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

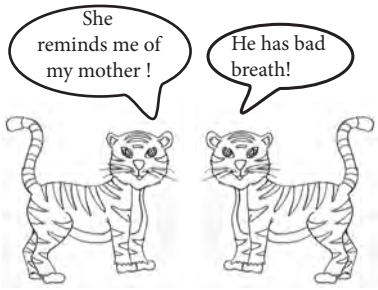
NOTHING WENT WRONG,

BUT according to

Walker's Law

IN LIFE
(AND IN NATURE)

THINGS GO WRONG



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
DROUGH
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

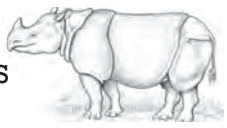
TO MEET SUCH CHALLENGES

GENETIC VARIATION,

AS WELL AS SIZE

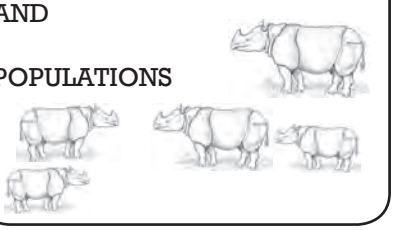
IS IMPORTANT FOR BOTH

INDIVIDUALS



AND

POPULATIONS



INDIVIDUALS

need Genetic Variation to be fit, . . healthy … vigorous so that they can ***reproduce***
.. for survival

POPULATIONS

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?

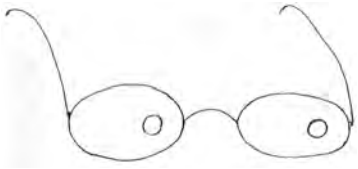
TO BE FIT..?
TO INCREASE THE POPULATION?
TO SURVIVE ….?
TO TRANSCEND RISK …..?
TO PRESERVE GENETIC VARIATION
.. . ?

NOBODY KNOWS
(for sure)
but here are some

RULES OF THUMB

OR

VERY EDUCATED GUESSES



SURVIVAL IN CAPTIVITY	SURVIVAL IN THE WILD
Maintenance of sufficient genetic variation necessary to MINIMISE INBREEDING.	Maintenance of sufficient genetic variation necessary for ADAPTIVE EVOLUTION
Some population biologists suggest 50 breeding adults	Some population biologists suggest 500 breeding adults
or a census population of 250	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

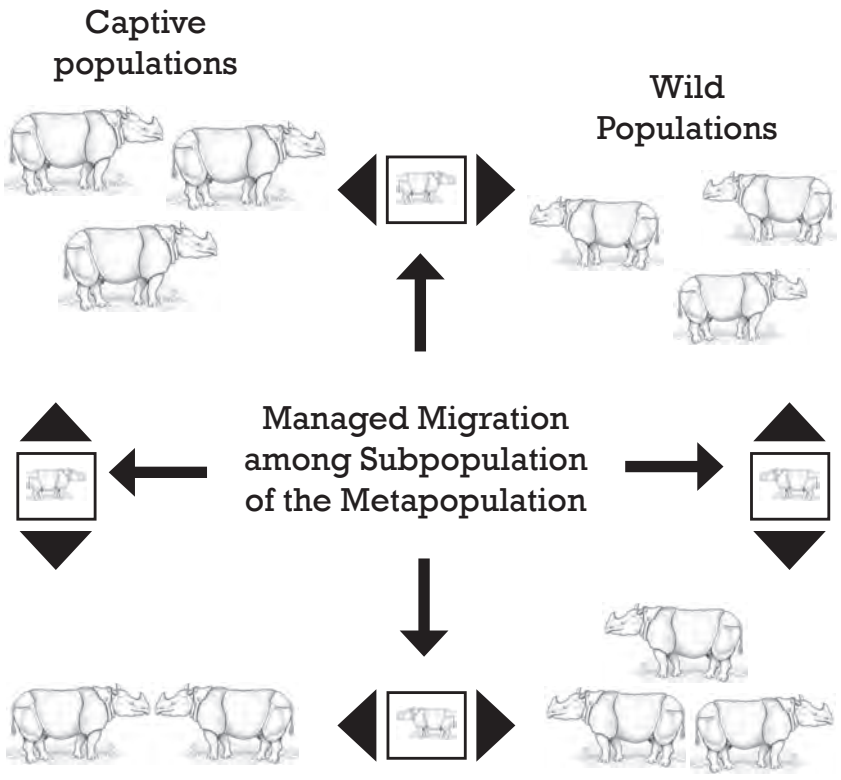
CONTROL

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

COOPERATIVE MANAGEMENT PROGRAMMES

THROUGHOUT THE WORLD'S ***ZOOS***

Continued next month ... "Why do we need zoos?"