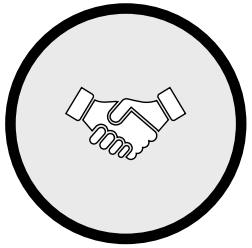
Plan of Action for the Management of Fleet Capacity in the IATTC

Prof. Dale Squires

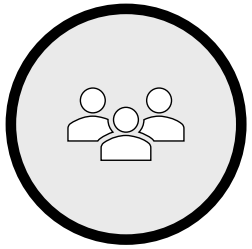
Purpose…(1)

REPORT RESULTS FROM CONTRACT TO IATTC: "ACTION PLAN FOR FLEET CAPACITY MANAGEMENT IN THE IATTC”

FUNDED BY DIRECTORATE GENERAL FOR MARITIME AFFAIRS AND FISHERIES OF COMMISSION OF THE EUROPEAN UNION



CONTRACT STATED TO FOCUS ON ALTERNATIVES TO REDUCE CAPACITY, EXCLUSIVELY.



…BUT STAKEHOLDER CONSULTATIONS SHOWED THAT SMALL BIGEYE AND YELLOWFIN TUNAS ARE CRITICAL ISSUE THAT MUST BE ADDRESSED TO OBTAIN FULL CPC PARTICIPATION

Purpose…(2)

DEVELOP A PLAN OF ACTION OR "ROAD MAP" FOR CAPACITY REDUCTION IN THE EPO

MORE BROADLY… TO PROVIDE NOT ANSWERS, BUT A STARTING POINT FOR ONGOING, SYSTEMATIC DISCUSSION AND ANALYSIS OF CAPACITY

STIMULATE THE DEVELOPMENT OF A SET OF PRINCIPLES BASED UPON THEORIES OF INTERNATIONAL ENVIRONMENTAL AGREEMENTS, ECONOMICS, GAME THEORY, INTERNATIONAL RELATIONS, FISHERIES MANAGEMENT, AND INTERNATIONAL LAW.

Purpose…(3)

- Inform discussion based upon experiences in other international and national fisheries plus other industries with related environmental and resource issues such as:
  - Pollution, water, climate, energy, conservation ,mining, forestry, whaling, etc.

FUNDAMENTAL MESSAGE

Build off of Existing Resolutions and IATTC Workshops

2005 Plan of Action for the Regional Management of Tuna Fishing Capacity

Resolution C-00-06 Resolution on Fleet Capacity

Resolution C-02-03

Elements for implementing a fleet capacity management plan in the IATTC

Mexico City and Cartagena workshops

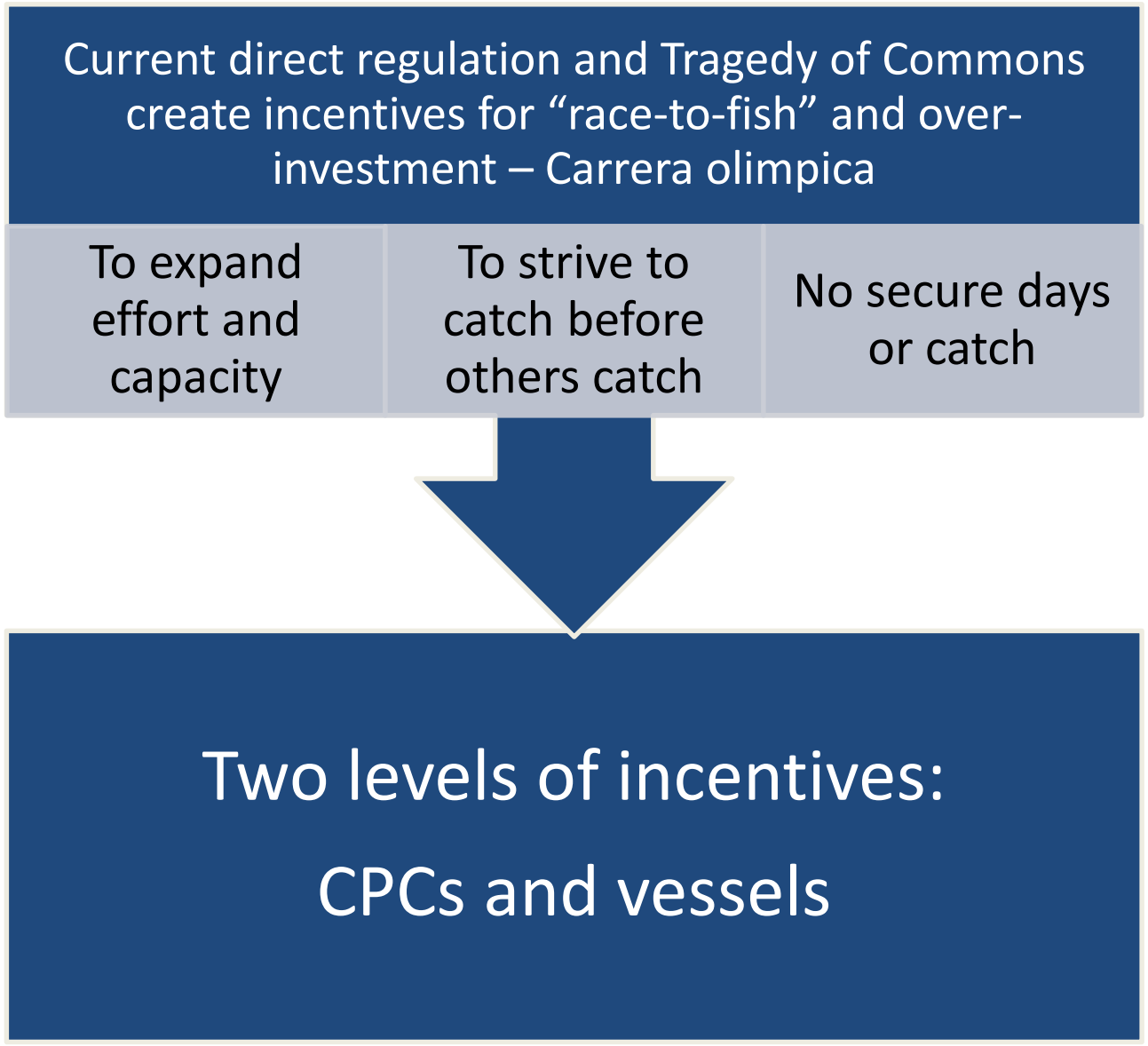
“El Corralito”

Break combined issues up into individual pieces and individually address each of them

Step-by-step, phased approach to ultimate goal

PHASED,
STEP-BY-STEP APPROACH

Change Current Incentives



CPC Incentives…(1)

Change CPC incentives to increase cooperation

Create aggregate gain for IATTC

No CPC loses, and in fact each CPC gains

CPC Incentives…(2)

1

Grant “legitimate” CPC capacity requests conditional to certain actions

2

Paradoxically, increase capacity to reduce capacity

3

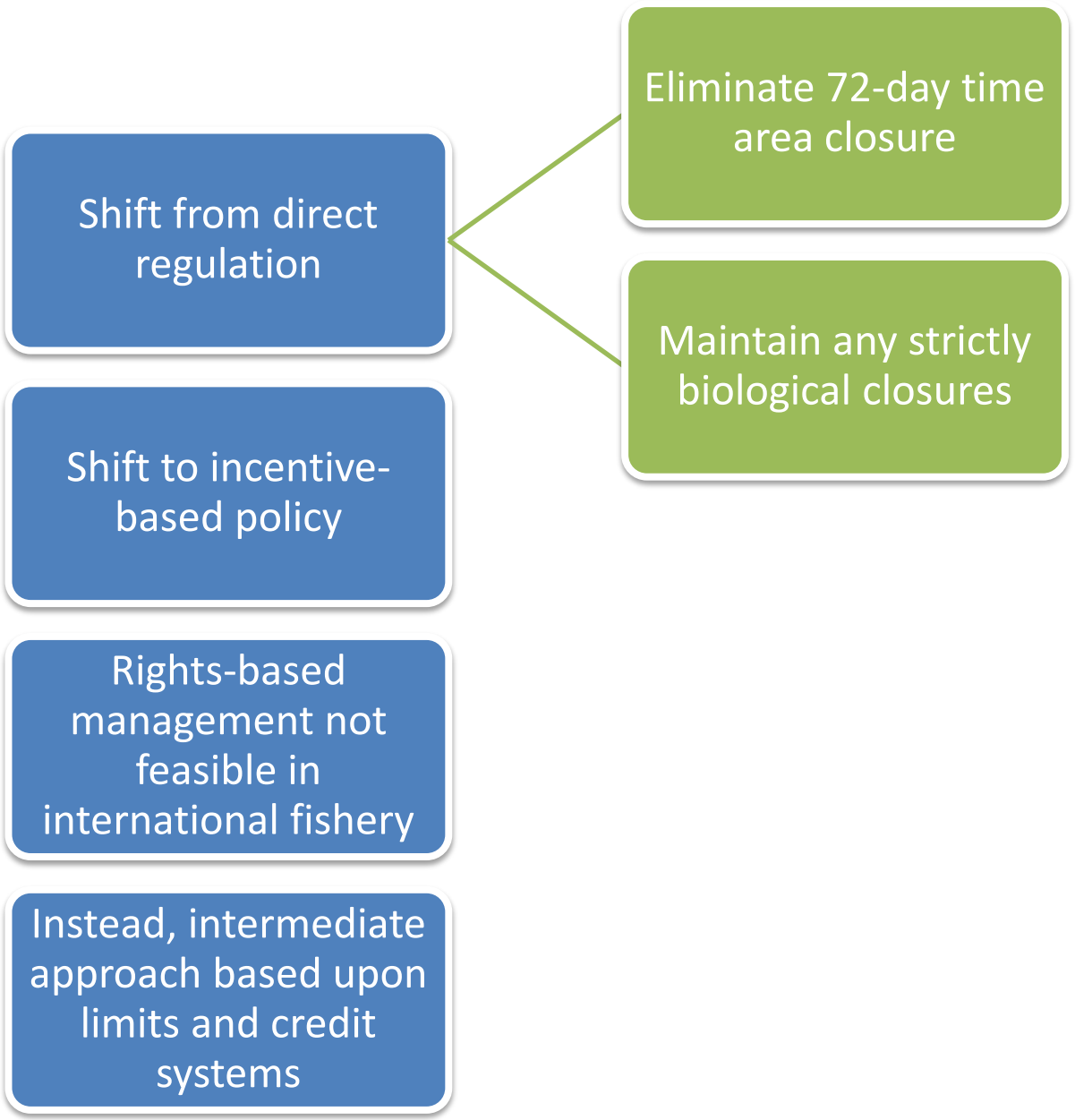
Conditional Actions:

1. Implement plan of action
2. Granted capacity tied to actual vessels fishing in that CPC’s waters, etc.
3. Restrictions or prohibition to transfer

4

Freeze capacity thereafter

Vessel Incentives



Incentive-Based Policy for Vessel Incentives

Change	Change incentives of vessels away from “race-to-fish” and over-investment to more closely align with IATTC objectives
Establish	Establish *Total Allowable Catch/Effort*
Allocate	Allocate exclusive use of day or catch limits to vessels and allow inter-vessel trade of unused days/catch (credits) and carry-forward

Augment with Additional Credit Programs

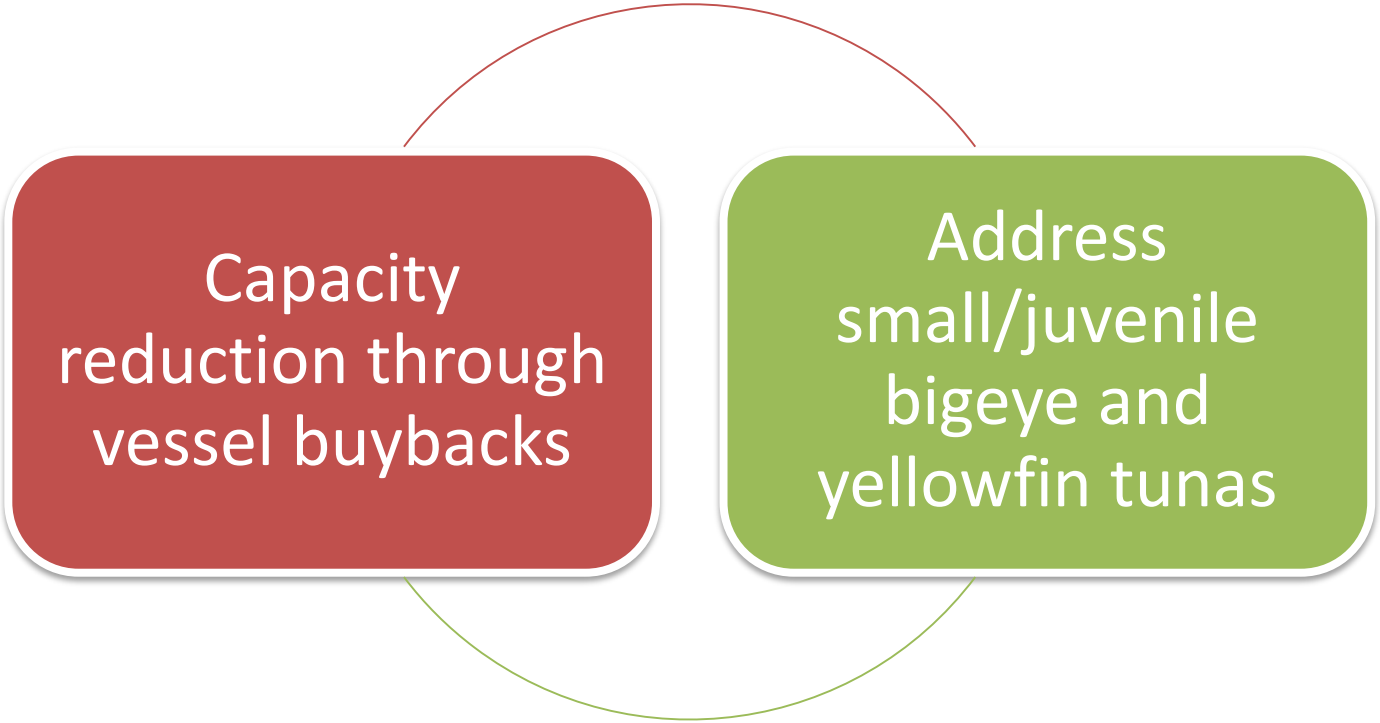
Reward additional days/catch for desired behavior

Incentive-based approach

Examples:

- Voluntary capacity reduction
- Catch of larger bigeye and yellowfin

After Change CPC and Vessel Incentives



Create Incentives that Support Buybacks

Successful buybacks require incentive-based policies

Buybacks under direct regulation are ineffective because incentives run at cross purposes

Because:…Direct regulation and *Tragedy of Commons* incentives increase capacity and counter buyback

Therefore…to start with incentive-based policy that replaces direct regulation then proceed to buybacks

Alternative is National Allocation of TACs/TAEs

An alternative to incentive-based policy is national allocation of TACs or TAEs and continued closures

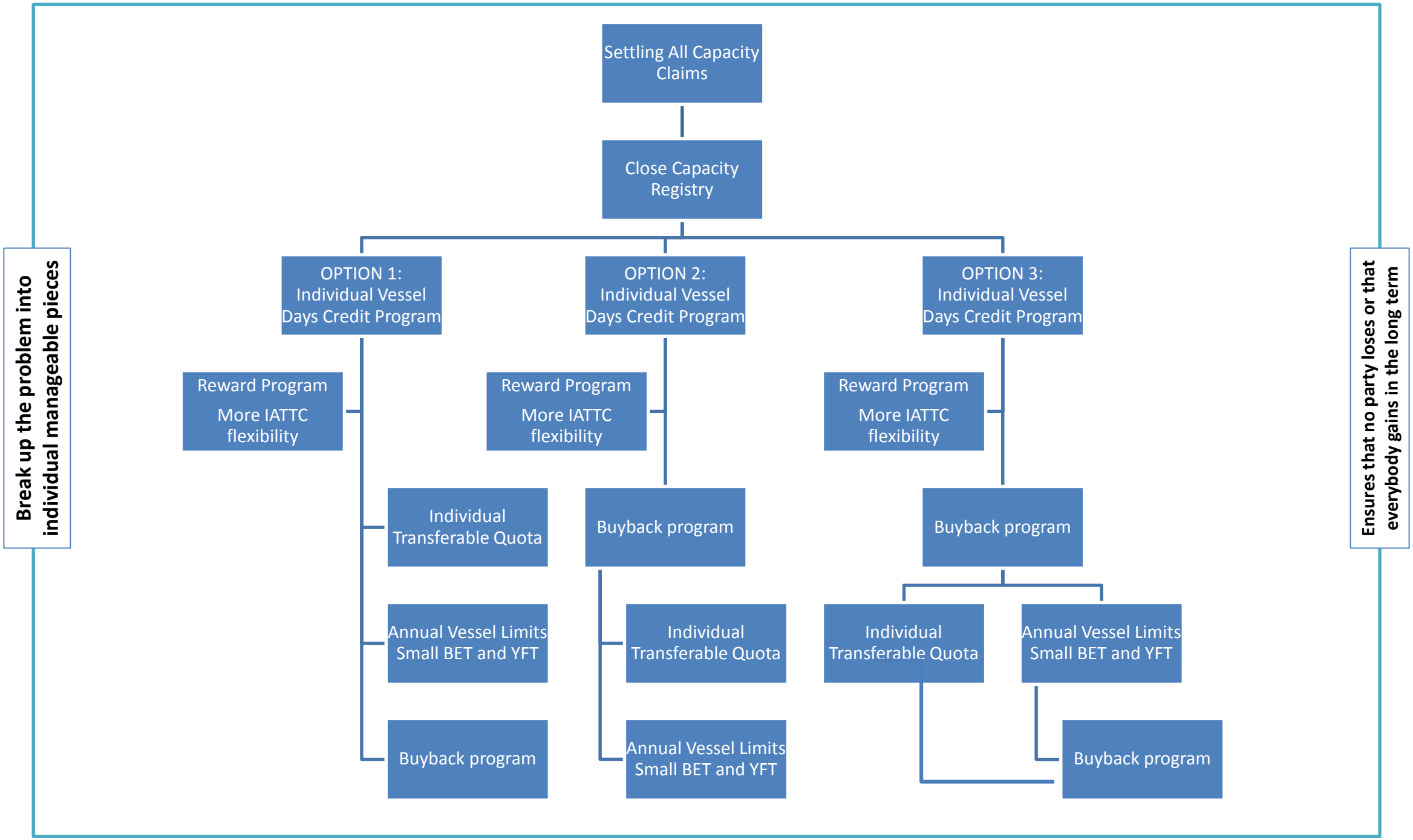
For CPCs with national plan of action to reduce capacity	Reward with days/catch for retired capacity	Reduces closure days for remaining vessels

Leaves unchanged incentives from direct regulation and Tragedy of the Commons for “race-to-fish” and over-investment.

Obtain result from previous national allocation unless national plans of action to reduce capacity

“Small Steps” of Direct Regulation

Additional, supplemental direct regulation measures that complement either incentive-based approach and buybacks or national allocation of TACs/TAEs


Break up the problem into individual manageable pieces
Settling All Capacity Claims
Close Capacity Registry
OPTION 1: Individual Vessel Days Credit Program
OPTION 2: Individual Vessel Days Credit Program
OPTION 3: Individual Vessel Days Credit Program
Reward Program More IATTC flexibility
Reward Program More IATTC flexibility
Reward Program More IATTC flexibility
Individual Transferable Quota
Annual Vessel Limits Small BET and YFT
Buyback program
Buyback program
Individual Transferable Quota
Annual Vessel Limits Small BET and YFT
Buyback program
Individual Transferable Quota
Annual Vessel Limits Small BET and YFT
Buyback program
Ensures that no party loses or that everybody gains in the long term

Selected Program Details and Empirical Results

Empirical Analyses

- Combination of selected Northern Economics results and original empirical analysis
- Same price, catch, and effort data
- Some difference on cost data
- Economic modeling approaches similar but different
  - This report uses models that give greater economic efficiency and lower costs
- Inflation-free (real) prices and values (base year = 2017) instead of nominal prices and values

Cost of Inaction

Northern Economics and Own Results

Year	Number of Impacted Class 5-6 Vessels	Number of Impacted Class 5-6 Vessel Days	Total Foregone Operating Profit Class 5-6 Vessels (US$2017)	Foregone as Percent of Observed Operating Profit
2014	9	200	949,214	0.32%
2015	8	157	1,437,858	0.97%
2016	9	109	330,103	0.23%
Average	8.67	155	905,725	0.51%
Source: IATTC data				

Compared to Current 62-Day Closure (i.e. 10 more days of closure)

	2010	2011	2012	2013	2014	2015	2016	Average
	Revenues in $Millions of U.S. Dollars							
NOR Under Status Quo (SQ)	$141.50	$314.25	$507.77	$524.77	$249.82	$135.20	$297.90	$310.17
Estimated NOR if there were No Closures	$172.73	$358.02	$555.91	$572.47	$284.29	$159.50	$324.67	$346.80
Impact on NOR of the 62-day closures	($31.23)	($43.76)	($48.14)	($47.70)	($34.47)	($24.30)	($26.76)	($36.62)
Expected NOR if Closures were 72 Days	$134.76	$306.60	$495.70	$506.63	$243.09	$125.48	$286.06	$299.76
Impact on NOR of the 72-day closures	($37.97)	($51.42)	($60.20)	($65.84)	($41.20)	($34.01)	($38.61)	($47.04)

Compared to No Closure (Northern Economics)

Optimum Fleet Size

Optimum Fleet Size

- **IATTC:**
  - 158,000 m^3 capacity
- **Shrader and Squires (2013):**
  - 167,000 m^3, 175 vessels all size classes
- **Shrader and Squires (2018):**
  - 169,000 m^3, 155 vessels all size classes
- **Northern Economics (2018):**
  - 211,003 m3, 195 vessels all size classes
- *Shrader and Squires (2013 and 2018) modeling gives more efficient fleet than Northern Economics*

Table 12. Efficient Fleet Configuration: Well Capacity, 2007-2016

Year	Class 2-3		Class 4-5		Class 6 Non-DML		Class 6 DML		Total	
	Observed	Optimal	Observed	Optimal	Observed	Optimal	Observed	Optimal	Observed	Optimal
2007	2,163	1,355	10,666	6,679	75,187	47,084	136,515	94,928	224,531	150,046
2008	1,687	1,092	10,884	7,048	87,837	56,878	122,174	89,263	222,582	154,282
2009	1,825	1,294	10,658	7,559	95,548	67,762	115,213	86,211	223,244	162,826
2010	1,321	920	10,865	7,567	86,367	60,151	111,106	80,805	209,659	149,443
2011	1,633	1,089	10,222	6,815	89,046	59,364	109,535	83,569	210,436	150,836
2012	1,384	994	11,040	7,926	91,200	65,472	109,571	83,483	213,195	157,873
2013	776	572	12,397	9,133	90,512	66,679	108,283	81,455	211,968	157,838
2014	775	513	12,725	8,420	101,277	67,011	114,046	85,005	228,823	160,948
2015	443	315	13,213	9,400	109,032	77,570	118,846	86,955	241,534	174,240
2016	469	294	12,137	7,604	118,872	74,473	128,514	89,554	259,992	171,925

Source: IATTC data and Data Envelopment Analysis (Johansen Industry Model) (Shrader and Squires 2013, 2018). Non-convex frontier aggregated over all vessel size classes.

Optimum Capacity (m^3)

Table 13. Efficient Number of Vessels by Size Class

Year	Class 2-3	Class 4-5	Class 6 Non-DML	Class 6 DML	Class 6 Total	Total No. Vessels
2007	3	18	52	70	112	143
2008	3	18	58	67	125	146
2009	4	24	61	66	127	155
2010	2	25	52	61	113	140
2011	4	22	52	64	116	142
2012	2	25	59	64	123	150
2013	2	27	59	62	121	150
2014	1	25	62	63	125	151
2015	1	34	63	63	126	161
2016	1	26	60	66	126	153

Source: IATTC data and Data Envelopment Analysis (Two-Stage Johansen Industry Model) Shrader and Squires 2013, 2018). Non-convex frontier estimated by aggregate frontier defined over all vessel size classes.

Optimum Fleet Size and Structure

Impact on Optimum Fleet Operating Profits Compared to Existing Fleet

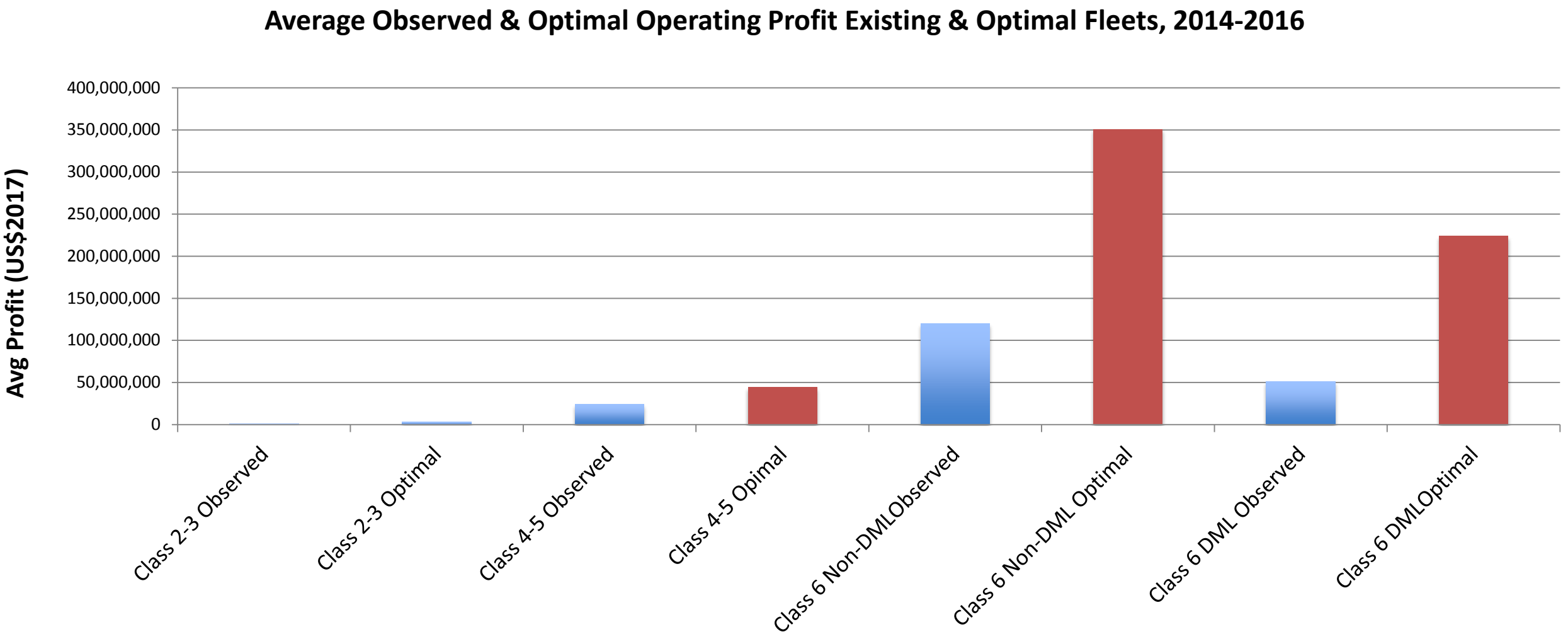


Table 20. Sources of Increased Profits (US$2017)

Existing Fleet	Optimal Fleet	
Observed Operating Profit	Efficient Operating Profit	Efficient Operating Profit Plus Fixed Cost Reduction
303,167,904	622,224,817	779,711,676

Sources and Amounts of Increased Profits

Table 21. Wealth of Present Value of Fleet (US$2017)

Discount Rate	Existing Fleet	Optimal Fleet	
	Observed Operating Profit	Efficient Operating Profit	Efficient Operating Profit Plus Fixed Cost Reduction
5%	6,063,358,080	12,444,496,340	15,594,233,520
10%	3,031,679,040	6,222,248,170	7,797,116,760
15%	2,021,119,360	4,148,165,447	5,198,077,840
Note: Present value of an annuity over an infinite time horizon.			

Wealth (Present Value) of Fleet

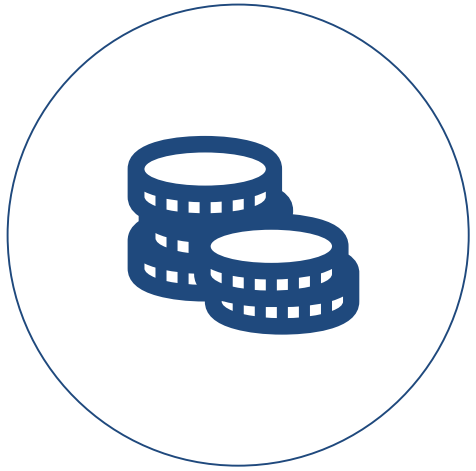
Proposed Incentive-Based Policies

Northern Economics and Own Results

CPC-Level Incentives

CREATE AN AGGREGATE GAIN THAT ALLOWS ALL CPCS TO BENEFIT.

ENSURE THAT NO PARTY LOSES, AND IN FACT THAT ALL PARTIES GAIN AT LEAST IN THE LONG TERM.



A CPC'S EXPECTED NET BENEFITS MUST EXCEED THE COST OF NO AGREEMENT.

Create Aggregate Gain for CPCs

Vessel-Level Incentives

Policy Options: Direct Regulation “Small Steps”

DIRECT REGULATION “SMALL STEPS”

1. Document existing vessels that are unavailable before replacement
2. Remove capacity from the Regional Vessel Register whenever reassign capacity to a different vessel
3. Freeze capacity immediately
4. Limit increases in replacement size for vessels
5. Stricter *force majeure*
6. Simplified onboard electronic monitoring (EM) system for set and possibly species identification
7. Change observer program to align with use of on-board monitoring systems
8. Increase shore-side plant inspectors
9. Introduce Vessel Monitoring System at IATTC level

Policy Options: Incentive-Based

INCENTIVE-BASED OPTIONS

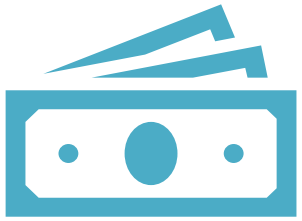
1. Change vessels' economic incentives through an individual transferable day credit program
2. Option to allocate national Total Allowable Effort to CPCs as sum of their flag individual vessel allocations
3. Days penalty-reward credit program for:
   a) Compliance
   b) Voluntary capacity reduction
4. Vessel buybacks
5. Rights-based management: Individual transferable quotas for catch

Policy Options: Small Fish

SMALL BIGEYE AND YELLOWFIN REGULATIONS

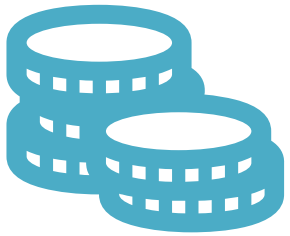
1. Annual vessel limits on harvests of small bigeye and yellowfin (direct regulation)
2. Limit on net depth or area fished (direct regulation, technology standard)
3. Processor size standard (direct regulation)
4. Reduce IATTC-wide time-area closure for small fish or limit number of days that can be used in certain months
5. Establish days penalty-and-reward credit system (incentive-based regulation)
6. Increase price discrimination by vessel size (voluntary tax levied on small fish)
7. Establish individual transferable quotas for catch by fish size (incentive-based regulation)

Intermediate Incentive Approach



Property rights not feasible in international fishery.

Would directly change incentives and reduce capacity.



Therefore, either use intermediate approach of:

Incentive-based credit systems and buybacks or

National allocations of TACs or TAEs and let individual CPCs reduce capacity

- Does not change incentives away from “race-to-fish” and over-investment

Which Intermediate Incentive-Based Approach is More Adequate? Catch or Effort?...(1)

EFFORT-BASED USING DAYS:

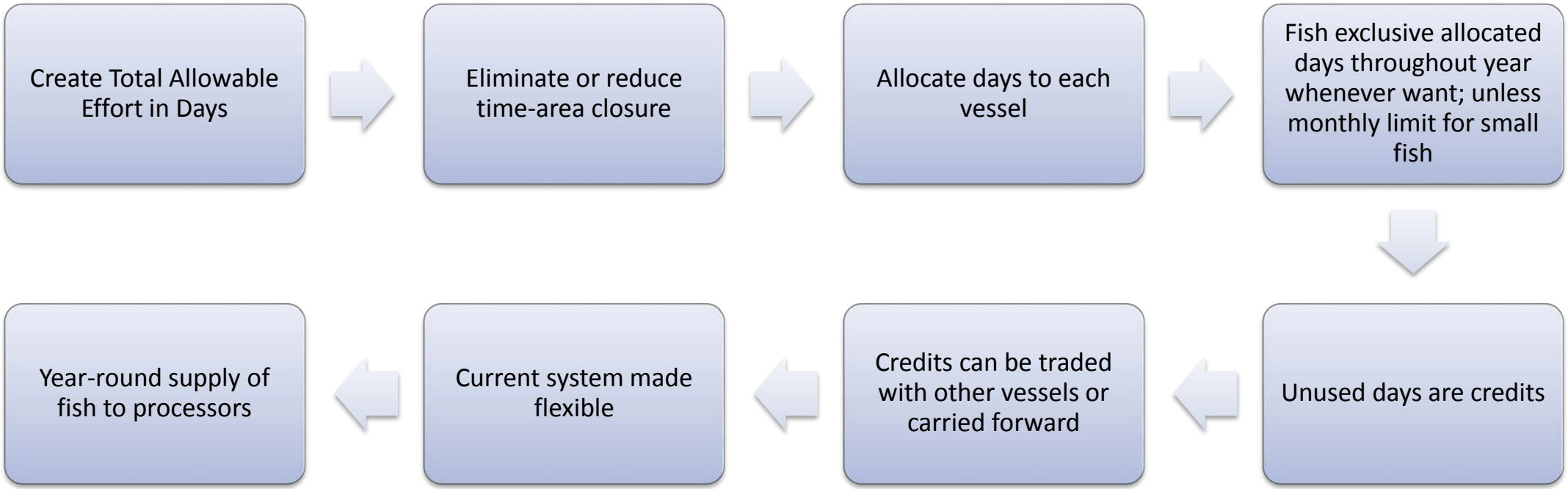
- Simple extension of current IATTC management of fishing mortality through days
- Subject to “effort creep” and weak incentives to reduce effort and costs
- Simple and low cost for monitoring, control, surveillance, and enforcement by VMS
- Easy, low cost, low risk (possible to try and revert to existing or transition to catch-based if don’t like)

Which Intermediate Incentive-Based Approach is More Adequate? Catch or Effort?...(2)

CATCH-BASED:

- Creates stronger incentives to reduce costs and effort.
- More costly in monitoring, control, surveillance (independent plant inspectors), data collection, stock assessments
- Bigger, more costly, more risky (important departure from current approach)

Individual Transferable Days Credit System…(1)

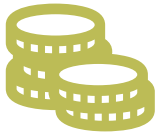


Individual Transferable Days Credit System…(2)

Multi-vessel companies can consolidate days on most efficient vessels and leave least efficient vessels idle

Can trade between vessels of different companies

Exchange rates for different size vessels; sets on dolphins or floating objects; etc.



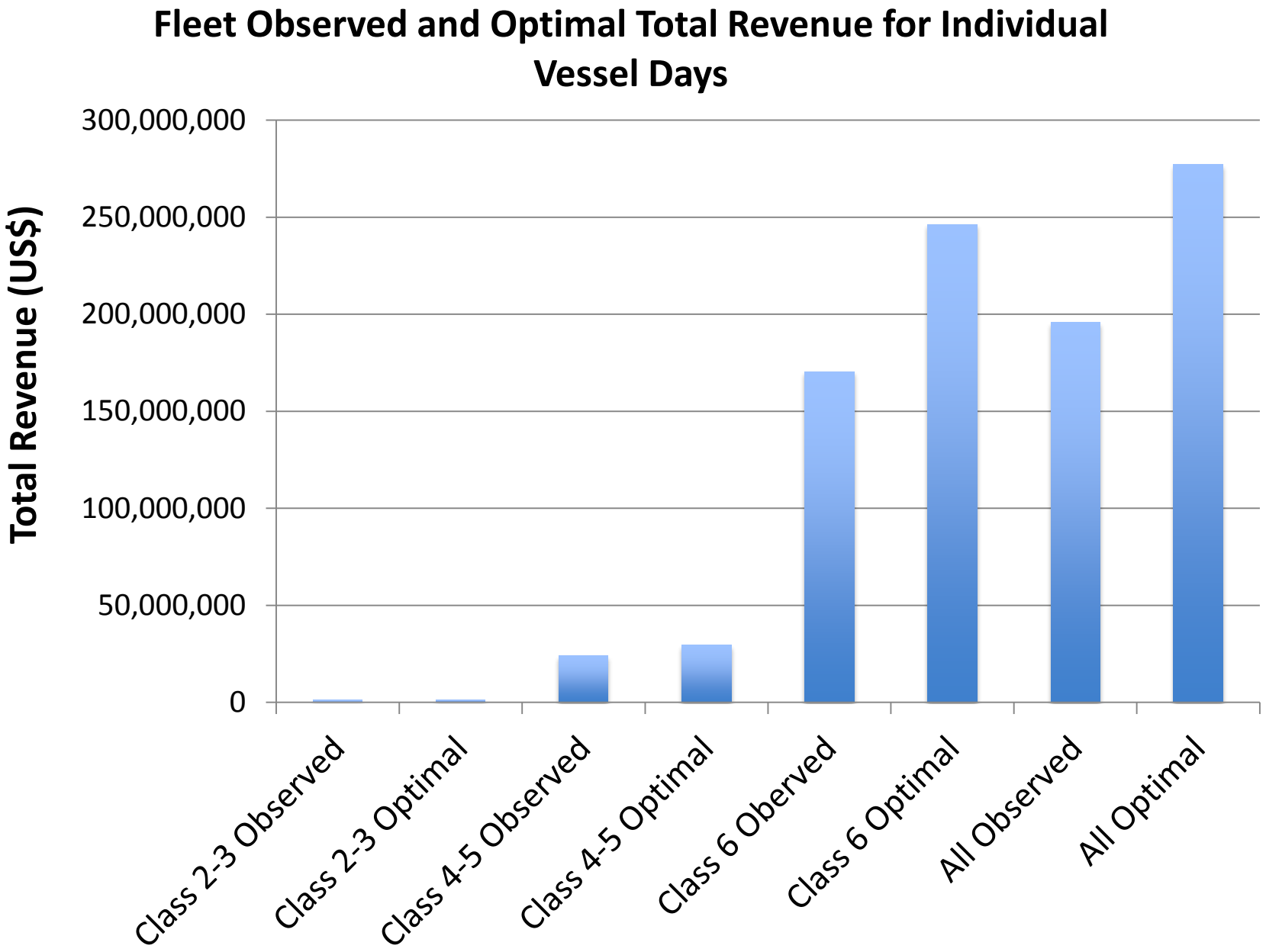
If don’t like the program after trying out, easy and low cost to revert to current system

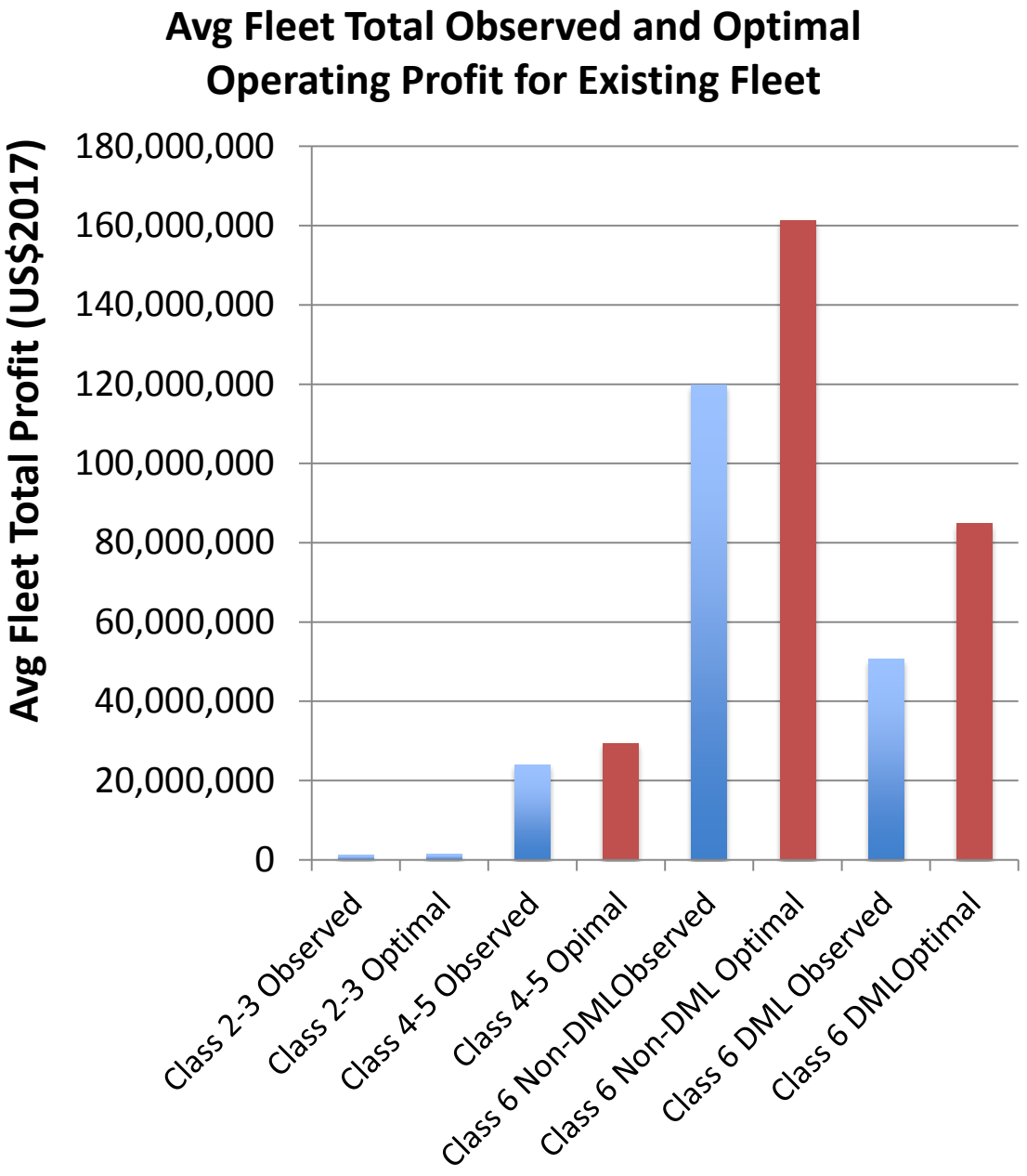
VMS for enforcement (low enforcement cost)

Sources of Efficiency Gains

- Current system made flexible
- Allocate exclusive use of an annual vessel day limit
- Vessels can use their days more optimally by choosing when to fish, length of trips, number of trips
- Multi-vessel companies can transfer days from inefficient to efficient vessels and even suspend fishing with inefficient vessels
- Unused part of allocated day limit (credit) can be trade to another vessel or purchased from a vessel if need additional days

Impact on Optimal Total Revenues Compared to Existing Fleet





Impact on Optimal Operating Profit Compared to Existing Fleet

Vessel Buybacks

Northern Economics

Results

Buybacks are Investment Issue

Buybacks are disinvestment by exiting vessels and investment in buying out vessels by remaining vessels

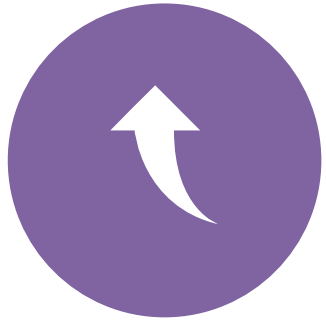
Investments require increase in future profitability and greater certainty over these increases for remaining vessels

Structure of Buyback

REVERSE AUCTION

VESSELS SUBMIT BID OF $/M^3 CAPACITY

SELECT LOWEST BID, THEN NEXT LOWEST BID, ETC. UNTIL BUDGET EXHAUSTED



FINANCED BY TAX ON VESSEL LANDINGS

Northern Economics Results

Northern Economics obtained different results depending upon assumptions

But always profitable for remaining vessels that bought out exiting vessels

Because released catch to remaining vessels increased profitability

Summary Results for Buyback That Eliminates Time-Area Closure…(1)

Multiple scenarios that eliminate closure

Average total cost of $223 million

Average annual fleet-wide payment from remaining vessels of $26.2 million

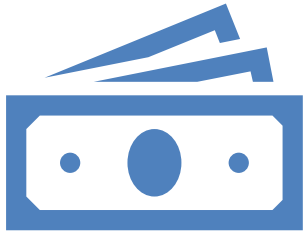
Average fee of expected returns is 3.1%

Average fee per m^3 of remaining capacity of $148.1/$m^3$

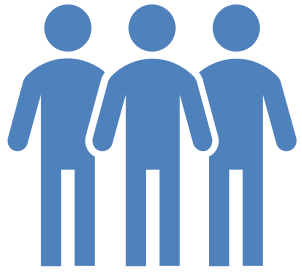
Summary Results for Buyback That Eliminates Time-Area Closure…(2)

- Average expected gains in operating profit of remaining vessels:
    1. Setting on floating objects: $312,270
    2. Setting on dolphins: $192,492

Flag State Capacity Right



Flag State capacity right assumed without economic value



Considerable uncertainty over this right

The legal right over the capacity belongs to the flag state then negotiations and policies should consider this characteristic.

National Allocations of TAC/TAE to Individual CPCs for Buybacks

Northern Economics

Results

National Allocations

- Without accompanying shift to incentive-based policy, incentives of direct regulation and Tragedy of Commons remains.
- Pilot or experimental national programs require implicit national allocations of days or catch.

Key Results

CPCs voluntarily remove capacity through buybacks in return for vessel-days through reduced time-area closure

Synthetic buybacks for Ecuador and Mexico

Remove about 30 vessels

- Approximately 35 percent of the number of vessels that would need to be removed under the fleet-wide buyback
- Due to no latent capacity otherwise found for fleet

Annual Repayment Fees

- $144/$m^3$ for Ecuador buyback
- $66/$m^3$ for Mexico buyback
- $171/$m^3$ for fleet-wide buyback

Pays for Itself

1

Remaining vessels in pseudo-Ecuador and pseudo-Mexico finance the buyback

2

Remaining vessels increase their profits through additional days and catch even after paying the buyback levy.

Table ES-6. Estimated Results of a Pilot Single-Country Buyback Program for the Pseudo-Ecuador Fleet

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
	$1M Minimum Bid	$2M Minimum Bid	$3M Minimum Bid	Minimum Bid Varies by m^3	Variable Min. & Weight by EPO DAS	Variable Min. & Inverse Weighting
Active Vessels Remaining (from 116)	97	98	97	96	92	98
Capacity (m^3) Remaining (from 96,568)	68,749	66,248	64,742	69,003	67,000	69,576
Annual Pilot Program Cost*	$4,834,014	$7,009,823	$9,311,312	$8,375,398	$12,363,811	$8,257,180
Average Payment per Remaining Vessel	$49,835	$71,529	$95,993	$87,244	$134,389	$84,257
NOR Gains per Vessel Less Average Fee	$325,172	$309,190	$280,824	$297,944	$271,711	$304,978

Note: Estimated pilot program cost include only the compensation paid to vessel owners.

Table ES-7. Estimated Results of a Pilot Single-Country Buyback Program for the Pseudo-Mexico Fleet

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
	$1M Minimum Bid	$2M Minimum Bid	$3M Minimum Bid	Minimum Bid Varies by m^3	Variable Min. & Weight by EPO DAS	Variable Min. & Inverse Weighting
Active Vessels Remaining (from 50)	40	41	42	42	41	42
Capacity (m^3) Remaining (from 61,925)	48,335	48,155	49,101	49,446	48,727	50,436
Annual Pilot Program Cost*	$1,531,096	$2,544,899	$3,213,091	$3,523,794	$3,878,892	$3,480,848
Average Payment per Remaining Vessel	$38,277	$62,071	$76,502	$83,900	$94,607	$82,877
Repayment fee per m^3 of remaining capacity	$31.68	$52.85	$65.44	$71.27	$79.60	$69.02
NOR Gains per Vessel Less Average Fee	$88,956	$43,706	$19,793	$9,825	($553)	$38,930

Note: Estimated pilot program costs include only the compensation paid to vessel owners.

Annual Vessel Limits for Bigeye and Yellowfin

Northern Economics

Results

Program Content

- Aimed at small number of vessels with largest catches of small (< 15kg) bigeye and yellowfin.
- Bigeye and yellowfin vessel limits set to eliminate closure days.
- Plant inspectors determine when vessel limits are reached.
- Vessels reaching their limit of either species must stop fishing for balance of year.

Additional Policies (1): Vessel Monitoring System

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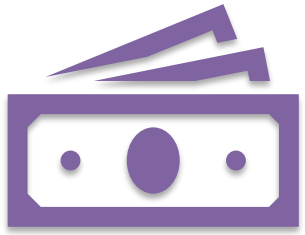
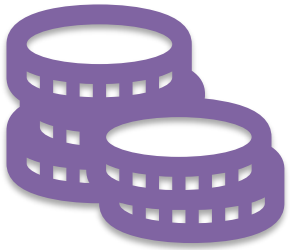
COSTS



IATTC contracts out services

1st year cost, including operation- $292,500

Yearly operational cost in subsequent years- $132,000



In-house IATTC services

1st year cost, including operation- $906,250

Yearly operational cost in subsequent years- $515,750

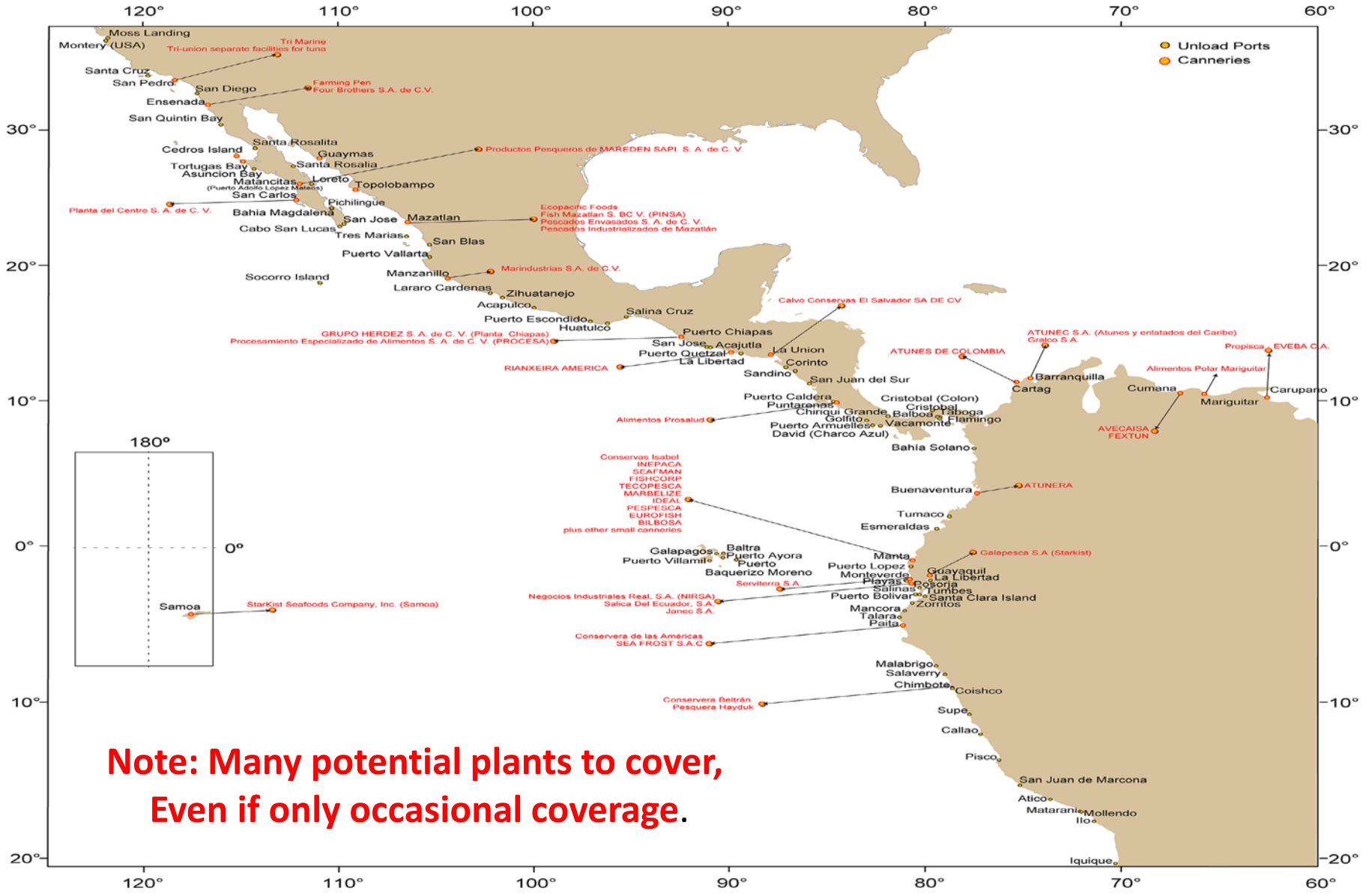
Additional Policies (2): Cannery Sampling and Plant Inspector Program

Brad Wiley IATTC

Comisión Interamericana de Atún Tropical
Inter-American Tropical Tuna Commission

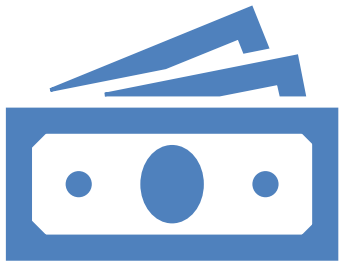
Puertos y Conserveras Activo–Ports and Active Canneries

Septiembre–September, 2016



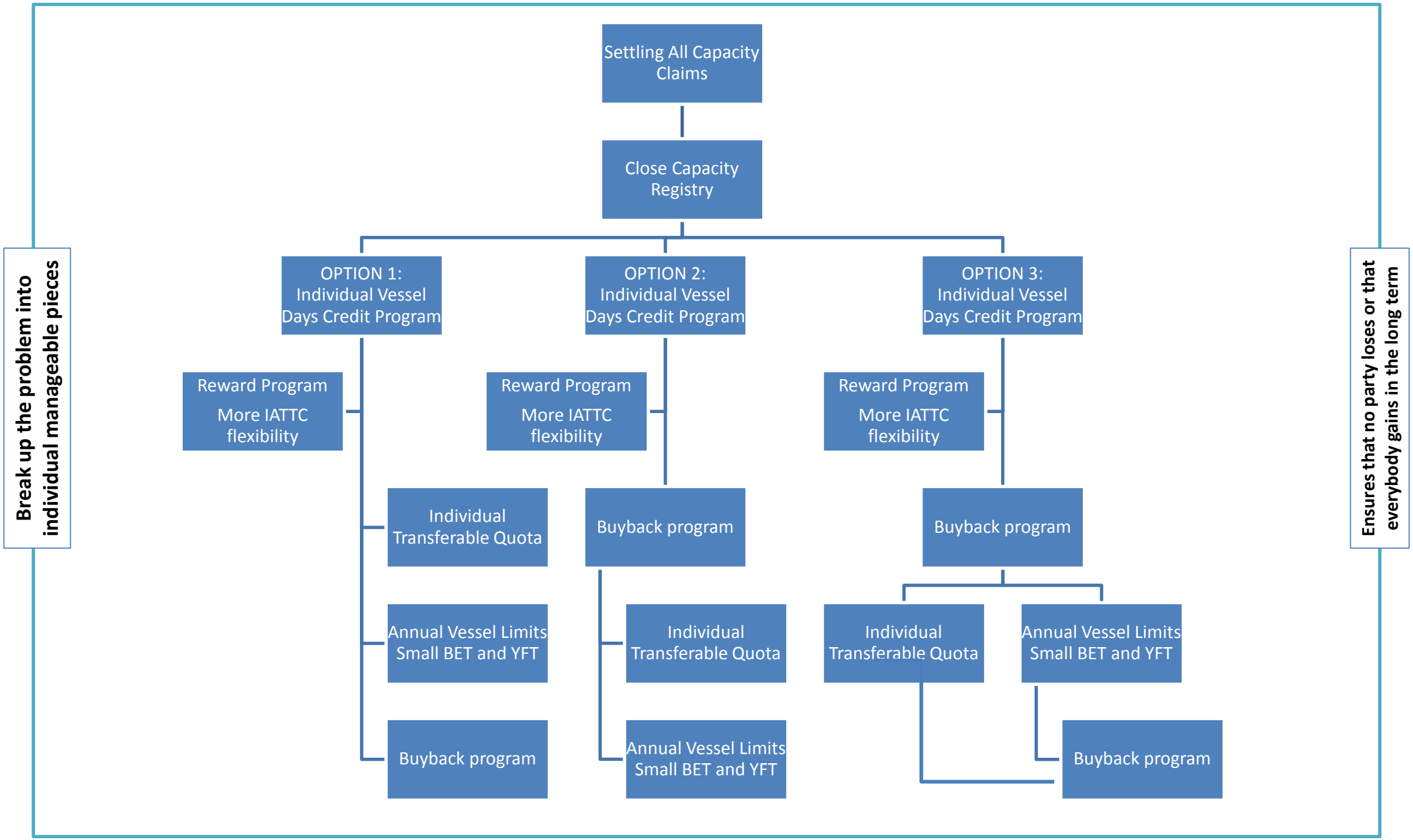
Note: Many potential plants to cover,
Even if only occasional coverage.

COSTS



- Total first-year cost to set up monitoring program for deliveries to processing facilities:
  - $1,892,000
- Estimated annual cost approximately:
  - $1,149,400.

TO SUM UP…


Break up the problem into individual manageable pieces
Settling All Capacity Claims
Close Capacity Registry
OPTION 1: Individual Vessel Days Credit Program
OPTION 2: Individual Vessel Days Credit Program
OPTION 3: Individual Vessel Days Credit Program
Reward Program More IATTC flexibility
Reward Program More IATTC flexibility
Reward Program More IATTC flexibility
Individual Transferable Quota
Annual Vessel Limits Small BET and YFT
Buyback program
Buyback program
Individual Transferable Quota
Annual Vessel Limits Small BET and YFT
Buyback program
Individual Transferable Quota
Annual Vessel Limits Small BET and YFT
Buyback program
Ensures that no party loses or that everybody gains in the long term

TAKE HOME MESSAGES

The main purpose of this work was:

- To provide not answers, but a starting point for ongoing, systematic discussion and analysis of fishing capacity in the EPO.
- To stimulate the development of a set of principles.
- To promote a phased approach to ultimate goal.
- To show the benefits of incentive-based policies over direct regulations.

THANKS!