The Economics of Aquaculture, Fisheries and Seafood Trade: Managing the Socio-Ecology of Sustainable Marine Resource Use

North American Association of Fisheries Economists

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How can analysis of ex-vessel value data of ex-vessel value data contribute to management of a commercial marine fishery?

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OUTLINE

Background

Unit price

Influencing factors

Steps taken & work to be done

How will this information be useful

BACKGROUND: MOTIVATION FOR THIS WORK

Alta California

BACKGROUND: COLLABORATIVE FISHERIES RESEARCH

Eureka

Fort Bragg

Bodega Bay

San Francisco

Monterey

Morro Bay

Santa Barbara

Los Angeles

San Diego

Collaborative fisheries research to build socioeconomic essential fishery information

California halibut

BACKGROUND: DATA SOURCES

California Department of Fish and Wildlife (CDFW) commercial fishery data

- landing receipts (fish tickets)
- vessel registration
- licenses and permits

Interviews with fishery participants

BACKGROUND: UNIT PRICE

Unit price is dockside ex-vessel price per pound as recorded by buyers on fish tickets in California

Land_Date	Market_Code
Serial_#	Reported_Catch_lbs
Port_Code	Unit_Price
Fbus_ID	Use
Vessel_ID	Condition_Code
Fishing_License	Gear_Code

RECORDING UNIT PRICE

California – Oregon – Washington

- Systems similar

- Reconciled in PSMFC PacFIN system

UNIT PRICE CAN BE USED IN

Estimating value of fishery

- Unit price → Calculated value/ticket → value of fishery

- Regional economic valuation

- Assessing impacts of changes

- Establishing catch share program

...and it affects people's livelihoods

STEPS TAKEN TO DETERMINE INFLUENCING FACTORS

- Review literature

- Interview agency staffs

- Interview fishery participants

- Analyze landings data

FIRST STEPS: REVIEW DATA WITH COLLABORATORS

- Port
- Gear
- Number of vessels
- Number of buyers
- Ex-vessel value
- Pounds landed

FISHERY PARTICIPANTS TOLD US TO LOOK FOR

Size of fish in *live* fish market

Gear & perception thereof
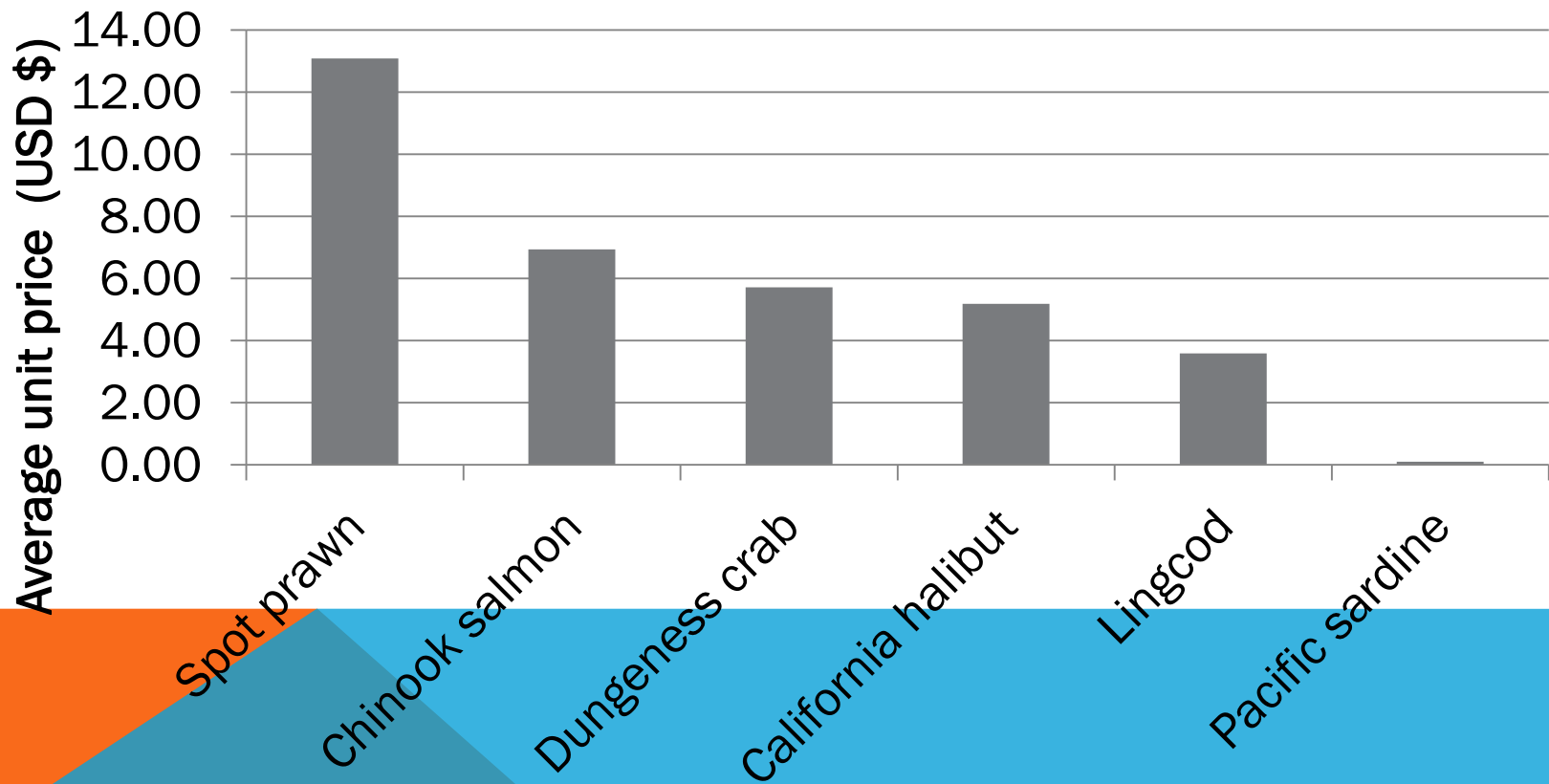
FACTORS THAT INFLUENCE UNIT PRICE

Species

Condition

Grade / quality / handling

Destination market

Fisherman's role

Supply chain & location in it

INFLUENCING FACTORS: SPECIES

Average unit price (USD $) chart by species:

Species	Average unit price (USD $)
Spot prawn	~13.00
Chinook Salmon	~6.90
Dungeness crab	~5.70
California halibut	~5.20
Lingcod	~3.50
Pacific sardine	~0.10

Subset of 2015 California landings

INFLUENCING FACTORS: CONDITION
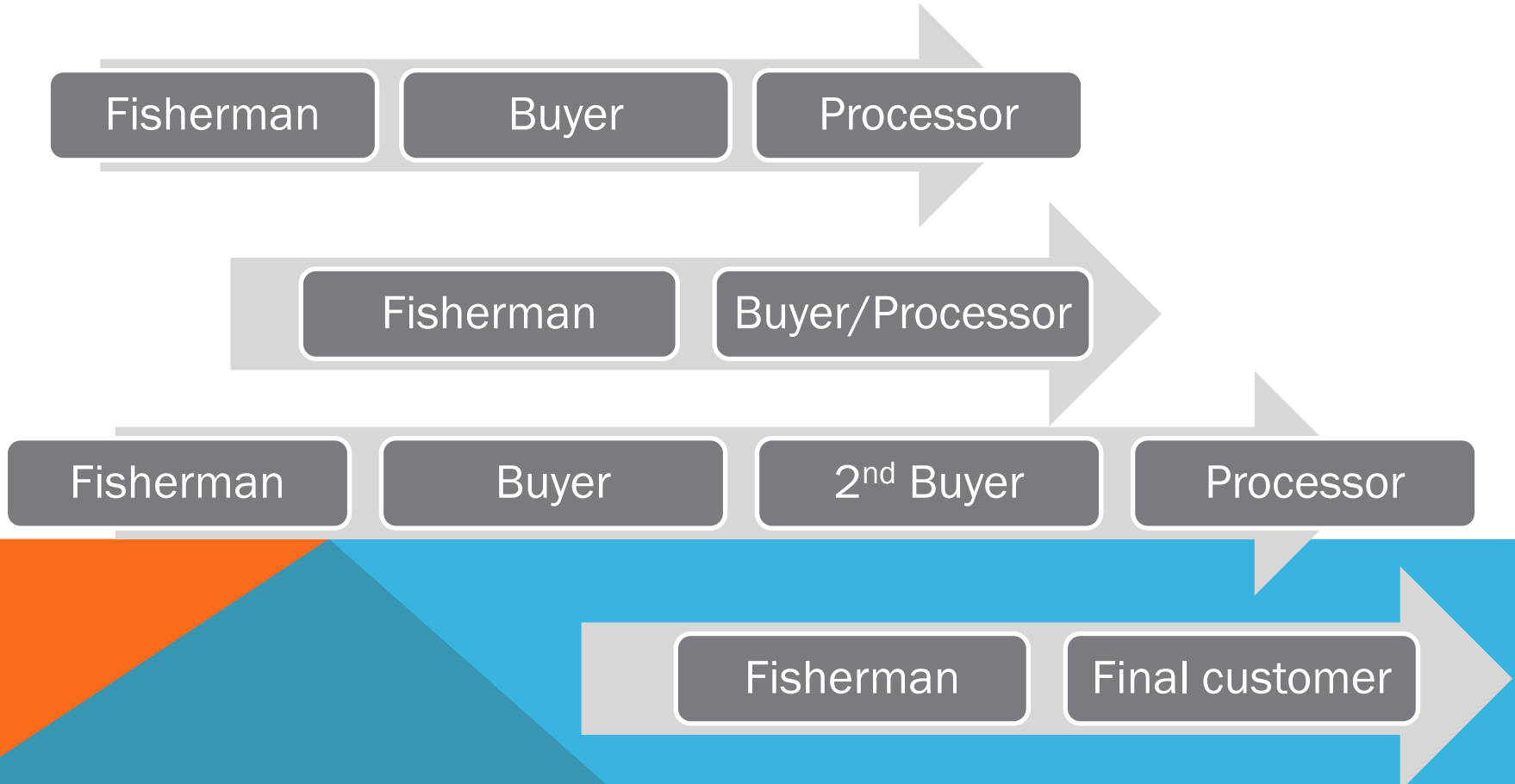

Subset of 2015 California landings
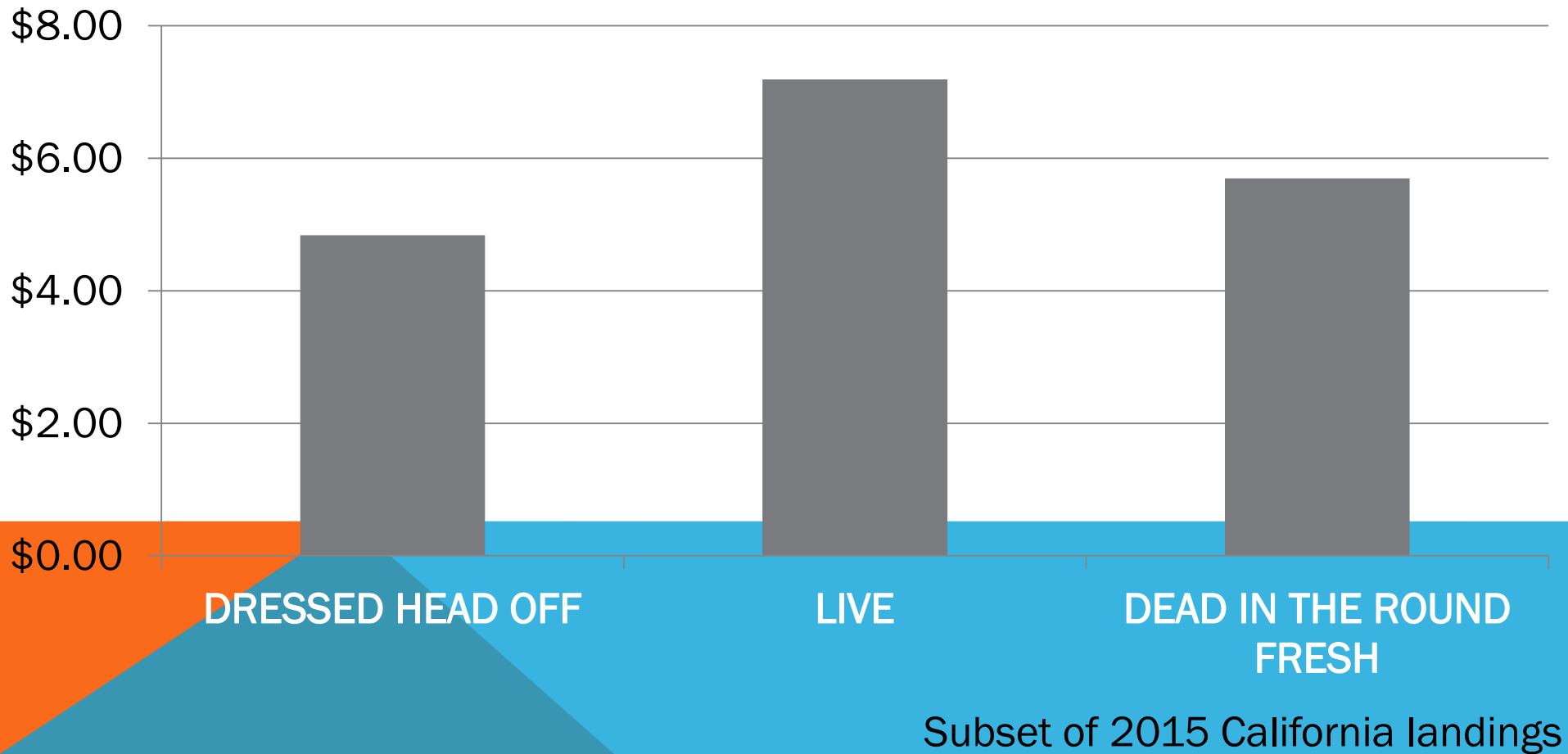
INFLUENCING FACTORS

- **Destination market**
  - Domestic or international?
  - Intended for live market?

- **Fisherman's role**
  - Part of a vertically integrated market?

INFLUENCING FACTORS: POSITION IN SUPPLY CHAIN

Fisherman → Buyer → Processor

Fisherman → Buyer/Processor

Fisherman → Buyer → 2nd Buyer → Processor

Fisherman → Final customer

POTENTIALLY RELEVANT FIELDS IN LANDINGS DATA

Buyer & Seller   Port

Condition   Species

Date landed   Use

Gear   Volume

ANALYSIS INCORPORATES

Reported_Catch_lbs	Use	Condition_Code	Gear_Code	Gear_Name	Unit_of_Measure
128.00	3	1	1	HOOK & LINE	LBS
36072.00	3	1	71	PURSE SEINE	LBS
12.00	5	12	27	CRAB OR LOBSTER TRAP	LBS

USE CODES SEEN FOR CALIFORNIA HALIBUT

- Human food (not canned) uses account for **98% of California halibut landings**
- Personal consumption: 1% of landings
- 8 other categories: 1% of landings

2000 through 2015 California landings

INITIAL DATA ANALYSIS

Buyer & Seller   Port

Condition   Species

Date landed   Use
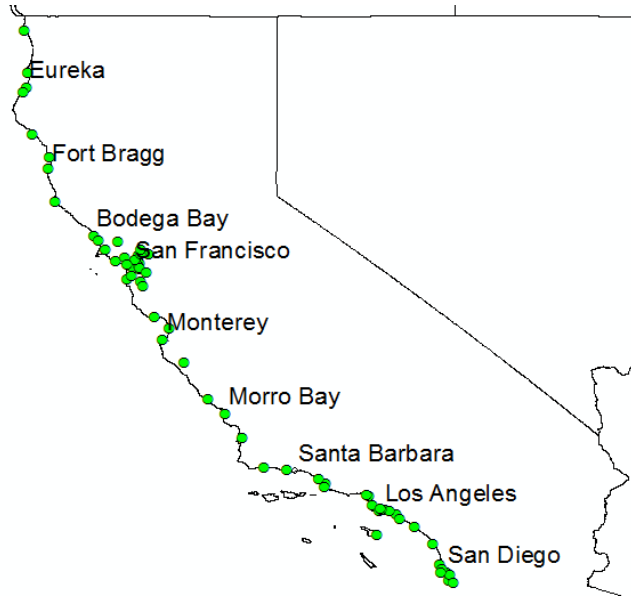
Gear   Volume

SPATIAL DATA ANALYSIS
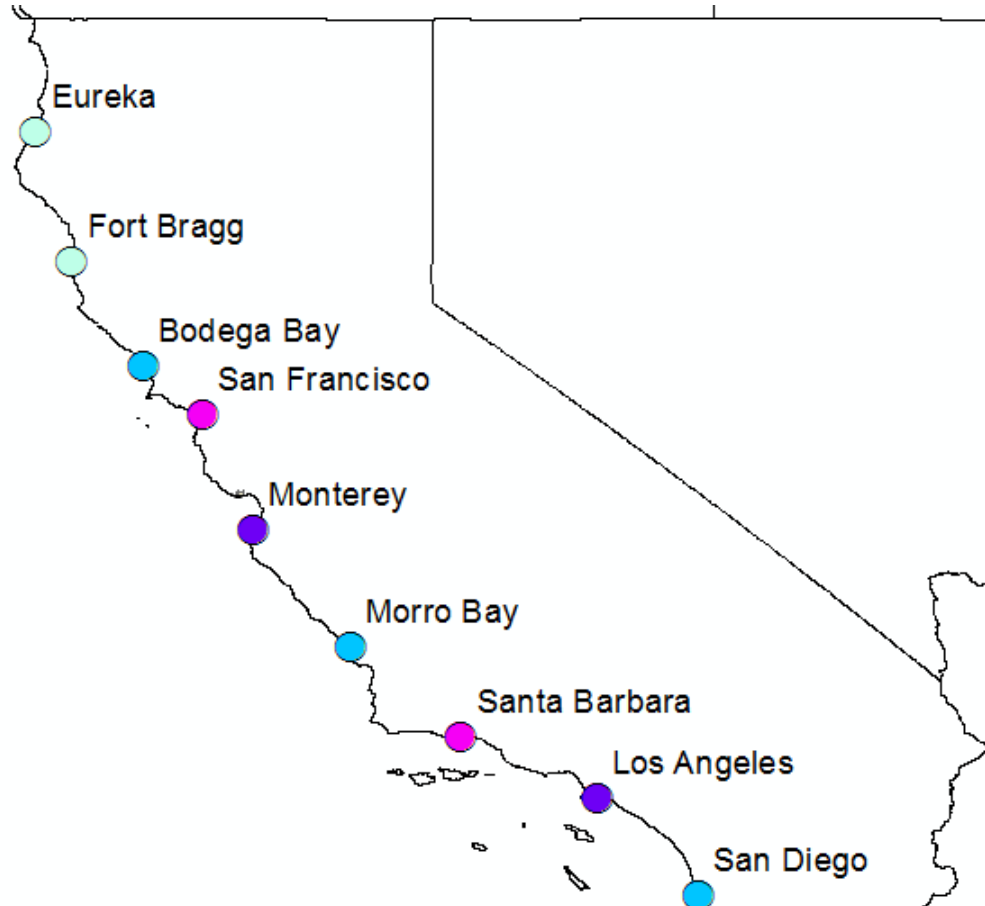
Percent of statewide landings by volume, 2000-2015

- 0.01% - 0.20%
- 0.21% - 3.64%
- 3.65% - 10.55%
- 10.56% - 46.73%
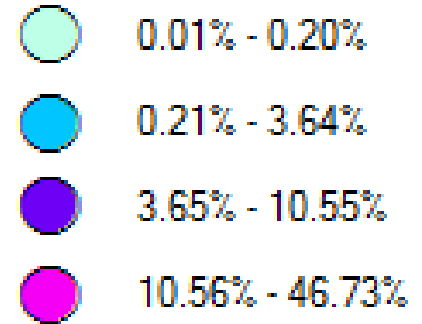
CDFW port groups

TEST FOR SPATIAL AUTOCORRELATION OF POUNDS LANDED BY PORT

Z score -0.887845
P value 0.374624
Cannot reject H_0, that distribution is random

WE DO NOT SEE SPATIAL AUTOCORRELATION

Z score -0.887845

|-089| < 1 → less than 1 standard deviation away from the mean
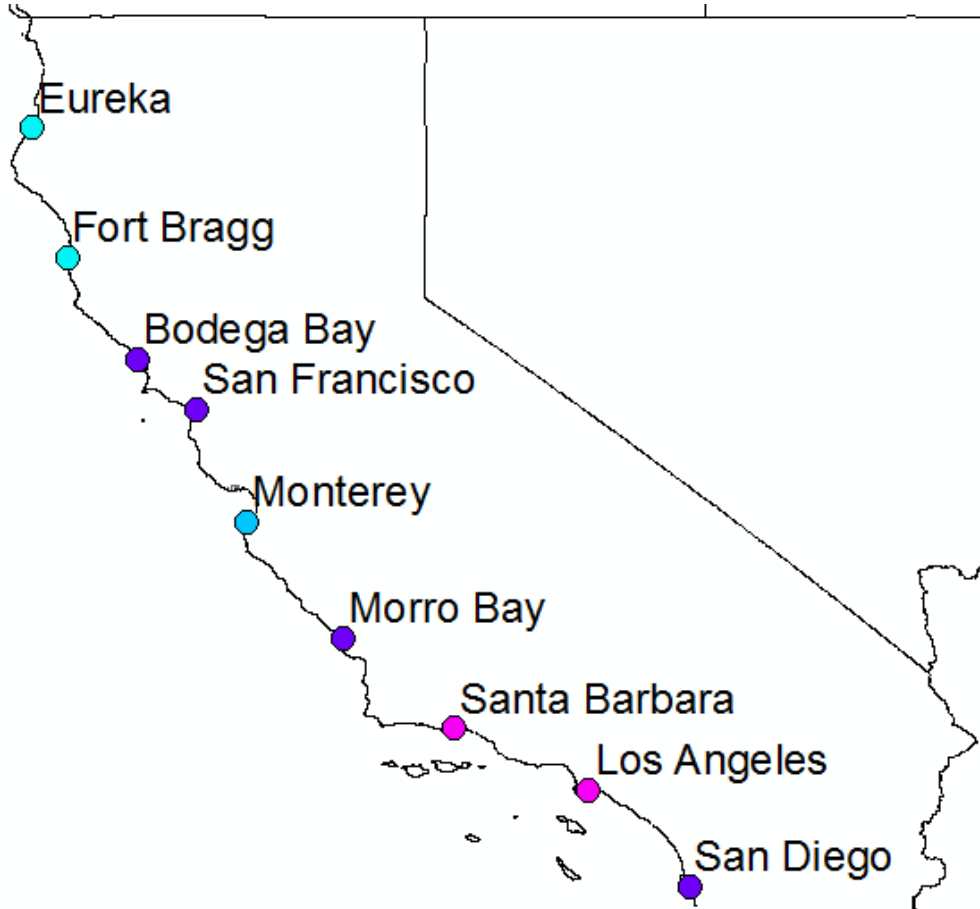
P value 0.374624, which is much greater than 0.05 → *Cannot reject H_0, that distribution is random*

Does this make sense? Why?

PORT GROUP AND UNIT PRICE
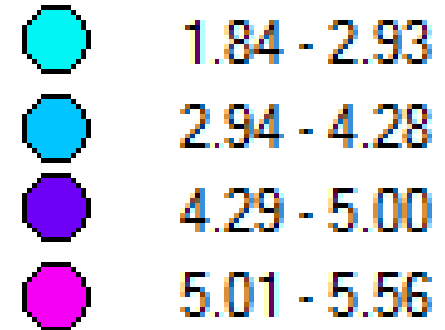

Average unit price, 2000 - 2015

⬤	1.84 - 2.93
⬤	2.94 - 4.28
⬤	4.29 - 5.00
⬤	5.01 - 5.56

(2015 US Dollars)

INITIAL STEPS ON UNIT PRICE

Examine data

- Noted unit price = $0.00 in some cases
- Discussed with CDFW & fishery collaborators

Review

- Sumaila, Marsden, Watson & Pauly 2007
- Swartz, Sumaila, Watson 2013

Plan resolution

- Global ex-vessel fish price database used
  country + *taxa* + *year*
- Our data set permits greater precision;
  port + *species* + *date* (month, day, year)

CONSIDERATIONS IN REPLACING UNIT PRICE

1.21% of CHL records have Unit Price = $0.00

- Difference of 0.6% to 2.15% in average price per pound for California halibut landed in California (2000-2015)

Do not impute prices for records where $0 is correct

- Use codes indicate
  - Personal consumption
  - Research
  - Seizure

ANALYZE RELATIONSHIPS

Anova to test for relationships between unit price and

- Condition
- Gear
- Port
- Use

Post hoc tests where appropriate

Categorical data

RELATIONSHIP BETWEEN PORT GROUP & UNIT PRICE

```
> anova(PG_UP.mod)#show anova table

Analysis of Variance Table

Response: Unit_Price
```

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
PortGroup	7	2107.2	301.028	136.09	< 2.2e-16 ***
Residuals	7539	16675.7	2.212		

```
---

Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Data set: All CHL landings (market code 222) from years 2014 & 2015, combined

POST HOC TEST APPROPRIATE (MORE THAN 2 LEVELS)

```
#call anova using aov()

aov_PG<- aov(CHL_Landings$Unit_Price ~ CHL_Landings$PortGroup)

summary(aov_PG)

#call Tukey to review pairwise differences between port groups

tuk<- TukeyHSD(aov_PG)#partial results shown here
```

Pair	diff	lwr	upr	padj
Fort Bragg-Bodega Bay	-1.08240506	-5.6056141	3.440804	0.996263
Los Angeles PG-Bodega Bay	0.08904448	-0.3183616	0.4964506	0.9978925
Los Angeles PG-Fort Bragg	1.17144954	-3.3416479	5.684547	0.9938153
Monterey-Bodega Bay	-0.8201713	-1.2026343	-0.4377083	0
Monterey-Fort Bragg	0.26223377	-4.2486804	4.773148	0.9999997
Monterey-Los Angeles PG	-0.90921578	-1.1435371	-0.6748944	0

PRELIMINARY RESULTS, AND A CAVEAT

Preliminary results suggest relationships between Unit Price and each of the 4 factors tested

There are gaps in the data not yet resolved

NEXT STEPS

Where appropriate, fill in gaps in data based on matching values in other records

Re-run analyses with updated data

Add factors & re-run analyses

Interpret results of analyses

HOW WILL THE RESULT OF THIS WORK BE USEFUL

To analysts

- Methodology to apply to other commercial marine fisheries

To fishery managers

- California halibut FMP
- Guidance on future socioeconomic information contributions to state fishery management planning

ACKNOWLEDGEMENTS

Ideas? Preguntas?

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