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NAVY UNDERWATER SOUND LABORATORY
NEW LONDON, CONNECTICUT

(18) BIOLOGICAL DATA COLLECTED ON THE
PARKA I TRANSIT.

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ELECTE
MAR 10 1981

by

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David/Giuliano

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NUSL Technical Memo No. 2213-262-69

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23 October 1969

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INTRODUCTION

The investigation into the Deep Scattering Layer (DSL) of the world's oceans has become widespread with much data already collected (Backus Hersey, 1966). Although more data is needed, future research should involve a coordinated effort between acousticians taking reverberation data, and oceanographers taking biological data. In line with this thinking NUSL initiated a sampling program on the transit of the USNS SANDS from New London, Connecticut to Honolulu, Hawaii, (1 July 1968-2 August 1968. Acoustic and biological data was obtained concurrently at 10 stations along the cruise track (Figure 1) to assess the geographic distribution of reverberation and the influence of the biological community on this distribution.

METHODS

It was planned to utilize a newly designed net, The Micro Nekton Net, but at the last minute, a malfunction necessitated its removal from the ship and instead an open 10 foot Isaacs-Kidd Midwater Trawl (IKMT) was used. The Micro-Nekton Net would have allowed 3 discrete samples from each depth or one discrete sample from each of 3 depths. This feature would have allowed a quantitative assessment of the biomass of different portions of the DSL, and of the migrating vs non-migrating segments of this layer. The use of the non-closing single sample IKMT necessitated

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one oblique haul where the depth from which the animals were captured and the precise concentration remained unknown.

Since silent ship conditions were required for the acoustic tests, the net tows were taken immediately after the acoustic tests. All tows except Station 1 were made just after sunset and were of 3 hours duration. The procedure was to lower the net to the bottom of the DSL and begin towing. The net would tow for 30 minutes at each of five equally spaced depths from the bottom of the DSL to the surface. At Station 1 a deep day tow was undertaken. The net was lowered at 0930 local time. It reached a depth of 850m at 1200 hrs. and after 30 minutes at that depth was retrieved slowly reaching the surface at 1430 hrs.

The samples were preserved in 10% formalin and stored for later laboratory analysis. Upon return to NUSL the animals were identified according to taxonomic groups; the more important scatterers were identified to species.

Depth monitoring of the net was accomplished with a Benthos depth-telemetering pinger which sends out two acoustic pulses. The time between the pulses measured on an oscilloscope, indicates the depth. A Benthos time-depth recorder (TDR) was also attached to the net for a permanent record of depths samples.

RESULTS AND DISCUSSION

As shown in the tables of results, all samples were taken at night between the bottom of the DSL and the surface except for the sample at station 1 which was taken during the day at depths of 850m to the surface. It should be noted, however, that the figures for number of animals per 1000m³ are minimum numbers. These numbers were calculated assuming a homogeneous distribution over the whole sample range from the deepest sampling depth to the surface. Since these animals are known to occur in shallow bands perhaps only 10-50m thick these numbers may underestimate the population of scatterers by as much as an order of magnitude or more. Except for station 1, the Tables show the mean size of the swim bladder for all animals possessing one.

The data shows that the Myctophids were present at each station. Over the whole series of stations, these known scatterers were the most consistent single contributors to scattering. Among the other scatterers, Argyropelagus spp., the hatchet fish, were caught in small numbers, 0.013 per 1000m³, at station 6 (Table 5) and in very large concentrations, 1.13 per 1000m³, at station 4 (Table 3). Station 4 was found to have relatively high scattering strength, -65db at 13.5 kHz (Dullee and Cron, 1969), compared to other stations, which undoubtedly was caused by the hatchet fish with a lesser contribution from the

Myctophids. At station 5 the greatest concentration of scatterers occurred. At this station an air bladdered fish, Vinciguerria attenuata, was present in very large numbers, 5.11 per 1000m³. Myctophids also occurred here in the greatest concentration of the whole series, 0.499 per 1000m³ (Table 4). Present in very large numbers were Euphausiids, 2.7 per 1000m³, and the Galatheid crab, Pleurencoidea planipes, 15.48 per 1000m³, but their relative contribution to scattering is not known. At this station Dullea and Cron found the greatest reverberation of any of the stations, -50db at 13.5 kHz. At station 6 the reverberation fell back to the low level which was found at most of the stations along the track, -80db-70db at 13.5 and 15.5 kHz. The numbers of fish, in this case Myctophids, 0.094 per 1000m³, and Vinciguerria attenuata, 0.313 per 1000m³ also were much less than at either station 4 or 5. Similar conditions existed for the remainder of the stations on the track.

The Myctophids are distributed along the whole track of stations rather evenly with the exception of station 5 (Table 4) where high concentrations were found and at station 6 where concentrations were low (Table 5). Argyropelagicus spp. were only present in appreciable numbers at station 4 (Table 3) where high levels of reverberation occurred. Vinciguerria attenuata was present at stations 5, 6, and 9 (Tables 4, 5, and 8) but only in large concentrations at station 5 where it contributed or was responsible for the highest levels of reverberation found in these stations.

Although the biological and acoustical data do seem to corroborate each other, a greater amount of information would have been gained if a multiple sampling net had been utilized. Concentrations and exact species depth distributions could have been assessed accurately. The migrating and non-migrating constituents of the DSL could have been distinguished from one another, and the possible contribution to scattering of the non-fish population might have been recognized.

From the data of swim bladder size and concentration of fish, calculations of scattering strengths will be made and compared with those obtained in real time.

Station For	5	GRA&I	☐
	2	TAB	☐
Distribution/ Availability Codes Avail and/or Special Dist			

Handwritten notes:
 abundant
 Vinciguerria attenuata
 5.11 per 1000m³
 0.499 per 1000m³
 2.7 per 1000m³
 15.48 per 1000m³
 -50db at 13.5 kHz
 -80db-70db at 13.5 and 15.5 kHz

David F. Giuliano
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 Biological Oceanographer

BIBLIOGRAPHY

Backus, R. H. and J. B. Hersey, The Geographic Variation of Midwater Scattering (U), Woods Hole Oceanographic Institute Reference No. 66-14, March 1966 (C)

Dulles, R. K. and B. F. Cron (1969) Acoustical Investigation of the Deep Scattering Layer for Specific Locations in the Atlantic and Pacific Ocean NUSL Report No. 960.

**CRUISE TRACK
(1 JULY - 2 AUGUST 1968)**

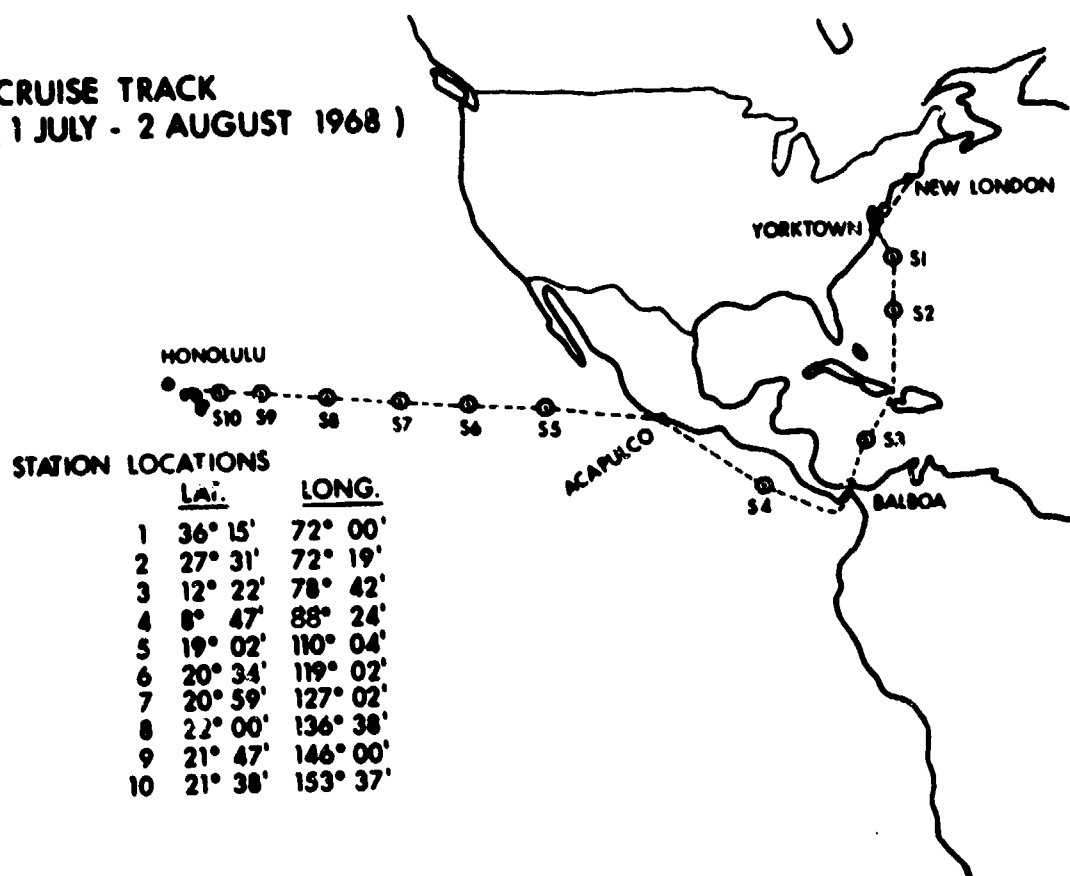


Fig. 1 - Geographical Location of the Test Stations

Station No.	Tow Depth Range (m)	No. m ³ H ₂ O Filtered	Species	No. Caught	No. per 1000m ³ H ₂ O Filtered	Size Range and Mean Size	Bladder Mean Size	Remarks
1	0-850	194,250	<i>Chauliodus sloani</i>	3	.015	80 mm, 95mm, 29 cm.		Daytime Tow
			Malacosteidae	1	.005	10 cm.		
			<i>Gonostoma elongatum</i>	2	.010	20, 16.5 cm.		Flat filled swim bladder
			Cyclothone spp.			1.4 - 2.5 cm $\bar{x} = 1.6$		
			Myctophidae	16	.08	18-65 mm $\bar{x} = 35$ mm		
			<i>Argyropelicus</i> sp.	2	.010	10.58 mm		Hatchetfish
			<i>Sternoptyx</i> sp.	3	.015	32-36 mm $\bar{x} = 35$ mm		Hatchetfish
			Sergestidae	7	.036	$\bar{x} = 5.1$ cm		Prawn
			Peneidae	8	.041	$\bar{x} = 1.5$ cm		Prawn
			Decapoda	4	.021	$\bar{x} = 4.5$ cm		Scarlet prawns
			Euphausiidae	6	.031	$\bar{x} = 1.5$ cm		
			amphipoda	10	.051	$\bar{x} = 2.6$ cm		

TABLE 1

Animal Abundance at Station 1

Station No.	Tow Depth Range (m)	No. m ³ H ₂ O Filtered	Species	No. Caught	No. per 1000m ³ H ₂ O Filtered	Size Range and Mean Size	Bladder Mean Size	Remarks
2	0-200	170,940	Myctophidae	27	.158	10-55mm $\bar{x}$ = 28 mm	$\bar{x}$ = 3mm x 1mm	
			Unknown fish	8	.647	6-135mm		
			Leptocephalus	2	.012			Eel larvae
			Cephalopoda	3	.018	60 mm, 19 mm 25 cm		Squid
			Decapoda	11	.064	$\bar{x}$ = 34 mm		Caridean Prawns
			Euphausiidae	8	.047	$\bar{x}$ = 12 mm		

TABLE 2

Animal Abundance at Station 2

 MUS. Tech. Rep.
 No. 2213-242-69

Station No.	Tow Depth Range (m)	No. m ³ H ₂ O Filtered	Species	No. Caught	No. per 1000m ³ H ₂ O Filtered	Size Range and Mean Size	Bladder Mean Size	Remarks
4	0-150	186,480	Argyropelecis sp.	211	1.13	26-65 mm $\bar{x} = 43$ mm	$\bar{x} = 3.5 \times 4.5$ mm	
			Myetophidae	31	.166	35-85 mm $\bar{x} = 47$ mm	$\bar{x} = 2.5 \times 1.0$ mm	
			Vinciguerria spp.	15	.080	15-40 mm $\bar{x} = 27$ mm	$\bar{x} = 3 \times 1.5$ mm	
			Chauliodus sloani	2	.010	85, 105 mm		
			Unknown Stomatoid	9	.048	$\bar{x} = 50$ mm		
			Unknown fish	52	.279	$\bar{x} = 14$ mm		Squid
			Cephalopoda	11	.051	$\bar{x} = 60$ mm		
			Squilla sp.	10	.053	$\bar{x} = 25$ mm		
			Decapoda			$\bar{x} = 22$ mm		Red Prawn
			Euphausiidae			$\bar{x} = 12$ mm		
			Pleuronectes planipes	3	.016	$\bar{x} = 12$ mm		Galatheid Crab

TABLE 3

Animal Abundance at Station 4

 USL Tech Memo
 No. 2213-28-69

Station No.	Tow Depth Range (m)	No. m ³ H ₂ O Filtered	Species	No. Caught	No. per 1000m ³ H ₂ O Filtered	Size Range and Mean Size	Bladder Mean Size	Remarks
5	0-110	186,480	Vinciguerria attenuata	953	5.11	22-45mm $\bar{x} = 33\text{mm}$	3x2mm	
			Myctophidae	93	.499	25-72 $\bar{x} = 55$	$\bar{x} = 1.25 \times 2.6\text{mm}$	
			Chauliodus sloani	3	.016			
			Unknown fish	8	.043			
			Pleurencoides planipes	2,887	15.48			Calatheid Crab
			Euphausiidae	504	2.70			

TABLE 4

Animal Abundance at Station 5

MUSL Tech Memo
No. 2213-262-69

Station No.	Tow Depth Range (m)	No. m ³ H ₂ O Filtered	Species	No. Caught	No. per 1000m ³ H ₂ O Filtered	Size Range and Mean Size	Bladder Mean Size	Remarks
6	0-120	233,100	Vinciguerrria attenuata	73	.313	12-59mm $\bar{x}=15mm$	$\bar{x}=1 \times 5mm$	
			Myctophidae	22	.094	22-65 $\bar{x}=35mm$	$\bar{x}=2 \times 9mm$	
			Argyropellicus	3	.013	40, 21, 21mm	4x3mm 2x1.7mm	
			Unknown bladdered fish	7	.030	$\bar{x}=35mm$	$\bar{x}=1.6 \times 7mm$	
			Unknown fish	9	.039	50-125mm $\bar{x}=70mm$		
			Pleurencotes planipes	93	.399	$\bar{x}=25mm$		
			Eucopia sp.	5	.021	$\bar{x}=35mm$		
			Euphausiidae	42	.180	$\bar{x}=15mm$		
			Deep-sea Cephalopods	3	.013	50-80mm		
			Cephalopods	2	.009	30mm		
TABLE 5								
Animal Abundance at Station 6								
MUSL Tech Memo No. 2213-262-69								

MUSL Tech Memo
No. 2213-262-69

Station No.	Tow Depth Range (m)	No. m ³ H ₂ O Filtered	Species	No. Caught	No. per 1000m ³ H ₂ O Filtered	Size Range and Mean Size	Bladder Mean Size	Remarks
7	0-100	217,560	Myctophidae	72	.331	18-60mm $\bar{x}$ =40mm	2x7mm	
			Melanostomatoid	3	.014	80-140mm		
			Unknown fish	3	.041	12-30mm		
			Cephalopods	5	.023	1-3.25cm		
			Euphausiidae	26	.120	1-4cm $\bar{x}$ =1.5cm		
			Peneidae	54	.248	1-3.8cm $\bar{x}$ =2cm		

TABLE 6

Animal Abundance at Station 7

MSL Tech Memo
No. 2213-262-69

Station No.	Tow Depth Range (m)	No. m ³ H ₂ O Filtered	Species	No. Caught	No. per 1000m ³ H ₂ O Filtered	Size Range and Mean Size	Bladder Mean Size	Remarks
8	0-100	186,480	Myetophidae	43	.23	$\bar{x}=50$	1 x 5mm	
			Unknown fish	5	.027	35-130mm		
			Cephalopoda	12	.064	20-50mm		
			Euphausiidae	36	.193	$\bar{x}=20$		

TABLE 7

Animal Abundance at Station 8

MUSL Tech Memo
No. 2213-242-69

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MUSL. Tech Memo
No. 2213-263-64



DEPARTMENT OF THE NAVY
OFFICE OF NAVAL RESEARCH
800 NORTH QUINCY STREET
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Ser 93/160
10 Mar 99

From: Chief of Naval Research
To: Commander, Naval Meteorology and Oceanography Command
1020 Balch Boulevard
Stennis Space Center MS 39529-5005

Subj: DECLASSIFICATION OF PARKA I AND PARKA II REPORTS

Ref: (a) CNMOC ltr 3140 Ser 5/110 of 12 Aug 97

Encl: (1) Listing of Known Classified PARKA Reports

1. In response to reference (a), the Chief of Naval Operations (N874) has reviewed a number of Pacific Acoustic Research Kaneohe-Alaska (PARKA) Experiment documents and has determined that all PARKA I and PARKA II reports may be declassified and marked as follows:

Classification changed to UNCLASSIFIED by authority of Chief of Naval Research letter Ser 93/160, 10 Mar 99.

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2. Enclosure (1) is a listing of known classified PARKA reports. The marking on those documents should be changed as noted in paragraph 1 above. When other PARKA I and PARKA II reports are identified, their markings should be changed and a copy of the title page and a notation of how many pages the document contained should be provided to Chief of Naval Research (ONR 93), 800 N. Quincy Street, Arlington, VA 22217-5660. This will enable me to maintain a master list of downgraded PARKA reports.
3. Questions may be directed to the undersigned on (703) 696-4619, DSN 426-4619.

PEGGY LAMBERT
By direction

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LISTING OF KNOWN CLASSIFIED PARKA REPORTS

Operation Plan, Pacific Acoustic Research Kaneohe-Alaska PARKA Experiment, Undated, ONR, 48 pages
(NUSC NL Accession # 49531)

Fleet Research Project 109 PARKA II, Undated, COMASWFORPAC-OPORD-303-69, Antisubmarine Warfare Force, Pacific Fleet, Unknown # of pages
(NUSC NL Accession # 093561)

Preliminary Operation Plan Pacific Acoustic Research Kaneohe-Alaska PARKA Experiment, June 1968, ONR, Unknown # of pages
(NUSC NL Accession # 023063)

LRAPP Briefing Report on the PARKA Series, May 1969, MC Report 001, Maury Center for Ocean Science (ONR), 20 pages
(NUSC NL Accession # 023375)

Bathymograph Traces from PARKA, 20 May 1969, NUSL-TM-2213-118-69, 7 pages
(DTIC # B952 259)

Bathymetric Strip Charts in the North Pacific Ocean for Project PARKA II, 20 June 1969, Naval Oceanographic Office, Unknown # of pages
(NUSC NL Accession # 051659)

PARKA II Experiment Utilizing Sea Spider ONR Scientific Plan 2-69, 26 June 1969, MC-PLAN-01, 172 pages
(DTIC # B020 846)

PARKA I - Acoustic Processing and Results, 28 July 1969, USL Technical Memorandum No. 2210-015-69, NUSC New London, 115 pages
(NUSC NL Accession # 202993-001) (NRL SSC Accession # 85009134)

A Scheduled At-Sea Simulation of Adaptive Beamforming, 19 September 1969, NUSL-TM-2211-162-69, 23 pages
(DTIC # B026 991)

Biological Data Collected on the PARKA I Transit, 23 October 1969, NUSL-TM-2213-262-69, 15 pages
(DTIC # B952 263)

PARKA I Experiment, November 1969, MC Report 003, Volume 1, Maury Center for Ocean Science (ONR), 84 pages
(NRL Accession # 466930) (NRL SSC Accession # 85004881) (DTIC # 506 209)