Research Report on Allocation of Fishing Days with a Transferable Day Credit Program

Invited expert report by Dr. Dale Squires, Senior Research Economist with U.S. National Oceanic and Atmospheric Administration (NOAA).

Purpose: Fleet Capacity

- Part of Fleet Capacity Project
- Develop four alternative allocation formulae for days (at sea) for transferable days credit scheme for purse seine vessels active on the Regional Vessel Register.

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Purpose: Equity & Fairness…(1)

- I was asked to include equity in the research.

- I also included related concept of fairness.

- Equity and fairness principles used to design and evaluate allocation.

- Result will be procedural and distributive justice.
    - Includes environmental justice.
    - Won't elaborate here, but can be discussed later.

Purpose: Equity and Fairness…(2)

- Four alternative allocation formulae evaluated for impact of proposed scheme upon:
  1. Efficiency of individual vessels by gain in daily vessel operating profit after transferable credit scheme
  2. Equity of individual vessels' allocation by equity metrics
  3. Equity of individual Flag States' allocation by equity metrics.

Organization

- 1. Background (Reminder): Fleet Capacity & Transferable Day Credit Scheme
- 2. Pilot Program
- 3. Vessel's Proportional Allowable Effort Share (PAES)
- 4. What is the Basis of the PAES Allocation?
- 5. Definitions of Alternative PAES
- 6. Empirical Results: Efficiency as Daily Vessel Operating Profit
- 7. Empirical Results: Equity
- 8. Overall Conclusion

1. Fleet Capacity & Transferable Day Credit Scheme

- Proposed transferable day credit program is a means to address and compensate for the problems created by excess capacity of the purse seine fleet in the Antigua Convention area

- Not a property right program, but limits made flexible, more like DMLs.

- First step of broader fleet capacity management program.

- Sets the stage for capacity reduction:
  - through means such as buybacks, which have been thoroughly explored,
  - by allowing individual companies to retire vessels and reassign days among the remaining vessels.

2. Pilot Program

- Three-year pilot program.
- Consistent with usual IATTC conservation and management measures cycle.
- Pilot program allows assessing the way the scheme is implemented and its effects on the operation of the fisheries and on the resulting fishing effort.

3. Vessel's Proportional Allowable Effort Share (PAES)…(1)

- First step in pilot program is to calculate each vessel's Proportional Allowable Effort Share (PAES)

- PAES
  - Proportion or share of the total allowable effort (TAE) to be allocated to each individual vessel.

- TAE
  - Total nominal days during one management year.

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3. Vessel's Proportional Allowable Effort Share (PAES)...(2)

- ## Day
  - Any calendar day, or part of a calendar day, in a Management Year during with a purse seine vessel is in the waters under the jurisdiction of the IATTC outside of a port.

- ## Capacity:
  - Cubic meters of well capacity for purse seine vessels active on the Regional Vessel Register

- Allocate PAES first to respective flag State then to individual vessel.

4. What is the Basis of the PAES Allocation?

Why is the Basis for Allocation Important?

- I want to step back and spend some time to establish the basis of PAES allocation so that it is not subjective or arbitrary.

- May seem like a detour, but it is not.

- We want a consistent, non-arbitrary and well-defined way to approach the contentious problem of allocation and to create shared expectations.

- We want a systematic way to balance and reconcile competing points of view and claims.

- Draws upon extensive literature on allocation and distribution.

PAES Allocation Requires a Basis for Allocation

- PAES are claims.

- Claims require a justification.

- Exogenous rights justify and provide a basis for PAES allocation.
  - Exogenous rights are exogenous to the allocation of days and process of fishing

- Precedent can also justify claims and provide a basis for PAES allocation.
  - Precedent establishes what is normal, customary, and expected.
  - Maybe less strong than exogenous rights, but still widely used.

Exogenous Rights, Precedence, & Claims

- A PAES allocation has to consider the two exogenous rights and accompanying claims that IATTC has established:
- (1) rights of IATTC Contracting Parties to the Convention with a Flag State right
- (2) right to m^3 of purse seine vessel well capacity established by Resolution C-02-03.
- Resolution C-02-03 and other resolutions also establish background precedent.

Historical Days

- A vessel's historical days are not exogenous rights with accompanying claims.
    - Because IATTC has not established historical days as a right.
    - Moreover, credit system does not establish days as a right.
- Instead, historical days set precedence.
    - Historical activity that establishes a sense of entitlement for *status quo*.

Daily Vessel Operating Profit

- Daily vessel operating profits can be viewed as an opportunity cost or a floor for a vessel's PAES.
  - Opportunity cost: value of next best alternative.
- No vessel or Flag State should be penalized for joining the cooperative scheme.

In Sum

- Flag State right and capacity provide exogenous rights as basis for PAES allocation.

- Resolution C-02-03 & other resolutions provide background exogeneous rights or precedent to justify PAES allocation.

- Historical days provide precedent as a norm and hence basis for PAES allocation.

- No vessel should earn less than existing daily vessel operating profit after transferable day credit scheme.

- Since we have justified historical days and capacity as basis of PAES allocation and *status quo* daily vessel operating profit as a minimum standard, we now turn to practical issues.

5. Definitions of Alternative PAES

Vessel's Historical Days or Capacity

- In general terms, the PAES can be calculated as directly proportional to a vessel's:

- Historical days

- Capacity

- Hybrid historical days and capacity

Option 1: Historical Days as Average 3 Years

- Historical days formula Average 3 Years is the average of a vessel's days over 2016-2018.

Option 2: Historical Days as Best X of Y

- Historical days formula Best X of Y is each vessel's days during 2014-2018 and chosen as:

- a) Out of the most recent 5-year effort history, each vessel is allocated an average of its best 3 years of effort out of the most recent 5 years the vessel has been active on the regional vessel register.

- b) The average 3 out of the most recent 4 years of effort if a vessel has only been active on the regional vessel register 4 out of the past 5 years.

- c) The average 2 out of the most recent 3 years of effort if a vessel has only been active on the regional vessel register 3 out of the past 5 years.

- d) The average 1 out of the most recent 2 years of effort if a vessel has only been active on the regional vessel register 2 out of the past 5 years.

- e) A vessel active on the regional vessel register for 1 out of the past 5 years receives its effort for that one year.

Option 3: Capacity

- Days are directly proportional to a vessels m^3 of capacity.

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Option 4: Hybrid

- *Hybrid* of Best X of Y and Capacity lets vessels choose whichever is larger, Best X of Y days or days directly proportional to capacity.
- Vessels in practice would freely choose between historical days and capacity, and I assumed they would choose the larger.
- This free choice satisfies a standard definition of fairness.
  - More fair than arbitrarily weighting historical days and capacity.
- Resolves competing bases (historical days, capacity) for PAES claims.

PAES Formula

$$S_i = \frac{Days_i}{\sum_{i=1}^{N} Days_i} = \text{Proportional Allowable Effort Share (PAES), where:}$$

$i = $ vessel i

$N = $ number of vessels

Days$_i$ is a vessel's days from one of the four formulae

Vessel's Allocated Days Each Management Year

- Once a PAES formula has been selected, each Management Year a vessel *i* receives an allocation of days through its Flag State Contracting Party to the IATTC as follows:

$$Days_i^* = PAES_i \; x \; TAE$$

6. Empirical Results: Efficiency as Daily Vessel Operating Profit

Daily Vessel Operating Profit

- Daily vessel operating profit was calculated before and after the PAES allocation for each of the four formulae.

- Changes in daily vessel operating profit following the transferable day credit scheme are due to improved vessel operations from more flexible fishing.

- Also allows fish to be landed and processed throughout the year.

- Previous research for simulated multi-vessel companies, whereby (artificially constructed) companies can choose the optimum combination of days for each vessel, indicates that multi-vessel companies can expect considerable larger gains in daily vessel operating profit.

Ranking of Daily Vessel Operating Profit…(1)

- Ranking from highest to lowest:
- (1) Best X of Y
- (2) Average 3 Years
- (3) Hybrid of Best X of Y and Capacity
- (4) Capacity
- Best X of Y not surprising, since most closely resembles best possible precedent and efficient decisions already made

Ranking of Daily Vessel Operating Profit…(2)

- Some vessels displayed negative vessel daily vessel operating profit before the transferable day credit scheme.

- Some vessels still displayed negative daily vessel operating profit after the scheme but a lower amount.

- Some vessels displayed no change in daily vessel operating profit after the scheme, since these vessels were already optimally performing.

7. Empirical Results: Equity

Equity Metrics

- I applied standard equity metrics from economics and information theory.

- These give relative inequality rankings from 0 to 1

- I used these results to compare and rank results if the differences were sizeable

Equity of Allocated PAES by Flag State

- The relative sizes of PAES overall and by Flag State are similar and stable for the different PAES allocation schemes.

Equity of Vessel Allocated PAES

- Since Best X of Y is more economically efficient than Average 3 Years and their equity is similar, I dropped Average 3 Years from further consideration.

- Best X of Y, Capacity, and Hybrid have high degree of equity

- Order of increasing inequality from highest equality to lowest equality

- (1) Hybrid most equitable

- (2) Best X of Y middle equity -- but very close to Hybrid

- (3) Capacity least equitable

Equity of Daily Vessel Operating Profit

- Very similar results for both before and after transferable day scheme.

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8. Final Research Results

Economic Efficiency

- Economic efficiency ordering from highest to lowest:
- (1) Best X of Y
- (2) Average 3 Years
- (3) Hybrid of Best X of Y and Capacity
- (4) Capacity

Equity for Flag States Allocated PAES

- All four PAES allocation formulae give similar equity results for allocation to Flag States.

Equity for Vessels' Allocated PAES

- Highest equality to lowest equality:
- (1) Hybrid most equitable
- (2) Best X of Y middle but very close to Hybrid
- (3) Capacity least equitable
- But all display high degree of equity

Procedural and Distributive Justice

- Process and outcome provide procedural and distributive justice
- Procedural Justice
  - IATTC decision-making satisfies central fairness concept
  - Hybrid formula based upon same fairness concept
  - Normative equity principles (not discussed here) used in developing formulae
- Distributive Justice
  - Evaluated by equity metrics the impact of PAES allocation formulae among Flag States and individual vessels and impact of transferable day credit scheme upon daily vessel operating profit.
  - No substantive differences in equity among alternative PAES allocation formulae or efficient outcomes.

Overall Conclusion Based Upon Efficiency and Equity

- Equity is not a deciding issue in my mind.
  - Because equity is generally comparable across formulae for allocated PAES for Flag States and vessels and efficiency (daily vessel operating profit).
- In my mind, IATTC can choose between:
- (1) Best X of Y historical days, which is most efficient, or
- (2) Hybrid of X of Y historical days and Capacity
  - Somewhat less economically efficient
  - Compromise between historical days (opportunity cost, precedent) and capacity (exogenous right).
  - Allowing vessels to choose between historical days or capacity gives a fair process.
  - In sum, Hybrid fairly balances competing types of claims.

Thanks!   Questions?

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