

## SEA SCALLOP INVESTIGATIONS

The sea scallop fishery has been expanding rapidly since 1945 and is now the most valuable of the New England offshore fisheries. Pressure on the Georges Bank stocks has also increased recently with the expansion of the Canadian offshore sea scallop fleet.

When the present investigation was started, there was very little known of the biology of the animal or of the condition of the exploited stocks. We now have good estimates of growth and mortality rates in the catchable sizes and programs set up to measure the removals and evaluate the effects of changes in fishing practice. There is evidence that the older year-classes of larger animals have been fished out and that the fishery is heavily dependent upon the smallest catchable year-class. Population dynamics calculations indicate an increase in yield will result from a postponement of first capture, and a management program is being considered.

Nothing is known about the sea scallop from the time the eggs are spawned until they reach about 10 mm. and very little from this size to about 60 mm. It is during this period that the physical and biological environment presses most heavily on the stocks. Future expansion of this investigation will be concerned with these stages of the life history.

August 6, 1959

## SEA SCALLOP INVESTIGATIONS

### List of Projects

1. Basic statistics
2. Sampling at sea
3. Survey of grounds
4. Strength of pre-recruits
5. Growth from tags
6. Shell structure
7. Growth from rings
8. Total mortality from L-F
9. Fishery mortality from tags
10. Natural mortality
11. Mesh selection
12. Population dynamics
13. Aquarium
14. Ring formation
15. Gametogenesis
16. Spat collection
17. Variation in length-weight ratio
18. Larval culture
19. Temperature on larvae
20. Temperature on adult growth

21. Food on larvae
22. Vertical distribution of larvae
23. Salinity on growth
24. Food of adults
25. Survey of immature
26. Formation of beds
27. Predators
28. Hydrography and year-class strength
29. Middle Atlantic beds

SUMMARY CONTROL SCHEDULE

Investigation: Sea Scallops  
 Biological Laboratory: Woods Hole, Mass.

Project Title	Est.* Cost	Fiscal Years									
		57	58	59	60	61	62	63	64	65	66
1. Basic statistics of the sea scallop fishery	78.8	11.0	7.9	6.1	7.5	7.1	8.4	6.7	7.0	7.0	10.1
2. Sampling the commercial catch at sea	68.7	9.2	5.0	5.1	6.1	6.4	7.9	6.2	6.5	6.7	9.6
3. Survey of the sea scallop grounds	157.1	14.9	10.3	9.4	12.7	17.0	18.1	17.2	17.5	18.6	21.4
4. Strength of pre-recruit year class	34.6	--	--	3.0	4.1	4.1	5.4	3.6	3.9	3.9	6.6
5. Growth from tag returns	27.5	8.4	6.9	6.1	6.1	--	--	--	--	--	--
6. Structure and formation of the shell ligament	14.3	--	6.8	4.4	3.6	--	--	--	--	--	--
7. Growth from rings	53.9	--	--	4.1	6.8	6.4	7.9	6.1	6.5	6.6	9.5
8. Total mortality from L-F distribution analysis	34.8	--	--	3.0	4.1	4.2	5.3	3.6	3.9	4.0	6.7
9. Fishery mortality from tag returns	25.7	--	5.6	3.7	4.8	5.2	6.4	--	--	--	--
10. Natural mortality rate	30.8	--	--	2.5	3.6	3.7	4.8	3.1	3.4	3.5	6.2
11. Size selection of sea scallop dredges	16.9	--	5.2	3.0	4.1	4.6	--	--	--	--	--
12. Population dynamics of G.B. sea scallop fishery	26.9	8.4	5.9	4.0	4.1	4.5	--	--	--	--	--
13. Design and construction of temperature-controlled experi- mental tank	3.5	--	--	3.5	--	--	--	--	--	--	--
14. Ring formation	11.8	--	--	3.5	4.2	4.1	--	--	--	--	--
15. Gametogenesis and spawning seasonal cycles	8.3	--	--	--	4.2	4.1	--	--	--	--	--

SUMMARY CO. OL SCHEDULE

Investigation: Sea Scallops  
 Biological Laboratory: Woods Hole, Mass.

Project Title	Est.* Cost	Fiscal Years										
		57	58	59	60	61	62	63	64	65	66	
16. Spat collection	13.5	--	--	2.7	5.0	5.8	--	--	--	--	--	
17. Variation in length-weight ratio by season and area	14.4	--	--	--	4.2	4.5	5.7	--	--	--	--	
18. Larval culture	8.9	--	--	--	4.4	4.5	--	--	--	--	--	
19. Temperature effect upon larval mortality and growth rates	21.1	--	--	--	--	7.5	7.9	5.7	--	--	--	
20. Temperature on adult growth	20.0	--	--	--	--	--	7.9	5.9	6.2	--	--	
21. Food on larvae	22.7	--	--	--	--	--	8.9	6.9	6.9	--	--	
22. Vertical distribution of larvae	23.5	--	--	--	--	8.2	8.9	6.4	--	--	--	
23. Salinity on growth	15.8	--	--	--	--	--	8.9	6.9	--	--	--	
24. Food of adults	21.2	--	--	--	--	--	--	6.9	7.1	7.2	--	
25. Survey of immature	37.7	--	--	--	--	--	--	--	10.6	11.7	15.4	
26. Formation of beds	15.3	--	--	--	--	--	--	--	--	6.4	8.9	
27. Predators	15.9	--	--	--	--	--	--	--	--	6.5	9.4	
28. Hydrography and year-class strength	28.6	--	--	--	--	--	--	--	8.5	8.7	11.4	
29. Middle Atlantic beds	11.0	--	--	--	--	--	--	--	--	--	11.0	
Investigation Total		863.7	51.5	53.6	64.1	89.6	101.9	112.4	85.2	88.0	90.8	126.2
Annual Review												
Laboratory	Regional or Area Office	Washington Office	Prepared by: J. A. Fosgay		Date							
			Recommended by:		Date							
			Lab. Director Herbert W. Graham		8/6/59							
			Reg. or Area Dir. Joseph P. Penner									
			Branch Chief		12.24.59							
			Approved by:									
					Division Chief for Director							

\*Total needed by Laboratory for Project in thousands of dollars.

U. S. Fish and Wildlife Service  
Bureau of Commercial Fisheries

Sheet No. 1

Location: Woods Hole, Mass.  
Date: August 6, 1959  
File No.

Research Project Outline

Title of Project: Basic statistics of the Sea Scallop Fishery

Investigation Title: Sea Scallop

Investigation Chief: J. A. Posgay

Project Leader:	<u>E. E. Nichy</u>	<u>Fishery Research Biologist</u>	<u>GS-7</u>
	Name	Title	Grade

Assistants: (Title and Grade)  
Vacant - Statistical Clerk GS-4

Collaborators:

Need for Information: To keep the state of the fishery under continuous review in order to become aware of any changes in location and abundance.

Objective: To measure the removals in number and weight from all the fishing grounds.

Method of Procedure:

Phase 1: Compile data on catch and effort by unit area on punch cards. Prepare monthly, quarterly and annual summaries. Compile and tabulate data on size and age composition of the landings. Calculate the numbers removed.

Phase 2:

Sea Scallop - 1

Sheet No. 2

File No.:

Method of Procedure: (Cont'd)

Phase 3:

Estimated Costs:	Total Needed by Laboratory for Complete Project		
	FY <u>1959</u>	FY <u>1960</u>	FY <u>1961</u>
Personal Services	<u>3.8</u>	<u>3.7</u>	<u>3.8</u>
Other Expenses:			
Within Project	<u>0.2</u>	<u>0.2</u>	<u>0.2</u>
Lab. Adm. & Ser.	<u>2.1</u>	<u>3.6</u>	<u>3.1</u>
Lab. Total	<u>6.1</u>	<u>7.5</u>	<u>7.1</u>
Regional Office	<u>.061</u>	<u>.075</u>	<u>.071</u>
Washington Office	<u>          </u>	<u>          </u>	<u>          </u>
Total	<u>          </u>	<u>          </u>	<u>          </u>

Recommended Source of Funds S-K and Regular  
 (S-K, Regular, Contributed, etc.)

Estimated Date of Completion: Phase 1 FY ; Phase 2 FY ; Phase 3 FY ; Project FY

Recommended by:		Date
Originator	<u>J. A. Posgay</u>	<u>8/6/59</u>
Investigation Chief	<u>J. A. Posgay</u>	<u>8/6/59</u>
Laboratory Director	<u>Herbert W. Graham</u>	<u>8/6/59</u>
Regional Director	<u>Joseph F. Penner</u>	<u>8/19/59</u>
Branch Chief	<u>W.F.E.</u>	<u>12-24-59</u>
Approved by:		
Division Chief for Director	<u>          </u>	<u>          </u>

Remarks

(Continue on reverse side)

*This looks like a data collection  
 (continuing) project*

U. S. Fish and Wildlife Service  
Bureau of Commercial Fisheries

Sheet No. 1

Location: Woods Hole, Mass.  
Date: August 6, 1959  
File No.

Research Project Outline

Title of Project: Sampling the commercial catch at sea

Investigation Title: Sea Scallop

Investigation Chief: J. A. Posgay

Project Leader: F. E. Nichy Fishery Research Biologist GS-7  
Name Title Grade

Assistants: (Title and Grade)

Vacant - Statistical Clerk GS-4

Collaborators: Various commercial fishermen

Need for Information: The cull point, as well as the kind and amount of discard under various conditions, must be known to predict the effect of any management recommendation.

Objective: To measure the L-F of the catch, discards and landings under the conditions of normal commercial practice.

Method of Procedure:

Phase 1: To send observers aboard commercial scallopers fishing with standard gear as well as experimental gear. To have fishermen bring in special collections of scallops taken with dredge liners and with standard gear.

Phase 2:

Sea Scallop - 2

Sheet No. 2

File No.:

Method of Procedure: (Cont'd)

Phase 3:

Estimated Costs:	Total Needed by Laboratory for Complete Project		
	FY 1959	FY 1960	FY 1961
			68.7
Personal Services	2.5	2.5	2.7
Other Expenses:			
Within Project	0.5	0.5	0.6
Lab. Adm. & Ser.	2.1	3.1	3.1
Lab. Total	5.1	6.1	6.4
Regional Office	.051	.061	.064
Washington Office			
Total			

Recommended Source of Funds S-K and Regular  
 (S-K, Regular, Contributed, etc.)

Estimated Date of Completion: Phase 1 FY ; Phase 2 FY ; Phase 3 FY ; Project FY

Recommended by:		Date
Originator	J. A. Posgay	8/6/59
Investigation Chief	J. A. Posgay	8/6/59
Laboratory Director	Herbert W. Graham	8/6/59
Regional Director	<i>Joseph H. Pomeroy</i>	8/19/59
Branch Chief	<i>JHE</i>	12-24-59
Approved by:		
Division Chief for Director	<i>[Signature]</i>	

Remarks

(Continue on reverse side)

*This looks like a data collection project. Should be continuing.*

U. S. Fish and Wildlife Service  
Bureau of Commercial Fisheries

Sheet No. 1

Location: Woods Hole, Mass.  
Date: August 6, 1959  
File No.

Research Project Outline

Title of Project: Survey of the Sea Scallop grounds

Investigation Title: Sea Scallop

Investigation Chief: J. A. Posgay

Project Leader: J. A. Posgay Fishery Research Biologist GS-12  
Name Title Grade

Assistants: (Title and Grade)

A. S. Merrill Fishery Research Biologist GS-7  
F. E. Nichy Fishery Research Biologist GS-7

Collaborators:

Need for Information: To provide the data necessary for calculating the strength of pre-recruit and exploited year classes, natural and fishing mortality rates.

Objective: To collect length and age frequency data from the fishing grounds with standard and experimental gear.

Method of Procedure:

Phase 1: To make three regularly scheduled sampling cruises each year aboard a chartered fishing vessel:

May 10 days  
July 7 days  
September 10 days

Phase 2:

Sea Scallop - 3

Sheet No. 2

File No.:

Method of Procedure: (Cont'd)

Phase 3:

Estimated Costs:	Total Needed by Laboratory for Complete Project		
	FY 1959	FY 1960	FY 1961
Personal Services	1.4	1.6	2.9
Other Expenses:			
Within Project	6.0	8.0	11.0
Lab. Adm. & Ser.	2.0	3.1	3.1
Lab. Total	9.4	12.7	17.0
Regional Office	.094	.127	.17
Washington Office			
Total			

Recommended Source of Funds S-K and Regular  
(S-K, Regular, Contributed, etc.)

Estimated Date of Completion: Phase 1 FY ; Phase 2 FY ; Phase 3 FY ; Project FY

Recommended by:		Date
Originator	J. A. Posgay	8/6/59
Investigation Chief	J. A. Posgay	8/6/59
Laboratory Director	Herbert W. Graham	8/6/59
Regional Director	<i>Joseph H. Penner</i>	8/19/59
Branch Chief	<i>WHE</i>	12-24-59
Approved by:		
Division Chief for Director	<i>[Signature]</i>	<i>[Date]</i>

Remarks

(Continue on reverse side)

*Data collection?*

U. S. Fish and Wildlife Service  
Bureau of Commercial Fisheries

Sheet No. 1

Location: Woods Hole, Mass.  
Date: August 6, 1959  
File No.

Research Project Outline

Title of Project: Strength of the pre-recruit year class

Investigation Title: Sea Scallop

Investigation Chief: J. A. Posgay

Project Leader: J. A. Posgay Fishery Research Biologist GS-12  
Name Title Grade

Assistants: (Title and Grade)

A. S. Merrill	Fishery Research Biologist	GS-7
F. E. Nichy	Fishery Research Biologist	GS-7

Collaborators:

Need for Information: To predict the future supply of the resource which will be available to the fishery.

Objective: To predict the relative strength of the incoming year class at least one year before it enters the fishery.

Method of Procedure:

Phase 1: Sample the area at regular intervals with standard, small mesh gear. Compare strengths of successive year classes. Measure yields after they enter the fishery. Make predictions.

Phase 2:

Method of Procedure: (Cont'd)

Phase 3:

Estimated Costs:	Total Needed by Laboratory for Complete Project		
	FY 1959	FY 1960	FY 1961
Personal Services	1.0	1.0	1.0
Other Expenses: Within Project			
Lab. Adm. & Ser.	2.0	3.1	3.1
Lab. Total	3.0	4.1	4.1
Regional Office	.03	.041	.041
Washington Office			
Total			

Recommended Source of Funds \_\_\_\_\_  
(S-K, Regular, Contributed, etc.)

Estimated Date of Completion: Phase 1 FY 59; Phase 2 FY; Phase 3 FY; Project FY

Recommended by:		Date
Originator	J. A. Posgay	8/6/59
Investigation Chief	J. A. Posgay	8/6/59
Laboratory Director	Herbert W. Graham	8/6/59
Regional Director	<i>Joseph F. ...</i>	8/19/59
Branch Chief	<i>JHE.</i>	12-24-59
Approved by:		
Division Chief for Director	<i>JHE.</i>	

Remarks

(Continue on reverse side)

*Data collection?*

U. S. Fish and Wildlife Service  
Bureau of Commercial Fisheries

Sheet No. 1

Location: Woods Hole, Mass.  
Date: August 6, 1959  
File No.

Research Project Outline

Title of Project: Growth rate from tag returns

Investigation Title: Sea Scallop

Investigation Chief: J. A. Posgay

Project Leader:	<u>F. E. Nichy</u>	<u>Fishery Research Biologist</u>	<u>GS-7</u>
	Name	Title	Grade

Assistants: (Title and Grade)

Vacant - Statistical Clerk GS-4

Collaborators:

Need for Information: One of the basic parameters necessary for assessing the effects of fishing on the stocks.

Objective: To determine the annual growth rate in the most important fishing grounds. Validate the annual ring method.

Method of Procedure:

Phase 1: Tag and release large numbers of sea scallops. Measure the growth increment on the recaptured specimens and calculate the annual rates for each area.

Phase 2:

Sea Scallop - 5

Sheet No. 2

File No.:

Method of Procedure: (Cont'd)

Phase 3:

Estimated Costs: Total Needed by Laboratory for Complete Project			<u>27.5</u>
	FY <u>1959</u>	FY <u>1960</u>	FY <u>1961</u>
Personal Services	<u>2.5</u>	<u>1.4</u>	<u>---</u>
Other Expenses:			
Within Project	<u>1.6</u>	<u>0.6</u>	<u>---</u>
Lab. Adm. & Ser.	<u>2.0</u>	<u>4.1</u>	<u>---</u>
Lab. Total	<u>6.1</u>	<u>6.1</u>	
Regional Office	<u>.061</u>	<u>.061</u>	
Washington Office			
Total			

Recommended Source of Funds S-K and Regular  
(S-K, Regular, Contributed, etc.)

Estimated Date of Completion: Phase 1 FY ; Phase 2 FY ; Phase 3 FY ; Project FY60

Recommended by:		Date
Originator	<u>J. A. Posgay</u>	<u>8/6/59</u>
Investigation Chief	<u>J. A. Posgay</u>	<u>8/6/59</u>
Laboratory Director	<u>Herbert W. Graham</u>	<u>8/6/59</u>
Regional Director	<u>Joseph F. Penner</u>	<u>8/19/59</u>
Branch Chief	<u>JHE</u>	<u>12-24-59</u>
Approved by:		
Division Chief for Director	<u>[Signature]</u>	

Remarks

(Continue on reverse side)

U. S. Fish and Wildlife Service  
Bureau of Commercial Fisheries

Sheet No. 1

Location: Woods Hole, Mass.  
Date: August 6, 1959  
File No.

Research Project Outline

Title of Project: Structure and formation of the shell ligament

Investigation Title: Sea Scallop

Investigation Chief: J. A. Posgay

Project Leader: A. S. Merrill Fishery Research Biologist GS-7  
Name Title Grade

Assistants: (Title and Grade)

Vacant - Fishery Aid GS-4

Collaborators:

Need for Information: A technique for determining the age of an individual scallop is necessary for establishing growth rates and year class strengths of the various fishing grounds.

Objective: To establish the presence, cause and time of formation of marks caused by annual phenomena

Method of Procedure: Sectioning and examination of the shells and ligaments of annuals collected at various times and places.

Phase 1:

Phase 2:

Method of Procedure: (Cont'd)

Phase 3:

Estimated Costs:	Total Needed by Laboratory for Complete Project		
	FY 1959	FY 1960	FY 1961
Personal Services	2.0	0.5	---
Other Expenses:			
Within Project	0.4	---	---
Lab. Adm. & Ser.	2.0	3.1	---
Lab. Total	4.4	3.6	---
Regional Office	.044	.036	
Washington Office			
Total			

Recommended Source of Funds S-K and Regular  
(S-K, Regular, Contributed, etc.)

Estimated Date of Completion: Phase 1 FY58; Phase 2 FY; Phase 3 FY; Project FY 60

Recommended by:		Date
Originator	<u>J.A. Posgay</u>	<u>8/6/59</u>
Investigation Chief	<u>J. A. Posgay</u>	<u>8/6/59</u>
Laboratory Director	<u>Herbert W. Graham</u>	<u>8/6/59</u>
Regional Director	<u>Joseph P. Penner</u>	<u>8/19/59</u>
Branch Chief	<u>noted J. A. W. E.</u>	<u>12-24-59</u>
Approved by:		
Division Chief for Director	<u>[Signature]</u>	

Remarks

(Continue on reverse side)

U. S. Fish and Wildlife Service  
Bureau of Commercial Fisheries

Sheet No. 1

Location: Woods Hole, Mass.  
Date: August 6, 1959  
File No.

Research Project Outline

Title of Project: Growth rate from annual rings

Investigation Title: Sea Scallop

Investigation Chief: J. A. Posgay

Project Leader: A. S. Merrill Fishery Research Biologist GS-7  
Name Title Grade

Assistants: (Title and Grade)

Vacant - Fishery Aid GS-4 (Part time)

Collaborators:

Need for Information: One of the basic parameters necessary for assessing the effect of fishing on the stocks.

Objective: To determine the average annual growth rate of the sea scallop throughout its range.

Method of Procedure: Collect samples of shells, locate the annual rings, measure the growth increments between rings, calculate the average growth rate.

Phase 1:

Phase 2:

Method of Procedure: (Cont'd)

Phase 3:

Estimated Costs:	Total Needed by Laboratory for Complete Project		
	FY 1959	FY 1960	FY 1961
Personal Services	2.0	3.0	3.1
Other Expenses:			
Within Project	0.1	0.2	0.2
Lab. Adm. & Ser.	2.0	3.6	3.1
Lab. Total	4.1	6.8	6.4
Regional Office	.041	.068	.064
Washington Office			
Total			

Recommended Source of Funds \_\_\_\_\_  
(S-K, Regular, Contributed, etc.)

Estimated Date of Completion: Phase 1 FY59; Phase 2 FY; Phase 3 FY; Project FY

Recommended by:		Date
Originator	J. A. Posgay	8/6/59
Investigation Chief	J. A. Posgay	8/6/59
Laboratory Director	Herbert W. Graham	8/6/59
Regional Director	<i>Joseph F. Pomeroy</i>	8/19/59
Branch Chief	<i>JHE</i>	12-24-59
Approved by:		
Division Chief for Director	<i>JHE</i>	

Remarks

(Continue on reverse side)

*please check completion schedule.*



Method of Procedure: (Cont'd)

Phase 3:

Estimated Costs: Total Needed by Laboratory for Complete Project		34.8	
	FY <u>1959</u>	FY <u>1960</u>	FY <u>1961</u>
Personal Services	<u>1.0</u>	<u>1.0</u>	<u>1.1</u>
Other Expenses:			
Within Project	<u>---</u>	<u>---</u>	<u>---</u>
Lab. Adm. & Ser.	<u>2.0</u>	<u>3.1</u>	<u>3.1</u>
Lab. Total	<u>3.0</u>	<u>4.1</u>	<u>4.2</u>
Regional Office	<u>.03</u>	<u>.041</u>	<u>.042</u>
Washington Office			
Total			

Recommended Source of Funds S-K and Regular  
(S-K, Regular, Contributed, etc.)

Estimated Date of Completion: Phase 1 FY 59; Phase 2 FY; Phase 3 FY; Project FY

Recommended by:		Date
Originator	<u>L. A. Posgay</u>	<u>8/6/59</u>
Investigation Chief	<u>J. A. Posgay</u>	<u>8/6/59</u>
Laboratory Director	<u>Herbert W. Graham</u>	<u>8/6/59</u>
Regional Director	<u>Joseph P. Penner</u>	<u>8/19/59</u>
Branch Chief	<u>JHE</u>	<u>12-24-59</u>
Approved by:		
Division Chief for Director	<u>[Signature]</u>	<u>[Date]</u>

Remarks

(Continue on reverse side)

U. S. Fish and Wildlife Service  
Bureau of Commercial Fisheries

Sheet No. 1

Location: Woods Hole, Mass.  
Date: August 6, 1959  
File No.

Research Project Outline

Title of Project: Fishing mortality rate from tag returns

Investigation Title: Sea Scallops

Investigation Chief: J. A. Posgay

Project Leader:	<u>J. A. Posgay</u>	<u>Fishery Research Biologist</u>	<u>GS-12</u>
	Name	Title	Grade

Assistants: (Title and Grade)

- Vacant - Fishery Research Biologist GS-7
- Vacant - Fishery Research Biologist GS-7 (At Sea)
- Vacant - Fishery Aid GS-4

Collaborators:

Need for Information: One of the basic parameters necessary for assessing the effect of fishing on the stocks.

Objective: To determine the rate of fishing mortality that is generated by any given amount of fishing effort.

Method of Procedure: Tag and release large numbers of sea scallops. Record recaptures and effort expended in the area. Calculate fishing mortality rate.

Phase 1:

Phase 2:

Method of Procedure: (Cont'd)

Phase 3:

Estimated Costs:	Total Needed by Laboratory for Complete Project		
	FY 1959	FY 1960	FY 1961
Personal Services	1.0	1.0	1.1
Other Expenses:			
Within Project	0.7	0.7	1.0
Lab. Adm. & Ser.	2.0	3.1	3.1
Lab. Total	3.7	4.8	5.2
Regional Office	.037	.048	.052
Washington Office			
Total			

Recommended Source of Funds S-K and Regular  
(S-K, Regular, Contributed, etc.)

Estimated Date of Completion: Phase 1 FY58; Phase 2 FY; Phase 3 FY; Project FY 62

Recommended by:		Date
Originator	J. A. Posgay	8/6/59
Investigation Chief	J. A. POSGAY	8/6/59
Laboratory Director	HERBERT W. GRAHAM	8/6/59
Regional Director	<i>Joseph F. Dunnecker</i>	8/19/59
Branch Chief	<i>WHE</i>	12-24-59
Approved by:		
Division Chief for Director	<i>[Signature]</i>	

Remarks

(Continue on reverse side)



Method of Procedure: (Cont'd)

Phase 3:

Estimated Costs:	Total Needed by Laboratory for Complete Project		
	FY <u>1959</u>	FY <u>1960</u>	FY <u>1961</u>
Personal Services	<u>0.5</u>	<u>0.5</u>	<u>0.6</u>
Other Expenses:			
Within Project	<u>--</u>	<u>--</u>	<u>--</u>
Lab. Adm. & Ser.	<u>2.0</u>	<u>3.1</u>	<u>3.1</u>
Lab. Total	<u>2.5</u>	<u>3.6</u>	<u>3.7</u>
Regional Office	<u>.025</u>	<u>.036</u>	<u>.037</u>
Washington Office			
Total			

Recommended Source of Funds S-K and Regular  
(S-K, Regular, Contributed, etc.)

Estimated Date of Completion: Phase 1 FY 59; Phase 2 FY; Phase 3 FY; Project FY

Recommended by:		Date
Originator	<u>J. A. Posgay</u>	<u>8/6/59</u>
Investigation Chief	<u>J. A. Posgay</u>	<u>8/6/59</u>
Laboratory Director	<u>Herbert W. Graham</u>	<u>8/6/59</u>
Regional Director	<u>Joseph A. Pennington</u>	<u>8/19/59</u>
Branch Chief	<u>JHE.</u>	<u>12-24-59</u>
Approved by:		
Division Chief for Director	<u>[Signature]</u>	<u>[Date]</u>

Remarks

(Continue on reverse side)

U. S. Fish and Wildlife Service  
Bureau of Commercial Fisheries

Sheet No. 1

Location: Woods Hole, Mass.  
Date: August 6, 1959  
File No.

Research Project Outline

Title of Project: Size selection of sea scallop dredges

Investigation Title: Sea Scallop

Investigation Chief: J. A. Fosgay

Project Leader: J. A. Fosgay Fishery Research Biologist GS-12  
Name Title Grade

Assistants: (Title and Grade)

Vacant - Fishery Research Biologist GS-7

Vacant - Fishery Research Biologist GS-7

Vacant - Statistical Clerk GS-4

Collaborators:

Need for Information: Any management recommendations for this fishery will probably take the form of controlling the size at first capture by specifying a minimum mesh size.

Objective: To measure the 50% selection point of dredges made up of various sizes of frings and links.

Method of Procedure: Make simultaneous tows of dredges with standard and experimental mesh sizes. Record length-frequencies of the catch of each dredge. Calculate selection points.

Phase 1:

Phase 2:

Sea Scallop - 11

Sheet No. 2

File No.:

Method of Procedure: (Cont'd)

Phase 3:

Estimated Costs: Total Needed by Laboratory for Complete Project			16.9
	FY 1959	FY 1960	FY 1961
Personal Services	1.0	0.5	0.5
Other Expenses:			
Within Project	--	0.5	1.0
Lab. Adm. & Ser.	2.0	3.1	3.1
Lab. Total	3.0	4.1	4.6
Regional Office	.03	.041	.046
Washington Office			
Total			

Recommended Source of Funds S-K and Regular  
(S-K, Regular, Contributed, etc.)

Estimated Date of Completion: Phase 1 FY 58; Phase 2 FY; Phase 3 FY; Project FY 61

Recommended by:		Date
Originator	J. A. Posgay	8/6/59
Investigation Chief	J. A. Posgay	8/6/59
Laboratory Director	Herbert W. Graham	8/6/59
Regional Director	<i>Joseph P. Dunneley</i>	8/19/59
Branch Chief	<i>24NE</i>	12-24-59
Approved by:		
Division Chief for Director	<i>1/15/60</i>	

Remarks

(Continue on reverse side)

U. S. Fish and Wildlife Service  
Bureau of Commercial Fisheries

Sheet No. 1

Location: Woods Hole, Mass.  
Date: August 6, 1959  
File No.

Research Project Outline

Title of Project: Population dynamics of G. B. Sea Scallop Fishery

Investigation Title: Sea Scallops

Investigation Chief: J. A. Posgay

Project Leader:	<u>J. A. Posgay</u>	<u>Fishery Research Biologist</u>	<u>GS-12</u>
	<small>Name</small>	<small>Title</small>	<small>Grade</small>

Assistants: (Title and Grade)

- Vacant - Fishery Aid GS-4
- Vacant - Fishery Research Biologist GS-7
- Vacant - Fishery Research Biologist GS-7

Collaborators:

Need for Information: To make possible recommendations for management of this fishery.

Objective: To determine the optimum age at first capture and/or fishing effort and predict the effect of changes in these factors.

Method of Procedure: Combine data on rates of growth, natural mortality, and fishing mortality with data on catch and effort into a population model. Make recommendations for management.

Phase 1:

Phase 2:

Method of Procedure: (Cont'd)

Phase 3:

Estimated Costs: Total Needed by Laboratory for Complete Project			
	FY <u>1959</u>	FY <u>1960</u>	FY <u>1961</u>
Personal Services	2.0	1.0	1.5
Other Expenses:			
Within Project	---	--	---
Lab. Adm. & Ser.	2.0	3.1	3.0
Lab. Total	4.0	4.1	4.5
Regional Office	.04	.041	.045
Washington Office			
Total			

Recommended Source of Funds S-K and Regular  
(S-K, Regular, Contributed, etc.)

Estimated Date of Completion: Phase 1 FY; Phase 2 FY; Phase 3 FY; Project FY 61

Recommended by:

Originator	<u>J. A. Posgay</u>	8/6/59 <u>Date</u>
Investigation Chief	<u>J. A. Posgay</u>	8/6/59
Laboratory Director	<u>Herbert W. Graham</u>	8/6/59
Regional Director	<u>Joseph G. Pomeroy</u>	8/19/59
Branch Chief	<u>WHE</u>	12-24-59
Approved by:		
Division Chief for Director	<u>[Signature]</u>	

Remarks

(Continue on reverse side)

U. S. Fish and Wildlife Service  
Bureau of Commercial Fisheries

Sheet No. 1

Location: Woods Hole, Mass.  
Date: August 6, 1959  
File No.

Research Project Outline

**and construction**

Title of Project: Design of temperature-controlled experimental tank.

Investigation Title: Scallops

Investigation Chief: J. A. Posgay

Project Leader: J. A. Posgay, Fishery Research Biologist, GS-12

Name

Title

Grade

Assistants: (Title and Grade)

Collaborators:

Need for Information: In order to perform various experimental programs in the new laboratory, a reasonably portable temperature controlled tank is needed. This tank should be relatively inexpensive and easily constructed on the premises.

Objective: To design, build and test a laboratory experimental tank with temperature control.

Method of Procedure: Design tank  
Build and test design.

Phase 1:

Phase 2:

Method of Procedure: (Cont'd)

Phase 3:

Estimated Costs:	FY 59	FY	FY
Total Needed by Laboratory for Complete Project	3.5		
Personal Services	0.5		
Other Expenses:			
Within Project	1.0		
Lab. Adm. & Ser.	2.0		
Lab. Total	3.5		
Regional Office	.035		
Washington Office			
Total			

Recommended Source of Funds S-K and Regular  
 (S-K, Regular, Contributed, etc.)

Estimated Date of Completion: Phase 1 FY 59; Phase 2 FY; Phase 3 FY; Project FY 59

Recommended by:

Originator	<u>J. A. Posgay</u>	Date	<u>8/6/59</u>
Investigation Chief	<u>J. A. Posgay</u>		<u>8/6/59</u>
Laboratory Director	<u>Herbert W. Graham</u>		<u>8/6/59</u>
Regional Director	<u>Joseph F. Pinner</u>		<u>8/19/59</u>
Branch Chief	<u>noted.</u>		<u>AKF.</u>

Approved by:  
 Division Chief for Director [Signature]

Remarks

(Continue on reverse side)

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U. S. Fish and Wildlife Service  
Bureau of Commercial Fisheries

Sheet No. 1

Location: Woods Hole, Mass.  
Date: August 11, 1959  
File No.

Research Project Outline

Title of Project: Time and Cause of formation of annual ring.

Investigation Title: Sea Scallop

Investigation Chief: J. A. Posgay

Project Leader:	<u>A. S. Merrill</u>	<u>Fishery Research Biologist</u>	<u>GS-7</u>
	Name	Title	Grade

Assistants: (Title and Grade)

F. E. Nichy      Fishery Research Biologist      GS-7

Collaborators:

Need for Information:      Annual rings are used in age and growth studies but  
   the time and cause of the ring, which may be different in  
   different areas or years, is not known.

Objective:      To determine the time and cause of the formation of annual rings.

Method of Procedure:      Collect monthly samples from as many areas as possible.  
   Observe when the ring forms.  
Phase 1:      Correlate the time with environmental factors.  
   Attempt to reproduce rings in aquaria.

Phase 2:

Method of Procedure: (Cont'd)

Phase 3:

Estimated Costs:	Total Needed by Laboratory for Complete Project		
	FY 1959	FY 1960	FY 1961
Personal Services	1.0	1.0	1.0
Other Expenses:			
Within Project	0.5	0.1	0.1
Lab. Adm. & Ser.	2.0	3.1	3.0
Lab. Total	3.5	4.2	4.1
Regional Office	.035	.042	.041
Washington Office			
Total			

Recommended Source of Funds S-K and Regular  
(S-K, Regular, Contributed, etc.)

Estimated Date of Completion: Phase 1 FY 59; Phase 2 FY; Phase 3 FY; Project FY 61

Recommended by:		Date
Originator	J. A. Posgay	8/6/59
Investigation Chief	J. A. Posgay	8/6/59
Laboratory Director	Herbert W. Graham	8/6/59
Regional Director	<i>Joseph F. DiMarco</i>	8/19/59
Branch Chief	<i>215E</i>	12-24-59
Approved by:		
Division Chief for Director	<i>1154</i>	1-1-60

Remarks

(Continue on reverse side)



Method of Procedure: (Cont'd)

Phase 3:

Estimated Costs:	Total Needed by Laboratory for Complete Project		
	<u>FY 1959</u>	<u>FY 1960</u>	<u>FY 1961</u>
Personal Services	---	1.0	1.0
Other Expenses:			
Within Project	---	0.1	0.1
Lab. Adm. & Ser.	---	3.1	3.0
Lab. Total	---	4.2	4.1
Regional Office		.042	.041
Washington Office			
Total			

Recommended Source of Funds S-K and Regular  
(S-K, Regular, Contributed, etc.)

Estimated Date of Completion: Phase 1 FY 60; Phase 2 FY; Phase 3 FY; Project FY 61

Recommended by:		Date
Originator	<u>J. A. Posgay</u>	<u>8/6/59</u>
Investigation Chief	<u>J. A. Posgay</u>	<u>8/6/59</u>
Laboratory Director	<u>Herbert W. Graham</u>	<u>8/6/59</u>
Regional Director	<u>SIGNED: JOSEPH F. PUNCOCHAR</u>	<u>8/19/59</u>
Branch Chief	<u>JHE.</u>	<u>12-24-59</u>
Approved by:		
Division Chief for Director	<u>[Signature]</u>	

Remarks

(Continue on reverse side)

U. S. Fish and Wildlife Service  
Bureau of Commercial Fisheries

Sheet No. 1

Location: Woods Hole, Mass.  
Date: August 6, 1959  
File No.

Research Project Outline

Title of Project: Collection of spat.

Investigation Title: Sea Scallops

Investigation Chief: J. A. Posgay

Project Leader:	<u>A. S. Merrill</u>	<u>FRB</u>	<u>GS-7</u>
	Name	Title	Grade

Assistants: (Title and Grade)

F. E. Nichy	FRB	GS-7
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Collaborators:

Need for Information: Nothing is known about how or where sea scallops less than one inch maintain themselves.

Objective: To determine the time and place that sea scallops leave the plankton.

Method of Procedure: Set out spat collectors, inspect at intervals during the year. Inspect the fouling organisms on navigation buoys  
Phase 1: for newly set sea scallop spat.

Phase 2:

Method of Procedure: (Cont'd)

Phase 3:

Estimated Costs: Total Needed by Laboratory for Complete Project	<u>13.5</u>		
	<u>FY 1959</u>	<u>FY 1960</u>	<u>FY 1961</u>
Personal Services	<u>0.2</u>	<u>1.5</u>	<u>1.5</u>
Other Expenses:			
Within Project	<u>0.5</u>	<u>0.5</u>	<u>1.3</u>
Lab. Adm. & Ser.	<u>2.0</u>	<u>3.0</u>	<u>3.0</u>
Lab. Total	<u>2.7</u>	<u>5.0</u>	<u>5.8</u>
Regional Office	<u>.027</u>	<u>.05</u>	<u>.058</u>
Washington Office			
Total			

Recommended Source of Funds S-K and Regular  
(S-K, Regular, Contributed, etc.)

Estimated Date of Completion: Phase 1 FY59; Phase 2 FY; Phase 3 FY; Project FY 61

Recommended by:		Date
Originator	<u>J. A. Posgay</u>	<u>8/6/59</u>
Investigation Chief	<u>J. A. Posgay</u>	<u>8/6/59</u>
Laboratory Director	<u>Herbert W. Graham</u>	<u>8/6/59</u>
Regional Director	<u>Joseph G. Pennercher</u>	<u>8/19/59</u>
Branch Chief	<u>244E</u>	<u>12-24-59</u>
Approved by:		
Division Chief for Director	<u>[Signature]</u>	<u>[Signature]</u>

Remarks

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U. S. Fish and Wildlife Service  
Bureau of Commercial Fisheries

Sheet No. 1

Location: Woods Hole, Mass.  
Date: August 6, 1959  
File No.

Research Project Outline

Title of Project: Seasonal and areal variation in the length-weight ratio

Investigation Title: Sea Scallops

Investigation Chief: J. A. Posgay

Project Leader: F. E. Nichy FRB GS-7  
Name Title Grade

Assistants: (Title and Grade)

Collaborators:

Need for Information: Growth rates are measured in terms of increase in length but population dynamics calculations are made in terms of growth in weight calculated from the average L-W ratio. If this ratio varies from season to season, or place to place, it can seriously affect the predictions of benefit.

Objective: To measure the seasonal variation in the L-W ratio at several locations.

Method of Procedure: Collect samples at regular intervals from selected locations. Measure lengths, weigh meats, calculate L-W ratios,  
Phase 1: compare ratios seasonally and by area.

Phase 2:

Method of Procedure: (Cont'd)

Phase 3:

Estimated Costs: Total Needed by Laboratory for Complete Project			
	FY 1959	FY 1960	FY 1961
Personal Services	---	1.0	1.0
Other Expenses:			
Within Project	---	0.2	0.5
Lab. Adm. & Ser.	---	3.0	3.0
Lab. Total	---	4.2	4.5
Regional Office		.042	.045
Washington Office			
Total			

Recommended Source of Funds S-K and Regular  
(S-K, Regular, Contributed, etc.)

Estimated Date of Completion: Phase 1 FY60; Phase 2 FY; Phase 3 FY; Project FY62

Recommended by:		Date
Originator	<u>J. A. Posgay</u>	<u>8/6/59</u>
Investigation Chief	<u>J. A. Posgay</u>	<u>8/6/59</u>
Laboratory Director	<u>Herbert W. Graham</u>	<u>8/6/59</u>
Regional Director	<u>Joseph H. Dummer</u>	<u>8/19/59</u>
Branch Chief	<u>JANE</u>	<u>12-24-59</u>
Approved by:		
Division Chief for Director	<u>[Signature]</u>	

Remarks

(Continue on reverse side)

U. S. Fish and Wildlife Service  
Bureau of Commercial Fisheries

Sheet No. 1

Location: Woods Hole, Mass.  
Date: August 6, 1959  
File No.

Research Project Outline

Title of Project: Culture of Larvae

Investigation Title: Sea Scallops

Investigation Chief: J. A. Posgay

Project Leader:	<u>J. A. Posgay</u>	<u>FRB</u>	<u>GS-12</u>
	Name	Title	Grade

Assistants: (Title and Grade)

F. E. Nichy	FRB	GS-7
A. S. Merrill	FRB	GS-7

Collaborators:

Need for Information: Nothing is known about the first years of life from egg fertilization to the formation of beds.

Objective: To develop a technique for maintaining cultures of sea scallop larvae for experiments on survival and growth.

Method of Procedure: Set up cultures of phyto plankton which have proved to be suitable foods for polycepoel larvae. Induce spawning in ripe scallops.

Phase 1:

Phase 2:

Method of Procedure: (Cont'd)

Phase 3:

Estimated Costs: Total Needed by Laboratory for Complete Project			
	FY 1959	FY 1960	FY 1961
Personal Services		1.0	1.0
Other Expenses:			
Within Project		0.4	0.5
Lab. Adm. & Ser.	--	3.0	3.0
Lab. Total	--	4.4	4.5
Regional Office		.044	.045
Washington Office			
Total			

Recommended Source of Funds S-K and Regular  
(S-K, Regular, Contributed, etc.)

Estimated Date of Completion: Phase 1 FY 60; Phase 2 FY; Phase 3 FY; Project FY 61

Recommended by:		Date
Originator	<u>J. A. Posgay</u>	<u>8/6/59</u>
Investigation Chief	<u>J. A. Posgay</u>	<u>8/6/59</u>
Laboratory Director	<u>Herbert W. Graham</u>	<u>8/6/59</u>
Regional Director	<u>Joseph P. Dunne, Jr.</u>	<u>8/19/59</u>
Branch Chief	<u>JHE</u>	<u>12-24-59</u>
Approved by:		
Division Chief for Director	<u>JHE</u>	

Remarks

(Continue on reverse side)

U. S. Fish and Wildlife Service  
Bureau of Commercial Fisheries

Sheet No. 1

Location: Woods Hole, Mass.  
Date: August 6, 1959  
File No.

Research Project Outline

Title of Project: The effect of temperature upon larval mortality & growth rates.

Investigation Title: Sea Scallop

Investigation Chief: J. A. Posgay

Project Leader: J. A. Posgay Fishery Research Biologist GS-12  
None Title Grade

Assistants: (Title and Grade)

F. E. Nichy - Fishery Research Biologist GS-7

A. S. Merrill - Fishery Research Biologist GS-7

Collaborators:

Need for Information: Once the environmental factors which affect survival and growth are known, it may be possible to predict the success of any year-class from a knowledge of the condition of the environment at the time of spawning.

Objective: To determine the optimum temperature for survival and growth of the pelagic larvae.

Method of Procedure: Set up controlled experiments to establish the optimum temperature, measure the effect on survival and growth of departures from this optimum.

Phase 1:

Phase 2:

Method of Procedure: (Cont'd)

Phase 3:

Estimated Costs: Total Needed by Laboratory for Complete Project			21.1
	FY <u>1959</u>	FY <u>1960</u>	FY <u>1961</u>
Personal Services	---	---	2.5
Other Expenses:	---	---	2.0
Within Project	---	---	---
Lab. Adm. & Ser.	---	---	3.0
Lab. Total	---	---	7.5
Regional Office	---	---	.075
Washington Office	---	---	---
Total	---	---	---

Recommended Source of Funds S-K and Regular  
 (S-K, Regular, Contributed, etc.)

Estimated Date of Completion: Phase 1 FY 61; Phase 2 FY; Phase 3 FY; Project FY 63

Recommended by:		Date
Originator	<u>J. A. Posgay</u>	<u>8/6/59</u>
Investigation Chief	<u>J. A. Posgay</u>	<u>8/6/59</u>
Laboratory Director	<u>Herbert W. Graham</u>	<u>8/6/59</u>
Regional Director	<u>Joseph F. Pimental</u>	<u>8/19/59</u>
Branch Chief	<u>HSE</u>	<u>12-24-59</u>
Approved by:		
Division Chief for Director	<u>[Signature]</u>	<u>[Date]</u>

Remarks

(Continue on reverse side)

U. S. Fish and Wildlife Service  
Bureau of Commercial Fisheries

Sheet No. 1

Location: Woods Hole, Mass.  
Date: August 6, 1959  
File No.

Research Project Outline

Title of Project: Vertical distribution of the pelagic larvae

Investigation Title: Sea Scallop

Investigation Chief: J. A. Posgay

Project Leader: J. A. Posgay Fishery Research Biologist GS-12  
Name Title Grade

Assistants: (Title and Grade)

F. E. Nichy - Fishery Research Biologist GS-7

A. S. Merrill - Fishery Research Biologist GS-7

Collaborators:

Need for Information: The sea scallop is known to have a pelagic larval stage, but they have never been collected from the plankton.

Objective: To determine at what level in the water column one can expect to find the pelagic stages.

Method of Procedure: Maintain larval cultures at various conditions of temperature, salinity, light and turbulence to see if they have any preferred level. When laboratory experiments are successful, attempt to find them at sea.

Phase 1:

Phase 2:

Sea Scallop-22

Sheet No. 2

File No.:

Method of Procedure: (Cont'd)

Phase 3:

Estimated Costs:	Total Needed by Laboratory for Complete Project		
	<u>FY 1959</u>	<u>FY 1960</u>	<u>FY 1961</u>
Personal Services	---	---	3.2
Other Expenses:			
Within Project	---	---	2.0
Lab. Adm. & Ser.	---	---	3.0
Lab. Total	---	---	8.2
Regional Office			.082
Washington Office			
Total			

Recommended Source of Funds S-K and Regular  
(S-K, Regular, Contributed, etc.)

Estimated Date of Completion: Phase 1 FY 61; Phase 2 FY; Phase 3 FY; Project FY 63

Recommended by:		Date
Originator	<u>J. A. Posgay</u>	<u>8/6/59</u>
Investigation Chief	<u>J. A. Posgay</u>	<u>8/6/59</u>
Laboratory Director	<u>Herbert W. Graham</u>	<u>8/6/59</u>
Regional Director	<u>Joseph P. [Signature]</u>	<u>8/19/59</u>
Branch Chief	<u>[Signature]</u>	<u>12-24-59</u>
Approved by:		
Division Chief for Director	<u>[Signature]</u>	<u>[Signature]</u>

Remarks

(Continue on reverse side)