



Food and Agriculture
Organization of the
United Nations



WECAFC-FIRMS Data workshop

BELIZE, an overview on the
Fisheries and Marine Resources inventory

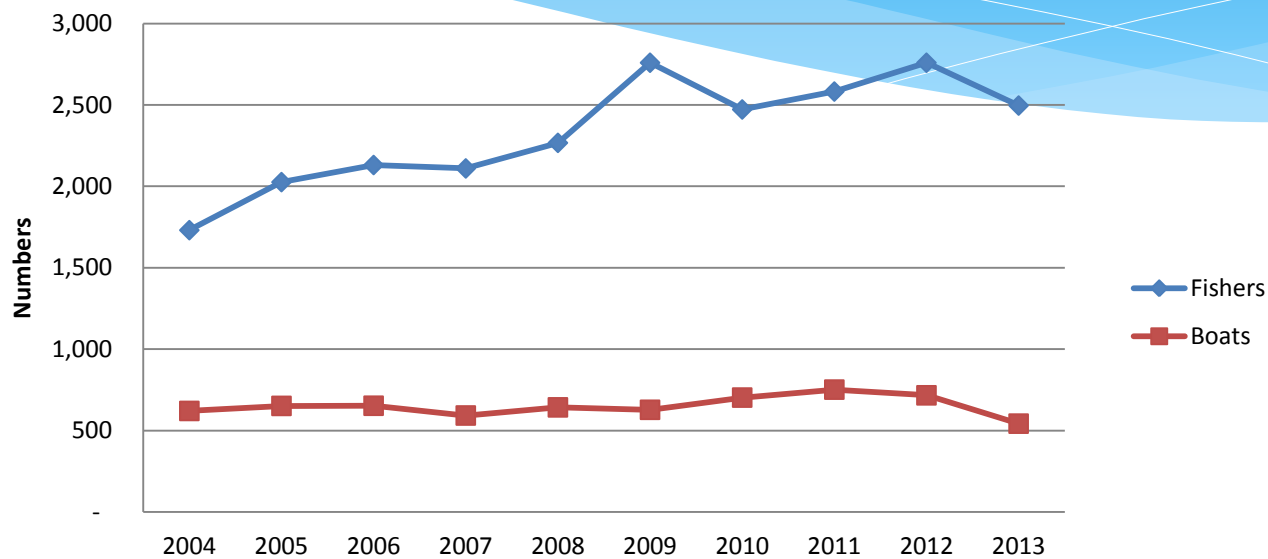
Issues, challenges and lessons learned focusing to data collection, data gaps and deficiencies, and capacity

Ramon Carcamo
Fisheries Officer
BELIZE FISHERIES DEPARTMENT 2016

Profile of fisheries and marine resources for BELIZE

Geographical overview	Marine surface	< 23,660 square kilometres >
	National boundaries	Mexico (North), part of Central America & East the Caribbean sea.
Maritime Domain	Main international agreements	<CITES, SPAW, OSPESCA REGIONAL REGULAITONS (lobster & sharks), ICCAT, others >
	Joint management plans	< OSPESCA- REGIONAL POLICY, >
General figures on production sector	Catches	< 1.2 million LBS , valued at US \$ 12 million >
	employments	< 15,000 >
Available fisheries in the country	National fleet	< approx. 600 >
	Foreign fleet	< ?? >
Stocks assessed		Spiny lobster (2003, 2007 & 2009)
Trends and issues		<fully matured commercial fisheries>

Number of Fishers & Boats



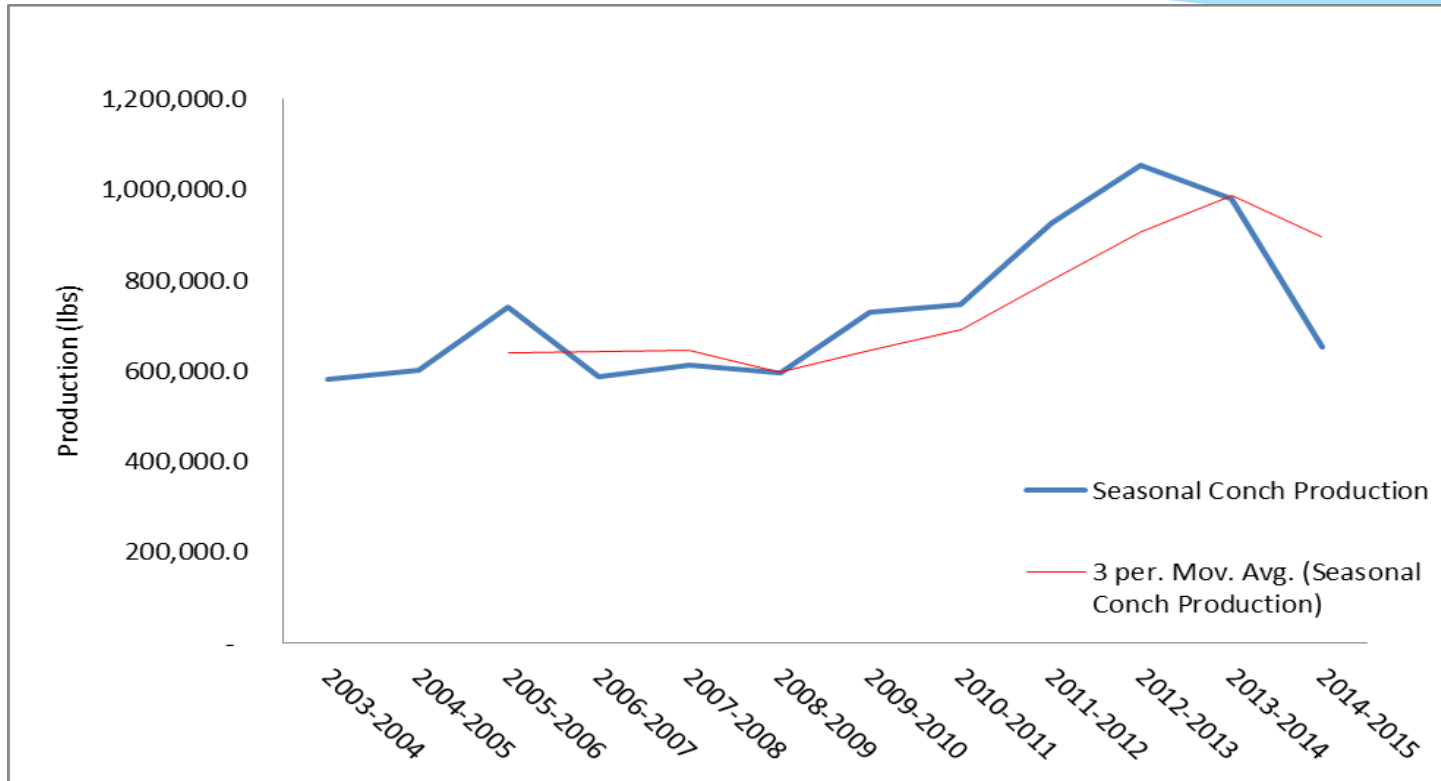
2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
1,731	2,026	2,131	2,110	2,267	2,759	2,472	2,582	2,759	2,496
621	652	653	593	643	628	703	752	717	543

Conch fishery

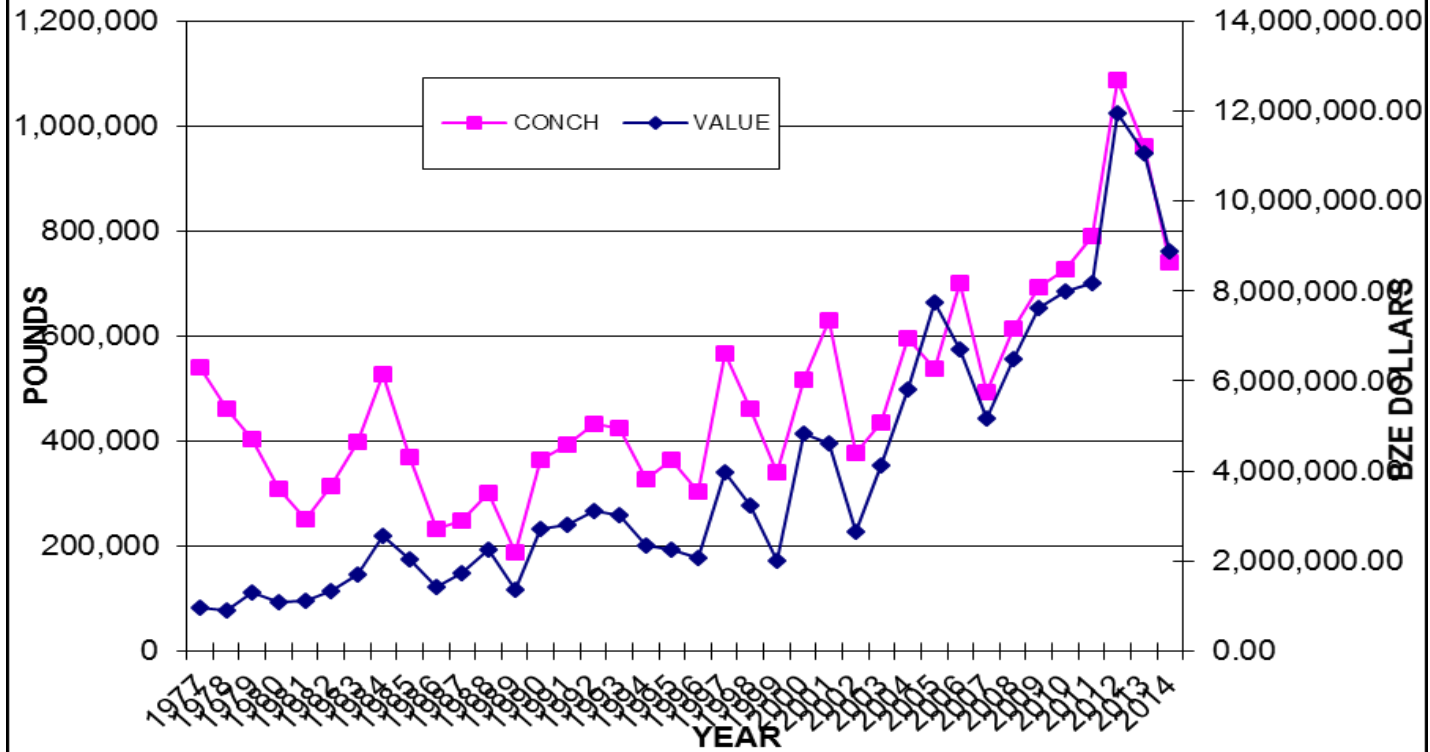
Description of the fishery

- Conch is harvested by skin-diving only at depths ranging from 5 - 90 feet along the barrier reef, patch reefs, reef lagoon and in the 3 atolls.
- * Size of fishing vessels between 16 to 40 feet in length and vessels divided into two main types: outboard motor powered skiffs and sailing boats (can carry up to 8 fishermen).
- * Sailing boats (equipped with ice boxes for product storage) use small outboard engines (15-40 Hp).
- * Fishing trips last from 6 – 10 days.





CONCH MEAT EXPORT IN POUNDS AND VALUE IN BZE \$ FOR 1977-2014



MANAGEMENT MEASURES FOR CONCH IN BELIZE

Minimum Size

- Market clean conch weight should exceed 3 ounces or 85g
- The shell length should exceed 7 inches or 18 cm

Closed Season

- From 1 Jul -30 Sept

OTHER MEASURES

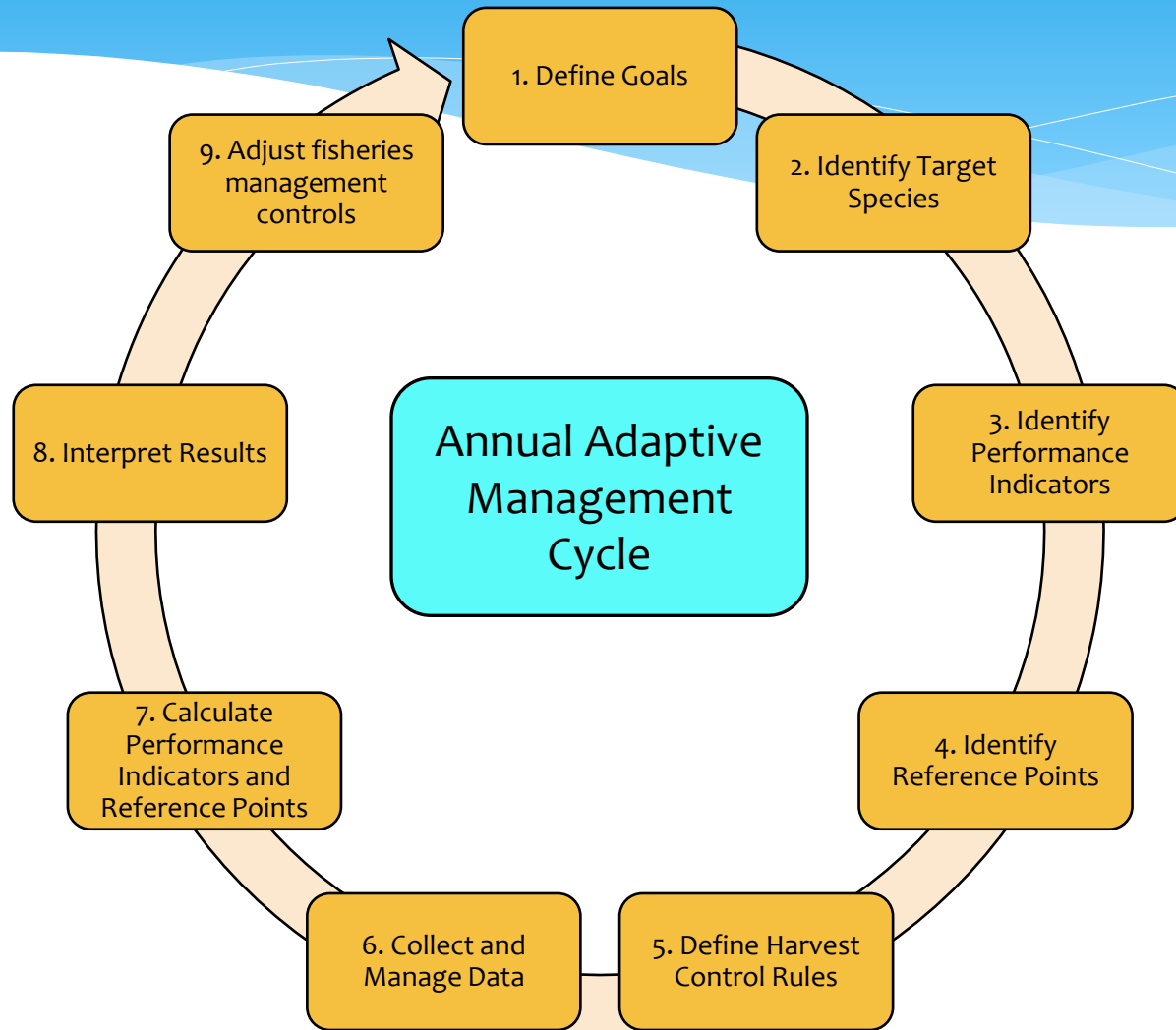
- ✓ Quota System
- ✓ Gear restrictions (No SCUBA diving)
- ✓ Area closure (8 marine reserves)
- ✓ Diced conch is prohibited
- ✓ Managed Access Programme
- ✓ Conch Management Plan

Issues for conch fishery

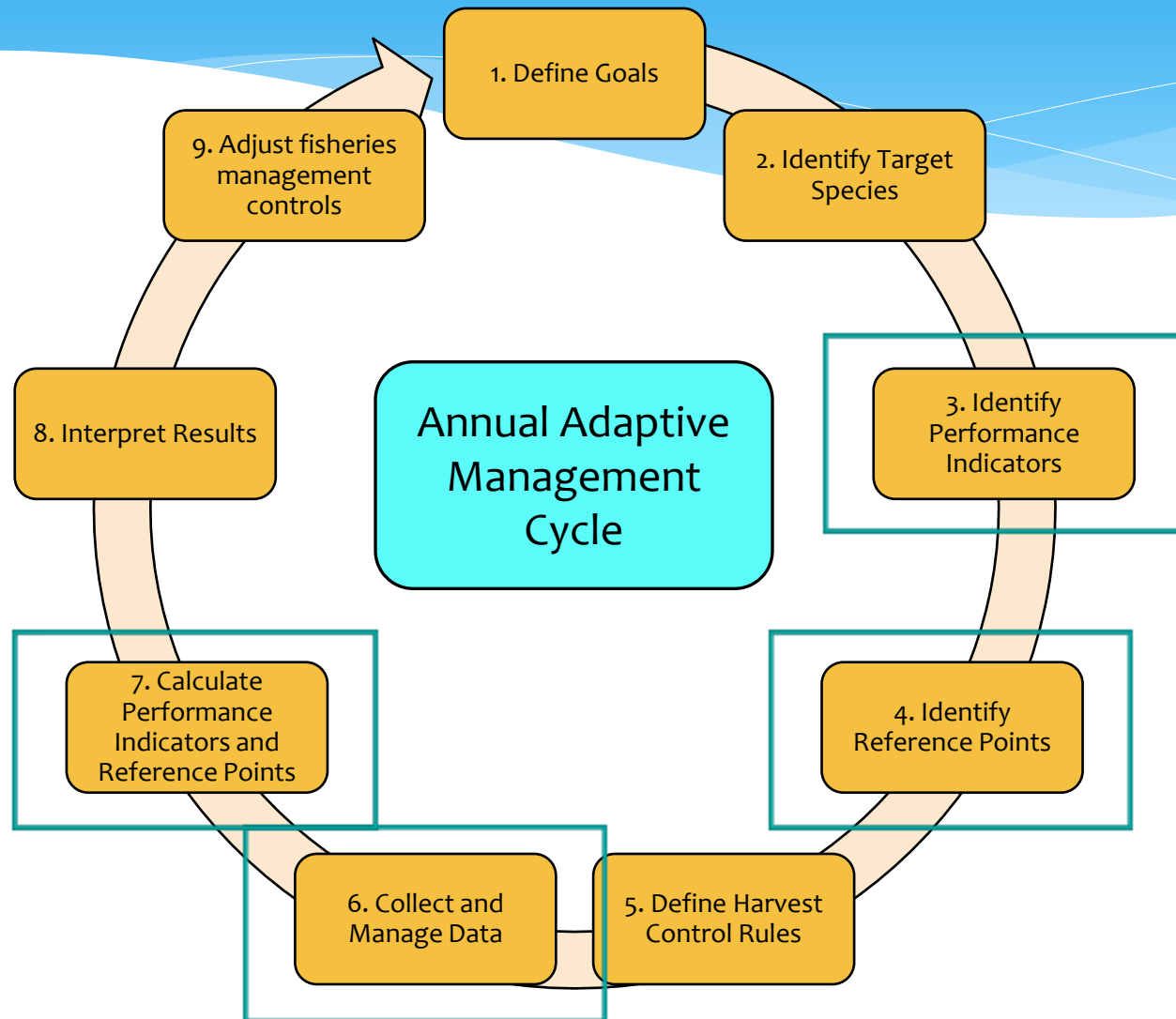
- * Unable to quantify the Total landings of Conch due to that landings are now diverted to other markets, restaurants and etc.
- * Hard to quantify the illegal poaching and exportation of conch meat, which affects the Quota system in place.
- * Unable to determine the Deep water stock.
- * Do not have a formal data base necessary to manage data that is gathered from the different research efforts.
- * Limited financial resources to buy fuel and equipment to conduct long term monitoring.
- * No historical socio-economic data

Lessons learned

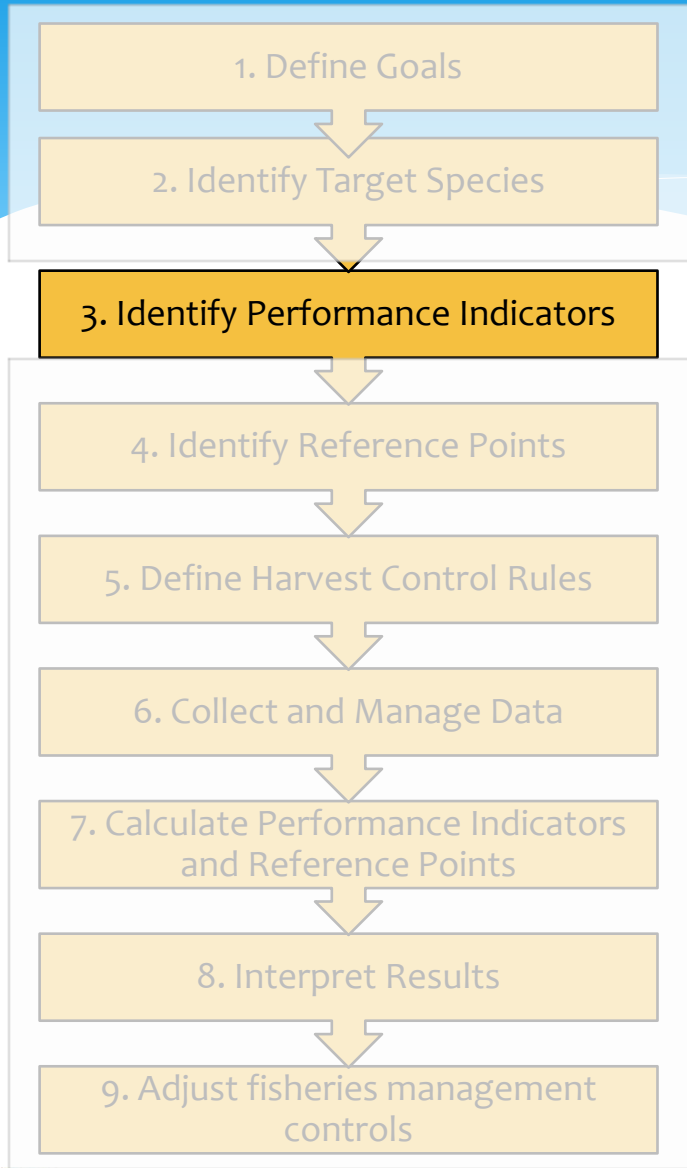
Belize Adaptive Management Framework



Belize Adaptive Management Framework



Step 3: Identify performance indicators



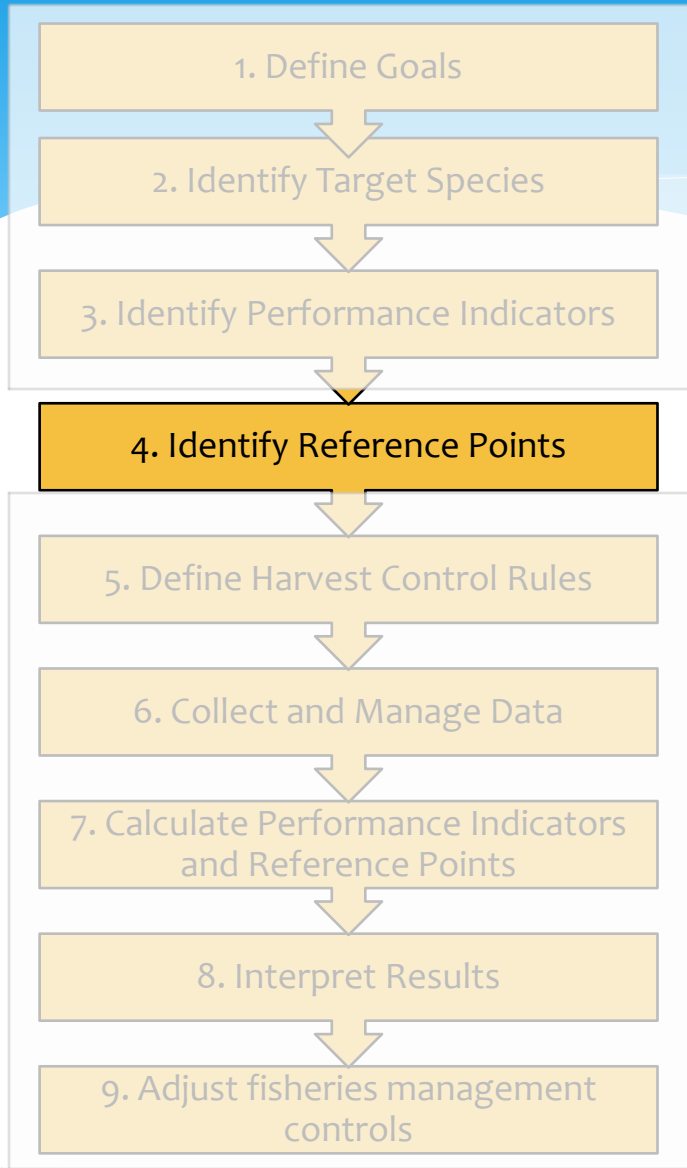
Conch

Performance Indicator	Current Data Source
Pre-season adult and sub-adult patch density	National fishery independent conch survey
Previous season's total catch	National co-op data
Pre-season average shell length	National fishery independent conch survey
Early and late season CPUE	National co-op data

Lobster

Performance Indicator	Current Data Source
Early and late season CPUE	National co-op data
Previous season's total catch	National co-op data
Previous season's average tail weight	National co-op data

Step 4: Identify reference points



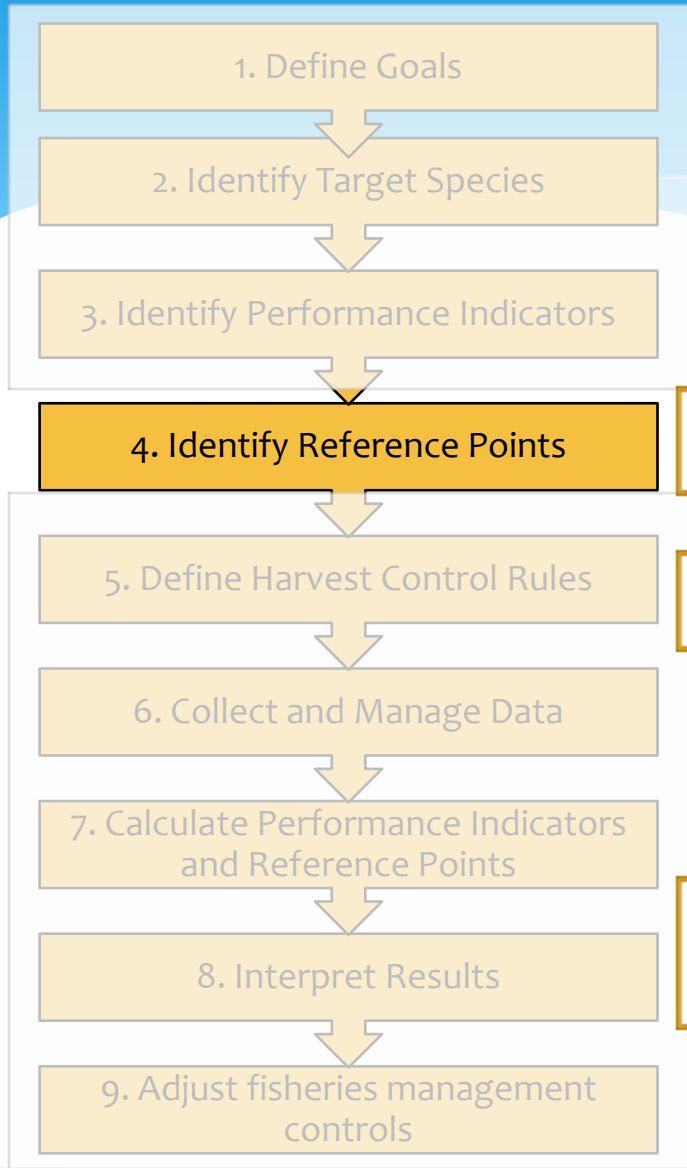
Conch

Performance Indicator	Reference Point
Pre-season adult and sub-adult patch density	Target – Average over 2001-2010 Limit – 88 individuals/Ha
Previous season's total catch	Average over 2001-2010
Pre-season average shell length	Average over 2001-2010
Early and late season CPUE	Average over 2001-2010

Lobster

Performance Indicator	Reference Point
Early and late season CPUE	Average over 2001-2010
Previous season's total catch	Average over 2001-2010
Previous season's average tail weight	Average over 2001-2010

Step 4: Identify reference points



Conch

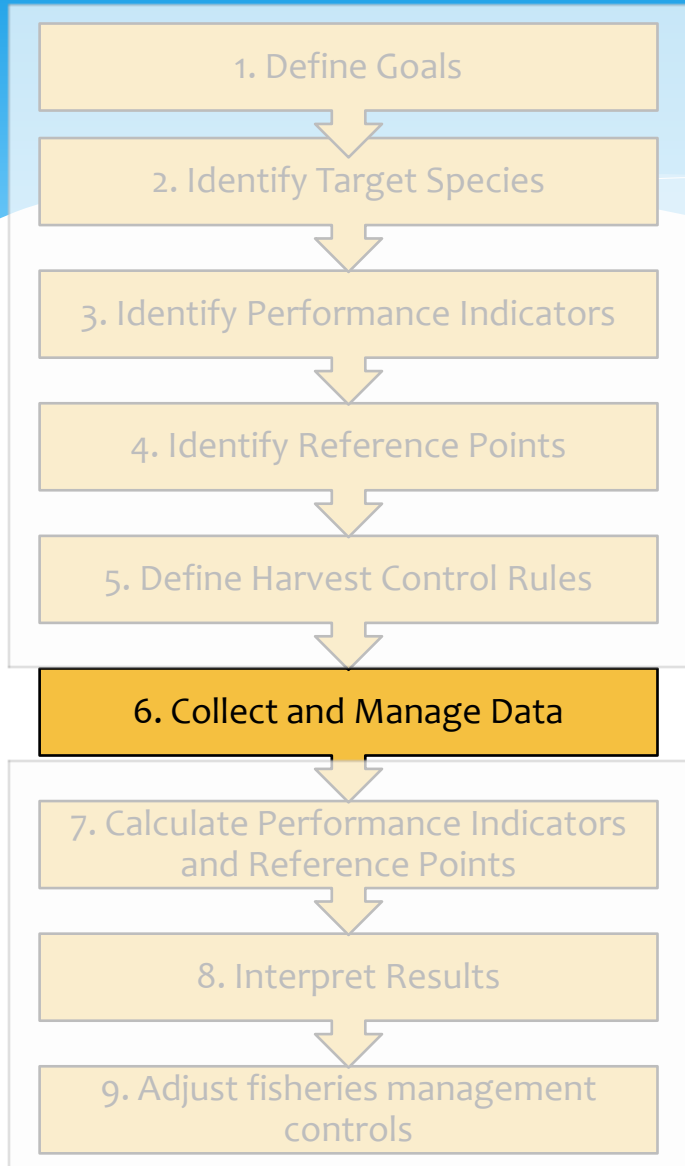
Performance Indicator	Reference Point
Pre-season adult and sub-adult patch density	Target – Average from 2001-2010 Limit – 88 individuals/Ha
Previous season's total catch	Average over 2001-2010
Pre-season average shell length	Average over 2001-2010
Early and late season CPUE	Average over 2001-2010

Lobster

Performance Indicator	Reference Point
Early and late season CPUE	Average over 2001-2010
Previous season's total catch	Average over 2001-2010
Previous season's average tail weight	Average over 2001-2010

Step 6: Collect and manage data

Microsoft Access Database With data entry form



CPUE Data Entry Form - Lobster and Conch

Close

ID: (Auto)

Voucher: Date: Location:

DAY: Month: Year: Days Fished:

Area:

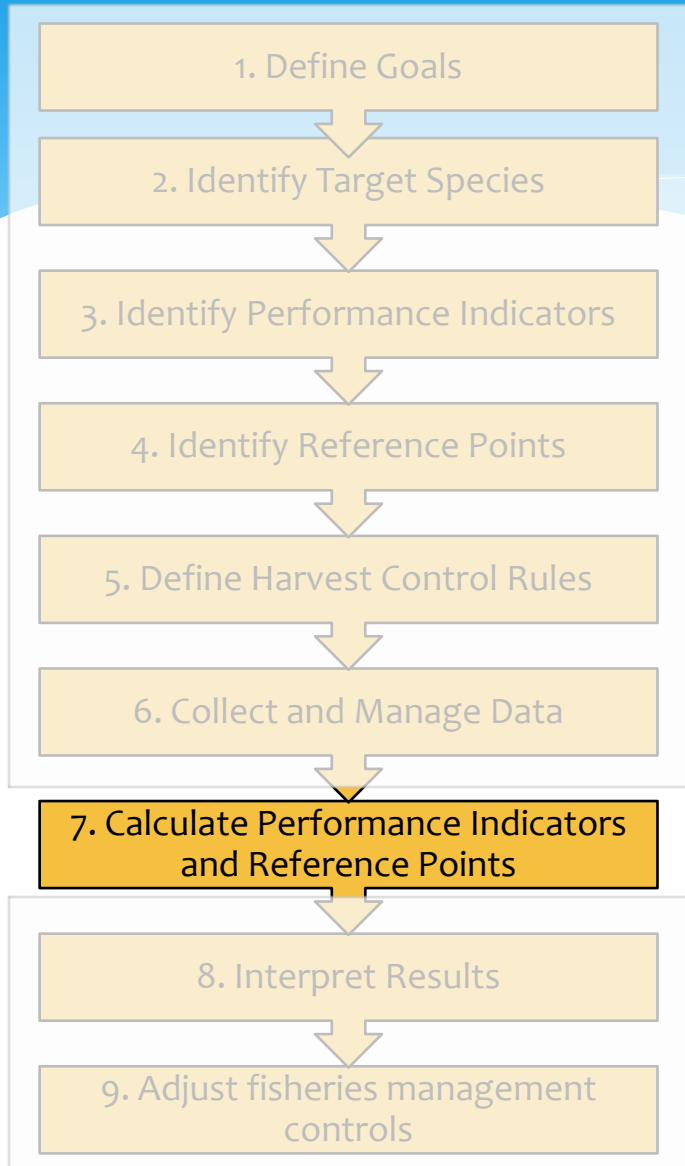
Lobster Tails: Lobster Meat: Whole Lobster: Conch: Conch Meat:

Fisherman name: Boat name: Type of Boat:

Add Save

← → ↻

Step 7: Calculate performance indicators and reference points



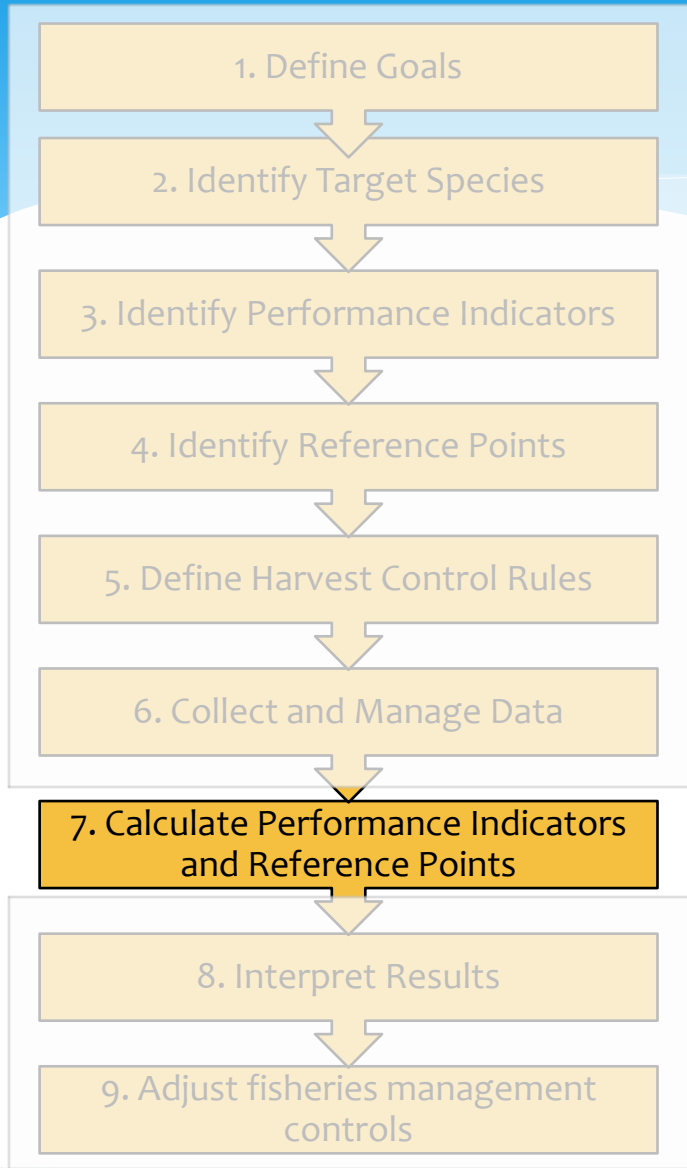
```
coopCode_BFD.R
Source on Save
Run
Source

73 # Calculate Reference Points
74 earlyCPUE = vector()
75 lateCPUE = vector()
76 earlyCPUE2 = vector()
77 CPUEdepletion = vector()
78 seasonCatch = vector()
79 for (i in 1:length(seasons))
80 {
81   subsetData=subset(filteredData,season==seasons[i])
82   subsetDataEarly=subset(filteredData,season==seasons[i] & month==earlySeason)
83   subsetDataLate=subset(filteredData,season==seasons[i] & month==lateSeason)
84   subsetDataEarly2=subset(filteredData,season==seasons[i] & month %in% earlySeason2)
85   earlyCPUE[i]=mean(subsetDataEarly$CPUE,na.rm=TRUE)
86   earlyCPUE2[i]=mean(subsetDataEarly2$CPUE,na.rm=TRUE)
87   lateCPUE[i]=mean(subsetDataLate$CPUE,na.rm=TRUE)
88   CPUEdepletion[i]=(1-lateCPUE[i]/earlyCPUE[i])*100
89   seasonCatch[i]=sum(subsetData$weight)
90 }
91 earlyCPUEMean=mean(earlyCPUE,na.rm=TRUE)
92 earlyCPUE2Mean=mean(earlyCPUE2,na.rm=TRUE)
93 CPUEdepletionMean=mean(CPUEdepletion,na.rm=TRUE)
94 seasonCatchMean=mean(seasonCatch,na.rm=TRUE)
95
96 plot(seasonCatch~seasons,xlab="Year",ylab="Total Seasonal Catch (lbs)",main=paste(species,"Total Seasonal Catch (lbs)"),
97       abline(h=seasonCatchMean))
98
99
```

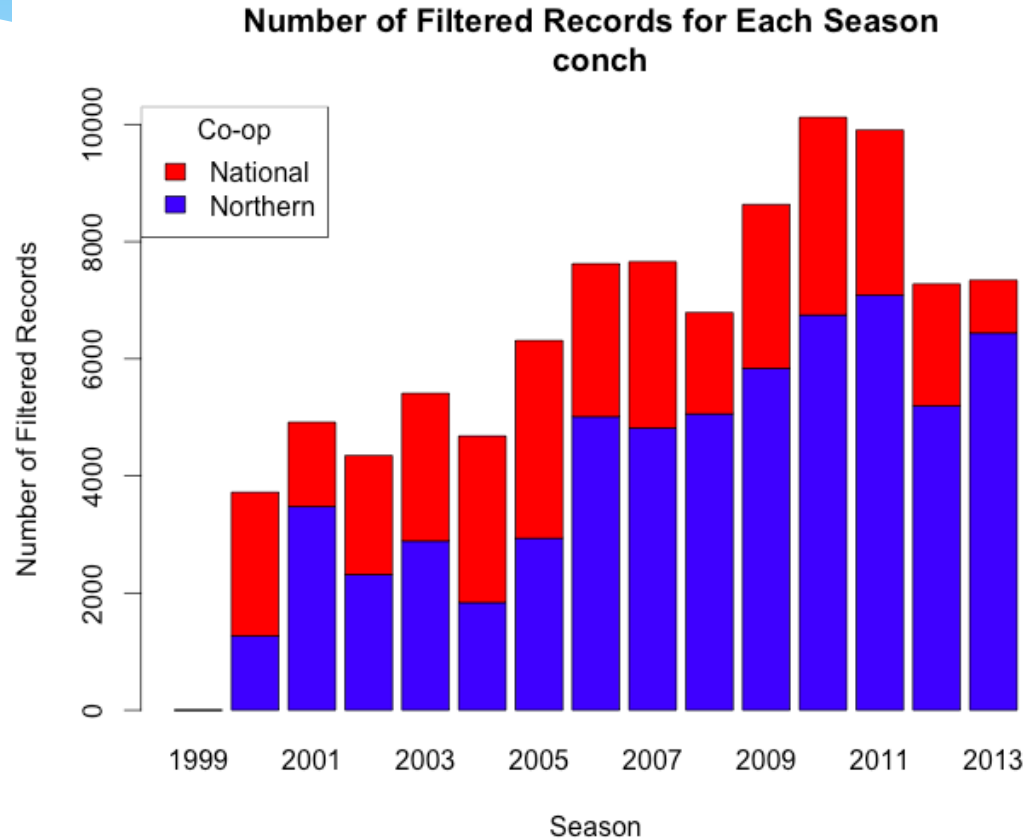
Options:

- Species
- Years over which average is calculated
- Remove certain years from analysis
- Upper limit CPUE filter
- Calculate CPUE as median or mean
- How many months to use for early-season calculation
- Filter out trips where species other than conch or lobster were caught

Step 7: Calculate performance indicators and reference points

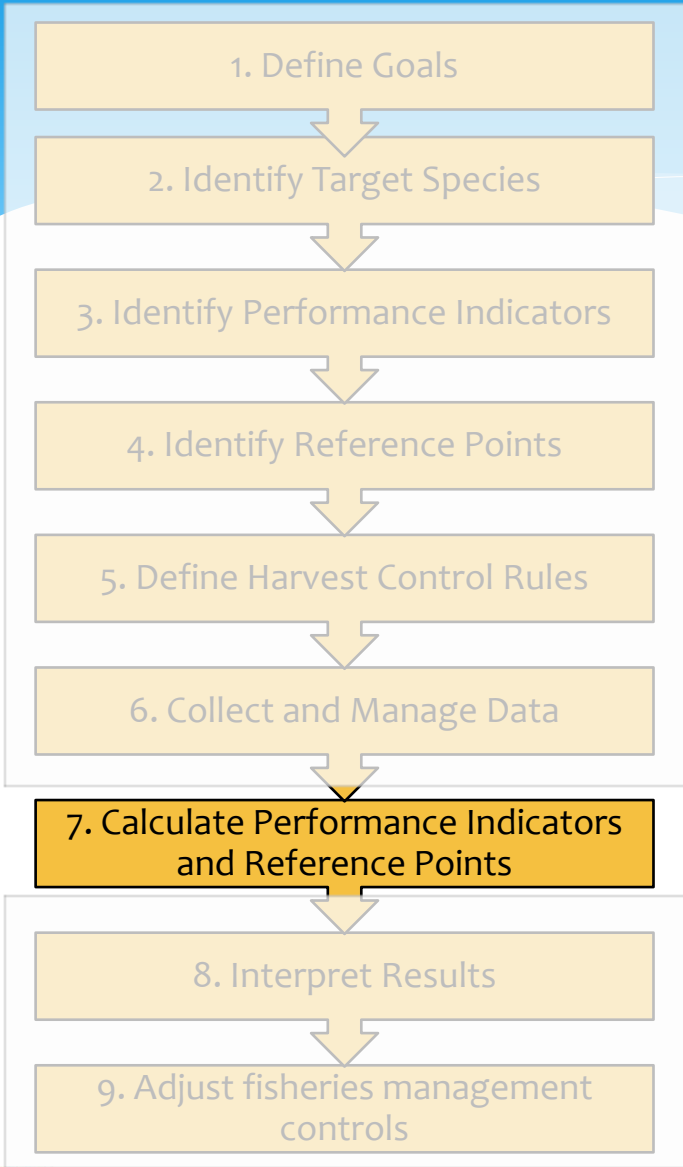


Conch

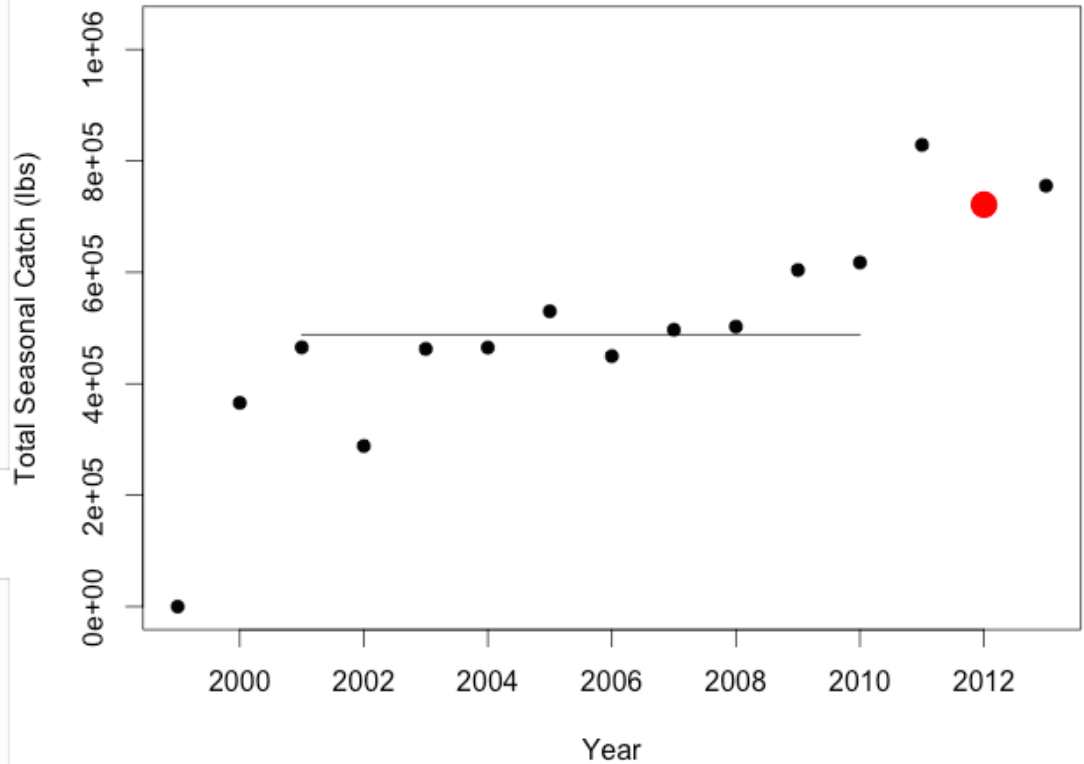


Step 7: Calculate performance indicators and reference points

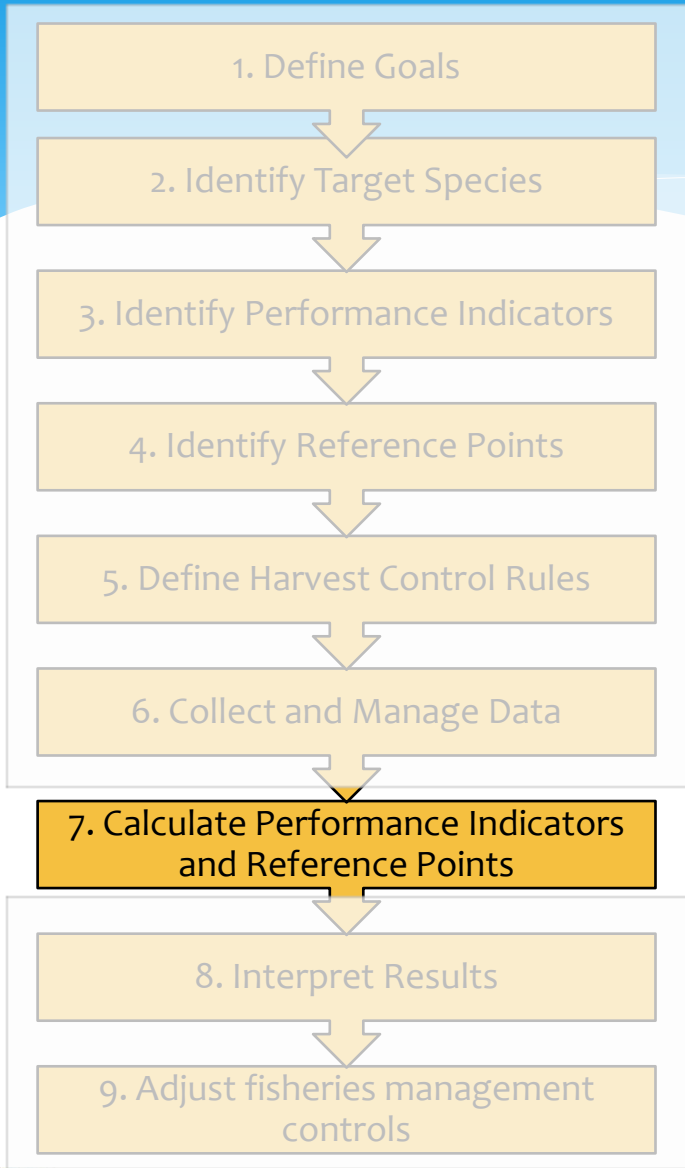
Conch



conch Total Season Catch (lbs)
Average value (Reference Point 2001 - 2010) = 488227
2012 value (Performance Indicator) = 721500

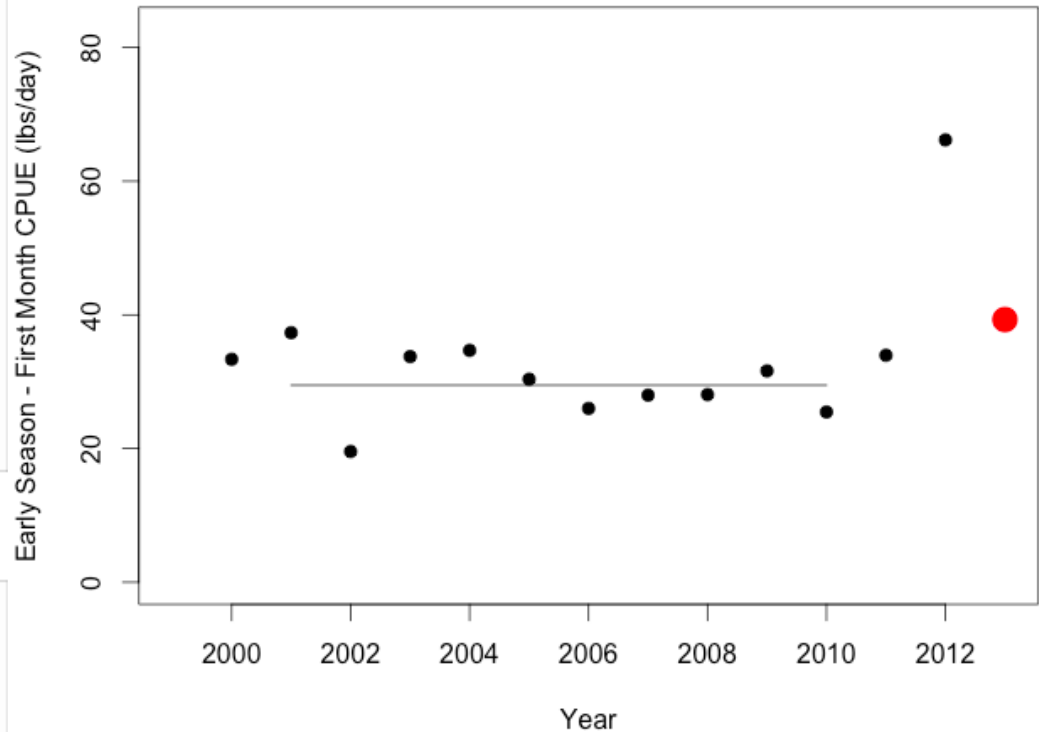


Step 7: Calculate performance indicators and reference points

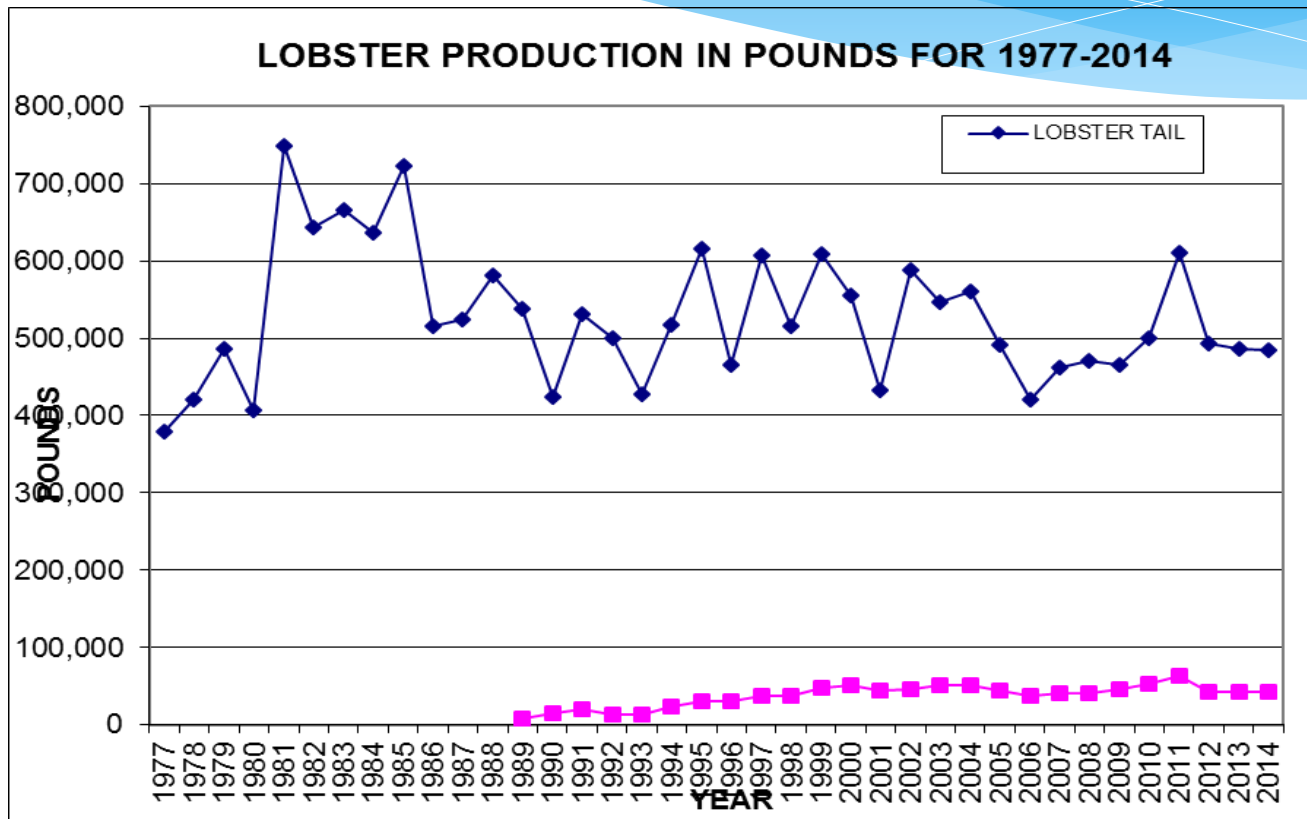


Conch

conch Early Season - First Month CPUE (lbs/day)
Average value (Reference Point 2001 - 2010) = 29.48
2013 value (Performance Indicator) = 39.29

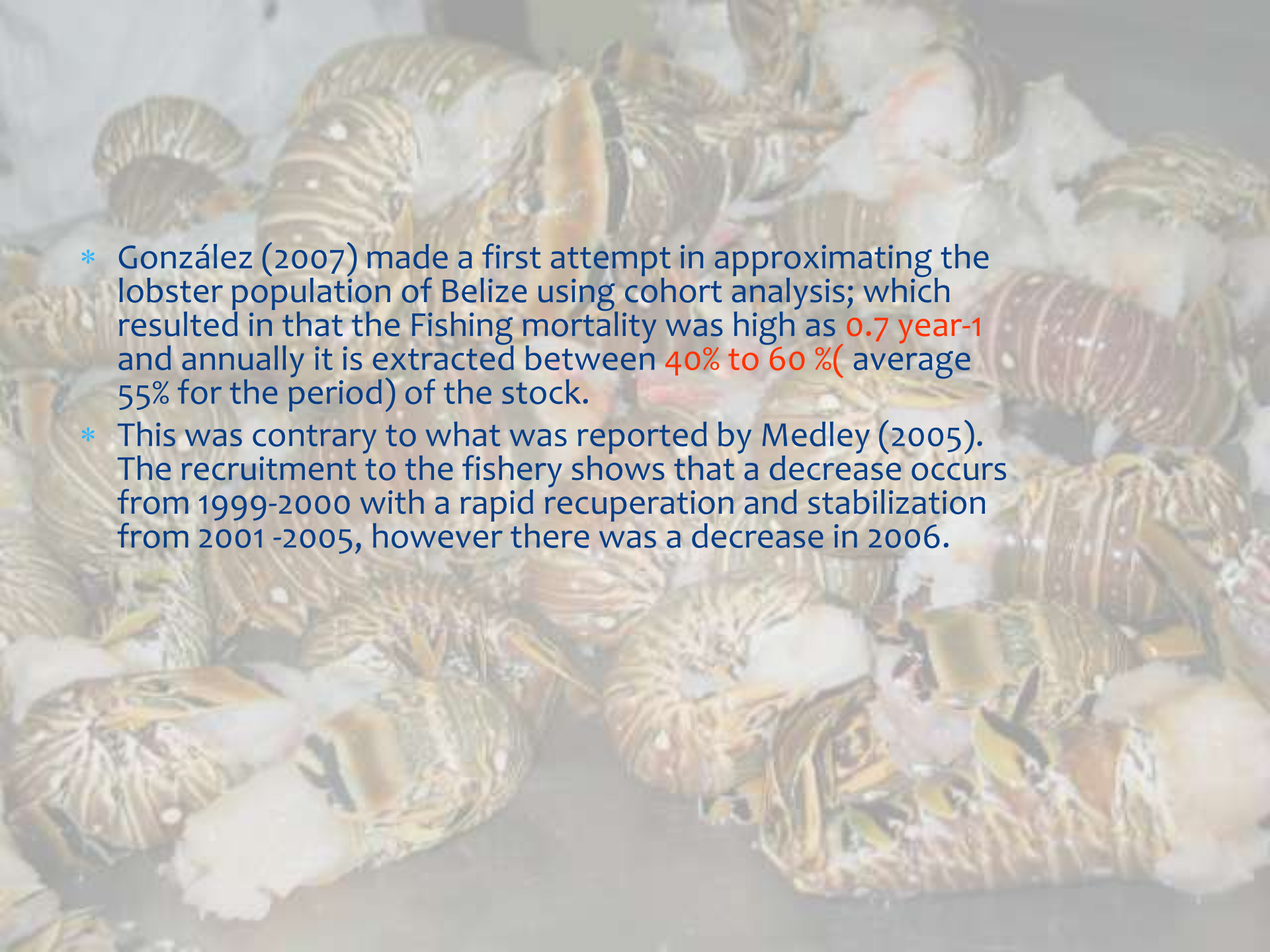


Lobster fishery



In 2014 the fishing cooperatives exported 452,930 lbs. of lobster tails to the U.S.A. valued at \$13.6 M Bze. This showed an increase in export weight of 12.4 % and an increase in foreign exchange earnings of 9.1 % compared to 2013

- * In Belize, the lobster fishery employs over 2,000 fishermen mainly from coastal communities such as Sarteneja, Hopkins Village, Monkey River Village, Copper Bank and others.
- * Medley (2005) indicated the spiny lobster (*Panulirus argus*) stock in Belize appears to be heavily exploited. This is suggested by the relatively high fishing mortality estimated for this fishery. However, it is suspected that this may only apply to a **proportion of the stock** and therefore the overall state of the stock remains **uncertain**.

- 
- * González (2007) made a first attempt in approximating the lobster population of Belize using cohort analysis; which resulted in that the Fishing mortality was high as **0.7 year⁻¹** and annually it is extracted between **40% to 60 %**(average 55% for the period) of the stock.
 - * This was contrary to what was reported by Medley (2005). The recruitment to the fishery shows that a decrease occurs from 1999-2000 with a rapid recuperation and stabilization from 2001 -2005, however there was a decrease in 2006.

Lobster management measures in Belize

Lobster regulations

- Minimum size (minimum carapace length is 3 inches or 7.6 cm, minimum tail weight is 4 ounces or 113.4 g).
- Closed season (15 Feb to 14 June).
- Prohibition of possession of diced lobster tail meat.
- No commercial deep water fishing is allowed.
- Prohibition of lobster fishing with SCUBA gear.
- Coastal network of 8 marine reserves.
- No lobster traps are allowed beyond the barrier reef.
- No lobster traps are allowed within a distance of 300 m from any coral formation.
- It is prohibited to capture “berried” or egg bearing lobsters, lobsters with “tar” spot and molting lobsters.

Other management measures

- * Lobster Management Plan.
- * National Managed Access Programme.
- * Data sharing with Statistical Institute of Belize (S.I.B), Belize Central Bank, fishing cooperatives, NGOs and other Departments.

National expansion



• Nine proposed Managed Access areas

- * Reflects current patterns of fishing to reflect traditional use of resources
- * Reinforces Belizean sovereignty over maritime region by establishing user rights for Belizean fishermen

Data and Monitoring – Log Books

- Fishery-dependent data log books combined with audits from managers
 - account for 100% mortality and submit data

Belize Fisheries Department

DAILY CATCH LOG BOOK

Vessel Name: _____

Serial Number: 10001-10020

MANAGED ACCESS: SUSTAINABLE FISHING,
SECURE LIVELIHOODS



Vessel Name	Fishery Product	Species Code	Species Name	Quantity	Unit	Serial
3 (Sanja Alva)	Clupea	00000000	Free Fish	10	kg	0110
4 (Sanja Alva)	Clupea	00000000	Free Fish	10	kg	0110



FISHERMAN NAME	FISHERY PRODUCT	TYPE OF FISH	FISHING METHOD	PROCESSED CATEGORY	QUANT. (NO.)	LBS.
John Doe	Lobster	Lobster	Dive	T	10	3.5
	Snapper	Mutton	Handline	F	15	6
	Grouper	Jew Fish	Handline	F	6	3.5
Juan Bayman	Queen Conch	Conch	Dive	MC	35	11
	Barracuda	Barracuda	Handline	W	6	22

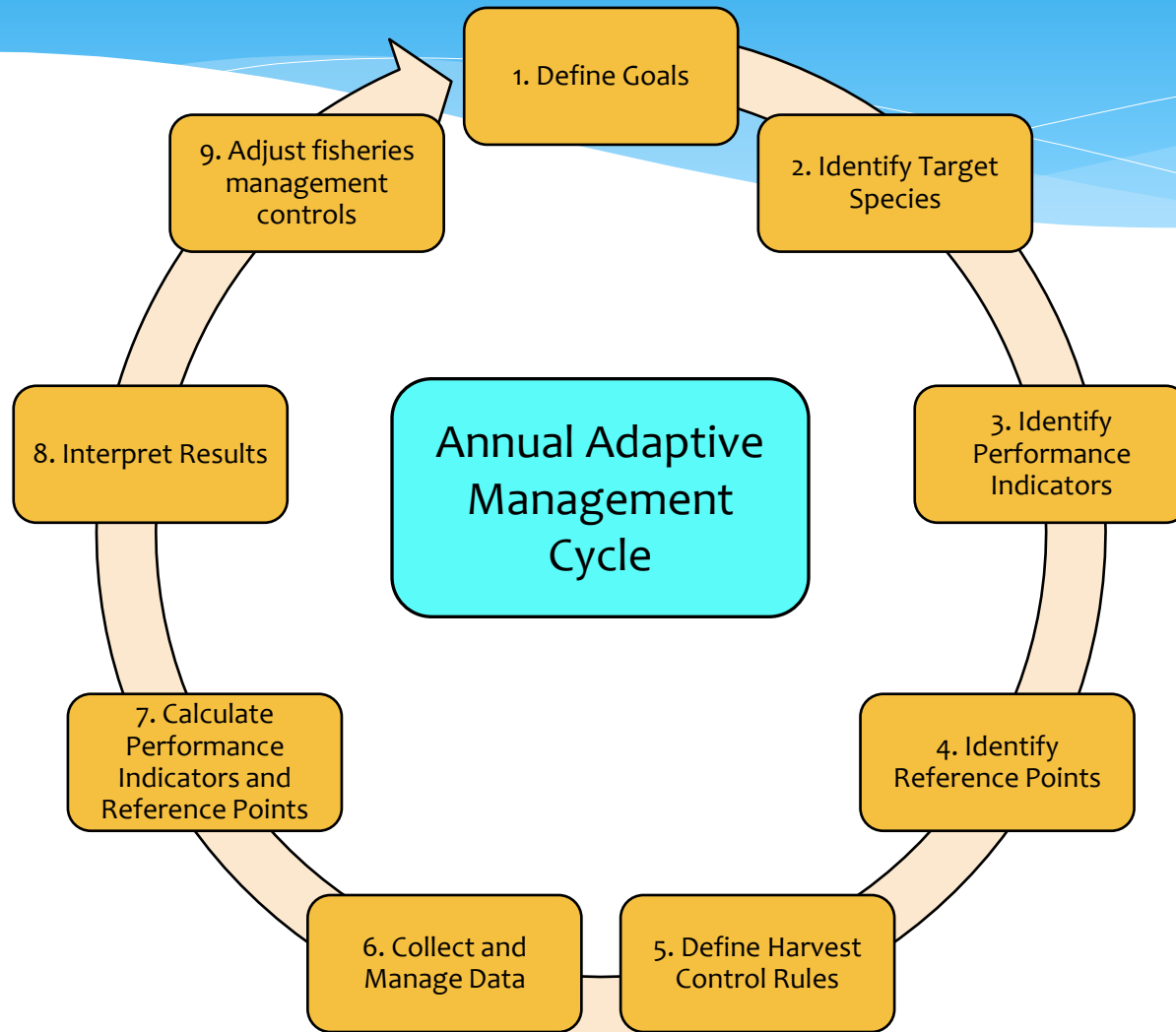
Management	Before Managed Access	After Managed Access
Access to Fishery	Open access. No controls on number of fishermen or where they fish.	Limited access based on eligibility. Zoning of fishing areas.
Enforcement and Compliance	Loose, ad hoc regulations. Lack of cooperation between fishermen and fishery managers.	More cooperation. Stricter enforcement under a “three strikes” policy. Number of infractions declining.
Monitoring	Fishermen not collecting data	100% data collection of fishery catches. required Socioeconomic surveys.
Community Involvement	Fishermen were consulted and informed	Fishermen are actively involved in making management decisions through Managed Access Committees
Catch Limits	National quota for conch divided between three cooperatives on a monthly basis.	Authorized and supported by government in managed access areas

Issues for Lobster fishery

- * Unable to quantify the Total landings of lobster due to that landings are now diverted to other markets, restaurants and etc.
- * Hard to quantify the illegal poaching and exportation of lobster.
- * Unable to determine the Deep water stock.
- * Do not have a formal data base necessary to manage data that is gathered from the different research efforts.
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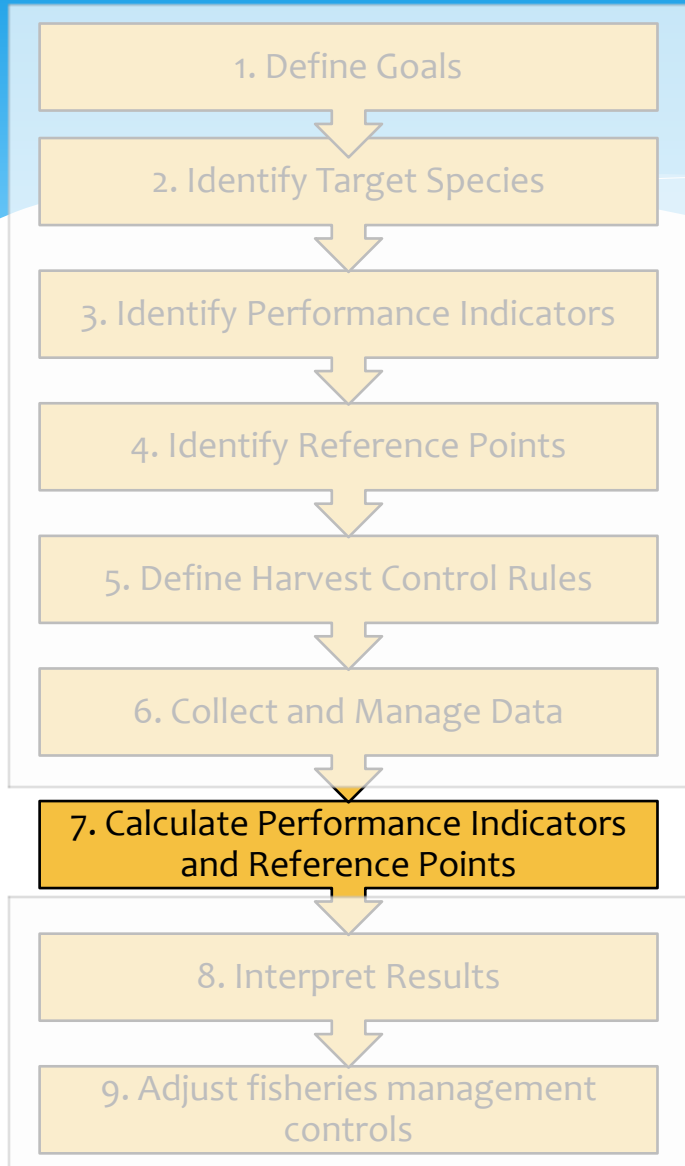
Lessons learned

Belize Adaptive Management Framework

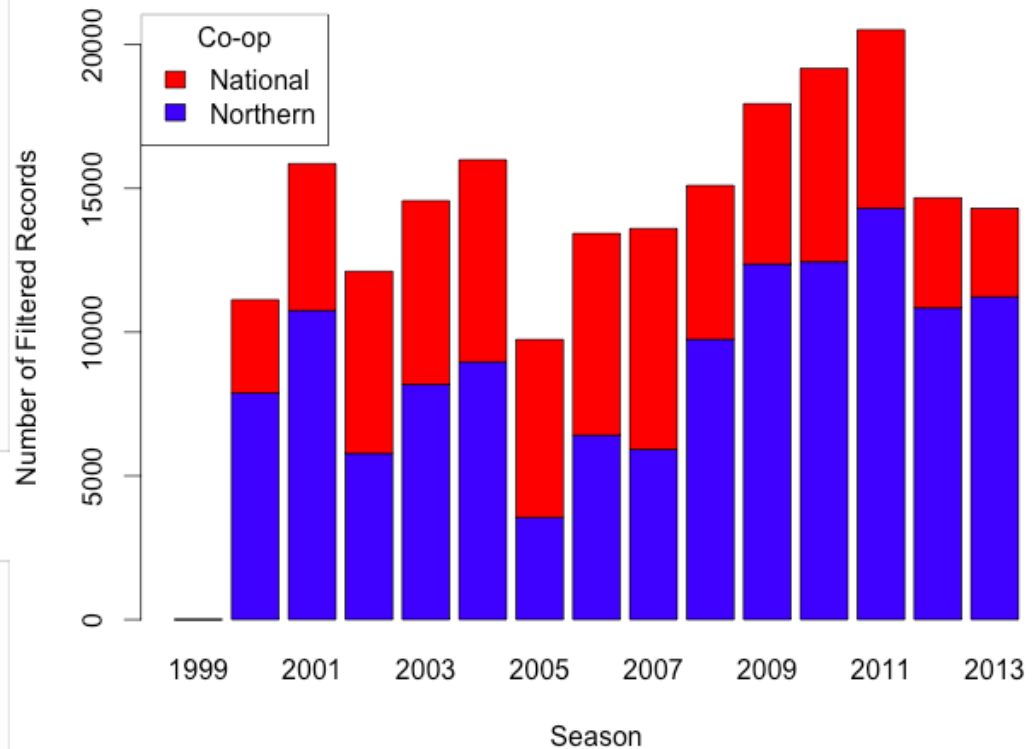


Step 7: Calculate performance indicators and reference points

Lobster

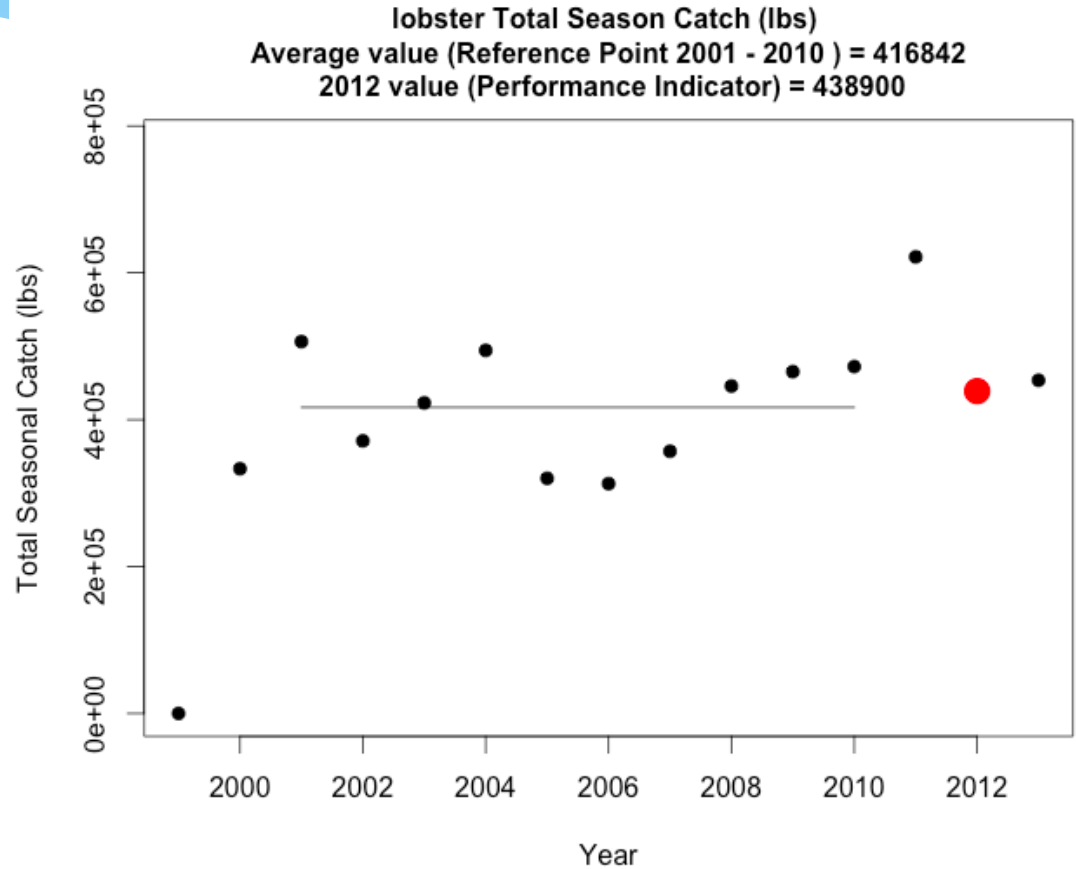
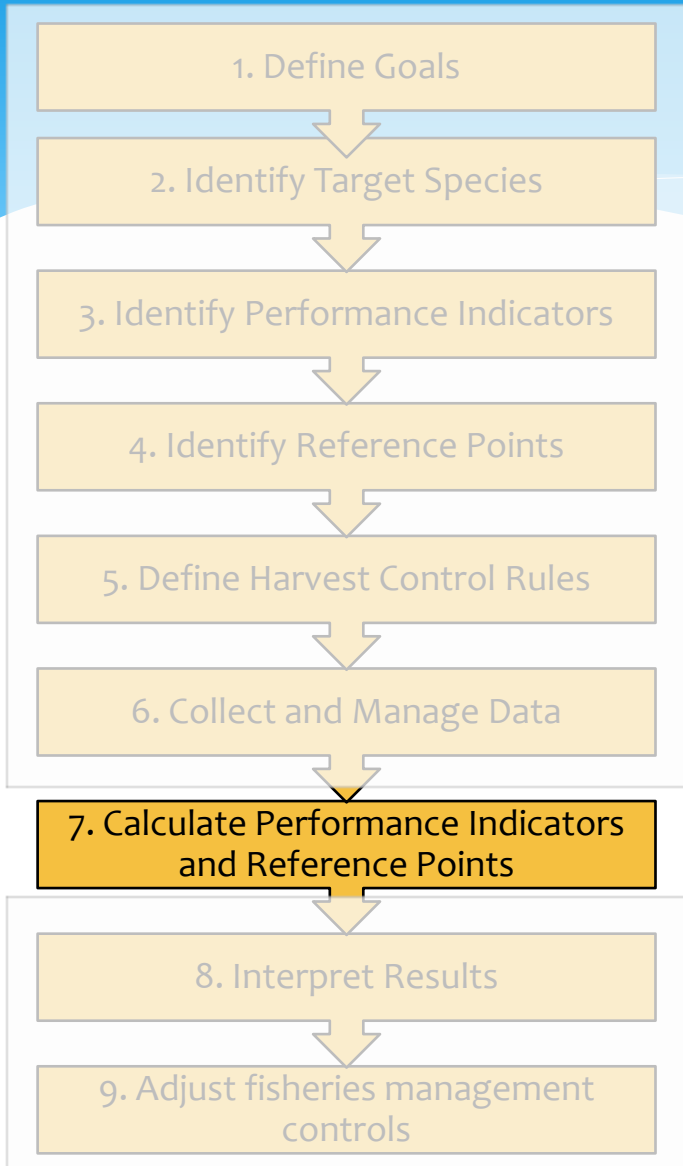


Number of Filtered Records for Each Season lobster



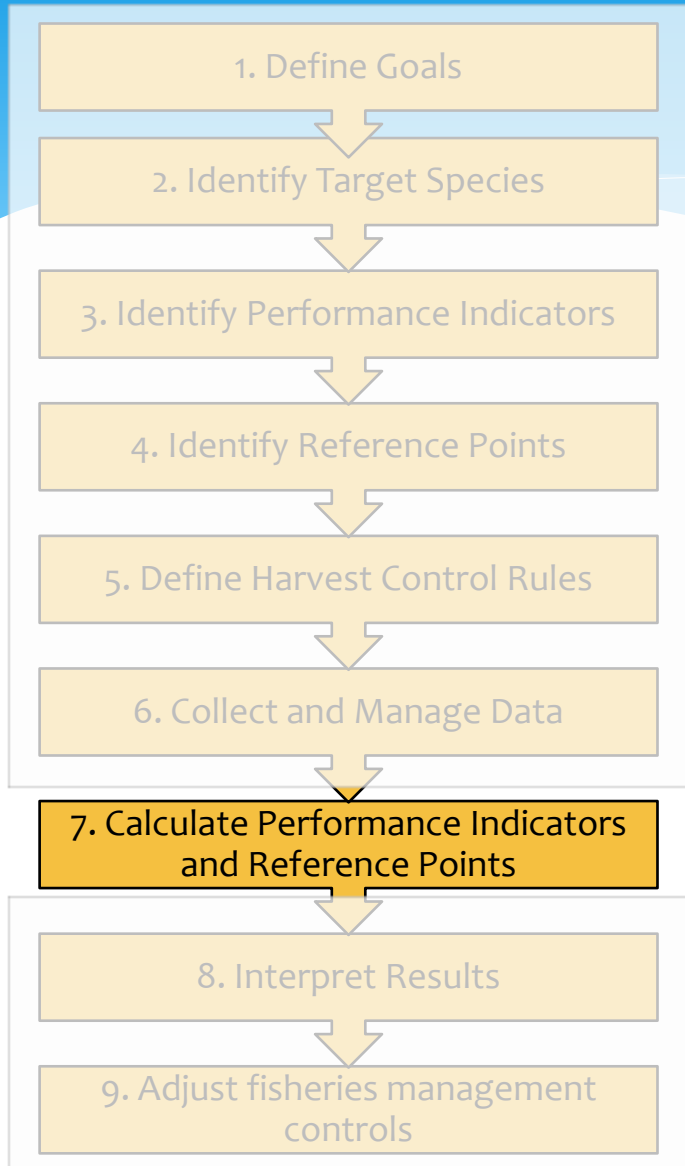
Step 7: Calculate performance indicators and reference points

Lobster

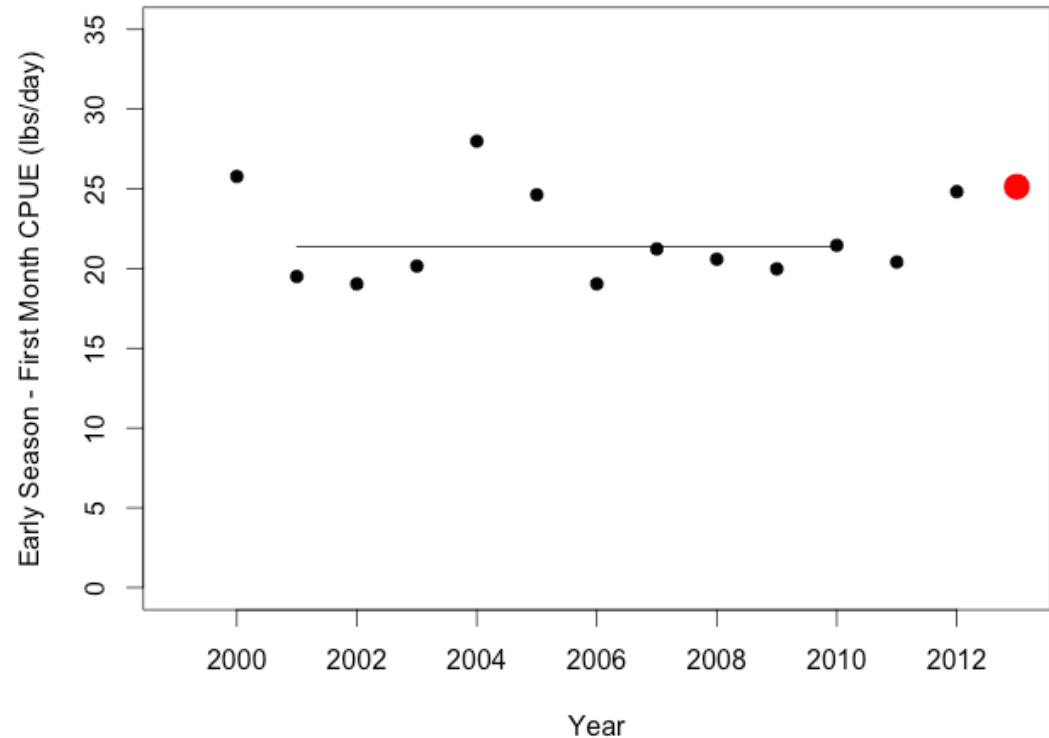


Step 7: Calculate performance indicators and reference points

Lobster



lobster Early Season - First Month CPUE (lbs/day)
Average value (Reference Point 2001 - 2010) = 21.36
2013 value (Performance Indicator) = 25.14



Outline

Day 1

- Profile of fisheries and marine resources for the country
- Brief overview for the focus fisheries
- Issues, Challenges & Lessons learned

DAY 2 & 3

- Type of available data for the focus fisheries:
 - Queen conch
 - Flyingfish
 - Lobster
 - Others
- Sources and quality of Information
- Potential indicators in support of the Fisheries Management Plans (FMPs)



Belize Fisheries Department Conch and Lobster Collection Program

Belize Fisheries Department

2015

STATUS OF FISHERIES DATA COLLECTION PROGRAM

- * Presently there are four (4) operational fishermen cooperatives in Belize, whereby two are situated in Belize City (Northern Fishermen Cooperative and National Fishermen Cooperative).
- * Placencia Fishermen Cooperative in Placencia Village.
- * In Punta Gorda Town is the Rio Grande Fishermen Cooperative. However, there are two receiving stations in Caye Caulker and the other in Mango Creek (Independence Village).

STATUS OF FISHERIES DATA COLLECTION PROGRAM

- * Since 2000 the Fisheries Department has been consistently collecting catch and effort data from Northern Fishermen Cooperative and National Fishermen Cooperative.
- * The main constrains have been not having enough personnel and resources to travel the landing sites/fish markets.

STATUS OF FISHERIES DATA COLLECTION PROGRAM

- * The catch and effort data gathered from the fishermen cooperatives is data obtained from copies of purchase slips compiled by the cooperatives.
- * The purchase slips information are completed by personnel from the each cooperative, then the data collectors from the Fisheries Department eventually amass and copy the relevant data onto a formal data sheet.
- * The data then is digitized in a Microsoft Excel spreadsheet and stored in relevant folders according to cooperative. The digital data is also store in another computer and is usually updated every so often.
- * The purchase slips contain information such as *fisher name, date, boat name, type of boat, items, pounds, unit, total in pounds, area fished, days fished and method fished* of the each commodity.

STATUS OF FISHERIES DATA COLLECTION PROGRAM

- * Presently for the lobster commodity there is consistent monthly catch and effort data gathered from 2000 to few months in 2015 from Northern Fishermen Cooperative, National Fishermen Cooperative, Caye Caulker station and Mango Creek station.
- * In 2005 the Fisheries Department began to deploy data collectors at some landing sites to gather additional catch and effort data. Some of the landing sites include Corozal market, Vernon Street market, Dangriga Town market and Punta Gorda Market.
- * Data collection at fish markets has not been consistent.

FIELD DATA COLLECTION FOR THE SPINY LOBSTER

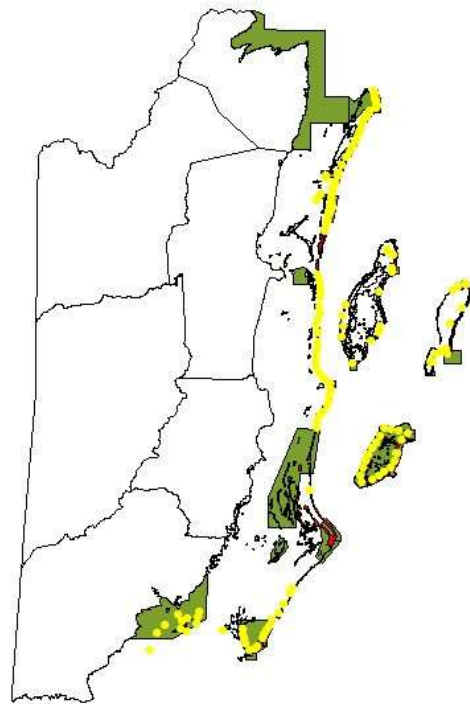
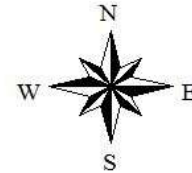


METHODOLOGY

- * Monthly samples from the six fishing zones.
- * 200 lobster samples per fishing zone.
- * Record catch and effort data from each fisher.
- * Record morphometric data from each lobster obtained (CL, Male/Female, etc.)



NATIONAL CONCH SURVEY 2012

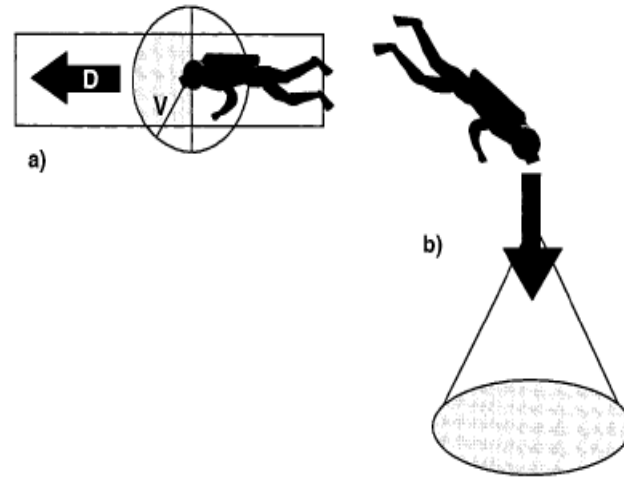


- National conch survey 2012.shp
- Coral_bz.shp
- Mpa_czmai_2004.shp
- Districts_ccad.shp

Materials and Methods

Sampling Method: (Visual census)

- * Two divers will dive along the belt transect at approximately 2 m away from the belt.
- * Each transect will be recorded using a hand held GPS.
- * Each conch found along the transect will be counted and morphometric measurement will be recorded.



Conch Export Inspections

- * The personnel that have been involved are Fisheries Officers from the Capture Fisheries Unit and Conservation Compliance Unit of the Department.
- * The customized data sheet are used to amass the relevant data.





THANK YOU