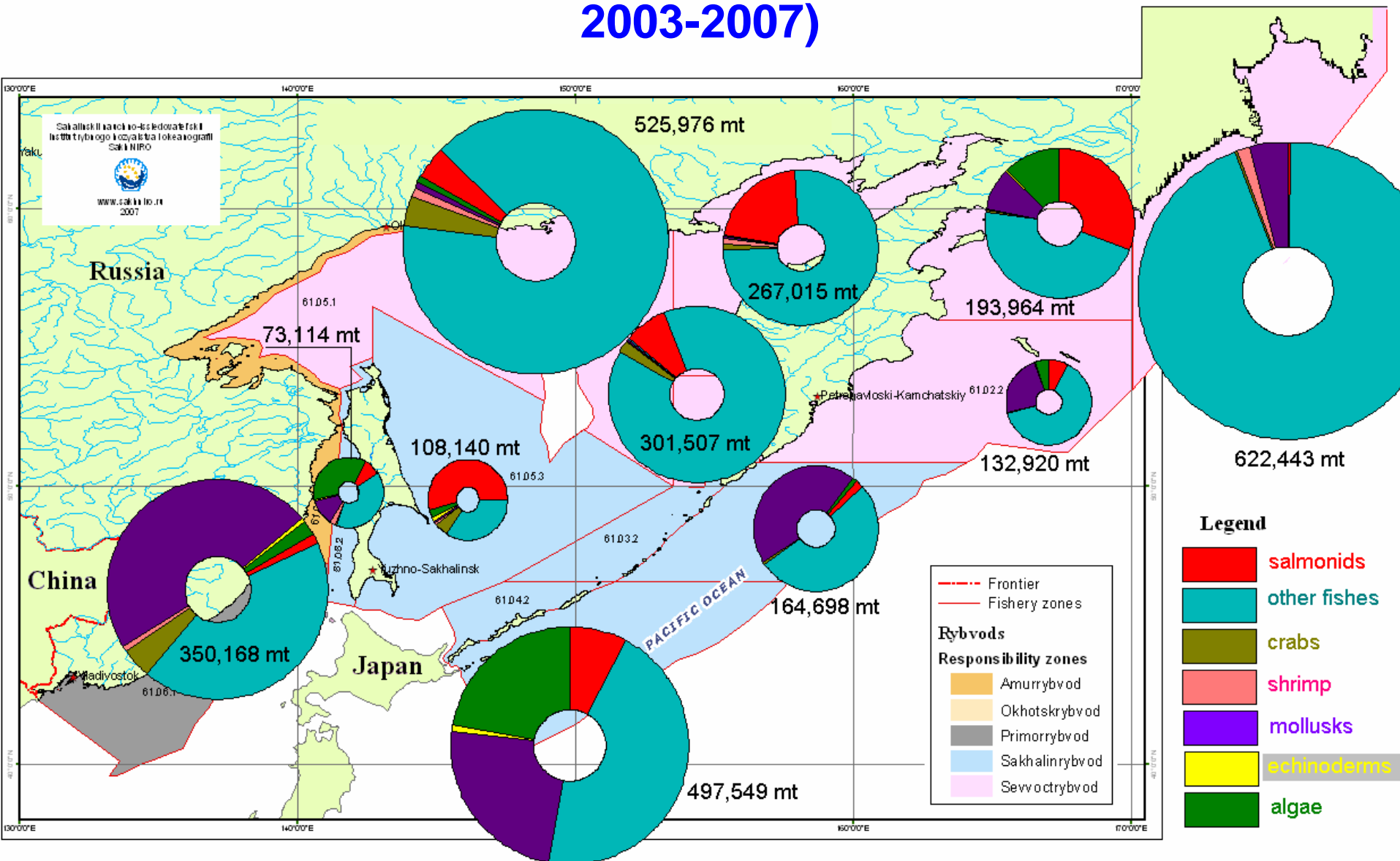


# Problems of TAC forecast development for multi-species fisheries in the Sakhalin-Kuriles region

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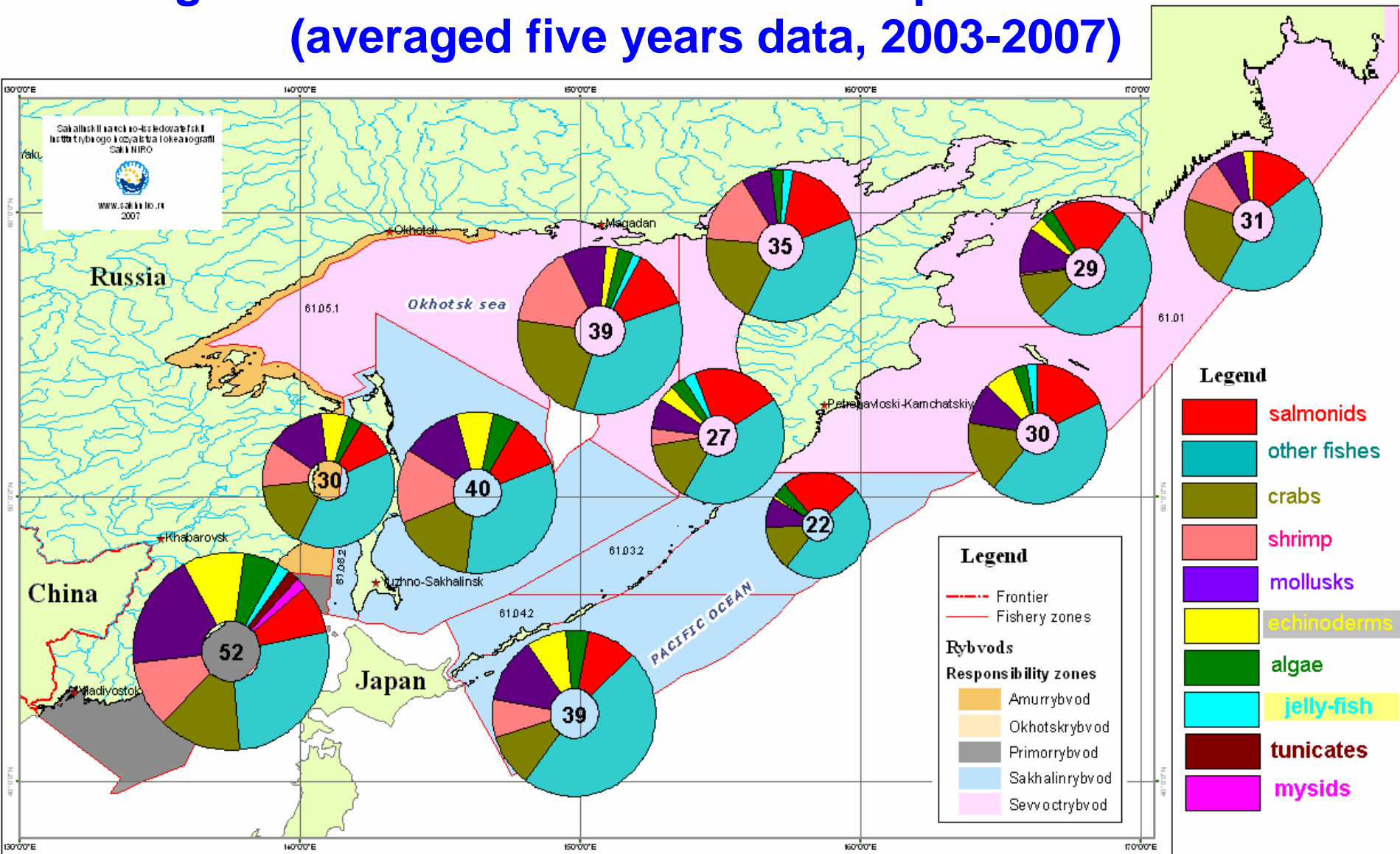
The Sakhalin regional fisheries economy consists of 614 enterprises of different forms of organization and property. About 410 of them possesses portions of the fishery quotas, 305 ventures have own processing facilities. Three hundred sixty three enterprises have in ownership at 647 fishery vessels: 34 large-tonnage (16.9%), 261 middle tonnage (40.2%), and 353 small tonnage (45.5%). Besides, fishery boats being under supervision of the State Inspection of small-sized vessels also take part in the coastal fisheries.

# TAC distribution between the fishery management zones on the far-eastern part of Russian EEZ (averaged five years data, 2003-2007)



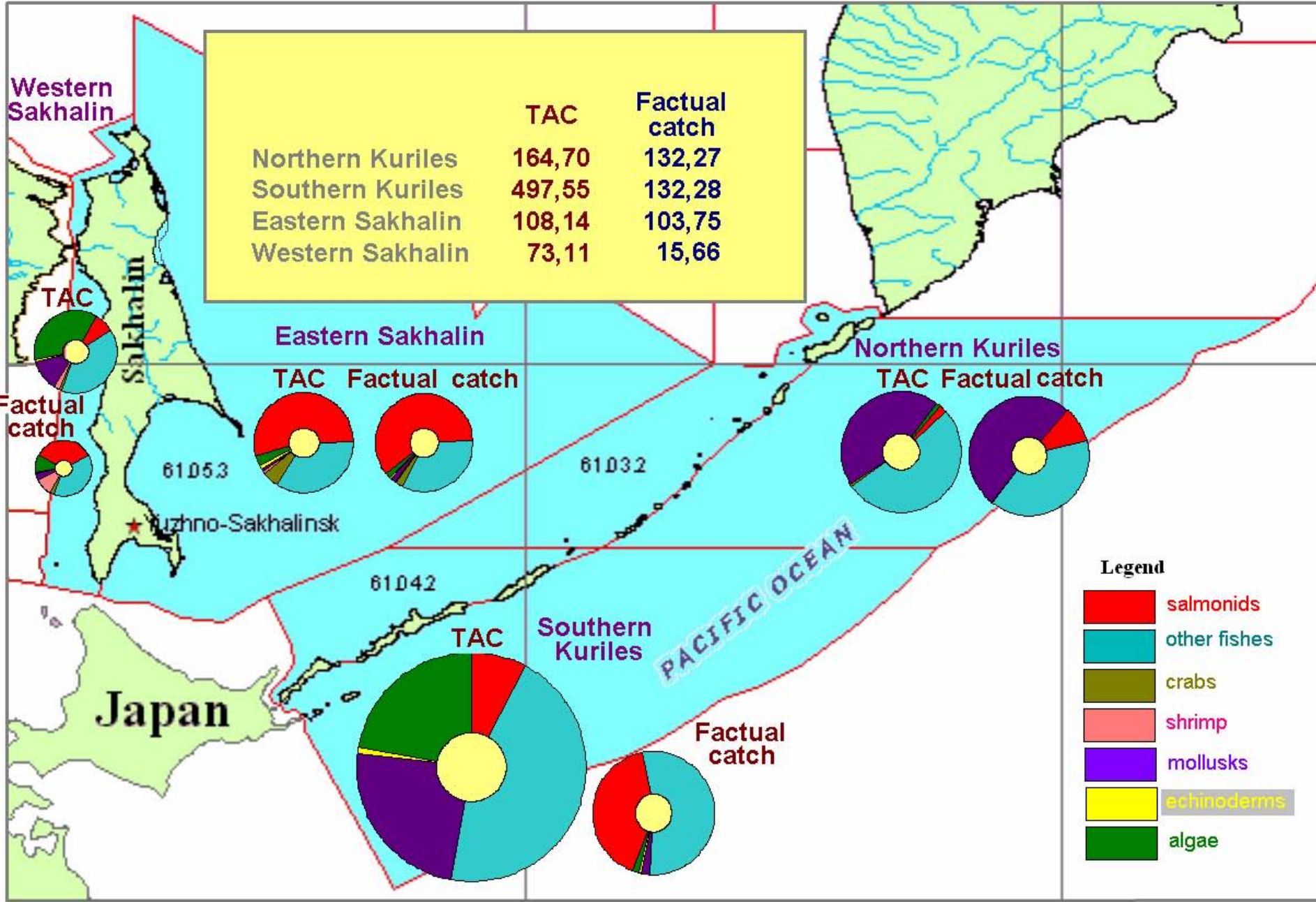
\* Portions of mysids, jelly-fishes and tunicates are too small for to be indicated on diagrams

# Number of fishery stocks distribution between the fishery management zones on the far-eastern part of Russian EEZ (averaged five years data, 2003-2007)

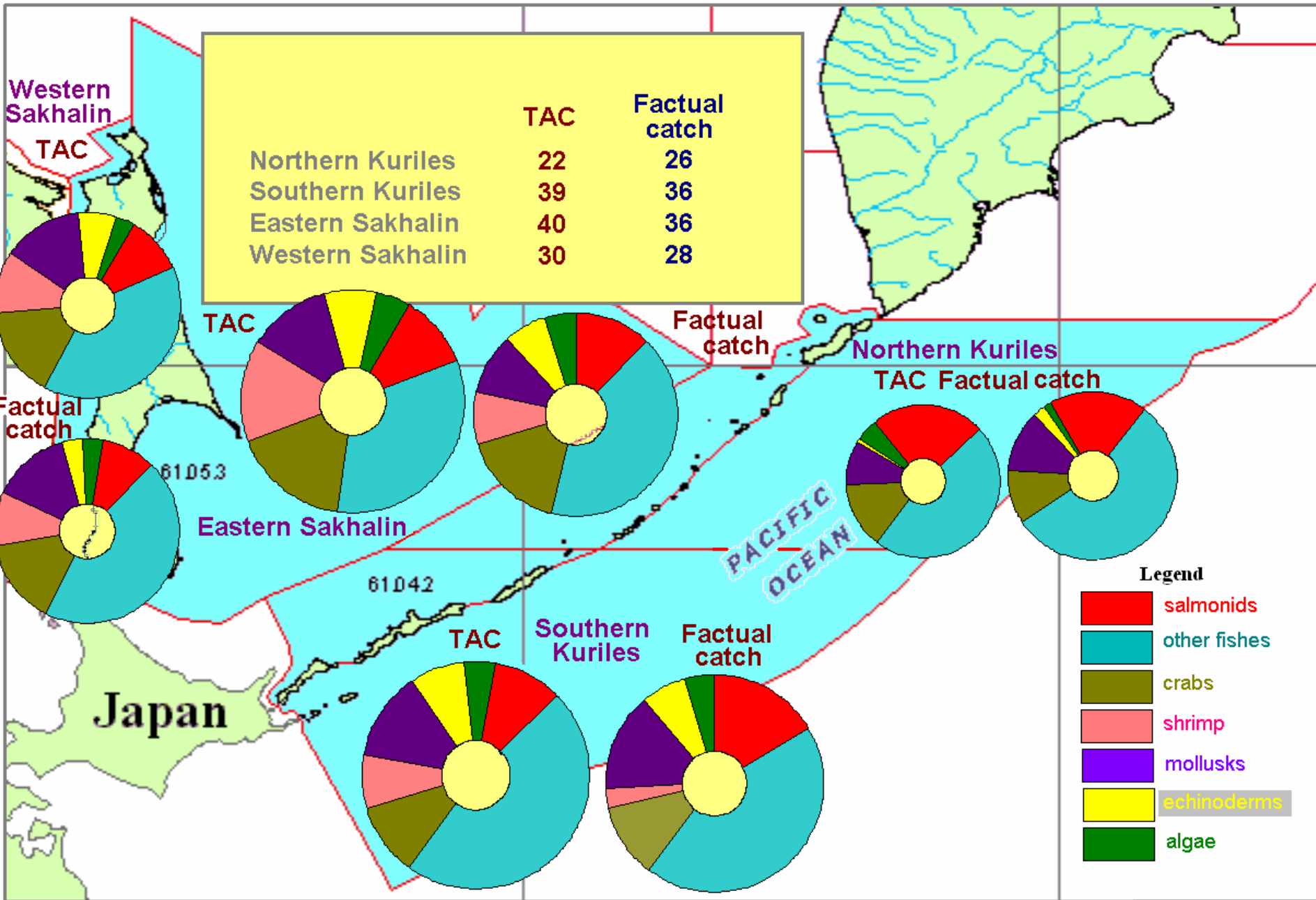


Number of fishery stocks for each fishery management zone is indicated inside the diagrams. Annual TAC setting is executed for the each of 374 fishery stocks.

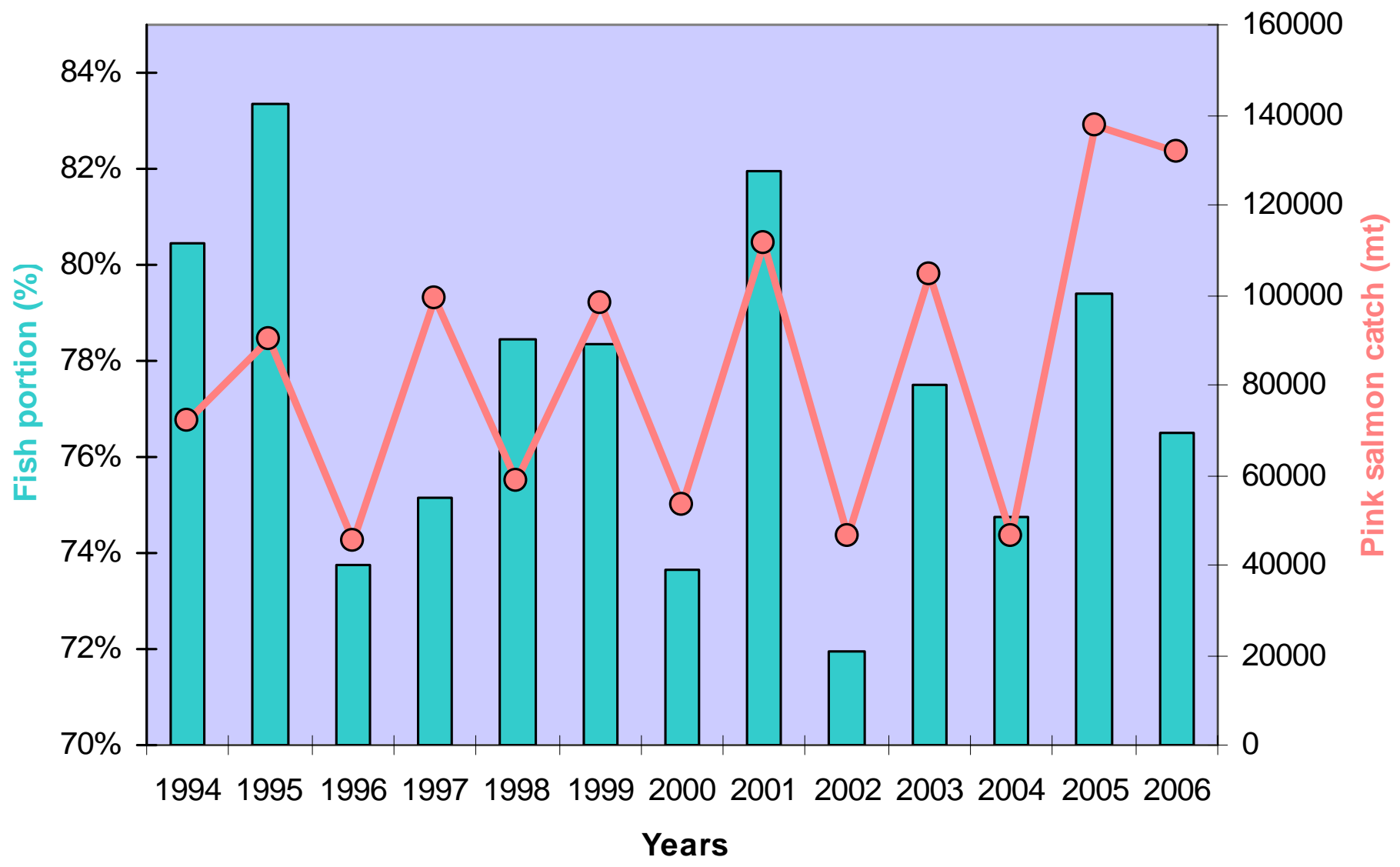
# TAC and factual catch ratio (1,000 mt) in the Sakhalin-Kurile Islands region, average data for 2003-2007 (TAC) and 2002-2006 (catch).



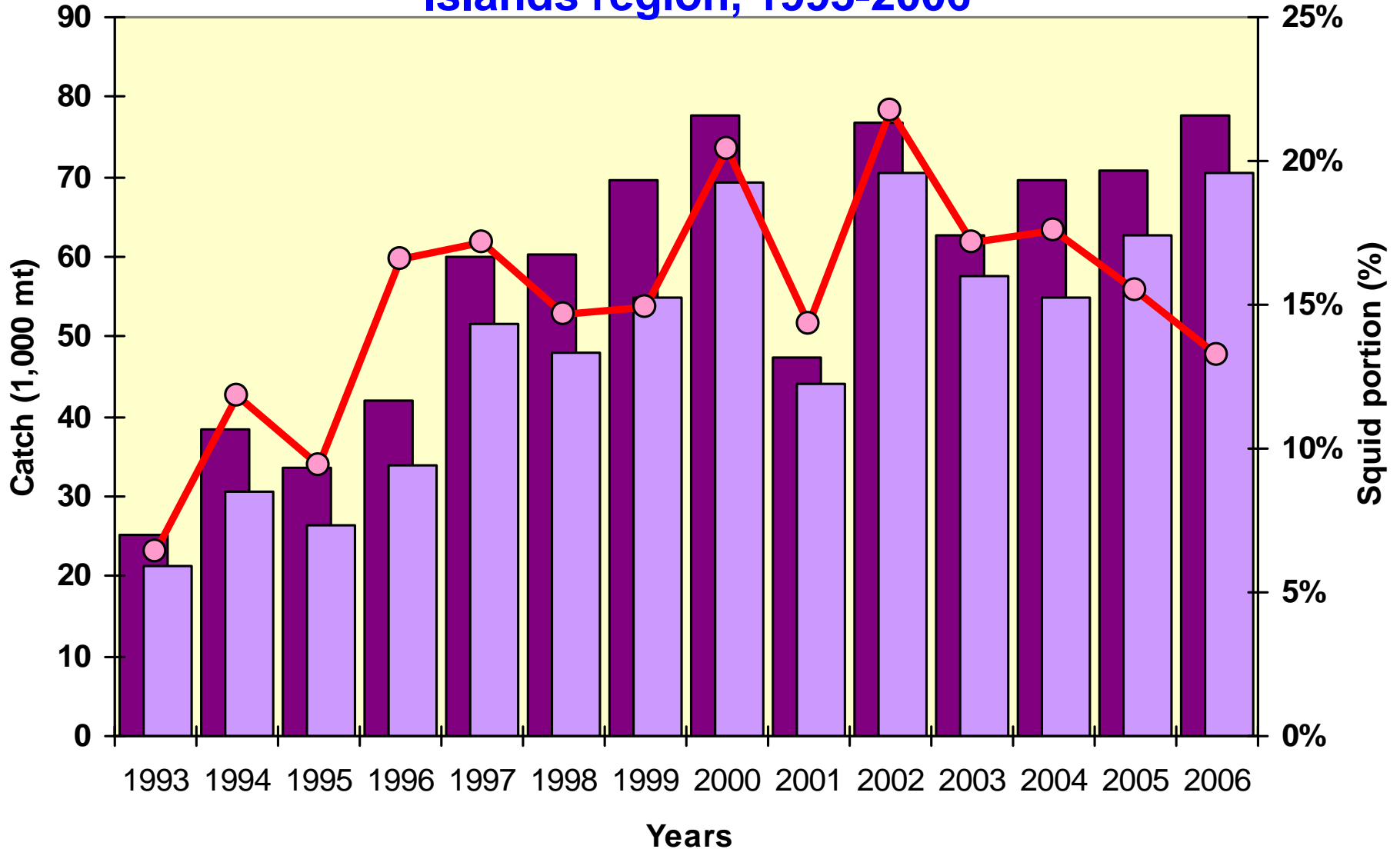
# Ratio of fishery stocks number (TAC setting and catch reported) in the Sakhalin-Kurile Islands region, average data for 2003-2007 (TAC) and 2002-2006 (catch).



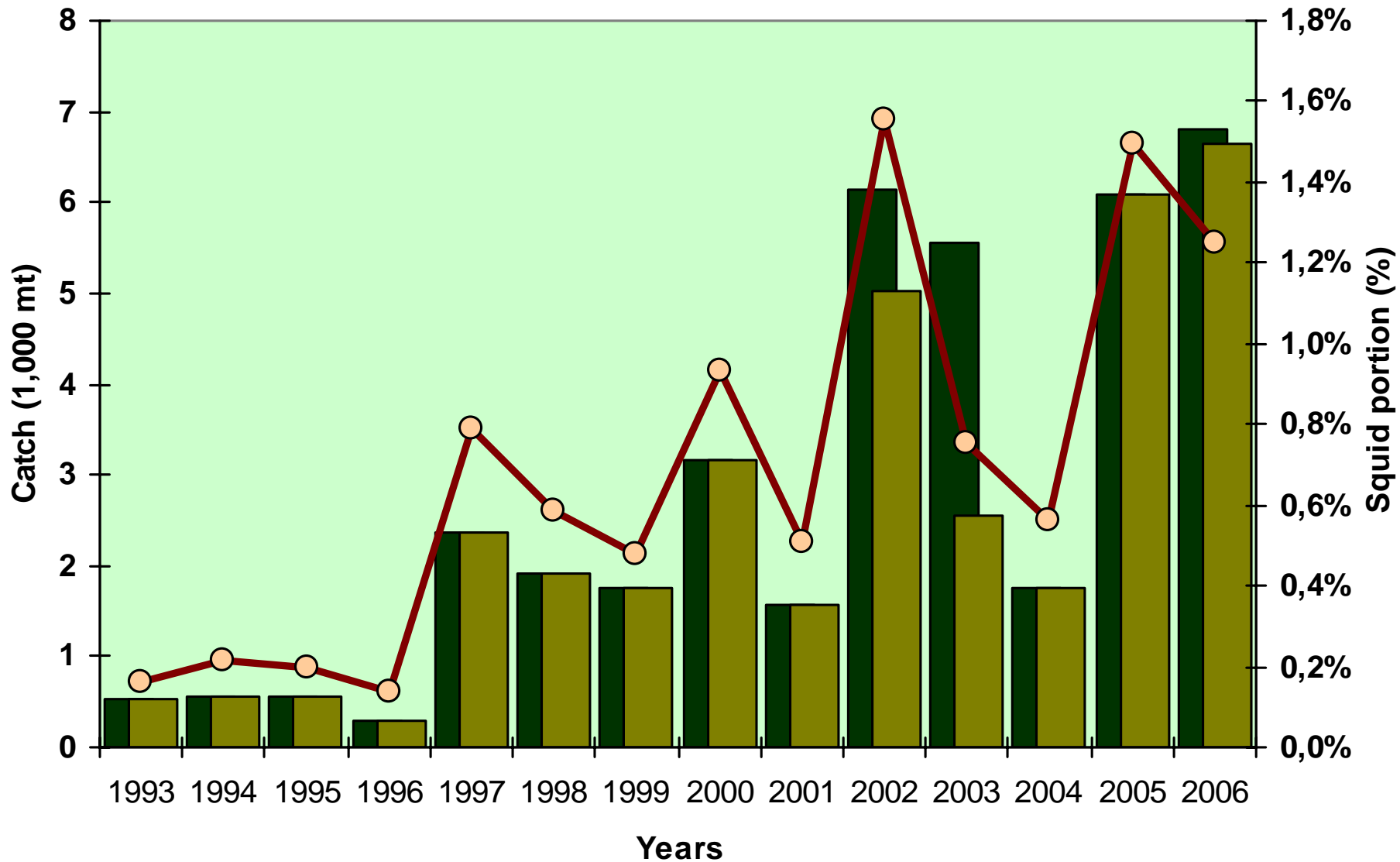
# Fish portion (%) in the total fishery harvest and pink salmon annual catch (mt) in the in the Sakhalin-Kurile Islands region, 1994-2006



**Commander squid annual catch in the Northern Kuriles zone on a background of the total mollusks harvest, and commander squid portion (%) in the total fishery harvest in the Sakhalin-Kurile Islands region, 1993-2006**



# Brown algae (kelp) annual harvest on a background of the total algae harvest, and algae portion (%) in the total fishery harvest in the Sakhalin-Kurile Islands region, 1993-2006

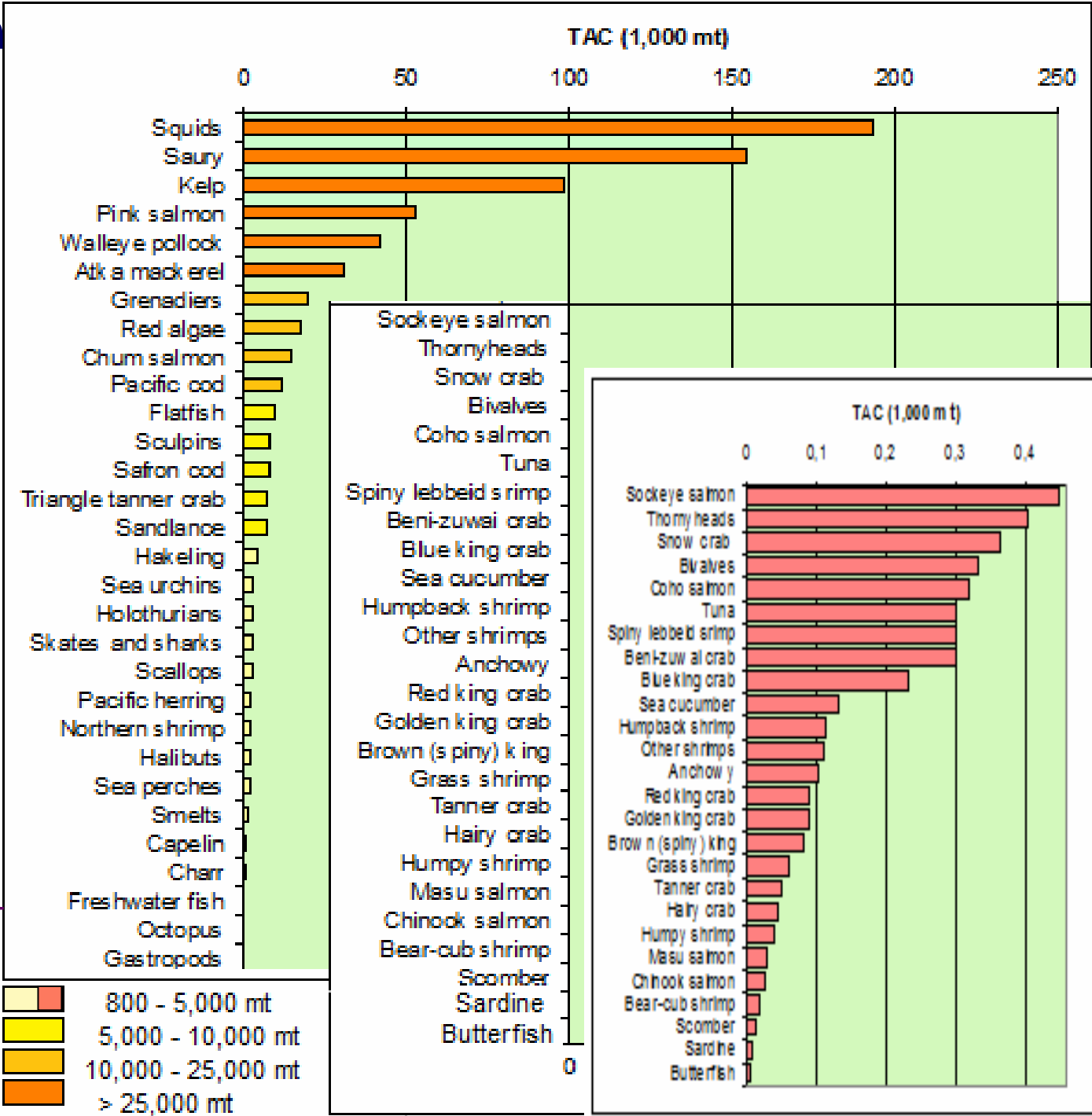




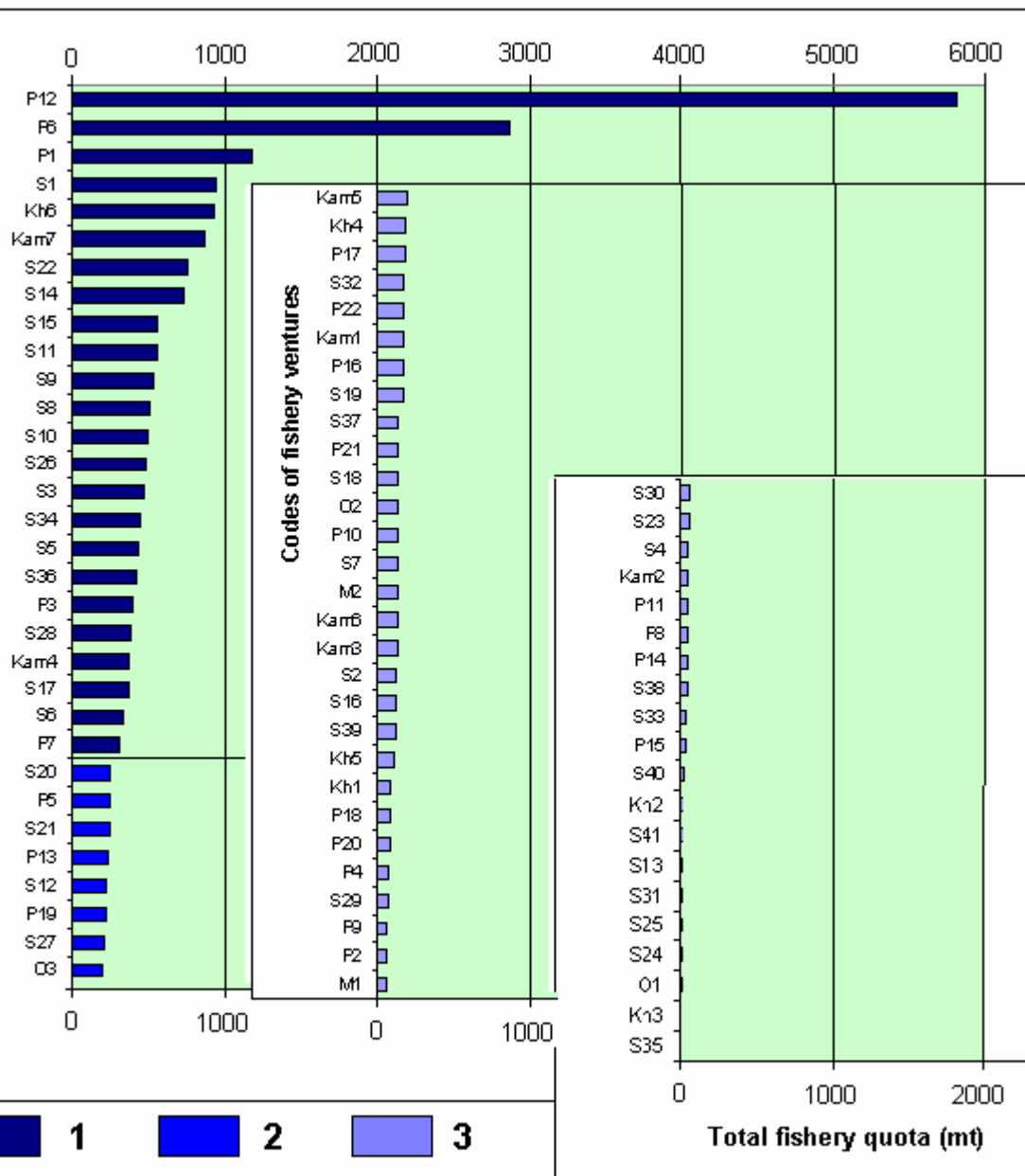
# TAC distribution among species & specific groups in the Sakhalin-Kuriles region, on example of 2005

**Note:** Data for 26 “tail” species are shown in finer scale in the lower right corner.

“Freshwater fish” group includes brackish and two-water species, and redfin *Tribolodon spp.* – the most abundant among them.



# Fishery quota distribution between Russian fishery ventures on example of the Atka mackerel trawl fishery in the Northern Kuriles zone in 2005



**Notes:** 81 individual fisheries ventures are indicated by the numerical-alphabetic code.

The fisheries ventures of the Sakhalin oblast economy are indicated as  $S_{n(1-41)}$

Legend:

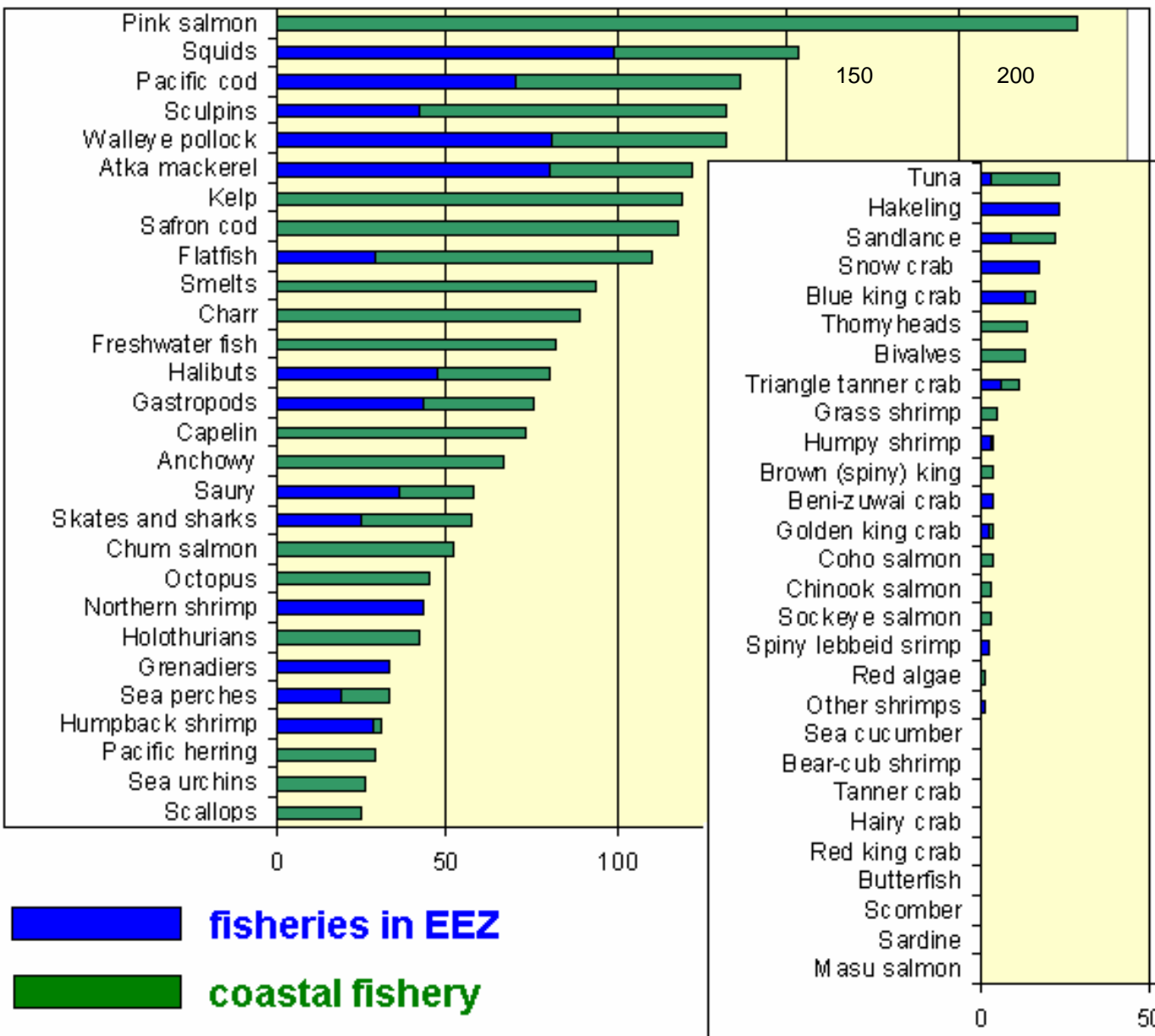
1 – profitable fishery possible

2 – profitable fishery risky

3 – profitable fishery impossible

About two thirds of fishery ventures can not execute profitable fishery on the basis of fixed shares of commercial quota of Atka mackerel in the Northern Kuriles zone

# Fishery stock distribution in relation to their demands expressed as the number of commercial fishery quota shares for all fishery objects in the Sakhalin-Kurile Islands region



**Notes:** Pacific salmon quotas are shared annually. The number shown is for 2005 (pink salmon – 235 shares, chum – 52 shares). All other quotas were shared for the 5-years term (2004-2008) on the basis of 5-year history of reported catch. Shares are not equal.

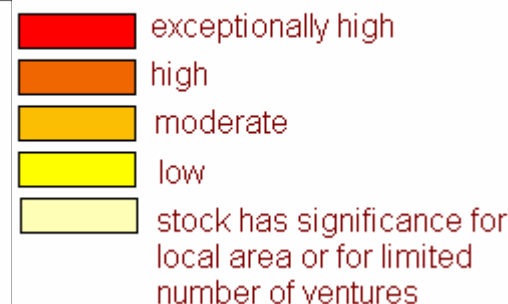
Individual fishery venture could has one share of EEZ quota and one share of the coastal fishery quota for the object, if this venture belongs to the Sakhalin oblast fisheries economy.

Limited number of quota shares could indicate low level of TAC during the long-term period. No shares established (9 objects in the tail) mean that there are not commercial quotas for these objects in the last years.

# Fishery stock distribution in relation to their demands expressed as the Factual catch/TAC ratio in 2006 (aggregated data for four fishery management zones in the Sakhalin-Kurile Islands region)

0%      50%      100%      150%      200%      250%

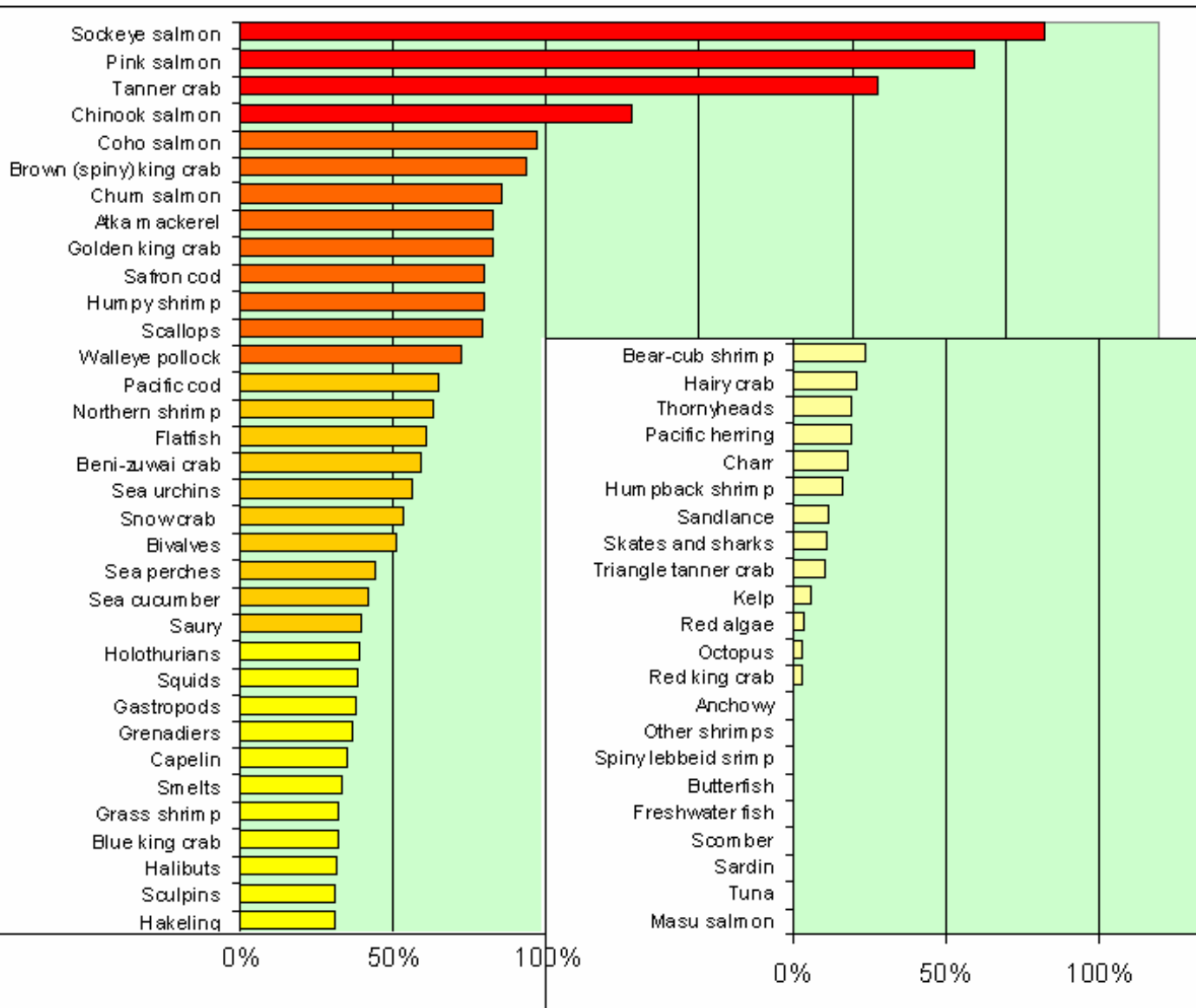
## Degree of demand



**Notes:** TAC for salmon species undergoes in-season changes in relation from the magnitude of spawning approaches.

Commander squid in the North Kuriles zone has index 100.6% while pelagic common squid in the Southern Kuriles and Western Sakhalin zones – less than 0.2%.

Tanner crab demand is overestimated due to relatively low TAC (50 mt) and notable by-catch during the other crab pot fishery.

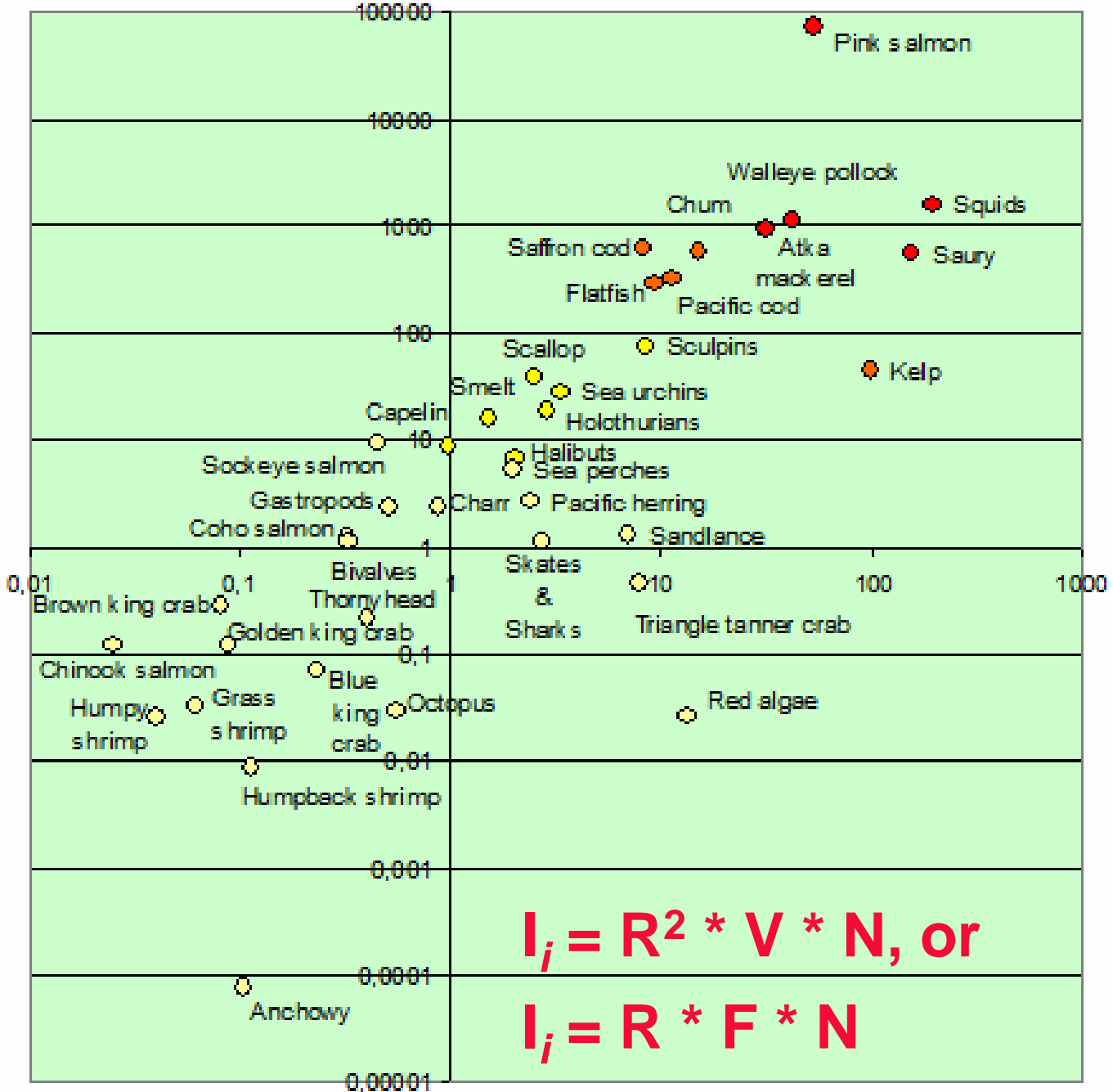


# Sources of existing problems:

## The TAC system

- ❖- is based on single-stock approach;
  - ❖- has not enough flexibility to on-line management;
    - ❖- suppresses applicability of all fishery regulation measures envisaged by Fishery rules;
      - ❖- lead for progressive inaccuracy of fishery statistics and increasing discards.

Importance ( $I_i$ ) of specialized fishery types in the Sakhalin – Kuriles region calculated from the TAC value (V), factual catch / TAC ratio ( $F/V = R$ ), and number of portions (N) of commercial fishery quota (logarithmic scale)



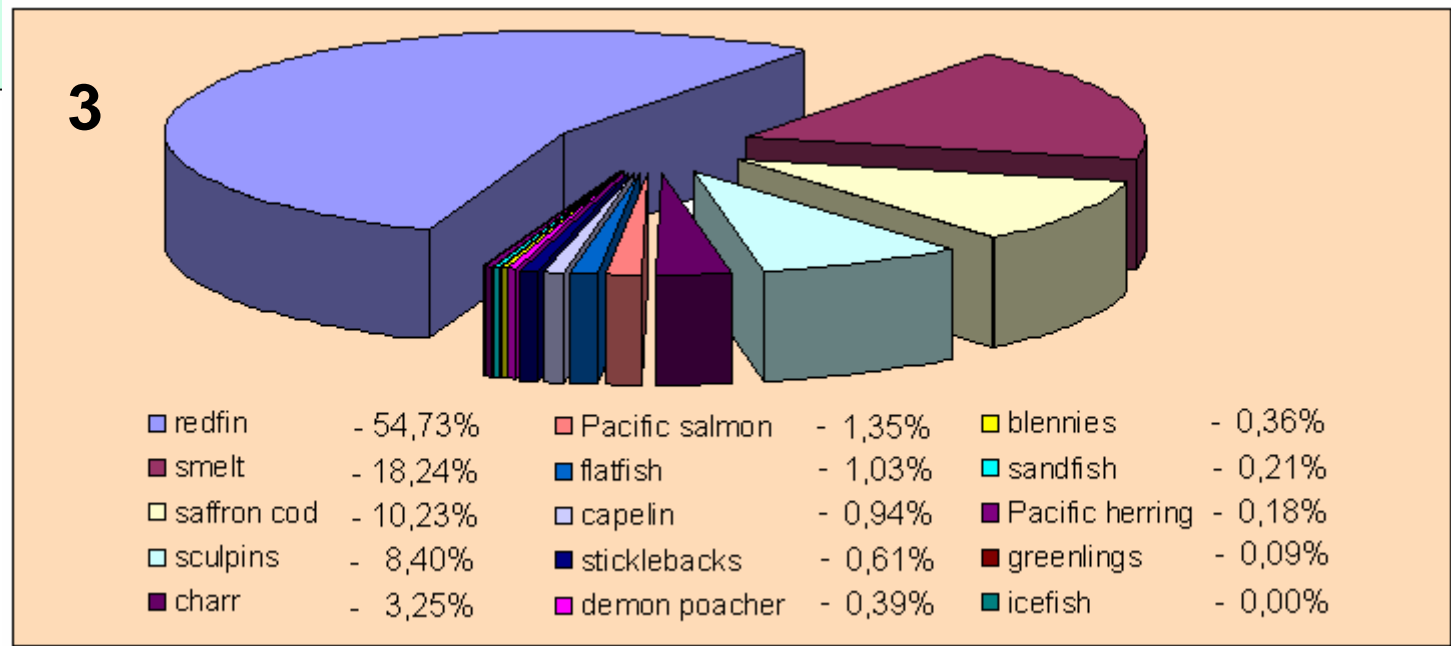
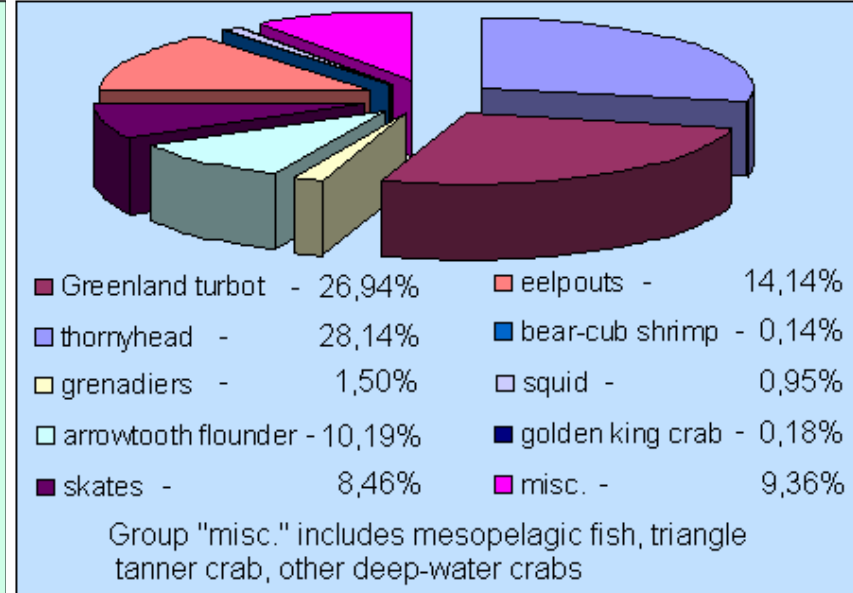
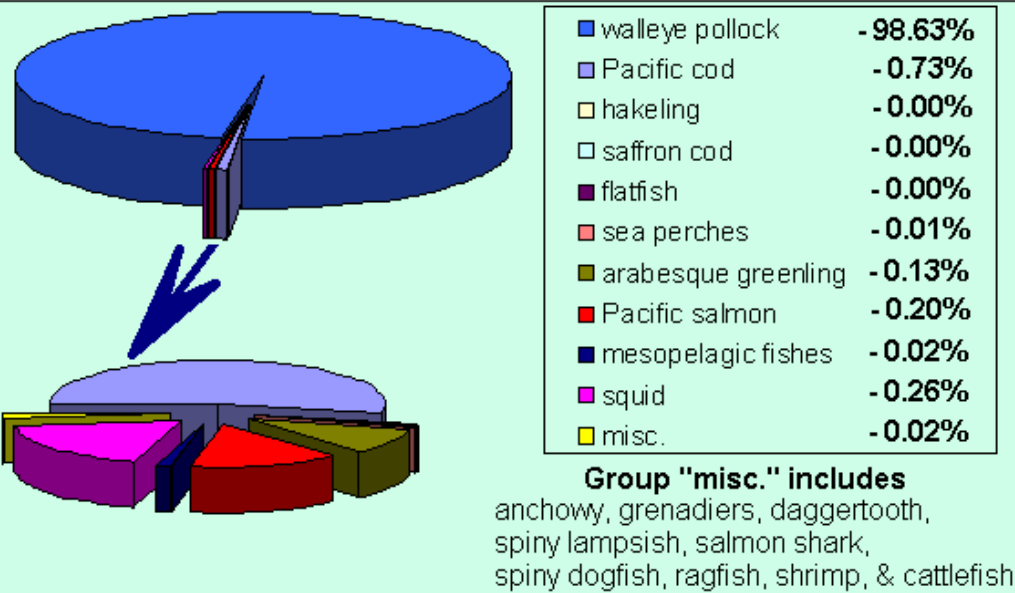
$$I_i = R^2 * V * N, \text{ or}$$

$$I_i = R * F * N$$

Specialized fishery types and objects	Northern Kuriles	Southern Kuriles	Eastern Sakhalin	Western Sakhalin	Specialized fishery types and objects	Northern Kuriles	Southern Kuriles	Eastern Sakhalin	Western Sakhalin
<b>Fishery by beach seines, beach traps and small beach traps</b>					<b>Longline fishery:</b>				
1. Pacific salmon	x	o	o	o	23. – halibuts		o	o	
2. coastal fish variety (smelts, capelin, red fin, herring, etc.) by small beach traps		o	o	o	24. – Pacific cod		o		
3. coastal fish variety by seines		x	o	o	25. – skates			x	
<b>Trawl fishery:</b>					<b>Gillnet fishery:</b>				
4. – walleye pollock	o	o	o	x	26. – halibuts and thornyhead		x	x	
5. – Atka mackerel	o				27. – Pacific cod		o		
6. – northern shrimp			x	x	28. – Arabesque greenling		x		
7. – Commander squid	o				29. – neon flying squid		x		
8. - pair trawling for saffron cod			o		<b>Dredging:</b>				
9. - flatfishes	o			o	30. - scallop	o			
10. – holothurians			o		31. – red algae		x	x	
11. – halibuts	x				<b>Diver's harvesting:</b>				
12. – hakeling		o			32. – sea urchins		o	x	o
13. – grenadiers	x				33. – scallop		o	o	
14. – sandlance			x		34. – other bivalve mollusks			x	
<b>Pot and trap net fishery:</b>					35. – sea cucumber		x		
15. – saffron cod by trap net from the sea ice		o	o	o	<b>Kelp harvesting:</b>				
16. – for snow crab				x	36. – kelp by “kanza” (kelp pruner)		o	o	o
17. – for the brown (spiny) king crab			x		37. – collection of kelp thrown out by storms			x	x
18. – for triangle tanner crab			x		<b>Light-fishery:</b>				
19. – for golden king crab	x				38. – common squid jigging fisheries		x		
20. – for humpback shrimp				x	39. – saury by the lift net		o		
21. – for gastropod mollusks			x	x	<b>Dutch seine fishery:</b>				
22. – for octopuses		x		x	40. – bottom species for food (flatfishes, cods)		o	o	o

Importance:  primary  high  moderate  limited or local

# Catch composition on the specialized fisheries in the Sakhalin-Kurile Islands region: (1 ) pollock trawl fishery, (2) Greenland turbot and thornyhead gillnetting, (3) coastal fish variety by small beach traps





## No bycatch

32. – sea urchins	o	x	o
33. – scallop	o	o	
36. – kelp by “kanza” (kelp pruner)	o	o	o
39. – saury by the lift net	o		

## Insignificant bycatch

1. Pacific salmon	x	o	o	o
4. – walleye pollock	o	o	o	x
5. – Atka mackerel	o			
15. – saffron cod by trap net		o	o	o
8. - pair trawling for saffron cod			o	
30. - scallop	o			

## Significant bycatch

2. coastal fish variety		o	o	o
3. coastal fish variety by seines		x	o	o
7. – Commander squid	o			
9. - flatfishes	o			o
10. – holothurians			o	
12. – hakeling	o	o		
23. – halibuts		o	o	
24. – Pacific cod			o	
27. – Pacific cod by gillnets		o		
40. – bottom species for food		o	o	o

# Specialized fishery types classification by the proportion of bycatch in the Sakhalin – Kuriles region

### Note:

Fisheries of local or limited importance are not regarded here. Legends – as on the previous slide.



# Pelagic trawl fishery on walleye pollock

# Bottom trawl fishery on Atka mackerel and Commander squid

These fisheries have primary importance for the Russian fishery ventures. Demands for these resources remain on a high level. Average TAC utilization is close to 73% for walleye pollock, 83% for Atka mackerel, and at 100% for Commander (schoolmaster) squid. The TAC system and additional regulation measures must be retained.

Trawl fishery bycatch must be registered and reported. Fishery objects involved now in the TAC settings could be directed to processing in a weight up to 2% of the main object biomass, according to the Fishery rules. Fishery objects not involved in TAC – up to 49%. List of species with the annual TAC setting must be revised.



# Crab pot fishery

## Shrimp pot and trawl fisheries

For shelf crab species any fisheries are prohibited in the Sakhalin – Kuriles region excepting snow crab in the western Sakhalin fishery zones. Commercial shrimp fishery is conducted on the northern shrimp only. The TAC system and additional regulation measures must be retained.



Advanced poaching control is necessary. Illegal fishery (without permission) must be separated from other “Fishery rules...” violations, and persecuted by the unavoidable seizure of fishery vessel, gears, and catch.

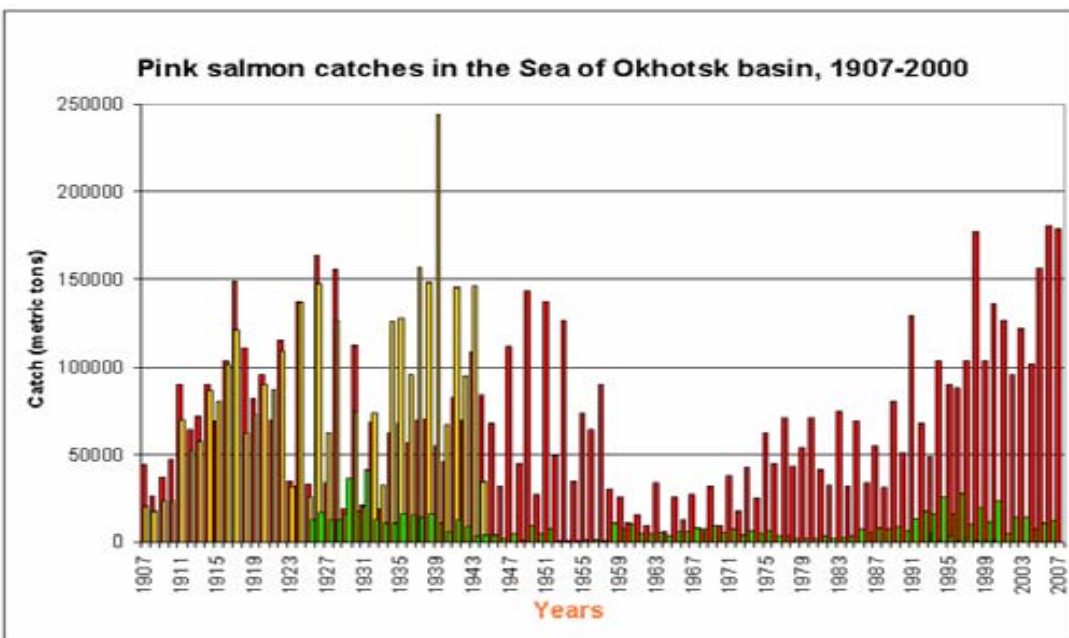




# Pacific salmon fisheries by beach traps

This fishery has primary importance for the Russian fishery ventures. Demands for salmon resources remain on a high level. Average TAC over-utilized (after procedure of additional TAC setting) due to abundant approaches of the last years.

Fishery regulation could include fishery efforts limitation proceeding from the pre-season forecast, gear restrictions, and area closures. “Days-without-fishery” could be applied to ensure gradual filling of spawning ground. TAC limitation must not be applied.



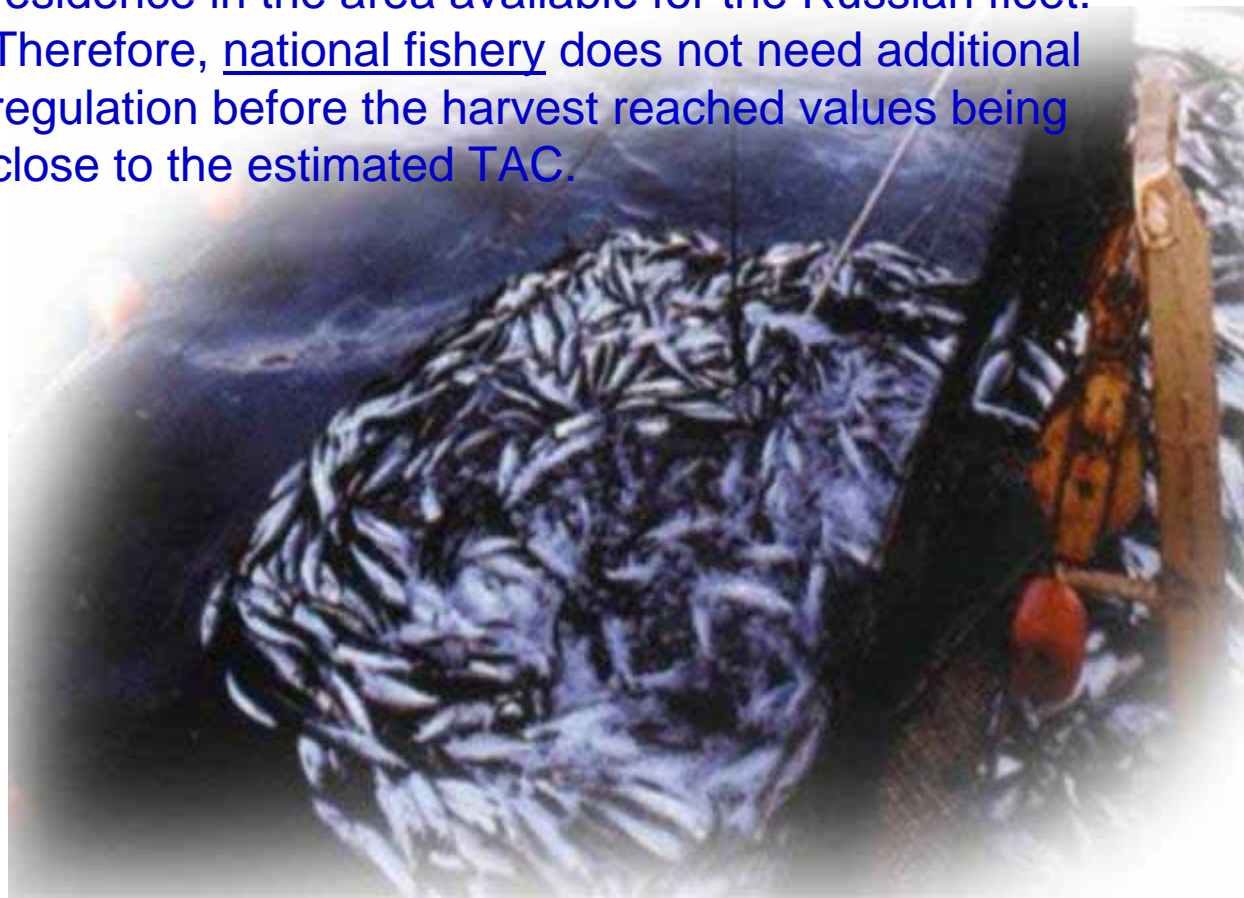
# Saury fishing by liftnet



During 1980 to 2000, World total catch of the Pacific saury fishery was ranged from 200,000 to 300,000 metric tons of which about 80% of the total catch was caught by Japan (Yang, 2004).

Since 2000, Pacific saury biomass reaches 1,296,000 mt (Baytalyuk & Savinykh, 2004)

Usually, it is conducted after the pink salmon fishery season since late August until end of October, rarely – till December. The most intensive fishery – in the beginning of season, when saury schooled near the southern Kuriles coast. TAC is underutilized, mean  $R = 39,8\%$ . Fishery is naturally regulated by timing of saury residence in the area available for the Russian fleet. Therefore, national fishery does not need additional regulation before the harvest reached values being close to the estimated TAC.



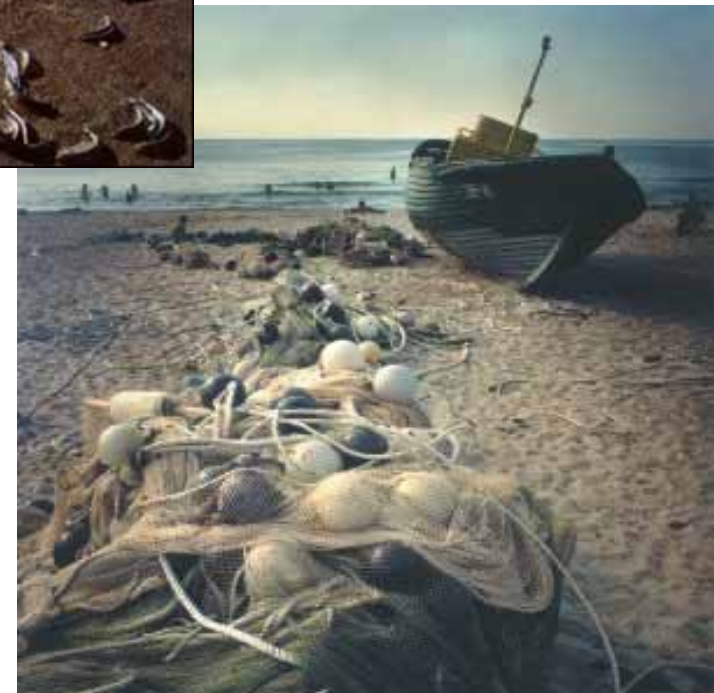
# Fishery for coastal fish variety by beach seines and small trap nets, bottom fish “species for food”



Conducted since end of April – early July. Has high priority due to ensure fisherman employment before Pacific salmon fishery season.

Fishery regulation could include fishery efforts limitation proceeding from the pre-season forecast and expected (last year mean) catch composition.

Gear restrictions, area closures, and “days-without-fishery” could be applied to ensure gradual filling of spawning ground for species with depressed stock conditions (e.g. Asiatic jack smelt). TAC limitation must not be applied. Species composition of catch needs permanent monitoring for the regulation measure statements for the following year.





## Flatfish trawl fishery, Pacific cod and halibut longline fishery, and other fisheries, where TAC is under-utilized in 33% and more

There are mostly fisheries of moderate importance. Since overfishing is not expected, effort limitation (days-at-sea) with remote monitoring of reported catch could be applied.

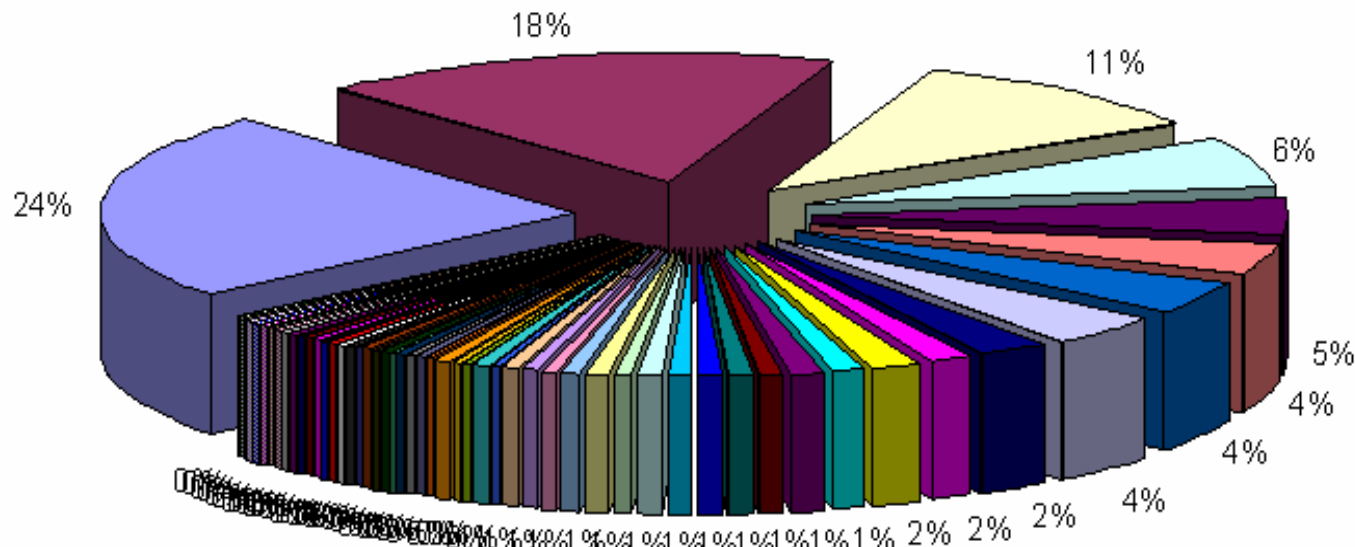
All Russian fishery fleet is equipped by the technical control devices. There is an opportunity to use it wider for fisheries management.

For the unreported catch prevention, **minimal rated catch** (MRC) value could be established before the fishery season under the fishery science suggestions.

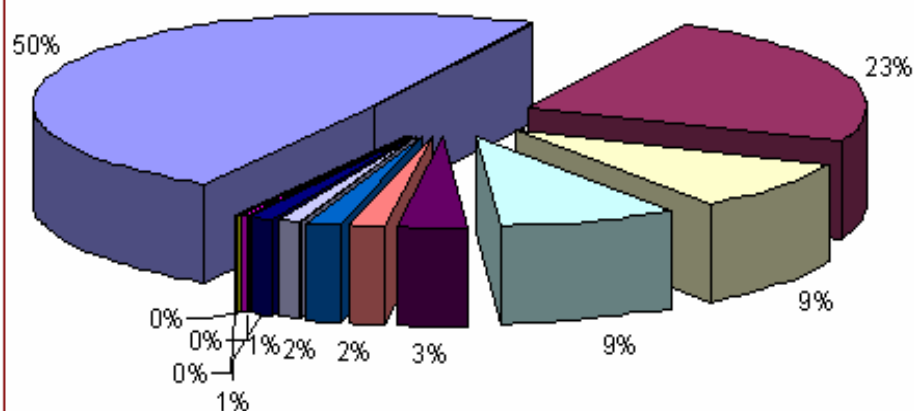
If reported catches are steady below the MRC, fishery must be ceased, since it means fishery stock conditions worse than expected, or non-reported catch has place to be.



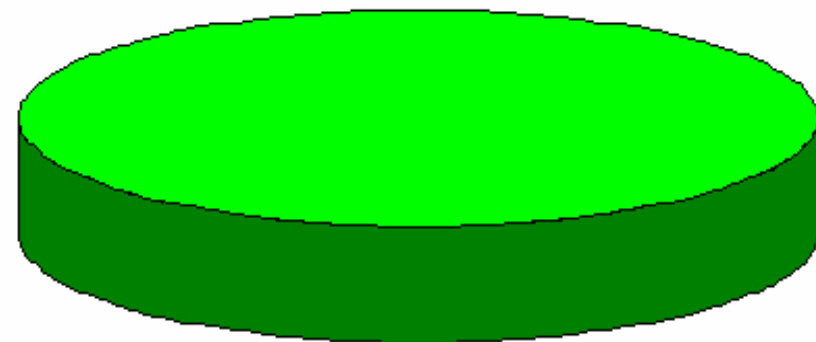
Current procedure divides the established TAC of 56 fishery objects by 123 individual quotas (without Pacific salmon):



Our suggestion is to divide the total TAC for the Sakhalin-Kuriles region by 15 specialized fisheries of primary importance and remain about one half of potential harvest without TAC limitation:



and



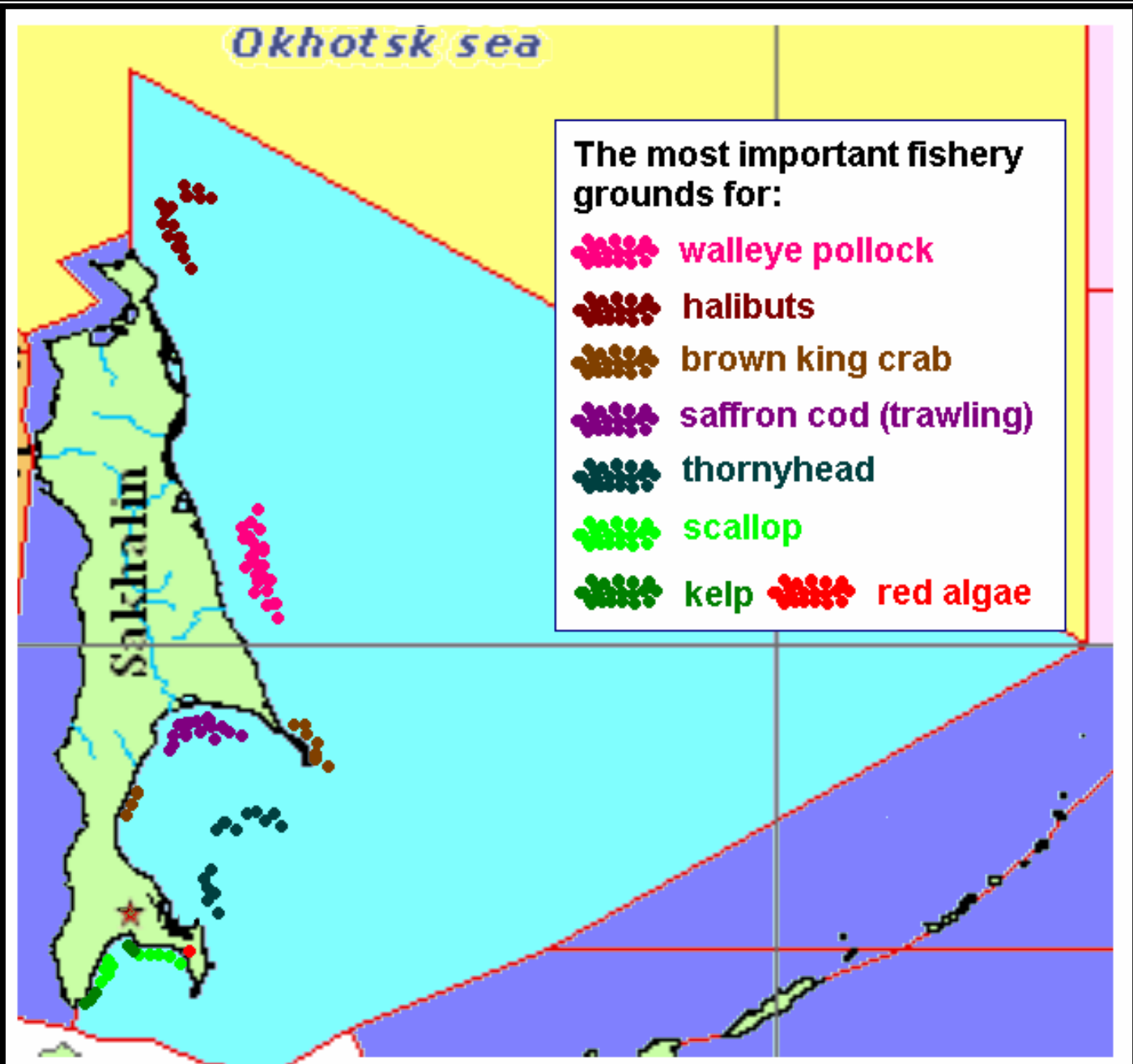


# Necessary conditions for successful reformation:

- ❖ Number of fishery ventures possessing the fishery rights must not be increased.
- ❖ Secondary market of fishery quota portions must be developed. However, further partitioning of the fishery quota portion may be prevented.
- ❖ Quota allocation as distribution of portions of one-species TAC must be exchanged by distribution of portions in the specialized fishery type with all set of bycatch species (Karedin, 2001; Balykin, 2006).
- ❖ Restoration of fisheries, which is not executed now, must begin under the recommendations and supervision of fishery science, including gears, vessel types, and calculations of economical benefits.
- ❖ Cutting down of TAC system application do not mean a cessation of their stocks monitoring with definition of total and fishery stock abundance, basic biological parameters of population.

# Fishery management benefits:

## Main fishery grounds for the different objects in the Eastern-Sakhalin zone



**Note:** Area of productive fishery grounds for the most of species and groups differs from the total area of permitted fishery zone in a hundred fold.

Limitation of area permitted for fishery operations facilitates fishery monitoring and supervision

## Other benefits:

- Fisheries ventures will be able to utilize bycatch. It foresees an increase of fisheries harvest and fishery statistics improvement.
- Suggested approach meets optimization of the fisheries economy structure envisaged by “Conception of fisheries development in the Russian Federation until 2020”. Fisheries venture with portions in specialized fishery can join in associations more naturally than possessing different quotas.
- Fisheries ventures, which had portions in quotas of objects non-demanded by market and used them only for official permission formalization, will be deprived of such possibility.
- Allocation of portion in the specialized fishery will allow to these portion assignment on the individual fishery vessel. It can improve fishery statistics and facilitate the secondary turnover of fishery rights.
- Underutilized quotas could be re-distributed before the end of fishery season. That will increase harvest up to the optimal value.
- Fishery since will obtain detailed data not only upon main commercial species but bycatch species also. These data will be used for the ecosystem studies.