Implementation of target and limits in Chilean fisheries management: Tier system, BRP, drastic quotas reductions and mitigation plans.

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New Chilean Fishery Act 2012 (CFA):

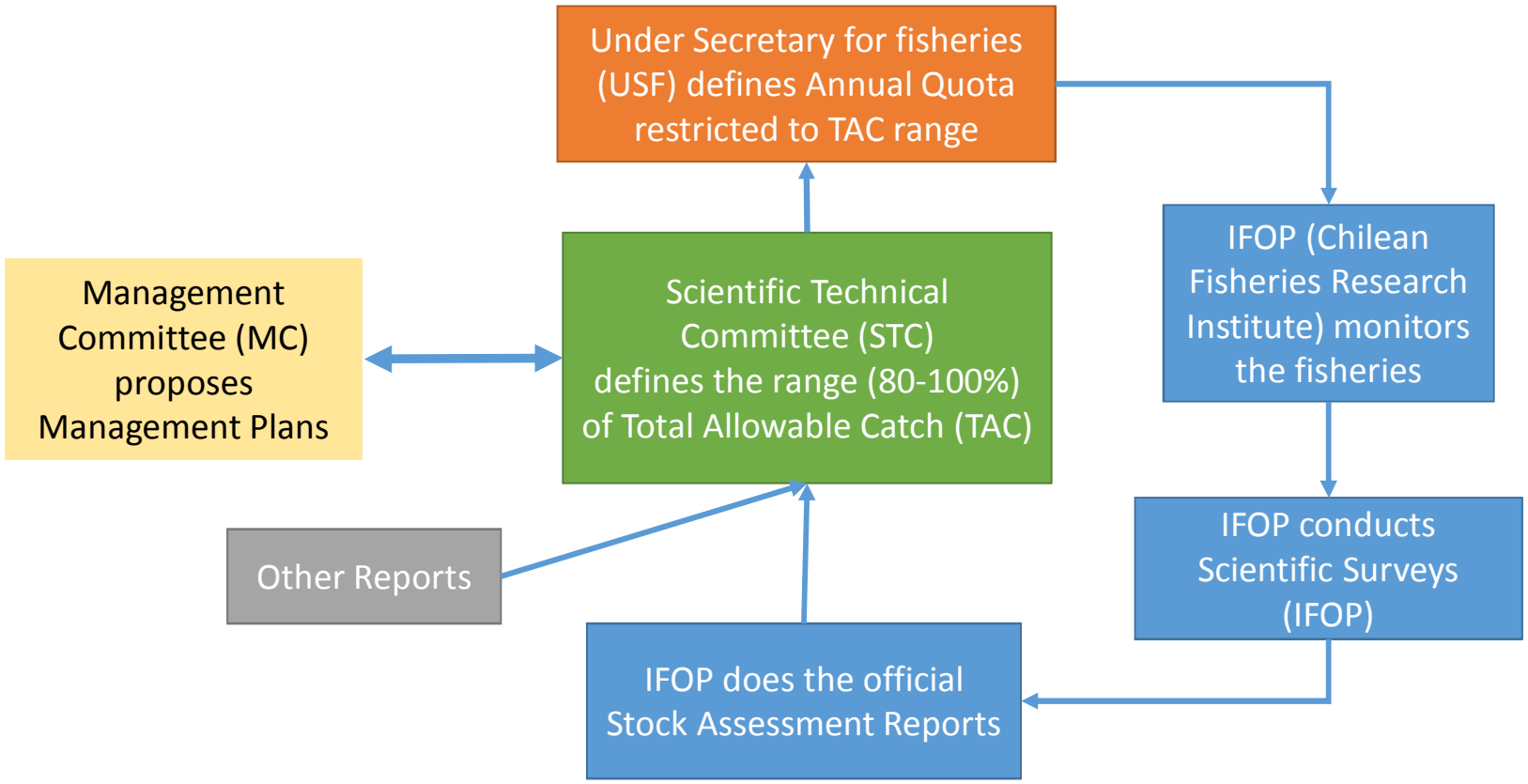
- The aim is the conservation and sustainable use of aquatic resources.

- Applying Precautionary Approach

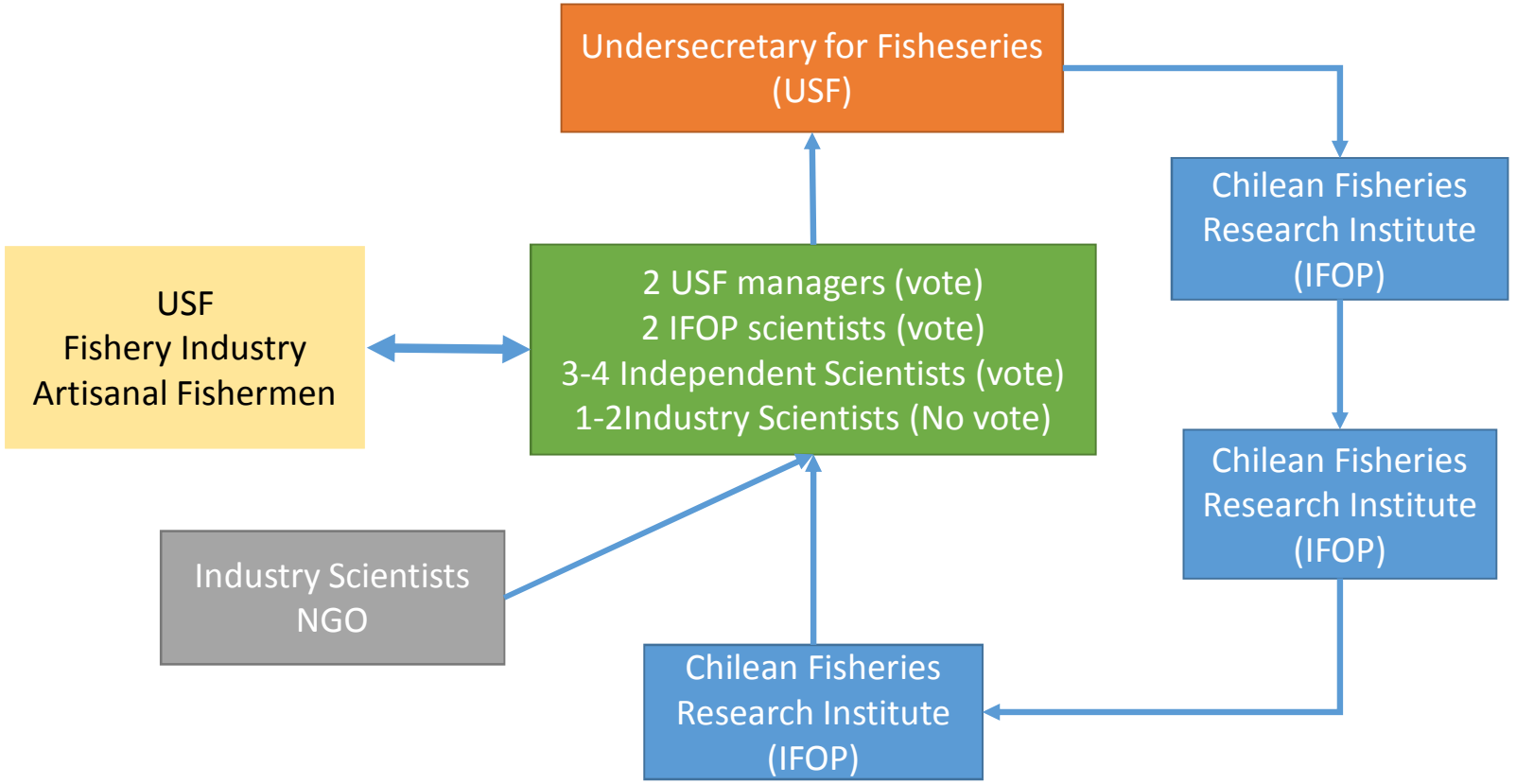
- Applying Ecosystem approach

- Protecting marine ecosystems in which fisheries exist

Annual cycle of quota system (New TAC Machine).



Participants in the Annual cycle of quota system.



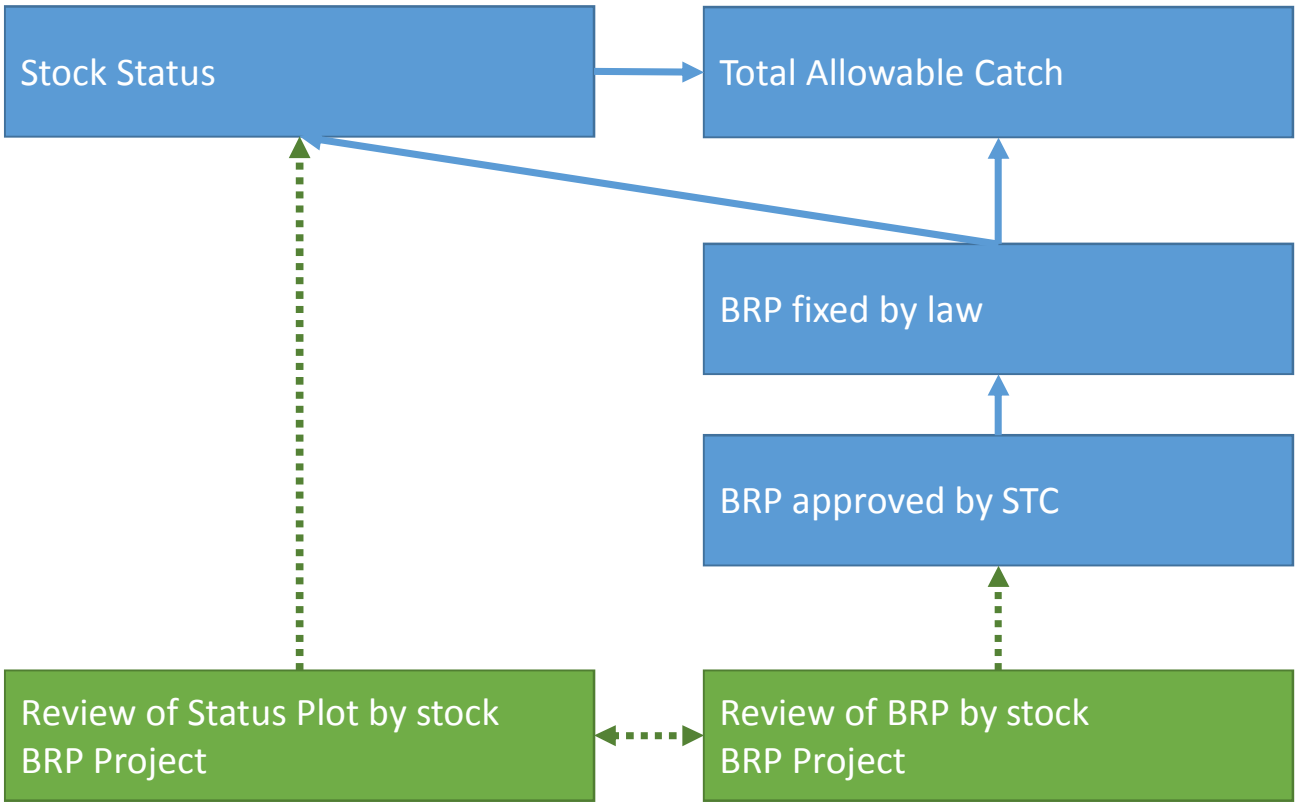
Target and limits.

- The aim is to recovery or to keep fisheries at their maximum sustainable yield (MSY).

- Scientific and Technical Committees (STC) must define MSY and Biological Reference Points (BRP).
  - Target BRP
  - Limit BRP

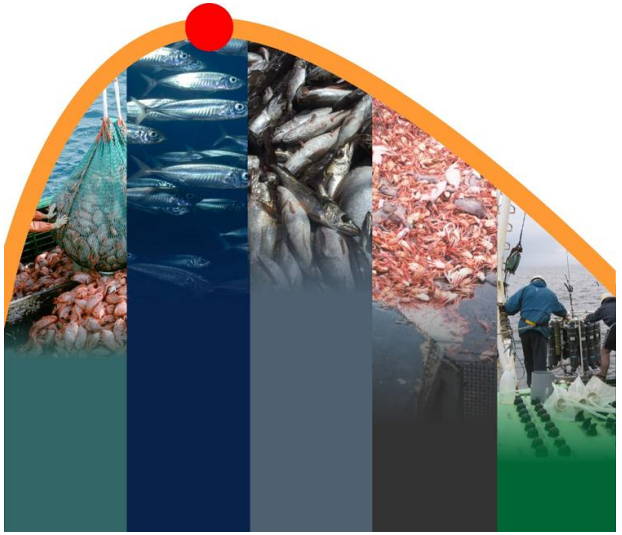
- BRP must be established by fishery and could be reviewed after two years.

BRP project to support implementation of BRP and TAC.



A Biological Referent Points (BRP) project was done to advice the STC.

- The BRP was conducted by the Chilean Fisheries Research Institute (IFOP) with objectives:
  - To review a tier system for BRP estimations
  - To review MSY estimations that are routinely done by IFOP.
  - To review status plots and stock status.
  - A total of 28 stocks were analysed (pelagic and demersal fish and crustaceans).
  - Three workshops were done with participations:
    - IFOP stock assessment scientists
    - Independent local scientists
    - Industry local scientists
    - STC members
    - 8 MSY-BRP experts



MSY-BRP experts

Mike Sissenwine, USA, ex NOAA, ICES.
William Clark. USA, ex Halibut Commission.
Martin Dorn, USA, NOAA.
Mathew Dunn, NZ, Ex NIWA, Victoria University.
Carmen Fernández, Spain, ICES.
Malcolm Haddon, AU, CSIRO.
Neil Klaer, AU, CSIRO.
Shijie Zhou, AU, CSIRO.

1st Workshop to define tier system and methods by tier (December 2013).

Chilean Tier System

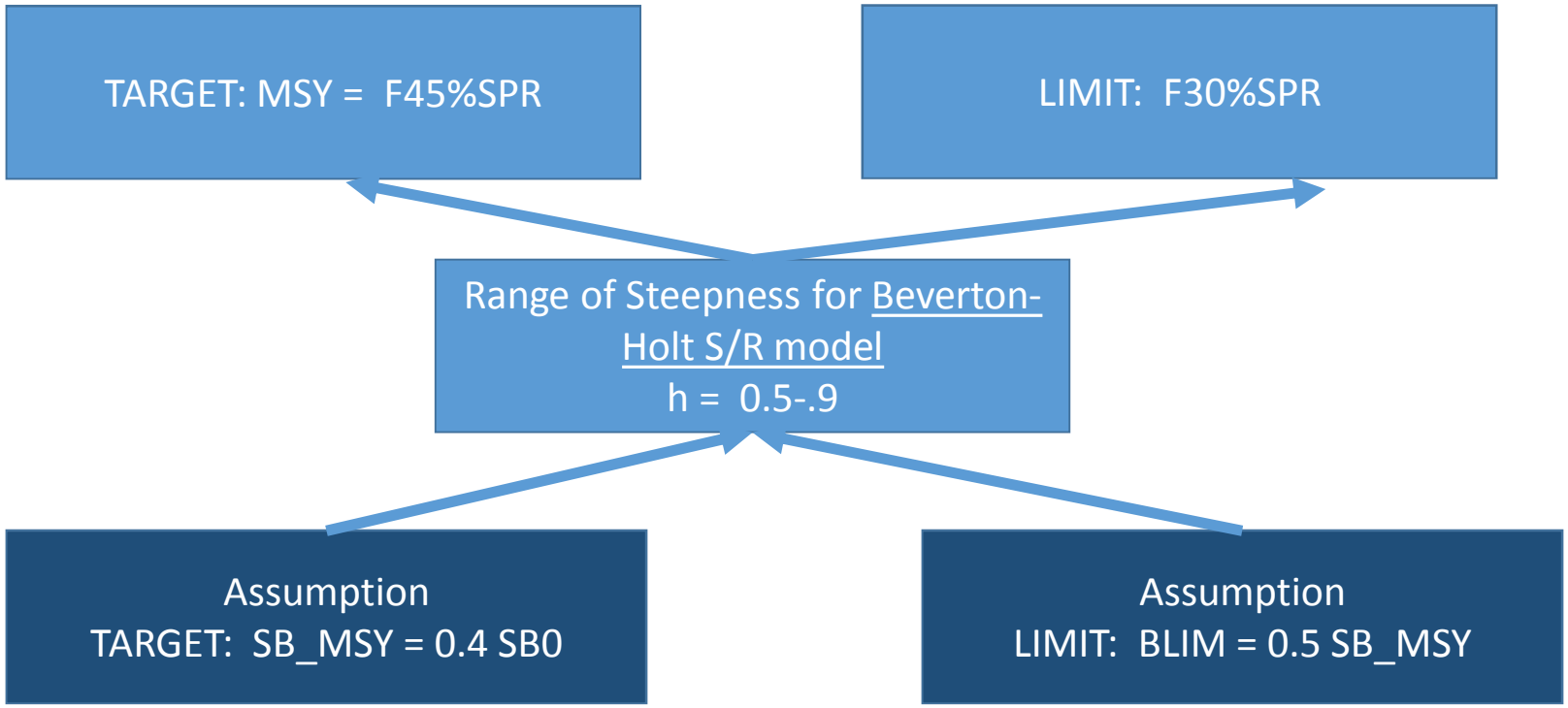
Tier	Type of Stock Assessment	BRP	Stocks
1	Age- or length-structured assessment model (e.g., Statistical Catch at Age type models).	1a. MSY and BRP can be reliably estimated from parameters estimated within the assessment model.	2
		1b. BRP as MSY proxies	19
2	Biomass dynamic models or an empirical approach based on catch and relative abundance data.	BRP based on dynamic model	1
3	There is insufficient data allowing application of a population dynamics model. Empirical approaches based primarily on catch data (with no relative abundance data), life history traits, and/or survey data have to be used.	BRP based on data-poor method Dynamic model with catch data only.	6

2nd Workshop for doing target and limits calculations (April 2014).

Target and Limit BRP.

Tier	Method	Target MSY and BRP		Limit BRP		Stocks
		F_MSY	SB_MSY	F_LIM	SB_LIM	
1a	1	F_MSY From S/R Model estimated within the assessment model.	SB_MSY From S/R Model estimated within the assessment model.	F_0.5 SB_MSY.	0.5 SB_MSY	2
1b	4	F45%SPR (B-H S/R) F40%SPR (Ricker S/R)	40%SB0	F30%SPR	0.2 SB0	16
	4 Small Pelagic	F55%SPR F60%SPR	50%SB0 55%SB0	F30%SPR	0.2 SB0	6

Method 4: Target and limit BRP.



MSY and BRP methods.

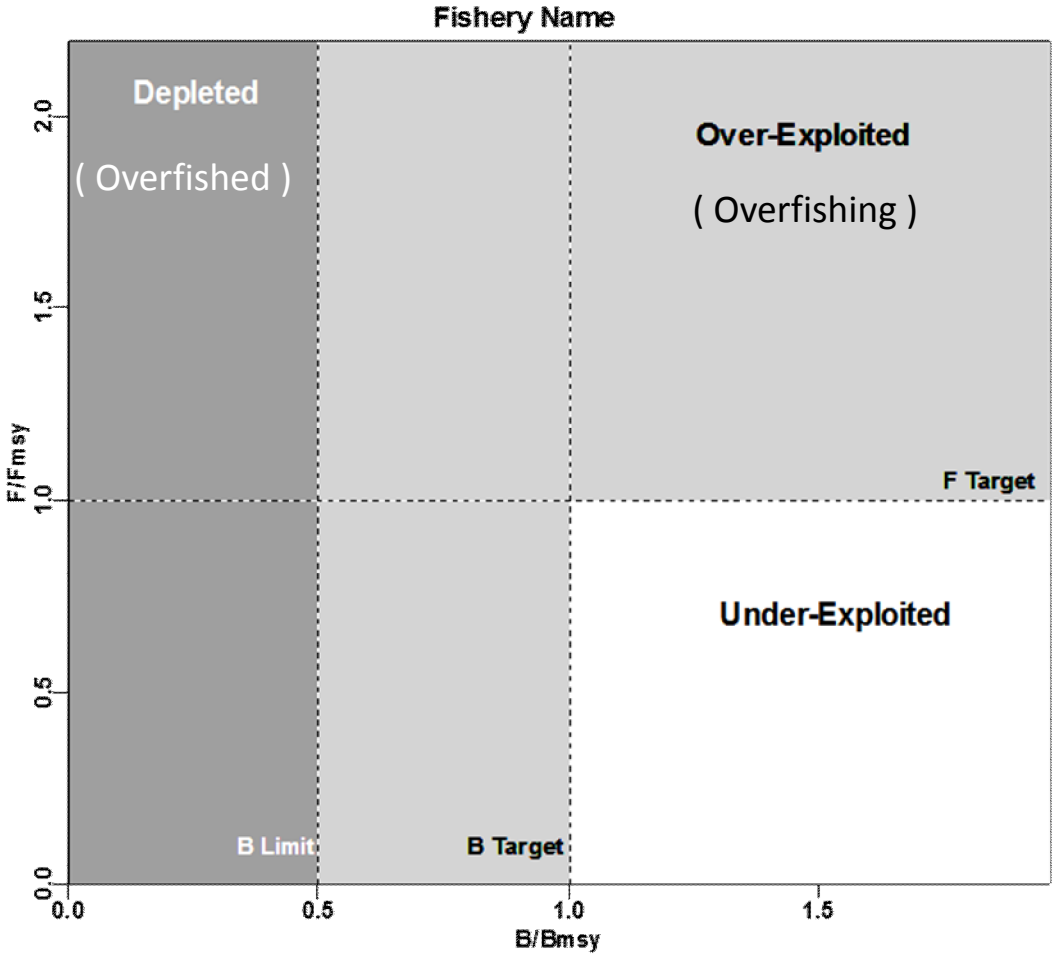
Tier	Method	Target MSY and BRP		Limit BRP		Stocks
		F_MSY	SB_MSY	F_LIM	SB_LIM	
2	6	r/2 Schaefer model.	K/2 Schaefer model.	1.5 F_MSY	k/4	2
3	8	r/2 Data-poor Method Catch data only	K/2 Data-poor Method Catch data only	1.5 F_MSY	k/4	2

Regime shift?

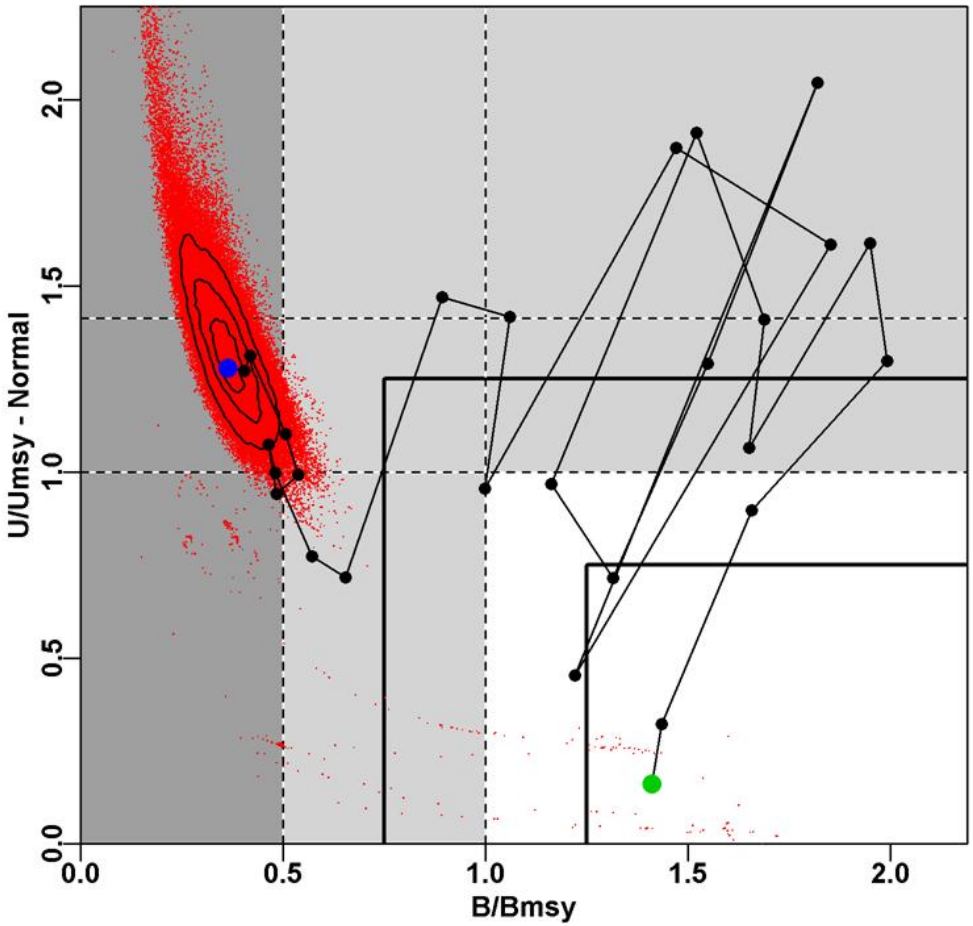
- Preliminary examination of the weight of evidence to support regime shift for Chilean fish stocks
  - Length of time series and lifespan
  - Observed change in a productivity indicator.
  - Understanding of assessment model input data.
  - Explanatory hypothesis
- Stocks: Hake, Hoki, Jack Mackerel, Pilchard.
- The final scores for Chilean stocks all suggest that further evidence is required to support the case for regime shift in base case stock assessments.

3rd workshop to define and create status plots (August 2014).

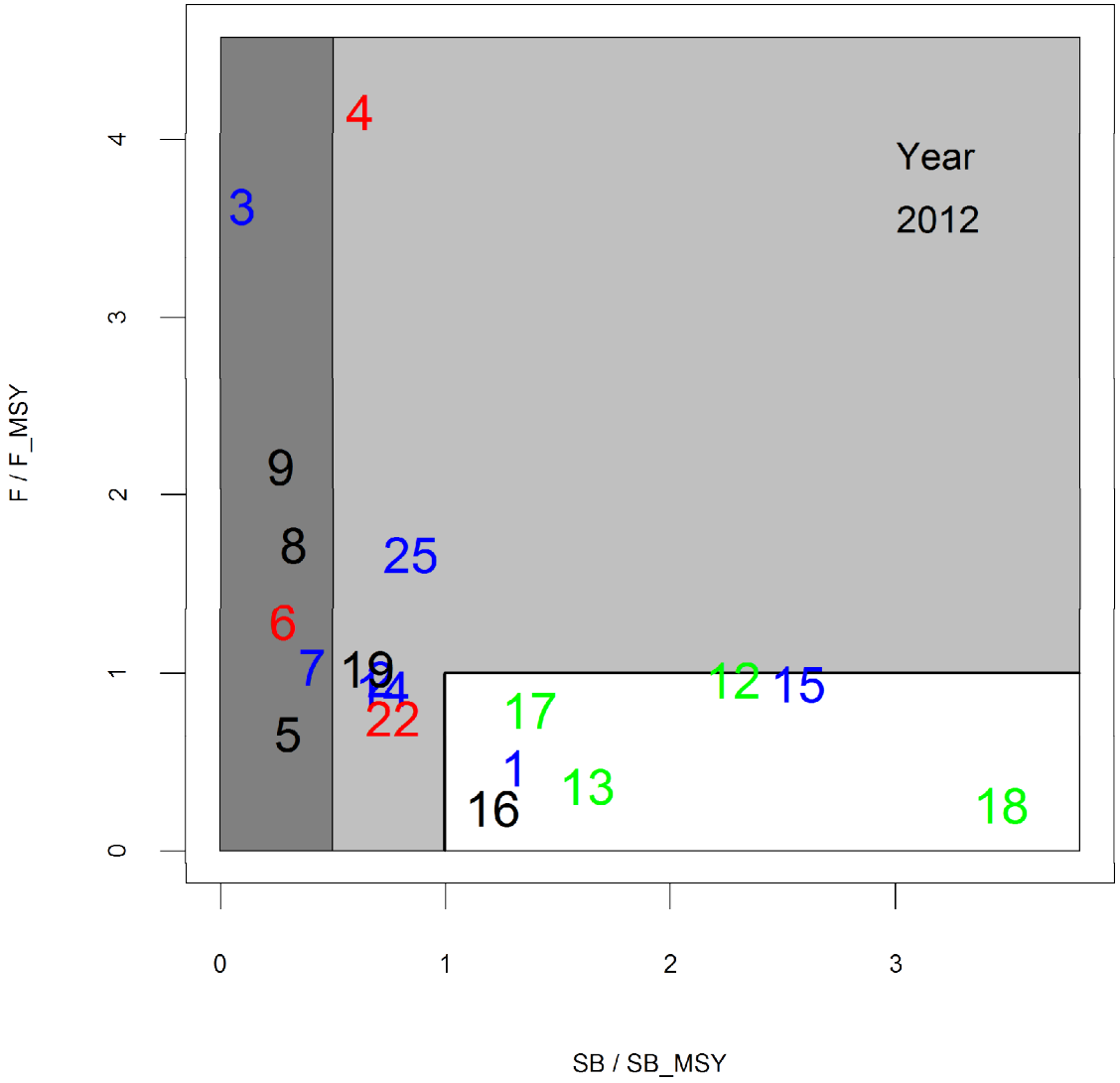
Status plot **according with Chilean Fisheries Act 2012**.



Status plot **according with Chilean Fisheries Act 2012**. Chilean hoki Example



Phase plot showing MCMC samples of F and SSB in the final assessment year, 2012. Contour lines indicate the 0.2, 0.5, and 0.8 percentiles of the bivariate distribution of U/U_{MSY} (annual harvest rates) and SSB/B_{MSY} in the most recent year (Payá 2012).



26	Skate
25	Pomfret
24	Orange roughy
23	Jumbo Flying Squid
22	Cardinal fish
21	Alfonsino
20	Swordfish
19	Southern Hake
18	Nailon Shrimp South
17	Nailon Shrimp North
16	Southern Blue Whiting
15	Common sardine V & IX
14	Southern Sardine Region 10
13	Red Squat Lobster South
12	Red Squat Lobster North
11	Pilchard III & IV
10	Pilchard XV & II
9	Kingclip South
8	Kingclip North
7	Jack Mackerel
6	Hoki
5	Hake
4	Chilean SeaBass
3	Anchovy V & X
2	Anchovy XV & II
1	Anchovy III-IV

2012 Stock status

2012 Stock status

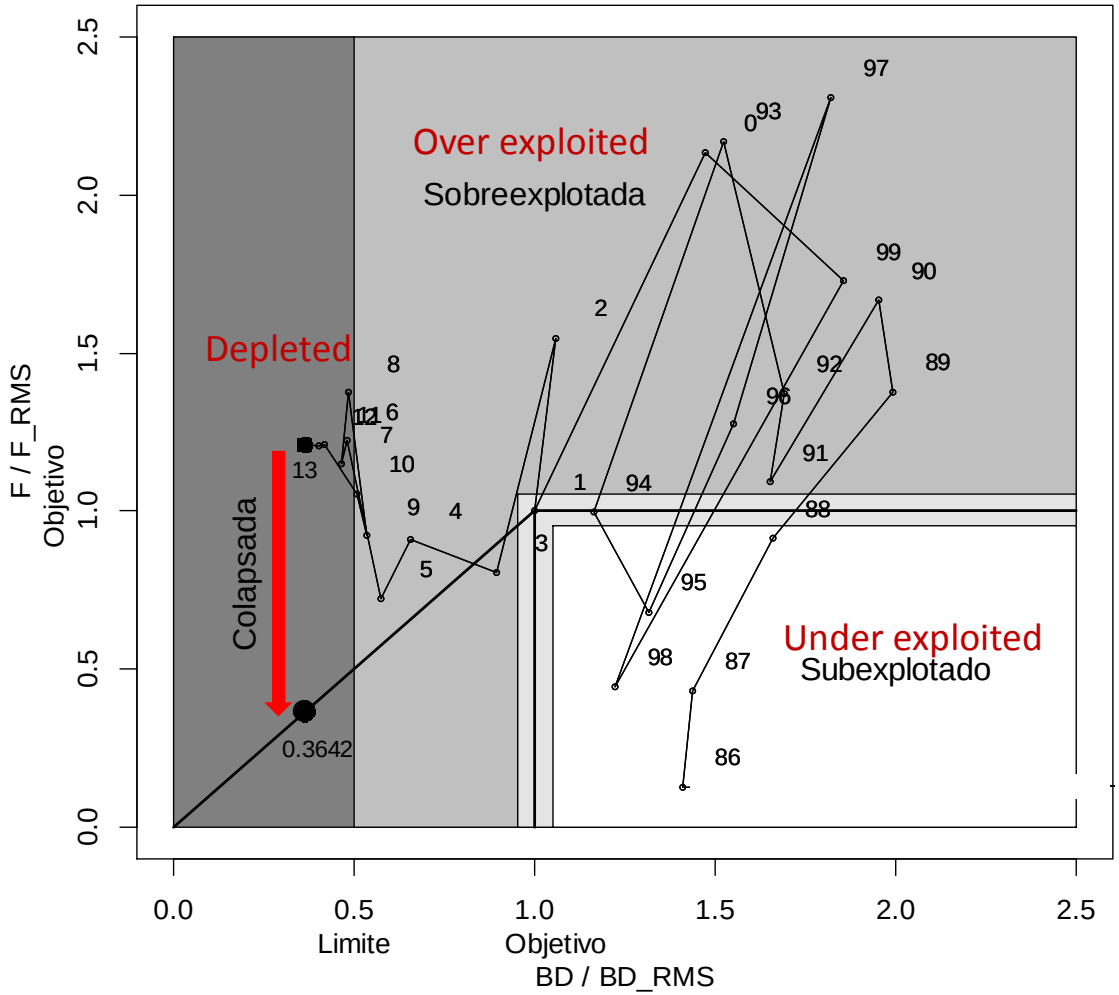
Å7 stocks were underexploited (F<Fmsy and SB>SBmsy).

Å6 stocks were overexploited (F>Fmsy or SB<SBmsy).

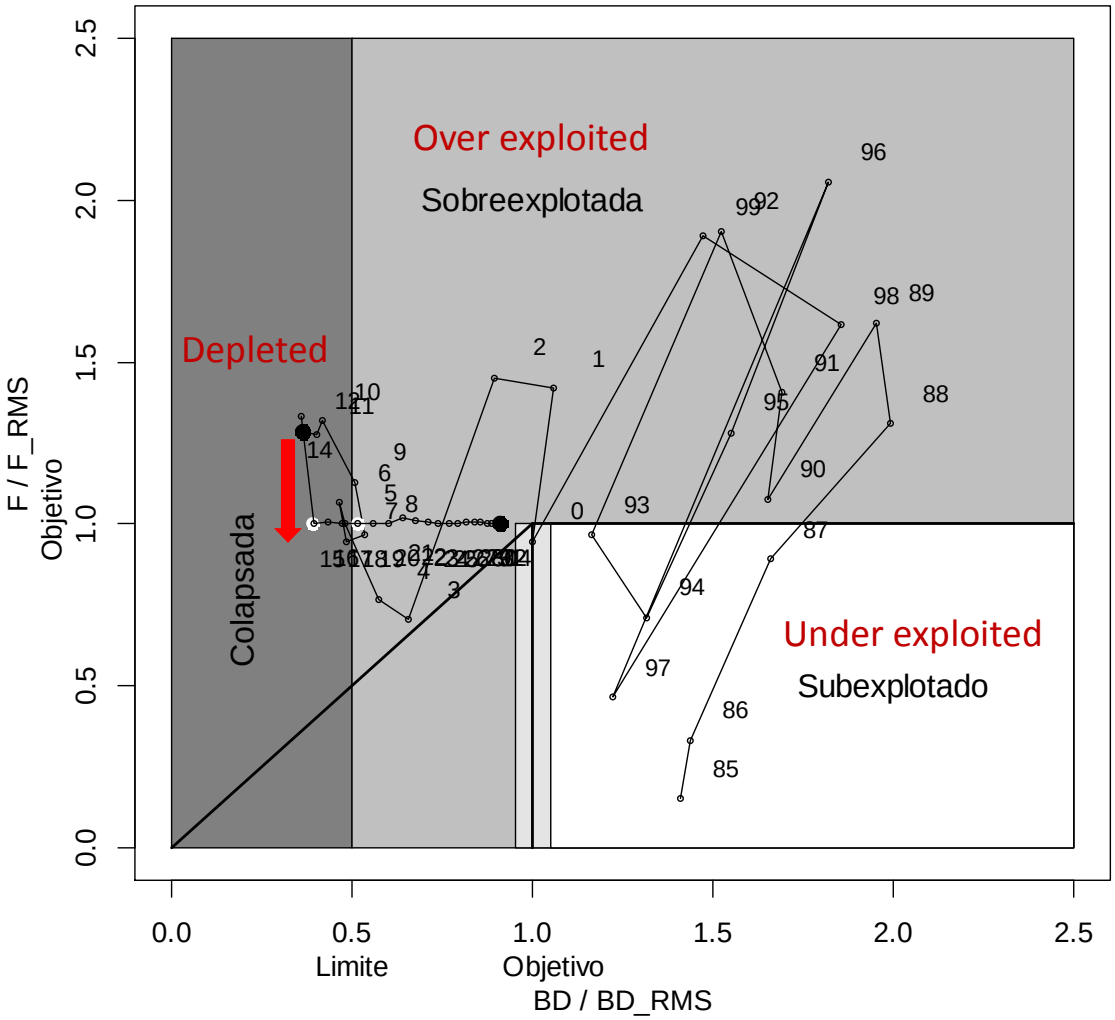
Å6 stocks were depleted (SB<SBlimit).

ÅCFA and UnderSecretary for fisheries established that annual fishing mortality (F_quota) cannot surpass Fmsy in every year (Fquota<=Fmsy).

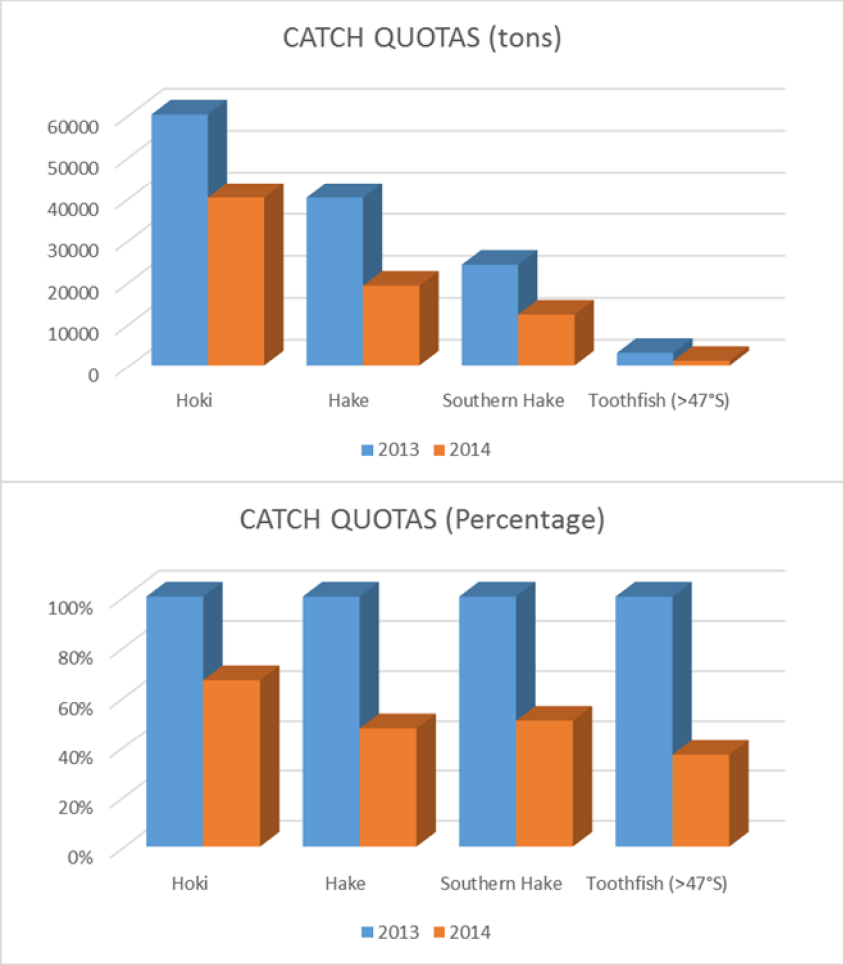
Hoki example: Ramp harvesting rule -> Huge catch reduction->Not applied



Hoki example: Harvesting rule F = F_MSY -> less impact -> applied



Drastic quota reductions (F = F_msy) in several stocks.



STC reduced drastically the annual quotas for overexploited stocks, based on CFA restriction and the BRP project results.

Quota were reduced in just one year for several important fisheries.

Entrepreneurs and fishermen complained against STC for not taking into account social and economic impacts, **unaware that STC cannot set F_quota >Fmsy.**

Industrial and Artisanal fishermen protested

Government implemented a mitigation plan for artisanal fishermen.

- A total of US$ 5 million plan.
- For helping circa 3600 artisanal fishermen.
- Each fisherman received 280 US$/month for 5 months.
- However some fishermen still protest.
- Fishermen have representatives in Management Committees (MC)
- MC should develop management plans in 2015, which should be consulted with STC.

Government applies several others management actions. Examples of ecosystem related actions:

- Reduction of **bird mortalities** (tori lines or bird scaring lines in longline fisheries).
- Monitoring **bycatch and discards**.
- Banning of trawling on vulnerable ecosystem as **seamounts.**
- Creation of the **Largest Marine Reserve in the Americas** (297000 square kilometres), called the Nazca-Desventuradas Marine Park, constitutes about 8% of the ocean areas worldwide that have been declared off-limits to fishing and governed by **no-take protections**.

Conclusion.

- So far implementation of CFA 2012 have been successful.
- BRP project results were accepted by STC.
- CFA 2012 and USF constrains F_quota <= F_MSY.
- STC reduced drastically the annual quotas.
- Fishermen strongly complain against quota reductions.
- Mitigation plan partially stopped fishermen protests.
- Industry and artisanal fishermen representatives should participate in the creation of management plans.

Preliminary evaluation of quota system (CFA 2012).

	Positive effects (+)	Negative effects (-)
Target and limit BRP defined by law	To end discussions about definition of target and limit BRP	
Status Stock definition by law	To end discussions about stock status definition	
Quota bounded by STC Quota Range 80-100%	To restrict government quota decision	
Management and recovery plans	To coordinate government, fishing industry and artisanal fishermen	
F_quota <= F_MSY		Drastic and quick quota reduction Social and economic impacts Increase of discards and unreported catches
Recovery plans	Recovery SB to SB_MSY	Recovery time no defined by law. Maximum time when F_quota = F_MSY

THE END

BRP workshops participants. Thank you