

**THE FLOOD PULSE CONCEPT
AND ITS RELATION TO FISH BIOLOGY IN THE PANTANAL.**

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The main challenge for sustainable use of the Pantanal means that we need to understand the main ecological process that makes Pantanal to work. This is the flood pulse concept thought by Junk et al., (1989), “*the principal driving force responsible for the existence, productivity and interactions of the major biota in river-floodplain systems is the flood pulse*”; “*a predictable pulse of long duration engenders organismic adaptations and strategies that efficiently utilize attributes of the aquatic/terrestrial transition zone*”.

Comparing available fish production data, from 1995 to 2000 (Catella et al., 1998; Catella & Albuquerque, 2000 a,b; Catella et al., 2001; Catella et al., 2002; Campos et al., 2002) and from 1979 to 1985 (Silva, 1986), a decreasing of fish production can be viewed between this two periods, being something 7 times low now than in the past. What would be the causes for this decrease? An answer to this question needs to understand the flood pulse in rivers with large floodplain as Upper Paraguay river basin, particularly to Paraguay river and its tributary as Taquari river.

Welcomme (1979; 1985), Junk et al., (1989), Junk (1980, 1997, 2001) wrote a lot about the flood pulse concept in rivers with very well developed floodplains in South American tropical environments. The floodplain, due to their characteristics of being periodically flooded, acts as a bioprocessor. Inorganic nutrients carried from the river to the floodplain are used by different communities of primary producers during the terrestrial and aquatic phases to produce organic material that is used by aquatic and terrestrial consumer communities, resulting in high primary and secondary productions. Internal cycles of organic material and correlated nutrients among terrestrial and aquatic phases results in nutrient accumulation in the floodplain that makes the system

to work in a trophic level higher than expected only by the nutrients carried by the water rivers (Junk, 2001). In this way, biological and biogeochemical processes in the system river-floodplain are described by the flood pulse concept, which considers the lateral exchanges between the rivers and their floodplains as well exchanges between terrestrial and aquatic phases in this same plain. The importation of dissolved and particulated organic material from the headwaters have few importance, due to a small amount and low quality in comparison with the organic material produced in the floodplain.

South American rivers with well developed floodplain have a very diverse and abundant fish fauna that feed on organic detritus that is not known in other places. The most known of these species are the curimatá (*Prochilodus lineatus*) in the Paraguay-Paraná river and jaraquis(*Semaprochilodus spp*), curimatãs (*Prochilodus nigricans*) and branquinhas (Curimatidae family) in the Amazon river basin. These species feed on the organic particulated material produced by the decomposition of terrestrial vegetation during the flooding period. At the same time, during the flooding, the flowers, fruits, seeds and even the stems and leaf of the riparian and flooded vegetation are fed by herbivorous and omnivorous fishes, belonging to Myleinae, Bryconinae, Thiportheinae and Characinae sub-families. These group, together organic detritus feeding fishes are the base of food chain that support large carnivorous fishes as dourado “*Salminus brasiliensis*”, pintado, “*Pseudoplatystoma corruscans*” and others and a particularly interesting group, the piranhas (Serrasalminae) and a rich fish-eating species like cormorants, jabirus, wood storks, herons, caimans, otters and giant-otters.

Finally, the flooded vegetation, terrestrial or aquatic, act as a filter retaining in their roots, stems and leaves the detritus and other organic debris, on which develop a rich community of algae and microorganisms, which are used as food by fish larva, alewives and small sized-fishes. During the flooding season, abundant insect community develops on the macrophytes, which is got by insect feeding fishes.

Flood pulses are responsible for the fish richness and for fish production, more high the flood, more fish production and lower the flood, less fish production. In the dry season, terrestrial vegetation grows again, supported by the nutrients that comes trough the flooding water and from the decomposition of aquatic vegetation of the previous inundation. In this way, the system can incorporate and use the organic material in a very efficient way, explaining the richness and diversity of rivers with floodplains, even the river drains poor soils as happen in

the Upper Paraguay basin. The flooding also allows development of the aquatic vegetation that gives shelter and food for fishes. The flood pulse also explain the abundance of animals that depends on fish for their survival, as caimans, fish-eater birds (cormorants, jabiru, woodstork, spoonbill, herons, ...), giant otters and neotropical river otters.

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