



National Environmental
Research Program

MARINE BIODIVERSITY *hub*

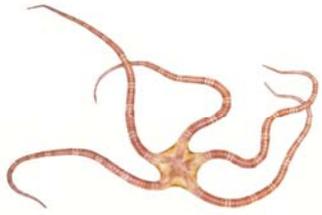


Supporting management of listed & rare species

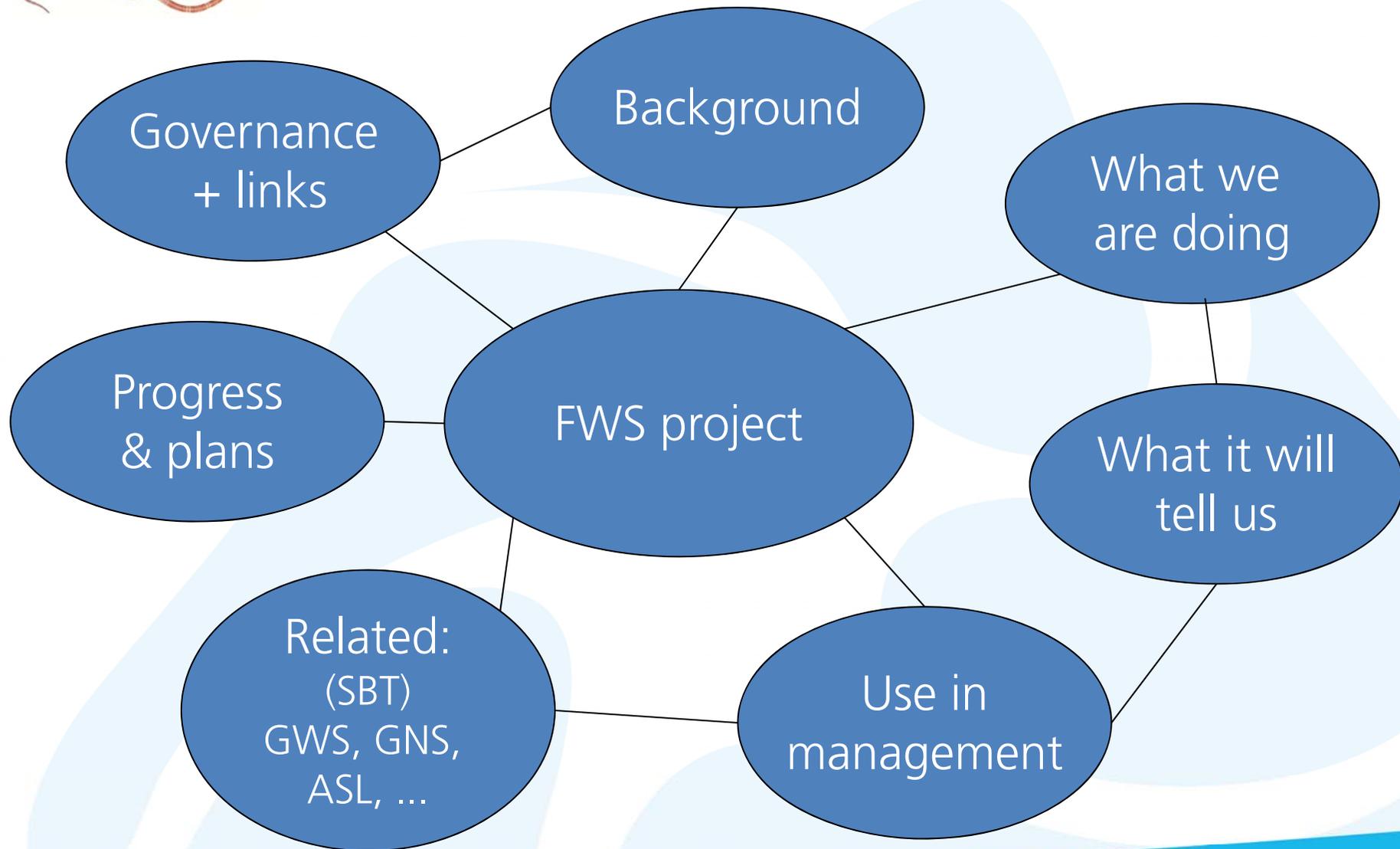
Freshwater Sawfish & beyond

Mark Bravington (CSIRO, Hobart)
on behalf of others

MARINE BIODIVERSITY *hub*



Freshwater Sawfish & beyond

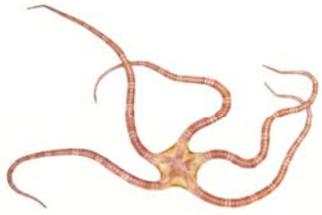




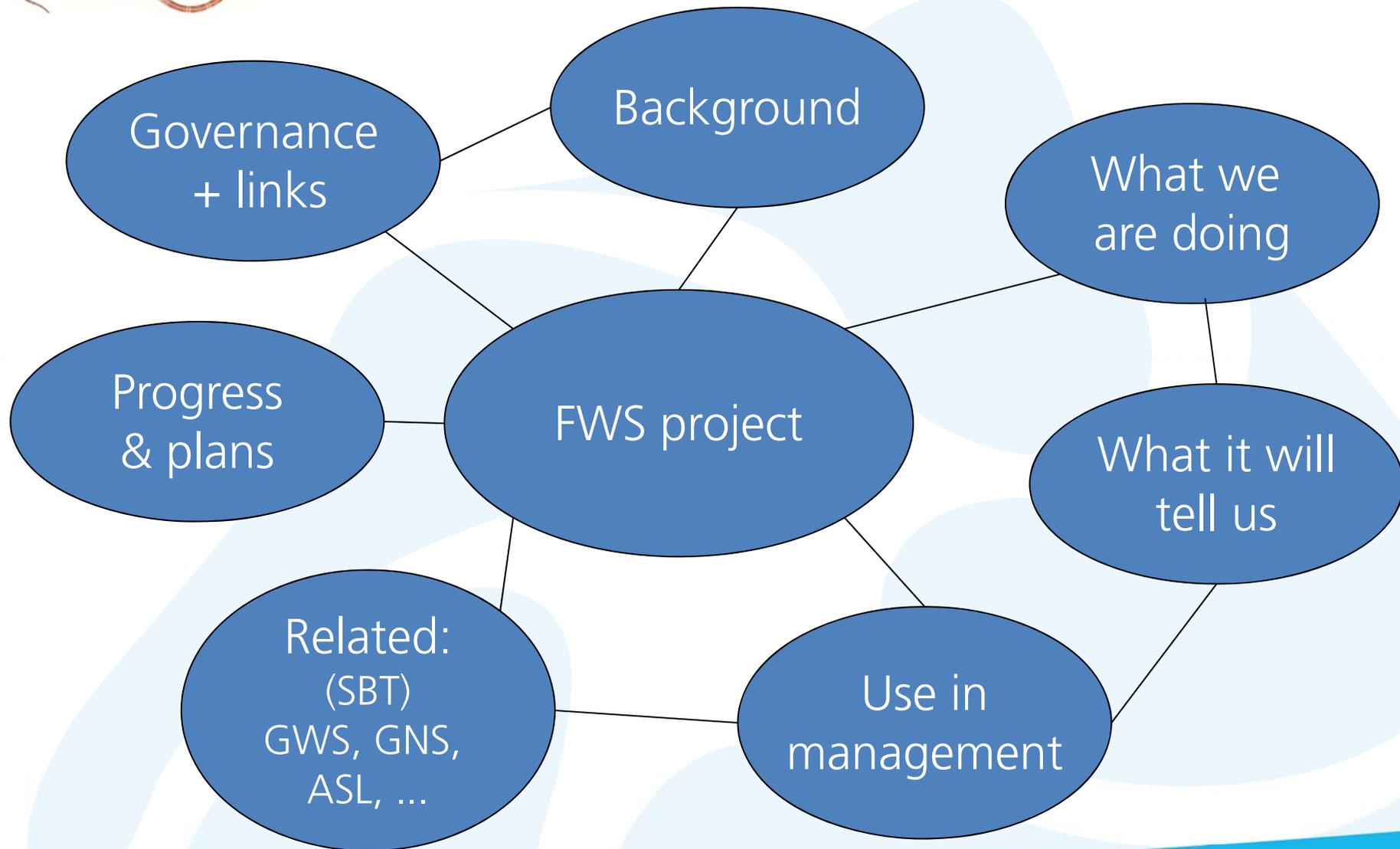
Why FWS? All of the below...

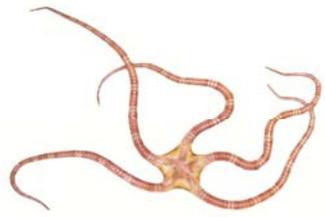
- Governance & linkages
- Pressing conservation question
- No solution with existing methods...
- ... but we thought of a new one
- Shared issues for similar TEPS (-to-be)





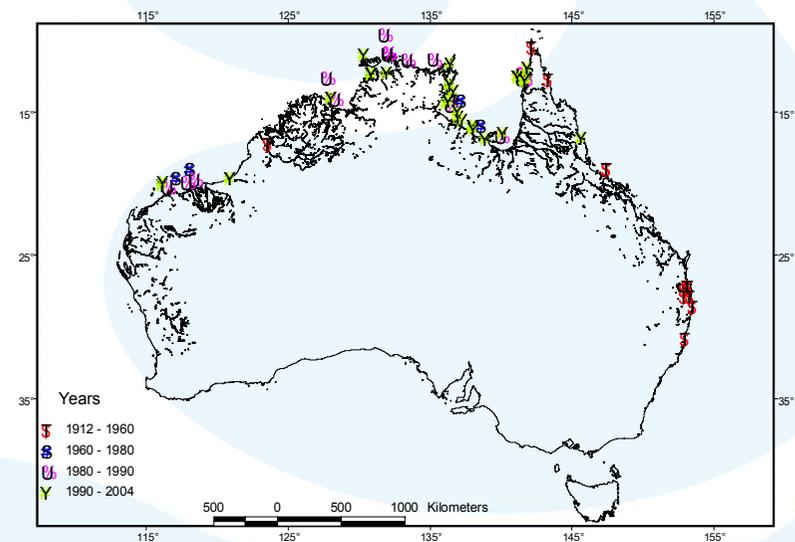
Freshwater Sawfish & beyond





FWS background #1

- Formerly Indo-Pacific
- Smashed except w. N Aus
- Long-lived, slow-breeding:
 - age 1-6 in rivers
 - then estuarine/coastal
 - mature ~3.5m (?10yr?)
 - grow to 7m
 - 10-30 pups per litter



FWS background #2



1960s – 1980s

Historically abundant

Large animals common

1990s – Present day

Juveniles still captured infrequently

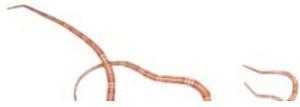
Large animals very rare



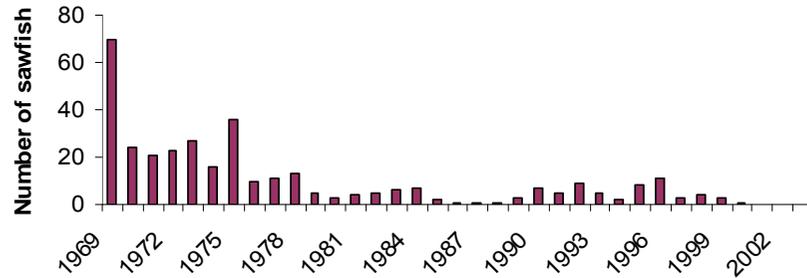
32 sawfish in one day - 1968



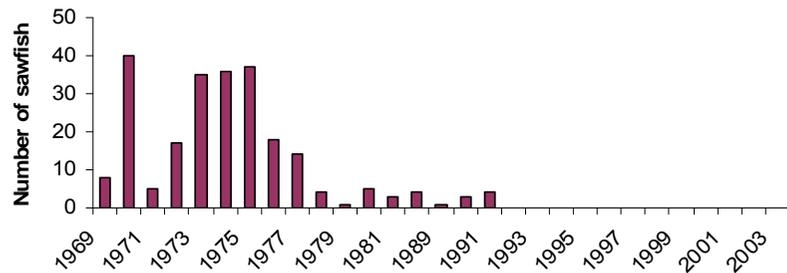
FWS background #3



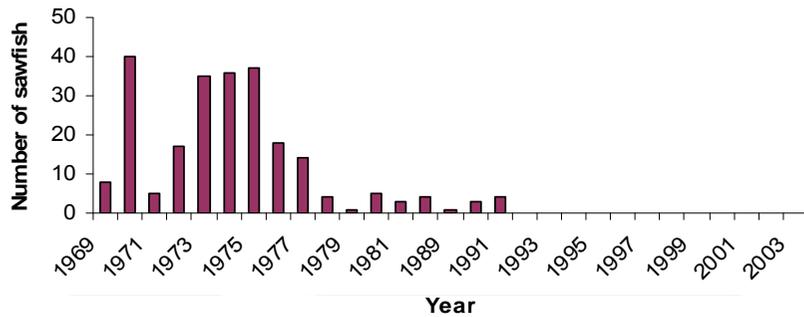
Cairns



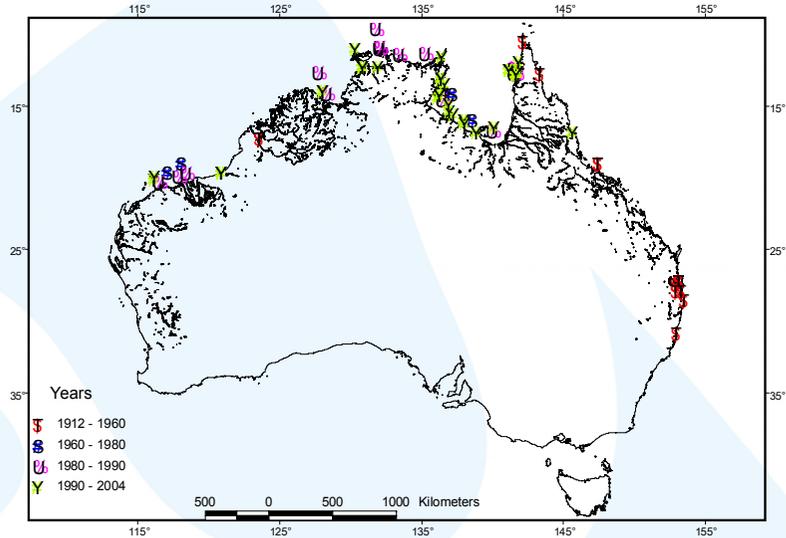
Townsville



Rockhampton



Freshwater sawfish – historical records

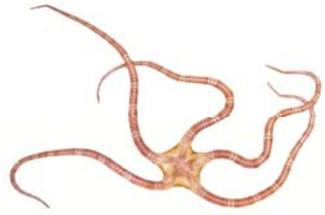


Genetics:

“maternal philopatry”

Fitzroy ≠ GoC ≠ E Coast...

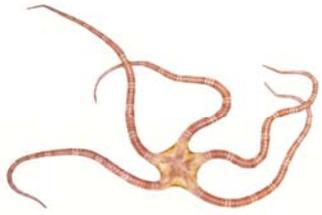
Queensland shark control data – all sawfish



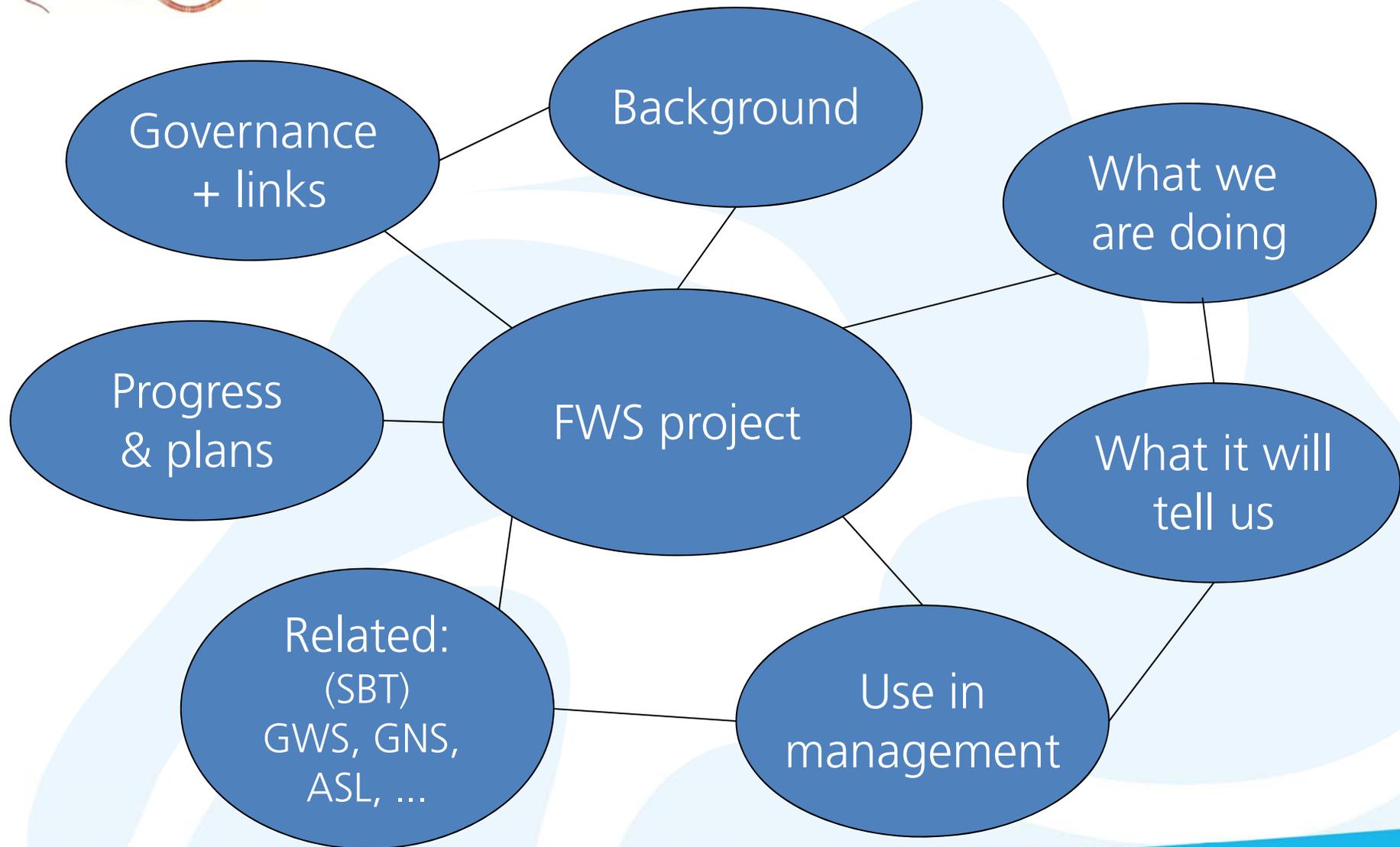
FWS background #4

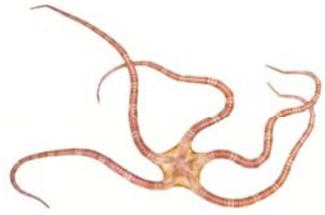
2012: Despite many projects,
we still don't know enough to manage

- Protected... on paper
 - but still caught
 - ongoing habitat reduction
- Is it working?
 - NO IDEA!
- No way to monitor
 - e.g. can't find adults *now*, no useful "fishery" data, no idea of targets...
- No way to assess impacts



Freshwater Sawfish & beyond





What we are doing

- Sample sites across Top End
- Acoustic tags and listening stations
 - juvenile survival
 - habitat usage in rivers
- Genetic ID of half-sibs
 - adult survival
 - maternal / paternal “range”
 - adult abundance (but...)
- Technology-driven: impossible 5 years ago



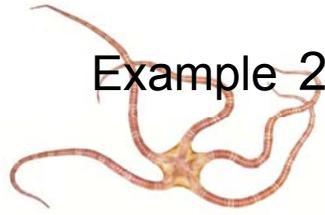


What we are doing

(explain half-sib business now!)

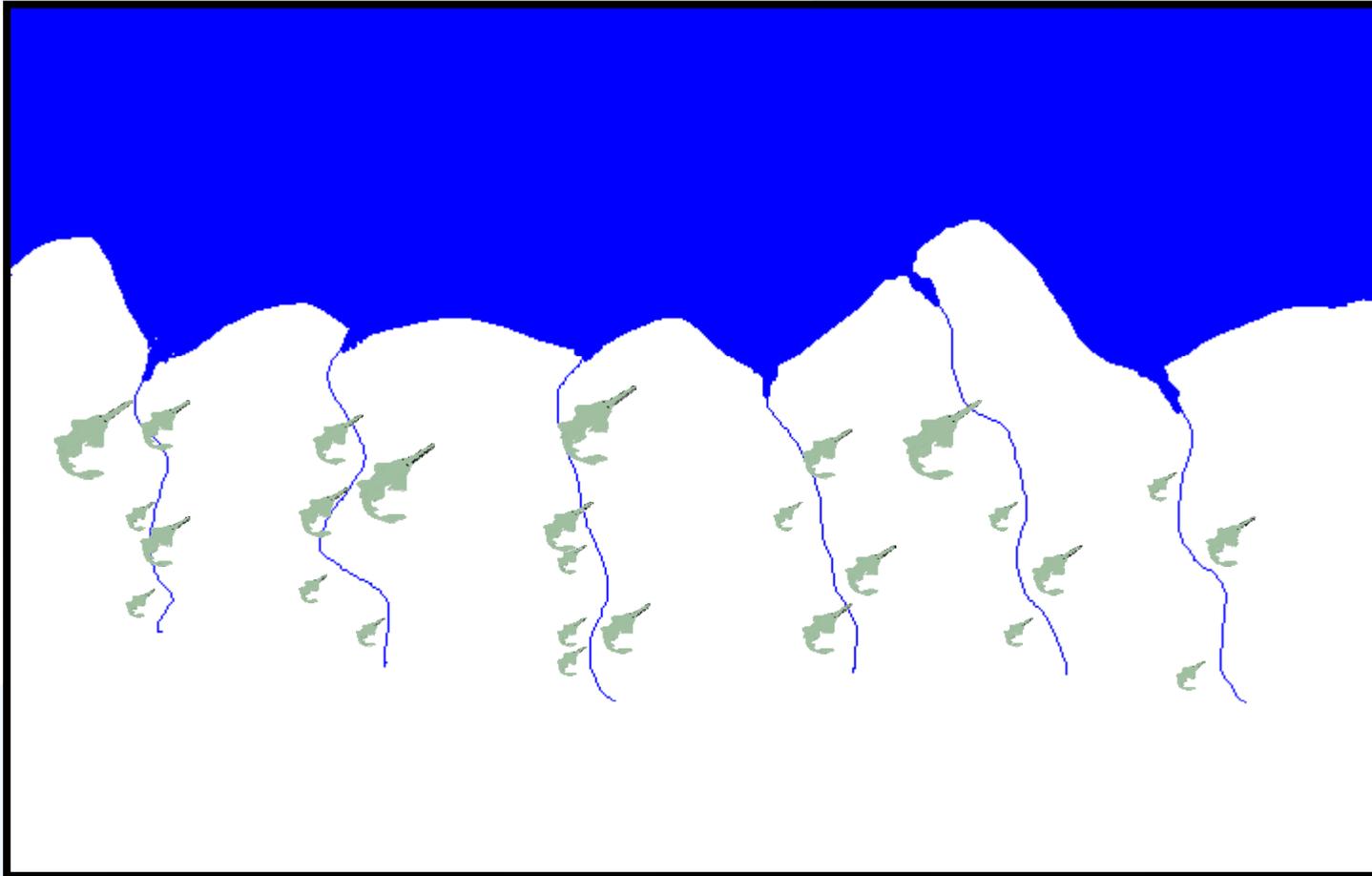
- Finding half-sibs:
 - technically hard, but nowadays do-able
 - SBT project: Parent-Offspring Pairs

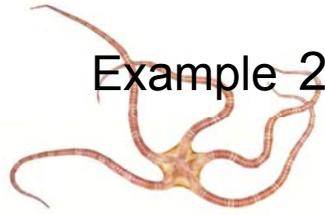




Example 2: Survival and pop. structure of sawfish

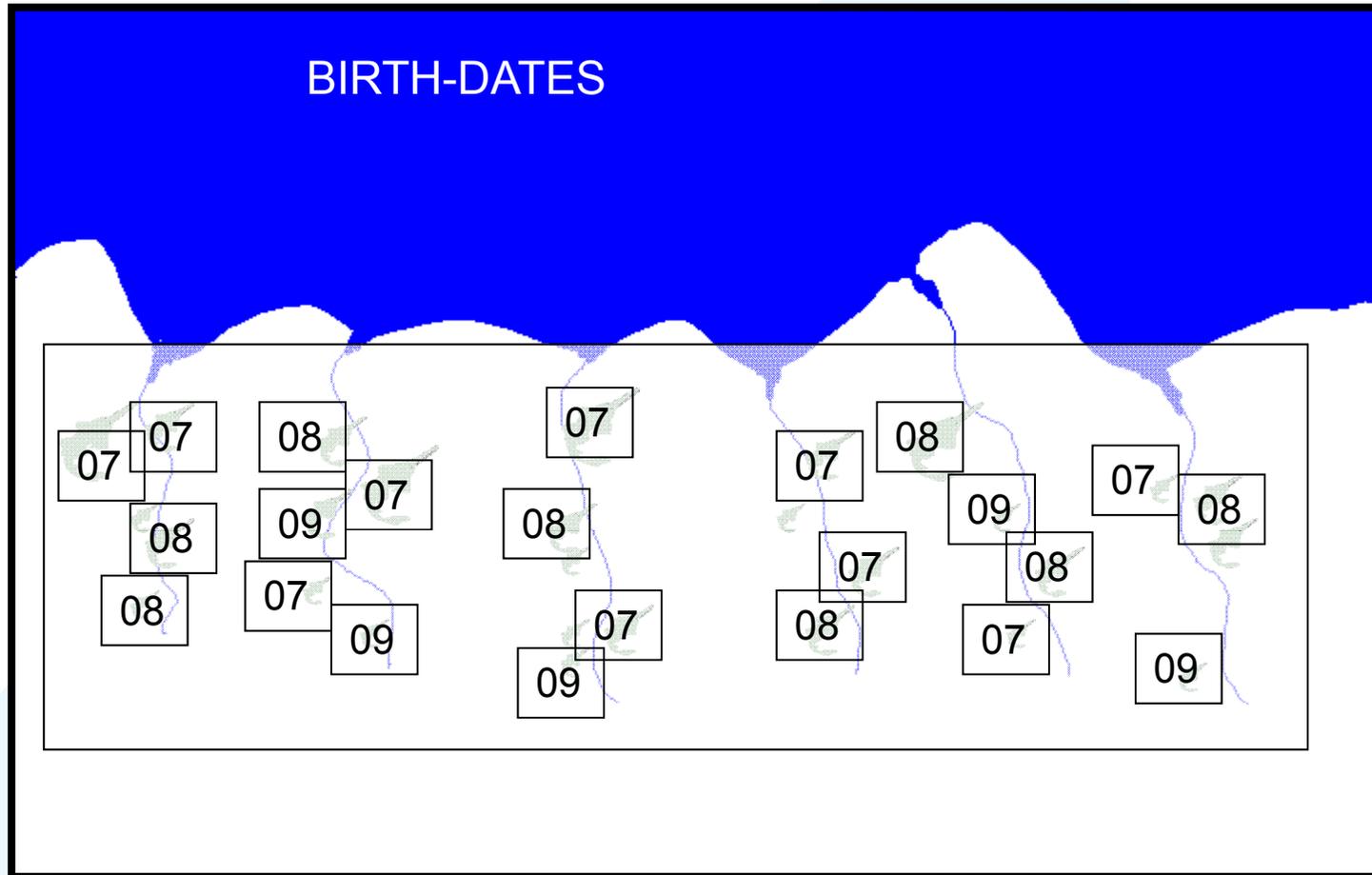
Cross-cohort half-sibs

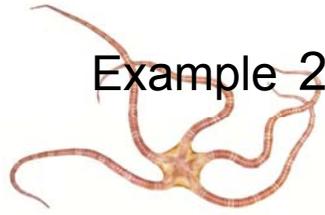




Example 2: Survival and pop. structure of sawfish

Cross-cohort half-sibs



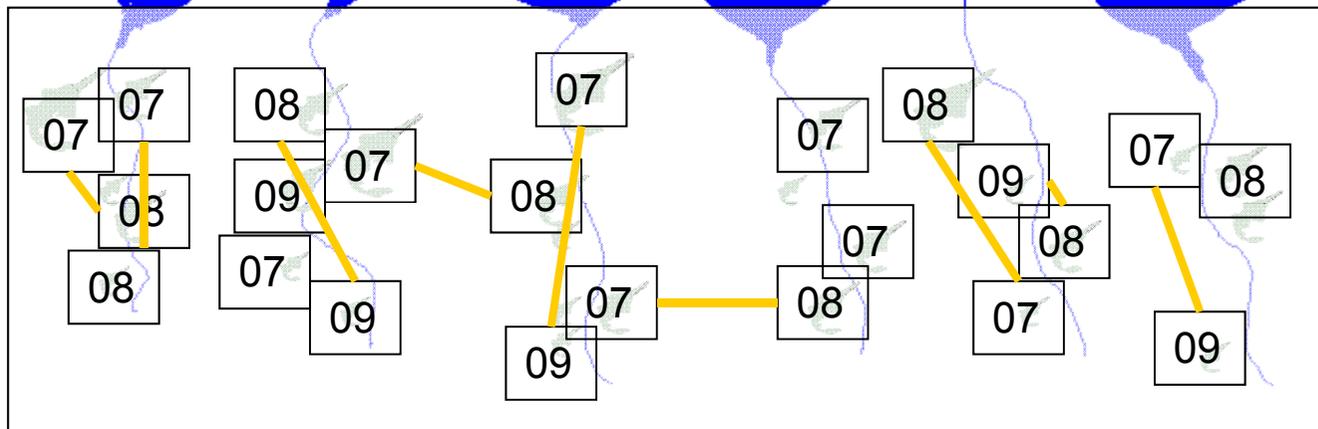


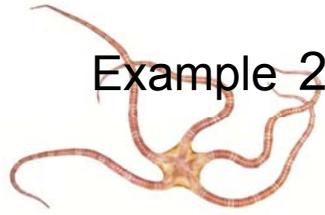
Example 2: Survival and pop. structure of sawfish

Population structure

Check for XC HS

Maternal or paternal HS? Check mtDNA



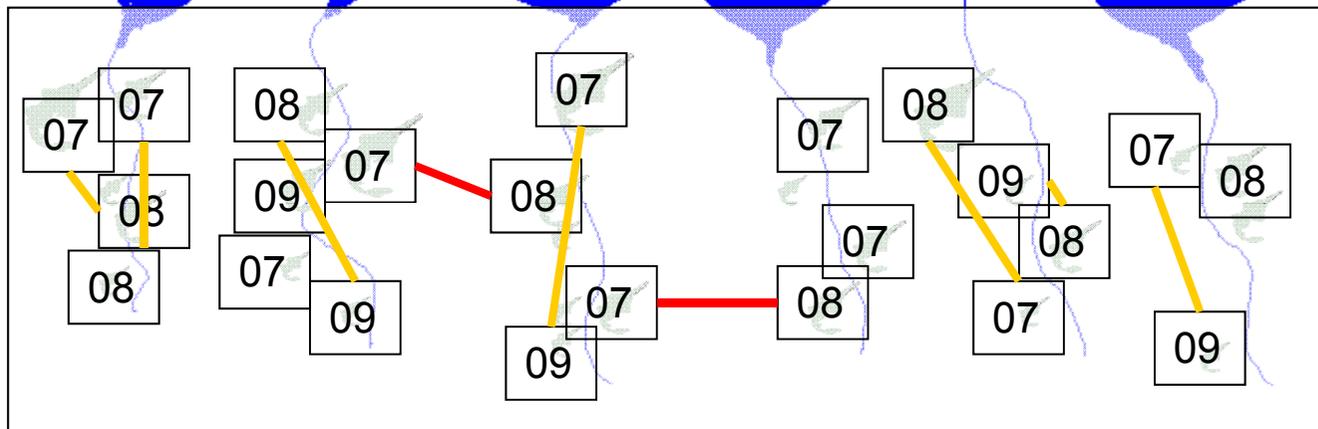


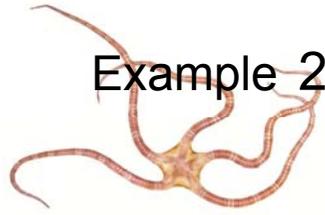
Example 2: Survival and pop. structure of sawfish

Population structure

XC HS in different rivers => parent "moved"

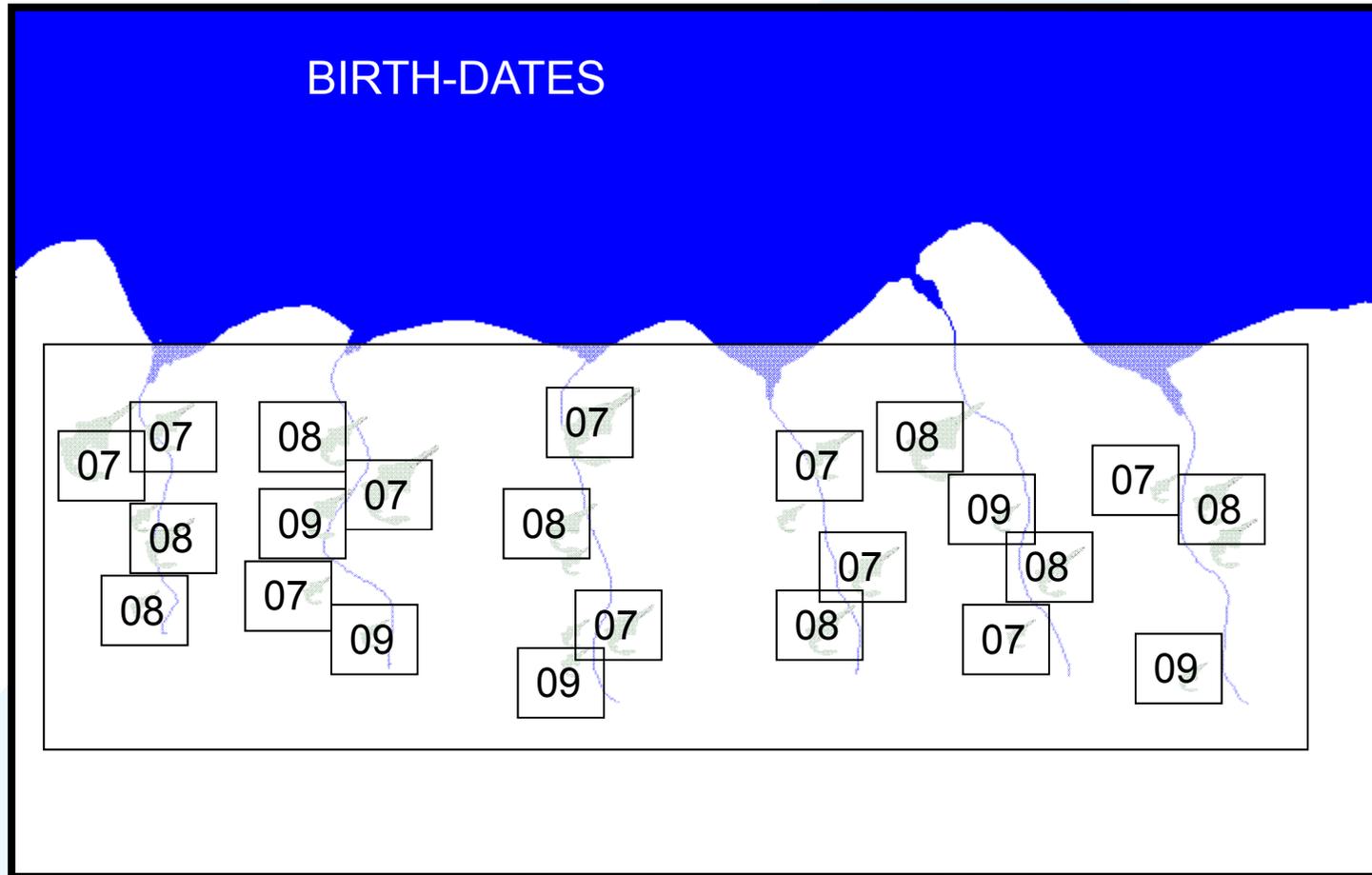
Can estimate "dispersal rate"

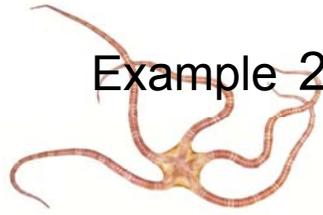




Example 2: Survival and pop. structure of sawfish

Survival rates





Example 2: Survival and pop. structure of sawfish

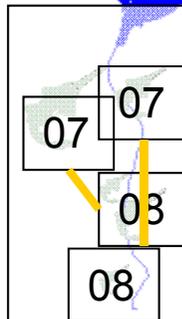
Survival rates

X1 comparisons 1 yr apart: H1 XC HS found

X2 ... : H2

....

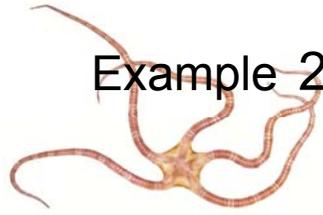
X9 comps 9 yrs apart: H9 XC HS found



08

Adults die sometimes, so

$\text{Expct}[H9/X9] < \text{Expct}[H1/X1]$



Example 2: Survival and pop. structure of sawfish

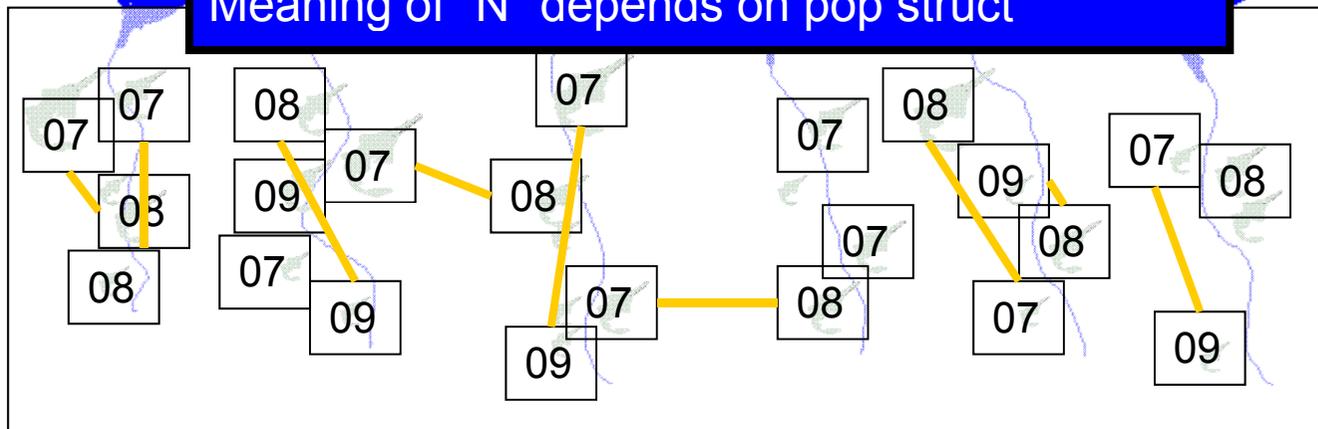
Abundance from XC HS

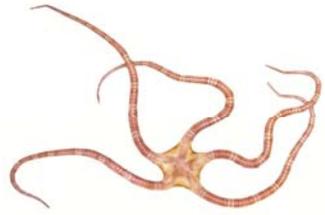
$$\Pr[A \& B \text{ are XC HS}] \approx 1/N_{\text{♂}} + 1/N_{\text{♀}} \approx 4/N$$

if no systematic effects on fecundity, eg size

Solved by size/fec data

Meaning of "N" depends on pop struct



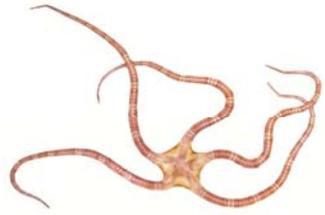


What we will learn

- SCALE of population unit(s)
- TREND in abundance
 - (1) Juvenile survival per year
 - & (2) Adult survival per year
 - & (3) Pups per adult per year

⇒ is abundance going up or down?

 - also, total adult abundance (maybe)
- HABITAT USE within rivers

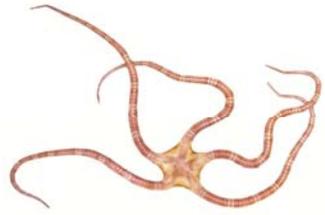


Use for management #1

THE BIGGEST need-to-know:

scale of population units relative to threats

- Are impacts local?
 - localized good because...
 - and bad because...
 - what is unit-to- conserve?
 - (ir)reversible depletions
- Conventional genetics can't fully answer this



Use for management #2

Next biggest N2NO: fecundity and survival rates

- Going up or down?
- Can separate the impacts on various life-stages
 - natural vs "fishing" mortality?
- Several ways to get at fec and surv
 - ... fec not for bony fish



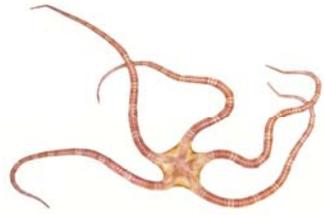
Use for management #3

(Not for FWS--- but in general)

Or: relative abundance time-series

- Absolute or relative?
- What is magnitude of threats?
- Blunt and slow--- but sometimes all there is
- Or: the roomful of experts :/

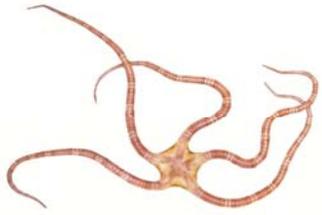
Sometimes, there is no solution



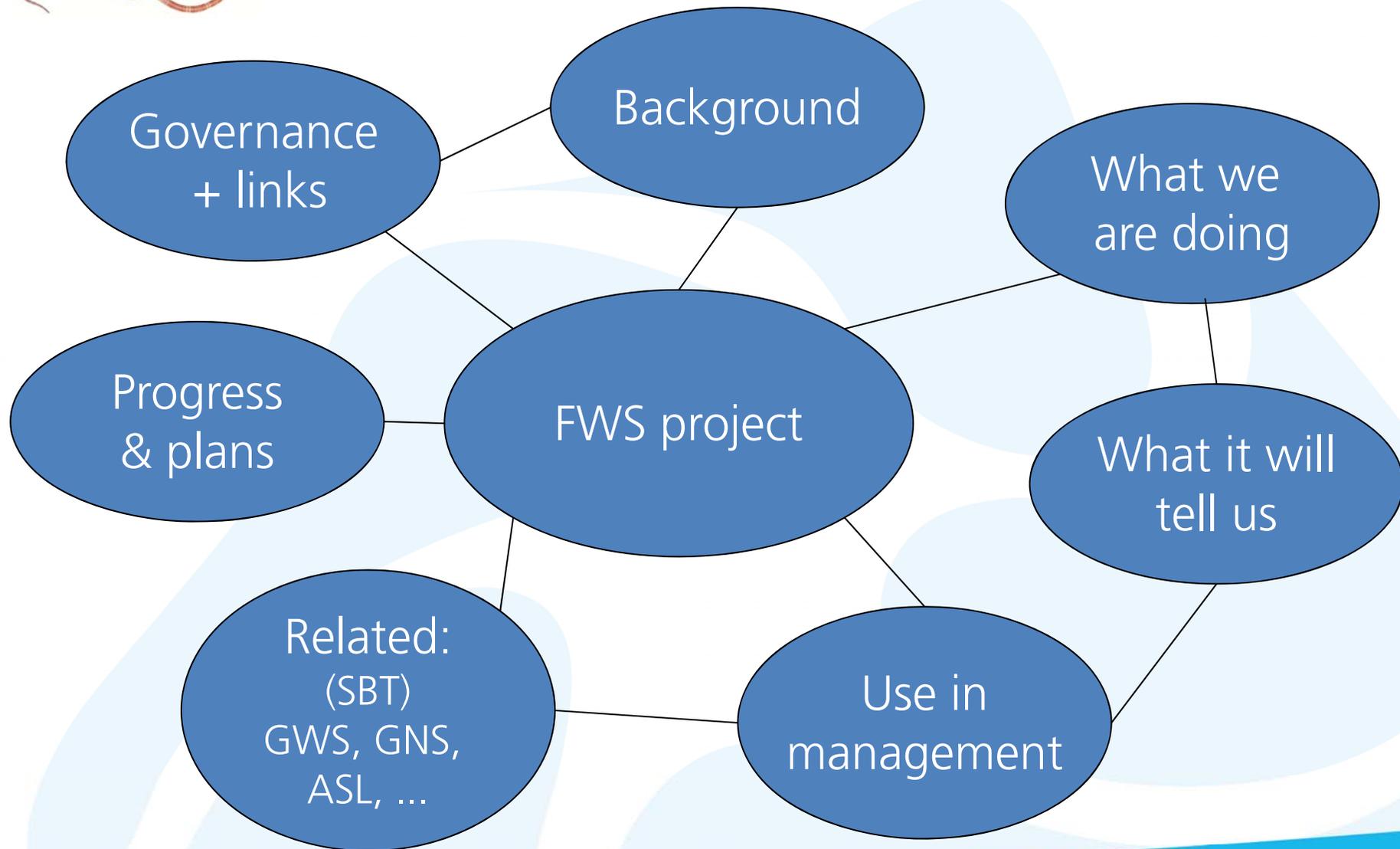
Use for management #4

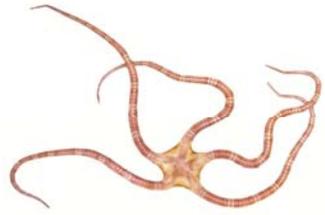
What might be in a FWS reco plan?

- Unit-to-serve
- Monitoring regime (if threats continue)
 - who pays???
- Protocol for considering impacts
- ...



Freshwater Sawfish & beyond

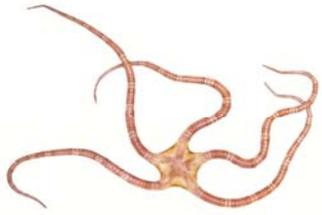




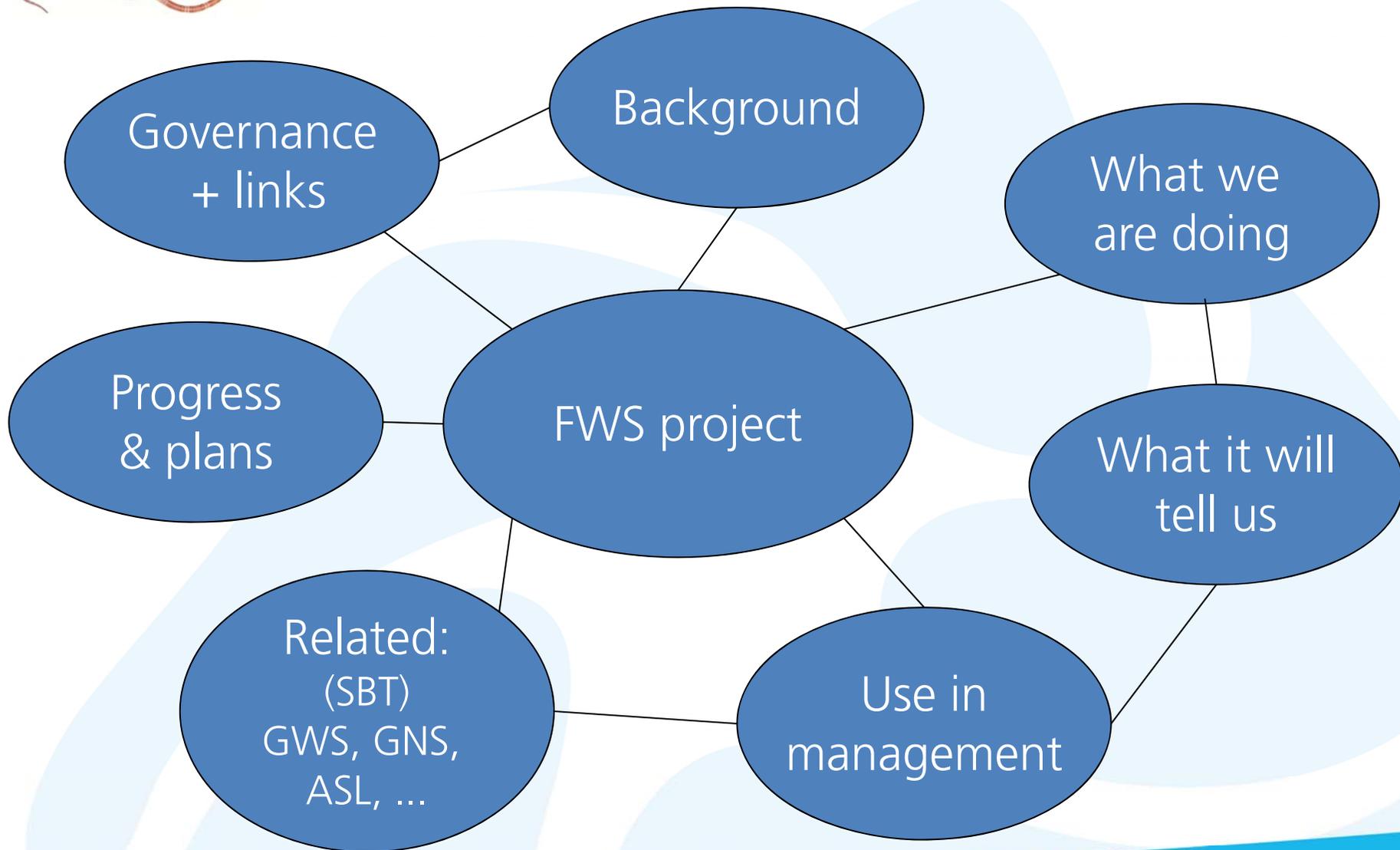
Governance / links

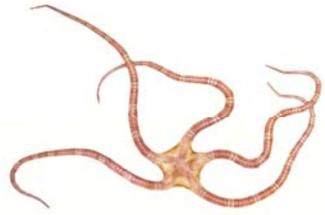
Placeholder for ad lib discussion

- Sawfishwise: brought together key expertise (CDU/CSIRO/NT fisheries) and...
- ... linking with researchers in other rivers
- Indigenous liaison
- General chance (not just FWS) to think thru reco plans
 - and who pays for what



Freshwater Sawfish & beyond

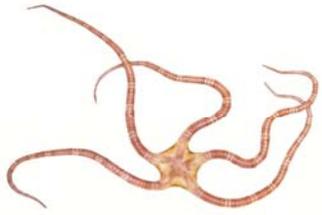




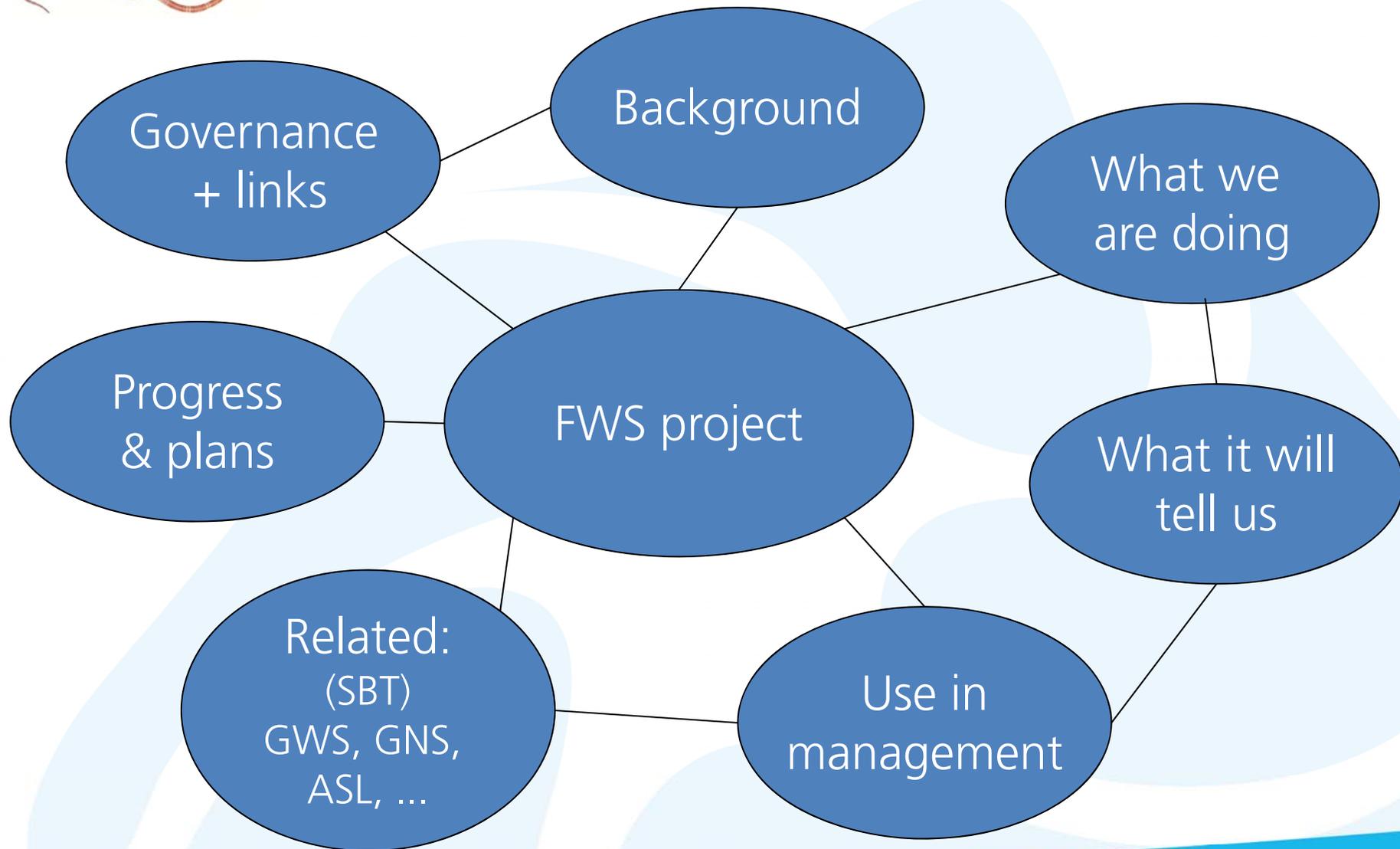
Related species

- Speartooth shark (Glyphis)
- [Southern Bluefin Tuna... shows the genetics works]
- Great White Sharks
- Grey Nurse Sharks
- Gulpers--- and the NEXT "gulper"
- Aus Sea Lions... dugongs... some cetaceans
- whale sharks
- shortfin makos

ETC...



Freshwater Sawfish & beyond



Contacts

Director

Prof Nic Bax

Tel: +61 3 6232 5341

nic.bax@csiro.au

Deputy Director

Paul Hedge

Tel: +61 3 6232 5023

paul.hedge@csiro.au

Executive Officer

Vicki Randell

Tel: +61 3 6227 7270

vicki.randell@utas.edu.au

Research Leaders:

National monitoring, evaluation and reporting

Dr Keith Hayes

Tel. +61 3 6232 5260

Keith.Hayes@csiro.au

Supporting management of marine biodiversity

Dr Tony Smith

Tel. +61 3 6232 5372

Tony.D.Smith@csiro.au

National ecosystems knowledge

Dr Scott Nichol

Tel. +61 2 6249 9346

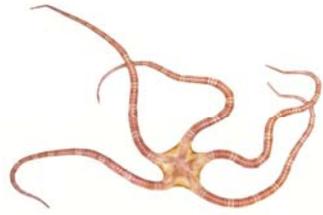
Scott.Nichol@ga.gov.au

Regional biodiversity discovery to support marine
bioregional plans

Dr Julian Caley

Tel. +61 7 4753 4148

J.Caley@aims.gov.au



Things to worry about

- Can't catch "enough"?
 - eventually it will work
 - Glyphis (plan B)
- No mtDNA variability?
 - bad news--- but we will find out soon
- Fecundity/size relationship?
 - not essential for surv, struct
 - from within-cohort (half)sibs?
 - eventually will get some big ones (?)
- Subadult surv/dispersal
 - interp for now
 - acoustic tags eventually
 - cousins?
- If the answer is "maybe"...