

# Prozac effect on a predator-prey system (mosquito fish-egret): an experimental approach

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## Aims of the project

Prey's population

indirect effects

Dynamics of predators populations

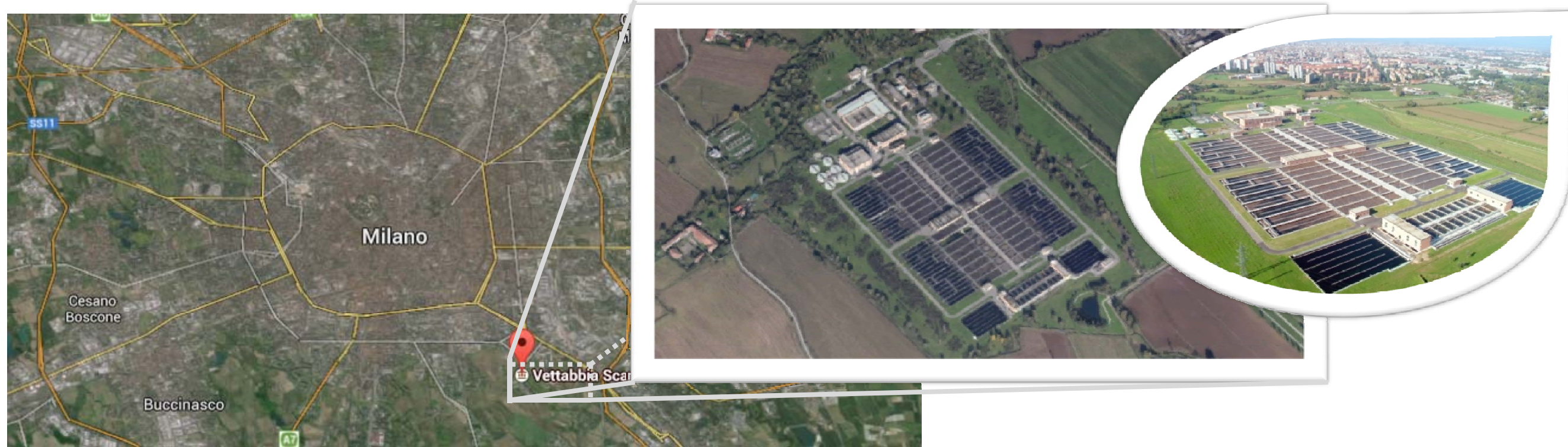
**How does Prozac change swimming ability of mosquito fish?**  
 Medium speed, distance, route, frequency and duration of freezing bouts

Changes in the ecology and behavior of the prey, induced by changes in ecological conditions or in the interactions with other species of the same community, can then have indirect effects on predator, as modifying the mean Darwinian fitness and, accordingly, productivity.

**How does Prozac change predatory efficiency of egret?**  
 Time and frequency of foraging

**How does Prozac affect the predator in the choice of prey?**  
 Group of FLX exposure levels the prey belongs to

## Area of study Milano-Nosedo Wastewater Treatment Plant



The plant is the end phase of a complex system that collects wastewater from the central and eastern part of Milano.  
 Processing capacity = 1,250,000 population equivalents<sup>[1]</sup>.

## Contaminant assessed Prozac



**Antidepressant:** selective serotonin reuptake inhibitors (SSRI)  
**Active ingredient:** fluoxetine (FLX)<sup>[2]</sup>

Parameter	Fluoxetine		
<i>Physicochemical parameter</i>			
Empirical formula	C <sub>17</sub> H <sub>18</sub> F <sub>3</sub> NO		
Molecular weight	309.33		
PK <sub>a</sub>	10.06 ± 0.10		
	pH		
<i>Environmental fate parameter</i>	2.0	7.0	11.0
log K <sub>ow</sub>	1.25	1.57	4.30
BCF	~1	2.00	1071.52
log K <sub>oc</sub>	0.64	0.97	3.70

Values calculated by ACD/Labs Software Version 5.0 (Toronto, Ontario, Canada).

## Phase I: test on prey

FLX concentration	Danio rerio dose-effect <sup>[3]</sup>		Conc. in Milano-Nosedo wastewater		Control
	100 µg/L	Medium measured	Max measured	-	
Type of test	Flow-trough chronic				
Test duration	21 days				
T (°C)	19 ± 2				
Length of orgs	3 cm				
No. orgs per tank	20				

Behavioral test

Video-tracking

Data processing

Treatment aquarium

After exposure the behavior of fishes will be analysed through video-tracking.

## Mosquitofish

(*Gambusia affinis*)<sup>[4]</sup>



**Distribution:** freshwaters all over the world.  
**Native range:** from southern of Illinois and Indiana to the northeastern of the Gulf of Mexico.  
**Dimensions:** 3-5 cm length. Sexual dimorphism: females longer than males.  
**Reproduction:** ovoviparous. Gestation period: 22-25 days. No. of newborn: about 30 younger.  
**Diet:** zooplankton, larvae and small insects, detritus material.  
**One of the 100 world's worst invasive alien species<sup>[5]</sup>:** intentionally introduced early XX century as a biological control of mosquitoes.

## Phase II: test on predatory efficiency

After 12 hours fasting little egret will be placed above a tank full of fishes. The hunting behavior of heron will be analysed through video-tracking.

FLX-exposed (chronically fed with exposed mosquito fishes before the starting of the test) and unexposed egrets.

Fishes exposed on the four different FLX levels (control + Phase I concentrations).

Video-tracking



## Little egret

(*Egretta garzetta*)

**Distribution:** wetlands in warm temperate to tropical parts of Europe, Africa, Asia and Australia. Trans-Saharan / infra - Palearctic migratory or erratic.  
**Dimensions:** medium sized: 400-600g weight, 55-65 cm length, 88-106 cm wingspan.  
**Reproduction:** Monogamous species, nesting in colonies. No. of eggs: 3-5 incubated by both adults for 21-25 days to hatching.  
**Diet:** fish, insects, amphibians, crustaceans and reptiles.  
**Conservation status<sup>[6]</sup>:** Least Concern.  
**Ethical notes:** Young birds (40-45 days), fallen before reaching the full efficiency in walking, are not taken care by their parents. They are destined to die by starvation or predation.

## References

<sup>[1]</sup> Milano- Nosedo Wastewater Treatment Plant website: <http://www.depuratorenosedo.eu/en/storia>  
<sup>[2]</sup> Brooks B.W. et al. (2003) Aquatic ecotoxicology of fluoxetine. *Tox. Letters* 142(2003)169/183  
<sup>[3]</sup> Cachat J. et al. (2010) Measuring behavioral and endocrine responses to novelty stress in adult zebrafish. *Nature Protocols* 5, 1786-1799

<sup>[4]</sup> Vondracek B. et al. (1988) Growth and reproduction of the mosquitofish, *Gambusia affinis*, in relation to temperature and ration level: consequences for life history. *Environm. Biol. Fish.* 21, 45-57  
<sup>[5]</sup> Fortini, N. (2011) Atlante dei pesci delle acque interne italiane. Aracne ed., 460 pp.  
<sup>[6]</sup> IUCN Red List Categories and Criteria. Version 3.1 (2001)