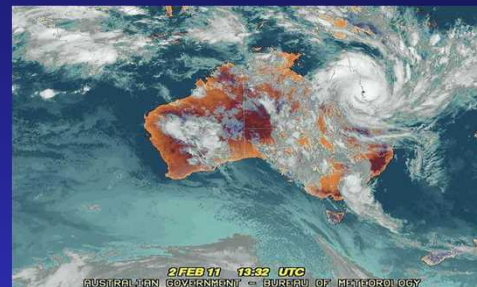
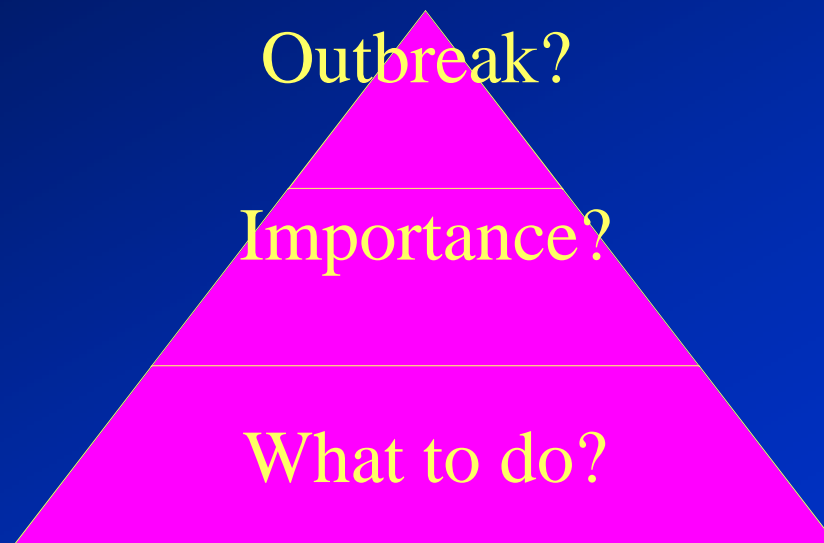


MITIGATING THE IMPACT OF DISEASES AFFECTING BIODIVERSITY – RETROSPECTIVE ON THE OUTBREAK INVESTIGATION FOR CHYTRIDIOMYCOSIS

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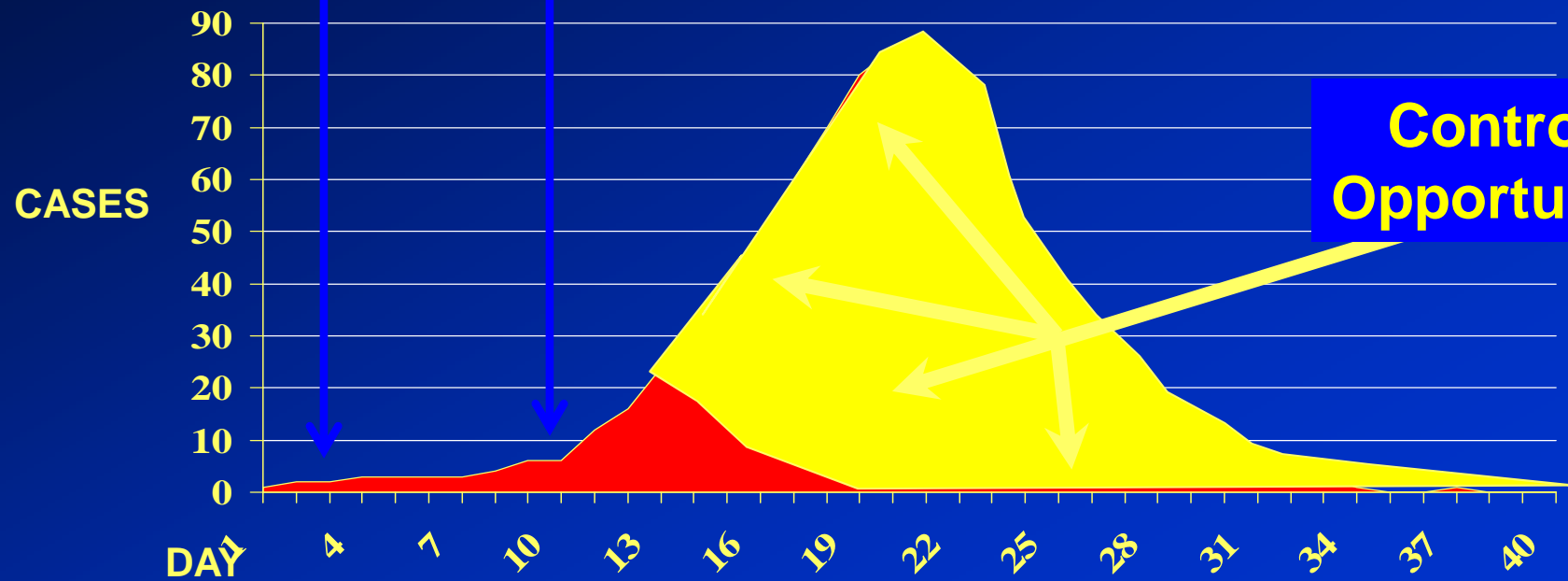


Outbreak Investigation and Response Framework



Outbreak

**Early
Detection** **Rapid
Response**

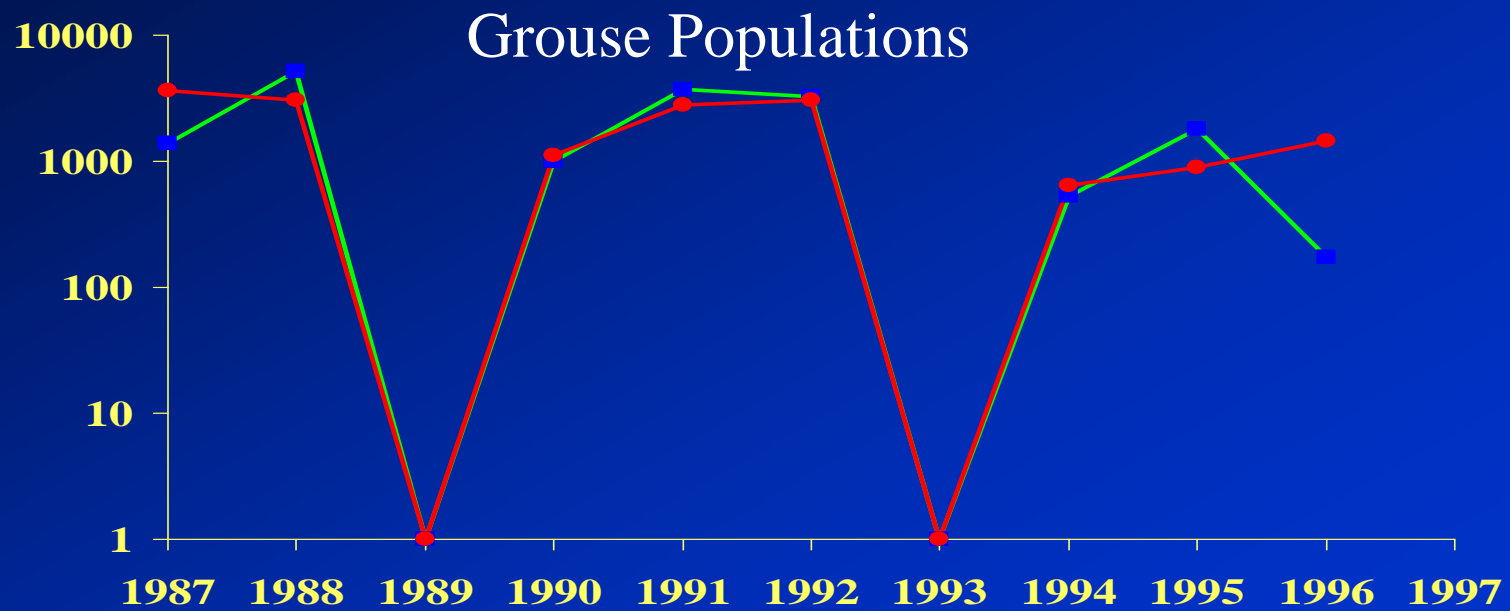


**Control
Opportunity**

Outbreak in Wildlife?



Outbreak in Wildlife?



Hudson et al.

Importance?

- Biodiversity?
- Ecosystem health?
- Domestic animal health?
- Human health?

What to do?

- Case definition
- Differential diagnosis list
- Pattern of outbreak in space and time
- Risk factors for cases
- Tentative diagnosis
- Implement control
- Pathological examination
- Testing hypotheses
- Refine control

First Sign of Outbreak in Amphibians

- 1978 Mountain ranges near Brisbane
Severe sudden declines: southern day-frog, southern gastric-brooding frog, cascade treefrog, giant barred frog, Fleay's barred frog
- 1977 Colorado and Wyoming
Severe sudden declines: northern leopard frog, Wyoming toad, and boreal toad
- 1977 Venezuela
Severe sudden decline: *Atelopus cruciger*

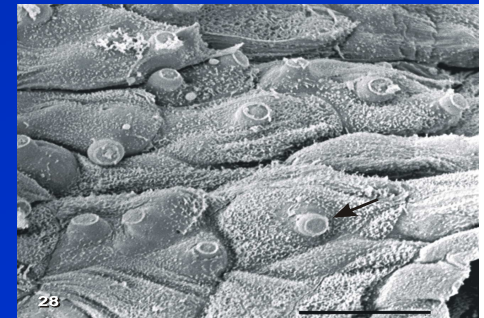
Importance?

- Biodiversity
- Ecosystem health?
- Human & domestic animal health (bioindicator)?



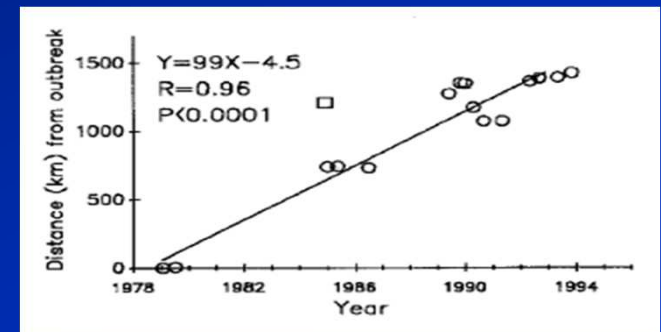
Outbreak Investigation began in 1993 at Big Tableland, Queensland

- Similar process followed for outbreaks in Panama 1997 & Washington Zoo 1996



Analysis of frog declines in Queensland suggested the introduction of a waterborne disease of adult frogs

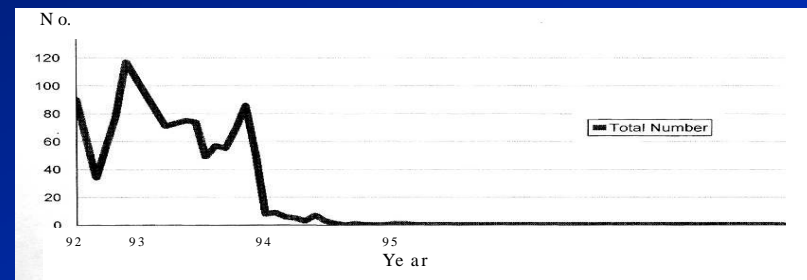
- Declines were asynchronous south to north spread
- Stream-dwelling frogs declined
- Tadpoles remained after adults disappeared
- No environmental problems detected
- Sudden declines since 1979
- Mass die-off detected in rainforest in 1993



(Laurance et al *CB* 1996)

Factors which suggested the introduction of chytridiomycosis

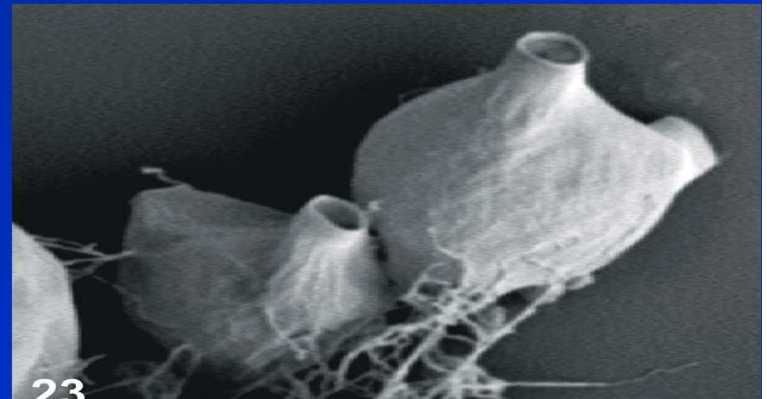
- Dying frogs had chytridiomycosis during mass die-off at Big Tableland in 1993 and Panama 1997
- 55% sick frogs in Australia have severe chytridiomycosis
- Experimentally produce up to 100% mortality in adults but not tadpoles
- Waterborne pathogen
- First record in 1978 from SE Qld (n=110<1978)



(Berger et al *PNAS* 1998, *AVJ* 2004)

Why didn't we mitigate the risk of these outbreaks in the 1970s?

- Risk assessment was inadequate for imported amphibians (did not incorporate uncertainty)



Why didn't we act during the first outbreaks in 1977-78?

- Lack of awareness and recognition of risk and importance
- Lack of outbreak investigation capacity (inability to initiate outbreak investigation in environmental sector)

What impeded the subsequent outbreak investigations?

Lack of :

- baseline data
- resources and capacity
- readily available framework
- formal network of experts
- tools for control

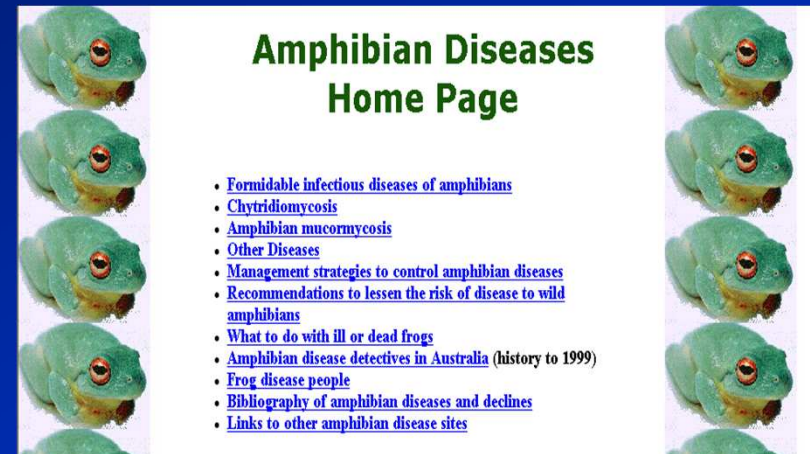
What have we learnt?

- Increased awareness of uncertainty of risk (fish diseases)
- Increased recognition of importance of wildlife health
- Increased capacity and resources for outbreak investigation for wildlife
- Developing frameworks, networks & tools

Acknowledgements

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