

Case studies.

Preliminary comments:

We will follow the book, though in some cases we'll just mention the case history briefly without going into the same detail as is in the book. On the other hand, we'll add some examples not in the book (towards the end).

Examples are informative in the sense that they illustrate different approaches that sometimes worked, sometimes didn't.

1) Dodo.

Large flightless bird (a bit bigger than turkeys), living in the Mascarene Islands. Recent DNA evidence shows that they were related to pigeons.

- Some reports are conflicting:
  - Sailors used the birds for food,
  - Sailors thought the meat tough and not pleasant (even after boiling for many hours!).
- Dutch and Portuguese arrived in the late 16<sup>th</sup> / early 17<sup>th</sup> century.
- According to text, sailors liked fresh meat (but see comments above).
- Birds were taken for meat, but suitable habitat survived, and this (forest) would have made hunting difficult.
- Dodo's were apparently fairly good runners. Conflicting reports exist of it standing around to be slaughtered vs. running away. NOTE: if they did stand around, this reflects "ecological naivete", not "stupidity".
- As usual, with the arrival of humans, a whole suite of "domestic" animals made it onto the islands:
  - Pigs destroyed the understory, competed for food, and probably destroyed nests.
  - Macaques competed for food.
  - Combination probably wiped out the dodo.
- Some years ago, biologists speculated that one of the trees on the island

(a tambalacoque tree) went extinct because the seeds of the tree needed to pass through the gut of the dodo (there are many examples in the plant world where seeds need to go through the gut of an animal before being able to germinate - why?).

- At one time seeds were being force-fed to turkeys in order to make them germinate.

- This theory has apparently been refuted.

- Question - So what's happening with the tambalacoque tree?? (not a rhetorical question - I haven't looked this up.)

## 2) The woodhen

A flightless rail found on Lord Howe Island (a small island about halfway between Australia and New Zealand)

Most oceanic islands have their own endemic species of rail.

- European colonization started in 1788. By 1924, 9/13 species of bird were extinct. The woodhen was restricted to damp forested mountain peaks.

- Eat invertebrates, nest in burrows of petrels.

- The basic story is similar to that of the dodo:

  - Sailors took woodhens for food, settlers brought pigs, dogs, cats, & goats, all before 1851. Of course rats came along as well.

- The mountain retreat of the woodhen was fairly inaccessible, surrounded by steep cliffs.

- The habitat was not ideal for woodhens, who preferred sunny lowland palm forests.

- 20 to 25 birds left in 1969.

- In 1978, unusually damp weather reduced the number even further.

- Basic research started (scientists weren't even sure how to sex the birds!)

- Careful research into the decline ruled out such things as:

  - Food supply (food was equally plentiful in their mountaintop and

previous lowland habitat).

- No shortage of nesting or roosting sites.
- The impact of rats and cats was examined:
  - rats were plentiful on the mountain (more so than in the lowlands) - this argued against rats.
  - cats were scarce due to an eradication effort. None had been recorded from the mountain.
- The distribution of pigs exactly coincided with the absence of the woodhen. Pigs might could potentially eat eggs and incubating adults.
  - This led to an effort to eradicate pigs, and all except one male were shot.
- In addition, a captive breeding program was set up.
- Both factors contributed to the successful increase in woodhen numbers. In 1993 the population consisted of 50 - 60 breeding pairs.
- The birds did much better in the lowlands (though factors restricting their growth on their mountaintop refuge were not identified.)

### 3) The Bermuda Petrel

Once very common in Bermuda (estimates of up to 500,000 individuals).

Thought to be extinct by 1621 until it's rediscovery in the early 1900's.

- Primary factor driving the petrel close to extinction is/was pigs. Presumably by destroying burrows, eating eggs and birds. Pigs really do eat anything!
- The role of other animals has not been established (rats seem to be excluded as a cause).
- Nests in burrows and crevices.
- An early attempt was made to protect the bird (1616 - the governor of Bermuda issued a proclamation protecting the petrel from hunting, but that didn't help much).
- When bird was rediscovered on some small islands off the coast (pig free), the

Bermuda government designated these islands as a refuge.

- Poisoning of rats did not help the petrel recover.
- Research showed that the nesting sites were often taken over by tropic birds.
- Killing of tropic birds (the Bermuda national bird) did not go over well!
- Instead, after some years of wrangling, artificial burrows and exclusion devices to keep tropic birds out of some nesting sites seems to have caused petrel numbers to increase.
- Again - an understanding of the biology of the organism was vital to it's recovery. A theme that the authors return to again and again.
- Auxiliary note: DDT seems to have played a short role in a decline seen in the population before 1967. With the disappearance of DDT, this was reversed.

#### 4) The large blue butterfly

- This example brings together a lot of principles from ecology and natural history.
- Larva are obligate parasites in ant colonies:
  - caterpillars first feed on flower buds, but then wander off in the hopes of being "adopted" by an ant colony.
    - Offer sugar treats to ants. This and a combination of chemical and tactile cues triggers the ant to carry the larva back to the nest.
    - Once in the nest the larvae feed on ant larvae, needing as many as 230 larvae before pupating.
    - When small, the butterfly larvae can not engulf the ant larvae all at once, and some pheromones may rub off on the butterfly larvae. If the butterfly larvae has been eating ant larvae that might develop into queens, this can trigger an attack by the nursing ants (important: these destroy the queen ant larvae if a queen is present).
- Early attempts at protection included:
  - establishment of reserves, that prevented collecting and excluded grazing animals.

- in hindsight, this made the situation worse.
- by 1979 the last known breeding colony of large blue butterflies went extinct in Great Britain.
  - habitat had changed considerably - bare ground/grassland replaced by more mature areas.
  - but habitat with wild thyme was still available.
- finally, someone noticed that survival of larvae in ant nests depended on the age of the ant nest.
  - in well established ant nests larva survival was 27%.
  - in less established nests (3 - 4 years), survival was 52%. This was due to absence of the “queen effect” - nurse ants were not destroying “potential competitors” to an existing queen.
- End result - more grasslands were burned to create areas for new ant colonies to form. Large blue butterflies were then imported from Northern Europe.
- Auxiliary note: Caterpillars must have the right species of ant - an experiment with a closely related species showed caterpillar survival dropping drastically with the wrong species of ant.

#### 5) Seychelles magpie-robin

- Only a short summary:
  - Related to thrushes.
  - Numbers dropped and the species only survived in on island that was free of predators.
  - Several times cats were shot and populations increased.
  - The last time that cats were killed, however, populations did not recover.
  - Habitat had been altered due to a change in the islands economy.
  - Supplemental feeding to offset habitat loss has shown some success.

#### 6) Black footed ferret

- Picture on lecture notes page
- Is totally dependent on prairie dogs. Each ferret requires:

- about 12.5 ha of colony for sustenance in one year.
  - the use of prairie dog burrows for shelter and denning sites.
  - unfortunately, ferrets may also be susceptible to a form of plague that infects prairie dog colonies on occasion.
- estimates indicate that about 800,000 may have been around as late as the 1920's.
- Problem - the prairie dog is considered a pest by ranchers and farmers. By killing and trapping, 90% - 95% of their range has been eliminated. As late as 1990 the U.S. government was subsidizing some of this.
  - Ferrets are also very susceptible to canine distemper that seems endemic in populations of carnivores on the plains.
  - By 1987, the last wild ferrets were taken into captivity (only 18 individuals!)
    - The national zoo has a few of these on display in the small mammal house.
  - There appears to be a problem with genetic diversity, but the extent of this is not clear.
  - Captive breeding programs seem to be working well, but re-introduction efforts have had mixed results.
    - finding suitable areas with prairie dogs is one difficulty.
    - finding areas free of canine distemper is another.
    - the exact effects of the plague are also not understood.
    - many captives who were released were affected by predation.
  - The first release was a failure. Subsequent releases seemed to do better.
  - Recent results are better than indicated in the text (which only lists only the results through the mid-1990's):
    - Numerous further re-introductions have been successful.
    - In South Dakota (only one re-introduction site), 65 litters and 150 kits were in evidence in the year 2000.

- Goal for 2010 is 1,500 wild ferrets. It seems possible that this goal may be reached.

(This is still a low number, but a lot better than 18!).

- See summary of events through 1994 in box 4.1, p. 91 of text.