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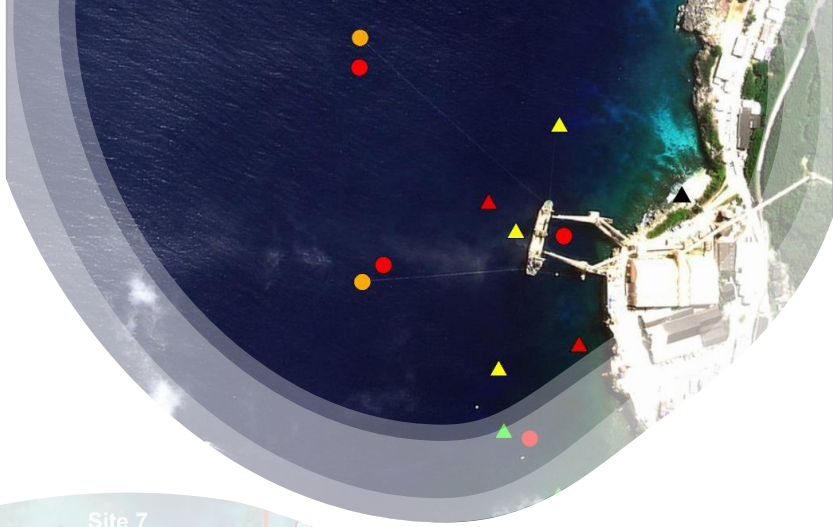
# Developing effective marine biosecurity surveillance for detection of introduced marine species in Western Australian using eDNA

Claire Wellington

Department of Primary Industries and Regional Development (DPIRD)

Western Australia

*I acknowledge the traditional custodians of the land on which this work was undertaken and pay my respects to their elders, past present and emerging.*



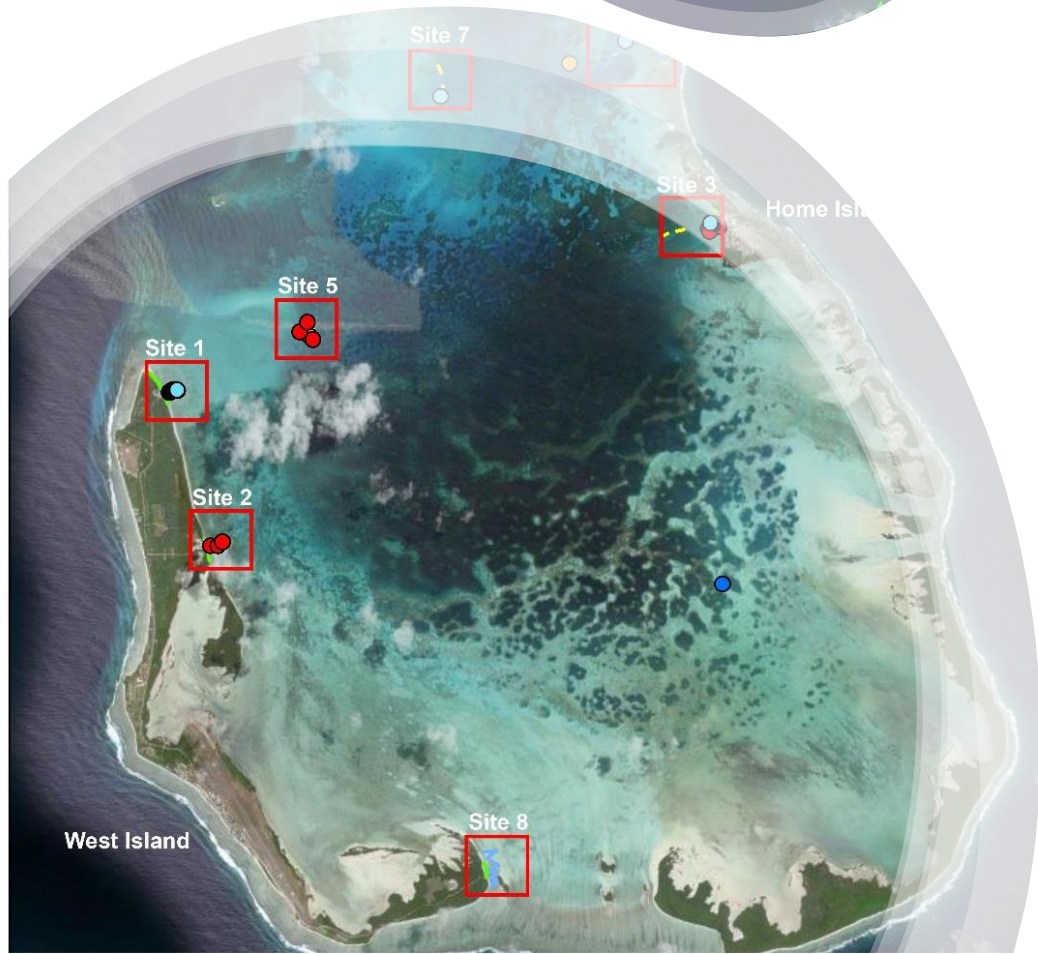
# Aquatic Pest Biosecurity, DPIRD WA

The Department of Primary Industries and Regional Development (DPIRD) is the lead agency for the management of Invasive Marine Species in WA.

Surveillance for IMS aligns with the *Fish Resource Management Regulations (FRMR 1995) Noxious species list* approx. 70 species across a range of taxonomic groups.

Invasive Marine Species Surveys focus on marine infrastructure, ports, and their surrounding natural habitats as nodes to shipping vectors, to intersect IMS Introductions.

Comprehensive surveillance methods, collect a wealth of data but can be expensive, resource heavy and sporadic.



# State-Wide array Surveillance Program - SWASP

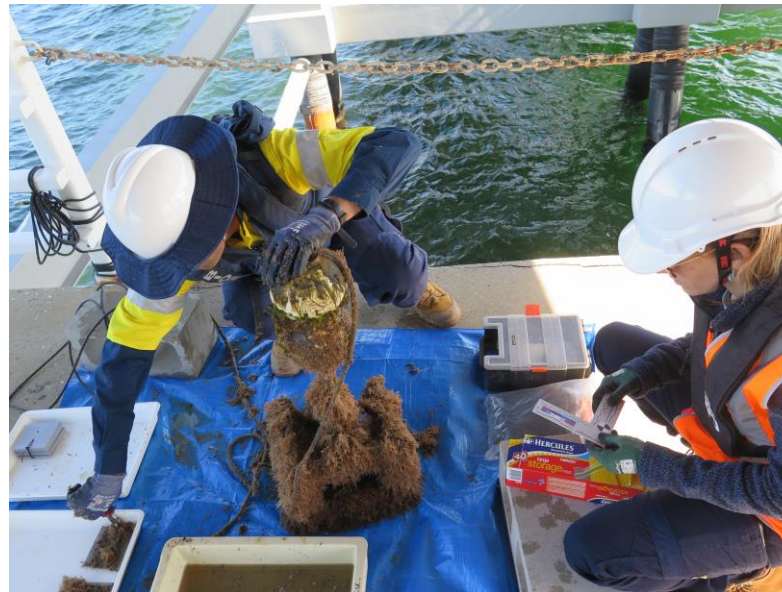
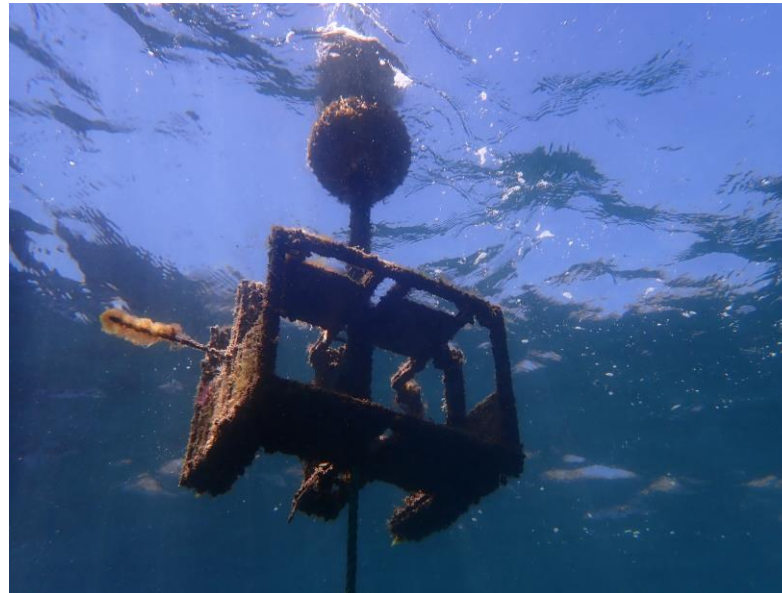
- IMS surveillance in WA first began using settlement arrays in 2008, using taxonomic approach.
- Developed into a collaborative surveillance program with Port Authorities in Western Australia.
- Integrated molecular diagnostics in 2016.
- Currently the State-wide Array Surveillance Program (SWASP) operates in 12 locations
- Ports of Broome, Port Hedland, Dampier, Ashburton, Port Walcott, Cape Preston, Geraldton, Fremantle, Garden Island (Defence), Albany, Esperance and Bandy Creek Boat Harbour.
- Each port unique design with varying number of settlement arrays (2 -7) per location.
- Risk based approach to selecting sites within locations close to vectors (shipping) but safe accessible locations, without interfering with port operations.

*A united front against marine invaders: Developing a cost-effective marine biosecurity surveillance partnership between government and industry.* McDonald, J.I., Wellington, C.M., Coupland, G.T., Pedersen, D., Kitchen, B., Bridgwood, S.D., Hewitt, M., Duggan, R. and Abdo, D.A., 2020. **Journal of Applied Ecology**, 57(1), pp.77-84.



# Settlement arrays

- Box settlement arrays deployed with 8 scuffed PVC plates soaked for two months at a time, twice per year.
- In addition, crab condos at most locations.
- Shoreline surveillance
- Deployments undertaken by Ports Environmental staff.
- DPIRD staff visit port to assist with collections



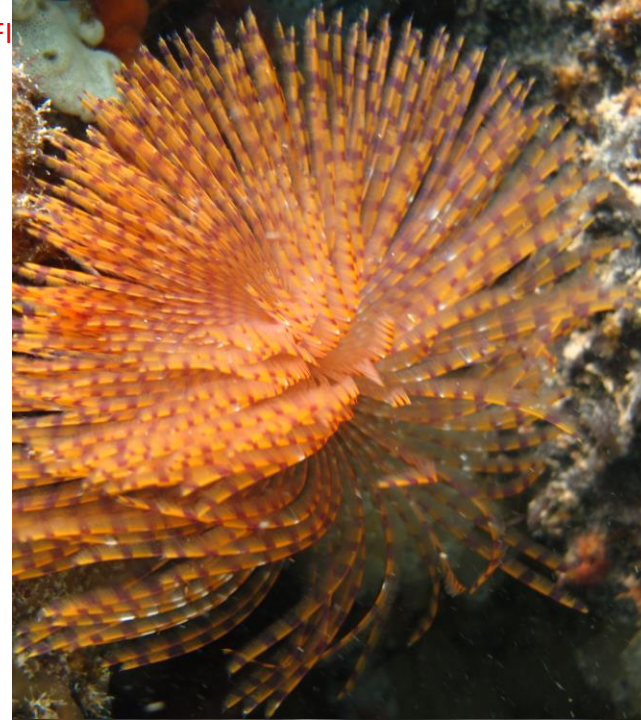
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# Invasive Marine Species analyses

Plates scraped & homogenised at DPIRD

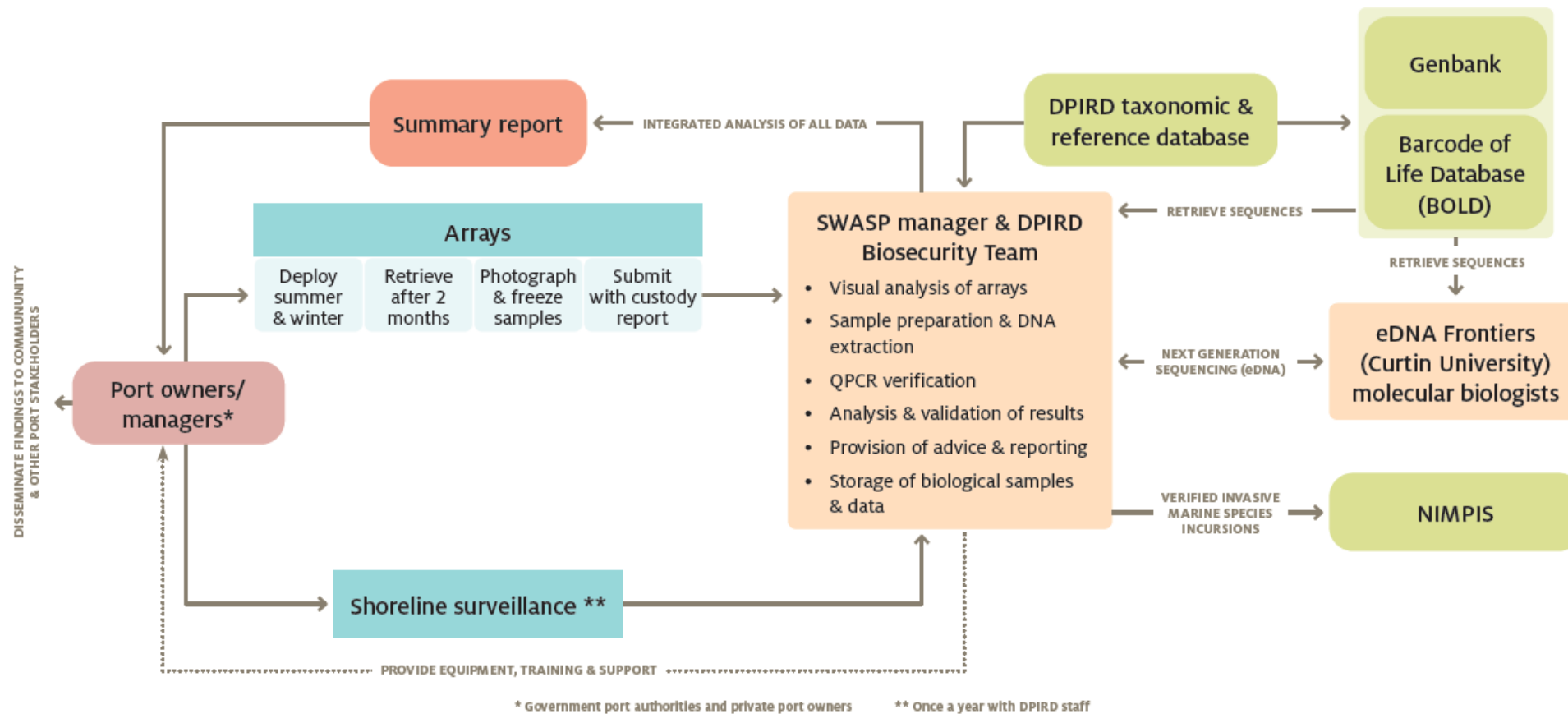
- Species-specific qPCRs P/A of priority pest species
- Metabarcoding using 18S and COI assays provide broad level diversity in addition to screening for potential IMS.
- Individual specimens can be ID using PCR or Taxonomic identification of specimens,
- Source material, DNA and data retained

OFFI



0° S 115° 51.00 E  
C. Willan 31 Aug 1985

### The data flow process



### Shining success ...

Since its establishment in just 3 ports, the SWASP program has collaboratively adapted, evolved, innovated and grown into an award-winning biosecurity surveillance program in 11 ports across the state. It won the WA Golden Gecko Award for environmental excellence (2018), Australian Biosecurity Award (2019) and an Institute of Public Administration Australia Achievement Award (2020). However, the creation of a strong network of government regulators, port authorities and the general public who are now aware and involved in protecting WA from invasive marine pests, is valued as a greater achievement.

# Molecular Reference Collection

*DAFF funded project in collaboration with Deakin University*



Sequence full Mitogenomes of pest species, natives and pest look -alike species



**128** Species selected for Mitogenome sequencing



Sequences uploaded to GenBank and made publicly available



Contribute reference collection to CSIRO National Biodiversity DNA Library

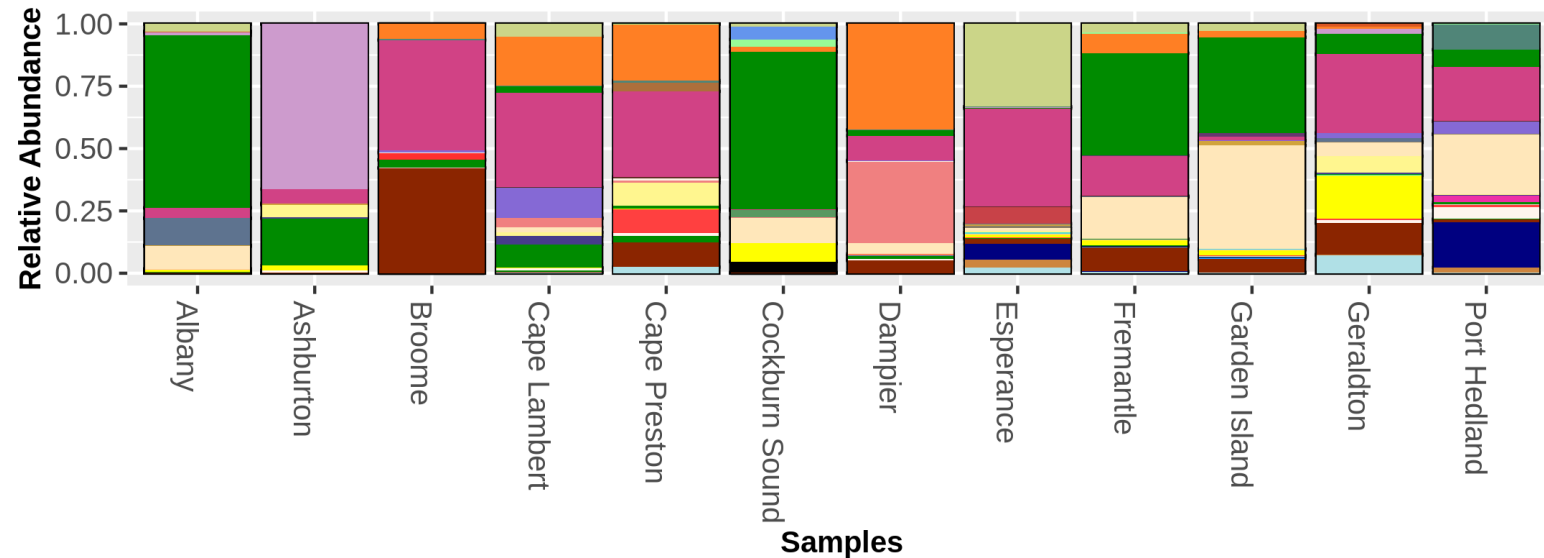
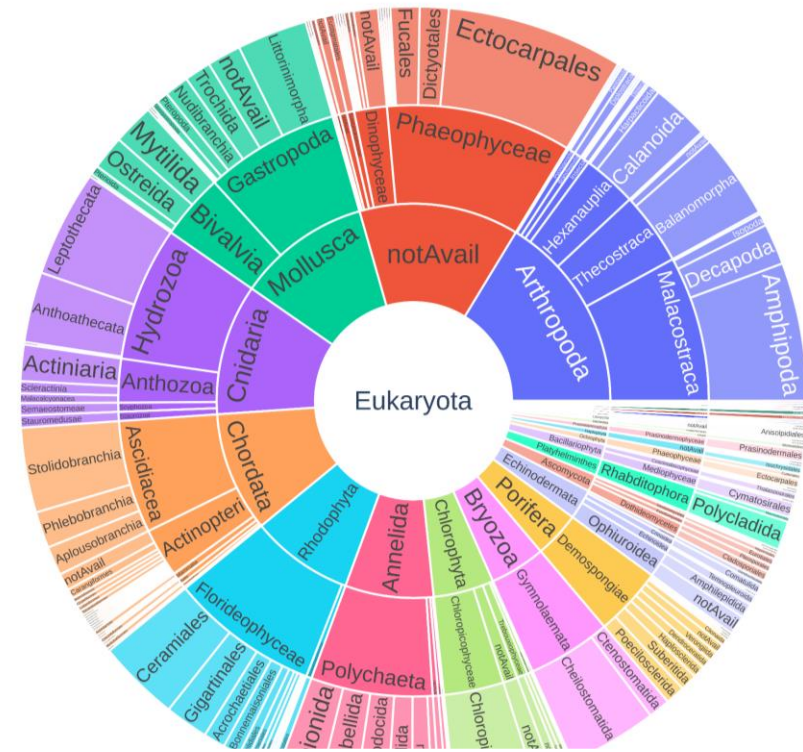


# Long term data set

Research project in collaboration with eDNA  
Frontiers Curtin University

Reassessing 5 plus years of data – long term patterns, indicator groups relative to different port environments.

Refine ways of delivering results and communicating additional outcomes beyond presence-absence of IMS.





## *Method Developments*

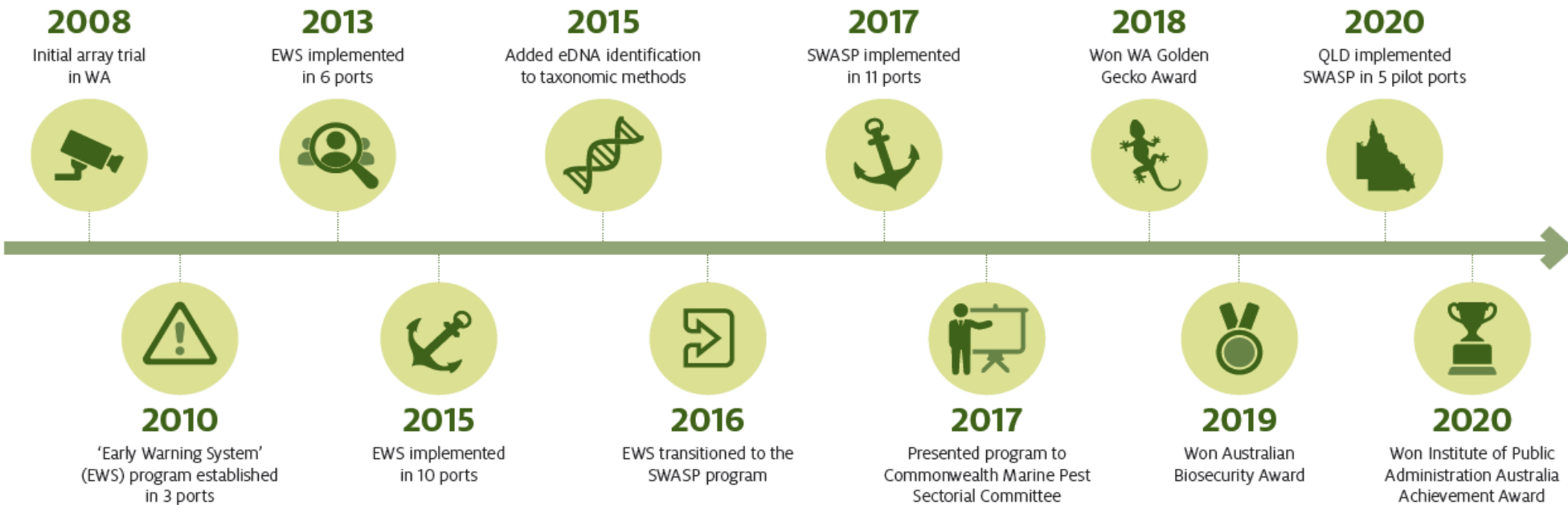
### *Collaboration with Curtin University*

- Trial passive filters: optimal deployment windows in marine environment
- Compare rollers vs plates

# State-Wide Array Surveillance Program (SWASP)

SWASP has succeeded in providing robust, coordinated, collaborative and consistent surveillance of potential marine pests within ports across Western Australia (WA), filling an important gap in the existing marine biosecurity surveillance for the state.

|  |   |  |  |
|--|---|--|--|
| <p><b>Successes of the program:</b></p> <ul style="list-style-type: none"> <li>• Collaborative</li> <li>• Consistent across the state</li> <li>• Effective in early detection</li> </ul> | <p><b>TRUST IS KEY TO SUCCESSFUL COLLABORATION</b></p> <ul style="list-style-type: none"> <li>• There is strong trust between DPIRD staff and the ports</li> <li>• It takes time and effort to build up trust</li> <li>• Annual DPIRD visits to the ports helps to maintain the relationships and two-way communication</li> <li>• Trust enables a strong collaboration between the regulator (DPIRD) and the ports and opens opportunities for collaboration on other issues</li> <li>• Ports like to feel connected and part of a larger program</li> </ul> | <p><b>SWASP PROVIDES MORE THAN BIOSECURITY SURVEILLANCE</b></p> <ul style="list-style-type: none"> <li>• Strong collaboration supports trialling new innovations</li> <li>• Molecular ID enabled biodiversity data (not just species presence/absence) to be collected</li> <li>• Ports utilise community interest in biodiversity information to increase engagement with them</li> <li>• Community engagement increases general knowledge and awareness of invasive species</li> </ul> | <p><b>INNOVATION HAS ITS CHALLENGES</b></p> <ul style="list-style-type: none"> <li>• Get the program up and running, then 'iron out the bugs'. (e.g. <i>Adapt surveillance design and equipment</i>)</li> <li>• Change is initiated by ports identifying a problem or DPIRD identifying an opportunity</li> <li>• Change and innovation presents new challenges so SWASP needs to be adaptable</li> <li>• Because the ports trust DPIRD they accept the challenge</li> </ul> |
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*Our Port Authorities and stakeholders: Kimberley Port Authority, Pilbara Ports Authority, Woodside, Rio Tinto, Citic Pacific Mining, Mid West Ports Authority, Fremantle Port Authority, Southern Ports Authority, Department of Transport, Department of Defence, Ventia.*

*eDNA Frontiers, Curtin University*

*On behalf of the Aquatic Pest Biosecurity team at DPIRD WA*

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