

Modelling human threats to sea turtle population viability

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Purpose

- identify major hazards or sources of sea turtle mortality
- framework for competing risks assessment rather than a long laundry list of hazards
- heuristic modelling approach (group-based learning tool, design policy models)
- better understanding of recovery process
- for further discussion at this meeting

Model overview

- stochastic (environmental, demographic)
- compensatory & depensatory processes
- spatially explicit if needed
- fast and interactive
- working group based

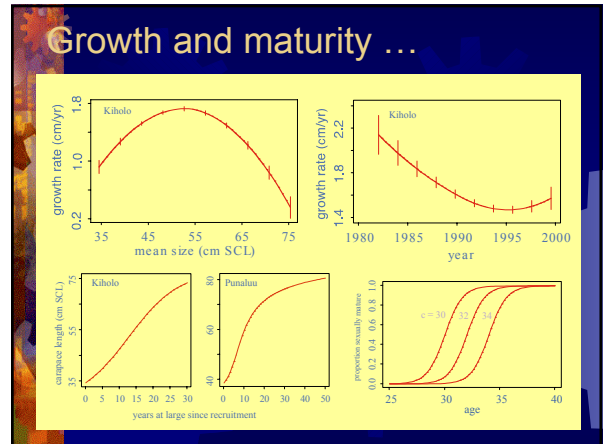
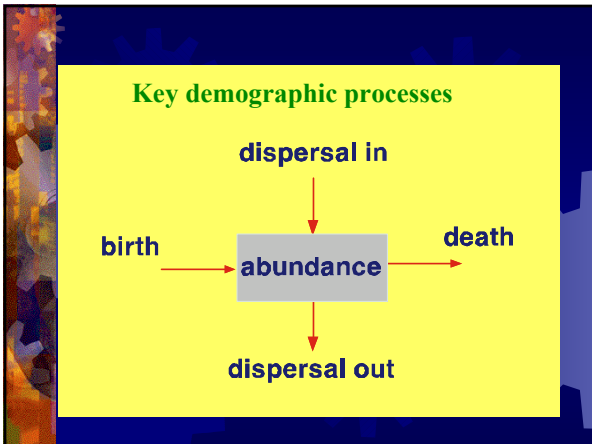
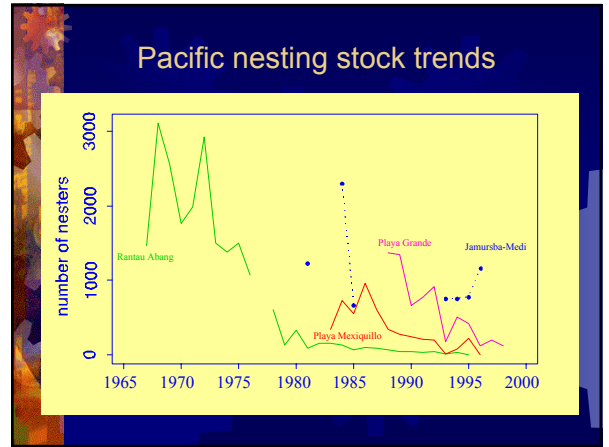
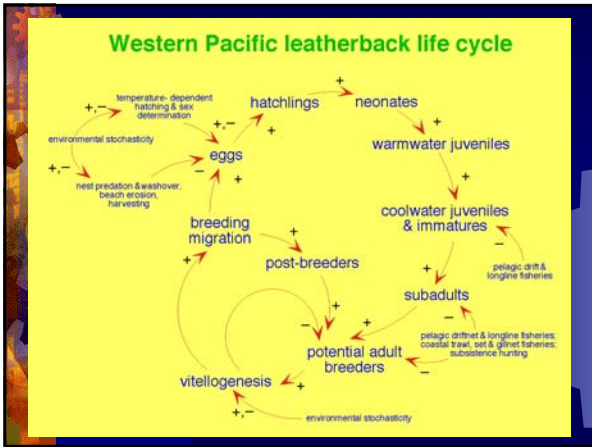
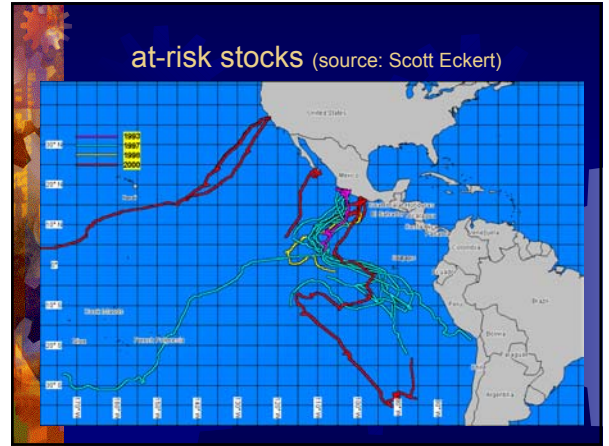
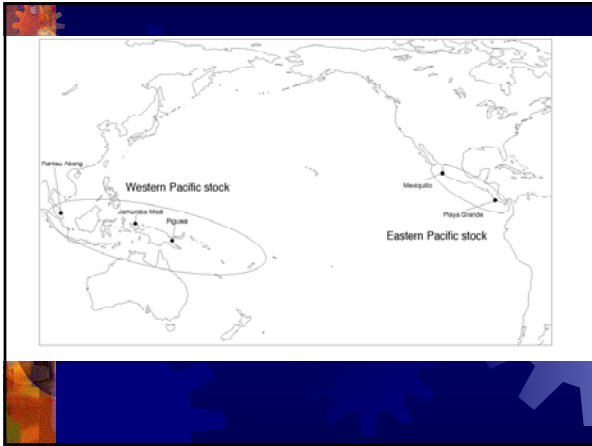
Models built for ...

- sGBR greens
- Hawaiian greens
- western Pacific leatherback
- north Pacific loggerhead
- eastern Pacific olive ridley
- Cayman greens
- Cuban hawksbills
- (in progress - Pacific hawksbills, EP green)

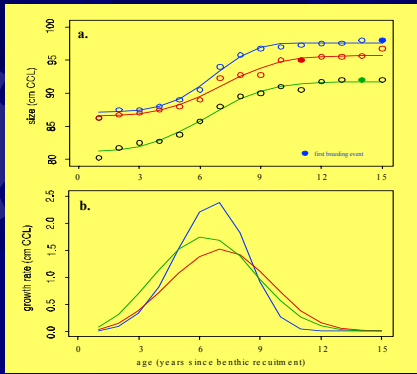
Three modeling cases

- western Pacific leatherback (metapopulation stochastic simulation model)
- Hawaiian green (metapopulation stochastic simulation model)
- Cuban hawksbill (Bayesian surplus production stock assessment model)

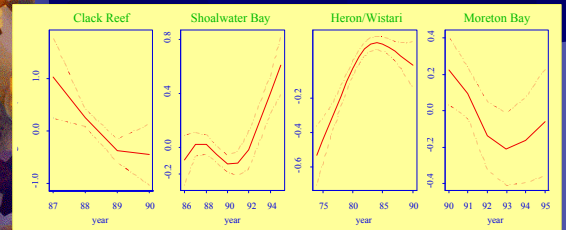




slow growth - so long exposure



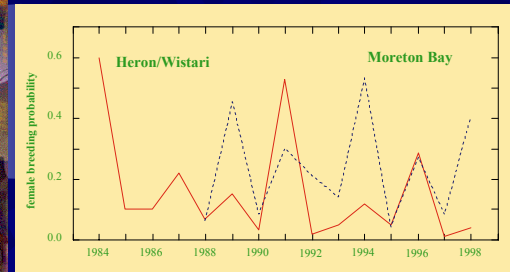
Environmental effects...



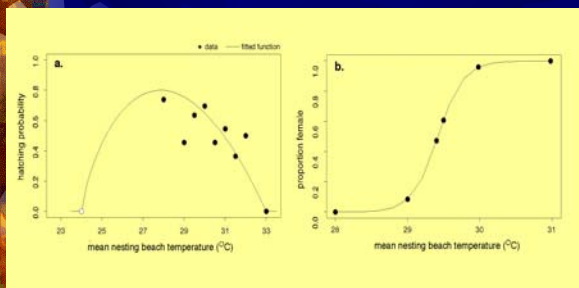
Birth (reproduction)

- year-to-year and sex-specific variability in breeding probabilities
- density-dependent and correlated
- seasonal nesting
- fecundity and sex-ratio include demographic stochasticity
- temperature-dependent hatching probabilities and hatchling sex-determination

foraging ground-specific breeding probabilities

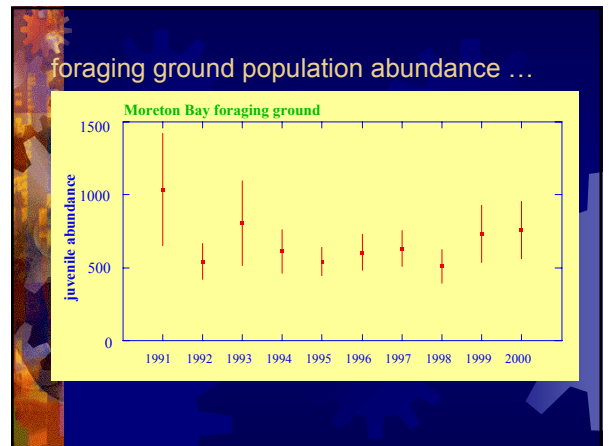
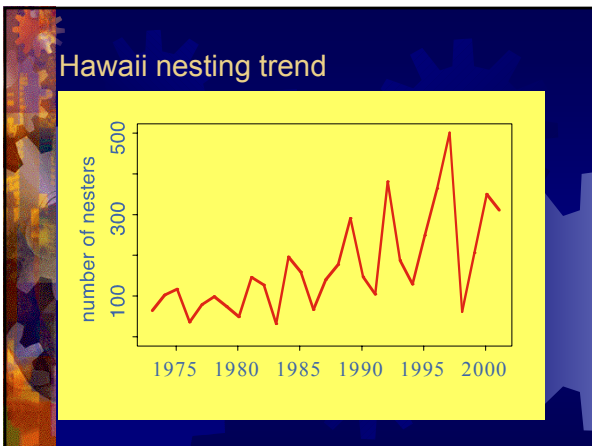
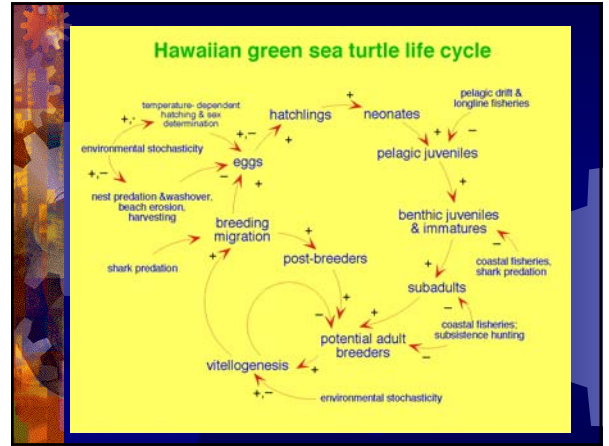
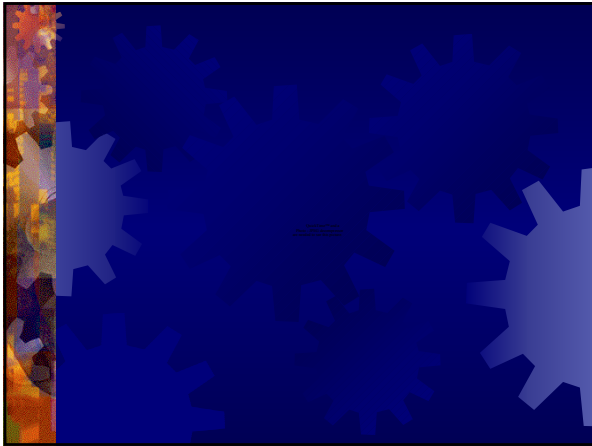


temperature dependent hatching & sex ratio functions

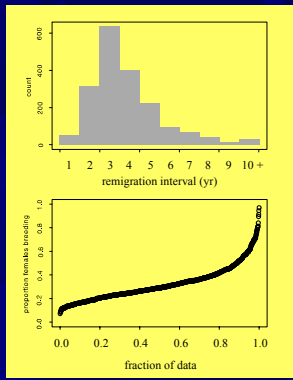


Survival (mortality)

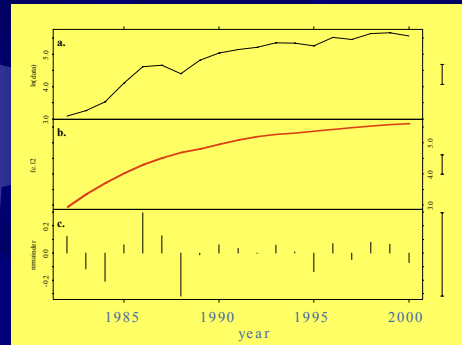
- ageclass-specific
- adult ageclass is high (>>90%)
- negligible environmental variability
- no sex- but habitat-specific differences
- survival probabilities are correlated with between sexes and between some ageclasses
- competing risks model



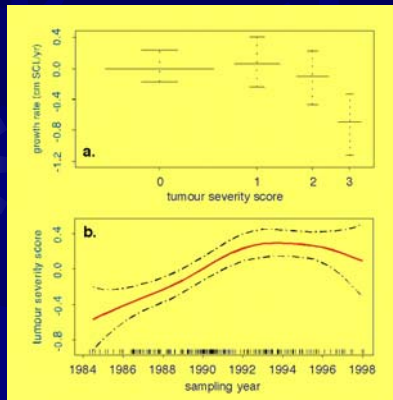
breeding probability functions (Hawaii - GH Bates)



Hawaiian strandings trend ...

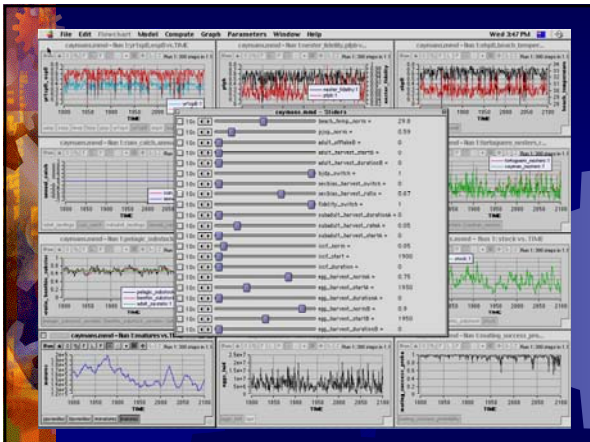


Disease ...

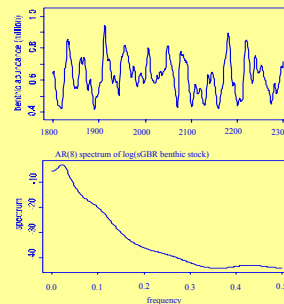


In summary ...

- modelling framework then needed to help diagnose competing risk effects
- consensus-based modelling approach
- fast and interactive



Model behaviour ...



Bayesian stock assessment model (interactive)

- harvest time series
- fishery dependent or preferably a fishery-independent stock abundance series
- parameter estimation using MCMC
- then interactive stochastic simulation model incorporating both process and observational (measurement) error

