

REDFISH INVESTIGATION

Redfish (or ocean perch) are being commercially exploited across a broad area of the North Atlantic Ocean by an increasing number of vessels representing six European nations, Canada and the United States. Knowledge of the biology of this species is necessary for understanding the causes of fluctuation in the fishery, and is needed for effectively managing this international resource.

Redfish is a deep water fish that differs from other commercial species in many important characteristics which cause special problems in biological studies. The species grows very slowly and, as a result, the stocks quickly decline in abundance when exploited. It has been difficult to study basic problems such as migration, schooling and spawning behavior and food habits because they cannot be taken alive from their normal deep-water habitat. The sensitivity of the fish to decomposition is such that capture by net or hook-and-line is usually fatal.

August 6, 1959

SUMMARY CONTROL SCHEDULE

Investigation: Redfish
 Biological Laboratory: Woods Hole, Mass.

Project Title	Est.* Cost	Fiscal Years									
		57	58	59	60	61	62	63	64	65	66
1. Age and Growth of Redfish in the Gulf of Maine	33.0	11.3	9.7	9.0	--	--	--	--	--	--	--
2. Biostatistics of U. S. Redfish Landings	86.0	11.3	9.7	9.0	8.0	7.0	8.0	8.0	7.0	7.0	8.0
3. Redfish Spawning Studies	48.1	11.3	9.7	9.0	8.1	7.0	--	--	--	--	--
4. Migration and Growth Studies of Tagged Redfish at Eastport, Maine	47.2	11.3	8.7	9.0	8.1	7.1	--	--	--	--	--
5. Vertical Distribution of Pelagic Young Redfish	39.9	--	8.5	9.2	7.1	7.1	8.0	--	--	--	--
6. Racial Studies - Identification of Adult Sebastes in the North Atlantic Ocean	37.9	--	7.5	8.2	7.1	7.1	8.0	--	--	--	--
7. Incidence of the Copepod Ectoparasite Sphyrion Lampi on Redfish in the Gulf of Maine	36.8	--	6.2	8.2	7.1	7.1	8.2	--	--	--	--
8. Comparison of Redfish Growth Rates Between Gulf of Maine and other North Atlantic Areas	38.6	--	--	8.2	7.1	7.1	8.2	8.0	--	--	--
9. Growth Rates of Redfish Stocks in the Gulf of Maine	36.4	--	--	--	6.1	7.1	8.2	8.0	7.0	--	--
10. Racial Studies - Identification of Sebastes Larvae	36.4	--	--	--	--	6.1	8.2	8.0	7.1	7.0	--
11. Migration Studies - Tagging Redfish in Deep Water	36.2	--	--	--	--	6.1	8.0	8.0	7.1	7.0	--

SUMMARY CONTINUED SCHEDULE

Investigation: Redfish

Biological Laboratory: Woods Hole, Mass.

Project Title	Est. * Cost	Fiscal Years									
		57	58	59	60	61	62	63	64	65	66
12. Underwater TV Study of Redfish Behavior at Eastport, Me.	35.2	--	--	--	--	6.1	7.0	8.0	7.1	7.0	--
13. Definition of Redfish Stocks in the Gulf of Maine and Western Nova Scotia	36.3	--	--	--	--	--	7.1	8.0	7.1	7.0	7.1
14. Age Composition of Gulf of Maine Redfish Stocks	29.2	--	--	--	--	--	--	8.0	7.1	7.0	7.1
15. Drift of Redfish Larvae and Post Larvae in the Gulf of Maine and Western Nova Scotia	28.4	--	--	--	--	--	--	7.2	7.1	7.0	7.1
16. Planktonic Associations of Redfish Larvae and other Plank- ton Organisms	21.2	--	--	--	--	--	--	--	7.1	7.0	7.1
17. Experimental Growth Studies of Redfish Larvae	21.2	--	--	--	--	--	--	--	7.1	7.0	7.1
18. Experimental Studies of the Transmission of Vertebral Numbers in Young Redfish	20.6	--	--	--	--	--	--	--	7.1	7.0	6.5
19. Population Dynamics of Gulf of Maine Redfish Stocks	11.1	--	--	--	--	--	--	--	--	4.0	7.1
20. Life History of Sphyrion Lampi, Ectoparasite on Redfish	10.0	--	--	--	--	--	--	--	--	3.9	6.1
21. Effect of Sphyrion Lampi Attachment on Redfish	6.0	--	--	--	--	--	--	--	--	--	6.0
22. Age Composition of Nova Scotia, Grand Banks and Gulf of St. Lawrence Redfish Stocks	6.0	--	--	--	--	--	--	--	--	--	6.0
Investigation Total	701.7	57.2	60.0	69.8	58.7	74.9	78.9	71.2	77.9	77.9	75.2
Annual Review											Date
Laboratory	Regional or Area Office	Washington Office	Prepared by: George F. Kelly							8/6/59	
			Recommended by:							Date	
			Lab. Director Herbert W. Graham							8/6/59	
			Reg. or Area Dir. Joseph H. Lawrence								
			Branch Chief J. Howard H. Eckman							12-24-59	
			Approved by: J. L. Kelly							1-2-60	
			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: Age and growth of Redfish in the Gulf of Maine

Investigation Title: Redfish

Investigation Chief: George F. Kelly

Project Leader:	<u>George F. Kelly</u>	<u>F.R.B.</u>	<u>GS-11</u>
	Name	Title	Grade

Assistants: (Title and Grade)

Allan M. Barker	F.R.B.	GS-7
George M. Clarke	Fishery Aid	GS-7

Collaborators: None

Need for Information: The growth rate of redfish was needed as a basis for population dynamic studies to assess the potential production of the Gulf of Maine redfish stocks.

Objective: To validate the formation of year zones in redfish scales and otoliths and determine the average growth rate for the species in the Gulf of Maine using the otolith age reading technique.

Method of Procedure: Sample young of the year redfish at a selected station throughout the year and record the seasonal changes in scales and otoliths.

Phase 1: Collect and examine larval and post-larval specimens to determine the age of the fish at time of first annulus formation in the scales and otoliths.

Phase 2: Estimate fish age from a large series of otoliths and draw a growth curve to the average length at each age.

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	---	---
Other Expenses:			
Within Project	---	---	---
Lab. Adm. & Ser.	8.0	---	---
Lab. Total	9.0	---	---
Regional Office	.09		
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 59

Recommended by:

Originator	<u>G. F. Kelly</u>	<u>8/6/59</u>
Investigation Chief	<u>George F. Kelly</u>	<u>8/6/59</u>
Laboratory Director	<u>Herbert W. Graham</u>	<u>8/6/59</u>
Regional Director		<u>8/14/59</u>
Branch Chief	<u>2/15/59</u>	<u>12-24-59</u>

Approved by:

Division Chief for Director	<u>[Signature]</u>	<u>1-2-60</u>
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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: Biostatistics of U. S. redfish landings

Investigation Title: Redfish

Investigation Chief: G. F. Kelly

Project Leader:	<u>G. F. Kelly</u>	<u>F. B. B.</u>	<u>GS-11</u>
	Name	Title	Grade

Assistants: (Title and Grade)

G. M. Clarke, Fishery Aid, GS-7

Collaborators: None

Need for Information: Knowledge of the quantities of redfish landed from each area, the fishing effort expended and the sizes and sex ratio of the fish in the population are primary requirements in fishery studies.

Objective: To obtain an annual compilation of the biological statistics of the U. S. redfish fishery in all areas fished by U. S. vessels.

Method of Procedure: Compile the interview and sampling material collected at the three primary redfish ports, Gloucester, Mass., Portland and Rockland, Maine.

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	<u>3.0</u>	<u>2.0</u>	<u>2.0</u>
Other Expenses:			
Within Project	<u>0.1</u>	<u>0.5</u>	<u>0.5</u>
Lab. Adm. & Ser.	<u>5.9</u>	<u>5.5</u>	<u>4.5</u>
Lab. Total	<u>9.0</u>	<u>8.0</u>	<u>7.0</u>
Regional Office	<u>.09</u>	<u>.08</u>	<u>.07</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 FY

Recommended by:		Date
Originator	<u>G. F. Kelly</u>	<u>8/6/59</u>
Investigation Chief	<u>George F. Kelly</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>WHE.</u>	<u>12-24-59</u>
Approved by:		
Division Chief for Director	<u>[Signature]</u>	<u>[Date]</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: Redfish spawning studies

Investigation Title: Redfish

Investigation Chief: G. F. Kelly

Project Leader:	<u>G. F. Kelly</u>	<u>F. R. B.</u>	<u>GS-11</u>
	Name	Title	Grade

Assistants: (Title and Grade)
G. M. Clarke, F. A., GS-7

Collaborators: None

Need for Information: It is important to know of variations in the time of breeding in fish stocks from different areas for use in studying the biology of the stocks and as a basis for management practices.

Objective: To determine the time of spawning, fecundity, size at maturity and other characteristics associated with the breeding cycle in each fishing area.

Method of Procedure: Observations of the gonad conditions of commercial fish samples from each area throughout the year.

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	3.0	2.7	2.5
Other Expenses:			
Within Project	2.0	2.4	3.0
Lab. Adm. & Ser.	4.0	3.0	1.5
Lab. Total	9.0	8.1	7.0
Regional Office	.09	.081	.07
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 1961

Recommended by:		Date
Originator	George F. Kelly	8/6/59
Investigation Chief	George F. Kelly	8/6/59
Laboratory Director	Herbert W. Graham	8/6/59
Regional Director	<i>Joseph F. Pinner</i>	8/19/59
Branch Chief	<i>WHE</i>	12-24-59
Approved by:		
Division Chief for Director	<i>J. G. H.</i>	

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: Migration and growth studies of tagged redfish at Eastport, Maine

Investigation Title: Redfish

Investigation Chief: G. F. Kelly

Project Leader:	<u>G. F. Kelly</u>	<u>F. R. B.</u>	<u>GS-11</u>
	Name	Title	Grade

Assistants: (Title and Grade)

A. M. Barker, F. R. B., GS-7

Collaborators: None

Need for Information: It is possible to tag redfish at Eastport, Maine. Tagging is the most practical method of obtaining a direct measure of growth and evidence of migration. This tagging in shallow water affords an opportunity to observe the resistance of redfish to tagging damage for future work in deep water.

Objective: To determine the migratory tendencies of redfish.

Method of Procedure: Tag about 5,000 redfish at Eastport, Maine, and await their recapture by fishermen from other locations. Obtain measurements of growth of Phase 1: recaptured fish.

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	<u>3.0</u>	<u>2.7</u>	<u>2.5</u>
Other Expenses:			
Within Project	<u>2.0</u>	<u>2.4</u>	<u>3.0</u>
Lab. Adm. & Ser.	<u>4.0</u>	<u>3.0</u>	<u>1.6</u>
Lab. Total	<u>9.0</u>	<u>8.1</u>	<u>7.1</u>
Regional Office	<u>.09</u>	<u>.081</u>	<u>.071</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 FY 1961

Recommended by:		Date
Originator	<u>George F. Kelly</u>	<u>8/6/59</u>
Investigation Chief	<u>George F. Kelly</u>	<u>8/6/59</u>
Laboratory Director	<u>Herbert W. Graham</u>	<u>8/6/59</u>
Regional Director	<u>Joseph F. Penick</u>	<u>8/19/59</u>
Branch Chief	<u>NOTE</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 pelagic young redfish

Investigation Title: Redfish

Investigation Chief: G. F. Kelly

Project Leader:	<u>G. F. Kelly</u>	<u>F. R. B.</u>	<u>GS-11</u>
	Name	Title	Grade

Assistants: (Title and Grade)
A. M. Barker, F. R. B., GS-7

Collaborators: None

Need for Information: There is little knowledge of the distribution of young redfish or of the duration of the period they spend as planktonic larvae. This information is needed to understand the inter-relationship of populations that may be mixed by the drift of young fish from one area to another, *and to determine for example*

Objective: To obtain information on the distribution of young redfish in the upper and midwaters from the time they are spawned until they move to the bottom to live.

Method of Procedure: Sample the upper water layers with plankton nets and mid-water trawls at a series of stations in the Gulf of Maine during mid and late summer.
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	<u>3.0</u>	<u>2.0</u>	<u>2.5</u>
Other Expenses:			
Within Project	<u>1.0</u>	<u>.5</u>	<u>3.2</u>
Lab. Adm. & Ser.	<u>5.2</u>	<u>4.6</u>	<u>1.4</u>
Lab. Total	<u>9.2</u>	<u>7.1</u>	<u>7.1</u>
Regional Office	<u>.092</u>	<u>.071</u>	<u>.071</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 FY1962

Recommended by:		Date
Originator	<u>George F. Kelly</u>	<u>8/6/59</u>
Investigation Chief	<u>George F. Kelly</u>	<u>8/6/59</u>
Laboratory Director	<u>Herbert W. Graham</u>	<u>8/6/59</u>
Regional Director	<u>Joseph F. Dumas</u>	<u>8/19/59</u>
Branch Chief	<u>H.W.E.</u>	<u>12-24-59</u>
Approved by:		
Division Chief for Director	<u>J. H. A.</u>	<u>1-2-60</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: Racial studies - Identification of adult Sebastes in the North Atlantic Ocean

Investigation Title: Redfish

Investigation Chief: G. F. Kelly

Project Leader:	<u>G. F. Kelly</u>	<u>F. R. B.</u>	<u>GS-11</u>
	None	Title	Grade

Assistants: (Title and Grade)

A. M. Barker, F. R. B., GS-7
G. M. Clarke, F. A., GS-7
C. F. Bocken, F. A., GS-6

Collaborators: None

Need for Information: It is necessary to know the systematic units of redfish found in all parts of the North Atlantic Ocean in order to be able to define the limits of the populations or stocks of fish for management purposes. This is a fundamental problem but is a difficult one because of the similarities of Sebastes from all areas.

Objective: To classify the species or subspecies of Sebastes found in the North Atlantic Ocean.

Method of Procedure: Collect specimens from several widely separated areas and compare a large number of meristic and morphometric characteristics from each sample.
Phase 1:

Phase 2:

Method of Procedure: (Cont'd)

Phase 3:

Estimated Costs: Total Needed by Laboratory for Complete Project <u>37.9</u>			
	<u>FY 1959</u>	<u>FY 1960</u>	<u>FY 1961</u>
Personal Services	<u>3.2</u>	<u>2.5</u>	<u>2.1</u>
Other Expenses:			
Within Project	<u>1.5</u>	<u>1.0</u>	<u>3.5</u>
Lab. Adm. & Ser.	<u>3.5</u>	<u>3.6</u>	<u>1.5</u>
Lab. Total	<u>8.2</u>	<u>7.1</u>	<u>7.1</u>
Regional Office	<u>.082</u>	<u>.071</u>	<u>.071</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 FY 1962

Recommended by:		<u>Date</u>
Originator	<u>George F. Kelly</u>	<u>8/6/59</u>
Investigation Chief	<u>George F. Kelly</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] NHE.</u>	<u>12-24-59</u>
Approved by:		
Division Chief for Director	<u>[Signature]</u>	<u>1-2-60</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: Incidence of the copepod ectoparasite *Sphyrion lumpi* on
redfish in the Gulf of Maine

Investigation Title: Redfish

Investigation Chief: G. F. Kelly

Project Leader:	<u>G. F. Kelly</u>	<u>F. R. B.</u>	<u>GS-11</u>
	Name	Title	Grade

Assistants: (Title and Grade)

G. M. Clarke, F. A., GS-7

Collaborators: None

Need for Information: The parasite attaches to the skin of the redfish and forms a large cyst in the flesh where the head is embedded. The incidence of this animal serves as a natural mark of redfish populations. Infestation by this pest may cause mortality of small redfish. Removal of the encysted growths by the fish processors is an expensive operation. More knowledge is necessary in order to evaluate the damaging effects of this important parasite.

Objective: To determine the extent of parasite infection in Gulf of Maine redfish.

Method of Procedure: Record incidence of parasites on specimens in commercial redfish samples from all areas in the Gulf of Maine.

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	<u>3.2</u>	<u>3.2</u>	<u>2.5</u>
Other Expenses:			
Within Project	<u>--</u>	<u>--</u>	<u>--</u>
Lab. Adm. & Ser.	<u>5.0</u>	<u>3.9</u>	<u>4.6</u>
Lab. Total	<u>8.2</u>	<u>7.1</u>	<u>7.1</u>
Regional Office	<u>.082</u>	<u>.071</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 1962

Recommended by:

Originator	<u>George F. Kelly</u>	Date	<u>8/6/59</u>
Investigation Chief	<u>George F. Kelly</u>		<u>8/6/59</u>
Laboratory Director	<u>Herbert W. Graham</u>		<u>8/6/59</u>
Regional Director	<u>Joseph G. Penner</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>		<u>12-24-59</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: Comparison of redfish growth rates between the Gulf of Maine
and other North Atlantic areas

Investigation Title: Redfish

Investigation Chief: Kelly, G. F.

Project Leader:	<u>G. F. Kelly</u>	<u>F. R. B.</u>	<u>GS-11</u>
	Name	Title	Grade

Assistants: (Title and Grade)

A. M. Barker, F. R. B., GS-7

Collaborators: None

Need for Information: Knowledge of differences in growth rate between areas is necessary for use as a basis for management of the fish populations.

Objective: To determine the differences in growth rate between areas fished by U. S. vessels.

Method of Procedure: Employ age readings of redfish otoliths collected from different areas to determine the average growth rates of the redfish populations.

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	2.5	2.0
Other Expenses:			
Within Project	--	--	--
Lab. Adm. & Ser.	6.2	4.6	5.1
Lab. Total	8.2	7.1	7.1
Regional Office	.082	.071	.071
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 1963

Recommended by:		Date
Originator	George F. Kelly	8/6/59
Investigation Chief	George F. Kelly	8/6/59
Laboratory Director	Herbert W. Graham	8/6/59
Regional Director	<i>Joseph G. Pincus</i>	8/19/59
Branch Chief	<i>JWA</i>	12-24-59
Approved by:		
Division Chief for Director	<i>JWA</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: Growth Rates of Redfish Stocks in the Gulf of Maine

Investigation Title: Redfish

Investigation Chief: G. F. Kelly

Project Leader:	<u>G. F. Kelly</u>	<u>F. R. B.</u>	<u>GS-11</u>
	Name	Title	Grade

Assistants: (Title and Grade)

A. M. Barker F. R. B. GS-7

Collaborators: None

Need for Information: It is necessary to know the range of differences in growth rate of closely related **redfish** populations in order to properly plan the management of the Gulf of Maine redfish fishery.

Objective: To determine the average growth rates of redfish populations in the Gulf of Maine.

Method of Procedure: Employ age readings of redfish otoliths collected from different parts of the Gulf of Maine to determine the differences in 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	2.5
Other Expenses:			
Within Project			
Lab. Adm. & Ser.		4.1	4.6
Lab. Total		6.1	7.1
Regional Office		.061	.071
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 1964

Recommended by:		Date
Originator	George F. Kelly	8/6/59
Investigation Chief	George F. Kelly	8/6/59
Laboratory Director	Herbert W. Graham	8/6/59
Regional Director	<i>Joseph P. ...</i>	8/19/59
Branch Chief	<i>...</i>	12-24-59
Approved by:		
Division Chief for Director	<i>...</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: Racial studies--Identification of Sebastes larvae.

Investigation Title: Redfish

Investigation Chief: G. F. Kelly

Project Leader:	<u>G. F. Kelly</u>	<u>F. R. B.</u>	<u>GS-11</u>
	Name	Title	Grade

Assistants: (Title and Grade)

G. M. Clarke F.A. GS-7

Collaborators: None

Need for Information: It is necessary to know the identifying marks of young fish of different stocks in order to trace the drift of the pelagic young to determine the recruitment of young to the population.

Objective: To identify the larvae of the species or subspecies of Sebastes in the North Atlantic Ocean.

Method of Procedure: Collect larvae from gravid females of known stocks and determine the characteristics or field marks by which they can be distinguished.

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	_____	_____	<u>2.0</u>
Other Expenses:	_____	_____	_____
Within Project	_____	_____	<u>2.0</u>
Lab. Adm. & Ser.	_____	_____	<u>2.1</u>
Lab. Total	_____	_____	<u>6.1</u>
Regional Office	_____	_____	<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 61; Phase 2 FY; Phase 3 FY; Project FY 1965

Recommended by:		Date
Originator	<u>George F. Kelly</u>	<u>8/6/59</u>
Investigation Chief	<u>George F. Kelly</u>	<u>8/6/59</u>
Laboratory Director	<u>Herbert W. Graham</u>	<u>8/6/59</u>
Regional Director	_____	<u>8/19/59</u>
Branch Chief	<u>2/10/60</u>	<u>12-24-59</u>
Approved by:	_____	_____
Division Chief for Director	<u>[Signature]</u>	<u>1-2-60</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: Migration studies--tagging redfish in deep water.

Investigation Title: Redfish

Investigation Chief: G. F. Kelly

Project Leader:	<u>G. F. Kelly</u>	<u>F. R. B.</u>	<u>GS-11</u>
	Name	Title	Grade

Assistants: (Title and Grade)

A. M. Barker	F. R. B.	GS-7
Vacant	F. R. B.	GS-7

Collaborators: None

Need for Information: The movements of redfish on the commercial fishing grounds are little known. Tagging is the best direct method of detecting migration. Successful deep water tagging would furnish vital evidence for the study of redfish populations.

Objective: To develop techniques of tagging redfish from deep water (100 fathoms +) for migration studies.

Method of Procedure: Devise traps or methods capable of collecting redfish from deep water for tagging at or near the surface.

Phase 1:

Phase 2:

Method of Procedure: (Cont'd)

Phase 3:

Estimated Costs: Total Needed by Laboratory for Complete Project			<u>36.2</u>
	FY <u>1959</u>	FY <u>1960</u>	FY <u>1961</u>
Personal Services	--	--	2.5
Other Expenses:			
Within Project			2.5
Lab. Adm. & Ser.			1.1
Lab. Total			6.1
Regional Office			.061
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 65

Recommended by:		<u>Date</u>
Originator <u>George F. Kelly</u>		<u>8/6/59</u>
Investigation Chief <u>George F. Kelly</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>WHE</u>		<u>12-24-59</u>
Approved by: <u>JHE</u>		<u>12-24-59</u>
Division Chief for Director		

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: Underwater television study of redfish behavior at Eastport, Maine.

Investigation Title: Redfish

Investigation Chief: G. F. Kelly

Project Leader:	<u>G. F. Kelly</u>	<u>F. R. B.</u>	<u>GS-11</u>
	Name	Title	Grade

Assistants: (Title and Grade)

A. M. Barker	F. R. B.	GS-7
R. J. Livingston	F. R. B.	GS-9
J. M. Crossen	Elec. Eq. Spec.	GS-9
Vacant	F. R. B.	GS-7

Collaborators:

None

Need for Information: Little is known of the feeding and schooling behavior of redfish on the commercial grounds. Virtually nothing is known of the breeding habits of the species. The shallow water redfish population at Eastport, Maine, offers an excellent opportunity to study these characteristics at close hand.

Objective: To view and photograph the behavior of redfish in their natural habitat at Eastport, Maine, with special interest in recording the spawning activities.

Method of Procedure: Set T. V. camera on bottom near the dock and observe the day and night activities of redfish as they move into the dock area to feed.

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
Other Expenses:			
Within Project			1.0
Lab. Adm. & Ser.			3.0
Lab. Total			6.1
Regional Office			.061
Washington Office			
Total			

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

Estimated Date of Completion: Phase 1 FY61; Phase 2 FY; Phase 3 FY; Project FY65

Recommended by:		Date
Originator	<u>George F. Kelly</u>	<u>8/6/59</u>
Investigation Chief	<u>George F. Kelly</u>	<u>8/6/59</u>
Laboratory Director	<u>Herbert W. Graham</u>	<u>8/6/59</u>
Regional Director	<u>Joseph H. Diverchia</u>	<u>8/19/59</u>
Branch Chief	<u>JHE.</u>	<u>12-24-65</u>
Approved by:		
Division Chief for Director	<u>JHE</u>	<u>1-2-60</u>

Remarks

(Continue on reverse side)

Please check time schedule. To 1965 seems rather long.