

Regional Information Report No. 1J08-07

**A Program for Improving Management and Research
of Fisheries in the Southeast Region—Vessels Program**

by

Kyle Hebert

February 2008

Alaska Department of Fish and Game

Division of Commercial Fisheries



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Weights and measures (metric)		General		Measures (fisheries)	
centimeter	cm	Alaska Administrative Code	AAC	fork length	FL
deciliter	dL			mid-eye-to-fork	MEF
gram	g	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	mid-eye-to-tail-fork	METF
hectare	ha			standard length	SL
kilogram	kg			total length	TL
kilometer	km	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.		
liter	L	at	@	Mathematics, statistics <i>all standard mathematical signs, symbols and abbreviations</i>	
meter	m	compass directions:		alternate hypothesis	H _A
milliliter	mL	east	E	base of natural logarithm	<i>e</i>
millimeter	mm	north	N	catch per unit effort	CPUE
		south	S	coefficient of variation	CV
		west	W	common test statistics	(F, t, χ^2 , etc.)
Weights and measures (English)		copyright	©	confidence interval	CI
cubic feet per second	ft ³ /s	corporate suffixes:		correlation coefficient (multiple)	R
foot	ft	Company	Co.	correlation coefficient (simple)	r
gallon	gal	Corporation	Corp.	covariance	cov
inch	in	Incorporated	Inc.	degree (angular)	°
mile	mi	Limited	Ltd.	degrees of freedom	df
nautical mile	nmi	District of Columbia	D.C.	expected value	<i>E</i>
ounce	oz	et alii (and others)	et al.	greater than	>
pound	lb	et cetera (and so forth)	etc.	greater than or equal to	≥
quart	qt	exempli gratia (for example)	e.g.	harvest per unit effort	HPUE
yard	yd	Federal Information Code	FIC	less than	<
		id est (that is)	i.e.	less than or equal to	≤
Time and temperature		latitude or longitude	lat. or long.	logarithm (natural)	ln
day	d	monetary symbols (U.S.)	\$, ¢	logarithm (base 10)	log
degrees Celsius	°C	months (tables and figures): first three letters	Jan, ..., Dec	logarithm (specify base)	log ₂ , etc.
degrees Fahrenheit	°F	registered trademark	®	minute (angular)	'
degrees kelvin	K	trademark	™	not significant	NS
hour	h	United States (adjective)	U.S.	null hypothesis	H ₀
minute	min	United States of America (noun)	USA	percent	%
second	s	U.S.C.	United States Code	probability	P
		U.S. state	use two-letter abbreviations (e.g., AK, WA)	probability of a type I error (rejection of the null hypothesis when true)	α
Physics and chemistry				probability of a type II error (acceptance of the null hypothesis when false)	β
all atomic symbols				second (angular)	"
alternating current	AC			standard deviation	SD
ampere	A			standard error	SE
calorie	cal			variance	
direct current	DC			population	Var
hertz	Hz			sample	var
horsepower	hp				
hydrogen ion activity (negative log of)	pH				
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

REGIONAL INFORMANTION REPORT NO. 1J08-07

**A PROGRAM FOR IMPROVING MANAGEMENT AND RESEARCH OF
FISHERIES IN THE SOUTHEAST REGION—VESSELS PROGRAM**

By

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ABSTRACT

This report summarizes the Southeast Region's marine vessel program, including vessel missions, capabilities, and limitations. These vessels support commercial and personal use fisheries by providing platforms for research and management activities. The region's vessels are heavily relied upon for conducting department surveys for red king crab, Tanner crab, pot shrimp, herring, sea cucumbers, sea urchins, and geoducks. They are also important for management of herring and pot shrimp fisheries. Areas where funding gaps exist for the vessels program include regular annual maintenance, including transit costs to and from the shipyard, major repair or upgrades, and salary for seasonal boat officer staff. These areas are identified in this document as currently unfunded or under funded. If fully funded, the region's vessels would be adequately maintained for safety and functionality, and staffed without compromising funding of other existing projects.

Key words: vessels, missions, capabilities, platform, research, management, funding

INTRODUCTION

OVERVIEW OF SOUTHEAST REGION VESSELS PROGRAM

Alaska's Constitution mandates the management of fish and wildlife resources according to sustained yield principles and for the maximum benefit of the public. In order to fulfill this responsibility, the Alaska Department of Fish and Game (ADF&G) operates a wide variety of research and management programs for both fish and wildlife. ADF&G also assists its sister agencies such as the Department of Public Safety, Department of Environmental Conservation, University of Alaska, and some federal agencies when their responsibilities coincide with those of the department or during an emergency, for example during oil spill response.

In Southeast Alaska (Region I) this requires the department to carry out programs aimed at researching and managing marine and anadromous fishes, marine invertebrates, and marine mammals. Effective management of these resources requires a broad understanding of the biological and physical characteristics of the marine environment these species depend on. A wide variety of research and management projects are conducted throughout the year to gather this information. These projects require the services of vessels in the 40 to 110 foot class to gather the necessary information and provide department staff with on-site facilities.

VESSELS

BACKGROUND

The Commercial Fisheries Division, Southeast Region operates, maintains, and supports the operations of two large research vessels: the 110-foot Research Vessel (R/V) *Medeia* is home-ported in Juneau and the 106-foot *R/V Kestrel* is home-ported in Petersburg. The region also owns one small research vessel, 42-foot *R/V Kittiwake III*, which is home ported in Sitka and is operated primarily by Sitka area office biologists and technicians.

The Region is directly responsible for research and management of a wide variety of species important to commercial, subsistence, and personal use fisheries. Those fisheries harvest salmon, herring, groundfish, crab, shrimp, sea cucumbers, sea urchins, geoducks, and other miscellaneous fish and shellfish in the Southeast and Yakutat areas. The Region's vessels section, which includes professional licensed vessel staff, works with the Region's supervisory staff and professional contractors to operate and maintain the program. While there is a large capital investment in the Region's vessels, as well as substantial operating expenses for salaries and premium pay, these expenditures are necessary and in fact are highly efficient in providing

management and research platforms for a wide variety of tasks. The Regions's vessel program represents a long-term commitment to research and management of the state's resources.

STAFFING

The vessel program in Region I has suffered from inadequate stable funding to maintain a crew that is necessary for vessel operations that support the Regions's research and management programs. Consequently, the region has relied heavily upon leasing the vessels to external parties to generate funds required to support salaries of permanent full-time and season vessel staff. This has resulted in reducing the availability of the Regions's vessels to important programs such as shellfish, groundfish and dive fisheries stock assessment. As a result, vessel time for surveys within these programs is at times contracted out to external bidders to ensure completion of the work. This approach generates funds to supplement the vessel program, however it reduces consistency of surveys, adds complexity to survey logistics, and it detracts from the mission of the vessel program, which is to support the Regions's research and management programs. It also creates additional workload for supervisory and administrative staff to schedule and administer the contracts.

An increase in funding levels for vessel staff would reduce the Regions's need to rely on leasing of vessels. The result would be a more stable survey planning, fewer logistical problems, more consistency in survey methods, better understanding of project goals between project leader and skipper, fewer difficulties with vessel scheduling and an overall more efficient vessels program.

VESSEL PROGRAM CHARACTERISTICS

The following characteristics are found within the vessel program:

Professionalism: Southeast Region vessels employ licensed crews that are experienced and have undergone extensive specialized training, particularly in aspects of vessel safety. These crews help ensure the highest possible levels of safety and competency in vessel operation. While many private vessels also meet this standard, those vessels are typically engaged in fishing, tendering, or other commercial activities. It is difficult, especially on short notice, to obtain the services of qualified vessels and to assess the qualification and safety consciousness of any given vessel crew.

Confidentiality: Department vessels are often used in situations where confidentiality of information is required by law. Results of crab surveys, amount and location of fisher's catches, and amount of product purchased by processors are examples of confidential information with which state vessel crews routinely deal. Giving private vessels access to this information may create a perception of conflict of interest or favoritism that detracts from the department's ability to carry out its mission.

Consistent and Reproducible Results: One of the hallmarks of the scientific method is the need to have consistent and reproducible results. This requires using similar gear in a similar manner over a long time period. Southeast Region vessels are equipped with a wide variety of crab and shrimp pots, dive support gear, longline gear, and other equipment that is well suited to the vessels and can be fished or used in a consistent manner from year to year. Southeast Region vessel crews have fished a wide variety of gear for many years and have become competent and knowledgeable in the use of that specific gear. Southeast Region vessel crew also fish the same locations from year to year and develop insights into the best ways to fish certain areas. A chartered vessel would be starting from scratch each time it set a string of pots or net.

Local Knowledge: Safety and reliability of scientific results require that crews be intimately familiar with the weather, sea characteristics, location of safe harbors, geography, bottom types, and many other aspects of a region. While charters are often required to have a certain level of experience in the local area, any given charter vessel may have never operated in the specific areas where the vessel must go.

Availability: Availability of suitable vessels for charter is highly variable and depends on fishing and tendering opportunities, as well as other charter opportunities. Unfortunately, the department often needs vessels at exactly the same time that private vessels are engaged in these other activities. For example, one of the primary duties of Southeast Region vessels program is to act as a mobile field office for management of the herring fishery. During this fishery, nearly every suitable vessel is engaged in either fishing or tendering herring and it is extremely difficult to find a suitable vessel for charter. When fish prices are high and catches are good, it may be virtually impossible to charter a suitable vessel with a professional crew for any purpose. During emergencies, such as an oil spill, suitable vessels may have long-term contracts for clean up and not be available for department use. In either case, chartering a suitable vessel may require the state to compete on price with profits from lucrative fisheries or charter rates paid by some of the largest and most profitable corporations in the nation.

Cost Effectiveness: Southeast Region vessels have proven to be cost effective and efficient. Costs to operate state owned vessels are competitive, especially considering that they are often outfitted with special equipment to perform the special jobs required by fisheries researchers. There is also a savings in time for staff using the vessels. Chartering private vessels requires scientific staff to spend large amounts of time preparing and evaluating bids, assessing the suitability and safety of numerous vessels in order to select the best vessel available, dealing with appeals to the award, and adapting state owned fishing and scientific gear to an unfamiliar vessel. There are also safety and efficiency considerations with chartering the lowest bidder. Occasionally such vessels are poorly maintained, subject to breakdowns, and may not have adequate safety equipment for the size of a scientific party. Dealing with these issues further detracts from the staff's ability to do their job.

Table 1.—Capabilities of Southeast Region vessels.

Vessel Characteristics	<i>R/V Medeia</i>	<i>R/V Kestrel</i>	<i>R/V Kittiwake III</i>
Length	110 feet	106 feet	42 feet
Beam	26	26 feet	13
Draft	10	7.5 feet	4.5
Horsepower	1,250	644	600
Berths	16	13	4
Crew Members	4	3	1
Scientific Party	12	10	3
Annual Days At Sea	113	145	45
Approximate daily charter rate (standard crew, no indirect)	\$4,000	\$3,000	\$1,100
Primary Areas of Operation	SE Alaska	SE Alaska Nearshore Waters	SE Alaska Nearshore Waters – Baranof/Chichigof Islands
Cruising Range	7,200	7,000	500
Trip Length	30 days	20 days	10 days
Vessel Capabilities	<i>R/V Medeia</i>	<i>R/V Kestrel</i>	<i>R/V Kittiwake III</i>
Bottom Trawl	X		
Mid-water Trawl	X		
Longline	X		X
Salmon Seine			
Herring Seine			
Pot Gear	X	X	X
Dive Support	X	X	X
Hydroacoustic Gear	X	X	X
Side Scan Sonar	X		
Oceanographic sampling	X	X	X
Field Camp Support	X	X	X
Skiff Equipped	X	X	
Submarine Support	X	X	
ROV Support	X	X	X
Emergency Response	X	X	X
Search and Rescue	X	X	X
Shoreside Support	X	X	X

HISTORY, CAPABILITIES, AND LIMITATIONS OF THE R/V MEDEIA

The *R/V Medeia* was built by Universal Ironworks, in Houma, Louisiana and was completed in 1982. The vessel was purchased by the State of Alaska from Survey Boats, Inc., Patterson, Louisiana in October 1992. The vessel originally conducted high precision survey work for the oil industry in the Gulf of Mexico.

The *R/V Medeia* is over 20-years old and the mechanical systems need periodic replacement or overhaul. This maintenance requires substantial annual CIP funds to keep the vessel in a seaworthy condition.

The *R/V Medeia* is 110 feet length overall with a keel length of approximately 100 feet. The beam is 26 feet and draft of 10 feet. The steel hull is powered by two diesel engines and twin propellers. The vessel is configured with the wheelhouse forward and gross tonnage is 246 tons ITC, with a displacement of 400 long tons. The vessel can provide accommodations for up to twelve scientists at a time. The fuel capacity is 24,000 gallons and water capacity is 8,000 gallons. Service speed is 10 knots with a range of 7,200 miles. Provisions can be stored for voyages up to 30 days. Annual utilization of the vessel has been about 100 at sea days for the past two years.

Missions

Currently, the *R/V Medeia* supports Region I research efforts for crab, rockfish, shrimp, and herring. Management operations include supporting herring fisheries through inseason hydroacoustic surveys and providing a platform for staging management personnel. Herring trawl surveys are conducted in winter. The vessel also functions as a platform for Steller sea lion research in conjunction with ADF&G's Division of Wildlife Conservation and the National Marine Fisheries Service.

The vessel is used to survey stocks of king crab, Tanner crab, and shrimp with pot gear. The vessel is also a platform supporting other marine fisheries research: demersal shelf rockfish (DSR) research using a two-man submersible and herring trawl sampling for age and size estimates. Additionally, the vessel works under contract to support juvenile sea lion capture/tagging projects through use of scuba, hauling freight for the National Marine Fisheries Service, and performs search and rescue work as needed. The vessel is not currently utilized for longline surveys, however the vessel has the capability for these gear types with some reconfiguration. The vessel is not capable of seine fishing.

Herring hydroacoustic surveys occur in conjunction with management of spring herring fisheries and research sampling. Hydroacoustic means are primarily used to locate herring rather than estimate abundance.

Installation of side scan sonar equipment was completed and tested in 2005. The addition of side scan sonar is expected to provide the capability of mapping benthic habitat in detail to allow more precise targeting of species, particularly during stock assessment surveys. Better defined habitat often results in reducing variability of survey data.

Limitations

The *R/V Medeia* has a current Stability booklet. The vessel displays excellent stability characteristics and is normally operated well below the limitations specified in the stability letter.

The *R/V Medeia* is 23-years old and is due for a major overhaul. Due to the age of the vessel, a marine surveyor should estimate repairs and offer a professional opinion on the cost advantage of replacing the vessel. Considering the large expense expected for maintenance in the coming years, along with the high operating costs of this vessel, it will be worth seriously considering replacing the vessel with a newer, more fuel efficient vessel with lower operational costs. If the vessel is not replaced, then within the next few years the plumbing and wiring needs to be thoroughly inspected and upgraded. The need for this work was considered and anticipated at the time the vessel was purchased. Following is a list of the minimum maintenance that should be performed during the refitting of this vessel.

- 1. Plumbing:**

Replace all freshwater piping, most saltwater piping, hull penetrations, and about 50% of hydraulic piping and valves. This is normal major maintenance for a vessel of this age.

- 2. Wiring:**

Replace main panel and all sub-panels, replace lighting fixtures and outlets. Examine wiring runs, assume replacement of at least 50%. Incorporate present loadings into design of new panels. Replace alarm systems.

This is also normal for a vessel of this age. Electrical demands are quite different than 10 years ago, and components deteriorate with age.

- 3. Tophouse reconfiguration:**

Reconfigure wheelhouse, incorporating bridge wings. Extend office area aft about 6 feet. This is necessary due to changes of patterns of use and to the much expanded electronics suite over the past 10 years.

- 4. HVAC:**

Replace all components, including ducting. This system is old, has been repaired numerous times, and ducting is beginning to deteriorate.

- 5. Accommodations:**

Remove and replace paneling and overheads as determined to be feasible by naval architect. Replacements should be of fire retardant material. Insulate inside of hull as feasible.

- 6. Mechanical:**

Replace stuffing boxes. Balance and true shafts and propellers. Replace main hydraulic pumps. Overhaul hydraulic engine. Pull rudders and replace bearings and steering components.

HISTORY, CAPABILITIES, AND LIMITATIONS OF THE R/V KESTREL

The *R/V Kestrel* was built by Allied Shipbuilders, Ltd. in 1990 for the Canadian Department of Fisheries and Oceans (DFO). In February 2003, the Alaska Department of Fish & Game purchased the vessel from DFO and has entered it into service for the State of Alaska with the primary mission of supporting research dive operations in Southeast Alaska. This vessel will also support other fishery research and management activities involving a variety of gear types.

The *R/V Kestrel* is 106 feet in length with a beam of 26 feet and a draft of 7.5 feet. Fuel capacity is 12,600 gallons with water capacity of 2,300 gallons, augmented by a watermaker and additional water storage in ballast tanks. The vessel has an all-welded steel construction up to the level of the forecandle deck, with an aluminum tophouse. The vessel has an open aft deck approximately 9 meters in length. There are 13 berths, however the vessel is expected to typically travel with less total personnel while conducting dive operations. Service speed is 10 knots with a range of 7,000 miles. Voyages can be up to 20 days with most trip lengths of 10 to 15 days. Typical annual utilization of the vessel is approximately 125 days.

Missions

The *R/V Kestrel* is utilized in near-shore waters primarily for herring and invertebrate research and management. The department uses the *R/V Kestrel* mainly to support scuba surveys for herring spawn deposition and population estimates of sea cucumbers, sea urchins, and geoduck clams. The vessel is a times also used to conduct research surveys for shrimp and will serve as a platform to monitor commercial herring and shrimp fisheries. This vessel may also be leased for charter opportunities, for example to support sea lion capture and re-sighting studies conducted by the Wildlife Division. A minor role may be played transporting equipment and facilities for field camp activities.

The *R/V Kestrel* is a far superior vessel than the vessel it replaced, the *R/V Sundance*. The size, configuration and condition of the *R/V Kestrel* make this vessel highly capable of completing its mission. It is considered a stable and safe vessel and although its daily operational costs are higher than the *R/V Sundance*, it is expected that improvements in overall efficiency will make this vessel more economical by reducing the number of unworkable vessel days that are caused by poor weather and mechanical failures.

Limitations

The *R/V Kestrel* is 13-years old and is in excellent condition. The vessel is outfitted to support dive operations and has scuba tank compressors, capable of producing 36% NITROX. This vessel will be capable of other scientific and fishery management operations with relatively minor additions or reconfigurations of deck equipment. The current deck configuration limits its ability to perform pot surveys, however some options are being considered to increase versatility of the deck and vessel.

HISTORY, CAPABILITIES, AND LIMITATIONS OF THE R/V KITTIWAKE III

The *R/V Kittiwake III* was built by Lindel in Camano, Washington. In 1999 the Alaska Department of Fish & Game purchased the vessel from a private individual and entered it into state service after major modifications that included replacing the main engine, control systems, hydraulics, electrical wiring and electronic equipment.

The *R/V Kittiwake III* is 42 feet in length with a beam of 13 feet and a draft of 4.5 feet. Fuel capacity is 675 gallons with water capacity of 150 gallons. There are four berths, however the vessel typically does not travel with more than three personnel because of space limitations. Service speed is 11 knots with a range of approximately 500 miles. Voyages can be up to 10 days with most trip lengths of 7 to 10 days. Typical annual utilization of the vessel has been approximately 45 days.

Missions

The *R/V Kittiwake III* is utilized in near-shore waters primarily in support of salmon, shrimp and herring fishery management, primarily by the Sitka Area Office. The size of the vessel, including shallow draft, makes it ideal for conducting near-shore pot surveys, and in the past has been used for Dungeness crab surveys.

Limitations

The *R/V Kittiwake III* is 15-years old and in relatively good condition. Stability tests have not been conducted, however stability of the vessel is not a major concern due to the relatively light-duty work done in nearshore waters. Although the vessel can accommodate up to a total of four, space and capacity limitations allow three crew to be comfortable.

PROPOSED PROJECTS

This section contains a list of projects proposed for increased funding. The projects described are either not conducted due to a lack of funding or are currently operated at levels insufficient to meet management objectives. All costs are expressed in thousands of dollars.

Table 2.—Summary of proposed projects and estimated costs (thousands of dollars).

Project	Estimated First-Year Cost	Estimated Annual Continuing Cost	Duration
A. Boat Officer Staffing			
A.1. Seasonal Boat Officer Support	\$58.0	\$58.0	Long Term
A.2. Vessel Shipyard Transport Support	\$20.0	\$20.0	Long Term
B. Vessel Maintenance Plan			
Total	\$78.0	\$78.0	

PROJECT A.1. SEASONAL BOAT OFFICER SUPPORT

Location: Southeast Alaska.

Primary Objective: To provide stable, long-term funding for seasonal boat officer staff.

Description: Additional support is needed for seasonal boat officers for both the *R/V Medeia* and the *R/V Kestrel*. Currently, the *R/V Medeia* has a crew of three permanent full-time Boat Officers (one B.O. IV, one B.O. III, and one B.O. II), and one seasonal Boat Officer I. The *R/V Kestrel* has a crew of two permanent full-time Boat Officers (one B.O. IV and one B.O. III), and one seasonal Boat Officer I. Although the seasonal boat officers are critical to success of the missions of both vessels, there has been inadequate funding to maintain these positions without compromising other projects. The salaries of these positions have been covered with a variety of funding sources, including heavy reliance on chartering vessels out to parties outside of the division or department. This practice requires a great deal of time to administer and cannot be relied on as a long-term solution to maintaining vessel staff at the appropriate level.

This increment would fund eight months of Boat Officer I salary (4 mm for *R/V Medeia* B.O. I and 4 mm for *R/V Kestrel* B.O. I), and provide stability for staffing these vessels.

Duration: A long-term stable funding source is desired.

Estimated Annual Cost: \$58.0.

PROJECT A.2. VESSEL SHIPYARD TRANSPORT SUPPORT

Location: Southeast Alaska.

Primary Objective: To provide stable, long-term funding for the transportation of vessels from home port to the shipyard for regular haul out maintenance.

Description: The region's two large, manned vessels require regular maintenance that requires hauling the vessel from the water. This work can only be accomplished at a small number of shipyard facilities in the Pacific Northwest, most of which require several days of travel to reach. Currently, each vessel is scheduled for routine shipyard haul out every other year. The department funds this maintenance with Vessel Maintenance CIP funds that are appropriated most years, as necessary. However, restrictions on the use of those funds prevent their use for physically relocating the vessels from their home ports to the shipyard location. Shipyards that are capable of handling these vessels are located in Ketchikan, Bellingham/Seattle area, Vancouver/Victoria area, and Seward. Shipyards are chosen to conduct work through an open bidding process.

This increment would pay for operational costs involved with transiting the vessels and allowing boat officers to remain on site to advise during shipyard work. Specific costs include marine fuel, stores, seaduty pay, travel, and per diem for vessel staff. Presently, none of these expenses may be paid for using Vessel Maintenance CIP funds. Transiting vessels from Juneau or Petersburg to the Seattle/Vancouver area requires about six to seven days roundtrip, and vessels may stay on site at the shipyard for two weeks to one month.

Duration: A long-term stable funding source is desired.

Estimated Annual Cost: \$20.0.

PROJECT B. PROPOSED MAINTENANCE AND PROGRAM UPGRADE PLAN

This section contains a long-range vessel maintenance plan and lists costs expected to maintain or upgrade each vessel for the next three to four years. Tables include only essential or important items. One item that is not included in the table is a potential engine replacement for the *R/V Medeia*. This vessel's engines are old and less fuel efficient than modern versions and consideration is being given to replace these engines. The approximate cost to do so is \$500.0k.

Table 3.—Proposed maintenance and program upgrade plan for R/V Medeia with cost in thousands of dollars. Items are grouped in order of priority within fiscal year.

FY 09	
1) main engine service; electrical system retrofit; EPIRB replacement; firefighting gear upgrades; bilge pump replacements	\$164.0k
2) battery replacements; USCG license required training	\$14.0k
3) sodium crab lights	\$7.0k
4) furnace system overhaul; radar mast rebuild	\$21.0k
FY10	
1) shipyard haul out - bottom paint; zincs; hull paint; lazarette refit	\$135.0k
2) main engine service; autopilot replacement	\$15.0k
3) replace life rafts; replace survival suits	\$22.0k
FY11	
1) main engine service; genset rebuilds; fire pump replacement; appliance upgrades	\$58.0k
2) electronics upgrades; battery replacements; camera system; replace inflatable skiff	\$37.0k
FY12	
1) shipyard haul out - bottom paint; zincs; props/shafts; superstructure paint	\$145.0k
2) galley/bathrooms remodel	\$20k

Table 4.–Proposed maintenance and program upgrade plan for R/V Kestrel with cost in thousands of dollars.

FY09	
1) Shipyard haul out - keel coolers; superstructure paint; bottom paint/zincs	\$260.0k
2) top rebuild (one main engine); top rebuild (one genset)	\$27.0k
3) marine gear overhaul	\$30.0k
FY10	
1) sewage system overhaul; UPS battery replacement; re-plumb ballast tanks; deck crane service	\$30.0k
2) replace carpeting; false deck install; sodium lights; deck storage shed	\$43.0k
FY11	
1) Shipyard haul out - bottom paint; fuel tank cleanout; water tank cleanout	\$135.0k

Table 5.–Summary of future major maintenance costs, FY2009–FY2012 (in thousands of dollars).

Fiscal Year	<i>R/V Medeia</i>	<i>R/V Kestrel</i>	Total
2009	\$206.0	\$317.0	\$476.5
2010	\$172.0	\$73.0	\$249.0
2011	\$95.0	\$135.0	\$230.0
2012	\$165.0		\$165.0
Total	\$638.0	\$525.0	\$1,163.0