Whitespot- learning

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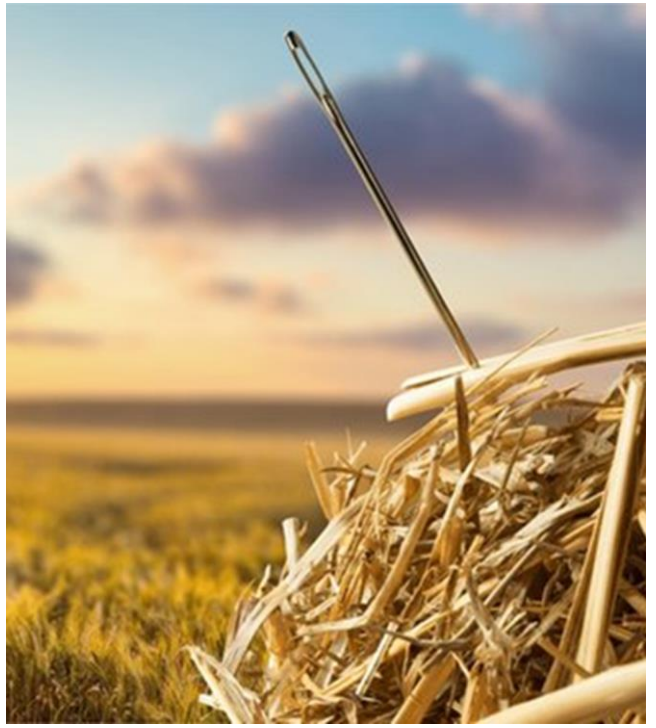
Q: How many wild crustacea test positive at the time a farm gets an outbreak?

A: **Very, very few**

- Qld Moreton Bay: Jan 2017:
- 7 of 6920 wild crustacea (0.101% prevalence)
- NSW Clarence River: May 2023:
- 1 of 2900 wild crustacea (0.034% prevalence)



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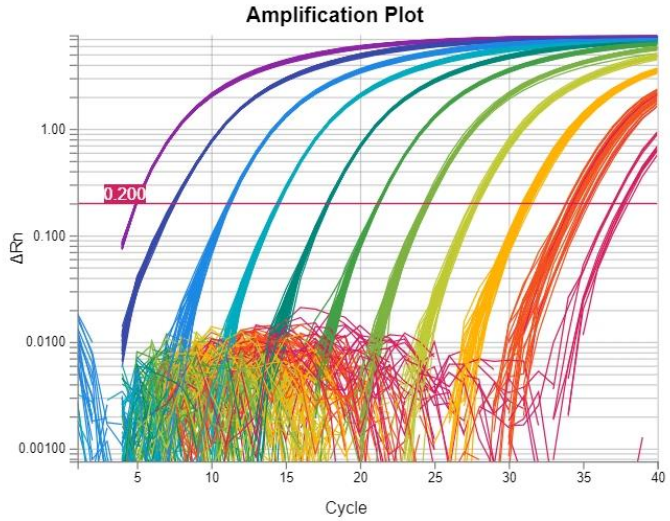
Q: How much virus do wild crustacea carry around?

A: **very, very little**

- Qld Moreton Bay: Jan 2017:
- Wild Prawn Ct 37.5-39.0, Wild mudcrab (Ct 40.46)
- NSW Clarence River: May 2023:
- Wild prawn Ct 43



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Q: Can we find very, very little WSSV in very, very few prawns?
A: Not reliably

- **Q**: Have we ever found wild positives before a region's first farm outbreak?
- **A**: Never
- **Q**: Have we looked?
- **A**: Yes, multiple times, but we got negative results.
- **WHY???**

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Survey terminology- all tests are imperfect

- Design prevalence: the proportion of infected animals in target population
- Test sensitivity (DSe): Ability of test to determine an animal is truly infected.
  - If less than 100%, test will produce some false positives
- Test specificity (DSp): Ability of test to determine an animal is truly not infected.
  - If less than 100%, test will produce some false negatives

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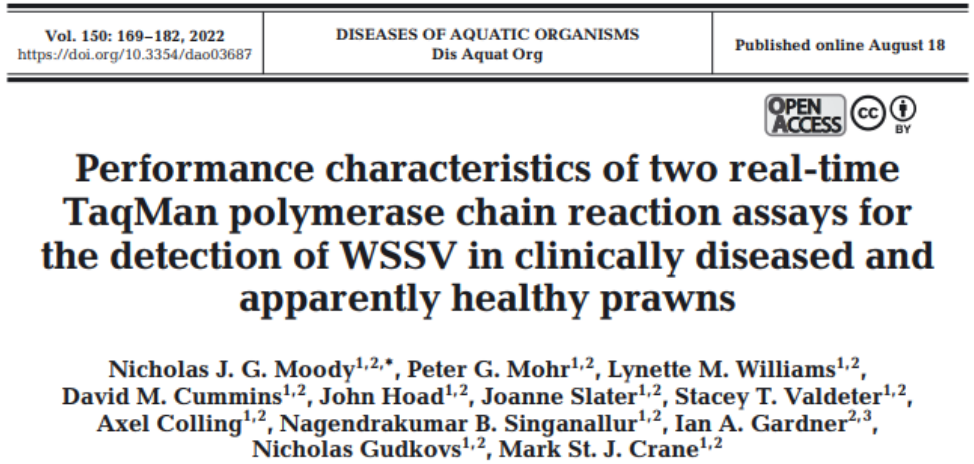
Test limitations- mathematical rules

- Design prevalence * sensitivity must be greater than the false positive rate (1 - specificity) Ausvet Epitools.



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DISEASES OF AQUATIC ORGANISMS
Dis Aquat Org

Published online August 18

OPEN ACCESS

Performance characteristics of two real-time TaqMan polymerase chain reaction assays for the detection of WSSV in clinically diseased and apparently healthy prawns

Nicholas J. G. Moody[1,2,*], Peter G. Mohr[1,2], Lynette M. Williams[1,2], David M. Cummins[1,2], John Hoad[1,2], Joanne Slater[1,2], Stacey T. Valdeter[1,2], Axel Colling[1,2], Nagendrakumar B. Singanallur[1,2], Ian A. Gardner[2,3], Nicholas Gudkovs[1,2], Mark St. J. Crane[1,2]

Combined test performance: DSe 98.3% DSp 99.4%

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Surveillance data

- *WSSV detected in wild crustacea in Moreton Bay early 2020, after no detections for almost 2 years*
- *WSSV detected on two Logan River farms early 2020 for the first time since farm decontamination in 2017*
- *WSSV genetics suggest 2020 isolate same as 2016/2017*.
- https://www.agriculture.gov.au/sites/default/files/documents/national-surveillance-program-wssv-2017-2020-summary-results.pdf
- Suggests WSSV became temporarily undetectable, rather than was eradicated, nor had it failed to become established.
- NSW declaration of successful eradication of WSSV just weeks after 2022 outbreak lacked sound evidentiary base.

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Conclusion:

- Wild surveillance at 2% design prevalence unlikely to predict outbreaks
- Wild surveillance unlikely to predict biological freedom
- Therefore, management must:
  - Be informed by known wild crustacea movements
  - Prepare farms for outbreaks with infrastructure and policy planning

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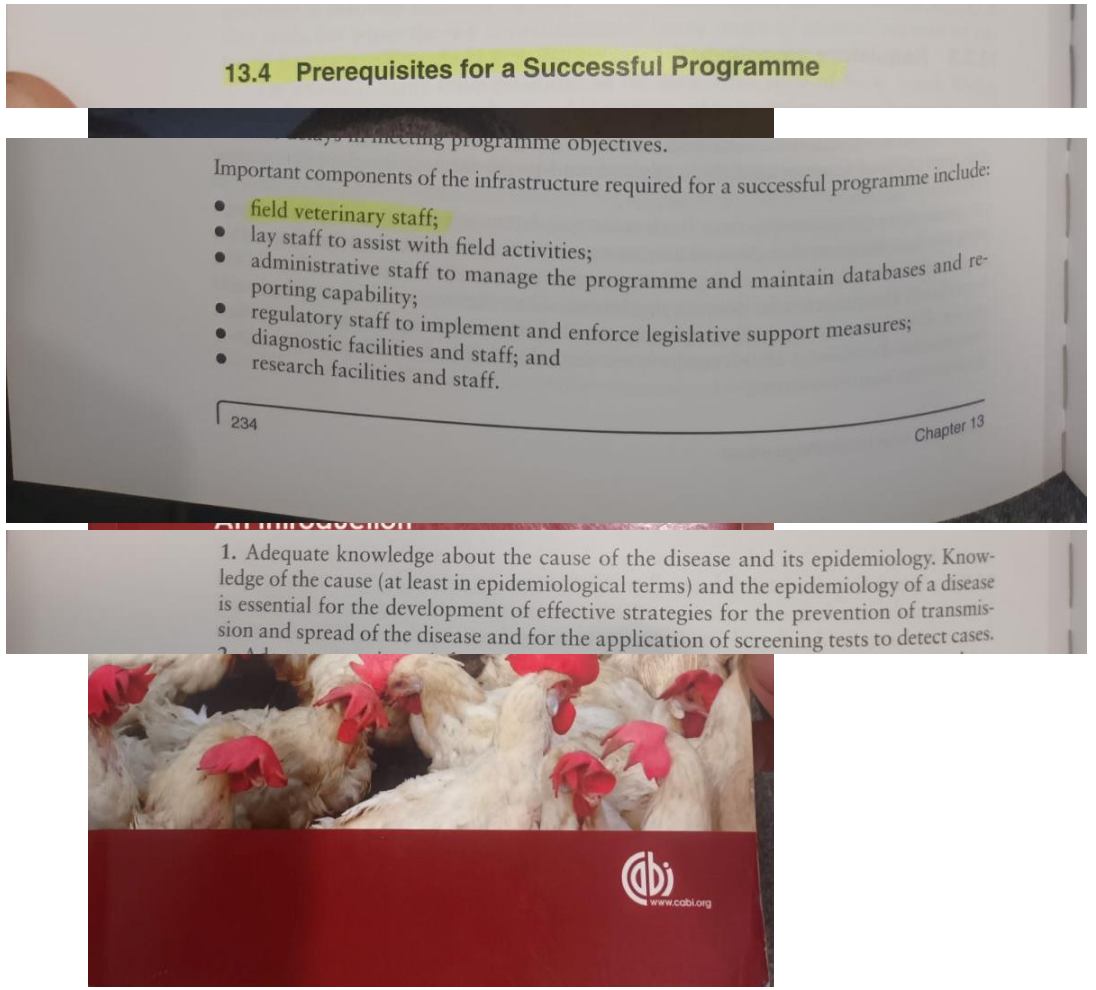
Eradicate or Control??

Authors are vets- so they would say use vets.

Was adequate knowledge in hand?
NSW source of virus described as unknown.
Entry path to farms described as unknown.

Sergeant & Perkins also say:
"A specific valid reason for eradication or control, and the programme should be justified by an independent cost-benefit analysis."
Was this done? Should it be shared with public?
"If eradication is proposed, there also must be a valid reason for recommending eradication rather than control."
Are the reasons valid?


13.4 Prerequisites for a Successful Programme

Important components of the infrastructure required for a successful programme include:

- field veterinary staff;
- lay staff to assist with field activities;
- administrative staff to manage the programme and maintain databases and reporting capability;
- regulatory staff to implement and enforce legislative support measures;
- diagnostic facilities and staff; and
- research facilities and staff.

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1. Adequate knowledge about the cause of the disease and its epidemiology. Knowledge of the cause (at least in epidemiological terms) and the epidemiology of a disease is essential for the development of effective strategies for the prevention of transmission and spread of the disease and for the application of screening tests to detect cases.

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Eradication cost –effective for who?

- Chlorine Qld ~$7 million, NSW ~$4 million after trichlorfon use – Why?
- Is Chlorine an effective treatment for fear?
- 2016 live crabs reported eating dead prawns in chlorinated ponds 24 hours post chlorination. Live prawn in pond 3 days post chlorination.
- NSW all farms unable to operate in 2023-24 due to Govt failure to dry-out farms and delay in setting clear policy on controls and who pays if WSD recurs.
- NSW shut entire river trawl fleet- ex-gratia payment made
- Higher domestic ALOP than applied for imported prawns- benefits imports
- Why?

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Choosing eradication- questions to ask

- Is the disease eradicable?
- Have other countries eradicated it?
- What is collateral damage?
- Is the quality of evidence able to change course of actions & prevent misguided effort and expenditure for little benefit?
- Are multiple lines of evidence available to build confidence in conclusions?
- Have alternate hypotheses been explored?

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WSSV will spread- crustacea move

"Current knowledge of crustacean movements in the area, as well as overseas experience with WSSV, suggests that the infection will spread naturally within marine ecosystems, even if this occurs slowly."

"Thus there is certainly an intermingling and movement of species from the river environment to outside areas of Moreton Bay and adjacent river systems. All of these crustacean species are susceptible to WSSV infection, although the disease is unlikely to be observed in the wild." 2 March 2017

https://www.daf.qld.gov.au/__data/assets/pdf_file/0010/1237285/wssv-advisory-panel-report.pdf

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WSSV is established

- Once it has been established in a wild crustacean population it has not been known to be eradicated. At this stage, we don't know if the virus that causes white spot disease has established in wild crustaceans in Moreton Bay. 13/08/2018

- https://www.daf.qld.gov.au/business-priorities/biosecurity/animal-biosecurity-welfare/animal-health-pests-diseases/a-z-list-of-significant-animal-pests-and-diseases/white-spot-disease/white-spot-disease-surveillance

WSD eradication choices expensive for farmers and citizens

Qld 2016-17
~$100 million

NSW 2022-23
>$20 million

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Learnings: Mechanism of spread

- 29/12/16 Farmer reports birds picking up dying prawns and dropping them in adjacent ponds.
- “**How it is spread**
- The disease is primarily spread through the movement of infected animals or contaminated water. Birds that feed on and move infected animals can spread the disease. ”
- https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/biosecurity/animals/diseases/guide/white-spot-disease

- NSW DPI did not allow NSW index farm to promptly use firearms to keep birds out of diseased ponds even though they had permit to do so.
- Diseased ponds were not culled on same day as detected.
- NSW farms 2 & 3 likely infected by birds.

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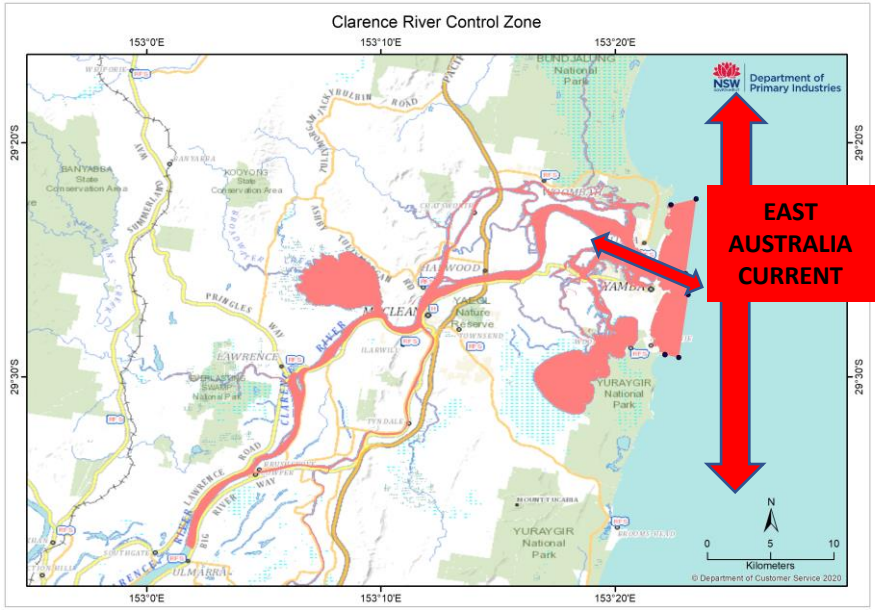
Moreton Bay & Clarence River WSSV control zones- **not** biosecure or biology- based

Yabbies, prawns, worms must not be moved outside the zone unless cooked.
Crabs, lobsters and bugs are exempt.
Red arrows show uncontrolled natural water, wild crustacean and boat movements



Map of the movement restriction area

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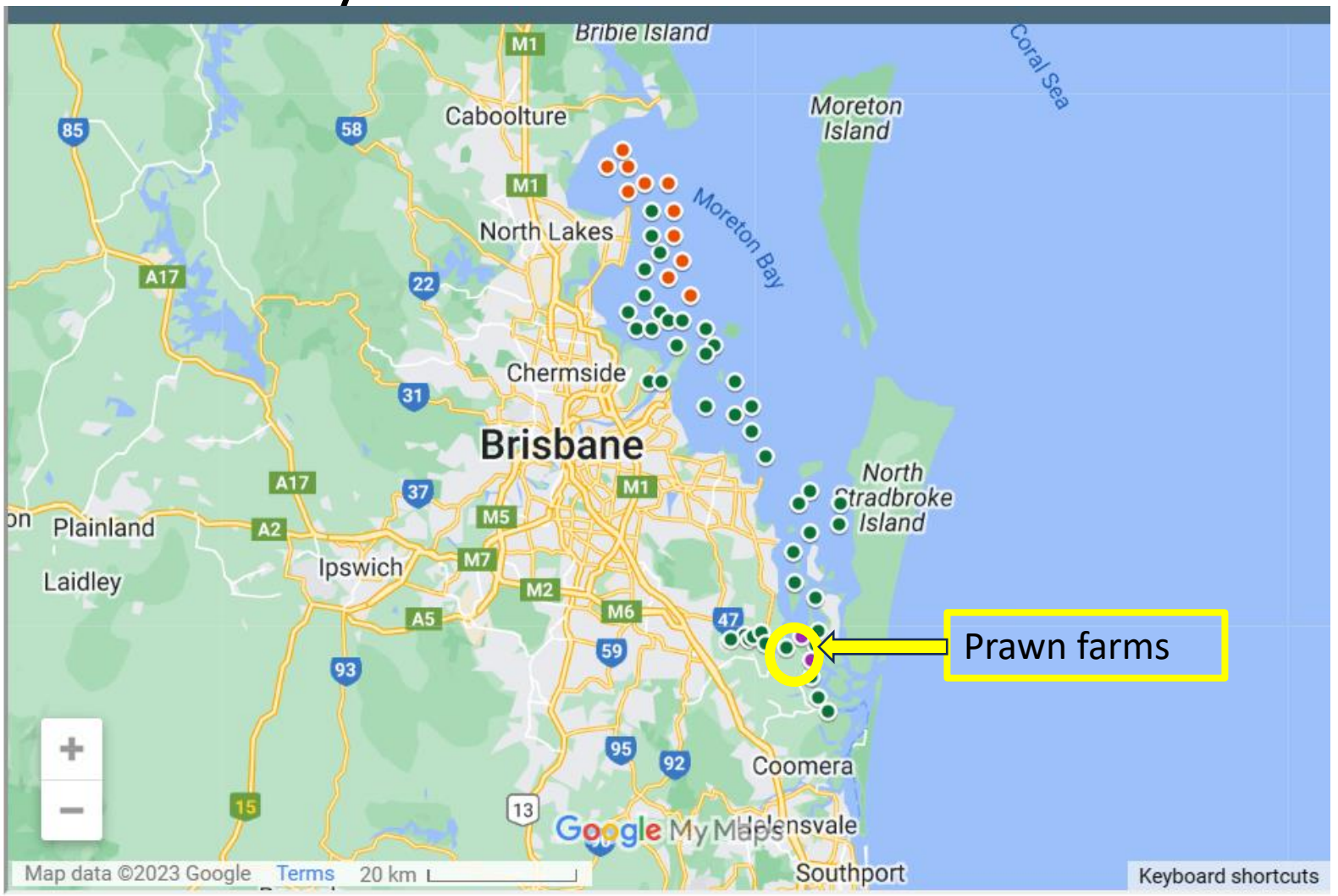
Moreton Bay WSSV surveillance 2020



Red dot positive
Green dot negative
Brown dot no samples caught

White spot disease surveillance | Department of Agriculture and Fisheries, Queensland (daf.qld.gov.au)

White spot disease east coast surveillance results

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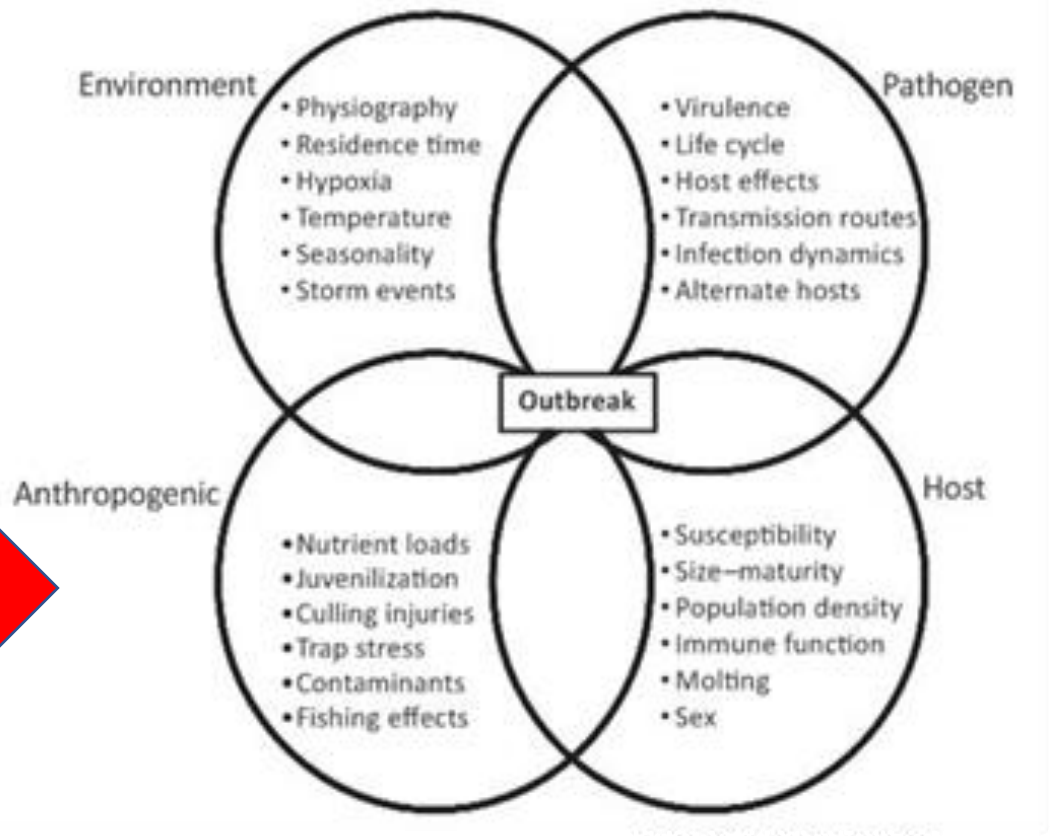
Disease now almost always involves anthropogenic (human derived) stresses

Pesticides
PFAS
Pharmaceuticals
Heavy metals
Surfactants



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Outbreak investigation- please do it properly

- Measure environmental contaminants
- NSW DPI refused to test
- NSW Environment and Planning knocked back proposal to test.
- **YET**
- SCU have identified multiple pesticides in Clarence biota recently
- CSIRO found significant pesticides in Logan R
- UQ found high heavy metals in Northern Moreton Bay & pesticides
- Moreton Bay turtle blood has lots of contaminants harmful to immunity

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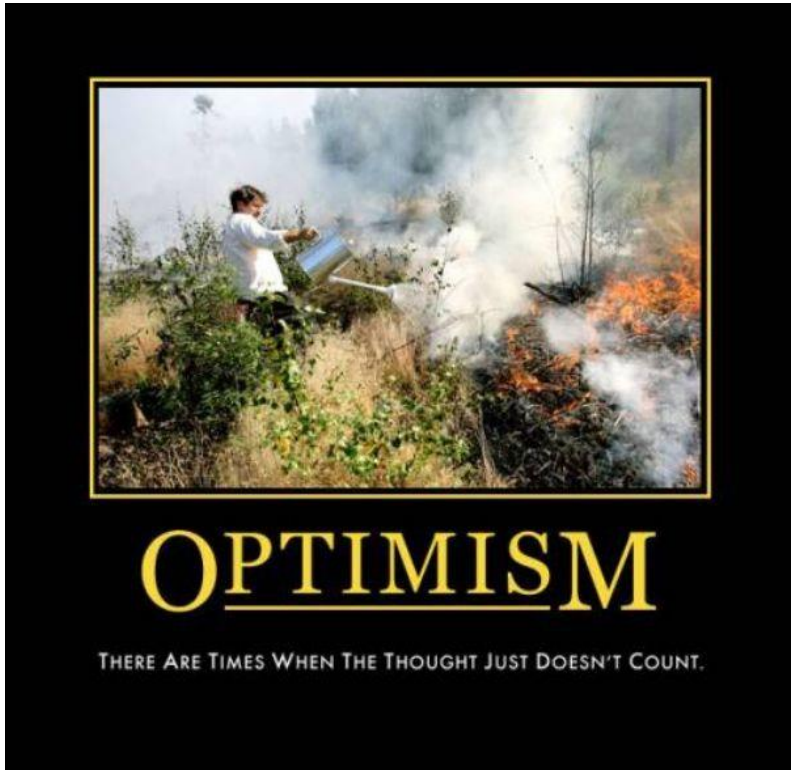
Eradication attempts had negative cost-benefit



Cook imported prawns – shut the gate!

Improving environmental health likely more cost-effective strategy for management