki Eigenmann, 1910

Figure 2Q

Material examined. BRAZIL – São Paulo • Iperó, Verde River; 23°26.35′S, 047°35.28′W; 570 m alt; 13.VI.2017; W.S. Smith and L. Halcsik leg.; trawl nets; LEEF 115143, LEEF 115168 (6 spec., 50.0–60.0 mm SL).

Identification. Body elongated; mouth terminal; premaxilla and dentary with several small and villiform teeth. Dorsal fin with 1,7 rays; pectoral fin with 1,10 or 12 rays; pelvic fin with 10 and anal fin with 5–7 rays. Light brown coloration, with a dark stripe along midline of body. First ray of the dorsal and pectoral fins transformed into a pungent thorn (Marceniuk et al. 2011).

Family Trichomycteridae

Paravandellia oxyptera Miranda Ribeiro, 1912

Material examined. BRAZIL – São Paulo • Iperó, Ipanema River; 23°22.40′S, 049°38.51′W; 560 m alt; 15.VI.2015; W.S. Smith and L. Halcsik leg.; trawl nets; LEEF 115146, LEEF 115171 (7 spec., 20.0–44.0 mm SL).

Identification. Deep body; inferior mouth; Mid-dorsal series of plates truncated much later, plates exceeding the length of the fin back; Scapular bridge partially or totally exposed (not covered by skin); anterior and lateral margin of the muzzle covered with about five relatively large plaques, provided with spines (Yoshiada et al. 2016).

Hypostomus ancistroides (Ihering, 1911)

Figure 2R

Material examined. BRAZIL – São Paulo • Iperó, Ipanema River; 23°22.40′S, 049°38.51′W; 560 m alt; 10.II. 2012; W.S. Smith and L. Halcsik leg.; hand nets; LEEF 115146, LEEF 115171 (18 spec., 80.0–190.0 mm SL).

Identification. Deep body; inferior mouth; teeth bifid; premaxilla with 24–33 teeth and dentary with 23–35 teeth. Mid-lateral series with 27 or 28 plates, pre-dorsal series with 3, and dorsal-fin base series with 8 or 9 plates. Dorsal fin with 1,7 rays; pectoral fin with 1,6; pelvic fin with 1,5; and anal fin with 6 rays. Brown ground color; dark brown blotches on body, especially on the dorsal region; dark fins with dark brown spots (Batista-Silva et al. 2018).

Hypostomus regani (Ihering, 1905)

Material examined. BRAZIL – São Paulo • Iperó, Ipanema River; 23°22.40′S, 049°38.51′W; 560 m alt; 08.II.2016; W.S. Smith and L. Halcsik leg.; hand nets; LEEF 140732 (6 spec., 120.0–140.0 mm SL).

Identification. Body elongated; mouth ventral; body covered with odontodes and bone plates; abdomen partially covered by plates; small yellow spots on the head; fins dark with large light round spots (Reia et al. 2020).

Hypostomus strigaticeps (Regan, 1908)

Material examined. BRAZIL – São Paulo • Iperó, Ipanema River; 23°22.40′S, 049°38.51′W; 560 m alt; 10.II.2012; W.S. Smith and L. Halcsik leg.; trawl nets; LEEF 151581 (3 spec., 80.0–110.0 mm SL).

Identification. Body elongated; mouth inferior; premaxilla and dentary with several small teeth, sometimes covered by skin. Dorsal fin with 9 rays, pectoral fin with 7 rays, pelvic fin with 5–7 and anal fin with 9–10 rays. Ground color whitish to pale yellow; dark-brown longitudinal band, from operculum to vertical through pelvic-fin origin. Hyaline fin. Presence of interopercular and opercular odontodes. (Graça and Pavanelli 2007; Ota et al. 2018).

Family Loricariidae

Hisonotus depressicauda (Miranda Ribeiro, 1918)

Material examined. BRAZIL – São Paulo • Iperó, Ipanema River; 23°22.40′S, 049°38.51′W; 560 m alt; 15.VI.2015; W.S. Smith and L. Halcsik leg.; trawl nets; LEEF 115146, LEEF 115171 (7 spec., 20.0–44.0 mm SL).

Identification. Deep body; inferior mouth; Mid-dorsal series of plates truncated much later, plates exceeding the length of the fin back; Scapular bridge partially or totally exposed (not covered by skin); anterior and lateral margin of the muzzle covered with about five relatively large plaques, provided with spines (Yoshiada et al. 2016).
the ventral region; body covered with plates (Ota et al. 2018).

**Rineloricaria latirostris** (Boulenger, 1900)

*Figure 2T*

**Material examined.** BRAZIL – São Paulo • Iperó, Verde River; 23°26.35′S, 047°35.28′W; 570 m alt; 10.II.2012; W.S. Smith and L. Halcsik leg.; cast nets; LEEF 115127 (4 spec., 60.0–750.0 mm SL).

**Identification.** Body depressed; mouth inferior; premaxilla and dentary with 5 teeth. Dorsal fin with 17 rays, pectoral fin with 16–8, pelvic fin with 16 and anal with 4–6 rays. Depressed caudal peduncle, forming one keel on each side (Castro et al. 2004).

Order Cichliformes

Family Cichlidae

**Geophagus brasiliensis** (Quoy & Gaimard, 1824)

*Figure 2U*

**Material examined.** BRAZIL – São Paulo • Iperó, Limão lagoon; 23°25.27′S, 047°36.19′W; 610 m alt; 13.VI. 2017; W.S. Smith and L. Halcsik leg.; cast nets; LEEF 115137, LEEF 115163 (8 spec., 80.0–250.0 mm SL).

**Identification.** Body deep; mouth terminal; premaxilla with 2 or 3 and dentary with 2–4 teeth rows. Upper lateral line with 17–19 pored scales, lower lateral line with 10–14 pored scales and longitudinal series with 28–30 scales. Transversal series above upper lateral with 4 and below lower lateral line with 7 scale rows. Dorsal fin with XVI–XVII, 10–13 rays, pectoral fin with 14 rays, pelvic fin with 16 and anal fin with III, 10–12 rays. Ground color iridescent blue and green; dorsal, anal, caudal and pelvic fin are red with blue with iridescent blue dots aligned between rays and with pectoral fin yellowish hyaline; conspicuous dark-brown rounded blotch on flank (Graça and Pavanelli 2007; Ota et al. 2018).

**Oreochromis niloticus** (Linnaeus, 1758)

**Material examined.** BRAZIL – São Paulo • Iperó, Limão lagoon; 23°25.27′S, 047°36.19′W; 610 m alt; 10.II. 2013; W.S. Smith and L. Halcsik leg.; cast nets; LEEF 140319 (12 spec., 40.0–190.0 mm SL).

**Identification.** Body deep; mouth terminal; premaxilla with 2 or 3 and dentary with 2–4 teeth rows. Upper lateral line with 17–19 pored scales, lower lateral line with 10–14 pored scales and longitudinal series with 28–30 scales. Transversal series above upper lateral with 4 and below lower lateral line with 7 scale rows. Dorsal fin with XVI–XVII, 10–13 rays, pectoral fin with 14 rays, pelvic fin with 16 and anal fin with III, 10–12 rays. Ground color iridescent blue and green; dorsal, anal, caudal and pelvic fin are red with blue with iridescent blue dots aligned between rays and with pectoral fin yellowish hyaline; conspicuous dark-brown rounded blotch on flank (Graça and Pavanelli 2007; Ota et al. 2018).

**Coptodon rendalli** (Boulenger, 1897)

*Figure 2V*

**Material examined.** BRAZIL – São Paulo • Iperó, Cobra lagoon; 23°26.37′S, 047°38.20′W; 750 m alt; 10.II. 2012; W.S. Smith and L. Halcsik leg.; cast nets; MZUSP 115233 (6 spec., 70.0–180.0 mm SL).

**Identification.** Body deep; mouth terminal; small mouth; often appearing brownish with a white belly; dark bands along the body (Ota et al. 2018).

Order Cyprinodontiformes

Family Poeciliidae

**Phalloceros harpagos** Lucinda, 2008

*Figure 2X*

**Material examined.** BRAZIL – São Paulo • Iperó, Ipanema River; 23°25.38′S, 047°28.36′W; 560 m alt; 08.II.2016; W.S. Smith and L. Halcsik leg.; hand nets; LEEF 120804-1 (18 spec., 10.0–25.0 mm SL).

**Identification.** Body elongated; mouth superior, dentary prognathous; premaxilla and dentary with several small teeth. Longitudinal series with 28–32 scales and transverse series with 7–9 scale rows; dorsal fin with 7 rays, pectoral fin with 11–13 rays, pelvic with 5 and anal fin with 10–12 rays (female) or 8–10 rays (male). Ground color yellowish brown; dark-brown lateral spot, vertically elongated; scales with dark-brown border, conferring reticulate pattern to body (Ota et al. 2018).

**Poecilia reticulata** Peters, 1859

*Figure 2W*

**Material examined.** BRAZIL – São Paulo • Iperó, Ipanema River; 23°25.38′S, 047°28.36′W; 560 m alt; 08.II. 2016; W.S. Smith and L. Halcsik leg.; hand nets; LEEF 130929 (22 spec., 10.0–28.0 mm).

**Identification.** Body elongated; mouth superior, dentary prognathous; premaxilla and dentary with several small teeth. Longitudinal series with 22–24 scales and transverse series with 8 or 9 scale rows; dorsal fin with 8 or 9 rays, pectoral fin with 13, pelvic with 6 and anal fin with 8 rays. Ground color pale yellow; scales with dark-brown border, conferring reticulate pattern to body; males with several black or colored spots and irregular stripes (Graça and Pavanelli 2007; Ota et al. 2018).

**Discussion**

The predominance of the orders Characiformes, Siluriformes, Gymnotiformes, and Cichliformes was expected as they have greatest number of species in the Neotropical Region (Lowe-McConnell 1987; Castro and Menezes 1998; Reis et al. 2003; Winemiller et al. 2008). Most of the species in Ipanema National Forest are native, small, and dependent on sources of allochthonous material from riparian vegetation, or they are endemic to the Alto Paraná and the Sorocaba and Middle Tietê river basins (Smith et al. 2013). Although only three species are Endangered, the presence of a diverse fish fauna in the Ipanema National Forest is indicative of the importance of this conservation unit. Ipanema National Forest is one of the most important sites for the conservation of...
the fish fauna of the Sorocaba river basin. *Prochilodus vimboides*, *Pseudopimelodus mangurus* (Valenciennes, 1835), and *Bunocephalus larai* (Ihering, 1930) have been assessed as Vulnerable in the state of São Paulo (Oyakawa et al. 2010). Two rare species, *Tatia neivai* (Ihering, 1930) and *Bunocephalus larai*, have already been recorded in the Ipanema River.

The species *P. vimboides* was not captured during this work. Currently, in addition to being rare in the literature, the catch records of *P. vimboides* are also scarce (Vieira and Rodrigues 2010; Marques et al. 2013). According to Polaz et al. (2011), there was a large catch of approximately 15 tons of curimbatás, in 1952 in the Paraiba valley region (mainly in the Paraiba do Sul River); the species was probably *P. vimboides*. Honji et al. (2017) mentioned that *P. vimboides* is present in the Estação de Hidrobiologia e Aquicultura de Paraibuna of CESP and Piabanha Project (NGO Piabanha Project), two conservation units in a tributary of the Paraiba do Sul River.

We noticed that *P. vimboides* is replaced by its congener, *Prochilodus lineatus*. Possibly, the process of substituting one species for another is due to its lower biotic potential and may also be associated with environmental changes. This explains the increasingly rare records of *P. vimboides* and the more abundant *P. lineatus* (Polaz et al. 2011). Honji et al. (2017) highlighted two threats to *P. vimboides*. Most severe is the construction of dams and reservoirs. As a rheophilic species, the genus *Prochilodus* needs to migrate to reproduce, and with the rivers blocked, it is not possible to complete the migration process. The second threat is the presence of introduced species, which is currently one of the largest threats to global biodiversity (Moraes et al. 2017).

The presence of *Psalidodon paranae* (previously identified as *Astyanax scabripinnis*), a species typically found in streams (Castro and Casatti 1997) was found in the Ribeirão do Ferro. This species is widely distributed in headwaters, indicating its preference for small streams. According Oyakawa et al. (2006), knowledge on the species diversity in headwaters is lacking and headwater fish species are in general small and uninteresting for fishing, habitats are cryptic, and aquatic environments are quite restricted. Oyakawa et al. also highlight the difficulty in sampling all species at the headwaters of rivers.

Among all the species found, only *Phalloceros harpagos* Lucinda, 2008 was found in all collecting sites, which can be attributed to this species’ successful adaptation to the different habitat types in quieter waters (Mazzoni et al. 2011). The predominant species at our sampling sites are native and non-threatened species, as is expected for national biodiversity (Moraes et al. 2017). The predominant species at our sampling sites are in general small and uninteresting for fishing, habitats are cryptic, and aquatic environments are quite restricted. Oyakawa et al. also highlight the difficulty in sampling all species at the headwaters of rivers.

Several species were introduced over time, such as the *Coptodon rendalli*, *Piaractus mesopotamicus* (Holmberg, 1887), *Brycon amazonicus* (Agassiz, 1829), and *Cyprinus carpio* Linnaeus, 1758 (Smith 2003), which have contributed to the decreased stability of this fish community. Several species have been introduced over time, such as *Coptodon rendalli*, *Piaractus mesopotamicus* (Holmberg, 1887), *Brycon amazonicus* (Agassiz, 1829) and *Cyprinus carpio* Linnaeus, 1758 (Smith 2003). Aquatic environments in conservation areas, although legally protected, can still have species introduced outside the basin, since aquatic systems tend to be connected with other subsystems (Agostinho et al. 2006).

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**Authors’ Contributions**

LH, WSS, and RCB collected the data and identified specimens. WSS, RCB, LASP, and MSS took photographs and wrote the text. All authors analyzed the data.

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