Could associative learning and operant conditioning in the captive neotropical otters' feeding procedure reduce negative effects of captivity ?

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WHAT IS THE DILEMNA OF CAPTIVITY FOR WILDLIFE ?

- The physiological consequences
- The development of abnormal behaviours
- Signs of ill-being such as stress, fear and depression

(e.g. Startle or defense responses, avoidance, suppression of feeding and sexual behaviour, aggression, stereotypic behaviour, lack of responsiveness or apathy) Garner 2005, Mason & Latham 2004

3 key characteristics predicts poor wellbeing in captive wild species :

- Timidity
- A wide-ranging lifestyle or being migratory
- Dietary or habitat specialism

This evidence suggests that conservation status itself for vulnerable wild species such as Neotropical Otter (*Lontra Longicaudis*) with such traits, prone to poor welfare, might predict their vulnerability in captivity Mason 2010, Swaisgood 2007

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HOW TO DEFINE THE CONCEPT OF STRESS RELATED TO POOR WELFARE ?

Stress is the behavioural and physiological adjustments that an organism undergoes to avoid or adapt to a perceived threat that challenges internal homeostasis Swaisgood 2007

Behaviour is easily measurable and a good indicator of the animal's perception of environmental change (e.g. Through its budget time spent in stereotypies or Abnormal Repetitive Behaviours (ARB))

On the ethological welfare risks factors,

Mason suggests that stereotypies (e.g.pacing, swimming in circle) could derive from aspects of natural hunting and that coastal marine mammals, little-ranging species will have poorer welfare in captivity

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→ ALL THESE CHARACTERISTICS DESIGNATED THE CAPTIVE NEOTROPICAL OTTERS AS THE IDEAL CANDIDATE FOR THIS STUDY

Lontra Longicaudis being a critically endangered coastal marine mammal, carnivorous very specialist, small forager, solitary with large cognitive abilities (CITES, Carvalho et al 2013)

The purpose of this study was:

- To find an essential response to the Abnormal Repetitive Behaviours (ARB) of the captive neotropical otters in a scientific breeding:
ARB and stereotypies resulting in various injuries (eg broken femur climbing fences, struggling passing heads through holes)

- To learn more about the behaviour of this little-known species, to improve its welfare and its chances of reproduction in captivity

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THE KEY ROLE OF THE FEEDING PROCEDURES FOR WELFARE IN CAPTIVITY

- Food
- How to get it
- The environment in which it is provided

Natural enrichment associated with food could enhance activity levels, increase the prevalence of natural behaviours (e.g A moving bait system) and reduce levels of some stereotypies promoting natural foraging behaviours (Quirke & Riordan 2011)

Enrichments are the temporary answers most practiced in captivity to improve the well-being of animals

BUT what is suitable for one species may not be for another

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→ We taylored the « FISH PIPE », an environmental enrichment coupled with an associative learning

- Not to move their behavioral problems linked with the feeding through fences
- To allow otters to perform a more species typical behaviours that return control over the environment to them

→ We made DAILY OBSERVATIONS before and after this new feeding procedures to examine the effects and the UNDERLYING MOTIVATIONS IN BEHAVIOUR

OUR HYPOTHESIS

OPERANT CONDITIONING IN THIS FEEDING PROCEDURE AND THE REMOVAL OF ANY DIRECT HUMAN INTERACTION SHOULD REDUCE NEGATIVE EFFECTS OF CAPTIVITY SUCH AS ARB

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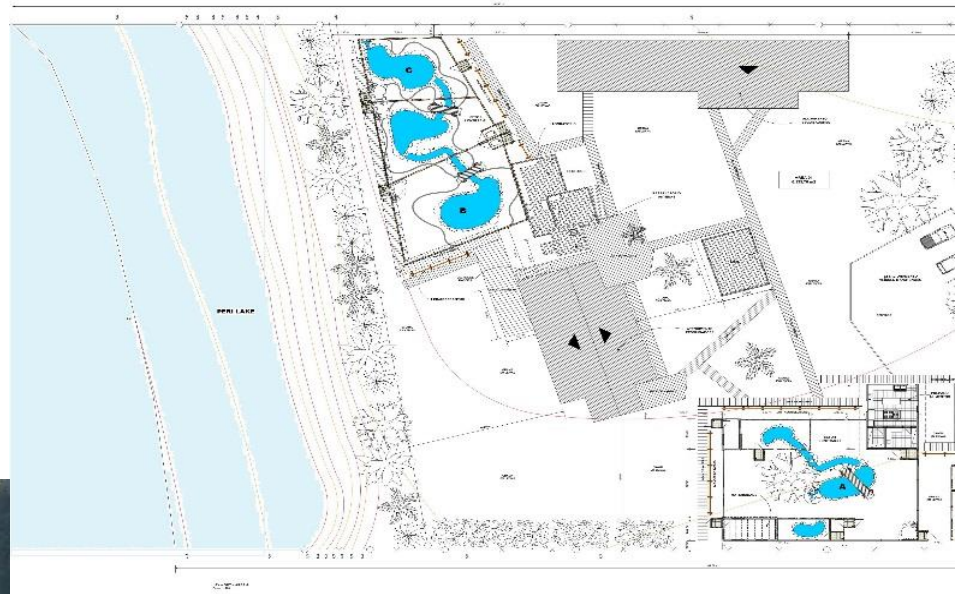
THE STUDY SITE

This research carried out in an otter scientific breeding for the conservation of neotropical otters in south of Brazil between April and June 2013.

Within a conservation area, in front of the Peri lake, habitat of wild neotropical otters, each enclosure contains natural sheds, stones and bushes, concrete pipes and wooden shelters



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THE SUBJECTS

CAPTIVE OTTERS OBSERVED IN THIS STUDY

		COMPOSITION	AGE	ORIGIN	RELATIONSHIP
CONTROL INDIVIDUAL	A1	MALE	6	ORPHAN/MOTHER KILLED	COUPLE
CONTROL INDIVIDUAL	A2	FEMALE	6	ORPHAN/MOTHER KILLED	COUPLE
TEST INDIVIDUAL	B1	MALE	6	ORPHAN/MOTHER KILLED	COUPLE
TEST INDIVIDUAL	B2	FEMALE	6	ORPHAN/MOTHER KILLED	COUPLE
TEST INDIVIDUAL	C1	MALE	3	ORPHAN/MOTHER KILLED	SIBLINGS
TEST INDIVIDUAL	C2	FEMALE	3	ORPHAN/MOTHER KILLED	SIBLINGS

6 orphan captive neotropical otters (*Lontra longicaudis*) (n=6), 3 males and 3 females, one couple in each group, were observed individually in their enclosure (A-B-C)

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THE FEEDING PROCEDURES

Initially handly through fences
by staff members
(still for the Control Individuals A1 A2)

After: Through Fish Pipe with a whistle
as a new conditional stimulus
(for the Test Individuals B1 B2 & C1 C2)

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PROCEDURE: Given the low behavioural knowledge for this species, baseline behaviour data were collected for 15 days 18 BEHAVIOURS WERE RECORDED (Kruuk 2006)

10 SOLITARY ONES

resting/sleeping, grooming, sand bath, maintenance, feeding/foraging, terrestrial locomotion, aquatic locomotion, swim in circle, fencing/pacing, on the alert behaviour

8 SOCIAL ONES AND OFF-TIME EXPOSURE social resting/sleeping, social grooming, scent marking & ano-genital sniffing, mating, social terrestrial locomotion, social aquatic locomotion, agonistic behaviour, vocalizing/communicating












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PROCEDURE:

1. CONTROL PERIOD from 1st to 7th May

Random ad libitum observations of 2 individuals at the same time in each of these 3 groups, sampling method to determine their active periods from 06:00h to 21:00h (Altmann 1974)

→ Active periods from 07:00h to 10:00h and from 15:00h to 18:00h

→Scan of 15 min/enclosure/hour, 6h/day, 5 days/week → 90 scans /week

2. TEST PERIOD from 10th to 31th May

Other parameters that could affect their behaviour were also recorded :

Exact feeding times; fed or not during the scan; their rank of observation/hour; different staff arrival time; weather; temperature; moisture; unexpected stressful; level of direct confrontation with the people

Observations were realized in silence from improvised places belonging to their environment above their enclosures

PROCEDURE: DATA ANALYSIS

Several correlations were analyzed using non-parametric statistics for dependent data (Spearman test, the exact method and explained variation r^2), each individual is the statistical unit, between the different feeding procedures during the month of May (without and with the fish pipe) and the average weekly time :

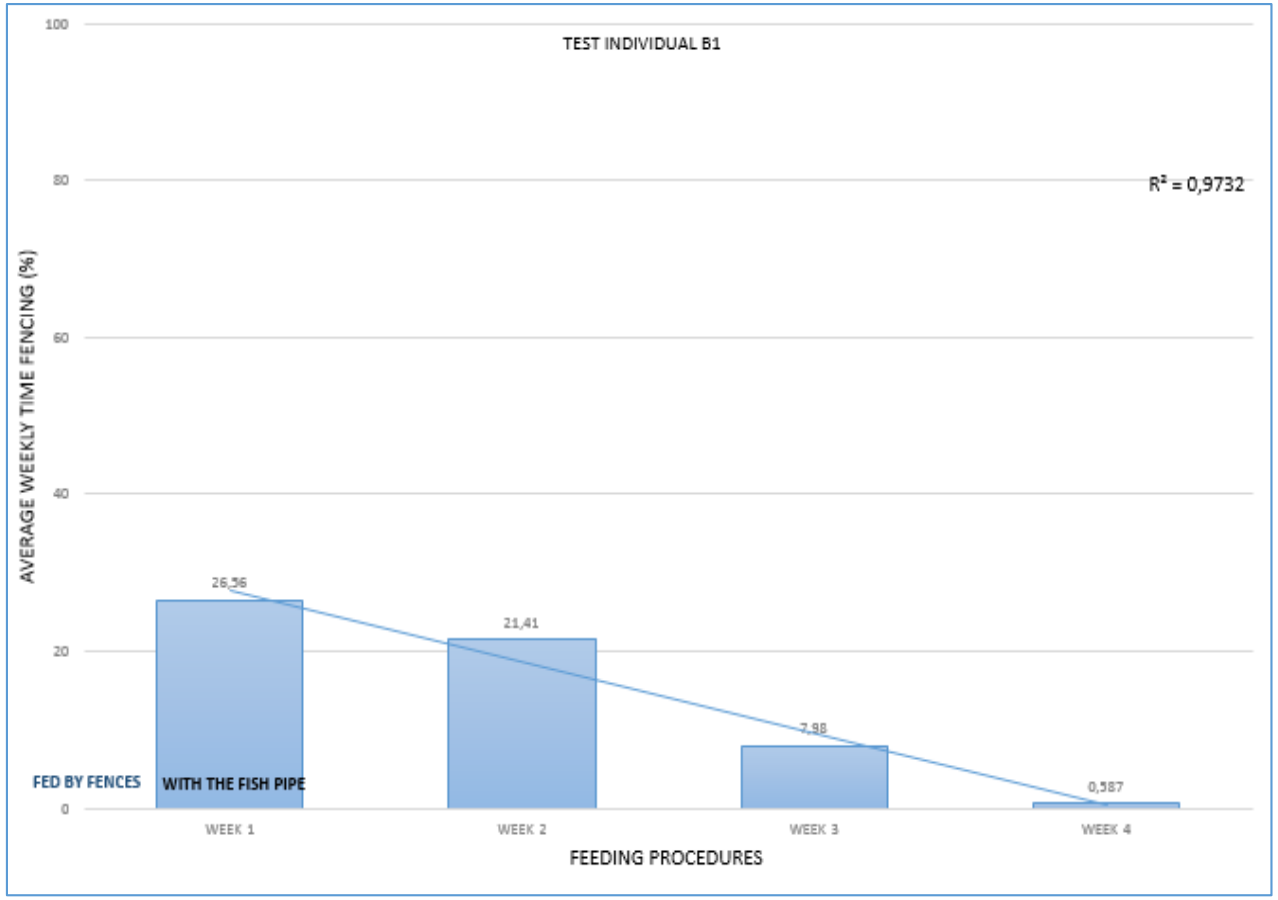
- Of fencing / pacing,
- Of 'on the alert behaviour',
- Of mating,
- Of feeding/ foraging

And the correlation between the different hours of the first arrival (reported a sharp audible alarm) and the rates:

- Of fencing / pacing,
- Of ‘on the alert behaviour’ recorded at this time

PROCEDURE: RESULTS

Correlation between the two periods with the different feeding procedures in May (handy fed as usual through fences and fed by the fish pipe) and the average weekly time of fencing/pacing



There are significant correlation for all the Test Individuals (B1, B2,C1,C2) between the decreasing of the fencing/pacing and the period of the implementation of the new food provider (the fish pipes) in their enclosures:
B1: $r^2 = 0,9732$; B2: $r^2 = 0,9236$;
C1: $r^2 = 0,9597$; C2= $r^2 = 0, 9283$

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PROCEDURE: RESULTS

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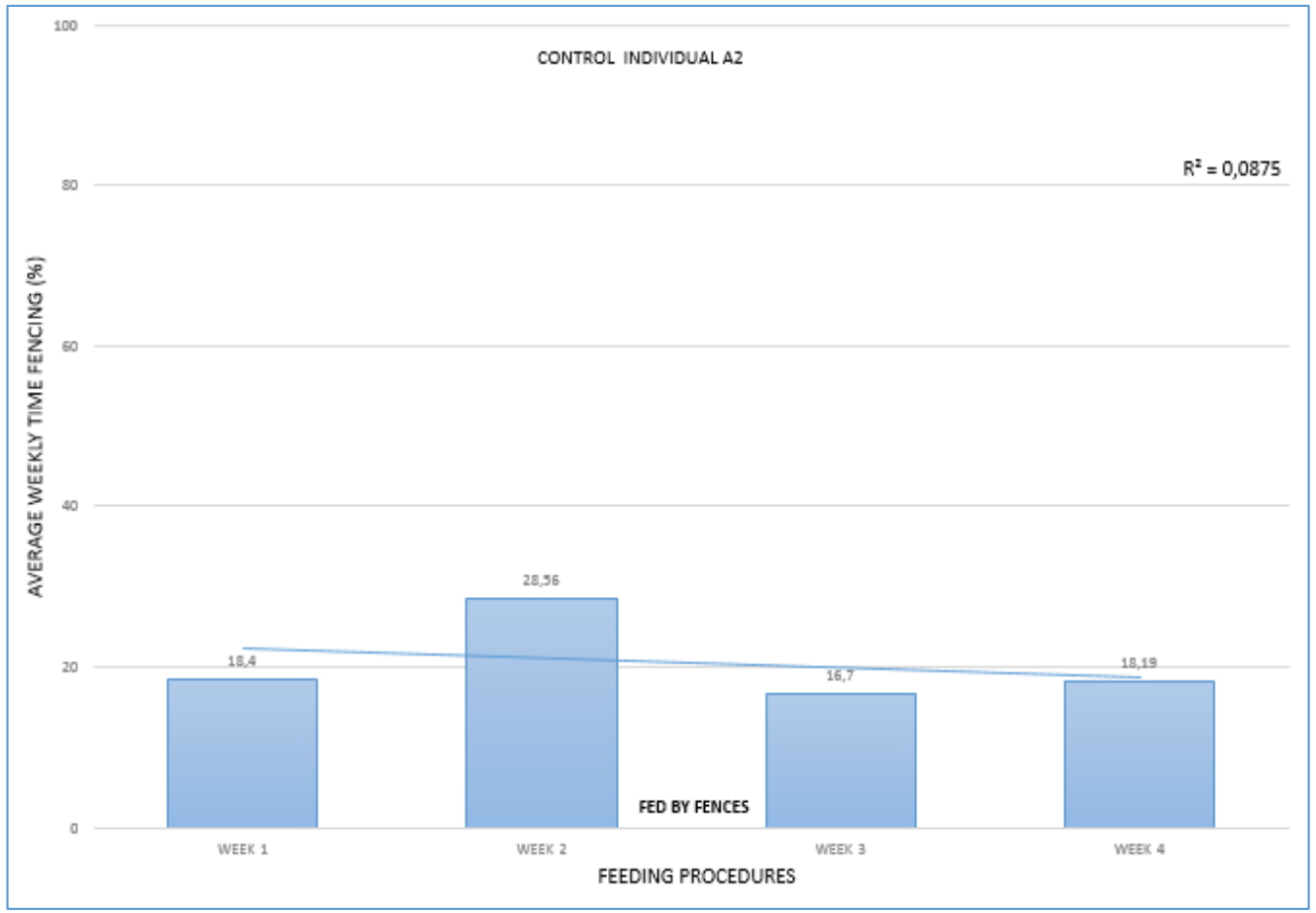

Control individuals
A1, A2 remain unchanged
A1: r^2 =0,4171; A2: r^2 =0,0875

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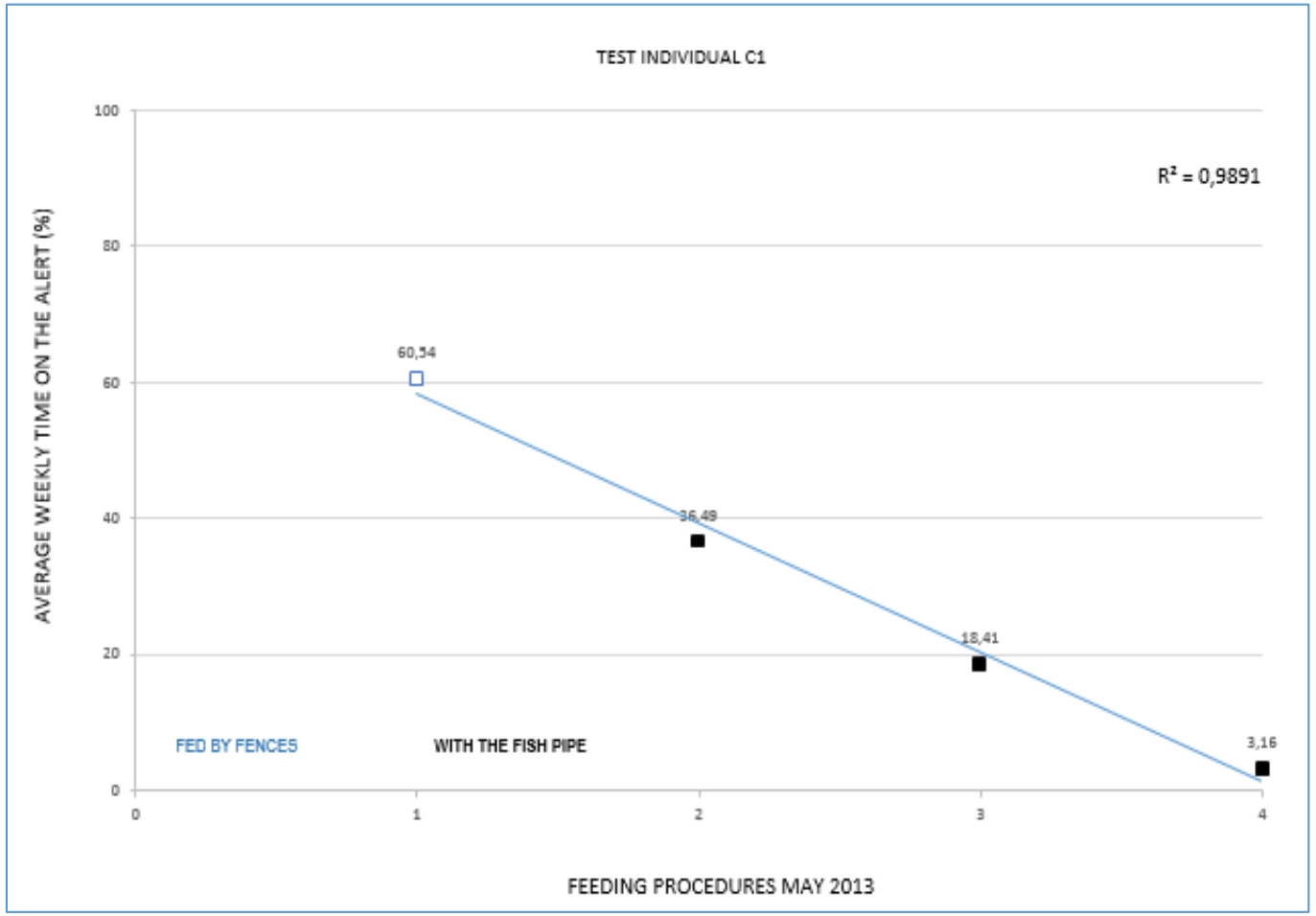
PROCEDURE: RESULTS

Correlation between the two periods with the different feeding procedures in May and the average weekly time of ‘on the alert behaviour’



There are significant correlation for all the Test Individuals (B1, B2,C1,C2) between the decreasing of the ‘on the alert behaviour’ and the period of the implementation of the new food provider in their enclosures:
B1: $r^2 = 0,9761$; B2: $r^2 = 0,8985$;
C1: $r^2 = 0,9891$;C2= $r^2 = 0, 9636$

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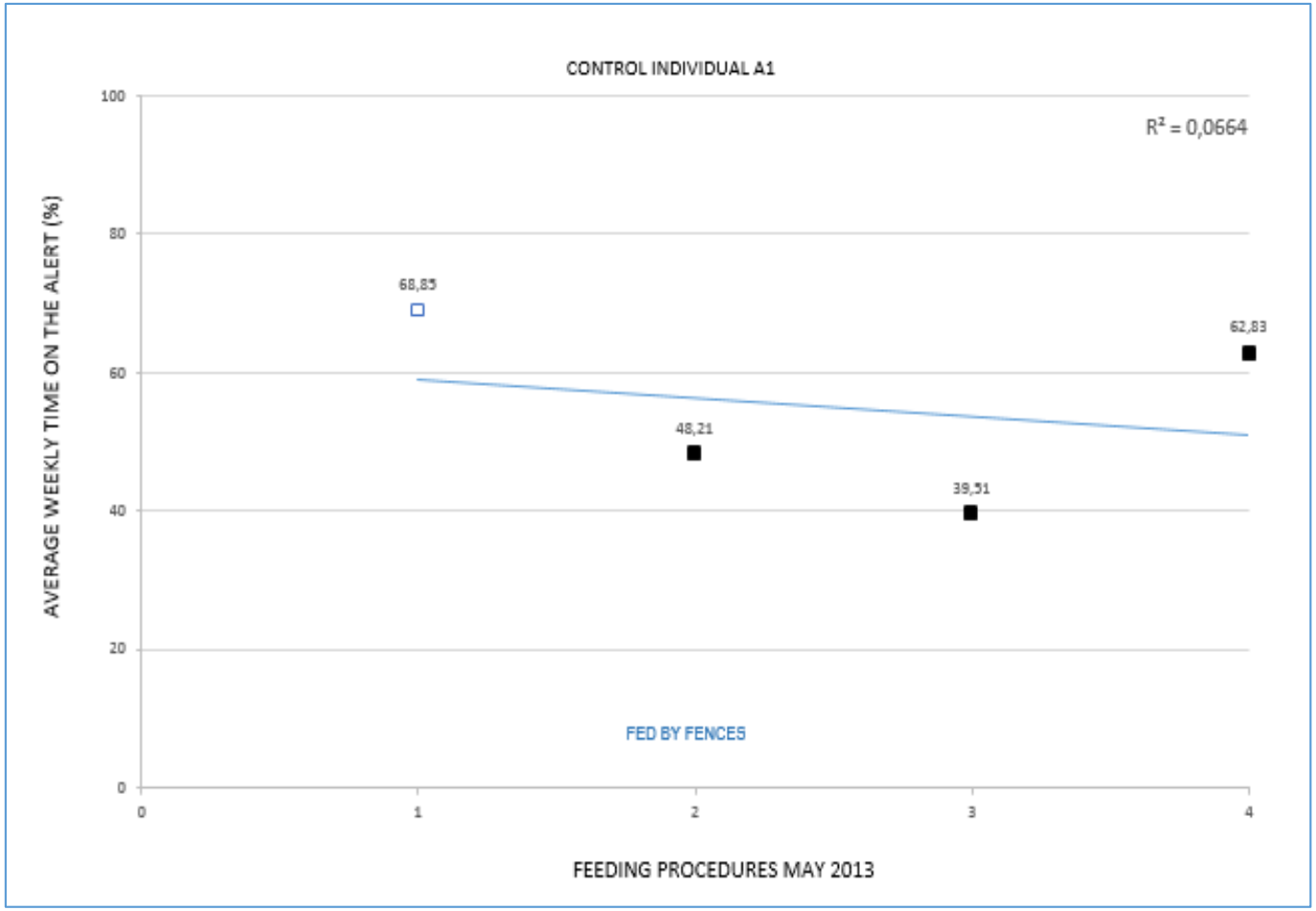
PROCEDURE: RESULTS

Correlation between the two periods with the different feeding procedures in May and the average weekly time of ‘on the alert behaviour’



Control individuals
A1, A2 remain unchanged
A1: r^2 =0,0664; A2: r^2 =0,4303

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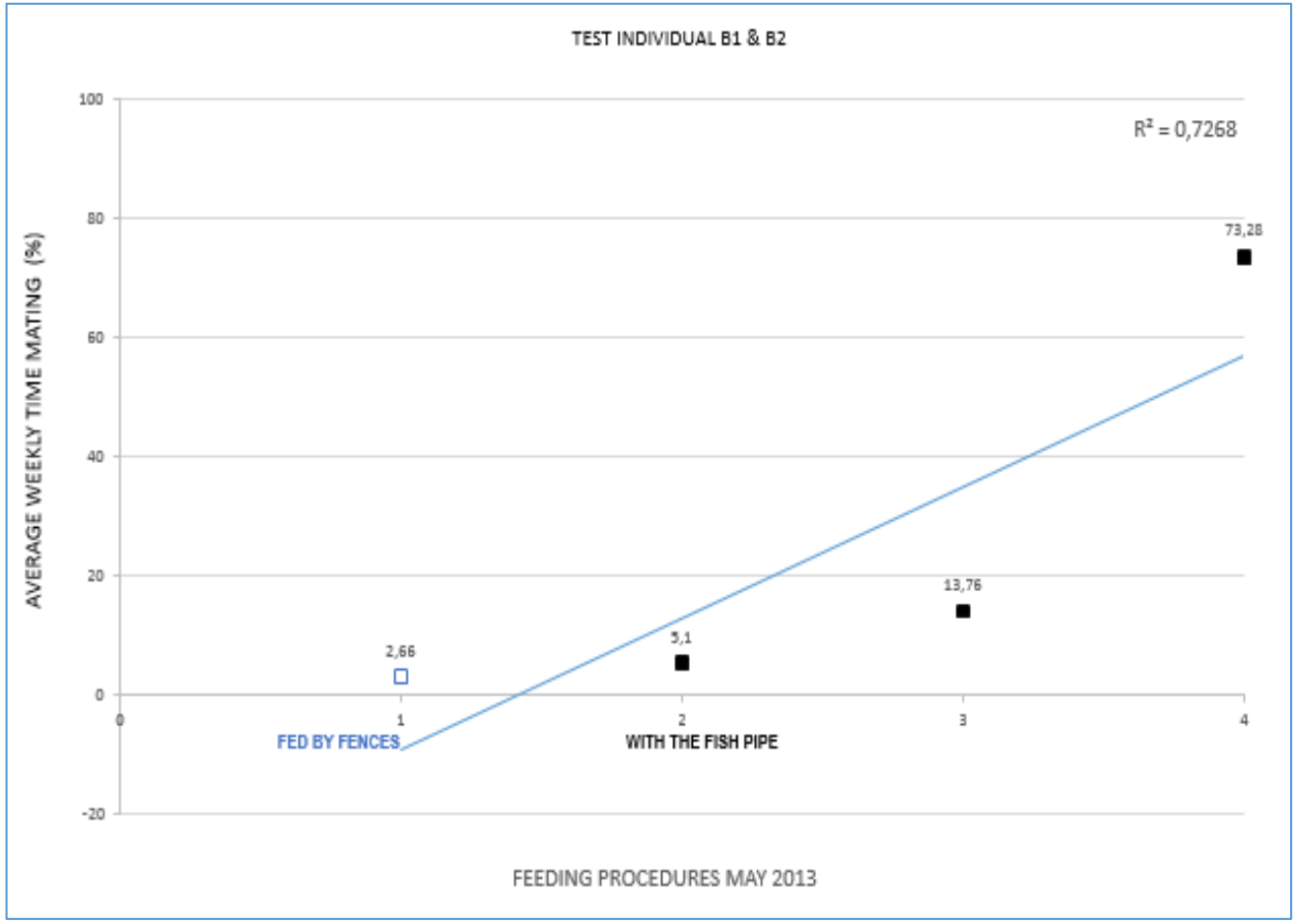
PROCEDURE: RESULTS

Correlation between the two periods with the different feeding procedures in May and the average weekly time of mating



There are significant correlation for all Test Individuals sexually matured (B1,B2) between the sharp increasing of time spent to mate and the arrival of the fish pipes in their enclosures

B1/B2: $r^2 = 0,7268$

Control Individuals remain unchanged

A1 A2 $r^2 = 0,3703$

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CONCLUSION

It is futile to address the perceived causes of behaviour without any prior reduce underlying motivations, otherwise it might only tackle temporarily the expression of the behaviour *(Mason & Latham 2004)*

- The first observations have clearly shown a **MENTAL ASSOCIATION** that has resulted in several of the ARB (whose behaviour 'on the alert') as being due to underlying motivation the idea of getting food to each human sound
- The main aim of this research was to put an end to dangerous behaviour and injuries coming from the ARB → As a behaviour not rewarded tends to extinct (Skinner):

The idea was to break this association to extinct such ARB by addressing the otters' underlying motivations

→ Assigning a different sound (the whistle) as conditional stimulus to get this primary reinforcer (food). As the unwanted behaviour can be remembered, it will be fundamental to never make any exception to this new feeding procedures

CONCLUSION

Stress can have suppressive effects on reproduction and is one measure of good welfare *Swaisgood*

Different behaviours were significantly affected by this new feeding process which could be the indicators of a better welfare

Mating results for the Test individuals B climbed from 2,66% to 73,28%; showed numerous copulations and the female was for the 1st time in oestrus;

Pacing/fencing and 'on the alert behavior' decreasing almost in totality (from the highest C2 at 43% to 0,2% after 3 weeks, to the lowest B1 at 27% falling to 0,6%; C1 at 60,5% to 3,1%, to the lowest B1 at 39,9% to 3,7%)

- Future research on the behavioural effects of this device should continue on the next months to refine the results and to compare them with previous studies on the same individuals and it will be extended to the control individuals

- Next research should develop aquaculture pond to provided live fish through the fish pipe

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THANKS FOR YOUR ATTENTION