

**COOPERATIVE (NMFS/USFWS) FIVE YEAR WORK PLAN
TO ADDRESS RECOVERY ACTIONS
FOR HAWAIIAN GREEN TURTLES
AT FRENCH FRIGATE SHOALS, HAWAII**

MARCH 1991

DRAFT

Five Year Work Plan to Address Recovery
Actions for Hawaiian Green Turtles
at French Frigate Shoals, Hawaii.

INTRODUCTION

The National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) have been cooperatively monitoring populations of nesting female green turtles at French Frigate Shoals since 1988. A variety of other projects such as nesting success, nesting phenology, hatchling predation by frigatebirds, and mtDNA analysis have occurred during this time and some are on-going.

Both agencies recognize their respective responsibilities regarding jurisdiction for this species. The agencies also recognize the value of a cooperative effort to address certain recovery actions listed in the *Draft: Hawaiian Sea Turtle Recovery Plan* and research objectives outlined in the *Research Plan for Marine Turtle Fibropapilloma*. The attached Five Year Work Plan provides a scenario for addressing the objectives centered at French Frigate Shoals, Hawaii.

The planning team made up of biologists and managers from both agencies recommends that the agencies enter into a Cooperative Agreement to formalize the plan and allow for the transfer of funds, when necessary, to accomplish the stated objectives.

OBJECTIVES:

1. Monitor nesting female population numbers. Continue the development of numerical models and population estimation procedures.

Justification:

2. Investigate epidemiology of fibropapilloma in nesting population.

Justification:

3. Investigate nesting ecology at Tern Island.

Justification:

4. Monitor hatchling survival in pelagic habitats and recruitment of juveniles to benthic habitats.

Justification:

5. Investigate movement patterns of adults.*

Justification:

6. Investigate breeding ecology of adult males.*

Justification:

7. Investigate hatchling predation by ghost crabs.*

Justification:

8. Assist in ongoing mt DNA studies.

Justification:

* Studies designed to meet these objectives would provide excellent graduate student projects.

FUNDING REQUIREMENTS

SEE BELOW

ANNUAL FUNDING REQUIREMENTS SUMMARY
(Thousands of Dollars)

YEAR 1

<u>OBJECTIVE</u>	<u>USFWS</u>	<u>NMFS</u>	<u>TOTAL</u>
1			
2			
3			
4			
5			
6			
7			
8			

TOTAL

YEAR 2

<u>OBJECTIVE</u>	<u>USFWS</u>	<u>NMFS</u>	<u>TOTAL</u>
1			
2			
3			
4			
5			
6			
7			
8			

TOTAL

ANNUAL FUNDING REQUIREMENTS SUMMARY
(Thousands of Dollars)

YEAR 3

<u>OBJECTIVE</u>	<u>USFWS</u>	<u>NMFS</u>	<u>TOTAL</u>
1			
2			
3			
4			
5			
6			
7			
8			

TOTAL

YEAR 4

<u>OBJECTIVE</u>	<u>USFWS</u>	<u>NMFS</u>	<u>TOTAL</u>
1			
2			
3			
4			
5			
6			
7			
8			

TOTAL

ANNUAL FUNDING REQUIREMENTS SUMMARY
(Thousands of Dollars)

YEAR 5

<u>OBJECTIVE</u>	<u>USFWS</u>	<u>NMFS</u>	<u>TOTAL</u>
1			
2			
3			
4			
5			
6			
7			
8			
<u>TOTAL</u>			

YEAR 1

OBJECTIVE 1: NESTING FEMALE POPULATION MONITORING

Field Work (USFWS)

- 1) Saturation tagging of nesting females at East Island for entire nesting season.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Data Analysis (NMFS)

- 1) Estimate nesting female population at East Island.
- 2) Analyze past saturation tagging years data to refine population model parameters.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDING REQUIRED:

OBJECTIVE 2: FIBROPAPILLOMA EPIDEMIOLOGY

Field Work (USFWS)

- 1) Examine all turtles encountered during population monitoring and nesting ecology studies for presence of tumors.
- 2) Investigate relationship of tumors with nesting success.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Data Analysis (NMFS/USFWS)

- 1) Summarize tumor frequency information.
- 2) Report comparisons of nesting success of tumored vs. non-tumored turtles.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDING REQUIRED:

OBJECTIVE 3: NESTING ECOLOGY

Field Work (USFWS)

- 1) Map locations of all nests.
- 2) Monitor nesting and hatchling emergence phenologies.
- 3) Monitor nesting success.
- 4) Tag and identify all turtles encountered.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Data Analysis (USFWS)

- 1) Produce formal publication on 5 year summary of above parameters.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDING REQUIRED:

OBJECTIVE 4: HATCHLING SURVIVAL

Planning (NMFS)

- 1) Review technology for marking hatchlings and consider appropriate methods.
- 2) Initiate small scale tag tests in captive environment.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Field Work (USFWS)

- 1) Collect hatchlings for captive marking tests.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Data Analysis (NMFS)

- 1) Summary report of potential techniques and application to field situation.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDING REQUIREMENTS:

OBJECTIVE 5: ADULT MOVEMENT PATTERNS

Planning (NMFS)

- 1) Develop generic study plan.
- 2) Solicit funding.
- 3) Recruit graduate student.

Personnel Requirements:

Supplies and Equipment:

TOTAL FUNDING REQUIRED:

OBJECTIVE 6: BREEDING ECOLOGY OF MALES

Planning (NMFS)

- 1) Develop generic study plan.
- 2) Solicit funding.
- 3) Recruit graduate student.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDING REQUIRED:

OBJECTIVE 7: HATCHLING PREDATION

Planning (NMFS/USFWS)

- 1) Develop generic study plan.
- 2) Solicit funding.
- 3) Recruit graduate student.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDING REQUIRED:

OBJECTIVE 8: DNA STUDIES

Planning (NMFS)

1) Coordinate with outside researchers as needed.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Field Work (USFWS)

1) Provide genetic material as needed.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDING REQUIRED:

YEAR 2

OBJECTIVE 1: NESTING FEMALE POPULATION MONITORING

Field Work (USFWS)

- 1) Saturation tagging of nesting females at East Island for entire nesting season.
- 2) Partial season saturation tagging of nesting females on Tern Island.
- 3) Partial season saturation tagging of nesting females on Whale-Skate Island.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Data Analysis (NMFS)

- 1) Estimate nesting female population at East Island, Tern Island and Whale-Skate Island.
- 2) Continue to analyze past saturation tagging years data to refine population model parameters and firm up model.
- 3) Using revised model re-estimate and historic surveys, reestimate annual nesting female populations.
- 4) Undertake simulation studies to determine precision of estimates and reevaluate variance of past years estimates.
- 5) Review past years data to determine sampling level required to detect trends within ??????????

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDING REQUIREMENT:

OBJECTIVE 2: FIBROPAPILLOMA EPIDEMIOLOGY

Field Work (USFWS)

- 1) Examine all turtles encountered during population monitoring and nesting ecology studies for presence of tumors.
- 2) Investigate relationship of tumors with nesting success.
- 3) Initiate baseline health screening (blood, bacteriology, parasites, biopsy) of nesting turtles. (Good graduate project)

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Data Analysis (NMFS/USFWS)

- 1) Summarize tumor frequency information.
- 2) Report comparisons of nesting success of tumored vs. non-tumored turtles.
- 2) Report (thesis/publication) on baseline health parameters.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDING REQUIRED:

OBJECTIVE 3: NESTING ECOLOGY

Field Work (USFWS)

- 1) Map locations of all nests.
- 2) Monitor nesting and hatchling emergence phenologies.
- 3) Monitor nesting success.
- 4) Tag and identify all turtles encountered.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Data Analysis (USFWS)

- 1) Produce in house report on 6 year summary of above parameters.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDING REQUIRED:

OBJECTIVE 4: HATCHLING SURVIVAL

Planning (NMFS)

- 1) Continue to test marking methods in captivity.
- 2) Develop study design.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Field Work (USFWS)

- 1) Field test hatchling collection and marking techniques.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Data Analysis (USFWS/NMFS)

- 1) Summarize findings to date on acceptable marking techniques and field procedures.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDS REQUIRED:

OBJECTIVE 5: ADULT MOVEMENT PATTERNS

Planning (NMFS)

- 1) Continue search for funds and graduate student.
- 2) Refine study design.
- 3) Initiate study if possible.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDS REQUIRED:

OBJECTIVE 6: BREEDING ECOLOGY OF MALES

Planning (NMFS)

- 1) Develop generic study plan.
- 2) Solicit funding.
- 3) Recruit graduate student.

Personnel Requirements:

Supplies and Equipment:

Funding Requirement Subtotal:

Field Work (Grad. Student)

- 1) Initiate study if funds and student available, pending compatibility with on-going studies.

Personnel Requirements:

Supplies and Equipment:

Funding Requirement Subtotal:

TOTAL FUNDING REQUIRED:

OBJECTIVE 7: HATCHLING PREDATION

Planning (NMFS)

- 1) Develop generic study plan.
- 2) Solicit funding.
- 3) Recruit graduate student.

Personnel Requirements:

Supplies and Equipment:

Funding Requirement Subtotal:

Field Work (Grad. Student)

- 1) Initiate study if funds and student available, pending compatibility with on-going studies.

Personnel Requirements:

Supplies and Equipment:

Funding Requirement Subtotal:

TOTAL FUNDING REQUIRED:

OBJECTIVE 8: DNA STUDIES

Planning (NMFS)

- 1) Coordinate with outside researchers as needed.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Field Work (USFWS)

- 1) Provide genetic material as needed.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDS REQUIRED:

YEAR 3

OBJECTIVE 1: NESTING FEMALE POPULATION MONITORING

Field Work (USFWS) Subject to change based on past years data analysis.

- 1) Partial season saturation tagging of nesting females at East Island.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Data Analysis (NMFS)

- 1) Estimate nesting female population at East, Tern, and Whale-Skate Islands.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDS REQUIRED:

OBJECTIVE 2: FIBROPAPILLOMA EPIDEMIOLOGY

Field Work (USFWS)

- 1) Examine all turtles encountered during population monitoring and nesting ecology studies for presence of tumors.
- 2) Investigate relationship of tumors with nesting success.
- 3) Initiate baseline health screening (blood, bacteriology, parasites, biopsy) of nesting turtles. (Good graduate project)

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Data Analysis (NMFS/USFWS)

- 1) Summarize tumor frequency information.
- 2) Report comparisons of nesting success of tumored vs. non-tumored turtles.
- 3) Report (thesis/publication) on baseline health parameters.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDS REQUIRED:

OBJECTIVE 3: NESTING ECOLOGY

Field Work (USFWS)

- 1) Map locations of all nests.
- 2) Monitor nesting and hatchling emergence phenologies.
- 3) Monitor nesting success.
- 4) Tag and identify all turtles encountered.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Data Analysis (USFWS)

- 1) Produce in house report on 7 year summary of above parameters.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDING REQUIREMENTS:

OBJECTIVE 4: HATCHLING SURVIVAL

Field Work (USFWS)

- 1) Implement study plan (marking at Tern Island).

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Data Analysis (USFWS)

- 1) Summary report on status of marking.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDING REQUIREMENTS:

OBJECTIVE 5: ADULT MOVEMENT PATTERNS

Field Work (Grad Student)

- 1) Continue or initiate study.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Data Analysis (Grad Student)

- 1) Summary report.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

OBJECTIVE 6: BREEDING ECOLOGY OF MALES

Planning (NMFS)

- 1) Develop generic study plan.
- 2) Solicit funding.
- 3) Recruit graduate student.

Personnel Requirements:

Supplies and Equipment:

Funding Requirement Subtotal:

Field Work (Grad. Student)

- 1) Initiate study if funds and student available, pending compatibility with on-going studies.

Personnel Requirements:

Supplies and Equipment:

Funding Requirement Subtotal:

TOTAL FUNDING REQUIRED:

OBJECTIVE 7: HATCHLING PREDATION

Planning (NMFS)

- 1) Develop generic study plan.
- 2) Solicit funding.
- 3) Recruit graduate student.

Personnel Requirements:

Supplies and Equipment:

Funding Requirement Subtotal:

Field Work (Grad. Student)

- 1) Initiate study if funds and student available, pending compatibility with on-going studies.

Personnel Requirements:

Supplies and Equipment:

Funding Requirement Subtotal:

TOTAL FUNDING REQUIRED:

OBJECTIVE 8: DNA STUDIES

Planning (NMFS)

- 1) Coordinate with outside researchers as needed.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Field Work (USFWS)

- 1) Provide genetic material as needed.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDS REQUIRED:

YEAR 4

OBJECTIVE 1: NESTING FEMALE POPULATION MONITORING

Field Work (USFWS)

- 1) Partial season saturation tagging of nesting females at East Island.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Data Analysis (NMFS)

- 1) Estimate nesting female population at East, Tern, and Whale-Skate Islands.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDING REQUIRED:

OBJECTIVE 2: FIBROPAPILLOMA EPIDEMIOLOGY

Field Work (USFWS)

- 1) Examine all turtles encountered during population monitoring and nesting ecology studies for presence of tumors.
- 2) Investigate relationship of tumors with nesting success.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Data Analysis (NMFS/USFWS)

- 1) Summarize tumor frequency information.
- 2) Report comparisons of nesting success of tumored vs. non-tumored turtles.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDING REQUIRED:

OBJECTIVE 3: NESTING ECOLOGY

Field Work (USFWS)

- 1) Map locations of all nests.
- 2) Monitor nesting and hatchling emergence phenologies.
- 3) Monitor nesting success.
- 4) Tag and identify all turtles encountered.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Data Analysis (USFWS)

- 1) Produce in house report on 8 year summary of above parameters.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDING REQUIRED:

OBJECTIVE 4: HATCHLING SURVIVAL

Field Work (USFWS/NMFS)

- 1) Continue marking hatchlings at Tern Island (USFWS).
- 2) Begin main island surveys (NMFS).

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Data Analysis (USFWS/NMFS)

- 1) Summary report on status of marking (USFWS).
- 2) Summary report on resightings of marked turtles (NMFS).

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDING REQUIRED:

OBJECTIVE 5: ADULT MOVEMENT PATTERNS

Field Work (Grad Student)

- 1) Continue or initiate study.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Data Analysis (Grad Student)

- 1) Summary report.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDING REQUIRED:

OBJECTIVE 6: BREEDING ECOLOGY OF MALES

Planning (NMFS)

- 1) Develop generic study plan.
- 2) Solicit funding.
- 3) Recruit graduate student.

Personnel Requirements:

Supplies and Equipment:

Funding Requirement Subtotal:

Field Work (Grad. Student)

- 1) Initiate study if funds and student available, pending compatibility with on-going studies.

Personnel Requirements:

Supplies and Equipment:

Funding Requirement Subtotal:

TOTAL FUNDING REQUIRED:

OBJECTIVE 7: HATCHLING PREDATION

Planning (NMFS)

- 1) Develop generic study plan.
- 2) Solicit funding.
- 3) Recruit graduate student.

Personnel Requirements:

Supplies and Equipment:

Funding Requirement Subtotal:

Field Work (Grad. Student)

- 1) Initiate study if funds and student available, pending compatibility with on-going studies.

Personnel Requirements:

Supplies and Equipment:

Funding Requirement Subtotal:

TOTAL FUNDING REQUIRED:

OBJECTIVE 8: DNA STUDIES

Planning (NMFS)

- 1) Coordinate with outside researchers as needed.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Field Work (USFWS)

- 1) Provide genetic material as needed.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDS REQUIRED:

YEAR 5

OBJECTIVE 1: NESTING FEMALE POPULATION MONITORING

Field Work (USFWS)

- 1) Saturation tagging of nesting females on East, Tern, and Whale-Skate Islands for entire season.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Data Analysis (NMFS)

- 1) Update population model parameters.
- 2) Estimate nesting female populations on East, Tern, and Whale-Skate Islands.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDS REQUIRED:

OBJECTIVE 2: FIBROPAPILLOMA EPIDEMIOLOGY

Field Work (USFWS)

- 1) Examine all turtles encountered during population monitoring and nesting ecology studies for presence of tumors.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Data Analysis (NMFS/USFWS)

- 1) Summarize tumor frequency information.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDING REQUIRED:

OBJECTIVE 3: NESTING ECOLOGY

Field Work (USFWS)

- 1) Map locations of all nests.
- 2) Monitor nesting and hatchling emergence phenologies.
- 3) Monitor nesting success.
- 4) Tag and identify all turtles encountered.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Data Analysis (USFWS)

- 1) Produce in house report on 8 year summary of above parameters.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDING REQUIRED:

OBJECTIVE 4: HATCHLING SURVIVAL

Field Work (USFWS/NMFS)

- 1) Continue marking hatchlings at Tern Island (USFWS).
- 2) Begin main island surveys (NMFS).

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Data Analysis (USFWS/NMFS)

- 1) Summary report on status of marking (USFWS).
- 2) Summary report on resightings of marked turtles (NMFS).

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDING REQUIRED:

OBJECTIVE 5: ADULT MOVEMENT PATTERNS

Field Work (Grad Student)

- 1) Continue or initiate study.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Data Analysis (Grad Student)

- 1) Summary report.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDING REQUIRED:

OBJECTIVE 6: BREEDING ECOLOGY OF MALES

Planning (NMFS)

- 1) Develop generic study plan.
- 2) Solicit funding.
- 3) Recruit graduate student.

Personnel Requirements:

Supplies and Equipment:

Funding Requirement Subtotal:

Field Work (Grad. Student)

- 1) Initiate study if funds and student available, pending compatibility with on-going studies.

Personnel Requirements:

Supplies and Equipment:

Funding Requirement Subtotal:

TOTAL FUNDING REQUIRED:

OBJECTIVE 7: HATCHLING PREDATION

Planning (NMFS)

- 1) Develop generic study plan.
- 2) Solicit funding.
- 3) Recruit graduate student.

Personnel Requirements:

Supplies and Equipment:

Funding Requirement Subtotal:

Field Work (Grad. Student)

- 1) Initiate study if funds and student available, pending compatibility with on-going studies.

Personnel Requirements:

Supplies and Equipment:

Funding Requirement Subtotal:

TOTAL FUNDING REQUIRED:

OBJECTIVE 8: DNA STUDIES

Planning (NMFS)

- 1) Coordinate with outside researchers as needed.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

Field Work (USFWS)

- 1) Provide genetic material as needed.

Personnel Requirements:

Supplies and Equipment:

Funding Requirements Subtotal:

TOTAL FUNDS REQUIRED: