A VERY, VERY BASIC INTRODUCTION TO META POPULATIONS

for non-scientists

Written by Sally Walker in 1993 utilizing a variety of written publications, lectures, and personal communications with Tom Foose, Ulie Seal, Colin Tudge and Malcolm Whitehead. (They should not be blamed, however)

WHAT IS A META POPULATION?

... this is a continuation to last month’s topic on What is a Small Population? ...

We ended with understanding that small populations do not do too well because of ..
Walker’s Law
... huh?
A very small population could survive in the wild
IF
NOTHING WENT WRONK,
BUT according to
Walker’s Law

And what things can go wrong in Nature, pray tell?
WELL,

1. DEMOGRAPHIC THINGS

DISTORTED SEX RATIO
(i.e., a run of all male births …)

UNSTABLE AGE STRUCTURE
(i.e., too many kids and too many grandma’s)

REPRODUCTIVE FAILURES
(i.e., low romance factor?)

2. GENETIC FACTORS

DRIFT AND SELECTION
FOUNDER EFFECT
AND BOTTLENECKS
INBREEDING DEPRESSION
OUTBREEDING DEPRESSION

3. ENVIRONMENTAL EVENTS

Natural disasters
STORMS
FLOODS
FIRE
DROUGHT
PLAGUE
EARTHQUAKE
VOLCANIC ERUPTION

Human-caused disasters
DISEASE (domestic livestock)
SOCIAL (unrest)
POLITICAL (discontent)
ECONOMIC (instability)

... just to name a few

Any one of these could wipe out a small population in short order
TO MEET SUCH CHALLENGES
GENETIC VARIATION,
AS WELL AS SIZE
IS IMPORTANT FOR BOTH
INDIVIDUALS
AND
POPULATIONS
INDIVIDUALS
need Genetic Variation to be fit, healthy, vigorous so that they can reproduce
for survival

POPOPULATIONS
need Genetic Variation to be fit, healthy, vigorous so that they can adapt to the challenges of our changing world, or …

-- to evolve.

Then, what to do?
How to save species and populations
in the circumstances of our modern world …

Population Explosion
Human pressure on land
Shrinking habitat
Fragmented habitat
Isolated populations

BE SURE
YOU HAVE ENOUGH
So that these problems DON'T MATTER
HOW MANY ARE ENOUGH?
TO BE FIT.? TO INCREASE THE POPULATION?
TO SURVIVE …?
TO TRANSCEND RISK …?.
TO PRESERVE GENETIC VARIATION …?
NOBODY KNOWS
(for sure) but here are some

RULES OF THUMB

SURVIVAL IN CAPTIVITY
Maintenance of sufficient genetic variation necessary to MINIMISE INBREEDING.
Some population biologists suggest 50 breeding adults or a census population of 250

SURVIVAL IN THE WILD
Maintenance of sufficient genetic variation necessary for ADAPTIVE EVOLUTION
Some population biologists suggest 500 breeding adults or a census population of 2500

THESE NUMBERS ARE “RULES OF THUMB”
NOT “HARD AND FAST” RULES
SMALLER POPULATIONS HAVE SURVIVED, E.G.,
Sangai – from 14 to 200+ Manipur
Asiatic lion – 20 to 500+ Gir Forest
Indian Rhino – 16 to 1500+ Kaziranga
EVEN LARGER POPULATIONS HAVE GONE EXTINCT
Passenger pigeon -- 200,000,000+ to 0 U.S.A.

WHY DO POPULATION BIOLOGISTS SAY YOU NEED LESS TO INSURE SURVIVAL 50/250 IN CAPTIVITY THAN 500/2500 IN THE WILD?
BECAUSE – IN CAPTIVITY YOU HAVE

CONTROL
There are many advantages to captivity for small, “sick” populations
HOW TO HAVE ENOUGH?

When so many things are going wrong in the wild and the world?

METAPOPULATION MANAGEMENT IS ONE WAY

WE MAKE USE OF THE TOTAL POPULATION CAPTIVE & WILD

INDIAN RHINO (Rhinoceros unicornis)
STATUS – INDIAN SUB-CONTINENT 1992

USING A VARIETY OF THE “NEW ZOO SCIENCES” & MODERN MANAGEMENT TECHNIQUES IN WILD AND CAPTIVE POPULATIONS IN

COORDERATIVE MANAGEMENT PROGRAMMES

THROUGHOUT THE WORLD’S ZOOS

Continued next month ... “Why do we need zoos?”