Fertility control to mitigate human-wildlife conflicts in an overcrowded world: an overview

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8th Internat. Conference Fertility Control for Wildlife, July 2017
Human-wildlife conflicts are increasing

- Damage to crops, forestry, property
- Disease transmission
- Impact on native species
- Road traffic accidents
- Livestock predation
- Attacks on humans
Human-wildlife conflicts: current trends

Human world population

[World map showing population distribution with a legend indicating population density levels from 0-9 to 1000+ and bar charts for 1970, 2000, and 2030]
Human-wildlife conflicts: current trends
Human-wildlife conflicts: ideal conditions
Human-wildlife conflicts: current trends

Fig. 1. Change of forest area in the UNECE region (in relation to the area of 1990). Source: FAO FRA 2010.

UNECE region: Europe, North America, the Caucasus and Central Asia
Wild boar in urban areas

Berlin 2007: an ugly dog?
Wild boar populations in Europe

- Luxembourg
- Serbia
- Slovenia
- Switzerland

- Belgium
- Croatia
- Latvia
- Portugal
- Austria

- Czech Republic
- Hungary
- Italy
- Sweden
- Russia
- Spain

- Poland
- France
- Germany

Massei et al. 2015
Human-wildlife conflicts: current trends

Quebec animal-vehicle collisions

http://www.tc.gc.ca/eng/roadsafety/tp-tp14798-1289.htm
Methods to mitigate human-wildlife conflicts

Lethal methods
- poisoning
- shooting
- trapping

Non-lethal methods
- exclusion
- translocation
- fertility control
- diversionary feeding
An ideal contraceptive

- No side effects on welfare & individual behaviour
- Long-term effectiveness (most contexts)
- Single dose
- Oral or injectable

- Inexpensive to produce and administer
- Specie-specific
- No effect on food chain
- No effects on social behaviour
- Deliverable to a large proportion of the population
Vaccines inducing antibodies against proteins or hormones essential for reproduction

**“single (few) dose” injectable vaccines**

- **GnRH**
  - Gonadotrophin Releasing Hormone
  - 70-100% animals infertile for 2-8 years
  - Practical applications credible

- **PZP**
  - Porcine Zona Pellucida
Oral contraceptives

Nicarbazin for pigeons: Ovistop® and OvoControl®

ContraPest® for small rodents
Novel contraceptives

- Livestock
- Zoo animals
- Companion animals

$50 million funds
Case study 1: “Single-shot” GonaCon in captive wild boar

**Test 1**

- 2004
- 6 males
- vaccination
- 6 litters

**Test 2**

- 2004
- 6 males
- vaccination
- 6 litters

Massei et al. 2008 and 2012 Wildlife Research
Case study 2: field evaluation of GonaCon (UK)

Evaluation in individual free-living wild boar in UK

Quy et al. 2014 Wildlife Research
Case study 3: immunocontraception to manage feral goat populations in UK

- Move into town, “vandalise” gardens
- Damage plant communities
- Signs of poor health
- **Iconic** local status, tourist attraction
- Council **policy** is **not to cull**
- **Limited** opportunities to **translocate**

**Single injection of GonaCon significantly reduced goats’ reproductive output for at least 4 years**

*Cowan et al. in progress*
Case study 4: contraception for free-roaming dogs

- ~ 500 million dogs worldwide, 75% “stray”
- every year > 55,000 people die of rabies
- 14 million people per year receive rabies prophylaxis
- Cost of rabies control US$ 583 million per year
- Culling unacceptable and ineffective
- Contraception as alternative to surgical sterilization
- Fertility control + rabies vaccination = optimization of rabies control campaigns

Carroll et al. 2010, Wildlife Research
Massei & Miller 2013, Theriogenology
Contraception for free-roaming dogs

V + FC

S

E

I

death

S = susceptible
V = vaccinated
I = infected
E = exposed

Carroll et al. 2010 Wildlife Research
Case study 5: fertility control and disease transmission in possums

Transmission rate of *Leptospira* in gonadectomized possums:
- ↓ in males and females compared to controls

Fertility control → less frequent mating contacts → reduction of disease transmission, without having to reduce population density


*Ramsey 2007, J Wildl Mgmt*
Case study 6: immunocontraception to increase inter-calving in elephants

Immunocontraception used on individual, rotational basis stretches females’ inter-calving interval to a management-determined interval

Druce et al. 2011 PLOS ONE
Case study 7: immunoocontraception to manage feral cattle and buffaloes in Hong Kong

- Feral cattle cause road traffic accidents
- Translocated animals return to original area
- Public opposed to culling
- Surgical sterilisation unfeasible in remote areas

Captive trial ➔ Field trial ➔ Other species

Massei et al. 2015, PLOS ONE
Non-lethal control: when?

When lethal control is:
- illegal
- unacceptable
- unfeasible
- unsustainable
- environmentally hazardous
- ineffective

..........definitions?
Who supports fertility control to manage wildlife?

- Ecologists, wildlife managers
- Vets
- Hunter
- Animal welfare groups
- Local authorities

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<tr>
<th>Costs</th>
<th>Benefits</th>
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<td>Enthusiasm</td>
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- Pro: Animal welfare groups, Local authorities, Ecologists, wildlife managers, Vets, Hunters
- Con: No information provided
Research gap and challenges for fertility control

- **Time vs. effort**: what is the % of population to treat to achieve objectives?

- **How often** populations must be treated with contraceptives?

- What are the *behavioural* effects of contraception?
  - does fertility control affect contact rate and disease transmission?
  - does it affect social dominance? Cause social disruption?

- Increased *survival*: what are the effects on population?

- What are the *costs* of using chemical contraception?

- *Feasibility*? Including delivery

- *Alternatives* to fertility control?
Future work: towards practical applications of fertility control for wildlife

Contraceptives available

Model impact of FC on population dynamics

Development of new contraceptives
Field trials
FC in specific contexts
Registration of drugs

Costs and sustainability
Legal aspects of using contraceptives

Manage public expectations
Conclusions

Human-wildlife conflicts will continue to increase

Applications of fertility control for wildlife are growing but we have more work to do

Education, Public Engagement, Education
Thank you!

Many thanks to:

The National Wildlife Management Group in York and the National Wildlife Research Center in Fort Collins (USA)

The many colleagues and groups engaged in this field

Those that believe in this work

The Botstiber Institute for making this happen

The authors of some pictures used in the presentation

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