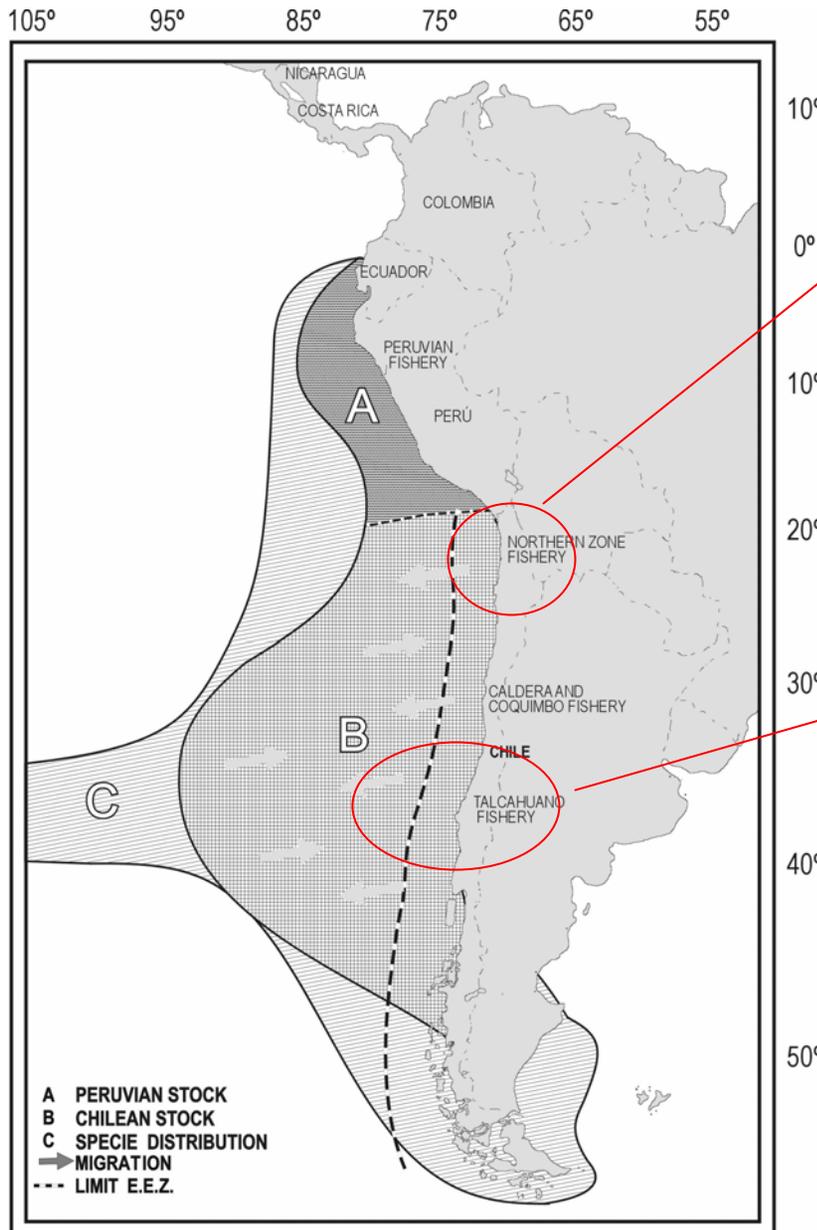


Right-based fishery management programs in Chile: How it was done & how it has worked

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Small pelagic fisheries in Chile



Annual Catch 2004 (million tons)

Northern pelagic fisheries

Anchovy	1.36
Jack Mackerel	0.15
S. Sardine	2.7
Mackerel	0.15
Total	4.36

Southern pelagic fisheries

Anchovy	0.4
Jack Mackerel	1.21
Sardine	0.36
Mackerel	0.37
Total	2.34

General Regulatory Context

- ITQs: since **February 2001** and valid until **December 2012**
 - **Industrial fleets:** *de jure* ITQs. Initially only for 2 years
 - **Artisanal fleets:** Gradual transition since early 2000s
 - collective quotas assigned to fishermen Organizations
 - *de facto* IQs & partial quota transferability.
 - **Organization's discretion to decide on** quota distribution, use & control
- **ITQs for industrial fleets:**
 - Individual (%) catch quotas: per firm, per Fishery Unit
 - Fishery Unit = Species, Area & Fleet (restricted entry)
 - **Only Operational Transferability.** No ITQ ownership transfers
 - Industrial fleets prohibited to do fishing within first 5 nm
- **Initial allocation criteria:**
 - based on historical records (catch & fishing capacity)
 - Increase in vessels' annual (lump-sum) license payment



Industrial Fisheries: ITQs coverage (data for 2003-04)

- 75% of national industrial (fish) landings
- 19 Fishery Units (12 fish species)
- US\$ 500 million of Exports
- 50-60% of yearly production value from Chilean extractive fishing industry

Political Economy behind the Enactment of a New Fisheries Law (early 2001)

- Increasing problems in fishing yields (small pelagics & others): since mid-1980s
- A protracted period of regulatory controversies & political negotiations:
 - 15 years to finally enact a new Fisheries Law (allowing for ITQs)
 - 4 big Proposed Bills of Reform (first 3: totally failed)
 - Critical negotiations:
 - a) stock sharing between \neq industrial fleets (\neq fishing zones)
 - b) accommodate *de facto* (oversized) growth of artisanal fleets
 - areas' exclusivity
 - gradual & voluntary quota allocations to fishermen's Organizations

Rent taxation: Chile vs other Fishing Countries

(Management Costs & Private sector Funding)

	N. Zealand	Island	Canada	Chile
Average annual values valid for →	(approx. values valid for late 1990s)			(2003)
(1) ITQs since...	Late 1970s	1979	1980s	2001
(2) Fisheries under ITQs:				
• # of species	40	21	19	12
• % Total annual landings	85	95	90	75
(3) Gross value^{a/} commercial fisheries under ITQ (in US\$ mills.)	400	1283	1400	500
(4) Annual Management Cost (US\$ mills.), fisheries under ITQs	36	32	154	14
• Research	59 %	56 %	31 %	52 %
• Monitoring & Enforcement	30 %	25 %	30 %	40 %
• Others	11 %	19 %	39 %	8 %
(5) Cost Recovery: % of (4) financed by private sector	45 %	100 % ^{b/}	18 %	74 %
(6) % Manag. Costs financed by private sector (as % of (3))	4 %	2.5 %	2 %	2 %

a/: Processed products valued at export (fob) price.

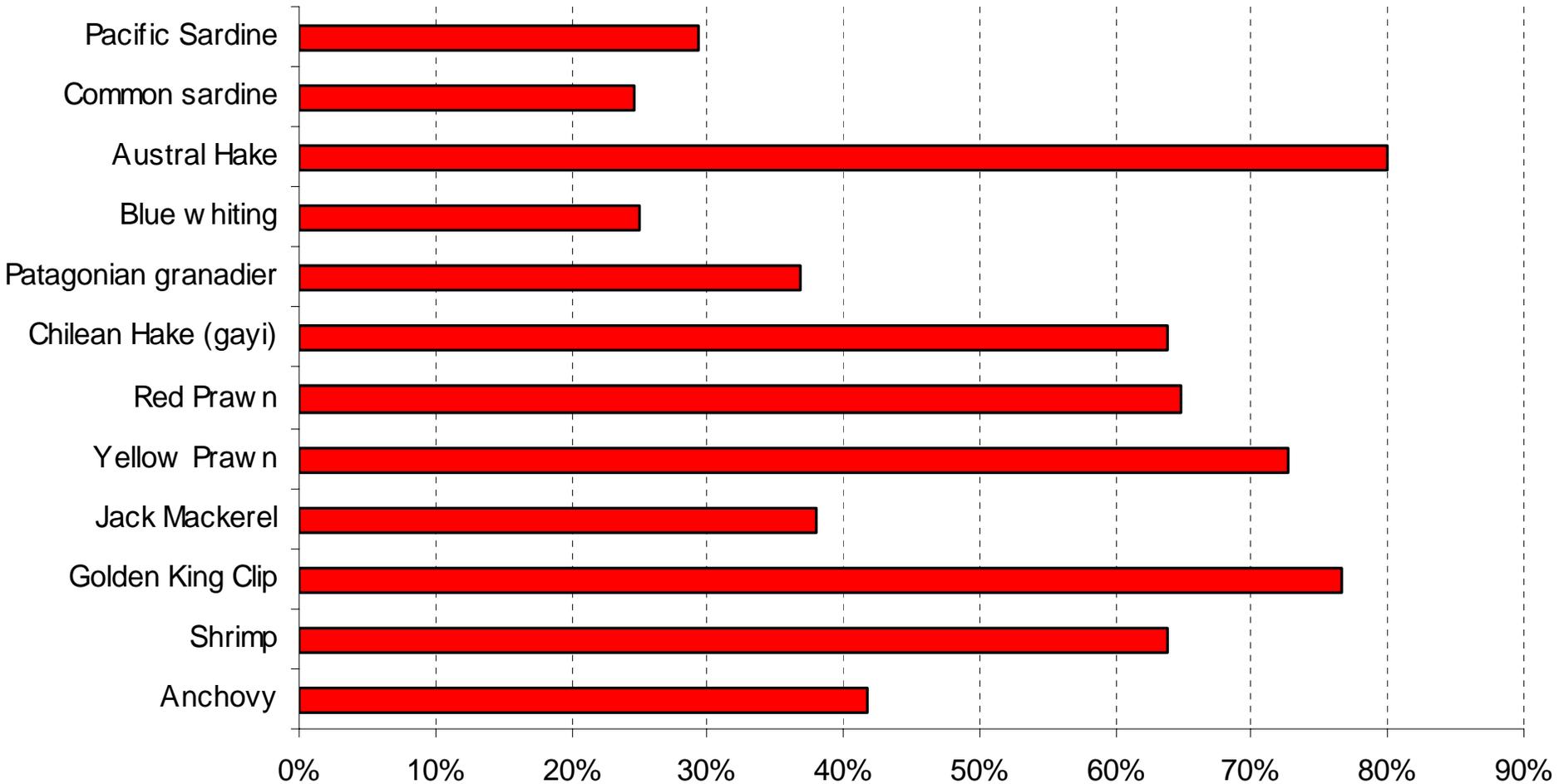
b/: Since late 2003, a new quota user fees has been approved (gradual increase, 3-5 years)

Effects from introducing ITQs (industrial fleets)

- Fleets: Greater Operational Efficiency
- Greater Product Diversification

An indirect measure of pre-ITQs overinvestment

(Number Operating Vessels / Total Number Licensed Vessels): %
(year 2003)



Fleet's operational efficiency with ITQs: Present Value Gains

(J. Mackerel industrial fishery; all areas)

- **Econometric model + Long-run Numerical Simulations (2001-2020)**

- Recruitment function:
- Population Dynamics (age-structured)
- Fleet Operation:
 - Annual Catch
 - Yearly fishing effort
 - Fleet composition (\neq vessel types): Ongoing fleet renewal process
 - Total number of operating vessels (per year)

- **Present Value of increased (fishery aggregate) Producers' Surplus:**

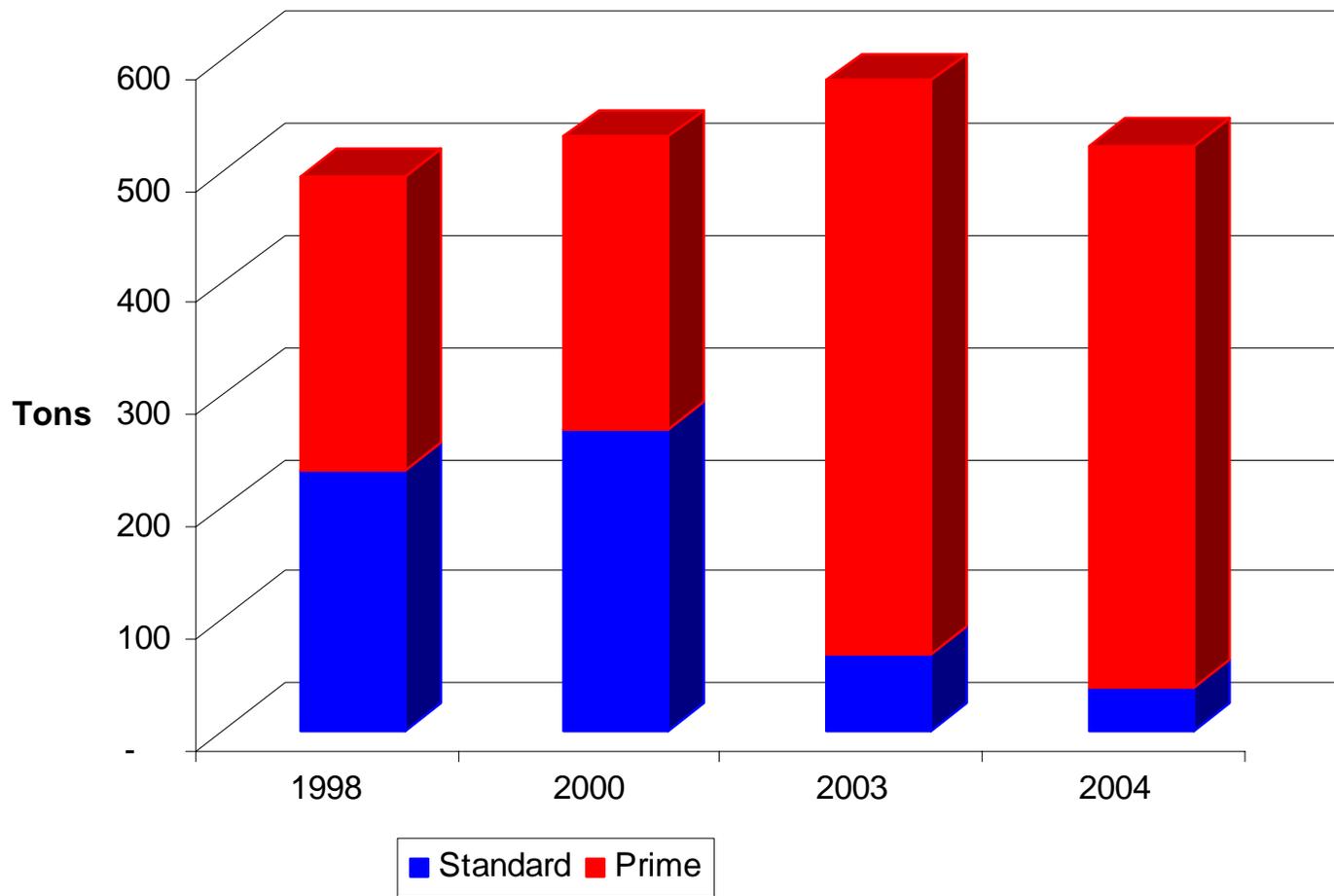
Comparing scenario “with ITQs” versus “without ITQs”

(TAC= constant at current levels; **unchanged production structure**)

Product Diversification at small pelagic fisheries

Greater Value Added (Fish Meals)

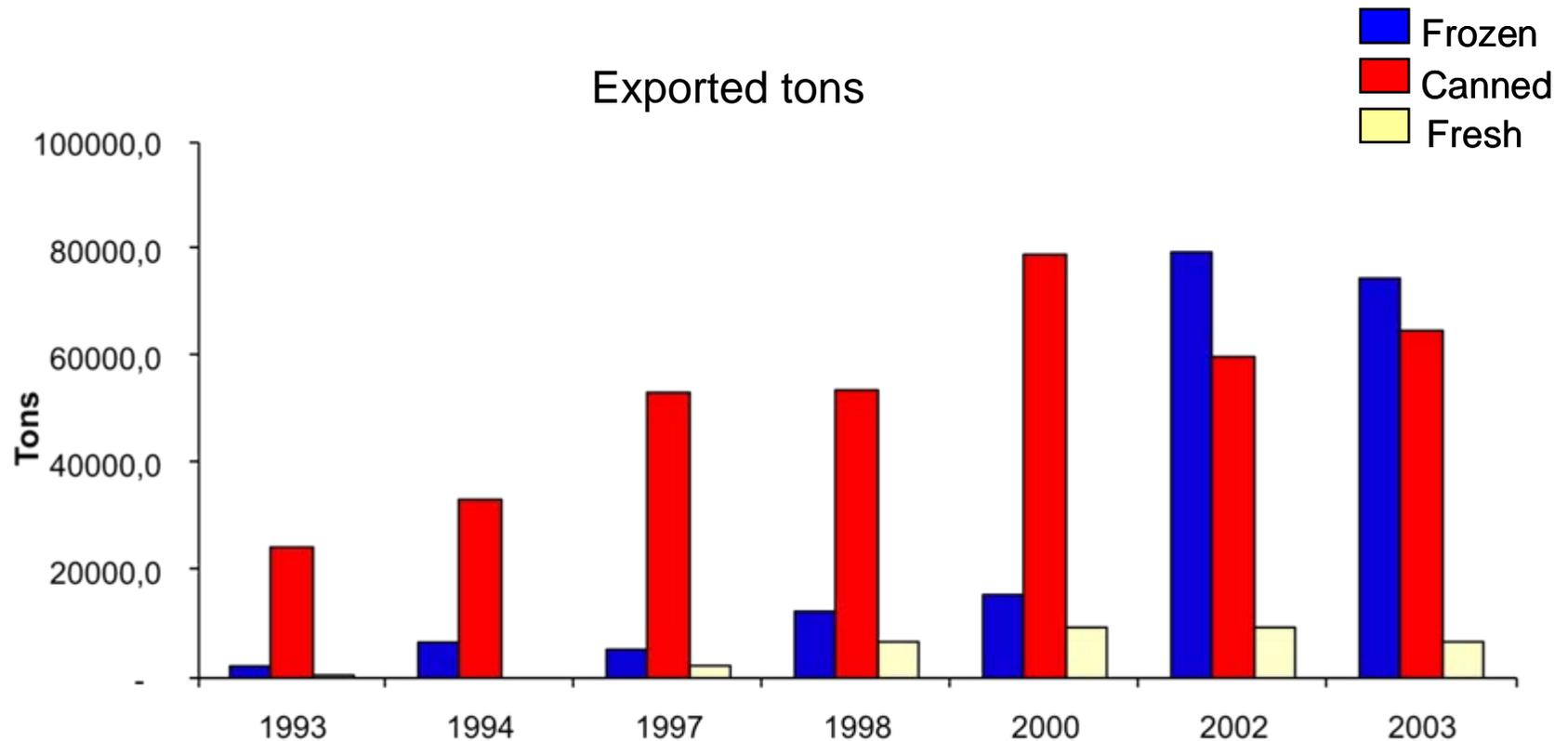
(Annual exported volumes, thousand tons)



Product Diversification

New market niches: Higher value added (Jack mackerel)

(especially frozen products)



Artisanal fishing sector: Gradual & Voluntary Introduction of Share Quota Management Programs

1. “Research fishing Trips” (PI) scheme: A flexible regulatory instrument

- TAC + entry & effort controls + vessel-specific quotas
- Quota allocated for a given area & fleet
- Register & Control of Quota Use: contracted with private firms
- ‘de facto’ operation since late 1990s; formally since early 2000s.

2. RAE (‘Artisanal Extractive Regime’): further consolidation of right-based fishery management

- Collective quotas: per Area & per fishermen’s Organization
- Greater autonomy to fishermen Organizations: decide how to distribute, use & control the collective quota
- Small pelagics: since 2004
(Austral hake since 2005; Hake (gayi) since 2003)

Artisanal small pelagic fisheries (VIII r.): Fleet participation in RAE Programs (2004)

VIII Región, 2004	Anchovy		Common Sardine (<i>clupea bentincki</i>)	
	RAE	no RAE	RAE	No RAE
	Total N of boats	209	620	205
lanchas (length: ≥ 16 mt)	208	196	203	192
Nº Bote a remo	0	109	0	117
Nº Botes a motor	1	315	2	306

- Anchovy & Sardine: 1/4 of total N boats
- Greatest participation: bigger vessels (lanchas)
- de facto transfers of quotas between fishermen Organizations
 - C. Sardine (2005): 4 transfers (Q_{\max} per transfer = 6600 tons)
 - Anchovy (2005): 7 transfers (Q_{\max} per transfer = 4400 tons)

Artisanal small pelagic fisheries: RAE coverage as % of regional TACs (year 2004)

Area	N Org.	% RAE (área)	% RAE (región)
Anchovy			
V	2		96.0%
VIII	14		94.6%
X	4		93.4%
X Norte	2	93.3%	
X Sur	2	94.0%	
Common Sardine			
V	2		86.60%
VIII	14		94.60%
X	4		92.20%
X Norte	2	91.30%	
X Sur	2	96.50%	

Effects from PI and RAE Management Schemes (Artisanal Austral Hake fishery)

(Results from Econometric Analysis, Focus Groups & Fishermen's Interviews)

(1) More Cost Effective Fishing Effort:

- less fishing days/boat & less operating boats
- Shared use of vessel-allocated cuotas (econs. of scale) & Quota Renting
- more stable landings per month
- greater resource diversificación (new species caught)

(2) Increases in ex-vessel (landing) prices (versus average Price under Olympic Race)

(estimated effect from policy change, after controlling for other conditionants)

- **PI (X1 r):** $\Delta^+ 30\%$
- **RAE (X1 r):** $\Delta^+ 24\%$

(3) More effective Quota Control

- Fishermen Organization: greater participation in quota control efforts
- Fishermen Organizations: now their representation at a more localized level.

Fishermen's Perceptions on Effects from Research Fishing (2000→) and RAE (2005 →) Management Schemes (Austral Hake artisanal fishery)

- 570 polls made to fishermen living in the further South of Chile (July-October 2007)
- Questions: fishermen's perceptions on effects from policy changes (PI & RAE)

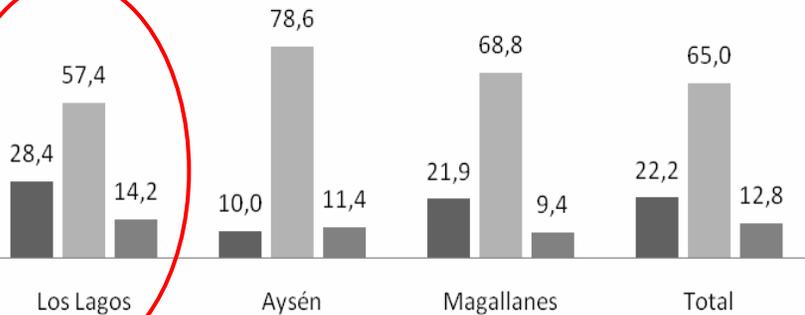
Population & Sampling Size:

Region	Boats' Owners			Vessels' Crew		
	Universe	Sample	% poll error	Universe	Sample	% poll error
X	1952	227	6.1	1652	147	7.7
XI	631	71	11	758	72	11
XII	120	20	20.1	322	33	16.2
Total	2703	318	5.2	2734	252	5.9

Under “Research Fishing Trips” (PI) Programs (2000→): Is (was) the future of the Hake better protected than before year 2000?

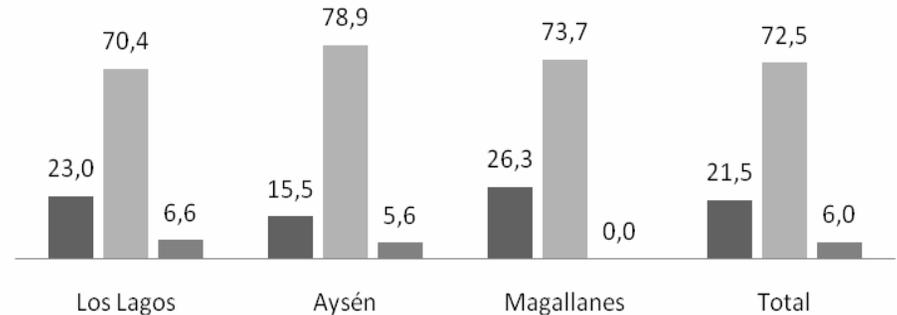
Vessels' Crew

■ No ■ Si ■ Igual al sistema anterior



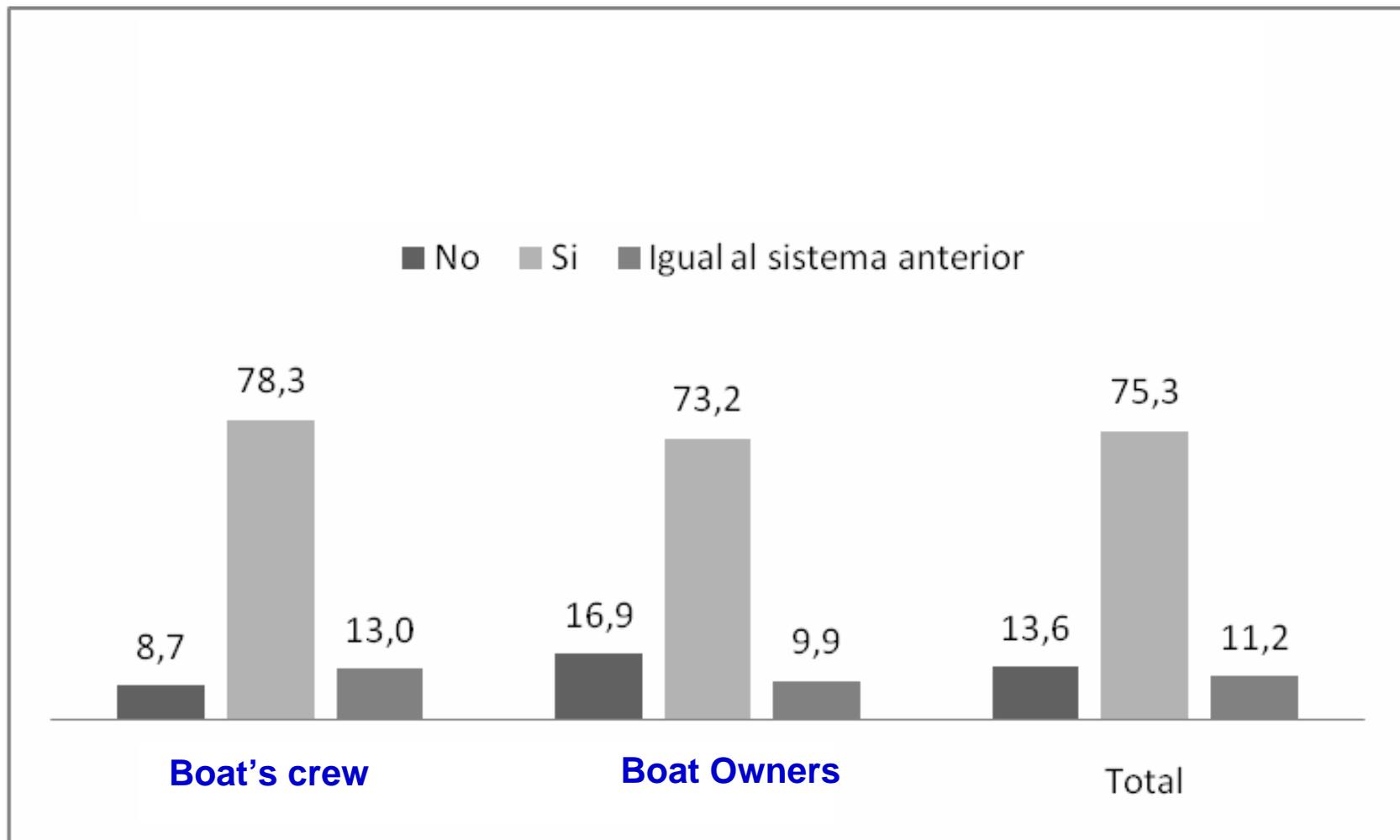
Boat Owners

■ No ■ Si ■ Igual al sistema anterior



Less positive perception. Related to initial quota allocation criterion

**Under the RAE Program (2005→; only XI region):
Is the future of the Hake better protected than under the
Research Fishing Trips (PI) scheme?**



More details & info. about the Chilean experience with ITQs at:

<http://www.fen.uahurtado.cl/>

(click: **Publications**, then **Documentos de Investigacion**)

- *Gomez-Lobo, Peña-Torres & Barria (2009), ITQs in Chile: Measuring the Economic Benefits of Reform*
- *Peña-Torres (2002), Individual Transferable Fishing Quotas in Chile: Recent History and Current Debates*
- *Peña-Torres (1997), “The Political Economy of Fishing Regulation: the case of Chile”, *Marine Resource Economics* 12(4)*

Post -ITQs: Changes in Employment Composition

Direct Employment industrial fishing sector: Numbers of jobs
(VIII region, firms \in ASIPES Association)

Year	Plants & Management	Fleets	TOTAL
Aug – 1997	9.663	3.543	13.206
Dec – 2001	6.592	2.297	8.889
Aug – 2003	9.001	2.217	11.218
Dec - 2004	10.056	2.252	12.308

Source: ASIPES

Initial Allocation Criteria

Initial allocation rule	Species	Fishery	Geographical area
50% landings from 1997-2000 and 50% storage capacity	Jack Maquerel (Trachurus murphyi)	Central Southern Pelagic	V to X región
		Northern Pelagic	III to IV region
		Northern Pelagic ^{a/}	I to II region
	Spanish Sardine (Sardinops sagax)	Northern Pelagic ^{a/}	I to II region
	Anchovy (Engraulis ringens)	Central Southern Pelagic	V to X region
		Northern Pelagic ^{a/}	I to II region
Common Sardine (Clupea bentincki)	Central Southern Pelagic	V to X region	
Hake (Macrurus magellanicus)	Central Southern demersal	V to X region	
Landings from 1999 to 2000	Spanish Sardine (Sardinops sagax)	Northern Pelagic	III to IV region
	Anchovy (Engraulis ringens)	Northern Pelagic	III to IV region
	Hake (Macrurus magellanicus)	Southern demersal	XI to XII region
	Southern Hake (Merluccius australis)	Southern demersal	41°28,6 L.S. to 57°L.S.
	Conger eel (Genypterus blacodes)	Southern demersal	41°28,6 L.S. to 57°L.S.
	Three finned Hake (Micromesistius australis)	Southern demersal	41°28,6 L.S. to XII region
	Common Hake (Merluccius gayi)	Central Southern Demersal	IV region to 41°28,6 L.S.
	Nylon prawn (Heterocarpus reedi)		II to VIII region
	Yellow lobster (Cervimunida johni)		III to IV region
	Red lobster (Pleuroncodes monodon)		I to IV region

$$q_i = 0.5 \cdot q_i^L + 0.5 \cdot q_i^K$$

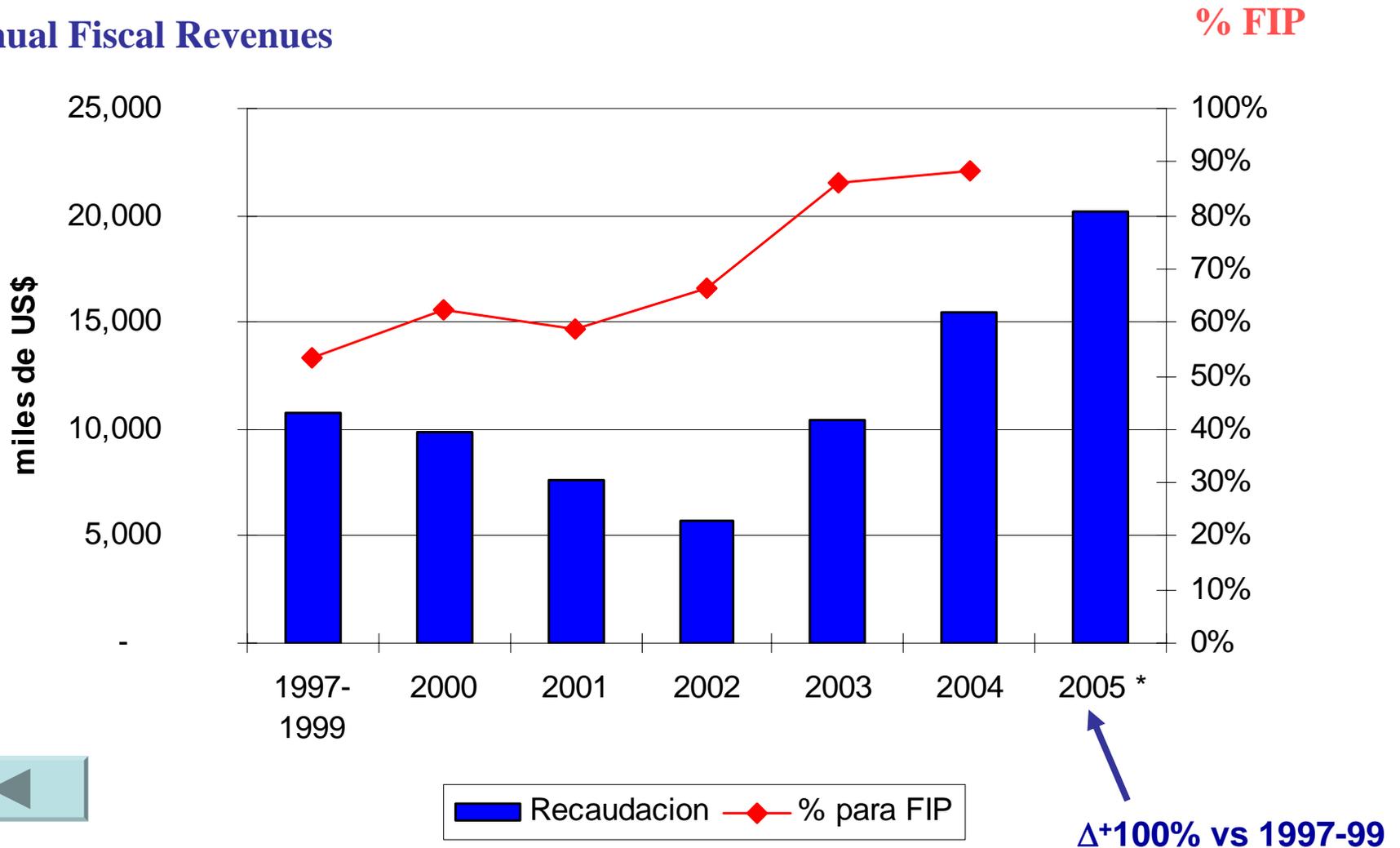
$$q_{ij}^K = \frac{k_{i2000}}{\sum_{i=1}^I k_{i2000}}$$

$$q_{ij}^L = \frac{\sum_{t=1997}^{2000} c_{itj}}{\sum_{i=1}^I \sum_{t=1997}^{2000} c_{itj}}$$



All Industrial vessels: Annual (lump-sum) license payments (US\$, thousand)

Annual Fiscal Revenues



Fleet's Operational Efficiency: Jack Mackerel Industrial Fishery (all zones)

(Annual Landings vs. Operating Fleet Hold Capacity)

Hold capacity

Landings

