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Resume

Assessing biological realism of wildlife population estimates in data-poor systems

Popescu et al. 2016

**1) Introduction**

regulated hunting => as a management tool needs reliable population data.

Decisions are based on a multitude of factors not only biological considerations.

Evaluate the biological plausibility of reported population estimates used for hunting decisions for: brown bear, wolf, lynx.

Romania as data-poor region and with “corrupting” game managers.

Aims of the article:

- compare population growth rates calculated from reported abundances (2005-2012) to growth rates in other countries.

- test whether reported estimates fell within the bounds of biologically plausible trajectories.

- relationship between the amount of hunting and occurrence of biologically unrealistic estimates.

For b. bear the annual population growth rates are greater than the max. published growth rates. The diff. was positively correlated with hunting.

For wolf the reported estimates were within the bounds of the plausible biological trajectories.

For lynx the reported estimates were lower.

POPULATION ESTIMATES USED BY MANAGEMENT AGENCIES vs. DEMOGRAPHIC DATA FROM STUDIES

=> evaluate the biological plausibility of wildlife data in data-poor systems.

Hunting is often aimed at reducing human-wildlife conflict, maintaining stable populations and building public support for carnivore conservation.

Most large carnivores are elusive species, have large home ranges and generally occur at low densities, posing significant methodological challenges for estimating abundances (Ripple et al 2014).

New methods for evaluating carnivore density and abundance => capture-recapture methods.

NEITHER THEY DO, AS THEY DON’T HAVE A CAPTURE-RECAPTURE PROJECT IMPLEMENTED IN THIS SENSE TO BE ABLE TO COMPARE THE RESULTS

Traditional methods for evaluating carnivore densities => traditional monitoring methods: regional track, sighting surveys, expert opinion; ACCURACY RARELY TESTED.

INFLUENCE OF NON-BIOLOGICAL FACTORS!

Scrutinize abundance data in data-poor systems by means of simulations (demographic projections). Evaluating the biological plausibility of population estimates used in hunting management.

WHAT KIND OF UNCERTAINTY ARE WE TALKING ABOUT?

YOU DON’T TEST A MODEL IN AN AREA WHERE YOU DON’T RELY ON THE EXISTING DATA! AND YOU HAVE TO CALIBRATE A MODEL BEFORE USING IT IN A NEW AREA!

**Analysis 1**:

- calculated how reported estimates changed from year to year (“estimated growth rates”)

- compared them to published, empirically derived growth rates (“published growth rates”)

estimated growth rates vs. published growth rates

Interpretation: Differences might indicate management operating on assumptions that are not biologically plausible.

THIS IS ONE POSSIBLE INTERPRETATION.

OTHERS MIGHT SOUND LIKE: diff. subspecies, diff. env. conditions, diff. attitudes (leading to immediate shooting after coming into a region).

**Analysis 2:**

- deals with trajectories

trajectories from reported estimates vs. trajectories biologically plausible

IT IS NORMAL THAT WILDLIFE MANAGEMENT TAKES INTO ACCOUNT MORE THAN JUST BIOLOGICAL ASPECTS!

**Analysis 3:**

- association between

total no. of animals hunted and biological plausibility of population estimates and traj

NONSENSICAL TO ME!

There is always a correlation between the no. of animals hunted and the pop. estimates. This is how such decisions are taken. The estimates are the basis for the no. of animals hunted!

=> messy interpretation of the statistical results for all 3 analyses!

3

Hypothesis: A positive correlation betw. unrealistic population trajectories and the amount of hunting for b.bear, wolf and lynx.

**2) Materials and methods**

2.1 Large carnivore data

- compiled official data on:

ABUNDANCE ESTIMATES, HUNTING QUOTAS, NO. OF HARVESTED INDIVIDUALS at county level for b. bear, wolf, lynx.

Of 41 counties in Romania:

- b. bear in 26 counties

- wolf in 30 counties

- lynx in 26 counties

These data didn’t include: POACHING, ROAD KILL, MORTALITY DUE TO HUMAN-ANIMALS CONFLICTS

additional sources of mortality like poaching, roadkill can be high but their assessment is difficult.

(see McLellan et al 1999, Liberg et al 2012)

They estimated additional mortality used data sources like:

- conservation associations

- National Registry for Accidental Wildlife Mortality in Protected Areas (2012-2014, spatial coverage of these data is limited)

- expert opinion

=> assumed a total additional mortality rate of 5% of the estimated population of b. bear.

For lynx and wolf there are only scare data available.

=> assumed a total additional mortality rate of 5% for lynx (WHY THAT HIGH?).

=> assumed a total additional mortality rate of 10% for wolfs, due to “a long history of persecution”.

2.2 Literature survey of population growth rates

RESEARCH ARTICLES AND REPORTS THAT ESTIMATED GROWTH RATES IN OTHER EUROPEAN POPULATIONS FOR THESE SPECIES.

- a low no. of articles for Europe (bear: Slovenia, Sweden; wolf: Scandinavia; lynx: Sweden)

- a low no. of articles for N. America (bear: Canada and USA; wolf: USA)

Growth rates for the stable Romanian large carnivore populations!

=> they might not be representative even for Slovenia or Sweden!

The “realistic range of growth rates was defined as ranging between the min. and max. .

Range of growth rate: to

Assumed max. growth rates:

2.3 Analyses

Analysis 1

estimated growth rates vs. published growth rates

(conditii optime de dezvoltare la urs in Romania, investigarea conditiilor/ factorilor ce controleaza rata de crestere a pop. de urs).

For each county and species they calculated the difference in reported estimates between consecutive years. They added the hunted animals and derived the growth rate:

difference in (Living + Hunted) between years = growth rate

Hilty et al “Corridor Ecology” (p. 68)

growth rate= (birth + immigration) – (death + emigration)

(growth rate=dN/dt)

more general:

GROWTH RATE = INPUT – OUTPUT

=> ANALYZE POSSIBLE TYPES OF INPUT AND OUTPUT SOURCES!!

Popescu deliberately left out counties with less than 10 bears, although this might be an important source of immigration into neighboring counties that have higher estimates.

Also emigration could be a factor when densities become higher.

(also + other mortality sources)

They calculated the diff for each species for each county.

The considered unrealistic high diff and calc. the no. of times that this occurred.

Analysis 2

Evaluate whether the deviations between estimated and plausible growth rates compounded through time:

reported population trajectories vs. biologically plausible population trajectories

biologically plausible population trajectories: combined recorded levels of hunting, plausible growth rates, estimated additional mortalities.

Biologically plausible population trajectories had as starting point year 2005.

WHY USE ?

They randomly chosen the from a distribution ranging between to .

They randomly selected the 1000 times to capture “the full range of biologically possible growth rates”.

Fig. 2 shows how often the reported estimates were out of bounds of the “plausible” population estimates.

Analysis 3

Correlation between log(hunt) and difference between reported and estimated abundances.

Why standardize like this? Was a diff. like this better correlated with log(hunt)?

3) Results

From Analysis 1: differences betw. and

Pop. of b. bear had an estimated growth rate 1.36 times higher than in published literature.

(despite high levels of hunting)

Estimated population growth rates for Lynx were occasionally higher.

Estimated population growth rates for wolf were more often higher than for lynx.

From Analysis 2: trajectories for and

For b. bear the reported estimates lead to a trajectory clearly out of bounds than the one using , hunting, additional mortality.

For lynx was lesser the difference.

For wolf the observed trajectory was within the bounds of the simulated ones.

From Analysis 3: correlation between hunting and differences in the two growth rates

r= 0.576 for b. bear (not a strong correlation though)

r=0.182 for wolf

r=0.164 for lynx

4) Discussion

- management decisions might have lacked biological realism.

- question the reliability of reported abundance data used in setting hunting quotas

- evaluations for the three species differ in their biological plausibility

B.bear was often above lit.max.

Lynx was often below lit.max.

Wolf was within the lot.max.

=> current hunting decisions are often based on biologically unrealistic population data.

HOW DOES HE EXPLAIN WHY THE POPULATION IS STABLE AFTER ALL THESE YEARS OF “OVERHUNTING”?

Management implications:

- Romanian wildlife management might benefit from reevaluating the current methods used to estimate large carnivore abundance. (this might be true!)

- implement monitoring programs based on genetic methods (repeated every 3-5 years)

- demographic studies to inform biologically meaningful hunting quotas

True!

Current assessments based on unmarked animals : tracks, sighting, camera traps are not reliable for capturing population trends!

Ignoring uncertainty can lead to unsustainable hunting mortality.