***Pterygoplichthys pardalis*** **System:** Freshwater

| Kingdom | Phylum | Class | Order | Family |
|---|---|---|---|---|
| Animalia | Chordata | Actinopterygii | Siluriformes | Loricariidae |

**Common name** Amazon sailfin catfish (English, United States), carachama (Spanish, Ecuador, Peru), cascudo (Spanish, Peru), peru-riesenschilderwels (German, Germany), acari (Portuguese, Brazil), ajas (Spanish, Peru), pantterileväpleko (Finnish, Finland), cachpas (Spanish, Peru), cachga (Spanish, Peru), vieja (Spanish, Peru), acari bodó bodó (Portuguese, Brazil)

**Synonym**
*Hypostomus pardalis* , (Castelnau, 1855)
*Liposarcus jeanesianus* , (Cope, 1874)
*Liposarcus pardalis* , (Castelnau, 1855)
*Liposarcus varius* , (Cope, 1872)

**Similar species**

**Summary**

view this species on IUCN Red List

**Lifecycle Stages**
Growth of *Pterygoplichthys* is rapid during the first two years of life, with total lengths of many sailfin catfishes exceeding 300 mm by age 2. Specimens in aquaria may live more than 10 years. The size range for most of the adult species in the Loricariid family is 30–50 cm, but individuals have been observed to reach 70 cm. *Pterygoplicthys* spp. start reproducing at approximately 25 cm (Mendoza *et al*, 2009).

**Habitat Description**
*Pterygoplichthys* spp. can be found in a wide variety of habitats, ranging from relatively cool, fast-flowing and oxygen-rich highland streams to slow-flowing, warm lowland rivers and stagnant pools poor in oxygen. They are tropical fish and populations are typically limited only by their lower lethal temperature which has been found to be about 8.8-11°C in some species (Gestring, 2006). They can thrive in a range of acidic to alkaline waters in a range of about (pH 5.5.0 to 8.0) (Mendoza *et al*., 2009). They are often found in soft waters, but can adapt very quickly to hard waters. *Pterygoplichthys* spp. are also highly tolerant to poor water quality and are commonly found in polluted waters (Chavez *et al*., 2006). They are known to use outflow from sewage treatment plants as thermal refugia and can readily adapt to changing water quality (Nico & Martin, 2001). *Pterygoplichthys* spp. may be found in from lowlands to elevations of up to 3,000 m (Wakida-Kusunki, 2007). Some species are salt tolerant (Mendoza *et al*., 2009).

**Reproduction**
*Pterygoplichthys* spp. reproduce sexually and have high fecundancy (Gibbs *et al*, 2008). Males construct horizontal burrows in banks that are about 120-150 cm long extend downward. The burrows are used as nesting tunnels and eggs are guarded by males until the free-swimming larvae leave. Females may lay between 500-3,000 eggs per female depending on size and species. Their reproductive season peaks in the summer and usually lasts several months but may be year-long in certain locations (Mendoza *et al*, 2009).

**Nutrition**

*Pterygoplichthys* spp. feed primarily on benthic algae and detritus (Ozedilek, 2007). They may also consume worms, insect larvae, fish eggs and other bottom-dwellers but the vast majority of its diet consists of detritus, algae, and various plant matter (Mendoza *et al*., 2009).

**General Impacts**

Potential effects of *Pterygoplichthys* spp. include alteration of bank structure and erosion, disruption of aquatic food chains, competition with native species, mortality of endangered shore birds, changes in aquatic plant communities, and damage to fishing gear and industry.
Environmental impacts of *Pterygoplichthys* spp. are not fully understood, but in locations where they are introduced and abundant, their feeding behaviours and burrowing activities can cause considerable disturbance. Their burrows have been reported as contributing to siltation problems and bank erosion and instability (Nico *et al*, 2009b). *Pterygoplichthys* spp. forage along the bottoms of streams and lakes, occasionally burying their heads in the substrate and lashing their tails. These behaviours can uproot or shear aquatic plants and reduce the abundance of beds of submersed aquatic vegetation, creating floating mats that shade the benthos from sunlight. By grazing on benthic algae and detritus, they may alter or reduce food availability and the physical cover available for aquatic insects eaten by other native and non-native fishes where they are introduced (Mendoza *et al*, 2009; Hossain *et al*, 2008). *Pterygoplichthys* spp. may also compete with native fish. They are believed to displace several species of minnow in Texas including the Federally threatened and 'Vulnerable (VU)' Devils River minnow (see *Dionda diaboli* ) (Mendoza *et al*, 2009).
*Pterygoplichthys* spp. are thought to create large, novel nutrient sinks in invaded streams of southern Mexico. They sequester the majority of nitrogen and phosphorus of systems in their body armor. These impacts on nutrient systems may also exacerbate the nutrient limitation of primary productivity in invaded streams (Capps *et al*, 2009).
Thousands of nesting tunnels excavated by *P. multiradiatus* have contributed to siltation problems in Hawai'i. Because of their abundance in Hawai'i, *P. multiradiatus* may compete with native stream species for food and space (Nico, 2006). The burrowing behaviour and overpopulation of *P. multiradiatus* may also displace native fish in Puerto Rico where they have been reported as detrimental to reservoir fishes (Bunkley-Williams *et al*, 1994). At least 20 brown pelicans have choked to death while trying to swallow the armored *P. multiradiatus* (Bunkley-Williams *et al*, 1994; Levin *et al*, 2008). In Lake Okeechobee, Florida *P. multiradiatus* feeds and burrows at the bottom and destroys submerged vegetation, essentially displacing native fishes that would otherwise use the aquatic vegetation for spawning and refuge and interfering with their reproduction (Mendoza *et al*, 2009). *P. multiradiatus* is known to cause economic losses to fisherman by damaging equipment such as cast and gill nets in India and displacing native fish (Krishnakumar *et al*, 2009).
*P. multiradiatus* and *P. pardalis* damage fishing gear and gill nets in various locations of Mexico (Wakida-Kusunoki *et al*, 2007).
*P. disjunctivus* and *P. pardalis* are reportedly destroying cages and nets and causing a decline in native, more desirable fish in Laguna de Bay, Philippines (Chavez *et al*, 2006). *P. disjunctivus* attaches to the skin of the 'Endangered (EN)' native Florida manatee (see *Trichechus manatus* ssp. *latirostris* ) and feeds on their epibiota. In some instances dozens of *P. disjunctivus* and manatees appeared agitated. This interaction may be detrimental to manatee but remains unclear (Nico *et al*, 2009a).

### Management Info

Preventative measures: Efforts to prevent the establishment of *Pterygoplichthys* spp. are recommended in potential habitats. Educating the public, especially aquarists, to avoid releasing their unwanted fishes into open waters may reduce their introductions (Mendoza *et al*, 2009).
Physical: It may be possible to reduce abundance in some locations, but based on the Hillsborough River studies, eradication is not feasible. Environmental management would only be useful in highly modified habitats located in urban areas. It is doubtful that it is possible to control populations over large areas. Shoreline hardening/barriers are effective, but expensive. A larger, commercial fish market for *Pterygoplicthys* coupled with intense egg collection could reduce their abundance. Some researchers recommend visiting nesting colonies during the breeding season and capturing and removing adults and any eggs and young. This method may be mostly effective in areas where breeding habitats are limited (Medoza *et al*, 2009).

### Pathway

Accidental release of *Pterygoplichthys* spp. has been documented, such as when typhoon Rosing struck the Philippines resulting in escape of the fish from commercial farms (Hubilla *et al*., 2007).*Pterygoplichthys* spp. are very common aquarium fish throughout the world. Nearly all of their introduced populations are believed to be the result of pet release or aquaculture escape (Page & Robins, 2006).While no substantial trade in catfish is thought to occur, the live food trade cannot be discounted completely as a potential mechanism for spread to new locations (Mendoza *et al*., 2009).

**Principal source:**

**Compiler:** National Biological Information Infrastructure (NBII) & IUCN/SSC Invasive Species Specialist Group (ISSG)

**Review:** Dr. Roberto Mendoza, Universidad Autónoma de Nuevo León (UANL).

**Pubblication date:** 2010-06-23

### ALIEN RANGE

**[3]** INDONESIA
**[1]** MEXICO
**[1]** PHILIPPINES
**[1]** PUERTO RICO
**[2]** UNITED STATES
**[1]** VIET NAM

### BIBLIOGRAPHY

**64** references found for **Pterygoplichthys pardalis**

**Managment information**
Aquatic Nuisance Species Information System (ANSIS), 2007. Species Profiles
Aquatic Nuisance Species Information System (ANSIS), 2007. Species Profiles. *Pterygoplichthys multiradiatus* - butterfly pleco
Aquatic Nuisance Species Information System (ANSIS), 2007. Species Profiles. *Pterygoplicththys anisitsi*- snow pleco.
**Summary:** Available from: http://el.erdc.usace.army.mil/ansrp/ANSIS/ansishelp.htm#html/pterygoplichthys_disjunctivus_vermiculated_sailfin_catfish.htm [Accessed 23 November 2009]
Aquatic Nuisance Species Information System (ANSIS), 2007. Species Profiles. *Pterygoplicththys disjunctivus*- vermiculated sailfin catfish.
Cagauan, G. Arsenia, 2007. Exotic Aquatic Species Introductions in the Philippines for Aquaculture -A Threat to Biodiversity or a Boon to the Economy? Review Paper Journal of Environmental Science and Management 10(1): 48-62 (June 2007).
**Summary:** Available from: http://filaman.uni-kiel.de/ifmgeomar/rfroese/AlienSpecies.pdf#page=6 [Accessed 23 November 2009]
Casal, C. M. V.; S. Luna; R. Froese; N. Bailly; R. Atanacio and E. Agbayani, 2007. Alien Fish Species in the Philippines: Pathways, Biological Characteristics, Establishment and Invasiveness. Journal of Environmental Science and Management 10(1): 1-9 (June 2007).
**Summary:** Available from: http://filaman.uni-kiel.de/ifmgeomar/rfroese/AlienSpecies.pdf#page=6 [Accessed 23 November 2009]
Gertzen, Erin; Oriana Familiar, and Brian Leung, 2008. Quantifying invasion pathways: fish introductions from the aquarium trade
**Summary:** Available from: http://biology.mcgill.ca/faculty/leung/articles/Gertzen_et_al_CJFAS08.pdf [Accessed 23 November 2009]
Joshi, Ravindra C., undated. Invasive alien species (IAS): Concerns and status in the Philippines. Philippine Rice Research Institute (PhilRice) Maligaya

Krishnakumar, K.; Rajeev Raghavan; G. Prasad; A. Bijukumar; Mini Sekharan; Benno Pereira and Anvar Ali, 2009. When pets become pests � exotic aquarium fishes and biological invasions in Kerala, India. Commentary Current Science, VOL. 97, NO. 4, 25 AUGUST 2009
Liang, Shih-Hisung; Ling-Chuan Chuang and Ming-Hsiung Chang, 2006. The Pet Trade as a Source of Invasive Fish in Taiwan Taiwania, 51(2): 93-98, 2006
**Summary:** Available from: http://www.press.ntu.edu.tw/ejournal/files/taiwan%5C200606%5C4.pdf [Accessed 23 November 2009]
Martinez Palacios, C., Mendoza, C. & Ross, L. 2009. Tentative solutions to an alien species invasion from aquarium aquaculture: developing viable industries to exploit and control *Pterygoplichthys multiradiatus* Hancock 1828 in Mexico.
**Summary:** Available from: http://www.aqua.stir.ac.uk/GISAP/pdfs/Pterygo_Istanbul.pdf [Accessed 22 June, 2010]
Mendoza, R.E.; Cudmore, B.; Orr, R.; Balderas, S.C.; Courtenay, W.R.; Osorio, P.K.; Mandrak, N.; Torres, P.A.; Damian, M.A.; Gallardo, C.E.; Sanguines, A.G.; Greene, G.; Lee, D.; Orbe-Mendoza, A.; Martinez, C.R.; and Arana, O.S. 2009. Trinational Risk Assessment Guidelines for Aquatic Alien Invasive Species. Commission for Environmental Cooperation. 393, rue St-Jacques Ouest, Bureau 200, Montr�al (Qu�bec), Canada. ISBN 978-2-923358-48-1.
**Summary:** In 1993, Canada, Mexico and the United States signed the North American Agreement on Environmental Cooperation (NAAEC) as a side agreement to the North American Free Trade Agreement (NAFTA). The NAAEC established the Commission for Environmental Cooperation (CEC) to help the Parties ensure that improved economic efficiency occurred simultaneously with trinational environmental cooperation. The NAAEC highlighted biodiversity as a key area for trinational cooperation. In 2001, the CEC adopted a resolution (Council Resolution 01-03), which created the Biodiversity Conservation Working Group (BCWG), a working group of high-level policy makers from Canada, Mexico and the United States. In 2003, the BCWG produced the �Strategic Plan for North American Cooperation in the Conservation of Biodiversity.� This strategy identified responding to threats, such as invasive species, as a priority action area. In 2004, the BCWG, recognizing the importance of prevention in addressing invasive species, agreed to work together to develop the draft CEC Risk Assessment Guidelines for Aquatic Alien Invasive Species (hereafter referred to as the Guidelines). These Guidelines will serve as a tool to North American resource managers who are evaluating whether or not to introduce a non-native species into a new ecosystem. Through this collaborative process, the BCWG has begun to implement its strategy as well as address an important trade and environment issue. With increased trade comes an increase in the potential for economic growth as well as biological invasion, by working to minimize the potential adverse impacts from trade, the CEC Parties are working to maximize the gains from trade while minimizing the environmental costs.
Available from: English version: http://www.cec.org/Storage/62/5516_07-64-CEC%20invasives%20risk%20guidelines-full-report_en.pdf [Accessed 15 June 2010]
French version: http://www.cec.org/Storage/62/5517_07-64-CEC%20invasives%20risk%20guidelines-full-report_fr.pdf [Accessed 15 June 2010]
Spanish version: http://www.cec.org/Storage/62/5518_07-64-CEC%20invasives%20risk%20guidelines-full-report_es.pdf [Accessed 15 June 2010].
Neal, J. Wesley; Craig G. Lilyestrom, and Thomas J. Kwak, 2009. Factors Influencing Tropical Island Freshwater Fishes: Species, Status, and Management Implications in Puerto Rico. Feature: Fisheries Conservation. Fisheries, vol 34 no 11. November 2009
**Summary:** Available from: http://www4.ncsu.edu/~tkwak/Neal_et_al_2009.pdf [Accessed 23 November 2009]
Page, Lawrence M. and Robert H. Robins, 2006. Identification of sailfin catfishes (Teleostei: Loricariidae) in Southeastern Asia. Raffles Bulletin of Zoology 54 (2), pp. 455-457.
Shafland, L. Paul, 1986. A Review of Florida s Efforts to Regulate Assess and Manage Exotic Fish. Fisheries, Vol 11 No 2
**Summary:** Available from: http://www.fwc.state.fl.us/docs/WildlifeHabitats/Nonnative_FW_ExoticRegAssMgt1996Fisheries.pdf [Accessed 23 November 2009]

**General information**

Agusan Marsh FOCAS. 2008. Janitor Fish for Sustainable Agriculture.
**Summary:** Available from: http://www.agusanmarshfocas.org/?p=579 [Accessed 22 June, 2010]
Armbruster, Jonathan W. and Lawrence M. Page2006. Redescription of *Pterygoplichthys punctatus* and description of a new species of *Pterygoplichthys* (Siluriformes: Loricariidae). Neotropical Ichthyology, 4(4):401-409, 2006.
Blake, R. W.; P. Y. L. Kwok and K. H. S. Chan, 2007. The energetics of rheotactic behaviour in *Pterygoplichthys* spp. (Teleostei : Loricariidae). Journal of Fish Biology. 71(2). AUG 2007. 623-627.
Bunkley-Williams, Lucy; Ernest H. Williams Jr.; Craig G. Lilystrom; Iris Corujo-Flores; Alfonso J. Zerbi and Catherine Aliaume, 1994. The South American Sailfin Armored Catfish, *Liposarcus multiradiatus* (Hancock), a New Exotic Established in Puerto Rican Fresh Waters. Caribbean Journal of Science, Vol. 30, No. 1 -2, 90-94, 1994
**Summary:** Available from: http://academic.uprm.edu/publications/cjs/VOL30/P090-094.PDF [Accessed 23 November 2009]
Burr, Brooks M.; Cynthia M. Basile; Ginny L. Adams and Matthew C. Nicholson, undated. Exotic Aquatic and Terrestrial Animals in the Hoosier-Shawnee Ecological Asessment Area. North Central Research Station USDA Forest Service
**Summary:** Available from: http://ncrs.fs.fed.us/pubs/gtr/gtr_nc244/gtr_nc244_ch9.pdf [Accessed 23 November 2009]
Capps, Krista A.; Alexander S. Flecker; and Roc�o Rodiles-Hern�ndez, August 4th 2009. COS 45-8: Exotic fishes alter nutrient dynamics in tropical streams. 93rd ESA Annual Meeting
**Summary:** Available from: http://eco.confex.com/eco/2009/techprogram/P16502.HTM [Accessed 23 November 2009]
Champeau, R. Thomas; Philip W. Stevens and David A. Blewett, 2009. Comparision of Fish Community Metrics to Assess Long-Term Changes and Hurricane Impacts at Peace River Florida. Florida Scientist. Vol 72 No 4 2009.
**Summary:** Available from: http://www.chnep.org/info/FloridaScientist_Autumn2009/6Champeau_Compar_Fish_Metrics_FS_72-4-289.pdf [Accessed 23 November 2009]
Chavez, J.M.; Reynaldo M. De La Paz; Surya Krishna Manohar; Roberto C. Pagulayan; Jose R. Carandang VI, 2006. New Philippine record of South American sailfin catfishes (Pisces: Loricariidae). Zootaxa (1109), pp. 57-68.
**Summary:**
Cohen, K. 2008. Gut content and stable isotope analysis of exotic suckermouth catfishes in the San Marcos River, TX: A concern for sping endemics?. Masters Thesis, Texas State University� San Marcos.

Cook-Hildreth, S.L. 2009. Exotic Armored Catfishes in Texas: Reproductive Biology, and Effects of Foraging on Egg Survival of Native Fishes (*Etheostoma fonticola*, Endangered and *Dionda diabolic*, Threatened). Master in Science Dissertation. Texas State University� San Marcos. 63 pp.
Edwards, Robert J. 2001. New additions and persistence of the introduced fishes of the upper San Antonio River, Bexar County, Texas. Texas Journal of Science. 53(1). February, 2001. 3-12.
**Summary:** The fish fauna of the upper San Antonio River, Bexar County, Texas, includes ten introduced species (Astyanax mexicanus, Hypostomus sp., Poecilia reticulata, P. latipinna, Xiphophorus helleri, Belonesox belizanus, Cichlasoma cyanoguttatum, Oreochromis mossambicus, O. aurea and Tilapia zilli). A recent sample from this environment contained nine of the ten known introduced species, as well as two additional species (the vermiculated highfin catfish, Pterygoplichthys disjunctivus, and the Amazon molly, Poecilia formosa), that were, heretofore, not found from this location. The only fish known to have been introduced but not taken in this collection, was Belonesox belizanus, a species introduced in the early 1960s and not captured or observed for more than 30 years and believed to be extirpated. The introduced fishes appear to be having a substantial impact upon the native fishes of this river. Introduced species made up 61% of the species, 17% of the individuals, and 62% of the biomass of the sample. It further appears that urban influences have had a major impact upon the conditions leading to the present fish assemblage.
FishBase, 2010b. *Pterygoplichthys disjunctivus* (Weber, 1991). www.fishbase.org.
**Summary:** Available from: http://www.fishbase.org/summary/SpeciesSummary.php?id=51938 [Accessed 23 November 2009]
FishBase, 2010. *Pterygoplichthys anisitsi* Eigenmann & Kennedy, 1903. www.fishbase.org
**Summary:** Available from: http://www.fishbase.org/summary/SpeciesSummary.php?id=12218 [Accessed 23 November 2009]
FishBase, 2010. *Pterygoplichthys gibbiceps* (Kner, 1854). www.fishbase.org
**Summary:** Available from: http://www.fishbase.org/summary/SpeciesSummary.php?id=12219 [Accessed 23 November 2009]
FishBase, 2010. *Pterygoplichthys multiradiatus* (Hancock, 1828). www.fishbase.org
**Summary:** Available from: http://www.fishbase.org/summary/SpeciesSummary.php?id=4793 [Accessed 23 November 2009]
FishBase, 2010. *Pterygoplichthys pardalis* (Castelnau, 1855). www.fishbase.org
**Summary:** Available from: http://www.fishbase.org/summary/SpeciesSummary.php?id=25741 [Accessed 23 November 2009]
Gestring, K.B., Shafland, P.L. & Stanford, M.S. 2006. The status of Loricariid catfishes in Florida with emphasis on Orinoco Sailfin (*Pterygoplichthys multiradiatus*). Abstracts for the 26th Annual Meeting of the Florida Chapter American Fisheries Society.
Gibbs, M. A.; J. H.Shields; D. W. Lock; K. M. Talmadge; T. M. Farrell, 2008. Reproduction in an invasive exotic catfish *Pterygoplichthys disjunctivus* in Volusia Blue Spring, Florida, U.S.A. Journal of Fish Biology. 73(7). NOV 2008. 1562-1572.
Hoover, J.J., Killgore, K.J. & Cofrancesco, A.F. 2004. Suckermouth catfishes: Threats to aquatic ecosystems of the United States? Aquatic Nuisance Species Research Program Bulletin, 4 (1).
Hossain, M. Y.; M. M. Rahman; Z. F. Ahmed; J. Ohtomi; A. B. M. S. Islam, 2008. First record of the South American sailfin catfish *Pterygoplichthys multiradiatus* in Bangladesh. Journal of Applied Ichthyology. 24(6). DEC 2008. 718-720.
Hubbs, C., R. J. Edwards and G. P. Garrett. 2008. An annotated checklist of the freshwater fishes of Texas, with keys to identification of species. Texas Academy of Science.
**Summary:** Available from: https://repositories.lib.utexas.edu/bitstream/handle/2152/6290/Hubbs_et_al_2008_checklist.pdf?sequence=2 [Accessed 23 November 2009]
Hubilla, Marianne; Ferenc Kis and Jurgenne Primavera, 2007. Janitor Fish *Pterygoplichthys disjunctivus* in the Agusan Marsh: a threat to freshwater Biodiversity. Journal of Environmental Science and Management 10(1): 10-23 (June 2007).
**Summary:** Available from: http://filaman.uni-kiel.de/ifmgeomar/rfroese/AlienSpecies.pdf#page=6 [Accessed 23 November 2009]
Hubilla, M., Kis, F. & Primavera, J. 2007. Janitor Fish *Pterygoplichthys disjunctivus* in the Agusan Marsh: a Threat to Freshwater Biodiversity. Journal of Environmental Science and Management, 10(1): 10-23.
Integrated Taxonomic Information System (ITIS), 2010a. *Pterygoplichthys multiradiatus* (Hancock, 1828)
**Summary:** Available from: http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=164375 [Accessed 23 November 2009]
Integrated Taxonomic Information System (ITIS), 2010b. *Pterygoplichthys* Gill, 1858
**Summary:** Available from: http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=164372 [Accessed 23 November 2009]
Integrated Taxonomic Information System (ITIS), 2010c. *Pterygoplichthys anisitsi* Eigenmann and Kennedy, 1903
**Summary:** Available from: http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=680350 [Accessed 23 November 2009]
Integrated Taxonomic Information System (ITIS), 2010d. *Pterygoplichthys disjunctivus* (Weber, 1991)
**Summary:** Available from: http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=680351 [Accessed 23 November 2009]
Integrated Taxonomic Information System (ITIS), 2010e. *Pterygoplichthys etentaculatus* (Spix and Agassiz, 1829)
**Summary:** Available from: http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=680352 [Accessed 23 November 2009]
Integrated Taxonomic Information System (ITIS), 2010f. *Pterygoplichthys pardalis* (Castelnau, 1855)
**Summary:** Available from: http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=680353 [Accessed 23 November 2009]
Integrated Taxonomic Information System (ITIS), 2010g. *Pterygoplichthys undecimalis* (Steindachner, 1878)
**Summary:** Available from: http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=680354 [Accessed 23 November 2009]
Integrated Taxonomic Information System (ITIS), 2010h. *Pterygoplichthys zuliaensis* Weber, 1991
**Summary:** Available from: http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=680355 [Accessed 23 November 2009]

Integrated Taxonomic Information System (ITIS), 2010i. *Glyptoperichthys gibbiceps* (Kner, 1854)
**Summary:** Available from: http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=639370 [Accessed 23 November 2009]
Joshi, R.C. 2006. Invasive alien species (IAS): Concerns and status in the Philippines. International Workshop on the Development of Database (APASD) for Biological Invasion. Taichung, Taiwan ROC, September 18-22, 2006.
Júlio Júnior, Horácio Ferreira; Claudenice Dei Tós; Ângelo Antonio Agostinho and Carla Simone Pavanelli, 2009. A massive invasion of fish species after eliminating a natural barrier in the upper rio Paraná basin. Neotropical Ichthyology, 7(4):709-718, 2009
Keszka, Slawomir; Remigiusz Panicz; Adam Tanski, 2008. First Record of the Leopard Pleco, *Pterygoplichthys gibbiceps* (Actinopterygii, Loricariidae) in the Brda River in the Centre of Bydgoszcz (Northern Poland). Acta Ichthyologica Et Piscatoria. 38(2). 2008. 135-138.
Levin B. A.; P. H. Phuong; D. S. Pavlov, 2008. Discovery of the Amazon sailfin catfish *Pterygoplichthys pardalis* (Castelnau, 1855) (Teleostei: Loricariidae) in Vietnam. Journal of Applied Ichthyology. 24(6). DEC 2008. 715-717.
López-Fernández, Hernán & Winemiller, Kirk. (2005). Status of Dionda diaboli and report of established populations of exotic fish species in Lower San Felipe creek, Val Verde County, Texas. The Southwestern Naturalist. 10.1894/0038-4909(2005)050[0246:SODDAR]2.0.CO;2.
Ludlow, M. E & Walsh S. J., 1991. Occurrence of the South American Armoured Catfish in the Hillsborough River Florida USA. Florida Scientist. 54(1). 1991. 48-50.
**Summary:** This note reports the presence of a South American catfish in the Hillsborough River, Hillsborough County, Florida. Although loricariid catfishes have been reported from the Tampa Bay area for several decades, until recently they had not been documented from the Hillsborough River drainage. The construction of a new canal system may have allowed ingress of Pterygoplichthys cf. multiradiatus into the Hillsborough River proper. A brief morphological description of three specimens is presented. Future research into the biological and ecological impacts of this algae-feeding armored catfish is strongly recommended
Nico, Leo 2003. *Pterygoplichthys pardalis* . USGS Nonindigenous Aquatic Species Database, Gainesville, FL.
**Summary:** Available from: http://nas.er.usgs.gov/queries/FactSheet.aspx?SpeciesID=769 [Accessed 23 November 2009]
Nico, Leo 2006. *Pterygoplichthys multiradiatus* . USGS Nonindigenous Aquatic Species Database, Gainesville, FL.
**Summary:** Available from: http://nas.er.usgs.gov/queries/FactSheet.aspx?speciesID=768 [Accessed 23 November 2009]
Nico, Leo and Pam Fuller. 2006. *Pterygoplichthys anisitsi* . USGS Nonindigenous Aquatic Species Database, Gainesville, FL.
**Summary:** Available from: http://nas.er.usgs.gov/queries/FactSheet.aspx?SpeciesID=766 [Accessed 23 November 2009]
Nico, Leo and Pam Fuller. 2008. *Pterygoplichthys disjunctivus* . USGS Nonindigenous Aquatic Species Database, Gainesville, FL.
**Summary:** Available from: http://nas.er.usgs.gov/queries/FactSheet.aspx?speciesID=767 [Accessed 23 November 2009]
Nico, Leo G.; Howard L. Jelks and Travis Tuten, 2009b. Non-Native Suckermouth Armored Catfishes in Florida: Description of Nest Burrows and Burrow Colonies with Assessment of Shoreline Conditions. Aquatic Nuisance Species Research Programme (ANSRP) Bulletin Vol-09-1 April 2009
**Summary:** Available from: http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA501422&Location=U2&doc=GetTRDoc.pdf [Accessed 23 November 2009]
Nico, Leo G.; R. Trent Martin, 2001. The South American suckermouth armored catfish, *Pterygoplichthys anisitsi* (Pisces: Loricariidae), in Texas, with comments on foreign fish introductions in the American Southwest. Southwestern Naturalist. 46(1). March, 2001. 98-104.
Nico, Leo G.; William F. Loftus; James P. Reid, 2009. Interactions between non-native armored suckermouth catfish (Loricariidae: *Pterygoplichthys*) and native Florida manatee (*Trichechus manatus latirostris*) in artesian springs. Aquatic Invasions (2009) Volume 4, Issue 3: 511-519.
Ozdilek, Sukran Yalcin. 2007. Possible Threat for Middle East Inland Water: an Exotic and Invasive Species, *Pterygoplichthys disjunctivus* (Weber, 1991) in Asi River, Turkey (Pisces: Loricariidae). Journal of Fisheries & Aquatic Sciences 2007. Cilt/Volume 24, Sayi/Issue (3-4): 303�306.
Stevens, W. Philip; David A. Blewett and Patrick Casey, 2006. Short-term Effects of a Low Dissolved Oxygen Event on Estuarine Fish Assemblages Following the Passage of Hurricane Charley. Estuaries and Coasts Vol. 29, No. 6A, p. 997�1003 December 2006
Trujillo-Jim�nez, Patricia; Eugenia L�pez-L�pez; Edmundo D�az-Pardo and Julio A. Camargo, 2009. Patterns in the distribution of fish assemblages in R�o Amacuzac, Mexico: influence of abiotic factors and biotic factors. Reviews in Fish Biology and Fisheries. Research Paper. Sunday, December 13, 2009
Wakida-Kusunoki, Armando T.; Ramon Ruiz-Carus; Enrique Amador-del-Angel, 2007. Amazon sailfin catfish, *Pterygoplichthys pardalis* (Castelnau, 1855) (Loricariidae), another exotic species established in southeastern Mexico. Southwestern Naturalist. 52(1). MAR 2007. 141-144.