



QUOTA TRADING & TECHNICAL EFFICIENCY

Andrew Ropicki
Sherry Larkin



Catch Shares and Technical Efficiency

- **More efficient use of assets**
 - Easing of harvesting restrictions (by season, trip, gear, vessel, etc.)
 - Changing incentives (maximize profits vs catch)
- **More consolidation through quota trading**
 - Profitability determines quota values
 - Trading depends on market structure and effectiveness

Past Research

- ❑ Weninger (2008) found that about 25% of the 1993 grouper fleet could harvest the entire TAC under IFQ management
- ❑ Solis et al. (2014) found that about 20% of the current red snapper fleet could harvest the entire quota

Technical Efficiency

Model

TE calculated pre- and post-IFQ implementation using a stochastic distance function:

- **Functional form:** Translog
- **Outputs:** red snapper, other snappers, other reef fish, other fish
- **Inputs:** crew size, days away, vessel length
- **Controls:** weather, regulatory closures, IFQ implementation

Technical Efficiency

Estimates

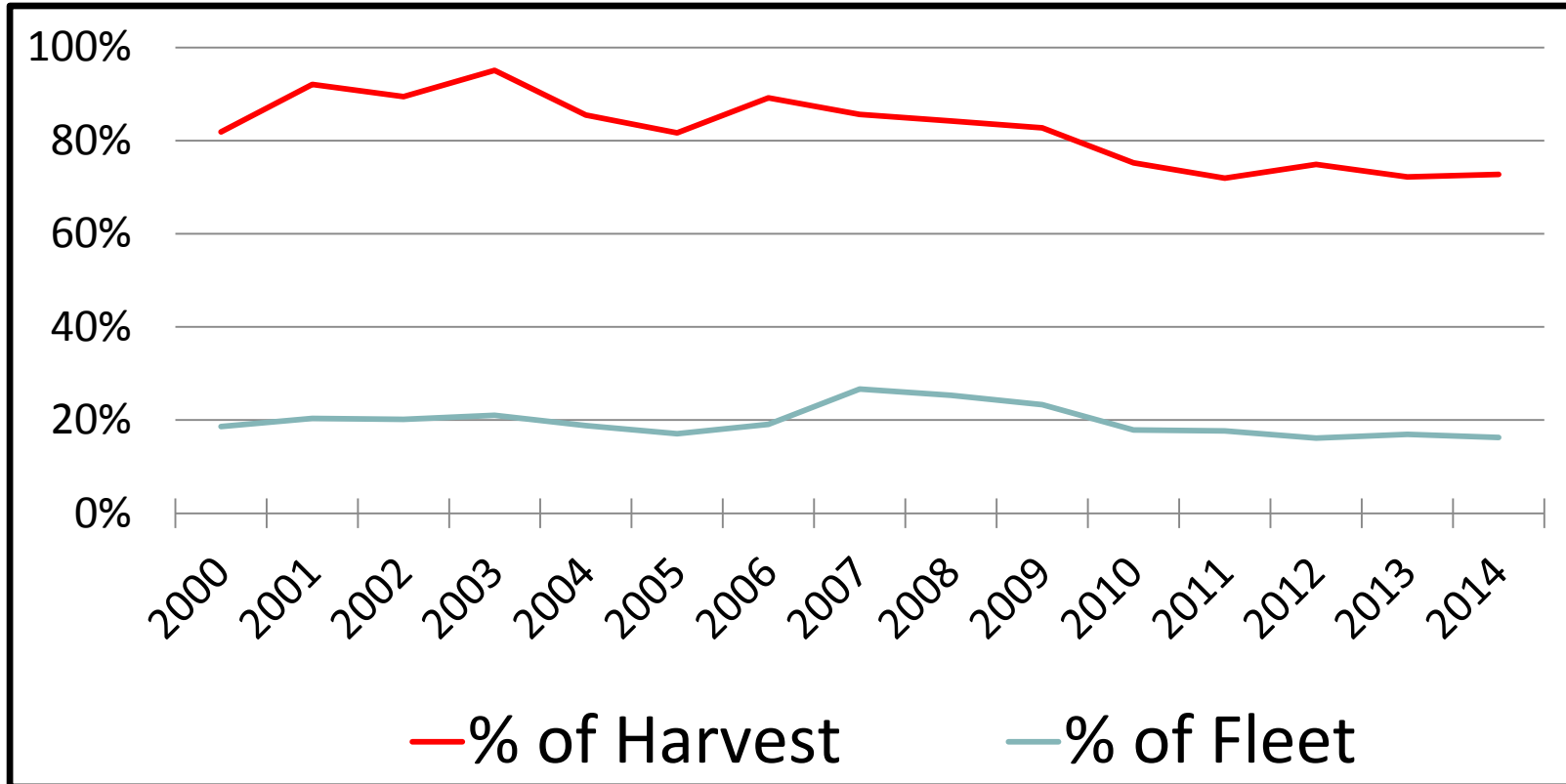
Using SEFSC logbook data from red snapper dominated trips from 2000-2014:

- Average vessel-level TE:
 - Pre-IFQ: 65%
 - Post-IFQ: 67%TE ↑ 3%
- Solis et al. (2014) TE's:
40% – 50%

Fleet Structure

| Average Key Metrics | | Large Harvesters | Small Harvesters |
|------------------------------------|----------|-------------------------------------|----------------------------------|
| | | $\geq 0.25\%$ of annual RS landings | $< 0.25\%$ of annual RS landings |
| No. of vessels: | Pre-IFQ | 94.7 | 395.9 |
| | Post-IFQ | 68.8 | 280.6 |
| RS landings (lbs): | Pre-IFQ | 39,645 | 1,170 |
| | Post-IFQ | 40,346 | 1,736 |
| All landings (lbs): | Pre-IFQ | 73,376 | 39,182 |
| | Post-IFQ | 78,011 | 42,138 |
| % vessels <10,000 lbs total catch: | Pre-IFQ | 0.0% | 49.5% |
| | Post-IFQ | 2.1% | 43.1% |

Large Harvesters Shares



Large Harvester Technical Efficiency

Estimates

- Average vessel-level TE:
 - Pre-IFQ: 90%
 - Post-IFQ: 92% } TE ↑ 2%
- Limited TE variability between vessels within this group

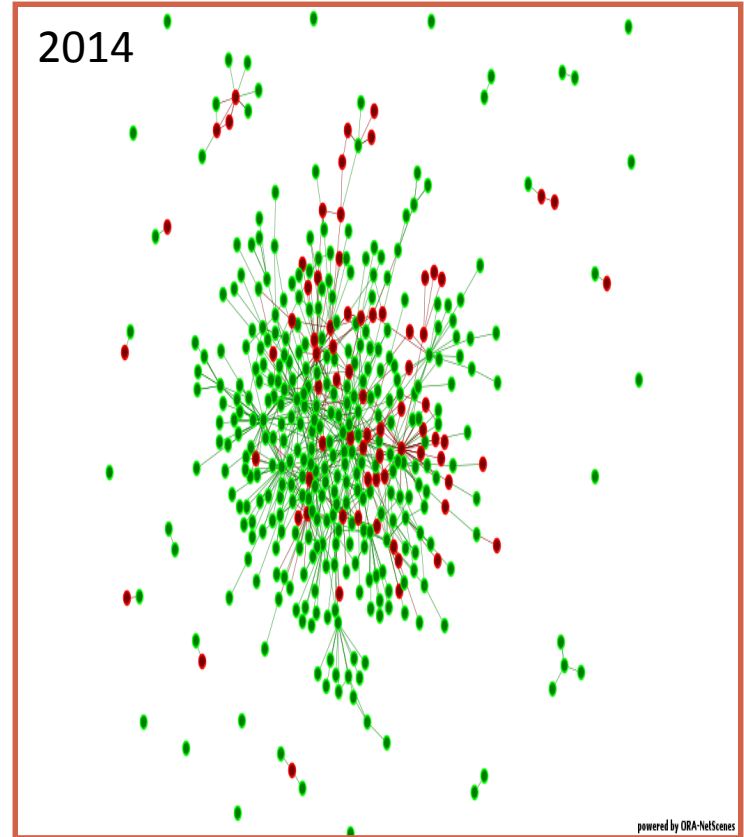
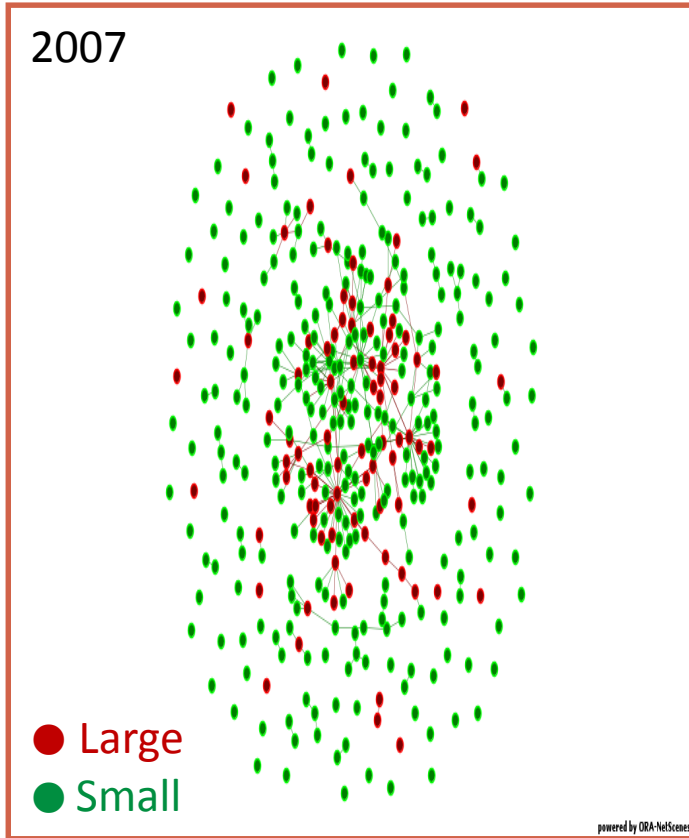
Social Network Analysis

- Is trading segmented in a way that might be limiting fleet consolidation?
- Do small and large harvesters trade quota more frequently amongst themselves?

Trading Network Segmentation

- The quota trading market is geographically segmented (Ropicki and Larkin, 2014)
- The majority of trades occur through landings network relationships
- Survey analysis found that 73% of all quota lease trades in the Tampa Bay Region occurred through information sharing networks

Trading Network Segmentation



Trading Network Segmentation

SNA Concept: Assortativity

*the tendency of nodes to form edges with similar nodes
(e.g., race, gender, location...)*

SNA Assortativity Metric: Modularity (Q where $-1 < Q < 1$)

$$Q = \frac{1}{2m} \sum_{ij} \left(A_{ij} - \frac{k_i - k_j}{2m} \right) \delta(c_i c_j)$$

m = no. of edges

A_{ij} = 1 if associated

k = degree of node

$\delta(\cdot)$ = Kronecker delta

c = class of node or vertex

Trading Network Segmentation

| Modularity Measure | 2007 | 2014 |
|--------------------------|------|------|
| Optimized | 0.46 | 0.44 |
| By Harvester Type | 0.08 | 0.18 |

Next Steps

- Evaluate quota trading by technical efficiency of participants
- Create quota trading simulations based on observed network metrics

Questions?

*Andrew.Ropicki@ag.tamu.edu



Sherry Larkin: slarkin@ufl.edu

