INTERNATIONAL PACIFIC HALIBUT COMMISSION

Regional fisheries management for increased economic value of shared stocks:

Understanding the economic impact of Pacific halibut

Barbara Hutniczak

International Pacific Halibut Commission

IIFET 2022, Vigo

Study objectives

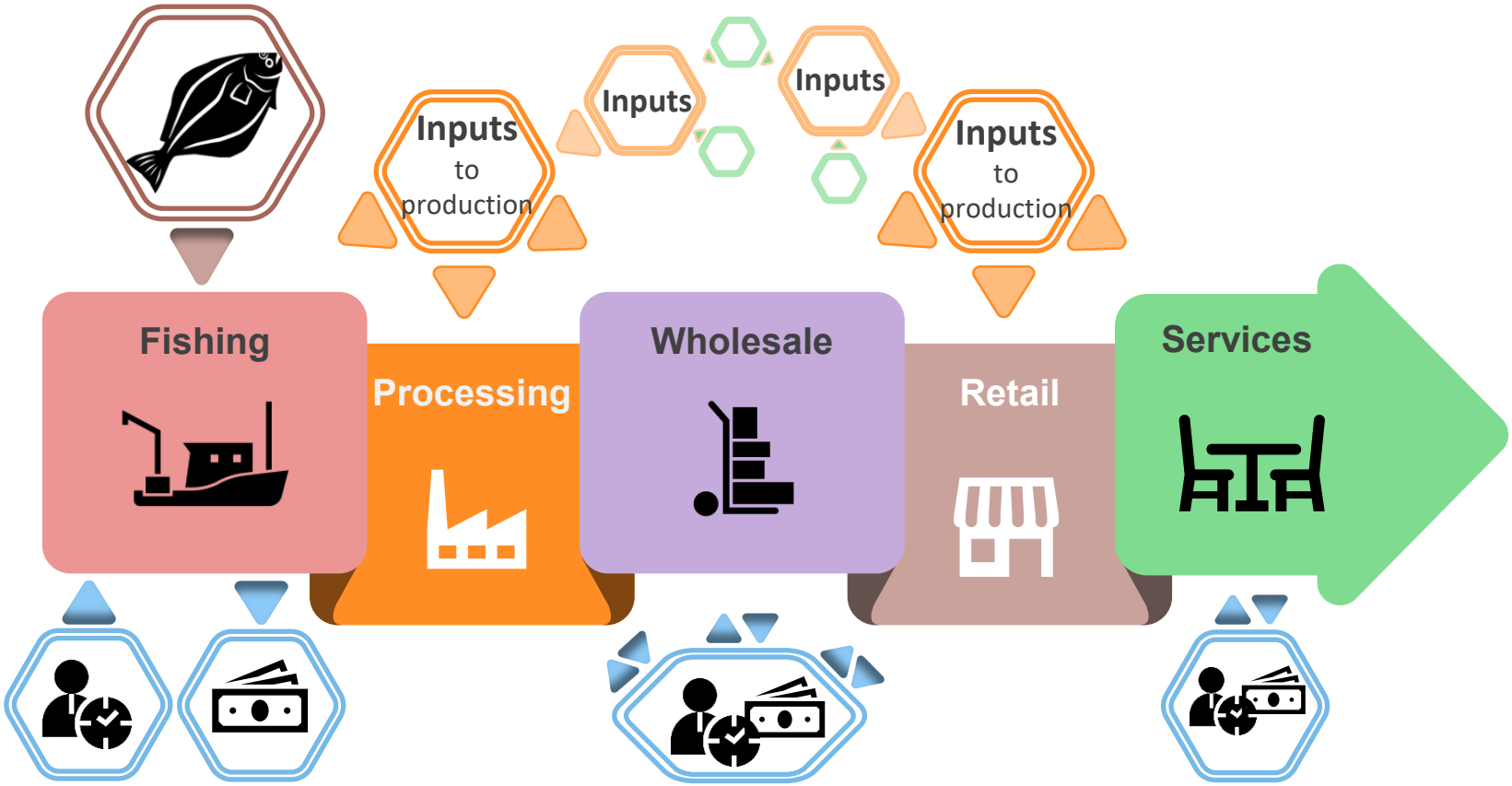
- IPHC socioeconomic study was a direct response to the Commission's "*desire for more comprehensive economic information to support the overall management of the Pacific halibut resource in fulfillment of its mandate"*
  - Commission's objective is to develop stocks of Pacific halibut that permit "***optimum yield from the fishery*** *and to maintain the stocks at those levels*"
- Research objectives – Pacific halibut multiregional economic impact assessment (PHMEIA)
  - Inform stakeholders about the full scope of Pacific halibut contribution to economies of Canada and the United States, and the distribution of economic benefits associated with Pacific halibut

Assessing cross-regional flows of economic benefits - a case study of Pacific halibut commercial fishing in Alaska; *Fisheries Research* [In Review]

Outline

1. **Economic impact**
   - Commercial fishing
   - Recreationaal fishing
   - Multiregional setup
2. **Model setup**
   Multiregional social accounting matrix (SAM) approach, estimated for 2014-2020
3. **Economic impact estimates**
   Interpreting PHMEIA model results
4. **Dissemination of results**
   Economic impact visualization tool
5. **Conclusions**
   Management support

Economic impact of the commercial fishing sector



Multiregional impact assessment

Economic impact in the area of resource extraction

Cross-regional impacts

- Import of inputs to production
- Export of production outputs (including services)
- Earnings by non-residents (wages, profit-type income)

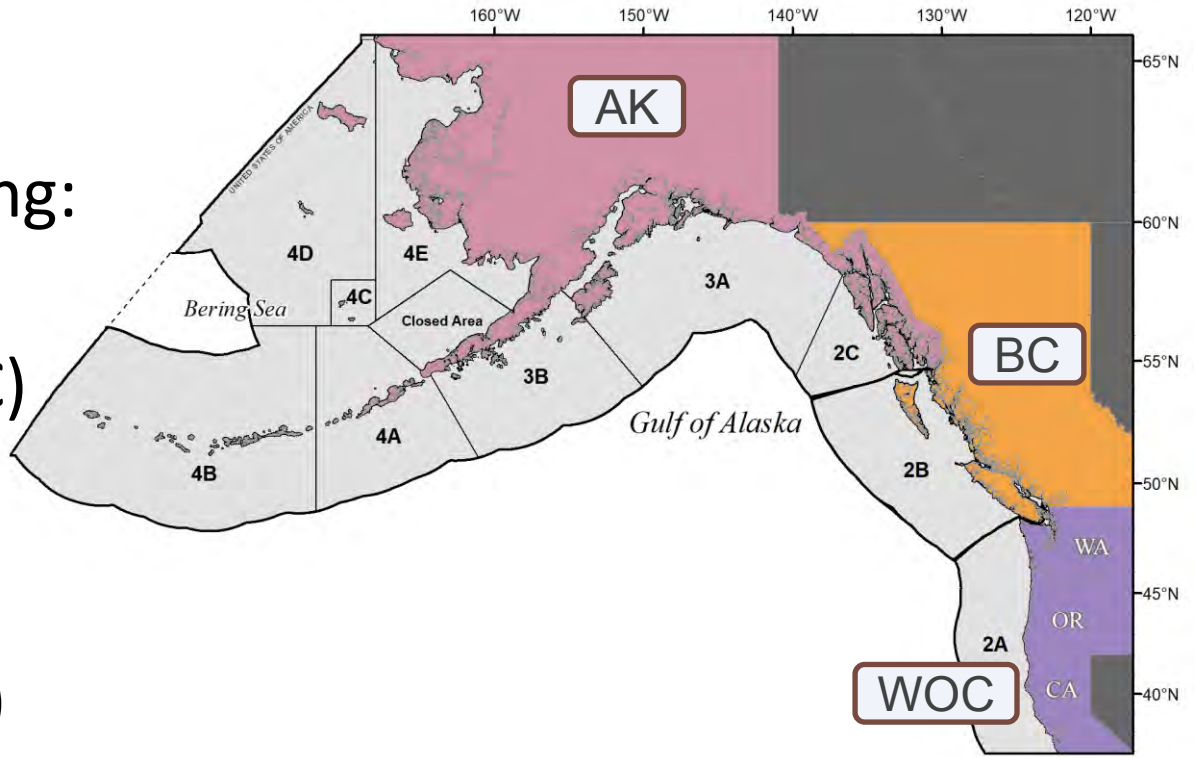
Regions

Pacific halibut producing:

- Alaska (AK)
- British Columbia (BC)
- West Coast (WOC)
  (WA, OR, and CA)

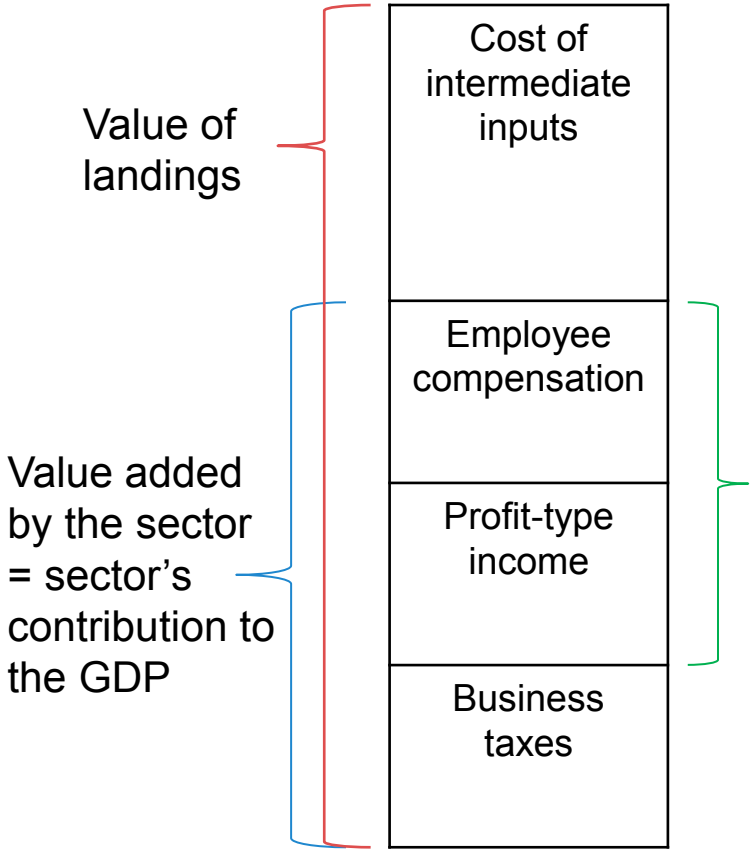
- Rest of the US (US-r)
- Rest of Canada (CA-r)
- Rest of the world (ROW)*

*treated as exogenous



Multiregional social accounting matrix/SAM-based approach
Estimated for 2014-2020

Direct earnings & income



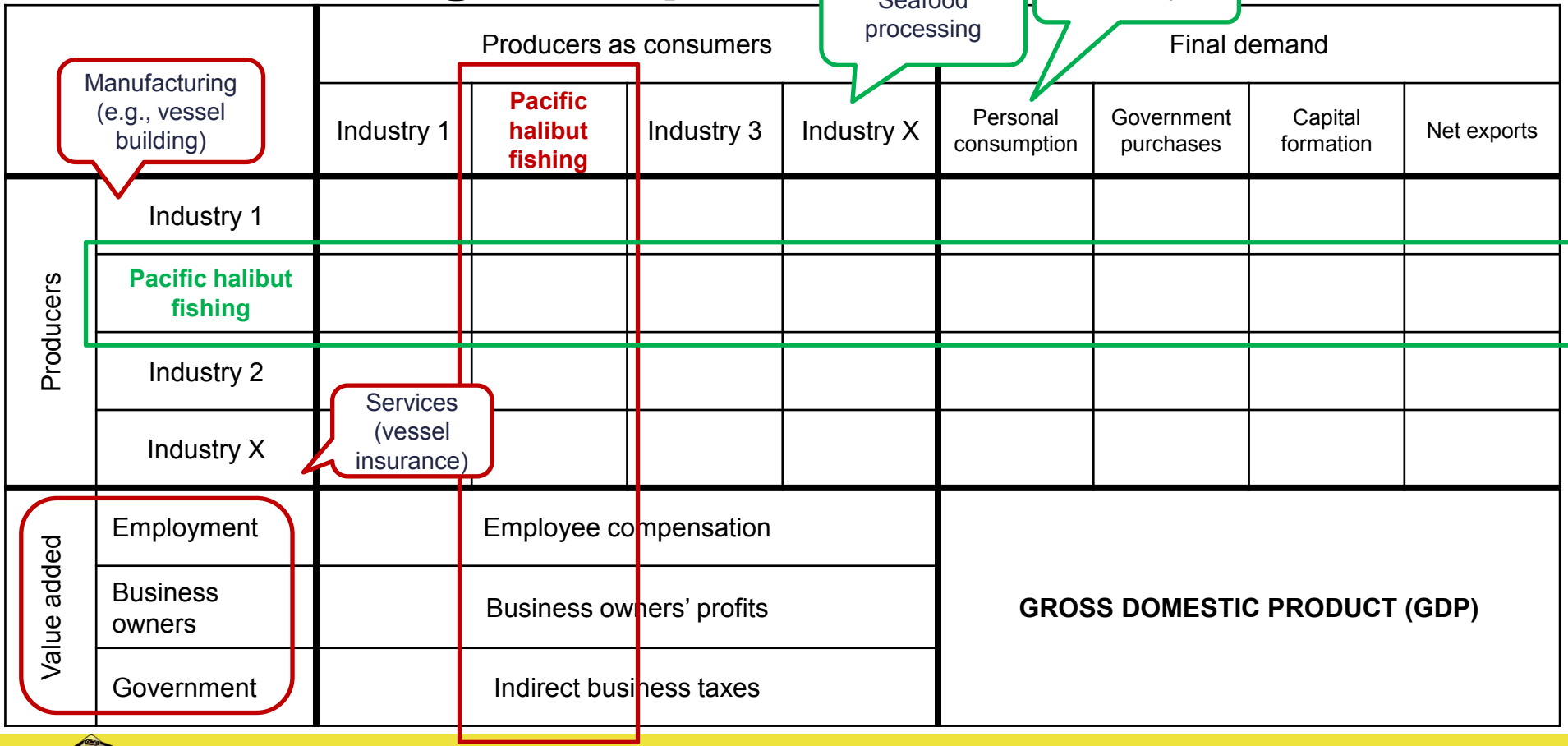
Earnings by place of work
Here: earnings where the fishing occurs

Household income* in the area of resource extraction

Household income* elsewhere (leakage)

*total income is also a subject to adjustment for other income sources (dividends, rent) and income taxes

Model – regional production



The Model - flows

		Region 1 (R1)					
		Industries (I)	Commodities (C)	LAB	PROP	Earnings	Households
Region 1 (R1)	I		Make matrix (V1)				
	C	Use matrix (U1)					Households' expenditure (R1)
	LAB	Employee compensation (R1) – LAB1					
	PROP	Proprietor income (R1) - PROP1					
	EARN			Net income from LAB1	Net income from PROP1		
	HH					Net earnings by place of residence (R1)	

- Exported production outputs
- Services offered by the charter sector to nonresidents
- Export of commodities from region 1
- Inflow of earnings to region 1
- Wages earned by nonresidents
- Profit from quota owned by nonresidents
- Leakage/outflow of earnings from region 1
- Import of commodities by region 1
- Imported inputs to production

The Model

		Region 1 (R1)	
		Industries (I)	Commodities
Region 1 (R1)	I		Make matrix
	C	Use matrix (U1)	
	LAB	Employee compensation (R1) – LAB1	
	PROP	Proprietor income (R1) - PROP1	
	EARN		
	HH		

- Base model: Seung, Waters, and Taylor (2019)
- Regional data:
  - US Bureau of Economic Analysis (BEA) industry accounts
  - Provincial-level supply and use tables published by Statistics Canada
- Trade data
  - US Trade database provided by the U.S. Census Bureau
  - Canadian International Merchandise Trade Database
- Fisheries-specific data (NOAA, ADFG, DFO, BC)
- Updated using multiregional generalized RAS (MR-GRAS) technique (Temursho et al. 2020)

➢ Imported inputs to production

Import of commodities by region 1

Leakage/outflow of earnings from region 1

➢ Profit from quota owned by nonresidents

From Leontief IO model to SAM

Leontief inverse

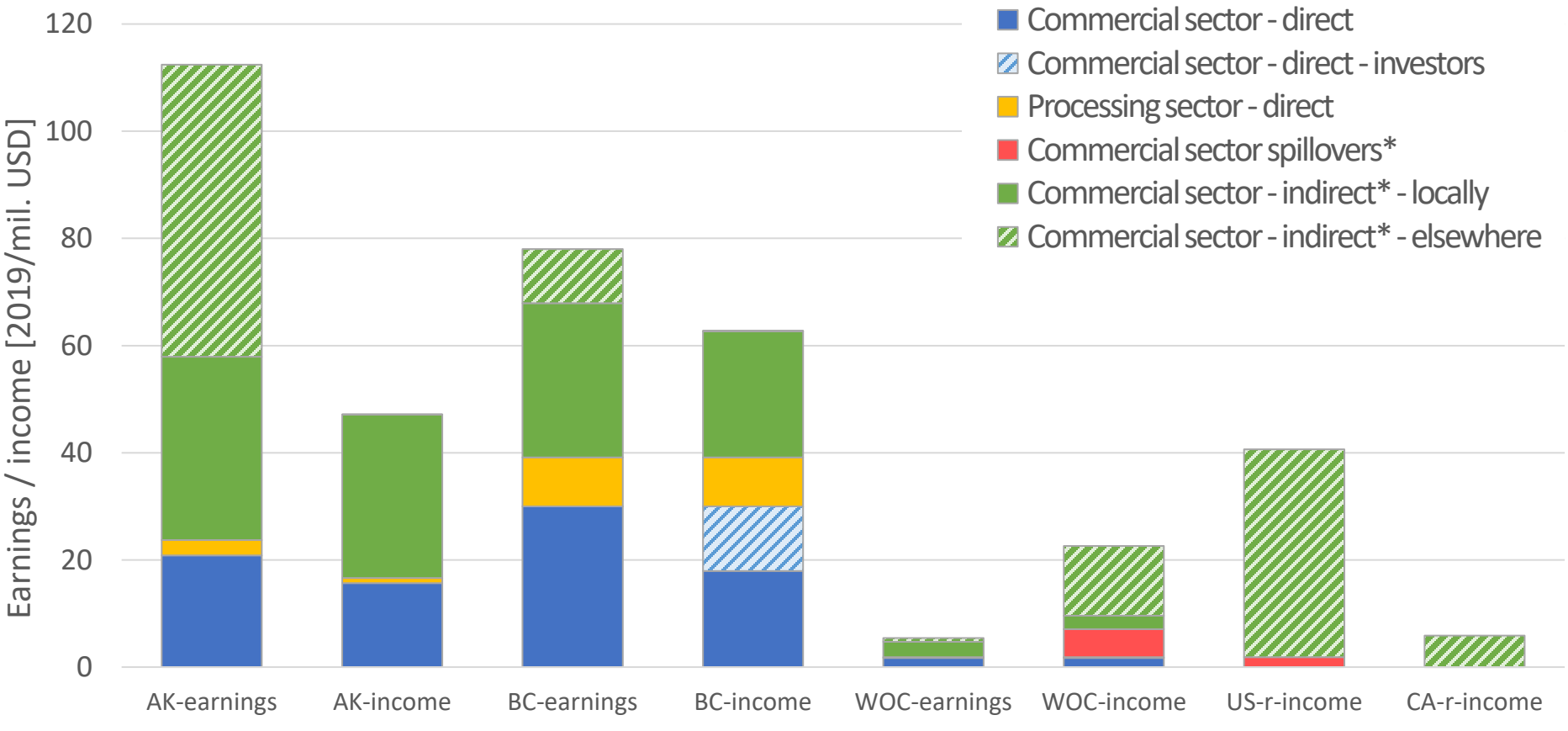
$$\mathbf{x} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{f}$$

$$\mathbf{x}^{\mathrm{SAM}} = (\mathbf{I} - \mathbf{S})^{-1}\mathbf{f}^{\mathrm{SAM}}$$

$\mathbf{x}$ - total industry output (production) vector
$\mathbf{A}$ - matrix of technical coefficients derived from inter-industry transaction matrix
$\mathbf{f}$ - vector of total industry final demands

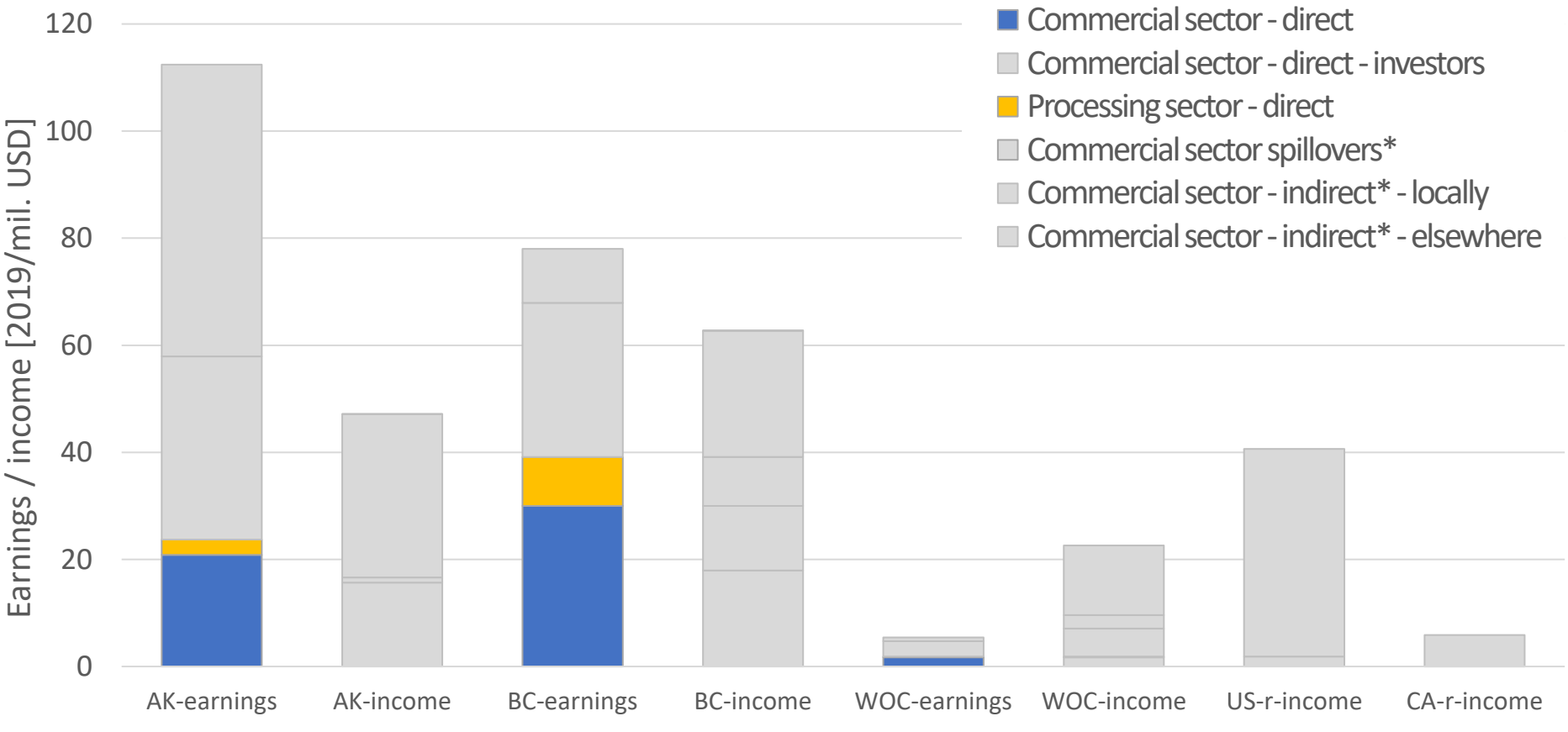
$\mathbf{S}$ is a matrix of direct SAM coefficients

Earnings and income



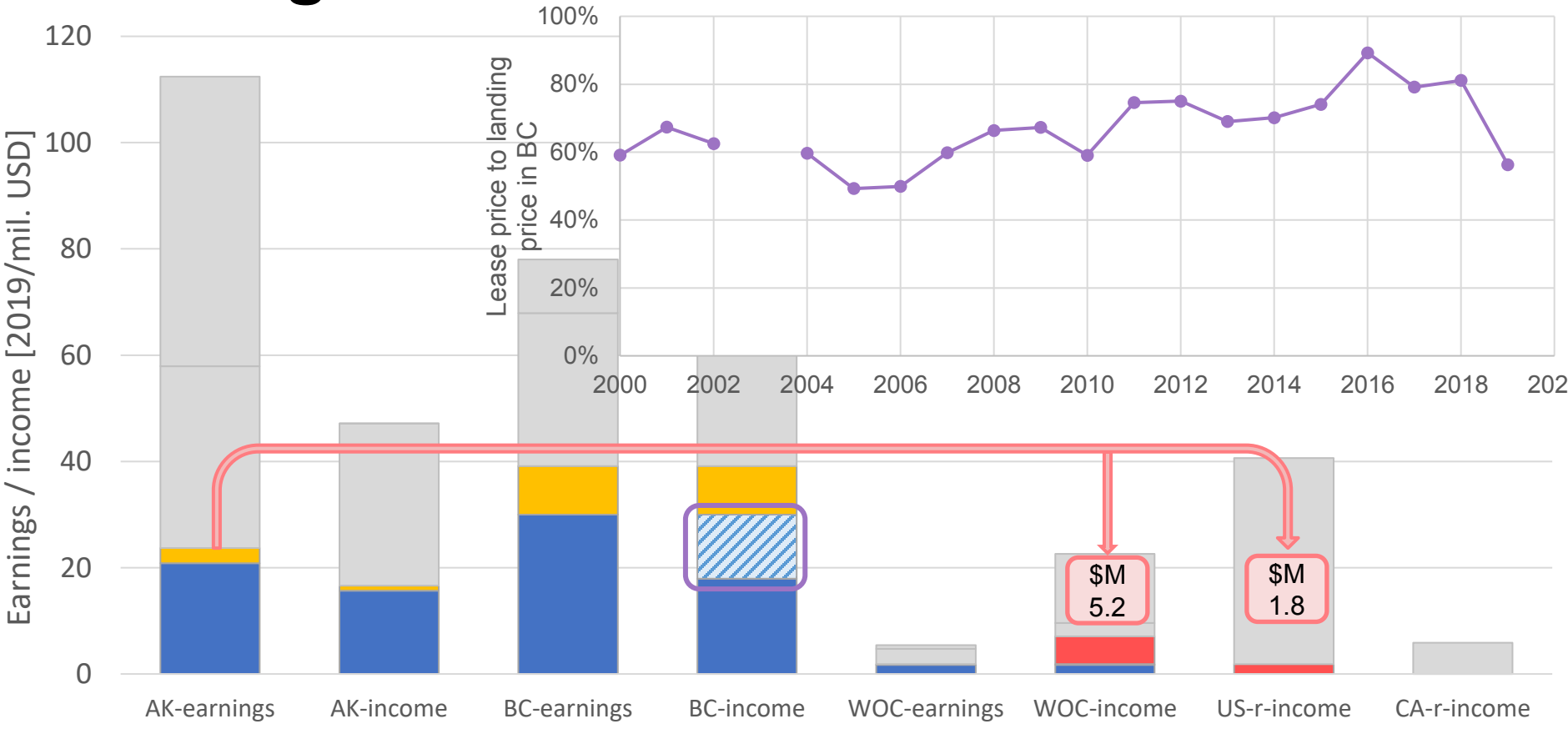
** commercial spillovers and indirect effects include processing*

Earnings and income



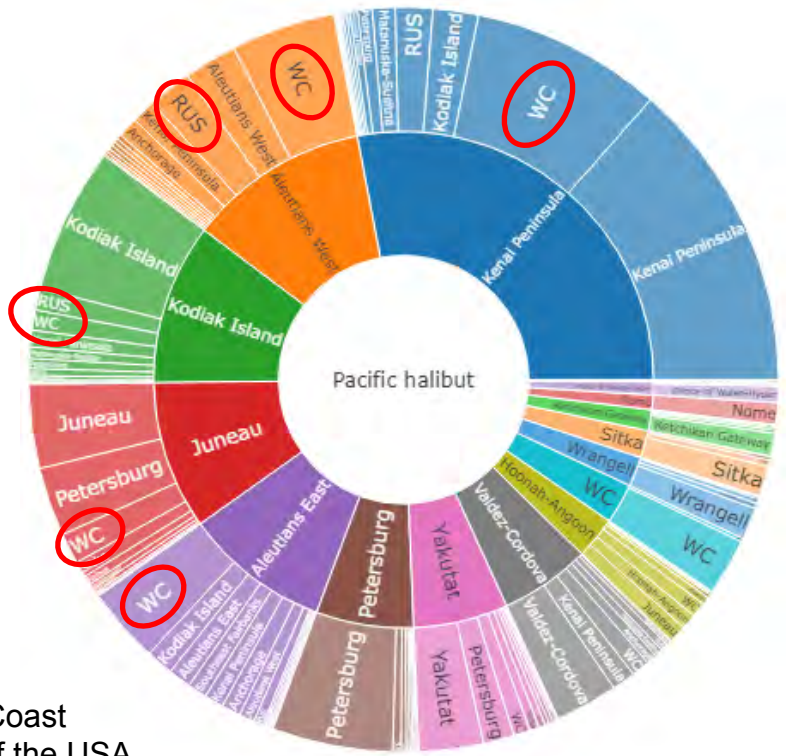
** commercial spillovers and indirect effects include processing*

Earnings and income



** commercial spillovers and indirect effects include processing*

Flows in the commercial sector - Alaska

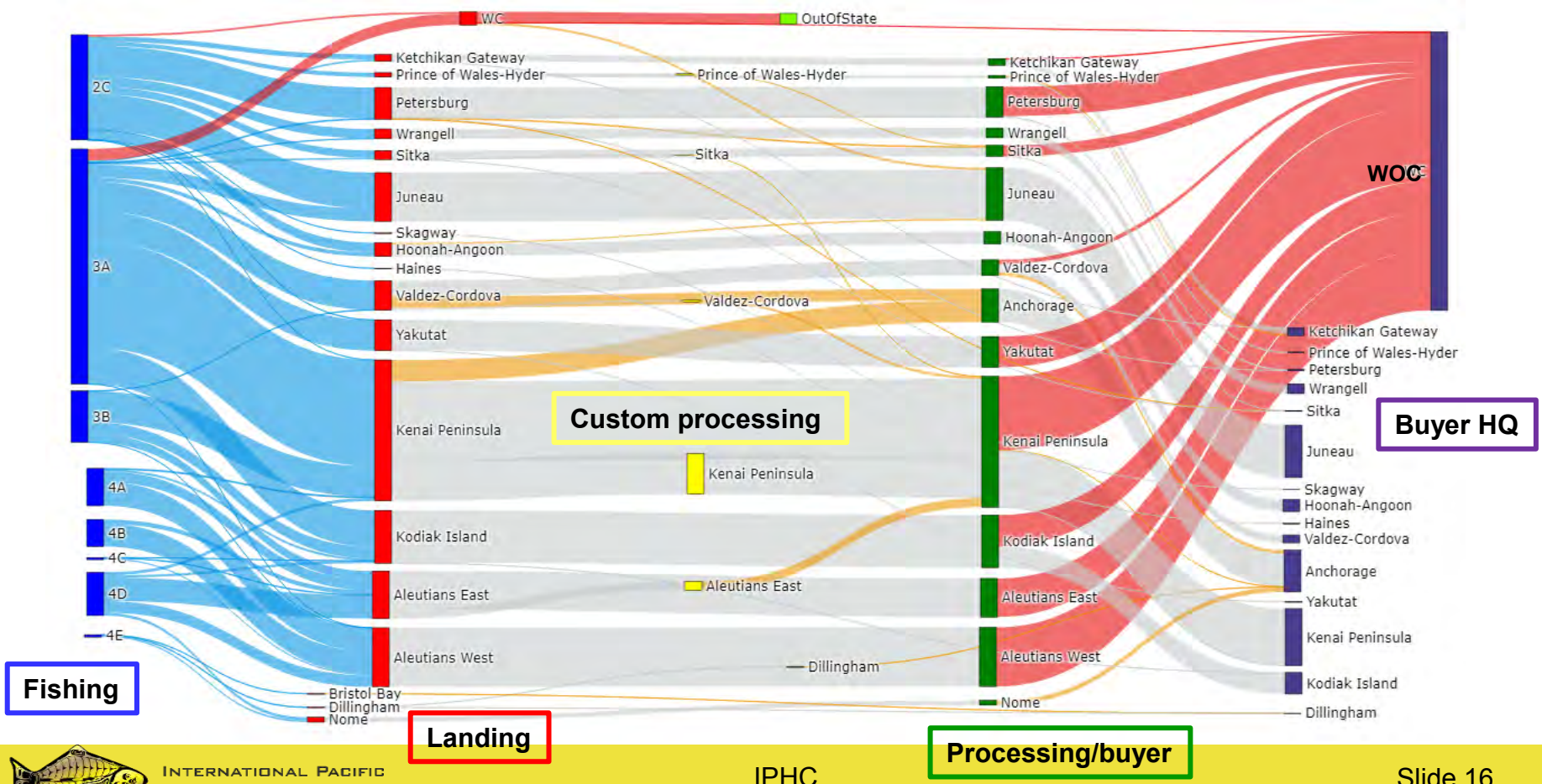


Here:
WC – West Coast
RUS – rest of the USA

(1) Landing area vs. vessel owner residence

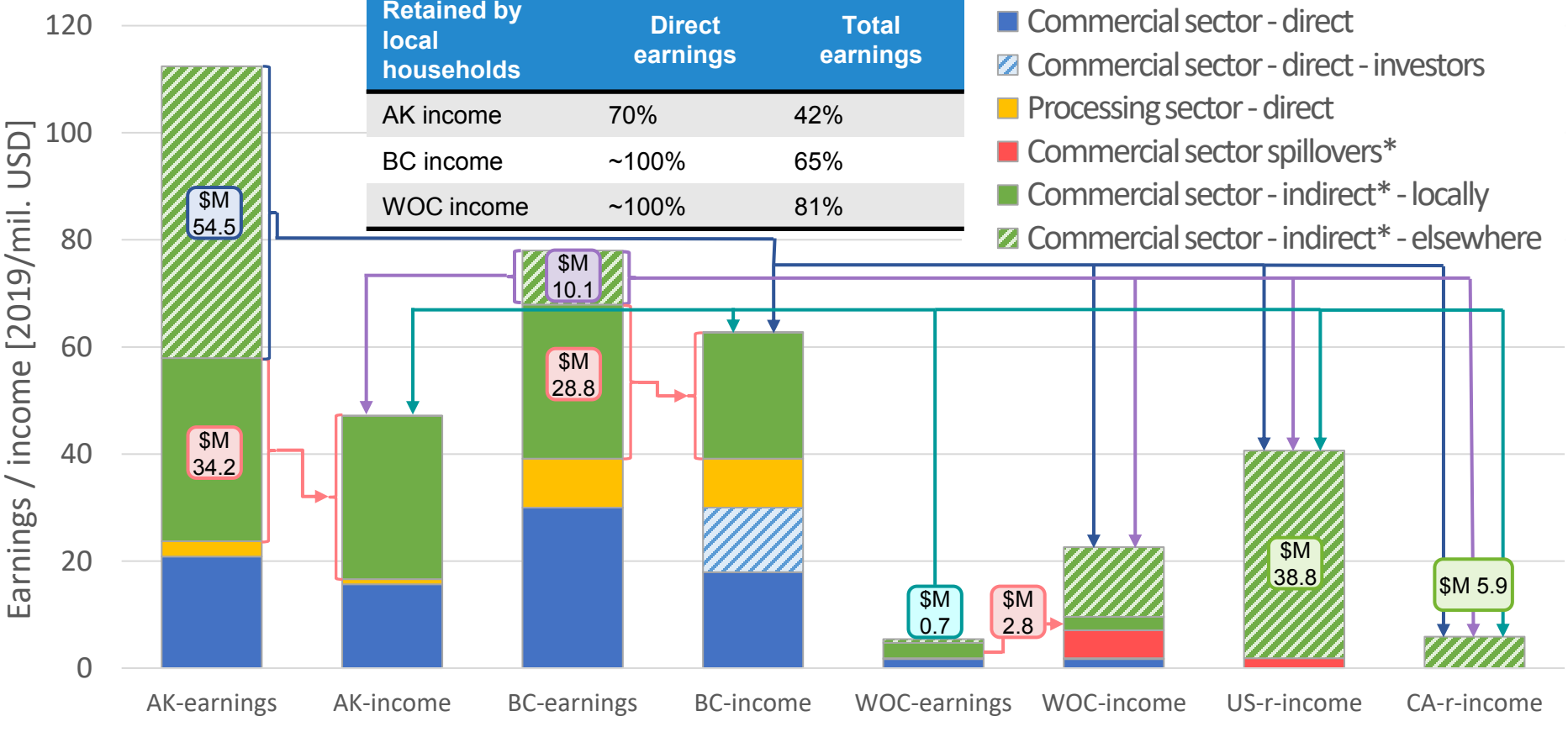
(2) Landing area vs. permit owner residence

Flows in the commercial sector - Alaska



Earnings and income

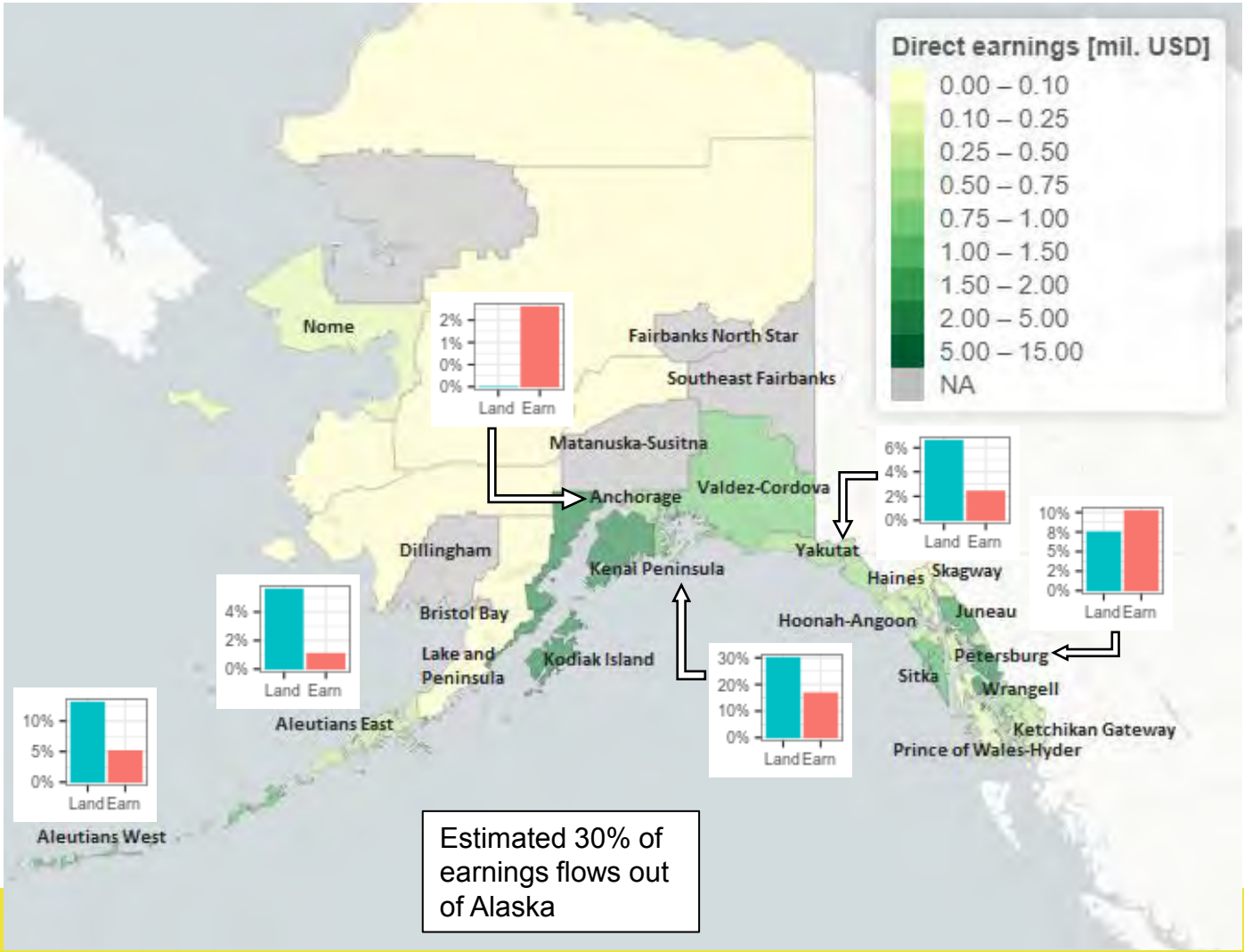
Retained by local households	Direct earnings	Total earnings
AK income	70%	42%
BC income	~100%	65%
WOC income	~100%	81%



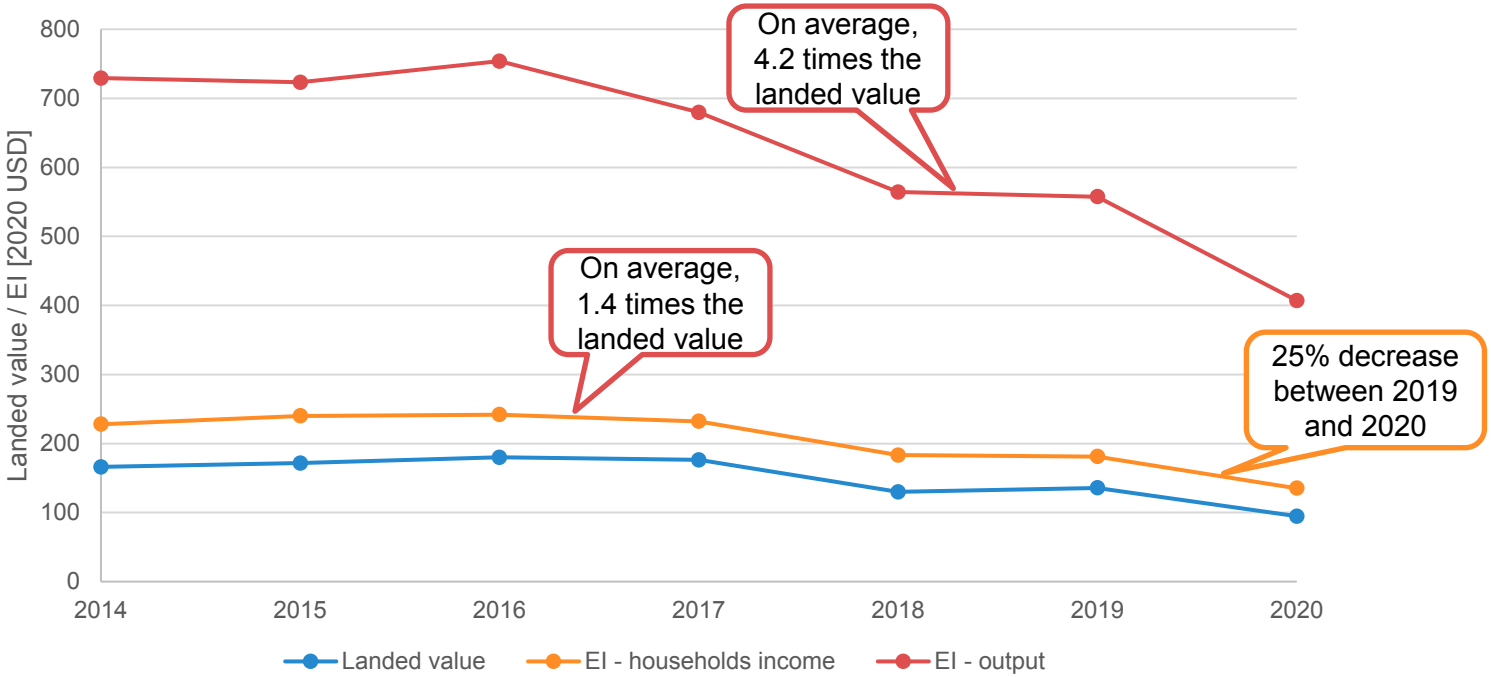
** commercial spillovers and indirect effects include processing*

Community impacts

Bar plots represent selection of county-level comparison between the value of landings and direct earnings [as % of total, 2019]



EI time series



Pacific halibut commercial fishing EI estimates for 2014-2020 in comparison with landed value in mil 2020 USD.

Map of the economic impact

[web-based tool manual]

Select year [2014-2020]:
2019

Select currency [USD, CAD]:
USD

Pacific halibut output - commercial fishing, Alaska [mil. USD]:
0 108 122
0 12.3 24.6 36.9 49.2 61.5 73.8 86.1 98.4 110.7 122.3

$M 14 (15%) increase

Pacific halibut output - commercial fishing, British Columbia [mil. USD]:
0 33
0 4.6 9.2 13.8 18.4 23 27.6 32.2 36.8 41.4 45.5

$M 2 (6%) decrease

Pacific halibut output - commercial fishing, West Coast [mil. USD]:
0 5.5 6.5
0 0.7 1.4 2.1 2.8 3.5 4.2 4.9 5.6 6.3 6.5

$M 0.5 (10%) increase

Type of impact to display:
Output

Direct economic impact (Pacific halibut fishery) Indirect economic impact Induced economic impact

Include forward-linked (FL) Pacific halibut processing

Metrics:
Output
GDP
Wages
Employment
Household income

Effects:
Direct
Indirect
Induced
Effects including forward-linked processing

Conclusions

- PHMEIA is a core product of the IPHC socioeconomic study undertaken to provide comprehensive economic information to support the overall management of the Pacific halibut resource

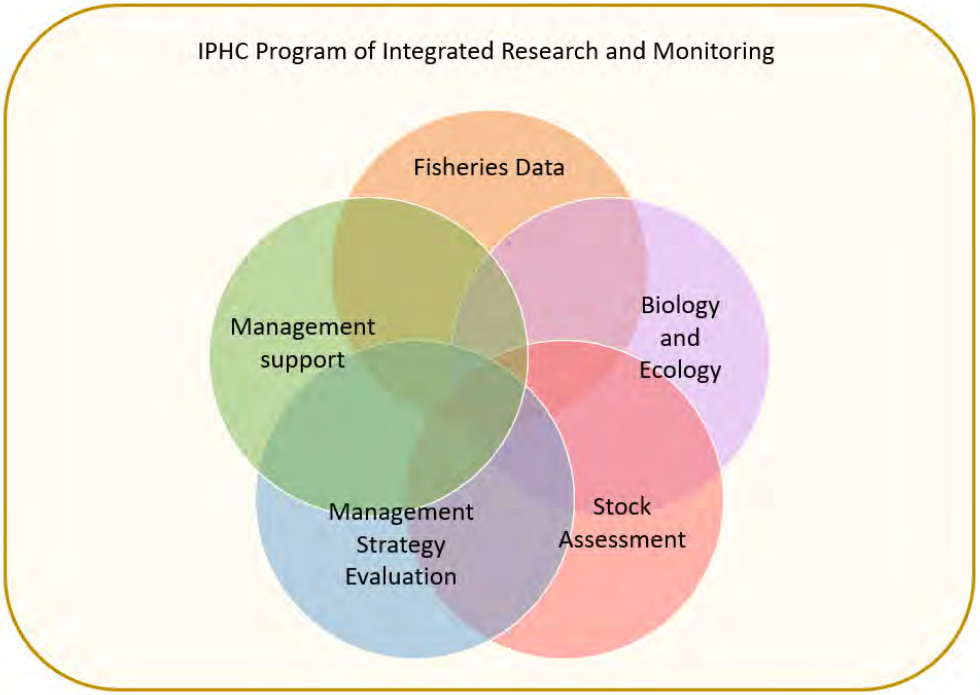
- PHMEIA provides a better understanding of a broad scope of impacts of the Pacific halibut resource at various spatial scales

- Revenue generated by direct Pacific halibut sectors accounts for only a fraction of economic activity that would be forgone if the resource was not available to fishers

- Multipliers can be misleading – what is important to local economy is EI retained in the region

- Understanding the complex interactions between sectors and regions is particularly important in the context of globalization and exposure to external factors beyond stock condition

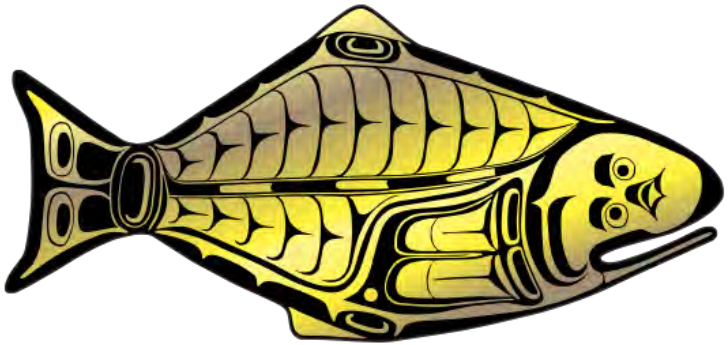
Integrated management support



- Integrated management support that incorporates human dimension contributes to a wholesome approach to Pacific halibut management that is optimal from both biological and socioeconomic perspective

IPHC 5-year Program of Integrated Research and Monitoring (2021-26)

INTERNATIONAL PACIFIC



HALIBUT COMMISSION