Population structure and provenance of tropical tunas: recent results from high throughput genotyping & potential implications for monitoring & assessment

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OCEANS AND ATMOSPHERE FLAGSHIP
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Perennial Challenges for Sustainable Fisheries

- **How many fish are being caught ?**
  (includes regulated harvest as well as IUU)
- **How many fish are left?**
  (population census, important for modelling long term harvest levels)
- **Agreeing how many can be caught in the future.**
  (e.g. implementation of formal harvest strategies for tuna fisheries)
- **Traceability /chain of custody and provenance**
  (i.e. compliance and informing consumer choice)

Genetics Solution : Fishery Independent Data

(Low cost, High Throughput, Forensic Grade)

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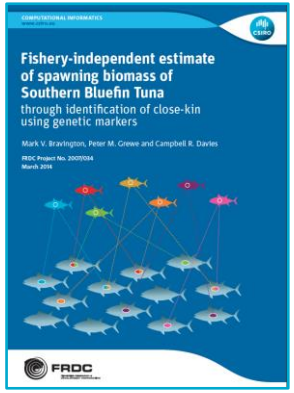
CSIRO - Strategic Program

(Fishery Independent Data Based on Genomics)

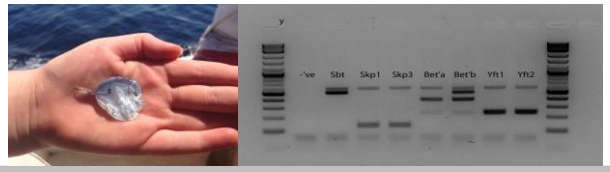


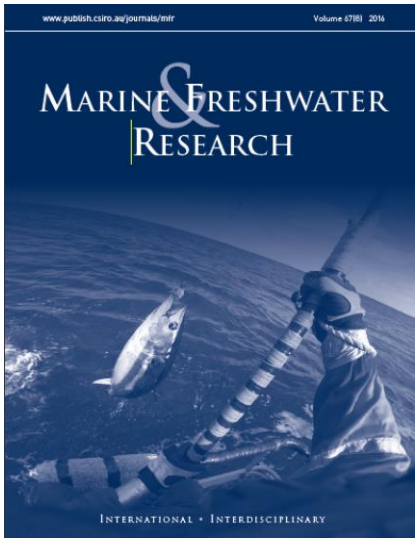
- Abundance and fishery monitoring

- Stock Structure/Provenance, chain of custody

- Gene Tagging

- Species ID





Bradford et al., 2016
Marine Freshwater Research
67(8):1081-1089

CSIRO Program – Species ID/Stock Structure/Chain of Custody

(Fishery Independent Data Based on Genomics)

- CSIRO internal funding kick started the development of baseline genetics
- Australian Centre for International Agricultural Research (**ACIAR**),
  (Indonesia, Maldives, Solomon Islands)
- Marine Stewardship Council (**MSC**),
  (Indonesia, Maldives)
- Australian Department of Foreign Affairs and Trade (**DFAT**, Australia),
  (Indonesia, Maldives)
- Indian Ocean Tuna Commission (**IOTC**),
  (Spain, France, Indonesia, Maldives, others….)
- Australian Government Fisheries Research & Development Council (**FRDC**)
  (Evans et al., **SA-IP-15**)
- **CCSBT** and **ICAAT** projects looking at CloseKin/Mark-Recapture & GeneTag

Species ID - Stock Structure / Provenace

Tackling IUU and Misreporting

Modern genetics delivers:

- **S**pecies ID
- **P**rovenance of fish populations through stock discrimination
- **I**ndividual ID for both product tracking & Gene Tags

Practical application:

- Truth in labeling
- Analysis of mixed stock fisheries
- Identifying IUU catch
- Catch documentation schemes

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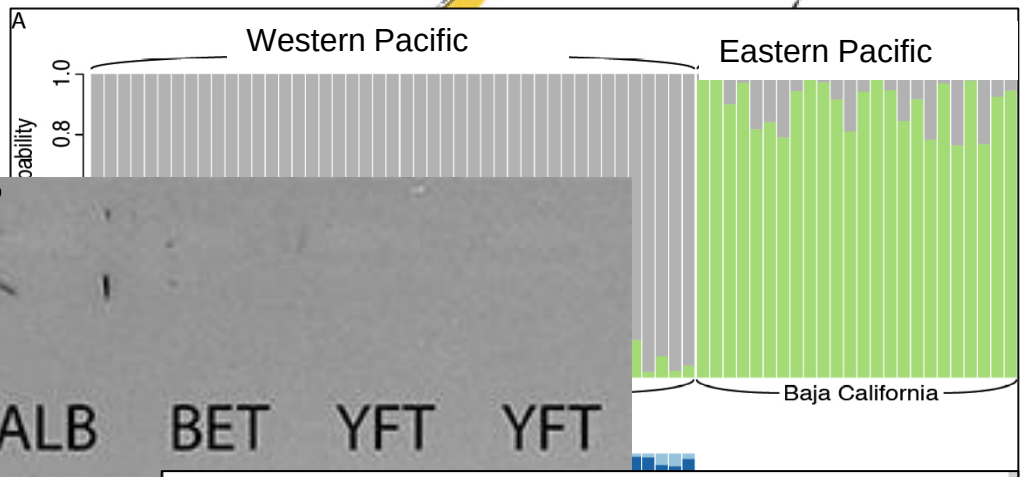
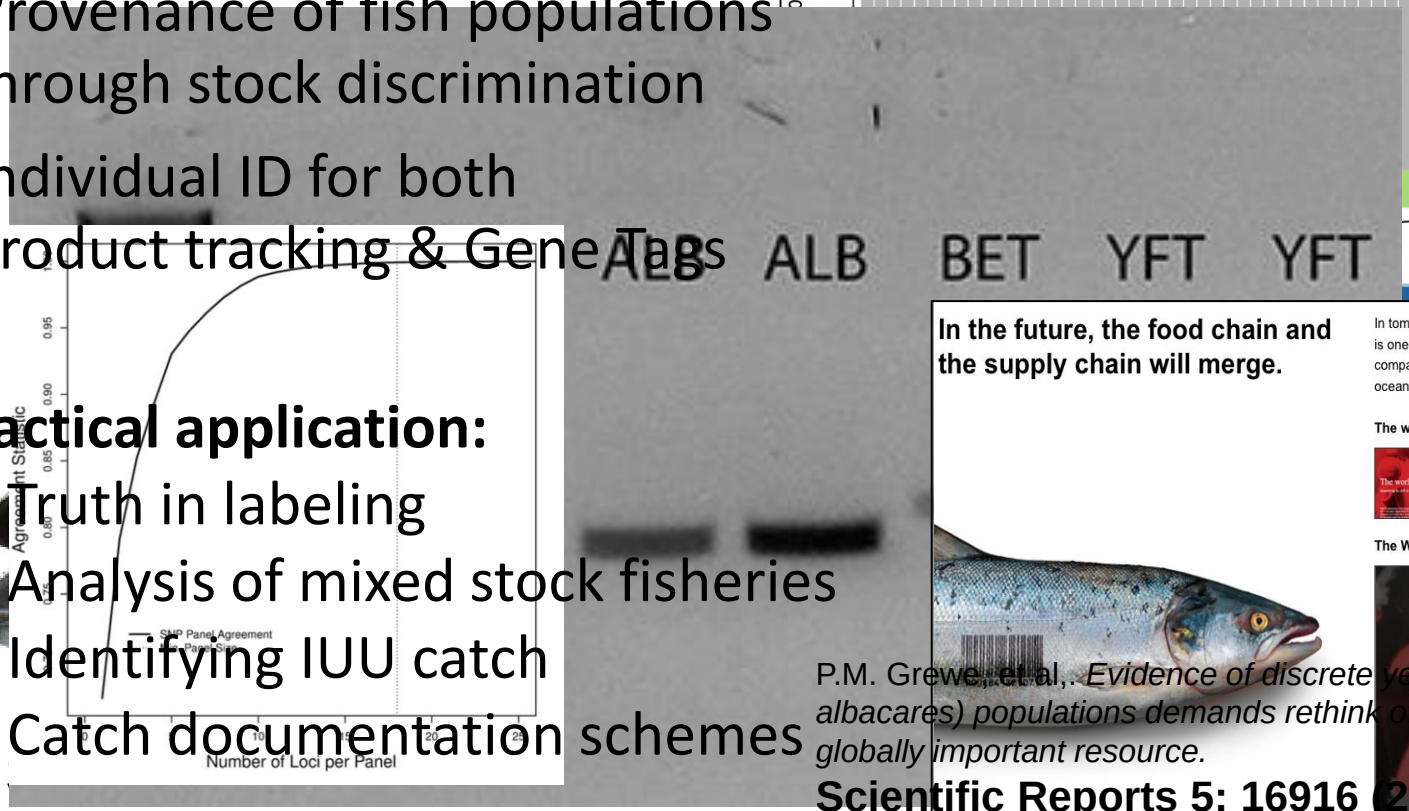
Discrete pan-Pacific yellowfin populations





P.M. Grewe, et al,. *Evidence of discrete yellowfin tuna (Thunnus albacares) populations demands rethink of management for this globally important resource.*
Scientific Reports 5: 16916 (2015)

Outcomes & Future Direction of Genetics

- Close-Kin Abundance Estimate (e.g. Bluefin tunas)
- Provenance/ mixed fishery analysis (e.g. Yellowfin)
- Tuna species ID (truth in labelling etc…)
- Targeted applications to identify sources of IUU
  (improved management and consumer confidence)
- Key to success
  - basin scale coverage
  - global partnerships and collaboration

Tackling Pacific Wide Stock Structure

- **I**dentify important questions relevant to management needs
- **G**ood effort put into sampling design, based on current project experience:
  - targeted and well coordinated sampling strategy
  - must consider spatial and temporal issues
  - efficient use of tissue bank samples
- **E**ffective integration into management requires broad scale genetic coverage
- **W**ill take time and require collaboration of member countries.
- **L**ook forward to discussion on global partnerships and future collaborations

Terima kasih - Thank you

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