

Estimating Size and Species Composition of Purse Seine Catches

Oceanic Fisheries Programme
Secretariat of the Pacific Community

Presentation Outline

- What we are trying to estimate and why
- Catch monitoring in port
 - At point of transshipment
 - At processing facility (cannery)
- Sampling in port
 - In processing facility
 - At point of transshipment
- Observer-based sampling
- Composite design

What are we trying to estimate and why?

- For general fishery monitoring, reporting and documentation purposes:
 1. Catch by species by vessel trip
 2. Catch by species by flag (aggregate over vessel)
 3. Total fishery catch by species (aggregate over flag)
- For stock assessment & management purposes:
 1. Catch by species by flag, area-time strata, set type
 2. Size composition (length frequency) of the above

Problem

- Logsheet data – if they were accurate and of universally high coverage, then NO PROBLEM (size composition aside)
- BUT
 - Logsheet declarations of total catch by set are estimates made by captain/fishing master
 - Individual species catch estimates may be inaccurate
 - Bigeye tuna in particular are not well reported, if at all
- Therefore, we need to employ other methods to:
 - Adjust total catch to be correct
 - Estimate the species composition of catches
 - Estimate the size composition
- Options
 - Collection of unloading data at unloading/transshipment in port and associated sampling
 - Sampling on board vessels by observers

Catch Monitoring in Port

- Option 1 – at point of PS vessel unloading
 - Onshore processing facility (e.g. In Japan, Pago Pago)
 - Transshipment to a reefer vessel for on-forwarding to processing facility (more common these days)
- Option 2 – at point of delivery to processing facility
 - In some locations, e.g. Thailand, will mostly be deliveries by reefer vessels with occasional direct PS unloadings
 - In other locations, e.g. Pago Pago, Japan, mainly direct PS vessel unloadings
 - Others, e.g. Playas, Manta in Ecuador, are a mix of the two

Catch Monitoring in Port

Option 1 (at point of transshipment/unloading)

- Transshipment data will be collected via WCPFC transshipment form (but not yet agreed)
- Will provide weighed estimates of catch by species or species category
- Separate documents for each part-unloading to an individual reefer
- Suitable to verify total trip catch and to some extent catch by species
- Data collection does not cover direct unloading to onshore processing facilities (but it should!)

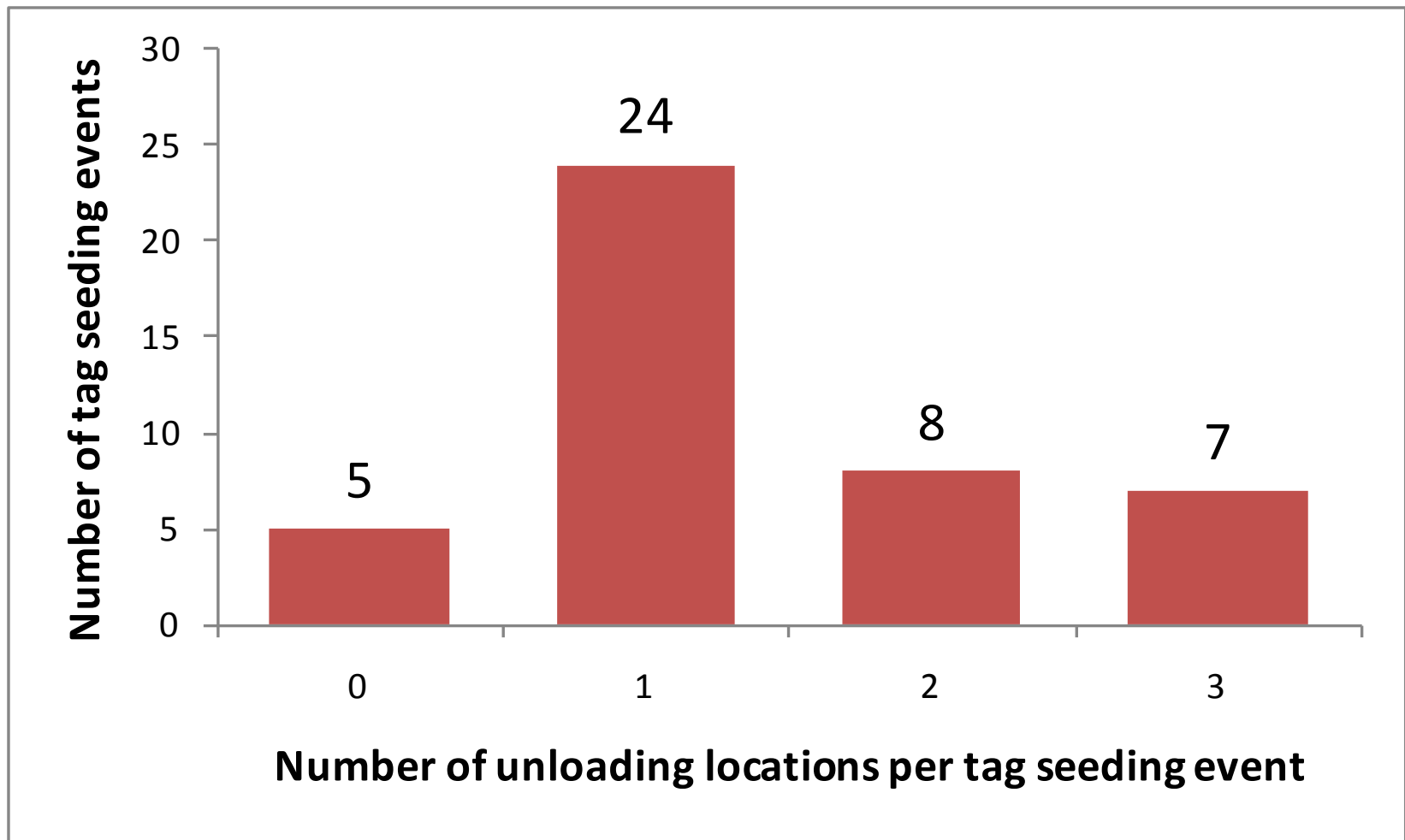
Catch Monitoring in Port

Option 2 (at point of delivery, e.g. cannery)

- Can provide weighed catches for that part of a trip catch delivered to that cannery
- But – many transhipments are split and delivered to different cannery destinations

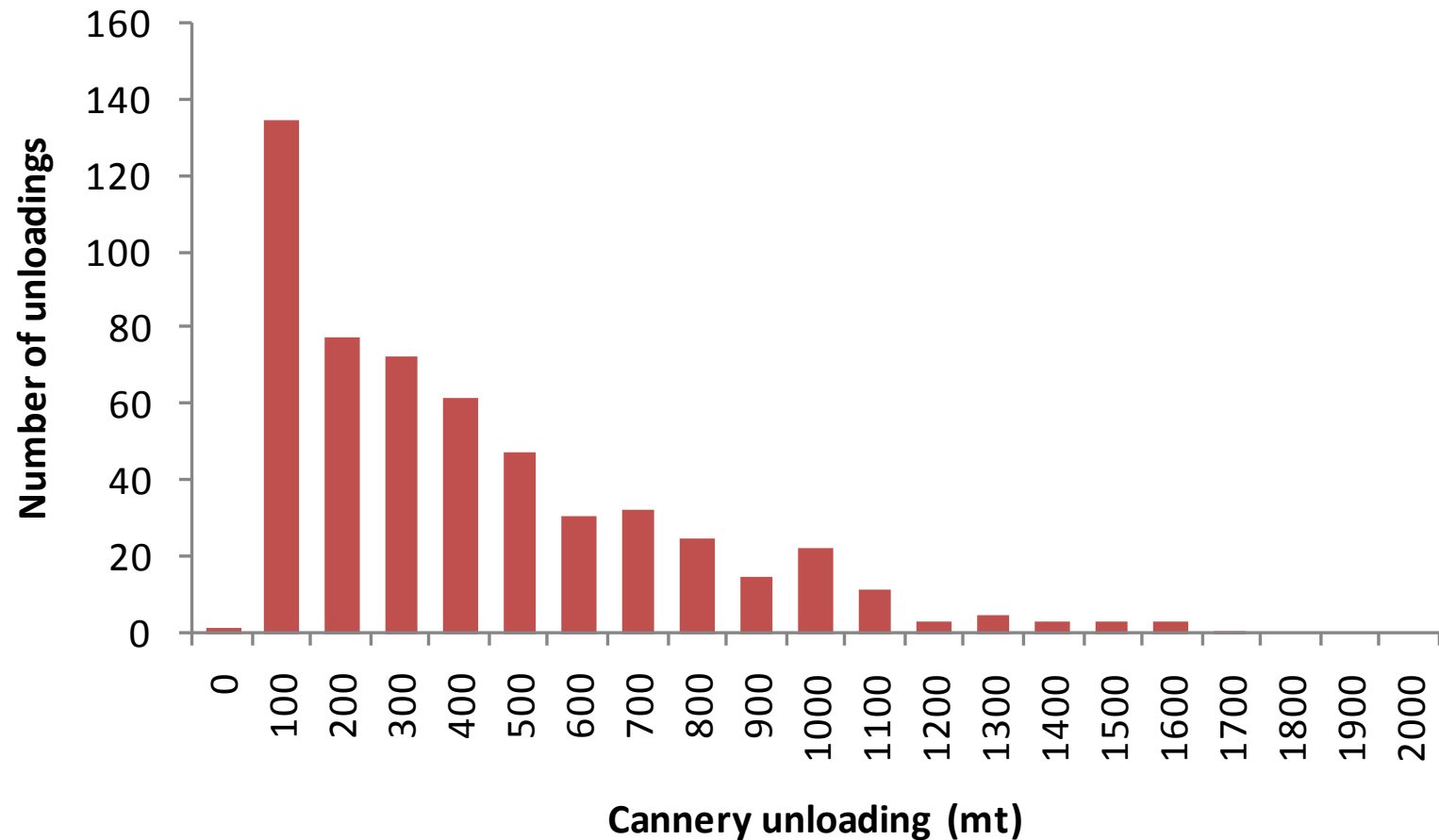
Indications of Split Transhipments

From tag-seeding experiments



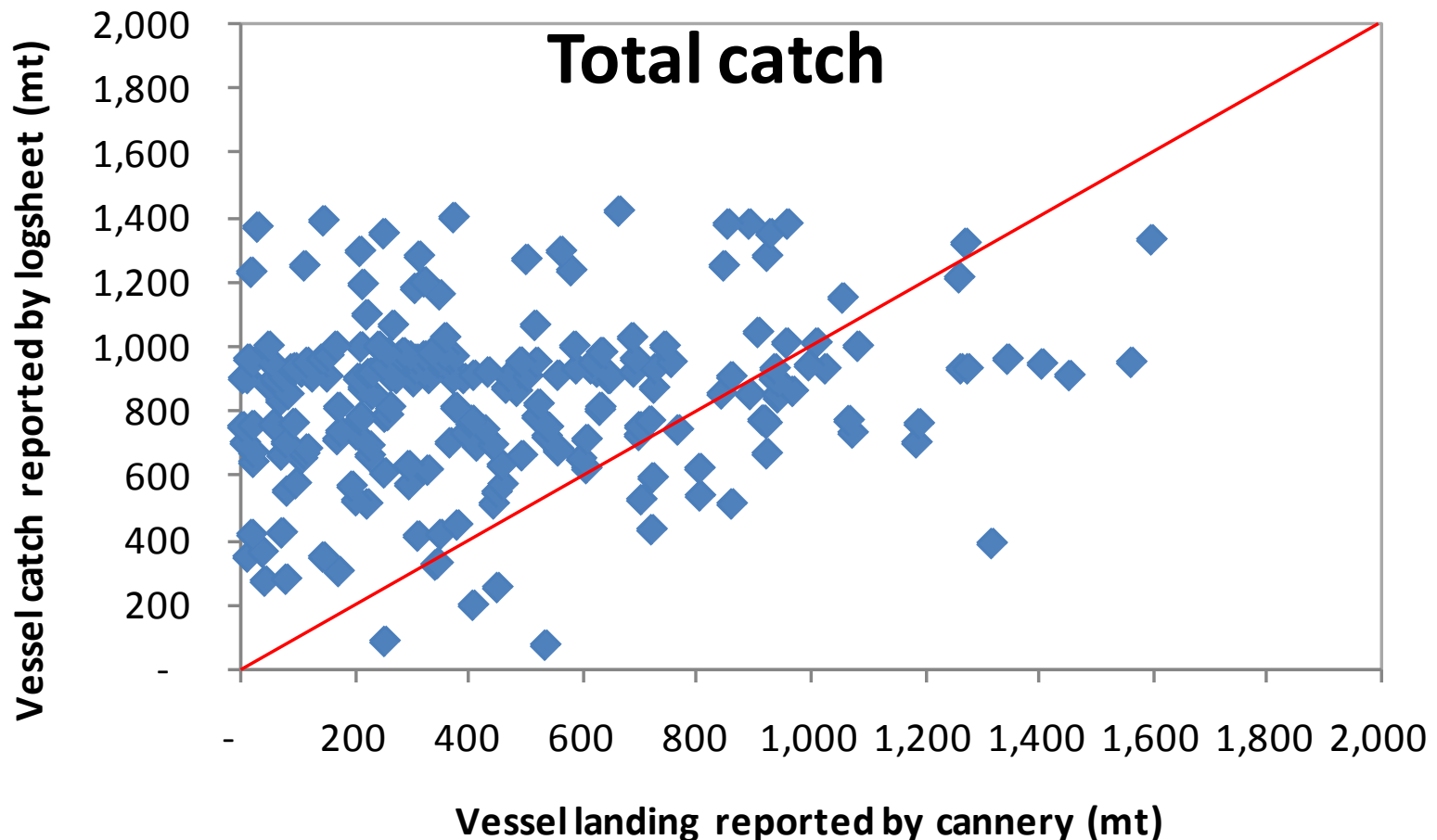
Indications of Split Transhipments

From landings data



Indications of Split Transhipments

From landings – logsheet comparisons



Implication

- If catch monitoring is focused on documentation from canneries, it must be comprehensive and allow partial transshipments to be re-assembled into the entire trip catch by combining data from different canneries

Sampling in Ports

- In-port catch unloading monitoring, if comprehensive, can provide a means to verify total catches
- In some special circumstances, e.g. Japan, very accurate estimates of catch by species, and perhaps by size group, for each vessel trip can be obtained
- But generally, sampling of the catches is required to estimate species composition of at least the mixed-species commercial groups and size composition

Sampling in Ports

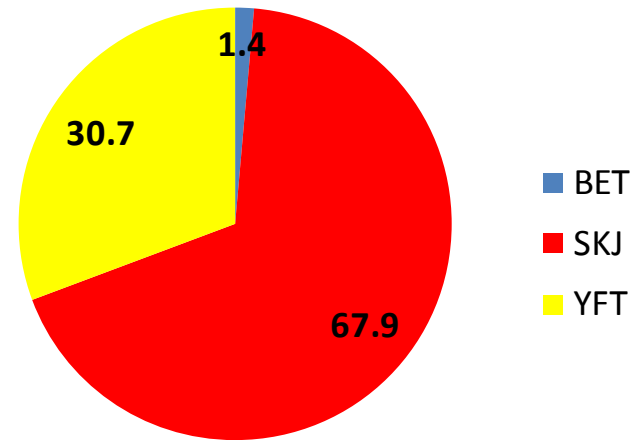
(a) Processing Facility

- In onshore processing facilities, it may be possible to effectively sample IF:
 - The fish being sampled can be identified to:
 - A single vessel trip
 - Ideally, an individual set from a trip
 - If not set, then at least a specific set type (FAD, free-school, etc) and area-time stratum
 - Sampling of species/size commercial categories can be undertaken & supporting documentation is available

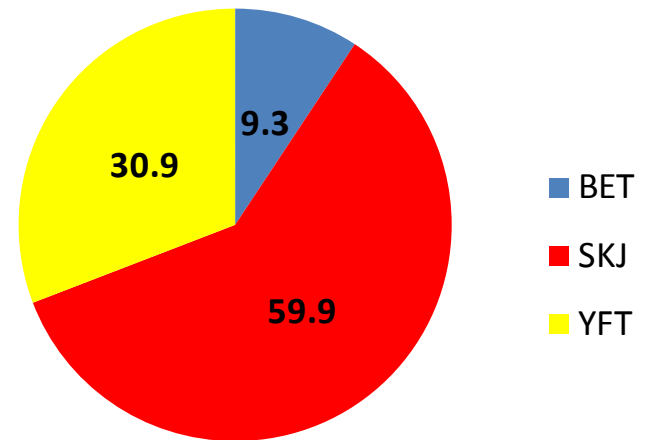
Why is it important to know set identity when sampling?

Set type is an important determinant of species composition

Unassociated Sets

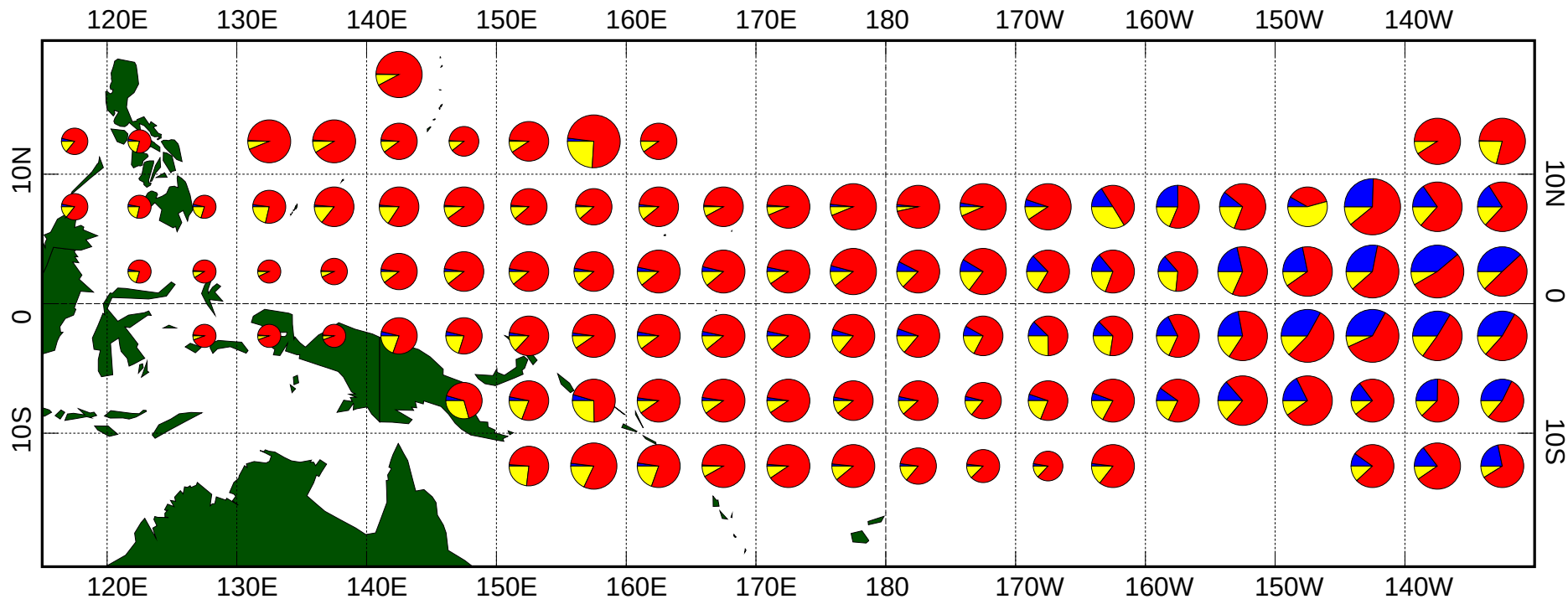


Associated Sets



Why is it important to know set identity when sampling?

Fishing location is an important determinant of species composition



Why is it important to know set identity when sampling?

- Species composition varies markedly by set type and fishing location
- Therefore sampling must be stratified by these factors to ensure unbiased estimates
- To stratify, we must know the set type and fishing location of the fish being sampled

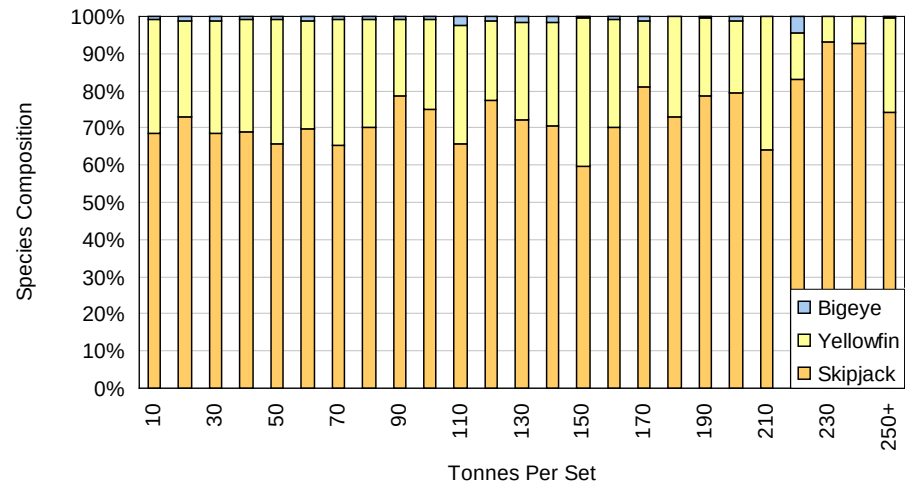
An Additional Problem – Set Size Bias

- Sampling in port generally focuses on wells that contain a single set
- This ensures that fish being sampled are not from mixed sets
- However, it means that larger sets tend to be sampled
- Lawson (2008) found that species composition depends on set size

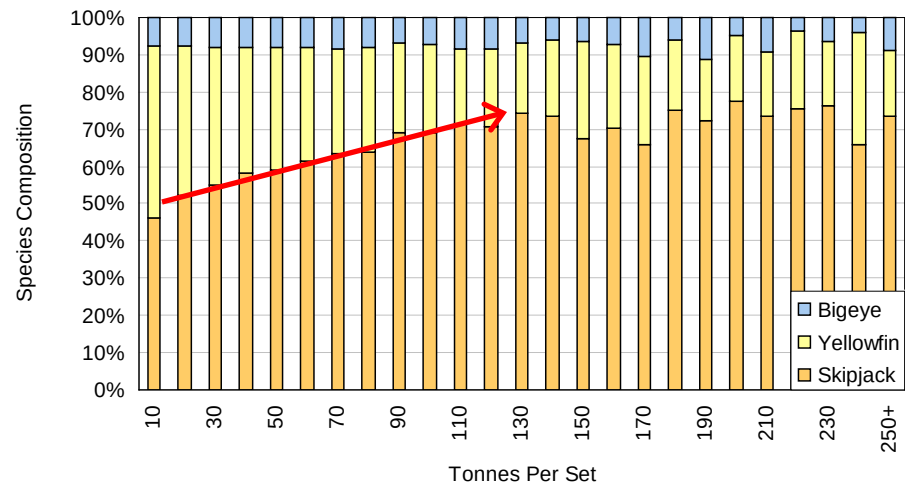
Set-Size Bias

Smaller sets test to have more yellowfin and less skipjack, particularly for associated sets → need to sample across all set sizes

Observer Data -- Unassociated Schools (n = 4,635)



Observer Data -- Associated Schools (n = 13,204)



Sampling in Port

(b) Transshipment

- Problematic because:
 - Transshipment operation is rapid and difficult to sample
 - Fish are frequently pre-sorted by species/size categories on board seiner → set identity is lost
 - Lack of means to stratify sampling (through set identity) → much higher sampling coverage required – close to 100% of trips
 - Problem of set-size bias would also apply

Observer-Based Sampling

- Advantages
 - Opportunity – 100% observer coverage mandated by WCPFC
 - Individual sets can be sampled, linked directly to logsheet data, known set type, set location and set size
 - All sets can potentially be sampled regardless of size, therefore no set-size bias problem

Observer-Based Sampling

- Challenges
 - Representative sampling → “spill sampling” methodology potential solution
 - How to conduct sampling with minimal disruption to fish loading operation
 - Sampling design needed, unless we wish to sample all sets on all PS trips
 - These issues currently under investigation as part of sampling trials
 - Possibility of using video imaging technology to “sample” fish

Composite Design

- Comprehensive data on purse seine catch by vessel trip from:
 - Cannery statistics and/or
 - Transshipment statistics
 - Provides reliable estimates of total catch by commercial species/size groups for every purse seine trip
- Use of observer sampling data (and port sampling data where set identity is available) to:
 - Disaggregate mixed-species commercial groups for individual purse seine trips by species
 - Estimate catch by species, flag, set type and area-time strata required for stock assessment
 - Estimate size composition