NOAA/NWFSC
Southern California Shelf Rockfish Hook and Line Survey

NOAA Fisheries, Northwest Fisheries Science Center
2725 Montlake Blvd. E, Seattle, WA 98112

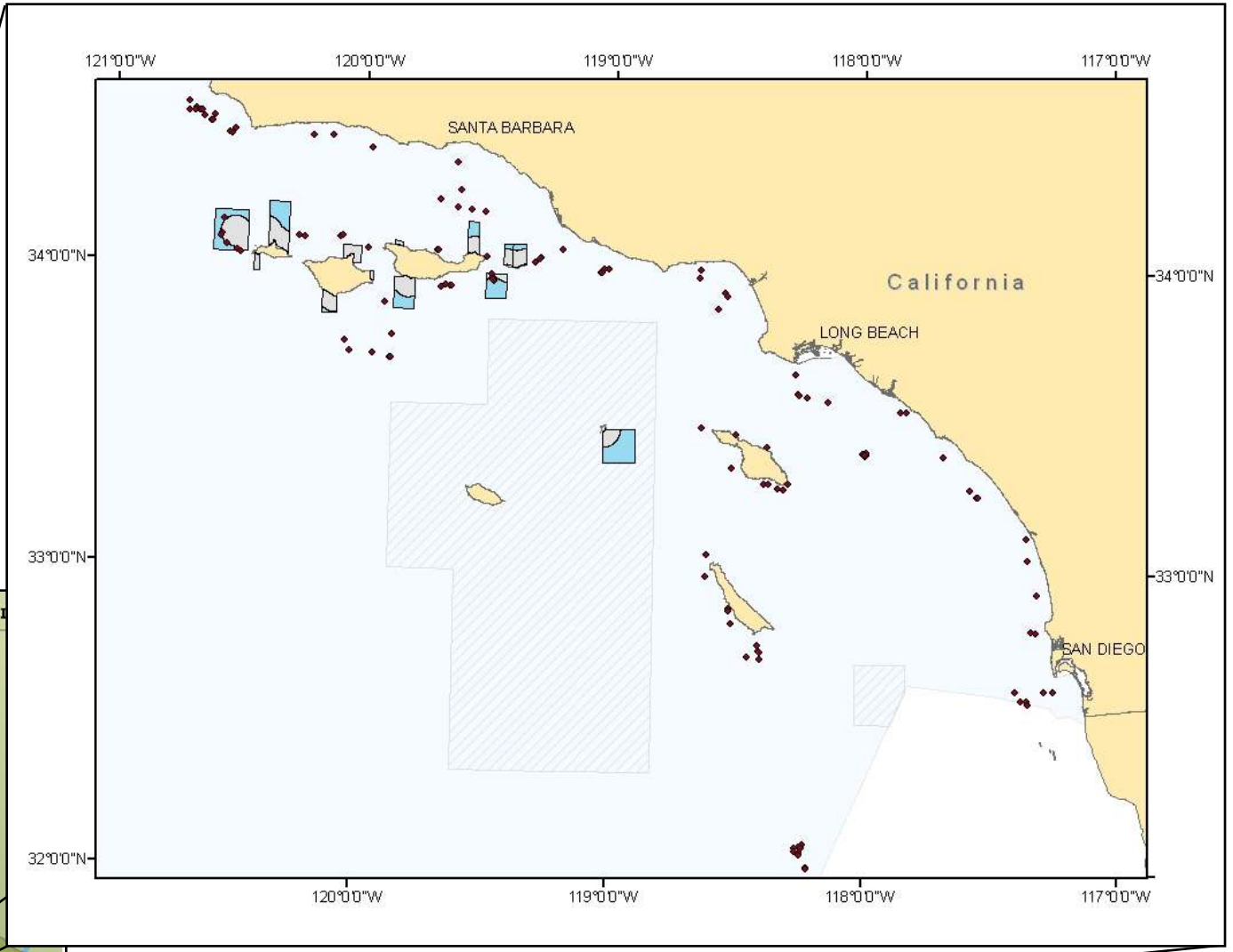
John Harms, NOAA/NWFSC
Jim Benante, PSMFC/NWFSC
Matt Barnhart, PSMFC/NWFSC

Rationale

- Prior to 2002, there was no ongoing fishery-independent groundfish data collection for the area from Pt. Conception (34 27′ N) to the Mexican border)

- Trawl survey coverage for the region began in 2002; however, untrawlable areas including rocky, high-relief habitats remained unsampled

Survey Region: Southern California Bight



Primary Objective

Develop an annual index of abundance and time series of other biological parameters for key species of structure-associated shelf rockfish (Genus: *Sebastes*) within the Southern California Bight including bocaccio, vermilion rockfish, sunset rockfish, greenspotted rockfish, and others.

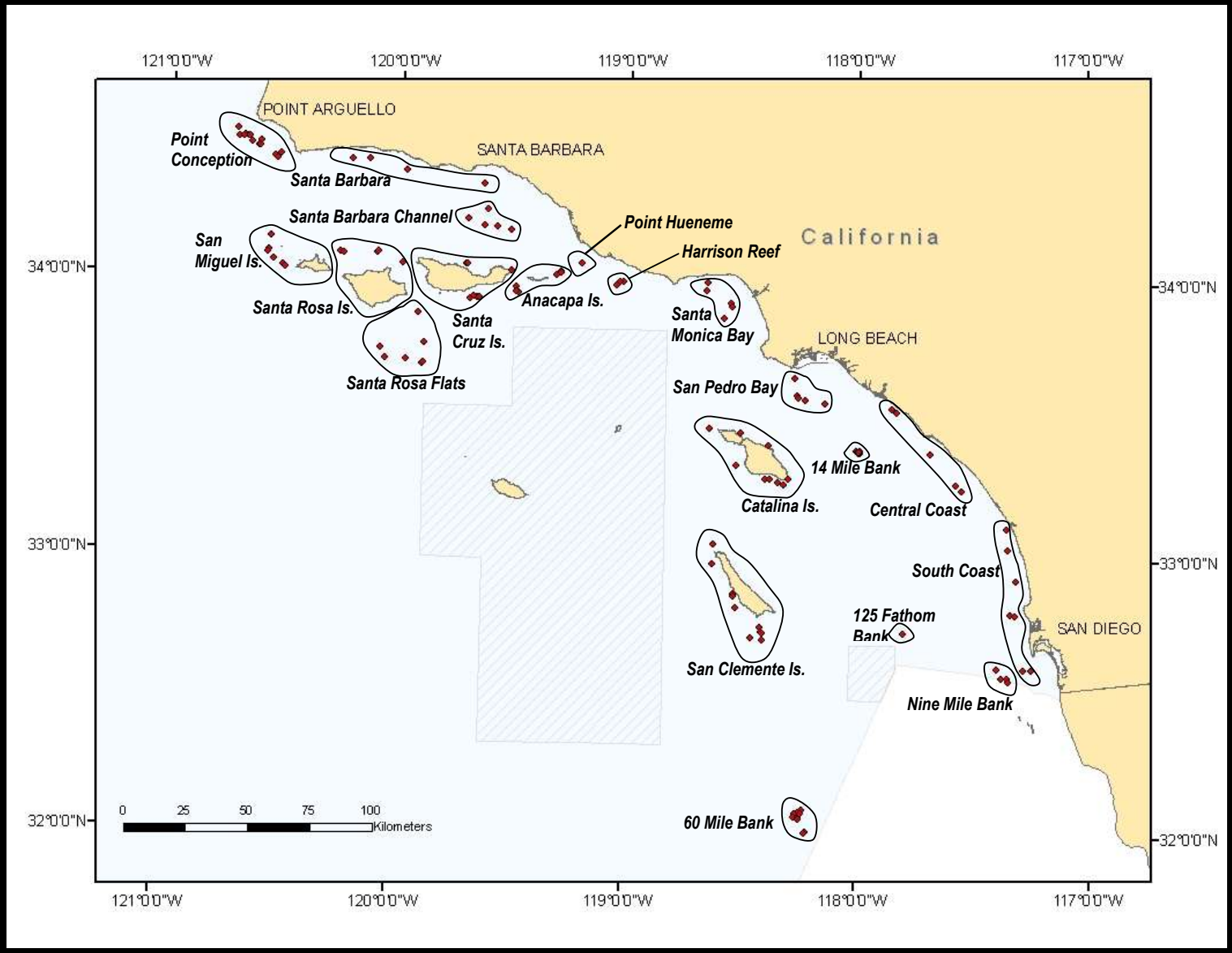
Background

- Initial planning: Summer 2002
  - Meetings between NOAA Fisheries researchers and representatives from the sportfishing and commercial fishing industry
- Pilot survey: May 2003
  - Research conducted aboard vessels chartered from both the sportfishing and commercial industries
- Survey has been conducted annually since 2004
  - 2011 will be the 8th year in the data time series

Survey Design

- Conducted annually
- 121 fixed stations sampled during the course of the survey
- Sampling area: Pt. Arguello to the boundary with Mexican waters
- Depth range: 40m – 230m (common depth range for bocaccio)
- Sampling frame developed through meetings with the local sport and commercial fishermen; previous groundfish monitoring programs conducted by California Dept. of Fish and Game; and stations sampled opportunistically during the 2003 pilot study

Survey Stations



Survey Logistics

- Cruise conducted aboard two chartered sportfishing vessels (~60’ length)
- Crew of 8
  - Vessel: Captain; relief captain; 3 deckhands
  - Science: Chief scientist; 2 deck biologists
- 12 days on the water for two boats (24 vessel-days)
- Survey conducted late September – early October

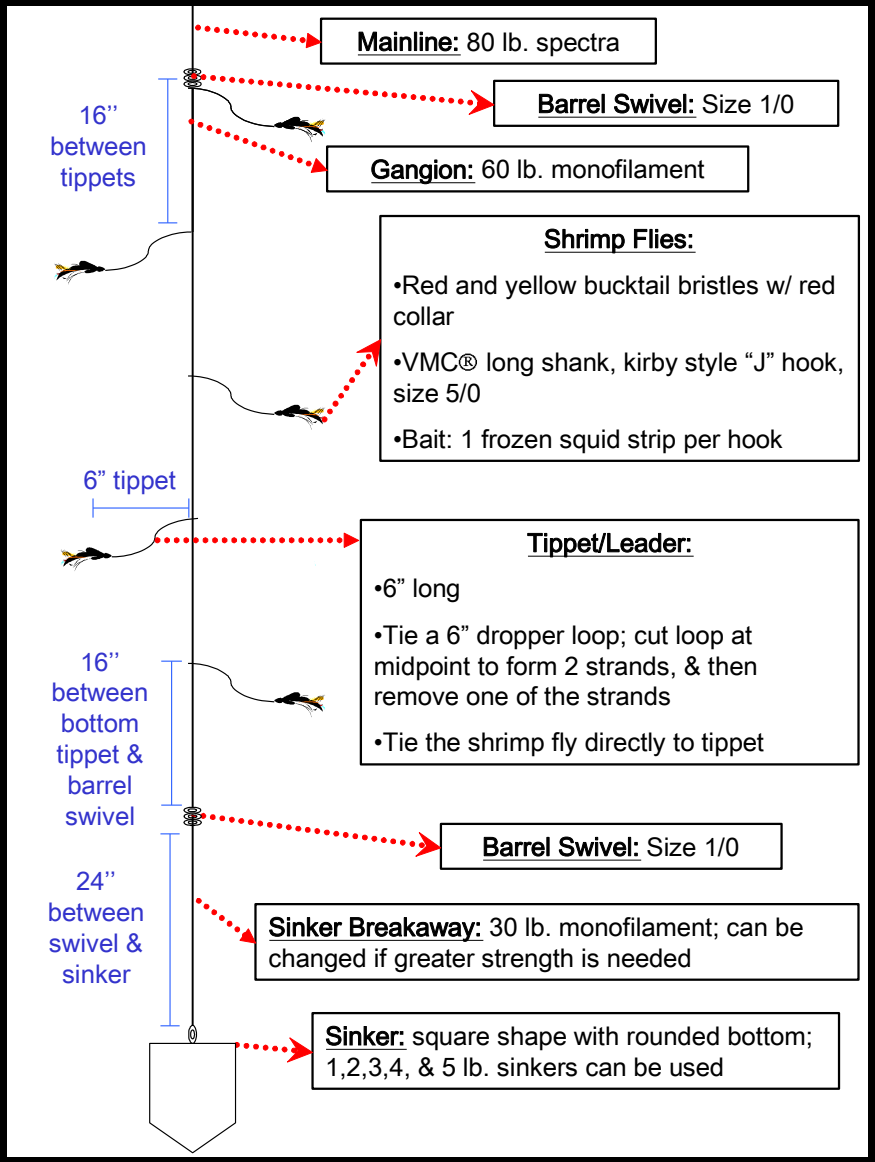

FISHERIES RESEARCH
AGGRESSOR


MIRAGE

Sampling Protocols

- Stations defined as a GPS point on the seafloor
  - Sampling must be initiated within a 100-yd radius of the station's point location
- Hook and line gear deployed by rod and reel
- 3 deckhands each make 5 coordinated drops of a 5-hook sampling rig (total of 75 hooks deployed per station)
- 5-minute maximum soak time
- ~2,500 - 3,000 fish captured and sampled during the survey

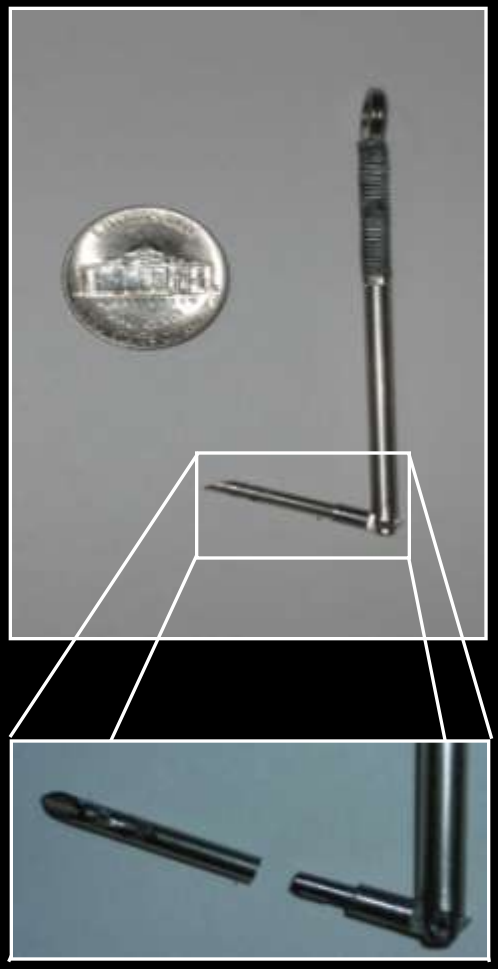
Sampling Rig



Data Collected

- Station information: position, depth, time of day, ocean & weather conditions, etc.
- Catch species composition and soak time
- Biological data (length, weight, sex, age, and finclip for genetics) collected from all individuals caught
- Oceanographic data (salinity, bottom and sea surface temperatures, and dissolved oxygen) collected at each station
- Maturity and stomach contents for key species to inform stock assessment parameters and identify trophic patterns
- Video - towed underwater camera sled collects seafloor footage for habitat classification

Genetic Hooks



Collects a piece of tissue that can be used for genetic analyses without bringing the fish to the surface

Genetic Hooks

- Designed to collect a small piece of tissue from fish when the fish bites the hook
- The tissue collected is brought to the lab to analyze the DNA – can be used to both verify species identifications made in the field as well as identify fish to the individual
- Fish identified to individual are effectively “tagged” and can be “recaptured” if they strike a genetic hook in the future (or via a finclip if a tagged fish is subsequently caught on a regular survey hook)

Analysis

- Catch data modeled in a Generalized Linear Model (GLM) framework; abundance indices have been generated for six species of rockfish: bocaccio, vermilion, sunset, greenspotted, starry, and speckled
- Biological data are used to calculate length-weight relationships; size at age; maturity at age, etc.
- Genetics information from fish caught during the survey provides information on stock structure; the genetic hooks represent a potential means of developing non-lethal survey technologies

Collaborative Research

- Project was developed from the outset with extensive input from the sport and commercial sectors
- One of the few ongoing collaborations between NOAA Fisheries and the sportfishing industry
- Has helped improve the working relationship between NOAA and the region's sportfishing industry
- Working directly with the fishermen has provided numerous opportunities for mutual education and improvements to the survey

For More Information

- Methods: Harms, J.H., J.A. Benante, and R.M. Barnhart. 2008. The 2004-2007 hook and line survey of shelf rockfish in the Southern California Bight: Estimates of distribution, abundance, and length distribution. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-95, 110 p.

- Abundance analysis: Harms, J.H., J.R. Wallace, and I.J. Stewart. 2010. Analysis of fishery-independent hook and line-based data for use in the stock assessment of bocaccio rockfish (Sebastes paucispinis). Fisheries Research. (106) 298-309.


Official Sunset Slide
(Questions can now be fielded.)

FRAM Hook and Line Survey

SITE SHEET

Date: 9/24/10 Vessel: AG Site Name: 374 Set ID: 10 0101 086

SCS File Index No.: 6 General Area: Con C Day of Cruise: 1

FPC name: JH Recorded by: JH

Drift / On anchor
Survey / Non-survey
Test Drop? Y **N**

Salinity: 33.80 (psu)
Temperature: 10.17 (°C)
Depth: 87 (m)
Dissolved O_2: 2.39 (µl/l)

Event Description	Time (24 hour)	Latitude (DD MM.MMM)	Longitude (DD MM.MMM)	Depth (fth)
Drop 1	1713	34 29.048	120 37.024	51.2
Drop 2	1731	34 29 042	120 37.034	51.4
Drop 3	1744	34 29 059	120 37 014	50.9
Drop 4	1803	34 29 063	120 37 008	51.1
Drop 5	1815	34 29 051	120 37 027	51.6
CTD Cast	1833	34 29 082	120 37 089	51.3

Wind spd. (kts)	Wind dir.*	Drift spd. (kts)	Drift dir.*	Sea state: swell ht. (ft)	swell dir.*	wave ht. (ft)	Moon phase (% full & phase)
0	300°	0	135°	3.5	290°	1.5	99 %
> 0-1		> 0 - 0.1					New moon
1-3		0.1 - 0.5					Waxing crescent
4-6		0.5 - 1.0					First quarter
7-10		**1.0 - 1.5**					Waxing gibbous
11-16		1.5 - 2.0					**Full moon**
17-21		2.0 - 2.5					Waning gibbous
22-27		3.0 - 3.5					Third quarter
28-33		> 3.5					Waning crescent
> 34							

Tide
Station: Pt Arguello
Distance: 6.1 nm
Phase: ebb flood **steady**
Type: **spring** neap neither
Height (ft): First 0.8 | Mid 0.9 | Last 1.0

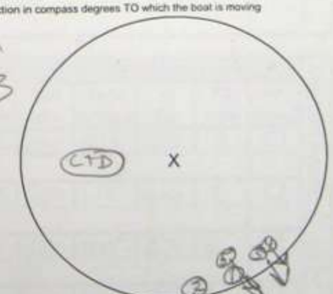
Sfc. Temp. 54 °F

Sunrise (24 hr) 0652

Sunset (24 hr) 1856

* For wind & swell direction, enter the direction in compass degrees FROM which they originate; for drift direction, enter the direction in compass degrees TO which the boat is moving

Habitat: no habitat in circle; semi-hard bottom
CTD SST = 53.3



Indicate the position of each drop using "1", "2", etc. and the direction of the drifts using arrows.

Fishfinder / aggregations: no fish reading
Red Death = Ø

Ocean / weather: clear, breezy

General: SST from hand thermometer
lots of small vermilions

FRAM Hook and Line Survey

HOOK MATRIX

Date: 9/24 Vessel: AG Site Name: 374 Set ID: 1001050010

SCS File Index No.: 6 General Area: CONC Day of Cruise: 1

FPC name: Harms Recorded by: VERM / MARK

ANGLER A

ANGLER NAME: Paul

Drop	Hook 1 (bottom hook)	2	3	4	5 (top hook)	On Bottom	First Bite	Begin Retrieval	At Sfc	Wt. Used	Exclude?
1	VERM	BB	BB	BOC	BB	52	121	540	1240	3	☐
Notes											
2	NB	BB	BB	VERM	NB	38	38	311	609	3	☒
Notes	HANG UP EARLY ON BUT CAME LOOSE						LOST SINKER				
3	NH	BOC	BOC	VERM	BOC	33	414	522	1207	3	☐
Notes											
4	VERM	BB	→	→	→	40	410	523	934	3	☐
Notes											
5	VERM	VERM	VERM	VERM	VERM	42	258	442	1216	3	☐
Notes											

ANGLER B

ANGLER NAME: Phillip

Drop	Hook 1 (bottom hook)	2	3	4	5 (top hook)	On Bottom	First Bite	Begin Retrieval	At Sfc	Wt. Used	Exclude?
1	BOC	VERM	VERM	VERM	BB	45	58	540	1054	3	☐
Notes											
2	BB	→	→	→	→	40	230	510	840	3	☐
Notes											
3	VERM	BB	→	→	→	40	127	500	1028	3	☐
Notes											
4	BB	→	→	→	→	40	—	540	830	3	☐
Notes											
5	VERM	BB	NH	STUCK	BB	41	55	410	921	3	☐
Notes											

ANGLER C

ANGLER NAME: MARK

Drop	Hook 1 (bottom hook)	2	3	4	5 (top hook)	On Bottom	First Bite	Begin Retrieval	At Sfc	Wt. Used	Exclude?
1	G SPLIT	NB	BB	→	→	44	143	510	878	3	☐
Notes											
2	VERM	BB	VERM	DB	VERM	42	206	315	800	3	☐
Notes											
3	VERM	BB	VERM	VERM	VERM	48	58	405	856	3	☐
Notes											
4	BB	VERM	DB	BB	DB	41	—	621	902	3	☐
Notes	LOST SINKER @ RETRIEVAL										
5	VERM	VERM	VERM	VERM	VERM	39	242	324	916	3	☐
Notes											

NOTES:

BIG OL WHALES OFF BOW
BLUE ONES

Data checked by VRM on 9/24/10

KEY:
- Record times in MM:SS format
- If a fish is hooked, enter species into matrix
  - "NB" = No bait on hook
  - "BB" = Bait back on hook
  - "NH" = No hook
- Note any snags, lost sinkers, or significant tangles with other anglers in space provided

FRAM Hook and Line Survey

DATA SHEET

Date: 9/24/10 Vessel: Accession Site Name: 374 Set ID: 10010S006

SCS File Index No.: 006 General Area: Conc Day of Cruise: 1

FPC name: Harms Recorded by: Mato / KRM

	Species	Angler	Drop No.	Hook No.	Weight (kg)	Length (cm)	Sex	Otolith No.*	Fin Clip No.*	Special Project(s)	Re-leased
	greenspot	C	1	1	0.66	32	F	G021	G020		☐
	vermillion	A	1	1	1.62	46	M	V247	V247		☐
	"	B	1	4	0.30	25	M	V248	V248		☐
	"	B	1	2	0.28	25	F	V249	V249	ovary	☐
	"	B	1	3	.46	31	M	V250	V250		☐
	"	C	2	1	.86	36	M	V251	V251		☐
	"	C	2	3	1.08	41	M	V252	V252		☐
	"	A	2	4	.40	29	M	V253	V253		☐
	"	C	2	5	.84	37	F	V254	V254	ovary	☐
	Bocaccio	A	1	4	1.14	45	F	B044	B044		☐
	"	B	1	1	.40	32	F	B045	B045		☐
	verm	C	3	3	.38	27	F	V255	V255	ovary	☐
	"	C	3	1	.22	23	M	V256	V256		☐
✓	"	A	3	~~1~~ 4	1.76	47	M	V257	V257		☐
	"	C	3	4	1.92	48	M	V258	V258		☐
	"	B	3	1	1.32	43	M	V259	V259		☐
+	"	C	3	5	0.24	25	F	V260	V260	ovary	☐
	Bocaccio	A	3	5	.60	38	F	B046	B046		☐
✓	"	A	3	~~4~~ 3	.64	39	M	B047	B047		☐
	"	A	3	2	0.60	37	F	B048	B048		☐
	vermillion	A	4	1	1.38	43	M	V261	V261		☐
	"	C	4	2	1.66	45	M	V262	V262		☐
	"	B	5	1	1.06	37	F	V263	V263		☐
	"	A	5	1	1.74	46	M	V264	V264		☐
	"	A	5	5	0.94	38	M	V265	V265		☐
	"	A	5	4	1.18	41	M	V266	V266		☐
	"	C	5	1	1.06	40	M	V267	V267		☐
	"	A	5	3	2.04	48	F	V268	V268		☐

* Include the first letter of the species name before the otolith, and finclip numbers and include leading zeroes when the number < 100 (e.g., "V024", "A008", etc.)

NOTES: + wt changed to 0.24

Data checked by KRM on 9/24/10