# THE VALUE OF THE MARYLAND SHELLFISH AQUACULTURE INDUSTRY

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**EAST COAST COMMERCIAL FISHERMAN'S AND AQUACULTURE TRADE SHOW**

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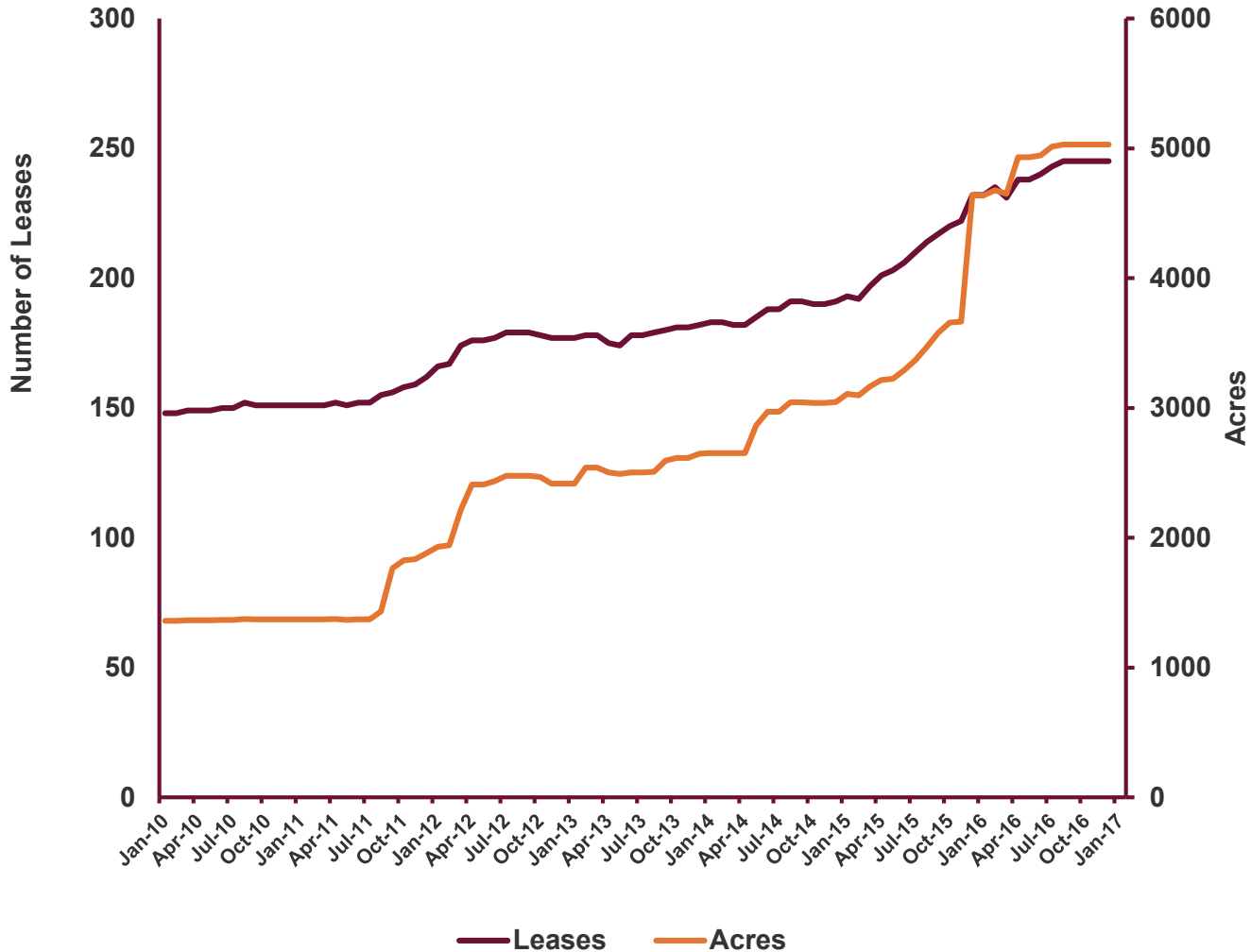
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# Overview



- Characterization of the Maryland shellfish industry
- Survey design and data collection
- Economic Impact Modelling

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# Characterization of the Maryland shellfish industry

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# Characterization of the Maryland shellfish industry



Bottom culture (2010 – 2017)

Increasing trend for:
- Number of leases
- Number of acres

Total (January 2017)
- 254 leases
- 5,028 acres

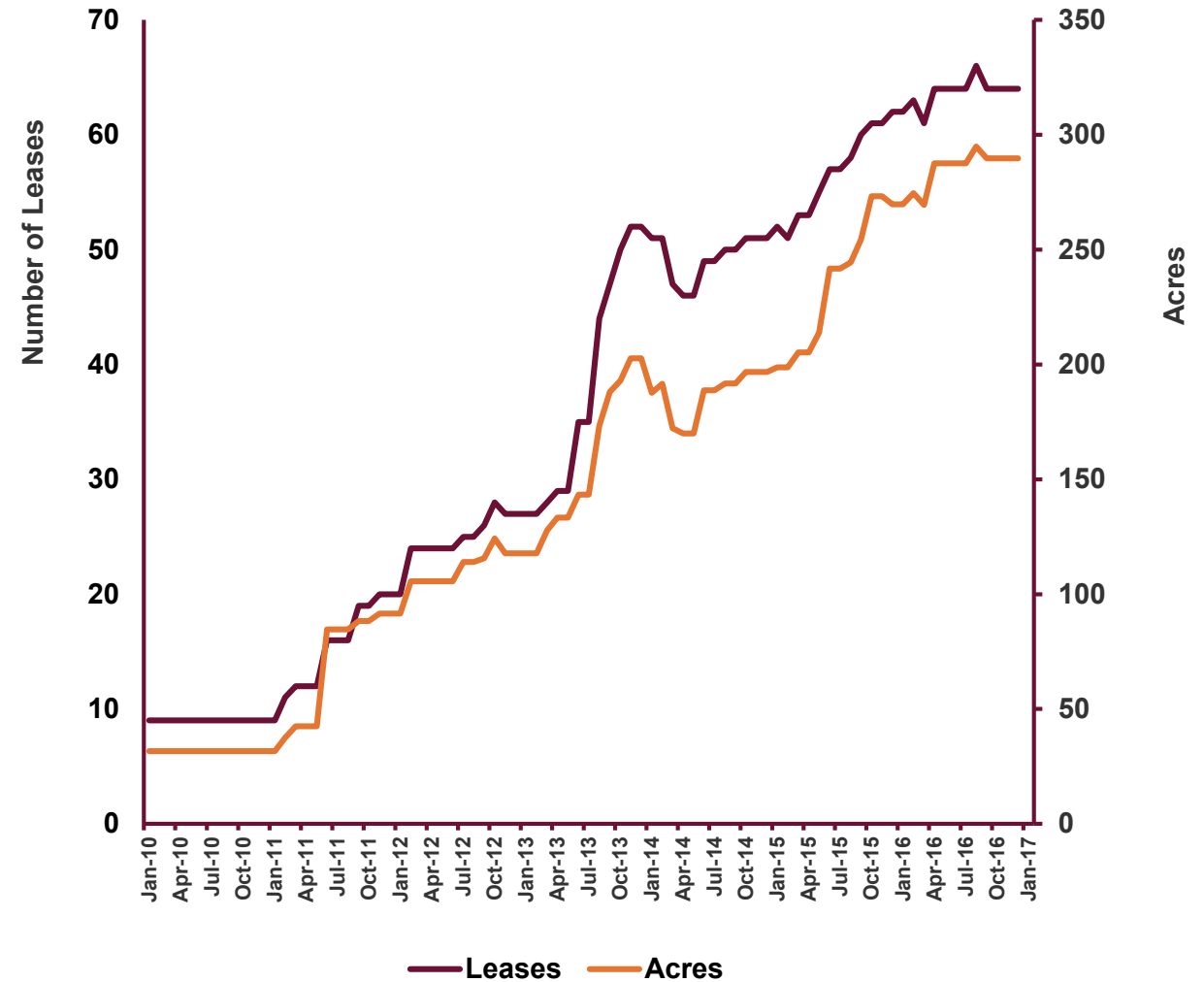# Characterization of the Maryland shellfish industry

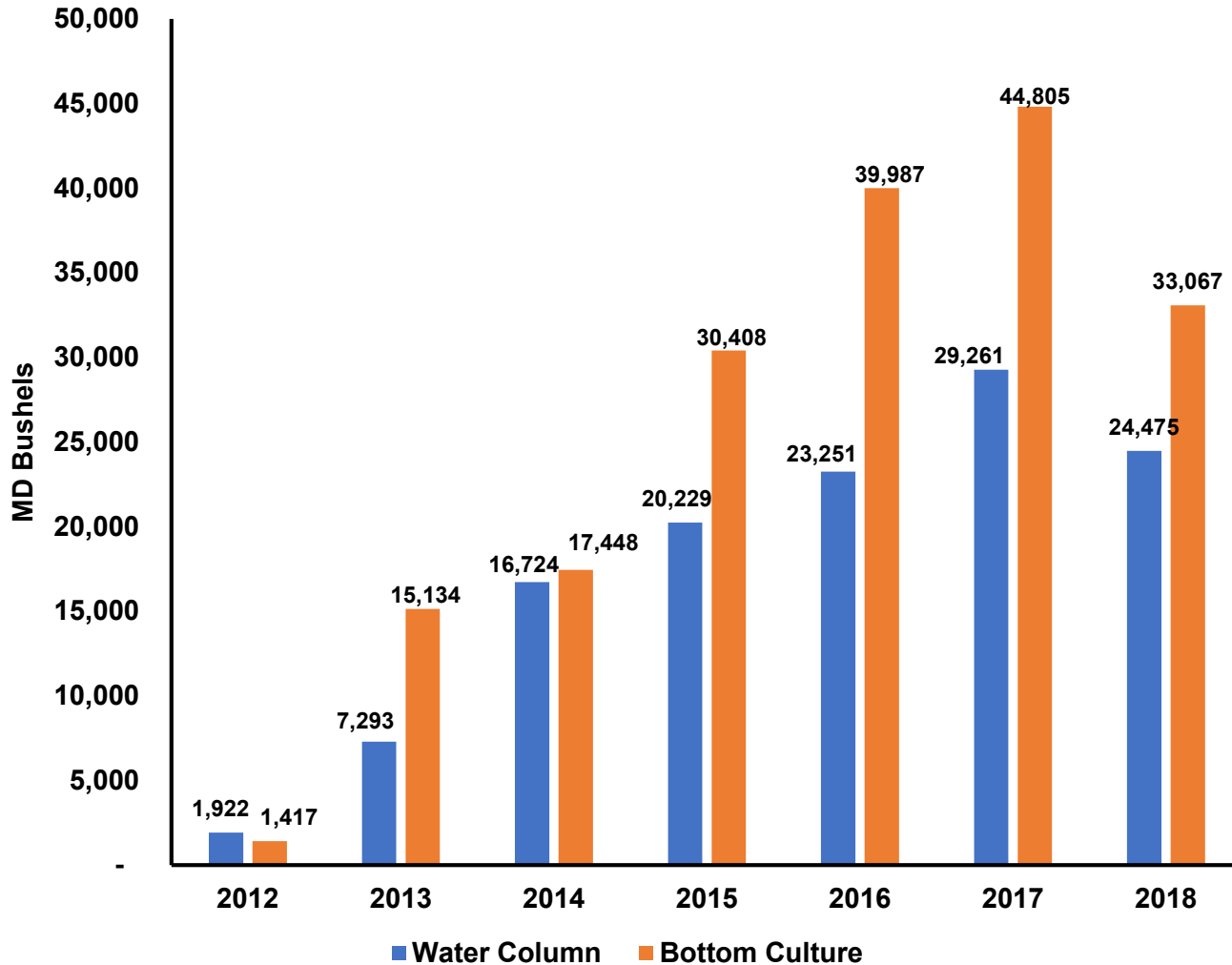Water column culture (2010 – 2017)

Increasing trend for:

- Number of leases
- Number of acres

Total (January 2017)

- 64 leases
- 290 acres

# Characterization of the Maryland shellfish industry



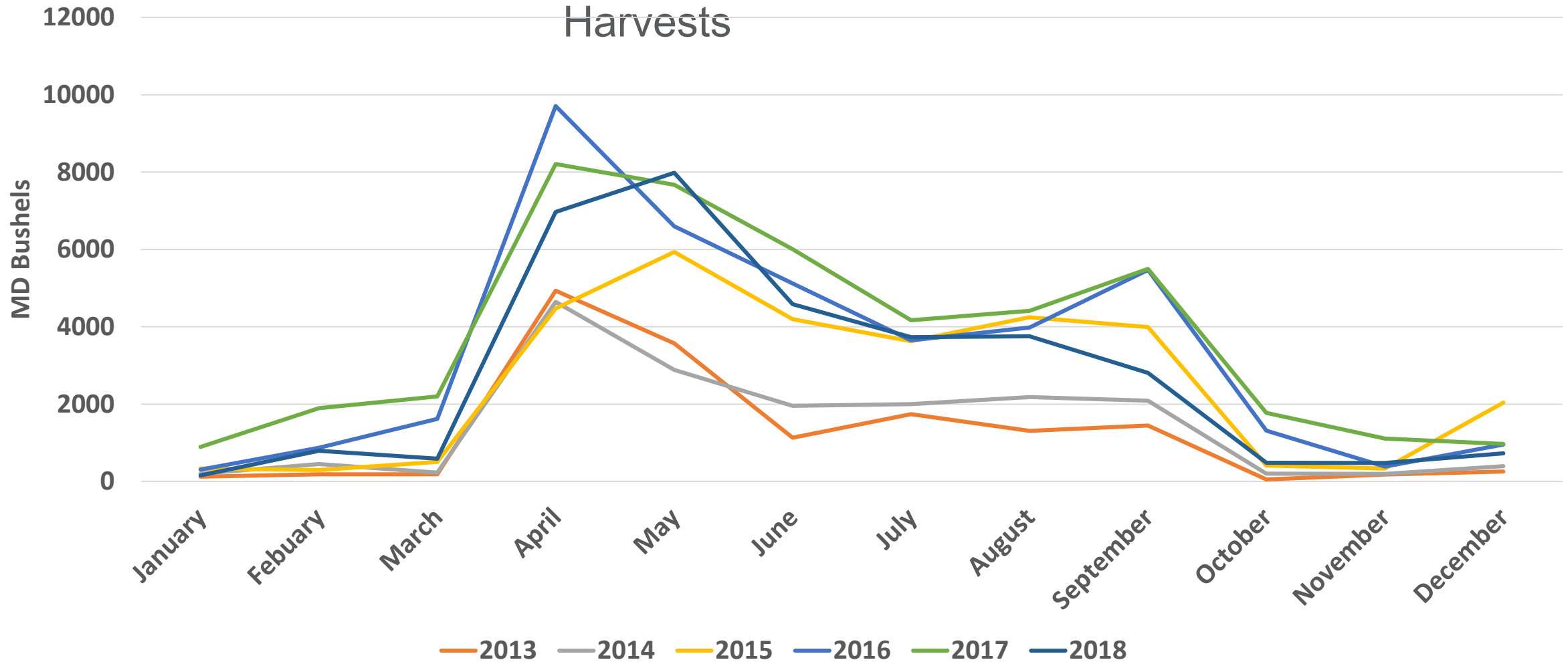Average annual growth in harvest 2013-2018 : 24%

2018 harvest decline -22%
- Bottom culture: -26%
- Water column: -16%

Decline believed to be driven by influx of fresh water due to rainfall
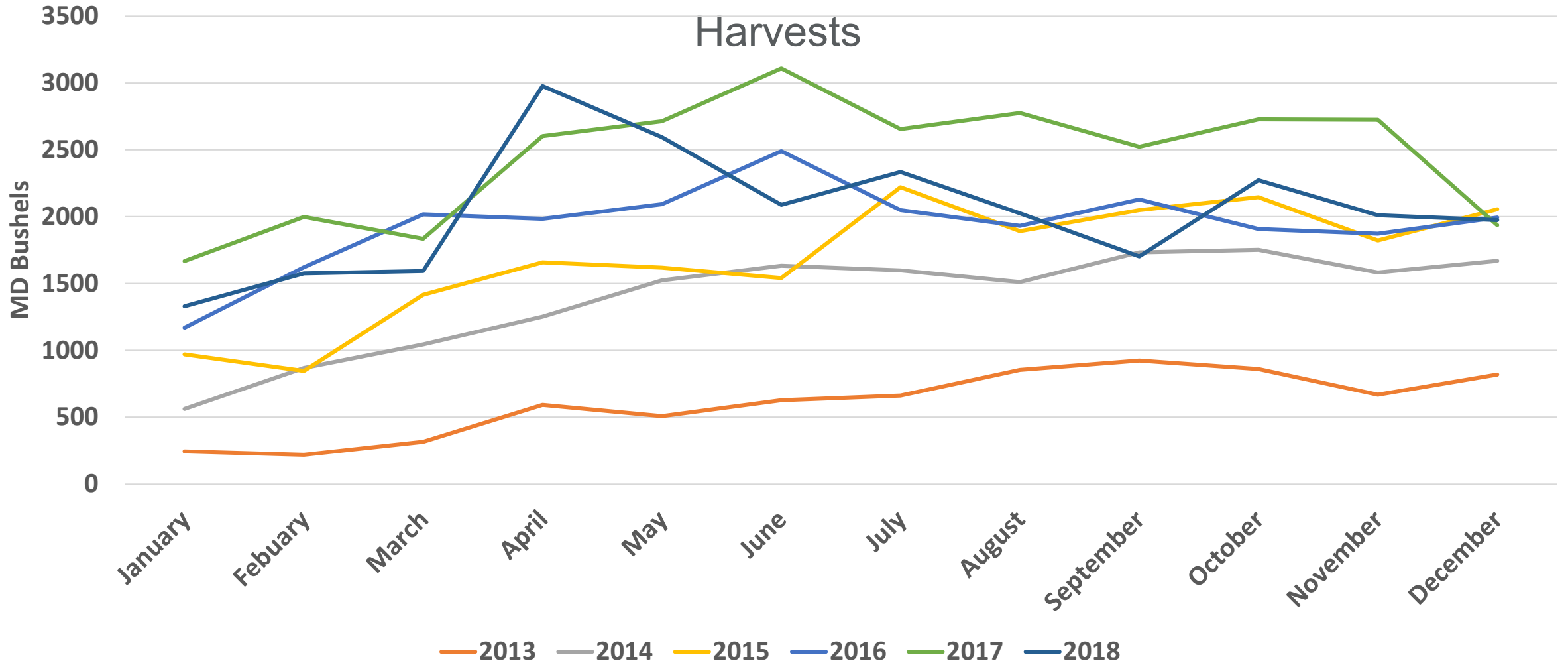
# Characterization of the Maryland shellfish industry

Bottom Culture Harvests

# Characterization of the Maryland shellfish industry



Water Column Culture Harvests

# Survey design and data collection

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# Survey design and data collection

To generate the comprehensive estimates of the economic impact of the Maryland shellfish aquaculture industry, it was necessary to gather data from each level of the supply chain.

Surveys developed for:

- 1) Shellfish hatcheries

- 2) Additional shellfish farms

- 3) Packing / shucking / processing plants

- 4) Wholesaler / distributors.

# Survey design and data collection

Contact lists developed with the aid of

- Industry lists

- University of Maryland Extension

- Chesapeake Bay Foundation

- Web searches

Notification of the study and its intended goals in advance of initiating any survey activities

Telephone contact to request participation

In person interviews by project personnel

# Survey design and data collection

Survey responses were recorded and coded

Respondents information treated as confidential



Survey activities continued for a period of four months over the summer of 2019, with repeated attempts to contact members of the target populations.

# Survey design and data collection

## Response Rates

| Supply chain level | List frame (no.) | Refusal/unable (no.) | No response (no.) | Completed (no.) | Response rate (%) |
|---|---|---|---|---|---|
| Hatcheries | 3 | 0 | 2 | 1 | 33% |
| Farms | 76 | 15 | 36 | 25 | 33% |
| Wholesale / Distributors | 76 | 1 | 71 | 4 | 5% |

# Economic impact modelling

# Economic impact modeling

- Money must enter an economy for it to grow (Blair 1995)
- Growth achieved by exports (Blair 1995)
- An economy can be separated into basic and non-basic activities (Tiebout 1956)

# Economic impact modeling

Assumptions: (Schaffer 1999)

- Linear relationship between inputs and level of output for each sector of the economy

- Basic sectors of the economy can produce excess goods for export while still meeting demand of the local economy

$$q_i = z_{ij} + z_{ij} + \cdots + z_{ij} + f_i$$
$$i = 1,2,\ldots,N \qquad j = 1,2,\ldots,N$$

i = Sector
q = output
z = transfers to other sectors
f = final demand sector

# Economic impact modeling

Social Accounting Matrix (Alward 1996)
- Expansion of the Input-Output Model
- Allows for better description of activities within the study area
- Captures transactions between all the actors within an economy

IMPLAN ProTM software
- Input-Output Model
- Social Accounting Matrix

# Economic impact modeling

Analysis by parts (ABP):

- IMPLAN does not contain a dedicated sector for aquaculture

- To more accurately estimate the impacts of the Maryland shellfish aquaculture industry

- ABP allows for dividing the effects from an industry into its individual components, budget expenditures, and income

- ABP allows for greater flexibility and customization of the model

- ABP allows for specification of commodity inputs, specification of proportion of local labor income, specification of local purchases, and the use of IMPLAN's special spending patterns

- One industry spending pattern was created for each activity (water column culture, bottom culture, equipment manufacturing, and nursery and hatchery production)

# Economic impact modeling

## Study area characteristics

| Category | Measure/Quantity |
|---|---:|
| Land area (square miles) [1] | 9,775 (2017) |
| Population | 6,042,718 |
| Total employment [1] | 3,703,941 (2017) |
| Gross Regional Product ($) [1] | $408,670,149,785 (2017) |
| Per Capita Income ($) | $39,070 |
| Percent poverty | 9% |
| Number of industries [1] | 473 (2017) |

(United States Census Bureau, 2019)

[1] (MIG, 2019)

# Economic impact modeling

Definitions (Kaliba and Engle, 2004):

- Direct effects: effects which are accumulated within the particular industry being investigated. For example, the direct employment or sales by shellfish farms.

- Indirect effects: effects that are experienced by related industries through linked sectors. For example, purchases of fuel by shellfish farms that affect the bigger petroleum refining and production industry.

- Induced effects: the changes in household expenditures from income changes in the related sectors. For example, salaries paid that lead to additional economic activity through the purchase of homes, utilities, groceries, etc.

# Economic impact modeling

Results

| Impact Type | Employment | Labor Income | Total Value Added | Output |
|---|---|---|---|---|
| **Direct Effect** | 77 | $2,867,579 | $812,435 | $3,632,564 |
| **Indirect Effect** | 12 | $644,664 | $1,036,130 | $1,681,742 |
| **Induced Effect** | 18 | $960,075 | $1,745,341 | $2,827,283 |
| **Total Effect** | 107 | $4,472,318 | $3,593,906 | $8,141,589 |

Total # of affected sectors: 450

# Economic impact modeling

## Most affected sectors : Employment

| Description | Total Employment | Total Labor Income | Total Value Added | Total Output |
|---|---|---|---|---|
| Retail - Miscellaneous store retailers | 4 | $96,869 | $116,287 | $176,909 |
| Commercial and industrial machinery and equipment repair and maintenance | 2 | $123,305 | $184,871 | $249,221 |
| Real estate | 1 | $49,443 | $241,524 | $310,800 |
| Retail - Building material and garden equipment and supplies stores | 1 | $51,897 | $81,337 | $128,669 |
| Hospitals | 1 | $77,281 | $90,666 | $165,273 |
| Limited-service restaurants | 1 | $21,092 | $51,600 | $86,169 |
| Full-service restaurants | 1 | $22,731 | $26,250 | $47,019 |
| Wholesale trade | 1 | $65,785 | $124,910 | $181,959 |
| Animal production, except cattle and poultry and eggs | 1 | $7,010 | $21,614 | $33,820 |
| Offices of physicians | 1 | $59,568 | $58,584 | $87,728 |

# Economic impact modeling

## Most affected sectors : Total Output

| Description | Total Employment | Total Labor Income | Total Value Added | Total Output |
|---|---|---|---|---|
| Owner-occupied dwellings | 0 | $0 | $274,414 | $419,523 |
| Real estate | 1 | $49,443 | $241,524 | $310,800 |
| Commercial and industrial machinery and equipment repair and maintenance | 2 | $123,305 | $184,871 | $249,221 |
| Insurance carriers | 0 | $38,583 | $131,870 | $194,192 |
| Wholesale trade | 1 | $65,785 | $124,910 | $181,959 |
| Retail - Miscellaneous store retailers | 4 | $96,869 | $116,287 | $176,909 |
| Hospitals | 1 | $77,281 | $90,666 | $165,273 |
| Retail - Building material and garden equipment and supplies stores | 1 | $51,897 | $81,337 | $128,669 |
| Wireless telecommunications carriers (except satellite) | 0 | $2,580 | $35,750 | $95,904 |
| Wired telecommunications carriers | 0 | $18,864 | $44,689 | $95,421 |

# Economic impact modeling

## Discussion

- Results are likely underestimating the impacts of the Maryland shellfish industry in 2018
- The response rate is the primary limitation to this analysis, and a potential cause of under-estimated activity expenditures
- Processors and wholesalers/distributors are not accounted for in the data that were utilized for impact estimation
- The economic impact estimated in this study was confined to activities and expenditures within the state of Maryland
- Harvests of oysters were lower in 2018 than in 2017, likely caused by an influx of fresh water to the Bay. This would also have affected farm sales values for 2018, and may have had an effect on farm expenditures.

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# Economic impact modeling

Estimate based on 2017 harvests

| Impact Type | Employment | Labor Income | Total Value Added | Output |
|---|---|---|---|---|
| **Direct Effect** | 98 | $3,000,523 | $2,139,072 | $4,225,250 |
| **Indirect Effect** | 13 | $693,691 | $1,113,944 | $1,803,304 |
| **Induced Effect** | 24 | $1,255,933 | $2,283,150 | $3,698,561 |
| **Total Effect** | 135 | $4,950,147 | $5,536,166 | $9,727,115 |

# Conclusions

- The oyster industry in Maryland has grown rapidly in recent years

- Oyster farming in Maryland provides valuable employment opportunities for watermen and others in coastal areas

- The total economic output effect of the Maryland shellfish industry was estimated at $8.1 million in 2018

- Total employment effect of the Maryland shellfish industry was estimated at 107 people; direct effect 77 jobs, indirect effect 12 jobs, and induced effect 18 jobs

- The greater harvests and sales of oysters in 2017 were estimated to have a greater total economic output of $9.7 million with a total employment effect of supporting 135 jobs

- The Maryland oyster industry supports a wide variety of other economic sectors, from real estate and wholesale trade through direct expenditures by oyster farms that multiply in Maryland's economy

# Acknowledgments

THANK YOU