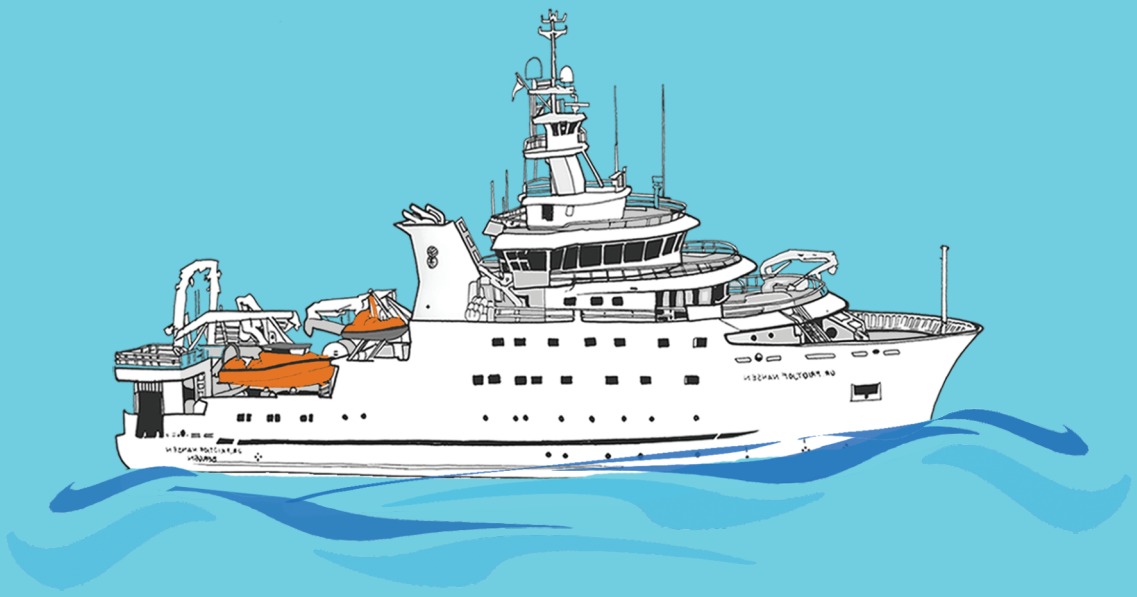
NORAD-FAO PROGRAMME
GCP/GLO/690/NOR

CRUISE REPORTS *DR FRIDTJOF NANSEN*
EAF-Nansen/CR/2017/5



SURVEY OF THE PELAGIC FISH RESOURCES AND ECOSYSTEM OFF WEST AFRICA

Guinea-Bissau, Guinea, Sierra Leone and Liberia

21 July – 20 August 2017

CIPA, Guinea-Bissau
CNSHB, Guinea
MFMR, Sierra Leone
BNF, Liberia

Institute of Marine Research
Bergen, Norway

The EAF-Nansen Programme

The EAF-Nansen Programme "Supporting the application of the Ecosystem Approach to Fisheries Management considering climate and pollution impacts" (GCP/GLO/690/NOR) aims to further strengthen the knowledge base and the overall institutional capacity for the implementation of the Ecosystem Approach to Fisheries (EAF) in developing countries, with additional attention to the impact of climate variability and change, pollution and other anthropogenic stressors.

The programme, that started implementation in May 2017, builds on earlier phases, and is governed by an agreement between the Food and Agriculture Organization of the United Nations (FAO), the Institute of Marine Research (IMR), Norway and the Norwegian Agency for Development Cooperation (Norad). The three pillars of the new programme are: Science, Fisheries management, and Capacity development. A new state of the art research vessel, *Dr Fridtjof Nansen* is an integral part of the programme. A science plan, covering 11 research themes, guides the programme scientific work.

The programme works in partnership with countries, regional organizations, other UN agencies as well as other partner projects and institutions.

Le Programme EAF-Nansen

Le Programme EAF-Nansen "Appuyer la mise en œuvre de l'approche écosystémique de la gestion des pêches en tenant compte des impacts du climat et de la pollution" (GCP/GLO/690/NOR), vise à renforcer la base de connaissances et les capacités institutionnelles pour la mise en œuvre de l'approche écosystémique des pêches (AEP) dans les pays en développement, en accordant une attention particulière aux effets de la variabilité et du changement climatique, de la pollution et d'autres facteurs de stress anthropiques.

Le programme, qui a débuté en mai 2017, s'appuie sur les phases précédentes et est régi par un protocole d'accord entre l'Organisation des Nations Unies pour l'alimentation et l'agriculture (FAO), l'Institut de recherche marine (IMR) de Norvège et l'Agence norvégienne de Coopération au développement (Norad). Les trois piliers du nouveau programme sont : la science, l'aménagement des pêches et le développement des capacités. Un navire de recherche à la pointe de la technologie, le nouveau *Dr Fridtjof Nansen*, fait partie intégrante du programme. Un plan scientifique, couvrant 11 thèmes de recherche, guide les travaux scientifiques du programme.

Le programme travaille en partenariat avec les pays, les organisations régionales, d'autres agences des Nations Unies ainsi que d'autres projets et institutions partenaires.

Boyer, D., Zaera, D., Børsheim, Y., Sanden, J., Paulsen, T., Weldegebriel, T.H., Bucal, D., Joaquim Gomes, M., Menda, A., Mendes de Almeida, A., Camara, O.T., Koivogui, R., Camara, H., Sane, A., Koulibaly, T., Coker, I.C.R., Kargbo, M., Kay, D.W., Wehye, A.S., Djiba, A. 2017. Survey of the Pelagic Fish Resources and Ecosystem Off West Africa. Guinea Bissau, Guinea Conakry, Sierra Leone and Liberia, 21 July - 20 August 2017. NORAD-FAO PROGRAMME GCP/GLO/690/NOR, CRUISE REPORTS DR FRIDTJOF NANSEN, EAF-Nansen/CR/2017/5

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SURVEY OF THE PELAGIC FISH RESOURCES AND ECOSYSTEM OFF WEST AFRICA

Guinea-Bissau, Guinea, Sierra Leone and Liberia

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by

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Institute of Marine Research
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CONTENTS

LIST OF ABBREVIATIONS

AGC	Automatic gain control
BT	Bottom trawl
CTD	Conductivity, temperature and depth
FAO	Food and Agriculture Organization of the United Nations
IMR	Institure of Marine Research (Havforskningsinstituttet), Norway
IWC	International Whaling Commission
LSSS	Large Scale Survey System
L.pel	Large pelagic trawl
MLD	Mixed layer depth
NIFES	Nasjonalt institutt for ernærings- og sjømatforskning (now part of IMR)
NORAD	Nowegian Agency for Development Cooperation
RCG	Reverberation controlled gain
s_A	Acoustic backscattering area
SD	Standard deviation
S.pel	Small pelagic trawl
sV	Acoustic backscattering volume
TS	Target strength
VMADCP	Vertical mounted acoustic Doppler current profiler

EXECUTIVE SUMMARY

This survey is part of a synoptic coverage of the pelagic resources and ecosystem off West Africa, from Morocco to South Africa, undertaken by R/V *Dr Fridtjof Nansen* in 2017. These surveys, covering the continental shelf and upper slope from approximatively 20 to 500 m depth, had multiple objectives and were hence multidisciplinary. The physical and chemical oceanography was intensively sampled both underway and with a series of fixed stations along transects perpendicular to the coast. Plankton and chemical samples were taken along a series of transects perpendicular to the coast, along with samples of microplastics. Simultaneously, the pelagic stocks were assessed using acoustics complimented by trawling. All surveys used standardised methods to ensure comparability.

This report presents the results from Leg 2.1, i.e. from Guinea Bissau to Liberia from 21 July to 20 August 2017.

The continental shelf of this part of West Africa forms a wide and shallow plateau from Dakar in Senegal to Sherbro Island in Sierra Leone, with most water depths less than 100 m. From Sherbro Island to Cape Palmas on the border of Liberia and Ivory Coast the continental shelf is much steeper and narrower.

An acoustic sampling grid with a transect spacing of 10 NM, approximately perpendicular to the coast, covered the shelf and slope to the 500 m bottom depth contour. Biological sampling of the fish was carried out using pelagic and bottom trawls. Standard hydrographic sections were sampled along the acoustic transects. Phytoplankton, zooplankton, ichthyoplankton and micro-plastics were also sampled. A single long transect from the coast to approximately 150 NM offshore collected hydrographic, plankton and micro-plastic data, as well as samples of the mesopelagic stocks.

With the expanding scope of the research to be carried out in the context of the EAF-Nansen Programme, the survey objectives and related sampling strategy have been expanded to support research on life cycles, stock identities, and trophic relationships of pelagic fish. For these facets, special effort was made to sample several biological parameters for post-survey age and growth, stock structure, population biology and trophic interaction studies.

Altogether 93 trawl hauls were carried out to identify acoustic targets during the survey. A total of 123 CTD casts were made to describe the hydrography of the survey area, 38 plankton stations were also sampled.

The information presented below is a brief summary of the results of the data analysed during the surveys. Some samples and data have been transported to research institutes in the region, and also farther afield (notably IMR in Bergen, Norway). Samples will be analysed in close cooperation with partner institutions and the resulting datasets will support research as part of the EAF-Nansen Science Plan.

Ecosystem

The hydrographic data suggested a well-stratified system with no signs of active upwelling; such stability is expected at this time of year. Dissolved oxygen levels were generally high,

with values in the range of 4.6 to 5.1 ml/l in the surface mixed layer. Temperatures in the surface mixed layer averaged 28.2ºC with little variability. Salinity in the surface mixed layer varied between 33.5 and 35‰, it was as low as 26‰ values found close to the coast of Sierra Leone, believed to be associated with runoff from land.

The highest densities of microplastics and marine debris were recorded around population centres and fishing grounds, strongly suggesting that these are a major source of microplastics in this region.

Large rafts of sargassum weed were found in Guinea Bissau, Guinea Conakry and Sierra Leone and is believed to have increased dramatically in recent years and warrants investigation. The impacts on beaches in Sierra Leone are well publicised, but the impact in the open ocean, if any, is apparently unknown.

Fish abundance and distribution

Pelagic fish were present over large parts of the region, but primarily in Guinea Conakry and the northern part of Sierra Leone where the shelf is wide and shallow. The main densities of pelagic fish were found inshore of 70 m bottom depth, sometimes extending inshore of the survey area.

The estimated biomasses of the main pelagic groups (in tonnes) are summarised in the following table.

	Sardinella & anchovy	**Other pelagic fish**
Guinea Bissau	32 401	33 116
Guinea Conakry	436 287	104 868
Sierra Leone	115 285	38 148
Liberia	16 434	12 873
Total	**600 407**	**189 005**

Two comparable surveys that have covered Guinea Bissau, Guinea Conakry, Sierra Leone and Liberia were conducted by the R/V *Dr Fridtjof Nansen*, in 2006 and 2007. Below is a brief comparison of these estimates to the current results. The overall biomass of sardinella in the four countries was almost identical to the 2007 value. Similarly, the total biomass of the other species of pelagic fish that were assessed, the carangids, scombrids, barracudas and hairtails, was virtually the same. The estimated biomass of both sardinellas and the other pelagic fish was much lower than those of 2006, indeed this survey yielded such different estimates that the data may be worth checking.

Sardinellas and anchovies (tonnes)

Survey Year	**Survey period**	**Guinea Bissau**	**Guinea**	**Sierra Leone**	**Liberia**	**Total**
2006	29.4 - 14.5	177 000	1 083 000	97 000	25 000	**1 382 000**
2007	5.5 - 29.5	197 000	192 000	139 000	48 000	**576 000**
2017	22.7 – 18.8	32 000	436 000	115 000	16 000	**600 000**

Carangids, scombrids, barracudas and hairtails (tonnes)

Survey Year	Survey period	Guinea Bissau	Guinea	Sierra Leone	Liberia	Total
2006	29.4 - 14.5	566 000	185 000	269 000	127 000	**1 147 000**
2007	5.5 - 29.5	45 000	63 000	100 000	16 000	**224 000**
2017	22.7 – 18.8	33 000	105 000	38 000	13 000	**189 000**

The amount of fish within each of the countries was rather different compared to 2007 and may reflect the different time of year that the survey was carried out.

RESUMO EM PORTUGUÊS

Este cruzeiro de investigação faz parte de uma cobertura sinótica dos recursos pelágicos e do ecossistema ao largo da África Ocidental desde Marrocos à África do Sul, realizados pelo N/I *Dr. Fridtjof Nansen* em 2017. Os objetivos destes cruzeiros foram multidisciplinares, e cobriram a plataforma continental e o declive entre os 20 e os 500 m de profundidade. A oceanografia física e a oceanografia química foram intensamente amostradas. O plano de amostragem tinha uma série de estações fixas ao longo de transectos perpendiculares à costa espaçados de 10 MN. Além das amostras recolhidas de plancton, também se recolheram amostras de ovos e larvas e de microplásticos ao longo de uma série de transectos perpendiculares à costa. Simultaneamente, os stocks dos recursos pelágicos foram avaliados por métodos acústicos normalmente seguidos por estações com redes de arrasto. A amostragem biológica dos peixes realizou-se utilizando redes de arrasto pelágico e de fundo. Três longo transectos mais ou menos a 150 MN da costa foram recolhidos dados hidrográficos, planktonicos, assim como amostras de stocks mesopelagicos. Todos os cruzeiros usaram os mesmos métodos de recolha de dados para se puderem comparar os resultados entre os cruzeiros de investigação.

Este relatório apresenta os resultados da etapa 2.1, ou seja, da Guiné-Bissau à Libéria, de 21 de julho a 20 de agosto de 2017.

A plataforma continental desta parte da África Ocidental forma um planalto amplo e raso de Dakar, no Senegal, à Ilha Sherbro, na Serra Leoa, com profundidades geralmente inferiores a 100 m. Da ilha de Sherbro a Cabo Palmas, na fronteira entre a Libéria e a Costa do Marfim, a plataforma continental é muito mais estreita.

Com a expansão da investigação no contexto do Programa EAF-Nansen, os objetivos dos cruzeiros e a estratégia da amostragem foram alargados para apoiar as investigações sobre ciclos de vida, identidades de stocks e relações tróficas dos peixes pelágicos. Com esta expansão teve que haver um esforço especial para amostrar vários parâmetros biológicos para estudos de idade e crescimento , estrutura populacional, biologia populacional e estudos de interação trófica. Todos estes novos estudos foram realizados após os cruzeiros de investigação.

No total, 93 arrastos foram realizados para identificação os sinais acústicos durante o cruzeiro. Foram realizadas 23 estações de CTD para descrever a hidrografia da área de investigação e 38 estações de plâncton foram também amostradas.

A informação apresentada à continuação é um resumo dos resultados dos dados analisados durante o cruzeiro. Algumas amostras e alguns dados foram enviados para os institutos de investigação na região, e também para outros (IMR em Bergen, Noruega). As amostras serão analisadas em estreita cooperação com instituições científica cooperantes e os conjuntos de dados resultantes apoiarão a investigação como parte do Plano Científico EAF-Nansen.

Ecossistema

Os dados hidrográficos sugeriram um sistema bem estratificado sem sinais de upwelling ativa; essa estabilidade é esperada nesta época do ano. Os níveis de oxigénio dissolvido eram geralmente elevados, com valores no intervalo entre 4,6 a 5,1 ml / l na camada mista da superfície. As temperaturas na camada mista de superfície apresentaram uma média de 28,2ºC com pouca variabilidade. A salinidade na camada mista de superfície variou entre 33,5 e 35 ‰. Os valores mais baixos encontrados de 26 ‰ foram perto da costa da Serra Leoa, acredita-se estarem associados com o escoamento dos rios.

O fitoplâncton concentrou-se na parte inferior da camada mista, formando densidades muito mais elevadas do que na camada superficial. Estas grandes camadas de fitoplâncton recebem nutrientes do fundo e as concentrações mais densas ocorrem onde há luz suficiente. A fluorescência mostrou alguma variabilidade na região, mas, em geral, os maiores valores superficiais foram próximos da costa. No entanto, na parte mais profunda da região, a fluorescência visível perto da superfície também estava presente.

As maiores densidades de microplásticos e detritos marinhos foram registadas em torno de centros populacionais e áreas de pesca, sugerindo fortemente que estas são uma importante fonte de microplásticos nesta região.

Grandes quantidades de sargaço e erva daninha foram encontradas na Guiné-Bissau, na Guiné Conacri e na Serra Leoa e acredita-se que aumentaram drasticamente nos últimos anos e justificam uma investigação. Os impactos nas praias de Serra Leoa são bem divulgados, mas o impacto no oceano, se houver, é aparentemente desconhecido.

Abundância e distribuição de peixe

Onde a plataforma é mais larga e de pouca profundidade é onde se encontram as maiores concentrações de peixes pelágicos , principalmente na Guiné Conacri e na parte norte da Serra Leoa,. As principais densidades de peixes pelágicos foram encontradas a 70 m de profundidade, e por vezes em áreas menos profundas junto à costa fora das áreas cobertas pelo cruzeiro.

As biomassas estimadas dos principais grupos pelágicos (em toneladas) estão resumidas na tabela a seguinte.

	Sardinha & anchova	**Outros peixes pelágicos**
Guiné Bissau	32 401	33 116
Guiné Conacri	436 287	104 868
Serra Leoa	115 285	38 148
Libéria	16 434	12 873
Total	**600 407**	**189 005**

Em 2006 e 2007 foram realizados dois cruzeiros de investigação pelo N/I *Dr Fridtjof Nansen* que cobriram a Guiné-Bissau, a Guiné Conacri, a Serra Leoa e a Libéria. Na Tabela a seguir

está uma breve comparação destas estimativas com os resultados atuais. A biomassa global de sardinela nos quatro países foi quase idêntica ao valor de 2007. A biomassa total das outras espécies de peixes pelágicos, tais como os carangídeos, os escombrídeos, as barracudas e peixe espada, era praticamente a mesma. A biomassa estimada de ambas as sardinelas e outros peixes pelágicos foi muito inferior à de 2006, de facto, as estimativas de biomassa deste cruzeiro são tão baixas que convém verificar os resultados estimados.

Sardinelas e anchovas (toneladas)

Ano do cruzeiro	**Período do cruzeiro**	**Guiné Bissau**	**Guiné**	**Serra Leoa**	**Libéria**	**Total**
2006	29.4 - 14.5	177 000	1 083 000	97 000	25 000	**1 382 000**
2007	5.5 - 29.5	197 000	192 000	139 000	48 000	**576 000**
2017	22.7 – 18.8	32 000	436 000	115 000	16 000	**600 000**

Carangídeos, escombrídeos, barracudas e peixe espada (toneladas)

Ano de pesquisa	**Período de pesquisa**	**Guiné Bissau**	**Guiné**	**Serra Leoa**	**Libéria**	**Total**
2006	29.4 - 14.5	566 000	185 000	269 000	127 000	**1 147 000**
2007	5.5 - 29.5	45 000	63 000	100 000	16 000	**224 000**
2017	22.7 – 18.8	33 000	105 000	38 000	13 000	**189 000**

As diferenças nos resultados dentro de cada pais em 2007 podem ser das diferentes estações do ano em que se realizaram os cruzeiros.

RÉSUMÉ EN FRANÇAIS

Cette campagne fait partie d'une couverture synoptique des ressources pélagiques et de l'écosystème au large de l'Afrique de l'Ouest, du Maroc à l'Afrique du Sud, réalisée par le N/O *Dr Fridtjof Nansen* en 2017.

Ces prospections, couvrant le plateau continental et le talu supérieure d'environ 20 à 500 m de profondeur, avaient des objectifs multiples et étaient donc multidisciplinaires. Les proprietées d' océanographie physique et chimique ont été intensivement échantillonnées en cours et avec une série de stations fixes le long des transects perpendiculaires à la côte espaces 10 MN. En plus, des échantillons de plancton, ouefs et larvae et microplastiques ont été prélevés le long d'une série de transects perpendiculaires à la côte. Simultanément, les stocks pélagiques ont été évalués en utilisant la méthode acoustique. Trois longs transects de la côte à environ 150 NM au large ont recueilli des données hydrographiques, planctoniques et microplastiques, ainsi que des échantillons de stocks mésopélagiques.

Ce rapport présente les résultats de la partie de la campagne entre la Guinée Bissau et le Liberia du 21 juillet au 20 août 2017.

Le plateau continental de cette partie de l'Afrique de l'Ouest forme un large plateau allant de Dakar au Sénégal à l'île de Sherbro en Sierra Leone, la plupart des profondeurs d'eau étant inférieures à 100 m. De l'île Sherbro au Cap Palmas à la frontière du Libéria et de la Côte d'Ivoire, le plateau continental est beaucoup plus étroit.

Avec l'élargissement de la portée de la recherche dans le cadre du programme EAF-Nansen, les objectifs de la campagne et la stratégie d'échantillonnage ont été élargis pour soutenir la recherche sur les cycles de vie, l'identité des stocks et les relations trophiques des poissons pélagiques. Un effort particulier a été fait pour échantillonner plusieurs paramètres biologiques par rapport à l'âge, la croissance, la structure du stock, la biologie des populations et les études d'interaction trophique.

Au total, 93 chalutages ont été effectués pour identifier les cibles acoustiques au cours de l'étude. Un total de 123 jets de CTD ont été réalisés pour décrire l'hydrographie de la zone d'étude, 38 stations de plancton ont également été échantillonnées.

Écosystème

Les données hydrographiques suggèrent un système bien stratifié sans signe d'upwelling actif; cette stabilité est attendue dans cette période de l'année. Les conditions d'oxygène étaient généralement élevées, avec des valeurs comprises entre 4,6 et 5,1 ml / l dans la couche de mélange de surface. Les températures dans cette couche ont été en moyenne de 28,2ºC avec peu de variabilité et la salinité variait entre 33,5 et 35 ‰, les valeurs les plus basses se trouvant près de la côte de la Sierra Leone, que l'on croit associées aux eaux provenants des riviéres.

Le phytoplancton était concentré au fond de la couche mélangée, formant des densités beaucoup plus élevées qu' au dessus. Ces grandes couches de phytoplancton reçoivent un apport de nutriments du fond et les concentrations les plus denses se produisent là où la

lumière est suffisante. La fluorescence a montré une certaine variabilité dans la region, mais en général, les valeurs de surface les plus élevées étaient proches de la côte. Cependant, dans la partie la plus profonde de la région, des maximums visibles de fluorescence pres de la surface étaient également présents.

Les densités les plus élevées de microplastiques et de débris marins ont été enregistrées autour des centres peuplés et des zones de pêche, ce qui suggère fortement qu'elles constituent une source majeure de microplastiques dans cette région.

De grands radeaux de sargasses ont été enregistrés en Guinée Bissau, en Guinée Conakry et en Sierra Leone et l'on estime qu'ils ont considérablement augmenté ces dernières années ce qui justifient une recherche plus approfondie. Les impacts sur les plages en Sierra Leone sont bien connus, mais l'impact en pleine mer, le cas échéant, est apparemment inconnu.

Abondance et distribution du poisson

Les poissons pélagiques étaient présents dans la grande partie de la région, mais principalement en Guinée Conakry et dans la partie nord de la Sierra Leone où le plateau est large et peu profond. Les principales densités de poissons pélagiques ont été trouvées près de la côte à 70 m de profondeur, s'étendant parfois dans les eaux côtières au dehors de la zone d'étude. Les biomasses estimées des principaux groupes pélagiques sont résumées dans le tableau suivant.

	Sardinelles & anchoi	**Autrès poisons pélagiques**
Guinée Bissau	32 401	33 116
Guinée Conakry	436 287	104 868
Sierra Leone	115 285	38 148
Liberia	16 434	12 873
Total	**600 407**	**189 005**

Deux études comparables couvrant la Guinée Bissau, la Guinée Conakry, la Sierra Leone et le Libéria ont été menées par le N/R *Dr Fridtjof Nansen*, en 2006 et 2007. On trouvera ci-dessous une brève comparaison de ces estimations avec les résultats actuels. La biomasse globale de la sardinelle dans les quatre pays était presque identique à la valeur de 2007. De même, la biomasse totale des autres espèces de poissons pélagiques évaluées, les carangidés, les scombridés, les barracudas et les haïtails, était pratiquement la même. La biomasse estimée des sardinelles et des autres poissons pélagiques était beaucoup plus faible que celle de 2006; en effet, cette étude a donné des estimations tellement différentes que les données peuvent valoir la peine d'être vérifiées.

Sardinellas and anchovies

Survey Year	**Survey period**	**Guinea Bissau**	**Guinea**	**Sierra Leone**	**Liberia**	**Total**
2006	29.4 - 14.5	177 000	1 083 000	97 000	25 000	**1 382 000**
2007	5.5 - 29.5	197 000	192 000	139 000	48 000	**576 000**
2017	22.7 – 18.8	32 000	436 000	115 000	16 000	**600 000**

Carangidés, scombridés, barracudas and sabre

Survey Year	Survey period	Guinea Bissau	Guinea	Sierra Leone	Liberia	Total
2006	29.4 - 14.5	566 000	185 000	269 000	127 000	**1 147 000**
2007	5.5 - 29.5	45 000	63 000	100 000	16 000	**224 000**
2017	22.7 – 18.8	33 000	105 000	38 000	13 000	**189 000**

La quantité de poisson dans chacun des pays était assez différente par rapport à 2007 et peut refléter la période différente de l'année où la campagne a été réalisée.

CHAPTER 1. INTRODUCTION

The research activities under the EAF-Nansen program are guided by the science plan. The science plan is intended to ensure good scientific use of the wealth of data generated by the R/V *Dr Fridtjof Nansen* and other related data, addressing key research questions in support of tactical and strategic fisheries management.

The science plan is a dynamic document that currently covers 11 themes, presented in the figure below:

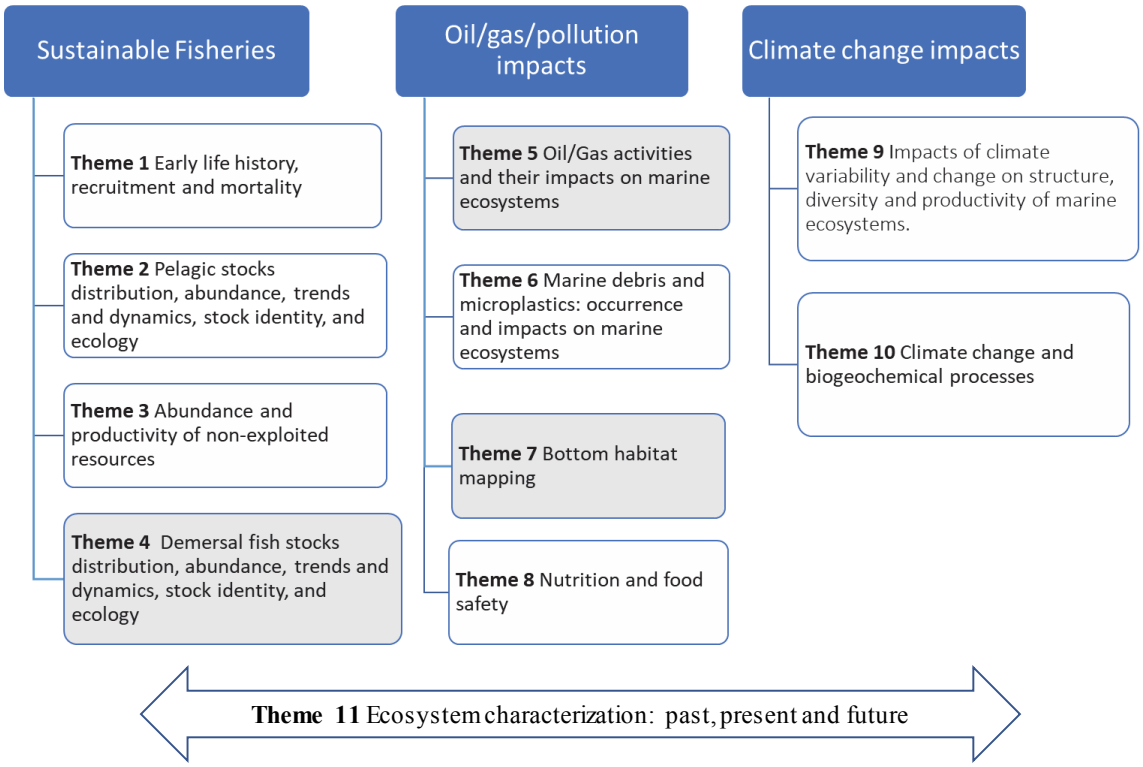

Figure 1. Themes of the Sciene Plan.

This survey has been designed to collect data towards addressing most of the research themes of the science plan (with white background in the figure above).

The specific objectives for this survey are formulated accordingly.

1.1 Survey objectives

Hydrography (Themes 9 and 11):

- To map the hydrographic/environmental conditions in the survey area (temperature, salinity, oxygen, chlorophyll, nutrients and pH values-acidity).

Phytoplankton, zooplankton and ichthyoplankton (Themes 1, 9 and 11):

- To establish as far as possible, the distribution, abundance and composition of phyto- and zooplankton, and species composition of fish eggs and larvae (data to be used, in

part, to understand acoustic backscatter from zooplankton that can be used to refine the target strength for fish and jellyfish targets).

Pelagic stocks (Themes 2, 9 and 11):

- To obtain information on abundance, distribution (also by size) of *Sardinella aurita, Sardinella maderensis, Engraulis encrasicolus, Trachurus trecae*, *Scomber colias, Ethmalosa fimbriata* and *Decapterus rhonchus* using acoustic methods and a systematic grid survey strategy;
- To collect samples for genetic analysis and for morphometric studies, both for stock identification of *S. aurita, S. maderensis, E. encrasicolus, T. trecae*, *S. colias* and *E. fimbriata;*
- To obtain information on maturity stages, and to collect stomach samples for analysis of contents and otoliths of *S. aurita, S. maderensis, E. encrasicolus, T. trecae*, *S. colias* and *E. fimbriata.*

Mesopelagic fish and jellyfish (Themes 3 and 11):

- To identify the main species and collect samples for identification and isotope analysis.

Top predators (Themes 9 and 11):

- To record occurrence of top predators.

Marine debris and microplastics (Theme 6):

- To record occurrence of marine debris (surface);
- To map occurrence of microplastics and describe associated neuston communities.

Contaminants (Theme 8):

- To collect samples of fish species for analysis of contaminant levels and nutrient values.

1.2 Participation

Institute of Marine Research, Bergen, Norway:
David Boyer, Diana Zaera, Yngve Børsheim, Jorunn Sanden, Tommy Paulsen

National Institute of Nutrition and Seafood Research, Bergen, Norway:
Teclu Habtemariam Weldegebriel

Centro de Investigação Pesqueira Aplicada, Bissau, Guinea Bissau:
Duarte Bucal, Martinho Joaquim Gomes, Abrigo Menda, Amadeu Mendes De Almeida

Centre National Des Sciences Halieutiques De Boussoura, Conakry, Republic of Guinéa:
Raymond Koivogui, Ousmane Tagbé Camara, Harouna Camara, Aboubacar Sane, Toumany Koulibaly

Bureau of National Fisheries, Monrovia, Liberia:
D. Wisseh Kay, Austin Saye Wehye

Ministry of Fisheries & Marine Resources, Freetown, Sierra Leone:
Ivory-Mae Coker, Mariatu Kargbo

Conservation Research of West Africa Mammals, Dakar:
Abdoulaye Djiba

1.3 Narrative

The vessel departed from Dakar, Senegal at 19h00 on 21 July 2017 and started the sampling work at the border of Senegal and Guinea Bissau on 22 July at 16h00. The survey proceeded using an acoustic sampling grid with a transect spacing of approximately 10 NM, covering the shelf and slope out to the 500 m bottom depth contour, and even deeper during the latter part of the survey. The sampling continued southwards along parallel transects approximately perpendicular to the coast, which throughout most of Guinea Conakry[1], Sierra Leone and Liberia were at an angle of 50° / 230° (Figure 2). Figures 3 to 8 show the cruise track and the stations worked during the survey.

The border between Liberia and Cote d'Ivoire was reached on 17 August at 03h30. A long environmental transect extending 125 NM offshore was then conducted, thereafter the vessel returned to Monrovia, Liberia for a change of staff, arriving at 06h00 on 20 August 2017.

The four countries were surveyed on the following dates.

Table 1: Survey dates.

	Total days in country	**Arrived**	**Departed**
Guinea Bissau	4.0	21 July	26 July
Guinea Conakry	10.0	26 July	5 August
Sierra Leone	5.3	5 August	10 August
Liberia	6.2	11 August	17 August

Standard hydrographic sections were sampled along acoustic transects every 30 NM from 500 m bottom depth, and deeper for some transects, to between 20 and 30 m bottom depth close to the coast. Along every second hydrographic, i.e. every 60 NM, section phytoplankton, zooplankton, ichthyoplankton and micro-plastics were also sampled. These stations were termed "super-stations". A single long transect from the coast to 125 NM offshore collected

[1] Guinea is sometimes referred to as Guinea Conakry, while Guinea Bissau is always known by its full name. In order to avoid any confusion, the full names of both countries are used throughout this report.

hydrographic, plankton and micro-plastic data, as well as samples of the mesopelagic fish encountered along this line.

The weather was generally favourable, but the survey was disrupted for about 24 hours on 2 August due to a malfunction of one of the main trawl winch motors. This could not be rectified on board and thereafter only the two small trawls (the small pelagic and bottom trawls) could be used for fish identification.

1.4 Survey effort

Altogether 93 trawl hauls were carried out to identify acoustic targets during the survey. 123 CTD casts were made to describe the water properties in the survey area. 38 plankton stations were also sampled. Tables 2 and 3 show the survey effort during the survey. Figure 2 shows the overall cruise track for the four countries, while Figures 3-10 show the specific course tracks, and sampling stations for hydrographic and plankton stations and fishing stations. Annex I gives the full details of the trawl stations.

Table 2. Survey sampling effort during the survey. Number of transects

	Acoustic	**Hydrographic**	**Plankton & hydrographic**
Guinea Bissau	12	2	2
Guinea Conakry	15	3	2
Sierra Leone	18	3	3
Liberia	27	4	4
Deep-water environmental transect			1
Total	72	12	12

Table 3. Survey sampling effort during the survey. Number of samples. Phyto for phytoplankton net, WP-2 – zooplankton net, Multinet for eggs and larvae, Manta trawl net for plastic particles in the surface, BT - bottom trawl, PT- Pelagic trawl.

Region	CTD	Phyto	WP-2	Multinet	Manta	BT	PT	Distance travelled (NM)
Transit from Dakar to Guinea Bissau border						1		1 650
Guinea Bissau	24	6	12	3	3	5	7	694
Guinea Conakry	35	6	9	5	6	14	29	1 690
Sierra Leone	27	9	18	9	9	7	7	848
Liberia	28	12	24	12	12	12	7	1 001
Deep water transect	9	4	4	4	4	-	4	160
Transit to Monrovia								310
Total	123	38	38	38	38	39	54	6 353

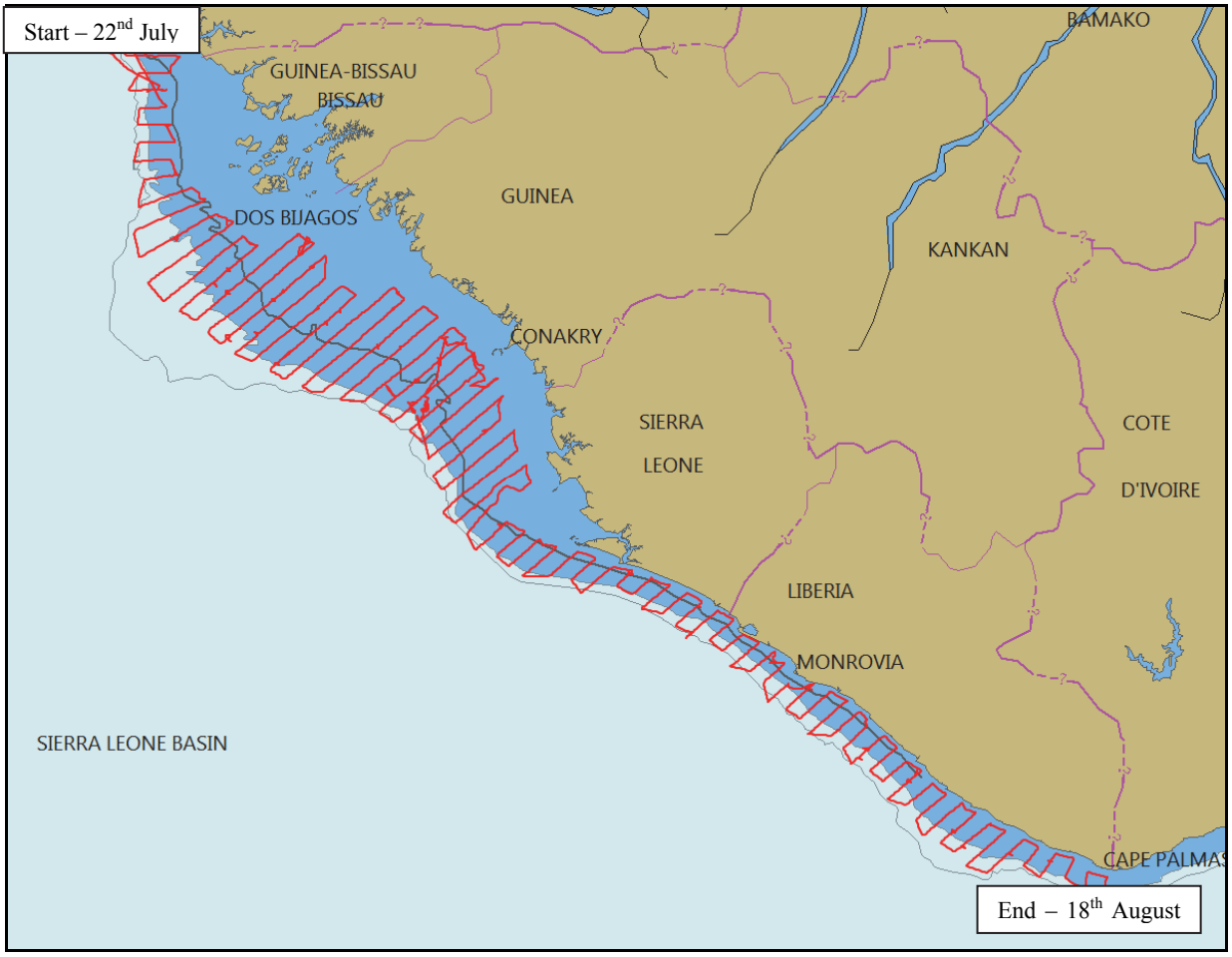

Figure 2. Map of the four countries surveyed showing the cruise track.

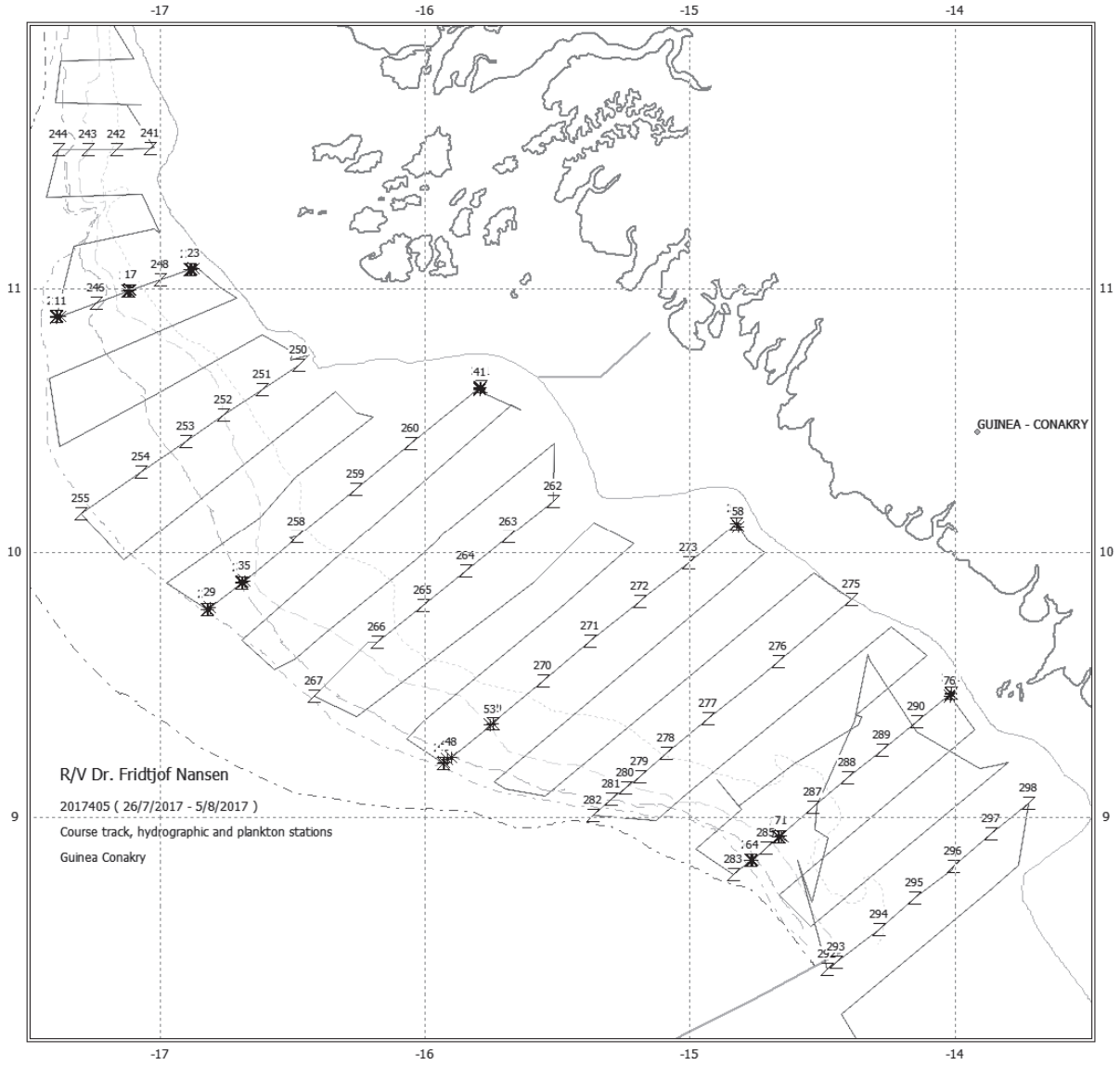

Figure 3. Course track with hydrographic and plankton (super-) stations, Guinea Bissau from Stn 241 to 261 and Guinea Conakry from Station 262 to 298. Depth contours at 20 m, 50 m, 100 m, 200 m and 500 m are indicated.

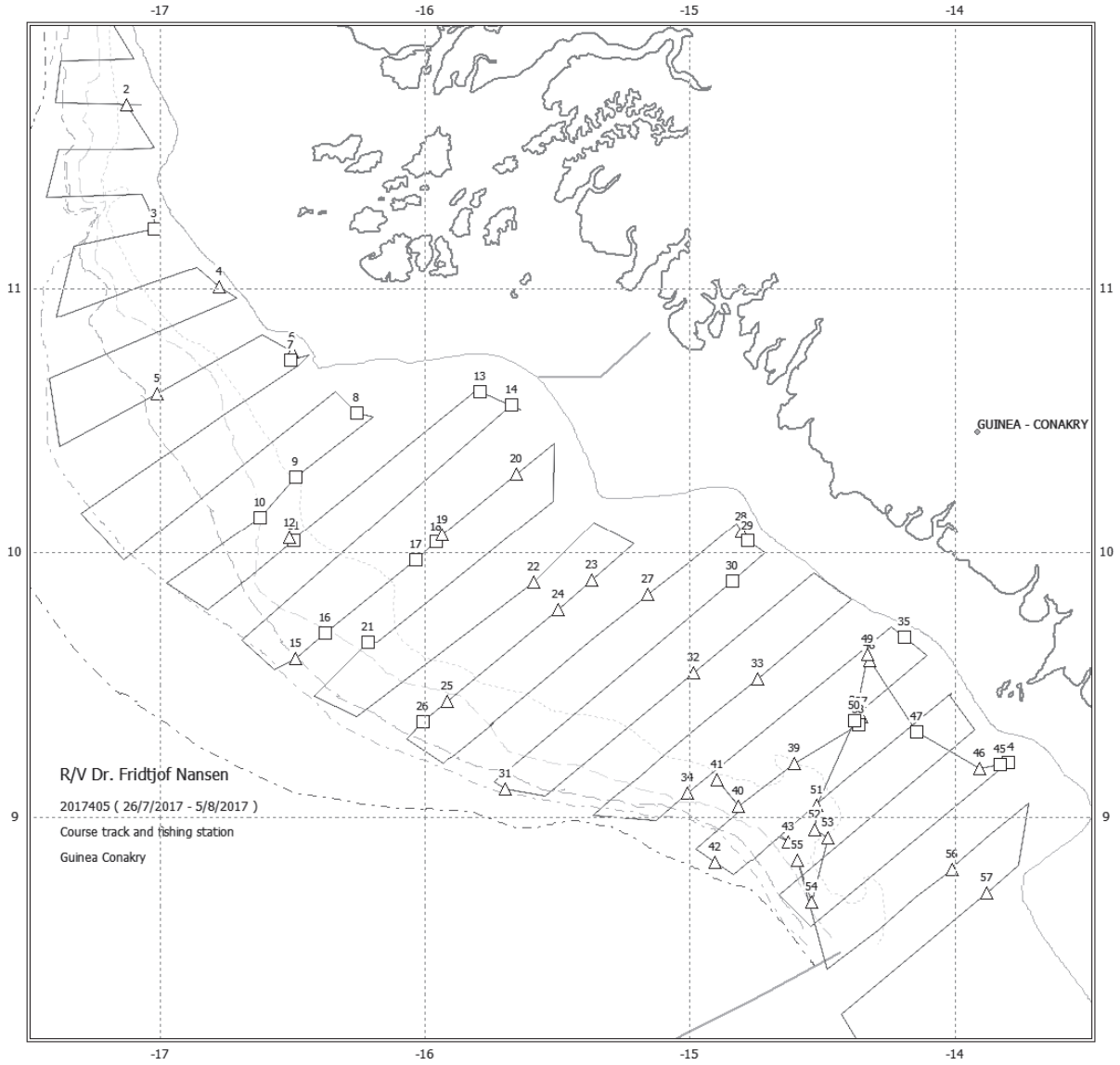

Figure 4. Course track with trawl stations, Guinea Bissau from Station 2 to 13 and Guinea Conakry from Station 14 to 56. Depth contours as in Figure 3.

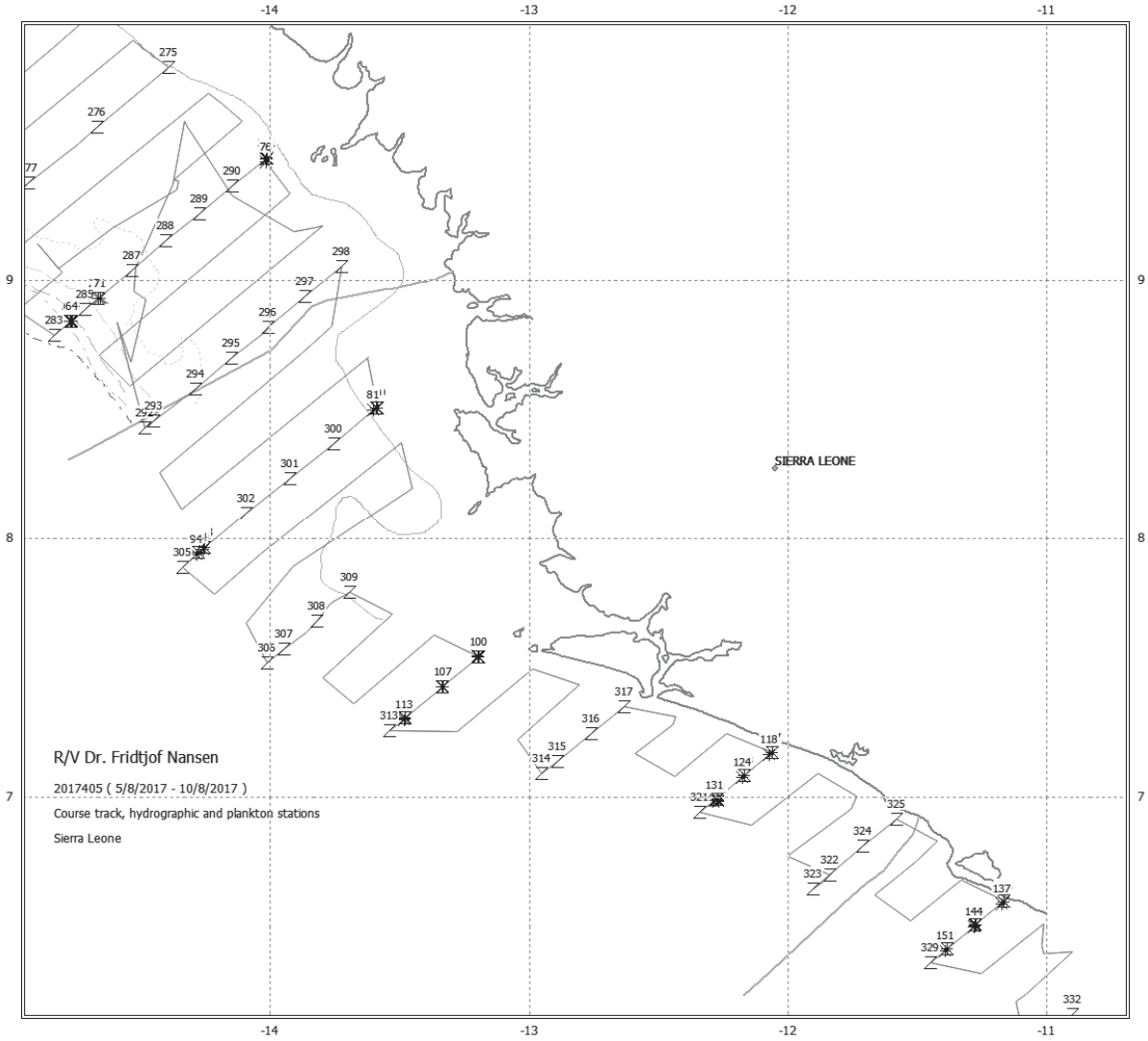

Figure 5. Course track with hydrographic and plankton stations, Sierra Leone (Stations 299 to 325). Depth contours as in Figure 3.

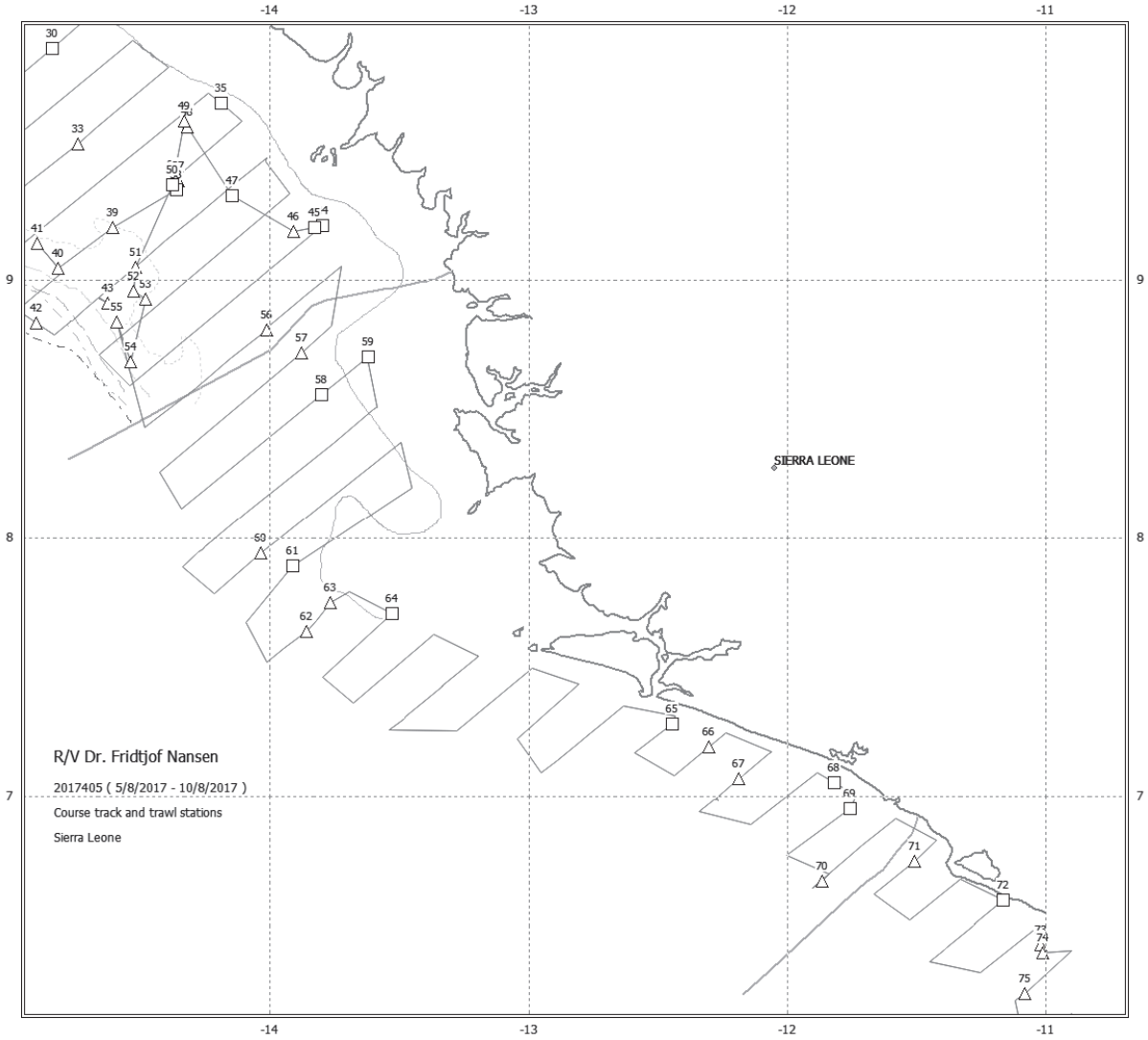

Figure 6. Course track with trawl stations, Sierra Leone (Stations 57 to 70). Depth contours as in Figure 3.

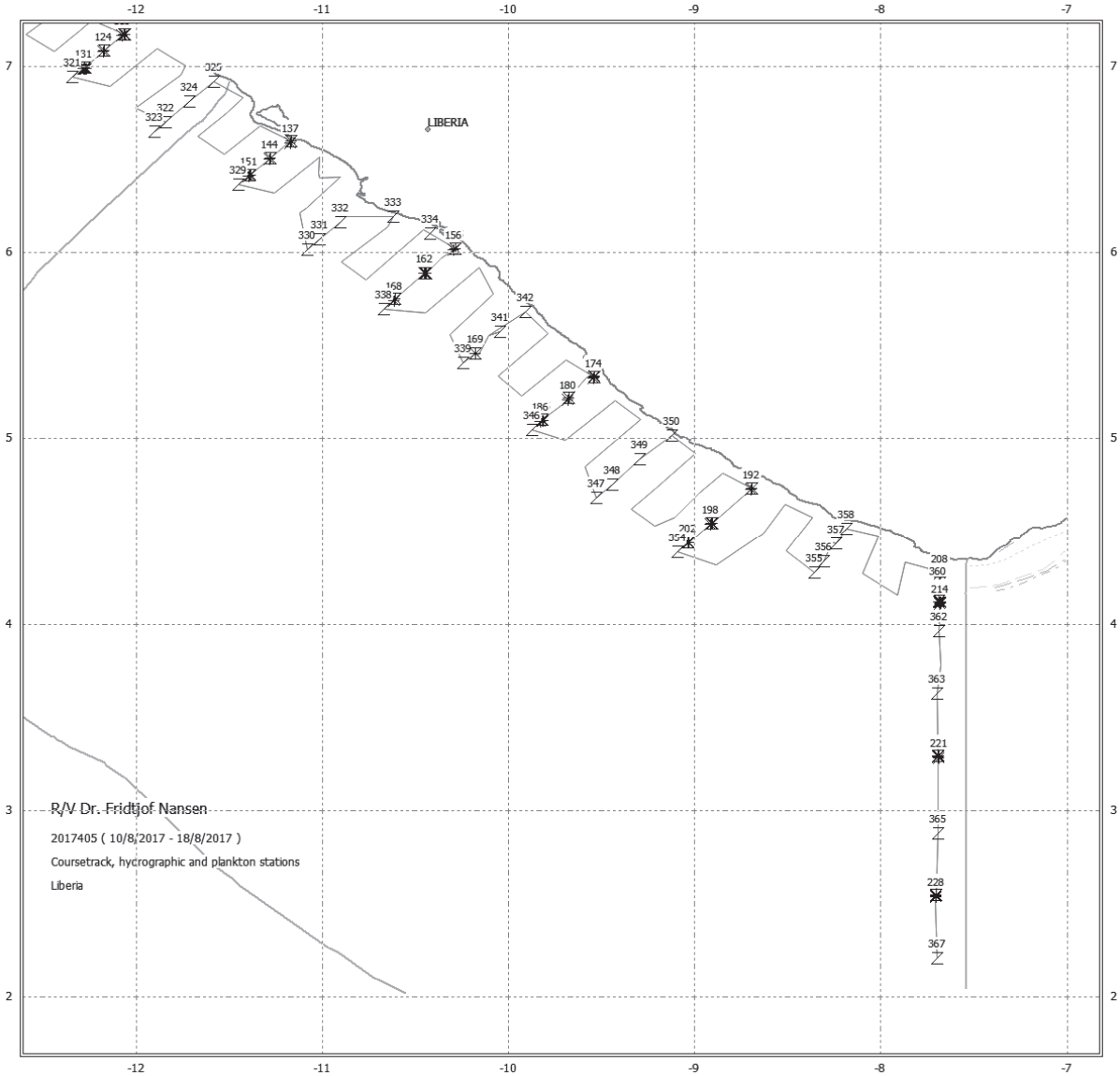

Figure 7. Course track with hydrographic and plankton stations, Liberia (Stations 326 onwards). Depth contours as in Figure 3.

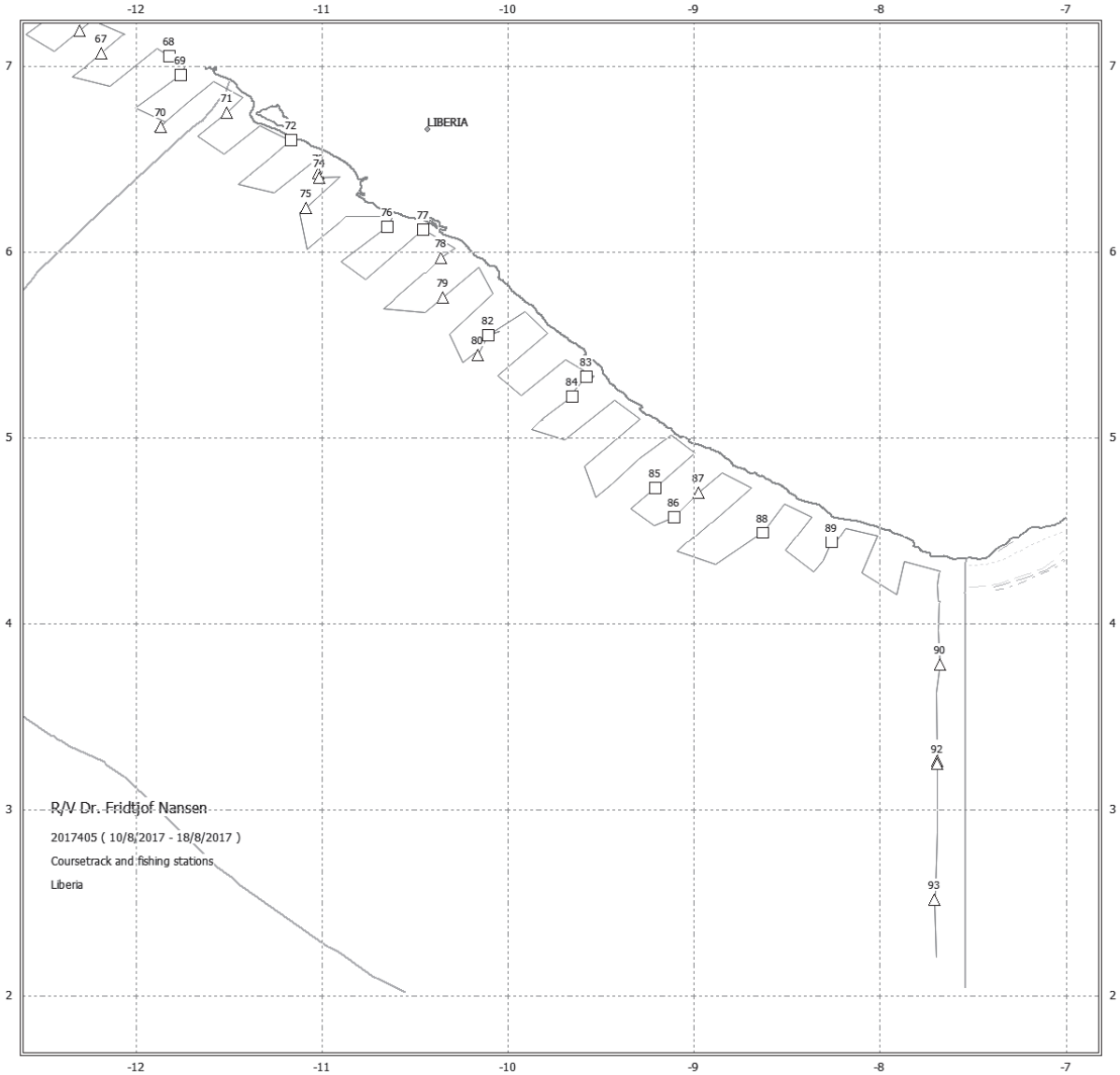

Figure 8. Course track with trawl stations, Liberia (Stations 71 onwards). Depth contours as in Figure 3.

CHAPTER 2. METHODS

The continental shelf of West Africa forms a wide plateau from Dakar in Senegal to Sherbro Island in Sierra Leone with most water depths less than 100 m deep (Figure 9), stretching from the coast up to 100 NM offshore at its widest part off Guinea Conakry. From Sherbro Island to the border of Liberia and Ivory Coast the continental shelf is much narrower, usually less than 40 NM miles across. The survey investigated the continental shelf and the waters over the upper slope. Hydrographic variables were measured along transects approximately perpendicular to the coastline.

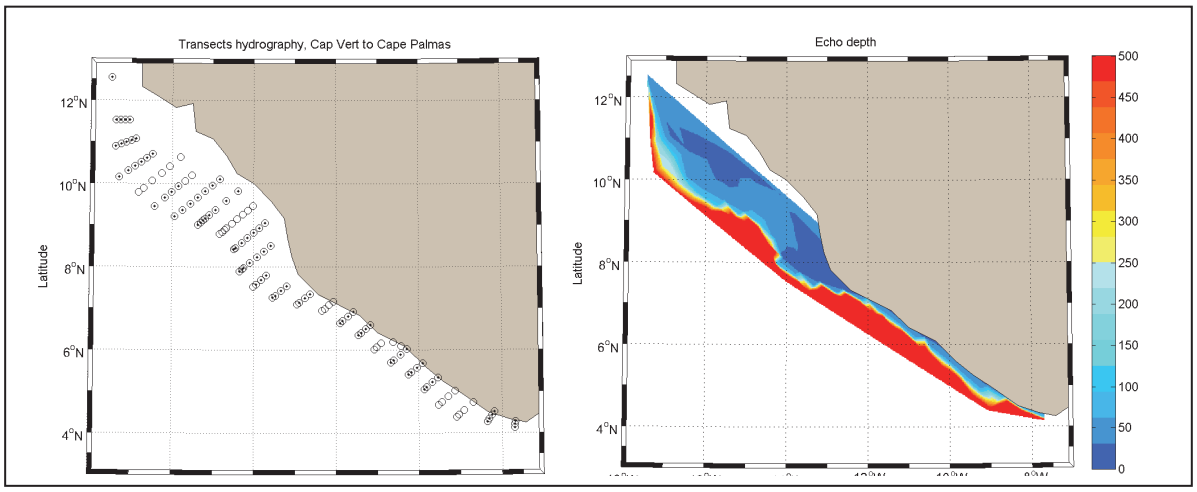

Figure 9. Positions of the CTD stations (left) for the entire survey. Circles mark stations sampled for hydrography, dotted circles mark stations also sampled for ocean acidification variables and chlorophyll. Right panel shows bottom depth (m) as registered by the ship's sounder.

2.1 Continuous underway meteorological and hydrographic sampling

2.1.1 Meteorological data

Meteorological data were logged continuously from the Aanderaa Smartguard meteorological station; data included wind direction and speed, air pressure, relative humidity, air temperature and solar radiation. All data were averaged every 60 sec and logged to the Nansis tracklog system.

2.1.2 Thermosalinograph

The SBE 21 Seacat thermosalinograph ran continuously during the survey, obtaining samples of sea surface (at 4 m depth) recording salinity and relative temperature every 10 seconds. An attached in-line C3 Turner Design Submersible Fluorometer measured turbidity and chlorophyll-*a* levels.

2.1.3 Current speed and direction measurements (ADCP)

Two hull-mounted Acoustic Doppler Current Profilers (VMADCP) from RD Instruments ran during the survey. The frequency of the VMADCPs are 75 and 150 kHz. The system was run in narrow band mode and data were averaged in 16 and 4 m vertical bins at 75 and 150 kHz

respectively and stored in files for post survey processing. The 150 kHz was run continuously while the 75 kHz was turned off during the last part of the survey due to interference with the ping rate of the EK80 echosounder.

2.1.4 Bottom mapping echo sounder

The EM710 multibeam echo sounder is a high to very high-resolution seabed mapping system. Data acquisition starts approximately 3 m below the transducers, while the maximum acquisition depth is limited in practice to 1 000 – 1 500 m on R/V *Dr Fridtjof Nansen*. Across track coverage (swathe width) is up to 5.5 times water depth and may be limited by the operator either in angle or in swathe width without reducing the number of beams. The operating frequencies are between 70 to 100 kHz. There are 128 beams with dynamic focusing employed in the near field. The transmitting fan is divided into three sectors to maximize range capability and to suppress interference from multiples of strong bottom echoes. The sectors are transmitted sequentially within each ping and use distinct frequencies or waveforms. The along-track beam width is 1 degree. Ping rate is set according to depth. The receiving beam width is 2 degrees. Sound profiles were set manually in the system according to the area of operation. The data were logged to the on-board Olex plotting system.

2.2 Fixed station sampling

A series of biological and oceanographic sampling stations were undertaken every 60 NM, i.e. along every sixth acoustic transect (Transects 6, 12, 18 and so on). Samples were collected at the inshore end of the acoustic transects, usually at a water depth of between 25 and 30 m, at the 100 m isobath and at the outer end of the transects, i.e. at 500 m bottom depth. These stations were referred to as “super-stations”. On many transects in the southern part of the region (part of Sierra Leone and Liberia) the shelf falls away steeply at around 100 m such that the 100 m and 500 m isobaths are often less than 5 NM apart. On these transects the 100 m station was moved to halfway between the inner and outer stations. The following types of samples/data were collected at these “super-stations”: phytoplankton, zooplankton, fish larvae and eggs, as well as microplastics.

CTD casts were deployed at all super-stations. If these stations were more than about 15 NM apart additional CTD stations were added such that stations were a maximum of 15 NM apart. The samples collected on these transects are shown below.

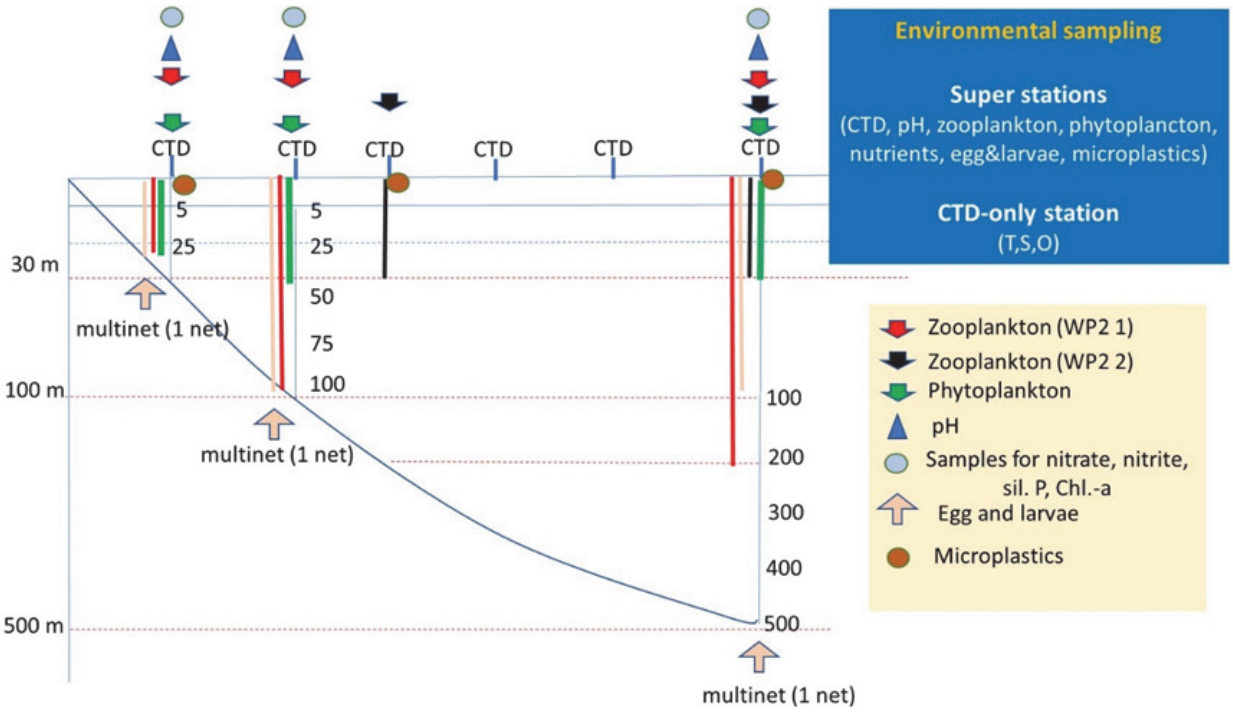

Figure 10. A diagrammatic scheme of the fixed-station sampling regime showing the three super-stations sampled along each transect (at the 25/30 m, 100 m and 500 m isobaths) and the extra CTD stations deployed when the distance between super-stations was greater than 15 NM (most extra stations were actually deployed between the inshore and 100 m super-stations)

Further lines of CTD stations were sampled along the intermediary transects between the "super-stations", that is 30 NM after a line of super-stations (i.e. Transects 3, 9, 15 and so on). As the survey progressed it became clear that there would be sufficient time for extra sampling. Hence, on all super-transects and CTD transects after central Guinea Conakry (Transect 36 onwards) an extra CTD cast was deployed 5 NM beyond the 500 m station, which was usually at a bottom depth of around 1 000 to 1 500 m.

Table 4. Sampling along the deep-water environmental transect.

Stn	Approx. bottom depth	Distance from previous station	Distance from 1st station	Sampling
a	30	/	/	Super-station, incl CTD water samples
b	80	5	5	CTD, no bottles
c	500	5	10	Super-station, incl CTD water samples
d	2 700	10	20	CTD, no bottles
e	3 800	20	40	CTD, no bottles
f	4 400	20	60	Super-station, incl CTD water samples
g	4 700	25	85	CTD, no bottles
h	5 000	20	105	Super-station, incl CTD water samples
i	4 800	20	125	CTD, no bottles
All CTD casts to bottom, if sufficient cable Water sample depths from deep stations: 5, 25, 50, 100, 250, 500, 750, 1 000, 2 000, 3 000, 4 000, 4 500 Nb. Water sample depths from Stn. (f): 5, 25, 50, 100, 250, 500, 750, 1 000, 1 500, 2 000, 3 000, 4 000				

At the end of the survey a deep-water transect from the coast to 125 NM offshore, sampling a range environmental parameters was performed. This transect was parallel to the Liberia / Ivory Coast border, 10 NM to the west of the border (i.e. in Liberian waters). It was approximately perpendicular to the coast at 180°. Details of the sampling regime is shown in Table 4.

2.2.1 CTD sensors – temperature, salinity, oxygen and fluorescence

Water samples for pH and total alkalinity, nutrients, dissolved oxygen and chlorophyll were collected from surface to bottom at stations at selected intervals along these transects. These data will be used to determine the state of ocean acidification and nutrients available for primary production, and combined with data from the CTD sensors. The sensors recorded temperature, salinity, oxygen and fluorescence at 1 meter intervals throughout the water column. Vertical temperature and salinity profiles were obtained by a Seabird 911 CTD, while *in situ* concentrations of dissolved oxygen were measured using a CTD-mounted SBE 43 oxygen sensor. Real time logging and plotting was performed using the Seabird Seasave software installed on a PC. Attached to the CTD was an uncalibrated Chelsea Mk III Aquatracka fluorimeter, which measures *in situ* fluorescence on relative scale.

The salinity sensor was validated during the R/V *Dr Fridtjof Nansen* survey of Morocco in April 2017[2] using a Portasal salinometer (mod. 8410A) on board the vessel (Figure 11, see cruise report of that survey for more details). The oxygen sensor was validated using the Winkler titration (Grasshoff *et al.* 1983) during the same survey (Figure 12).

The density of seawater is a function of salinity and temperature, and density gradients determine the stability of the water column. The upper part of the water column is usually well mixed, and at the bottom of the mixed layer is a density gradient denoting the pycnocline, which acts as a barrier to vertical mixing. The depth of the pycnocline was defined here as the maximum of $\delta\sigma t/\delta z$ where σt is density and z is depth, and was estimated from profiles of water density collected by the CTD. This procedure ensures a correct estimation of the depth of the pycnocline in waters with a large range of salinities, such as were present along parts of the coast investigated.

[2] See report *Survey of the pelagic fish resources and ecosystem off north west Africa. Part I Tangier - Cape Blanc. 7 May - 27 June 2017*

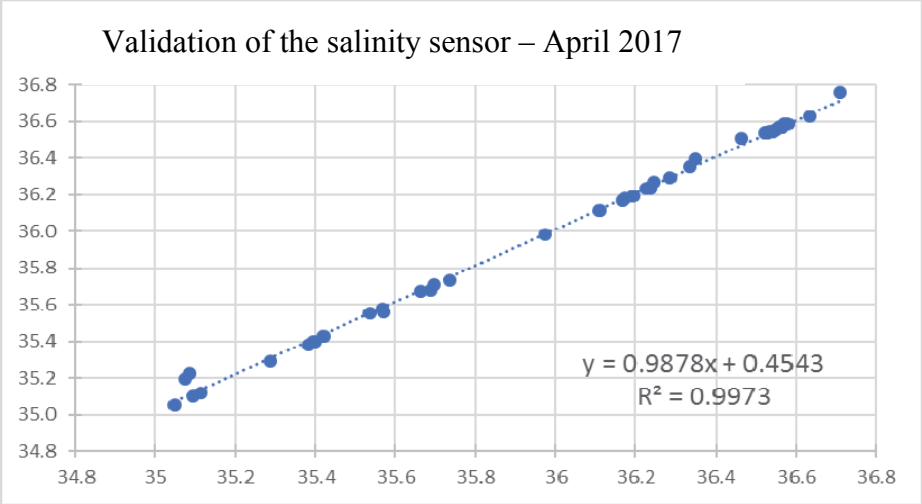

Figure 11. Salinity measured using a Portasal salinometer plotted against the result from the CTD sensor.

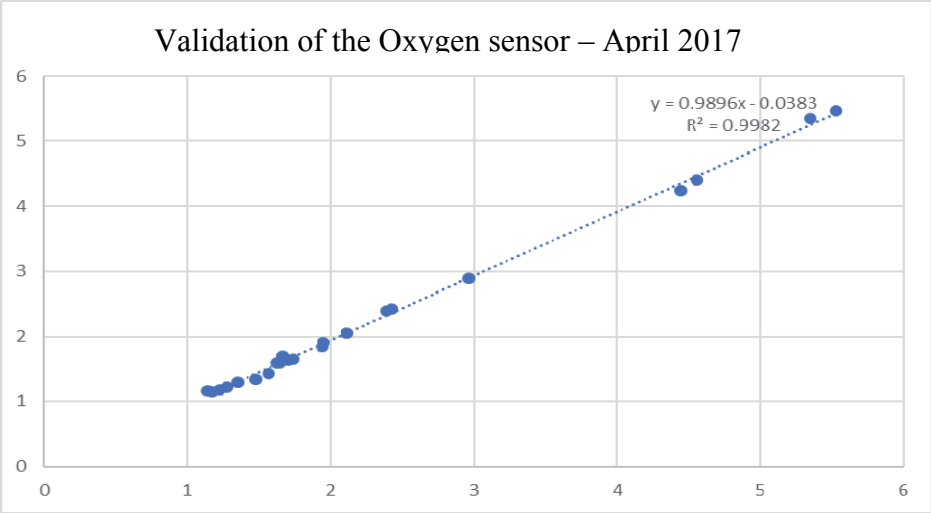

Figure 12. Measured oxygen concentrations (22 samples) plotted against oxygen sensor data.

2.2.2 Ocean acidification parameters - pH and alkalinity

At many of the CTD stations, but not all, 12 Niskin-bottles (10 litre) were attached to a CTD-mounted rosette and used to collect water at pre-defined depths. The standard sampling depths were 500, 400, 300, 250, 200, 150, 100, 75, 50, 25, and 5 m. These samples were used to determine pH, alkalinity and for nutrient analyses (nitrate, nitrite, silicate and phosphate) as described below.

Seawater samples (250 ml) from the CTD-mounted Niskin-bottles were collected in borosilicate glass bottles using silicone tubing to reduce air exchange. Both pH and alkalinity were analysed on board the vessel. pH was determined spectrophotometrically using a diode array spectrophotometer and a pH sensitive indicator, m-cresol purple in 2 mM solution, as

described by Clayton and Byrne, 1993; Chierici *et al*., 1999. Alkalinity was measured by titration with acid (0.05M HCl) and changes in pH were measured with an electrode (potential in mV) using Tiamo software.

Samples were analysed for pH and alkalinity on board and the preliminary results are shown in Annex VIII. The final analysis requires data on nutrient concentrations, which will be analysed later. The saturation state of calcium carbonates is an indicator used for monitoring development of ocean acidification in seawater, and the waters investigated with respect to aragonite saturation state. These results are also presented in Annex VIII. Further processing of the data will be done on land at IMR and will provide more information on the marine carbonate system and parameters for ocean acidification.

2.2.3 Nutrients

Seawater samples (20 ml) for nutrient analyses (nitrate, silicate and phosphate) were collected from the Niskin water bottles. The seawater samples were stored in 20 ml polyethylene vials, conserved with 0.2 ml chloroform, and kept cool and dark in a refrigerator (Hagebø and Rey, 1984). The analyses will be made on shore by IMR, using a modified Alpkem AutoAnalyzer C (O I Analytical, USA) and following standard procedures (Strickland and Parsons, 1972).

2.3 Plankton – phyto-, zoo- and ichthyoplankton

2.3.1 Phytoplankton biomass

Chlorophyll-*a* was sampled as an indicator of phytoplankton biomass. Seawater was collected from the CTD at the standard depths (not below 200 meters) for chlorophyll-*a* and phaeopigment measurements. The water was filtered using a 0.7µm filtration system (Munktell glass-fibre filters Grade: MGF, vacuum 200 mm Hg). In the southern part of the survey area (stations 105 to 163) three equal samples were filtered from each depth and stored at -20°C. After 3 weeks, all batches were transferred to -80□C. One of the batches was then freeze-dried and thereafter stored at -80°C. Two batches (one freeze-dried and one only frozen at -80°C) will be transported to IMR, which is an accredited laboratory, for subsequent analyses, the last batch will remain in the -80°C freezer on the ship for later analyses on board. The assay is performed by extraction with 90% acetone followed by centrifugation, and analysed with a fluorometer (model 10 AU, Turner Designs Inc., Sunnyvale, Ca., USA), according to Welshmeyer (1994) and Jeffrey and Humphrey (1975). The same assay (but not accredited) was planned to be implemented on board *Dr Fridtjof Nansen* later in 2017.

2.3.2 Phytoplankton identification

Phytoplankton was collected at all super-stations; qualitative phytoplankton samples were collected with a net (35 cm in diameter and mesh-size of 10 µm), hauled vertically at a speed of 0.1 ms^{-1} from a depth of 30 m to the surface (from ca. 5 m above bottom at the 30 m stations). The samples were preserved with 2 ml 20% formalin and stored in dark 100 ml glass bottles for subsequent taxonomic analyses on shore. These samples are not quantitative, but are used to establish the taxonomic composition of the phytoplankton community.

2.3.3 Zooplankton

Mesozooplankton was collected with a WP2-net. The WP2-net (56 cm diameter, mesh size 180 µm) (Fraser 1966, Anonymous 1968) was hauled vertically at a speed of ~0.5 ms^{-1} at each station. At the shallow and intermediate stations (bottom-depths of 30 m and 100 m, respectively) the sampling strata were from near-bottom to the surface (deepest sampling depths of ~25 and 90 m, respectively). At the stations with bottom-depth of 500 m, the sampling stratum was from the depth of 200 m to the surface.

Furthermore, a second sample was collected with the WP2 net from the upper 30 m at stations with bottom depths of 100 m and 500 m. The purpose of these additional samples was to enable a direct comparison of the zooplankton composition and concentrations in the upper 30 m layer of the water-column along the bottom-depth gradient. Each zooplankton sample was divided into two equal parts using a Motoda plankton splitter (Motoda 1959). The first part of the sample was size-fractioned by using a series of sieves of decreasing mesh-sizes (2 000 µm, 1 000 µm and 180 µm). The zooplankton retained on each sieve were dried on aluminium trays at ~60ºC for 24 h. These samples will be dried once more and weighed on shore after the cruise at IMR for estimation of zooplankton biomass of the different size-groups. The second part of the sample was preserved in seawater with a final solution of 4% formaldehyde buffered with borax for subsequent species identification and quantification, also at IMR.

2.3.4 Fish eggs and larvae

Sampling for fish eggs and larvae was done at the super-stations with a Hydro-Bios Multinet. The Multinet was supposed to be fitted with a 180-micron net, but part-way through the survey it was discovered that a 403-micron net was being used, and had been used for some weeks prior to this survey. The correct net was fitted on 9 August prior to Stn 310 at the start of Transect 42.

The net was towed obliquely from ~10 m above the bottom, or from a maximum depth of 100 m, to the surface with a speed of ~1.5 ms^{-1}.

Fish larvae visible with "the naked eye" were removed from the total sample, photographed and transferred to vials. The fish larvae were then preserved in 4% formaldehyde buffered with borax. When all visible fish larvae had been removed from the Multinet sample, the rest of the sample was preserved for reference purposes and to check for any overlooked larvae.

The fish eggs will be sorted, and the larvae identified, on shore after the cruise at IMR.

2.3.5 Microplastics

Microplastics are small pieces of plastic marine debris normally less than 5 mm long. Microplastics, and when present in the samples larger pieces of marine debris, were collected along the hydrographic transects at all super-stations. At each station, the surface layer was sampled with a Manta-trawl, with a rectangular opening of 19 cm × 61 cm (HxW), mesh-size 335 µm and two wings to keep it balanced and at the surface during the tow. Trawls were hauled horizontally at a speed of ~1.5 ms^{-1} for 15 minutes. The counts of a manual flowmeter

attached in the lower part of the trawl opening were recorded at the start and end of each trawl. Trawling was performed some meters away from the starboard side, about mid-ship, attempting to avoid the wake of the vessel.

The samples were washed in filtered seawater over a sieve with a mesh-size of 180 µm. Microplastic particles were sorted from the sample under a stereomicroscope, and the sorted sample was then checked once more to reduce the risk of overlooking the smallest plastic particles. All assumed plastic items were then placed on a gridded petri dish for examination under the stereomicroscope, photographed and, as far as possible, also measured and described (e.g. length, shape, type and colour). The sorted microplastics were washed with distilled water and dried in pre-weighed aluminium-trays in a drying cabinet at 30ºC. The trays were packed in aluminium foil and stored at room temperature until transport to IMR, where they will be studied in more detail. After removing the plastics, the remaining part of the samples - mainly biological material - was preserved in formalin for studies of neuston at IMR after the cruise.

2.4 Food safety

Whole fish, fillet and various organs from fish that are regularly consumed in the four countries were sampled during this survey and preserved. All the samples will be analysed for a wide variety of nutrients and contaminants in IMR, Bergen. Tissue samples from mackerel samples will also be analysed for the parasite *Kudoa*.

Some of the samples will also be analysed for correspondence between the microbiota and the metal content of the gut. One pelagic fish sample and two mesopelagic fish samples will be analysed for the content of microplastic particles.

2.5 Top predator observations

The R/V *Dr Fridtjof Nansen* was used as a platform of opportunity for marine mammal observations in 'passing mode', as the vessel's operation does not allow closing on marine mammal sightings, nor adapt the speed as a function of sightings. The cruise design, dedicated to fisheries and oceanographic research, required multiple daily stations for trawling, CTDs, plankton-net hauls and other experiments when the vessel's speed was greatly reduced, typically ranging from 0-5 km/h (3 knots or less). Full stops and back-tracking on a completed transect line also occur.

Such an operation mode does not allow a line transect sampling protocol for marine mammals as basic assumptions of the model are not fulfilled. Even between stations, cruise speed fluctuated around 10 knots, a borderline velocity, as many cetacean species can match this speed. Mean progress (velocity) along the major track lines was further reduced due to the sampling stations. Therefore, the probability of the same groups and individuals being re-sighted were high. An evaluation of likely re-sightings was made *in situ*.

Some measure of relative abundance between species, such as an encounter rate, may be considered in future data analysis, but comparability with other (non-fish survey) cruises will necessarily be limited.

During steaming, the two observers visually scanned from -90° (port) to 90° (starboard) both with 7x50 binoculars and by naked eye (to spot cetaceans close to the ship). This was occasionally from the monkey deck (Top-of-bridge deck, 16 m a.s.l.), but more usually from the 3rd deck (11 m a.s.l.), dependent largely on the weather and sea conditions. The purpose-built look-out observation platform was not used.

A maximum amount of effort was concentrated on and near the track-line so as not to miss any sightings there. During low-speed or stationary sampling activities the platform was treated as a quasi-fixed vantage point and 360° were scanned, considering that the probability that cetaceans may approach from behind the vessel was significantly increased.

The main parameters collected included: species, time, vessel GPS-position, relative position of animals to vessel (estimated angle and radial distance), group size estimates, group composition, diagnostic or unusual morphological features, any behavioural comments, basic air/sea conditions and some other information. A sketch of notable external features and of the sighting dynamics was added.

Species were identified in a strictly conservative way, i.e. only when diagnostic features were confirmed, or alternatively the sighting was assigned to the family or genus level. When identification was probable but not confirmed, it was classified as a "like-species" (cf. IWC usage).

As a high priority, but depending on distance, it was attempted to take photographs with a Canon reflex camera with a 70-300 mm zoom lens. A GPS waypoint was marked and a paper sighting data form was filled out.

A separate form was used for observer effort information, with indications of sea state, swell and ship's activity.

Seabirds were also recorded on a sporadic and opportunistic basis.

2.6 Biological sampling of fish

Biological sampling of the fish was carried out using pelagic and bottom trawls. A complete record of fishing stations and catches is shown in Annex II. In shallow water (<30 m) or at night when pelagic fish was close to the surface, the pelagic trawl with floats or bottom trawl with floats was used for sampling. In deeper waters, the MultPelt, a much larger trawl, was used. Annex III gives a summary of the catches.

All catches were sampled for composition by weight and numbers. Species identification was based on the FAO Species Guides. Length frequency distributions of selected target species, by total fish length to the nearest cm below, were taken from all stations where they were present. Other common pelagic and demersal fish were also measured (see Table 5). These

length measurements were used to estimate the length-weight relationship used in the biomass calculations. Individual weight measurements and biological information on sex, maturity, and stomach fullness was recorded for 30 fish per trawl (when present) of all target species. In addition, the following biological samples of the target species were taken: otoliths, fin clips for genetic analysis, stomach and liver samples, and samples for future biological investigations in the local countries.

The target groups used for this survey can be found in Table 5. A full list of biological samples per species and trawl station is given in Annex VI.

2.7 Acoustic sampling

2.7.1 Sonar data

A Simrad SH90 Sonar recorded data continuously for post processing after the survey. The sonar was set to a frequency of 26 kHz, in FM Normal mode. The sonar was operated using bow up/180° operation mode with the bearing of the vertical beams 90°, perpendicular to the vessel direction with a range of 450 m and with the horizontal beams set to 450 m with a tilt angle of 3 deg. The filters built into the sonar software to improve the school representation (i.e. AGC, RCG and ping to ping) were set to default values except for the Noise filter, which was turned off.

The settings including range and tilt were kept the same during all the surveying except during trawling operations where the sonar was at times used actively to focus in on targets.

No other sonars were used during the survey.

2.7.2 Echo sounder

Acoustic data were recorded using a Simrad EK80 Scientific Split Beam Echo Sounder equipped with keel-mounted transducers at nominal operating frequencies of 18, 38, 70, 120, 200 and 333 kHz. The survey was started without an *a priori* calibration, although the sounders were calibrated in Bergen on 23rd January 2017. Annex I gives the details of the acoustic settings used during the survey.

Acoustic data were logged and post-processed on board using the latest acoustic data post-processing software, the Large-Scale Survey System (LSSS) Version 2.0.

In cases where the integrated echo contained more than one category of fish (see Table 5 below), the mean s_A-value allocated to each category was in the same ratio as their contribution to the total catch of all trawls in that area.

The following target strength (TS) function was applied to convert s_A-values (mean integrator value for a given species or group of species in a specified area) to number of fish:

$$TS = 20 \log L - 72 \text{ dB}$$

which can be converted (see Toresen *et al*. 1998 for details) to the area form (scattering cross sections of acoustic targets):

$$C_{Fi} = 1.26\ 10^{6}\ L^{-2}$$

where L is total length in 1 cm length group *i* and C_{Fi} (m^{-2}) is the reciprocal back scattering strength, or so-called fish conversion function. In order to split and convert the allocated s_A-values (m^2/NM^2) to fish densities (numbers per length group per NM^2), the following formula was used:

$$\rho_i = s_A \cdot \frac{p_i}{\sum_{i=1}^{n} \frac{p_i}{C_{F_i}}}$$

where

ρ_i = density of fish in length group *i*
s_A = mean integrator value
p_i = proportion of fish in length group *i*
$\sum_{i=1}^{n} \frac{p_i}{C_{Fi}}$ = the relative back scattering cross section (m^2) of the length frequency sample of the target species, and
C_{fi} = reciprocal back scattering cross-section (σ_{bs}^{-1}) of a fish in length group *i.*

The integrator outputs were split into the fish groups listed below using a combination of behaviour pattern as deduced from echo diagrams, the LSSS analysis and catch composition.

Table 5 lists the target groups used. These are based on groupings used during previous *Nansen* surveys. Biomass estimates were also attempted for species identified as priority species by local scientists; *Decapterus* sp., *Scomber colias, Trachurus trecae*, *Engraulis encrasicolus* and *Ethmalosa fimbriata* (see Survey Objectives). Note that biomass estimates were not calculated for the latter two as insufficient quantities were caught in the trawls. Also, although *Decapterus punctatus* was not listed as a priority species in the Survey Objectives, it often occurs with its congener *D. rhonchus* and hence the two species cannot be separated acoustically. *D. punctatus* was therefore included in the Pelagic II fish group.

The acoustic backscatter was scrutinized daily and allocated to the various target groups. When sardinellas occurred an sV threshold of -45 dB used to filter out other species and plankton. In regions where the plankton layer was extremely dense and even lower threshold had to be applied. The protocol used when scrutinising sardinella is described in some detail in Annex VII. For Pelagic I, Pelagic II and "other pelagic species" -50 dB was used. To identify mesopelagic layers a threshold of -60 dB was used.

The above equations show that the conversion from s_A-values to number of fish is dependent on the length composition of the fish. It was therefore important to get representative length distributions for the key species groups throughout the whole distribution range.

If the targeted fish was a mixture of more than one species and they could not be separated during scrutinisation, for example sardinellas, representative distributions all the species, within the stratum, as reflected in the trawl catches, was used. Length distributions of each species, for each catch, was calculated and normalized to a unit number (usually 100). These were then averaged without weighting. Very small catches (normally less than about 20 fish) were not included. *Trichiurus lepturus* was not included in length frequency samples of Pelagic II fish as the shape, and hence length-weight relationship, as this species is very different from all the other priority pelagic fish, *T. lepturus* being an extremely long and thin fish. The proportion (by weight) in the trawl catches was however used to estimate the proportion of this species in the Pelagic II mixture.

When the size classes (of e.g. young fish and older fish) were well mixed, the various length distributions were pooled together, the length frequency sampled in each trawl being weighted equally. Otherwise, when the size classes were segregated, the total distribution area was post-stratified according to the length distributions, and separate estimates were made for each strata.

The total catch of each species from all the trawls in a stratum was used as a proxy for estimating the proportion of the total biomass of each species present. While it is recognised that catch is a poor indicator of relative abundance, especially for pelagic fish, no other method is easily available from the data obtained. This method of estimating the abundance of individual species from mixed catches was used for the two sardinella species and also separating *Decapterus* sp and *Scomber colias* (noting that in some strata these species occurred on their own and hence 100% of the estimated biomass was attributed to that species). Similarly, *Illisha africana* was scrutinised as part of the Pelagic II mixture of species and, when sufficient *I. africana* occurred in a stratum, the estimated biomass was based on the proportion of *I. africana* in the total Pelagic II catch for that stratum.

The length-weight relationship, which is used to convert numbers to biomass, was calculated for each species or group, based on all fish sampled within each country. Samples were not broken down into separate strata.

Table 5. Species groupings used to allocate acoustic backscatter.

Group	Family	Species	Sampling
Sardinellas	Clupeidae "	*Sardinella aurita* *Sardinella maderensis*	*Full biological*
Horse mackerel	Carangidae	*Trachurus trecae*	*Full biological*
Pelagic species I	Engraulidae Clupeidae	*Engraulis encrasicolus* *Ethmalosa fimbriata* *Illisha africana*[3]	*Full biological*
Pelagic species II	Scombridae Carangidae " " " " Clupeidae Trichiuridae	*Scomber colias*[4] *Decapterus punctatus*[4] *Decapterus rhonchus*[4] *Chloroscombrus chrysurus* *Caranx rhonchus* *Caranx crysos* *Selene dorsalis* *Trichiurus lepturus*	*Full biological* *Length & Weight*
Other pelagic species, incl:	Scombridae Carangidae Sphyraenidae	*Scomberomorus tritor* *Selar crumenophthalmus* *Sphyraena guachancho*	*Length & Weight*
Demersal species, incl:	Ariommatidae Haemulidae Caproidae Serranidae Polynemidae Sparidae " Priacanthidae Mullidae	*Ariomma bondi** *Brachydeuterus auratus** *Antigonia capros** *Epinephelus aeneus* *Galeoides decadactylus* *Pagellus bellotti** *Pagrus caeruleostictus** *Priacanthus arenatus* *Pseudupeneus prayensis**	*Total mass* **Length & Weight*
Mesopelagic	Myctophidae and other mesopelagic fish		*Total mass*
Plankton	Calanoidae, Euphausiidae and other plankton		

The biomass estimation process used the following procedure:

- Divide the s_A-value between groups of fish and/or species through scrutinisation of the acoustic data and information from the trawl catches.
- Define strata within each country based on the occurrence of a species, or group of species, in an area based on the distribution of s_A-values.
- Calculate the average s_A-value (per nm) of each species/group in each stratum
- The length-frequency samples of the species for the stratum were respectively pooled together with equal importance (as described above).

[3] Illisha africana was recorded in the SSSI database as a Pelagic II species. The biomass of this species was analysised separately.

[4] *Scomber colias*, *Decapterus punctatus* and *D. rhonchus* were recorded in the SSSI database as Pelagic I species. The biomass of these species was analysised separately.

- The mean back scattering strength (ρ/sA) of each length class of the target group/species was calculated. The total backscattering for all length classes was then summed. This was automatically done in the Excel spreadsheet made available for acoustic abundance estimation on board R/V *Dr Fridtjof Nansen*.
- The pooled length distribution was used, together with the mean sA-value, to calculate the density (numbers per NM^2) by length groups and species, using the above formula. The total number by length group in the area was obtained by multiplying each number/NM^2 by the area.
- The numbers were then converted to biomass using the estimated weight at length.

CHAPTER 3. RESULTS

3.1 Hydrography

3.1.1 Guinea Bissau

The continental shelf forms a large plateau off Guinea Bissau with most water depths less than 100 m deep (Figure 13).

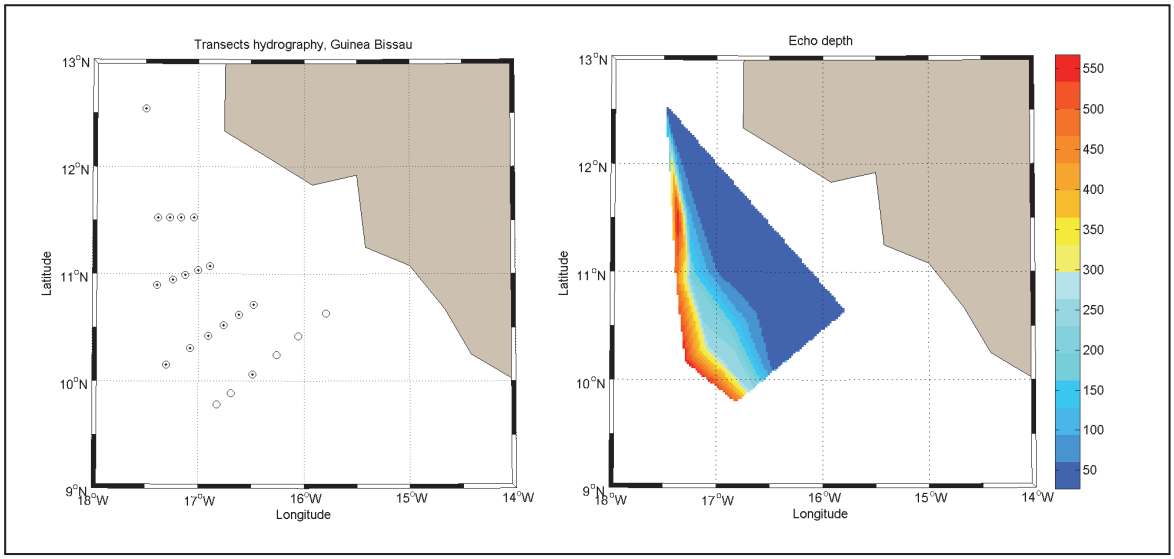

Figure 13. Positions of the CTD stations in waters off Guinea Bissau (left). Circles mark stations sampled for hydrography, dotted circles mark stations also sampled for ocean acidification variables. Right panel shows bottom depth (m) as registered by the ship's sounder.

3.1.1.1 Surface mixed layer

At the shallowest stations, the mixed layer depth was very shallow (Figure 12). At stations where the depth was more than 200 m, the mixed layer depth was between 40 and 50 m, with one extraordinarily deep MLD at 70 m.

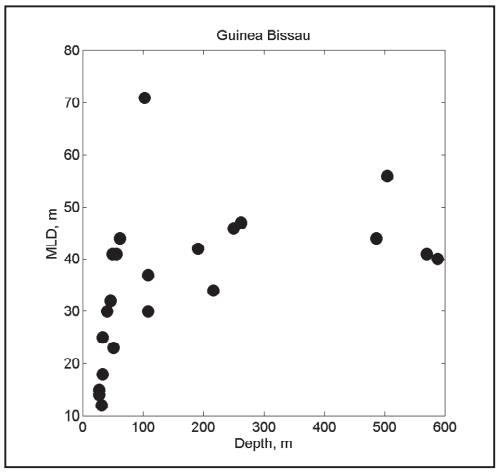

Figure 14. The relation between total depth and mixed layer depth (MLD) in station less than 100 m deep.

In Guinea Bissau waters, a subsurface chlorophyll maxima was present over the whole area investigated (Figure 15).

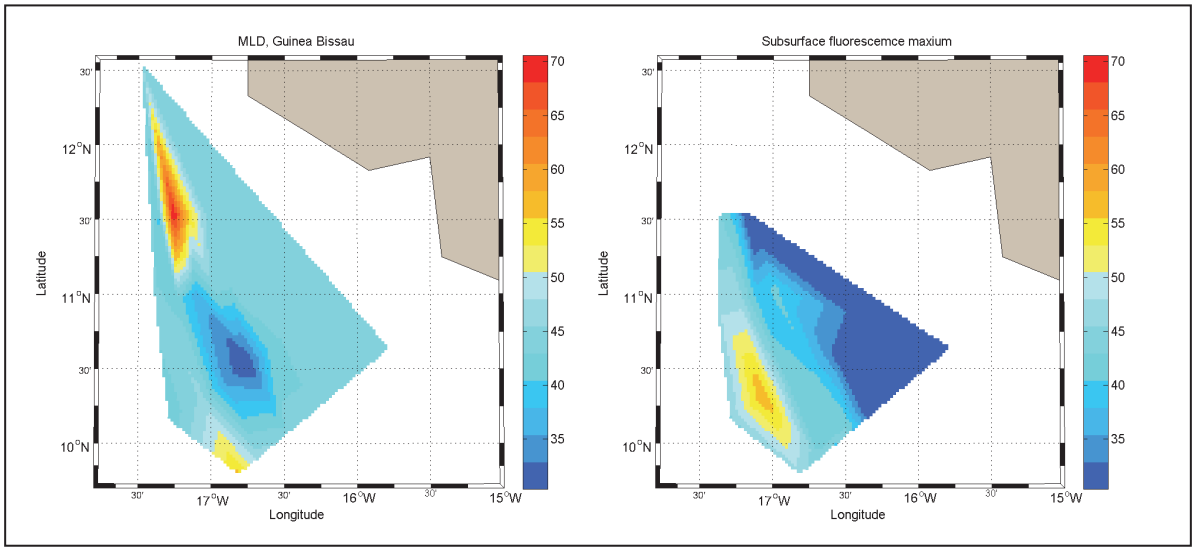

Figure 15. Mixed layer depth (left) and depth of subsurface chlorophyll maxima (m), where such a maxima were present.

3.1.1.2 Surface horizontal distribution of hydrographic variables

The horizontal distribution of hydrographic variables in surface water is shown in Figure 16. Average temperature at 5 m depth was 28.0ºC (SD=0.23, min=27.6, max=28.7). Within this small range, the warmer waters occurred over the edge of the continental shelf, with a further patch in middle of the investigated area (Figure 17).

Salinity at 5 m depth was on average 35.2‰ (SD=0.14, min=34.9, max=35.5). The less saline water corresponded to the patch of warmest water in the middle of the investigated area. Oxygen concentration at 5 m depth was highest over the deepest part of the area, with an inverse distribution compared to fluorescence. An inverse distribution of oxygen concentration compared to fluorescence occurred in Guinea Bissau, this somewhat surprising, since high oxygen and high fluorescence indicate areas of high primary production are usually expected to co-occur.

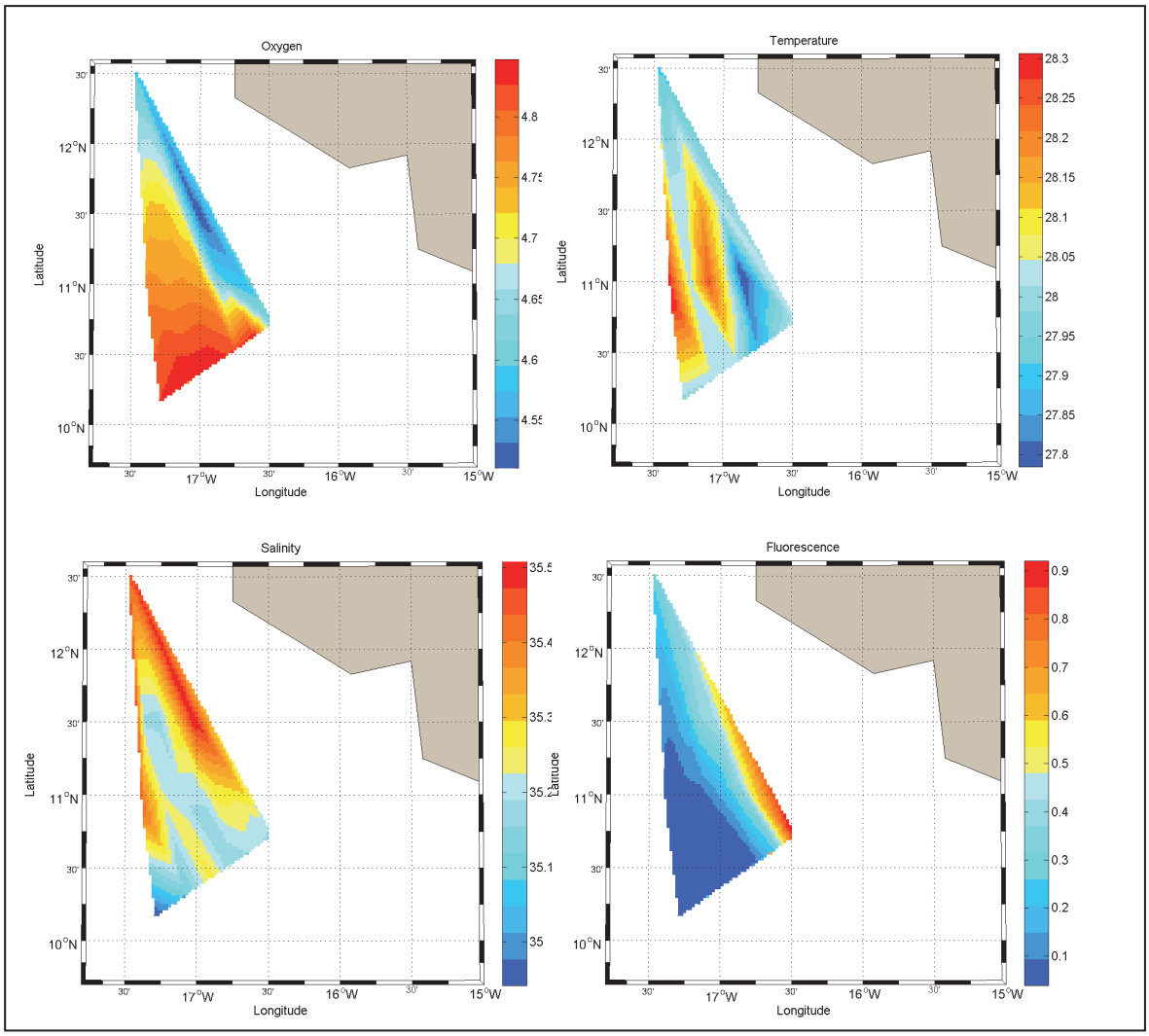

Figure 16. The horizontal distribution of sea surface temperature (ºC), salinity (‰), oxygen (V) and fluorescence in Guinea Bissau.

3.1.1.3 Vertical distributions of hydrographic variables determined from transects

Profiles of water samples were analysed along all four transects on the continental shelf area of Guinea Bissau (Figures 17 - 20).

At stations with a depth less than 100 m, the average temperature in the mixed layer was 26.9ºC (SD=1.7, min=21.5, max=28.4), while at the deeper stations the temperature was slightly higher in the same layer (average 27.3, SD=0.9, min=22.8, max=28.6). Temperature decreased with depth and below 500 m temperatures were less than 10ºC (Figure 17).

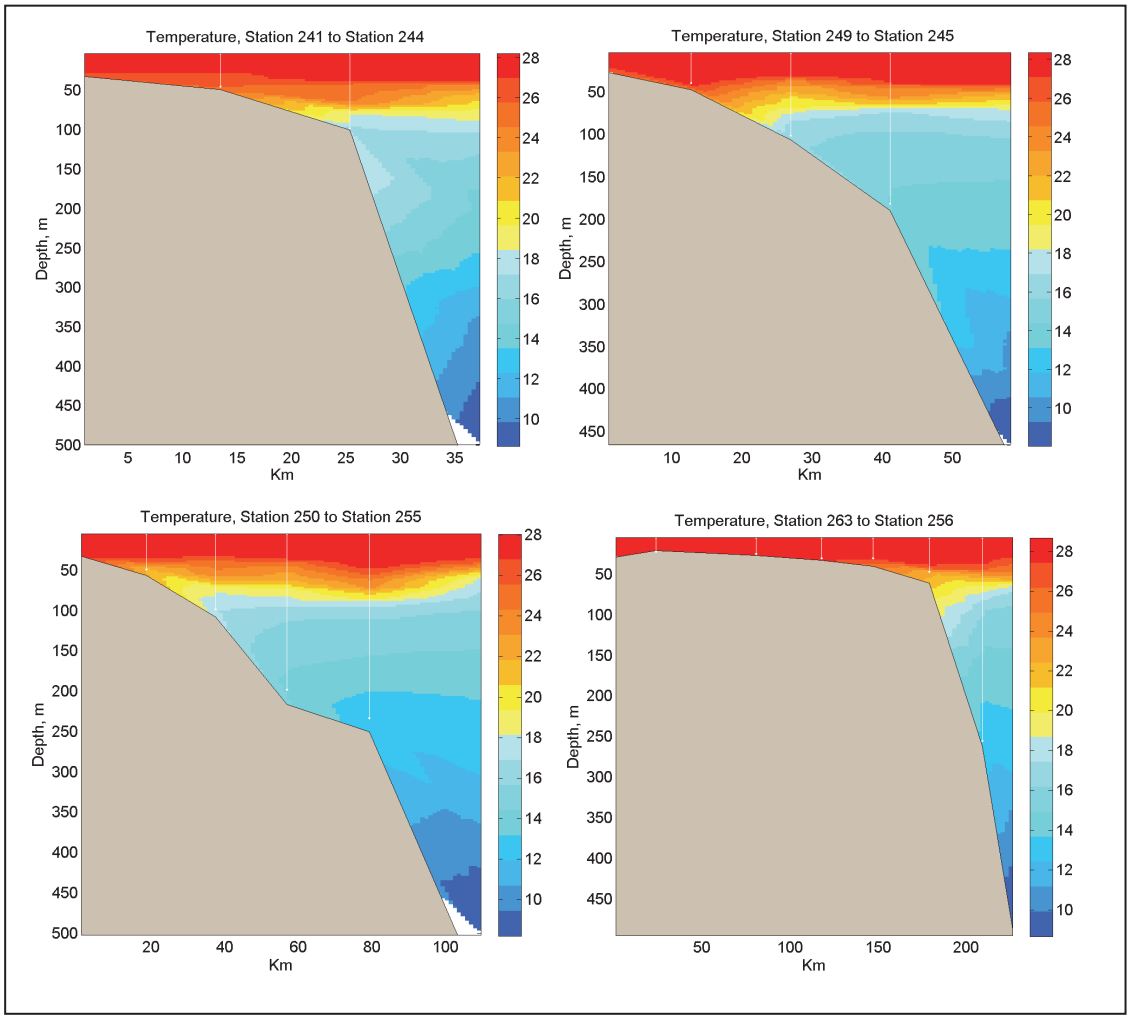

Figure 17. Temperature profiles in Guinea Bissau (ºC).

Salinity characteristically showed maximum values between 50 and 100 m depth at the deep part of the transects (Figure 18). This surface water was less dense than the waters below because of the higher temperature.

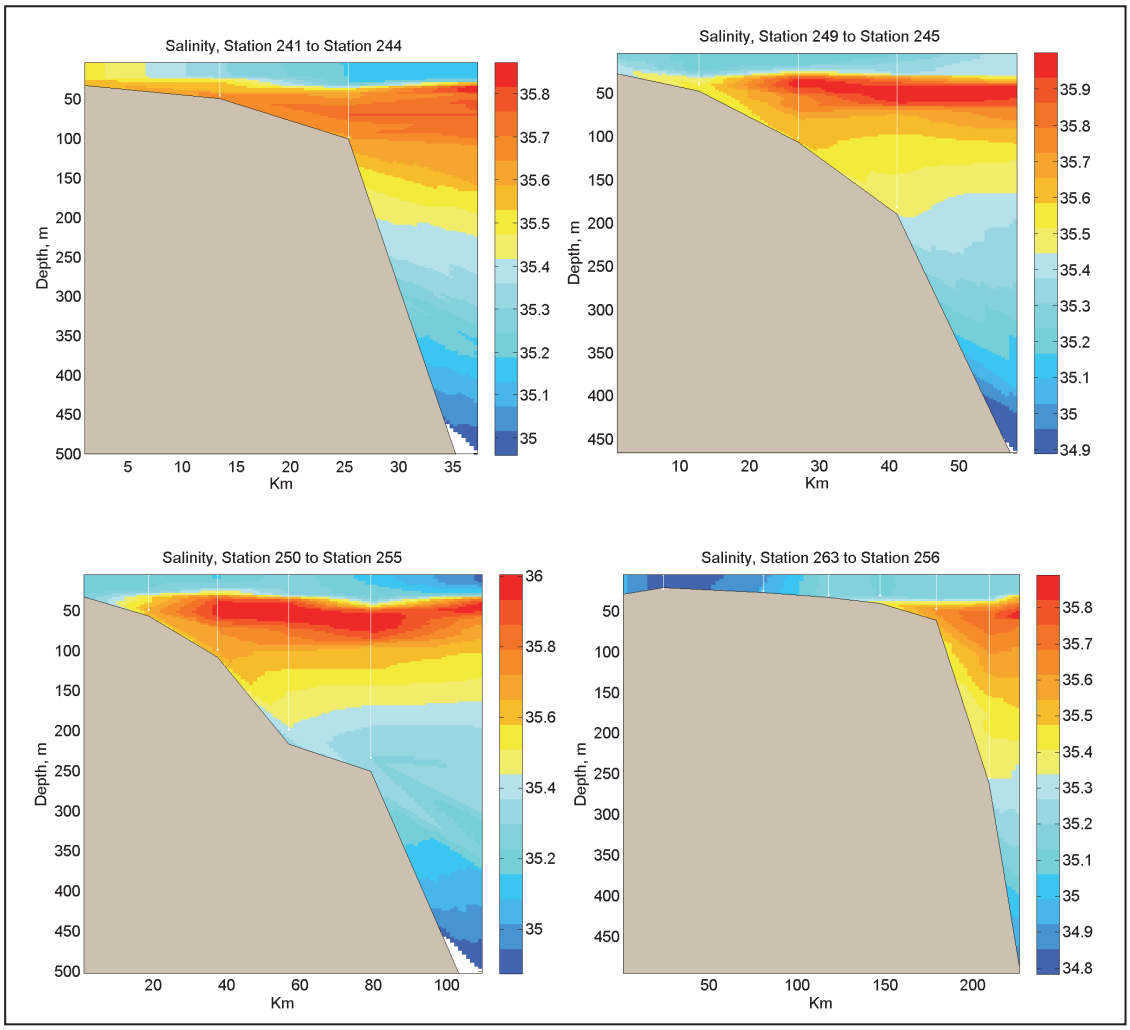

Figure 18. Salinity profiles in Guinea Bissau) ‰).

The waters were well oxygenated at all stations examined (Figure 19). In shallow waters, less than 100 m deep, oxygen concentrations in the mixed layer averaged 4.6 ml/l (SD=0.3, min=2.9, max=5.0) while in the deeper layers, oxygen concentrations were only slightly lower, on average 3.95 ml/l (SD=0.7, min=2.4, max=4.9). At stations deeper than 100 m the average oxygen concentration in the mixed layer was 4.6 ml/l (SD=1.4), the same as the concentrations found in the shallower part of the transects.

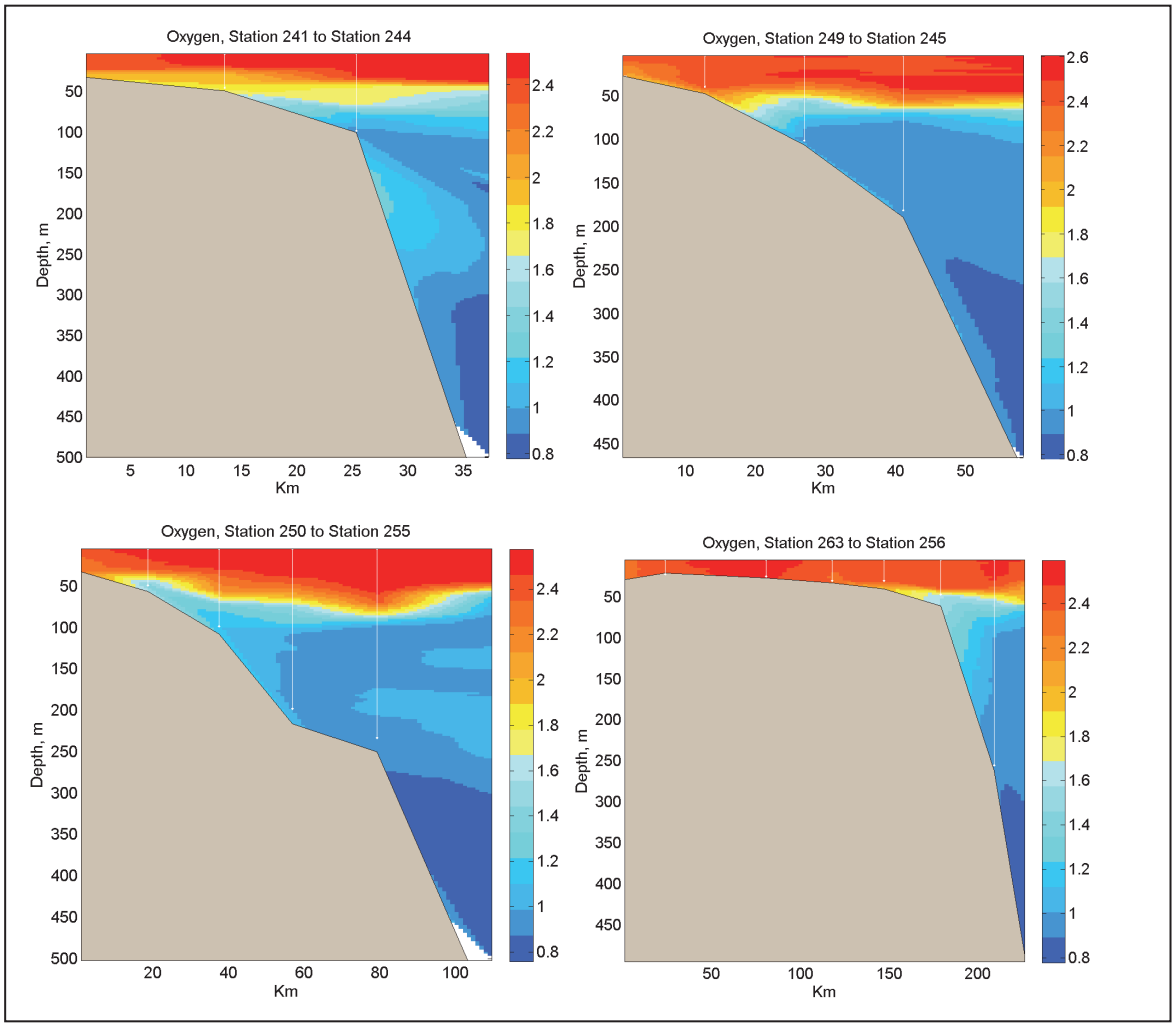

Figure 19. Oxygen profiles in Guinea Bissau (V).

The diagrams of fluorescence at depth show high chlorophyll concentrations in the shallow waters in the north-western part of the area investigated (Figure 20). Furthermore, maximum concentrations of fluorescence in depths of more than 100 m were clearly of subsurface.

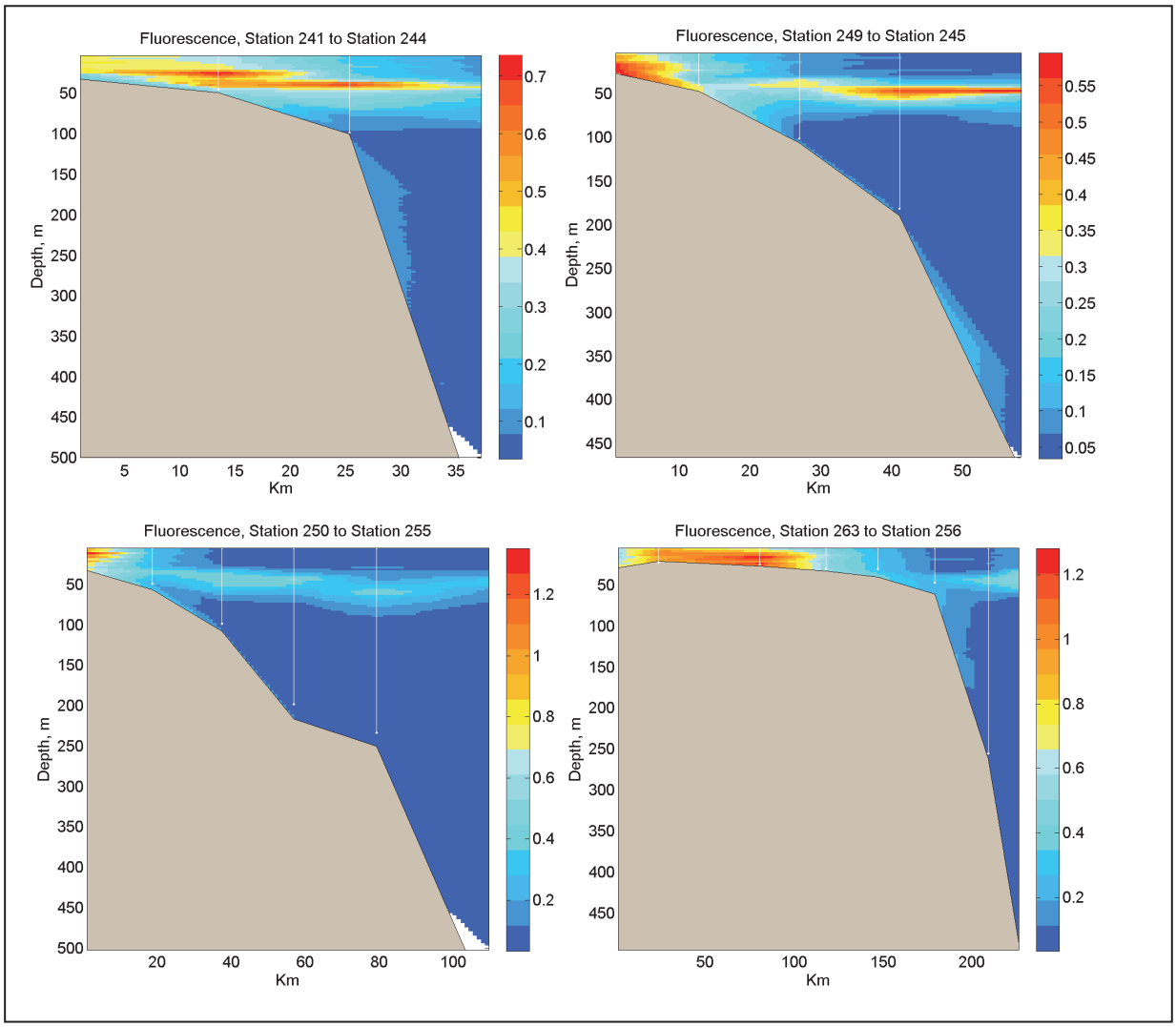

Figure 20. Fluorescence transects in Guinea Bissau.

3.1.2 Guinea Conakry

The continental shelf forms a large plateau off Guinea Conakry with most water depths less than 100 m deep (Figure 21).

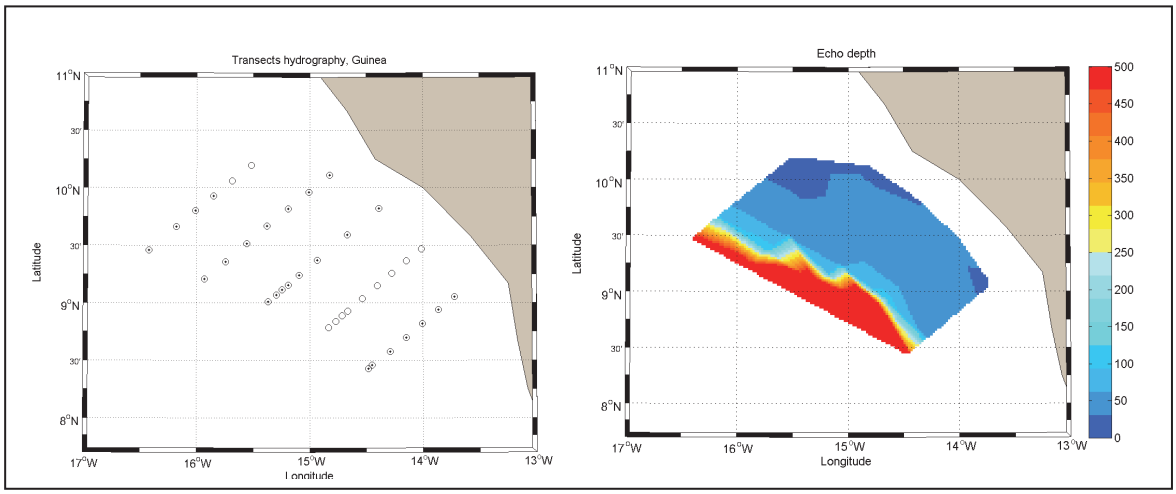

Figure 21. Positions of the CTD stations in Guinea Conakry (left). Circles mark stations sampled for hydrography, dotted circles mark stations also sampled for ocean acidification variables. Right panel shows bottom depth (m) as registered by the ship's sounder.

3.1.2.1 Surface mixed layer

The depth of the mixed layer generally increased with bottom depth in the shallower areas (Figure 22). Over the deeper area outside the shelf, the mixed layer depth varied between 45 and 60 meter. A subsurface chlorophyll maxima was present over the whole area investigated (Figure 23).

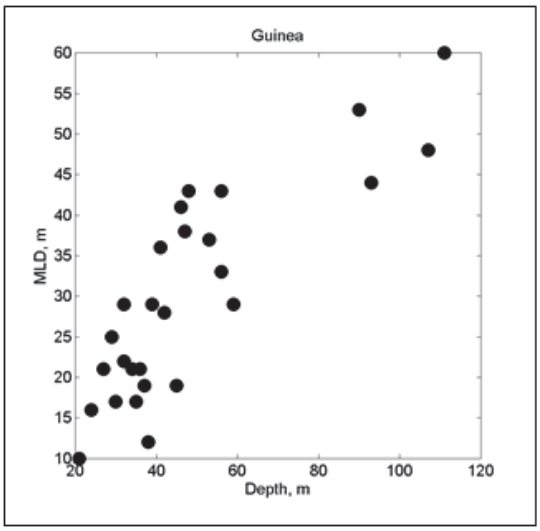

Figure 22. The relation between total depth and mixed layer depth (MLD) in the station less than 100 m deep in Guinea Conakry

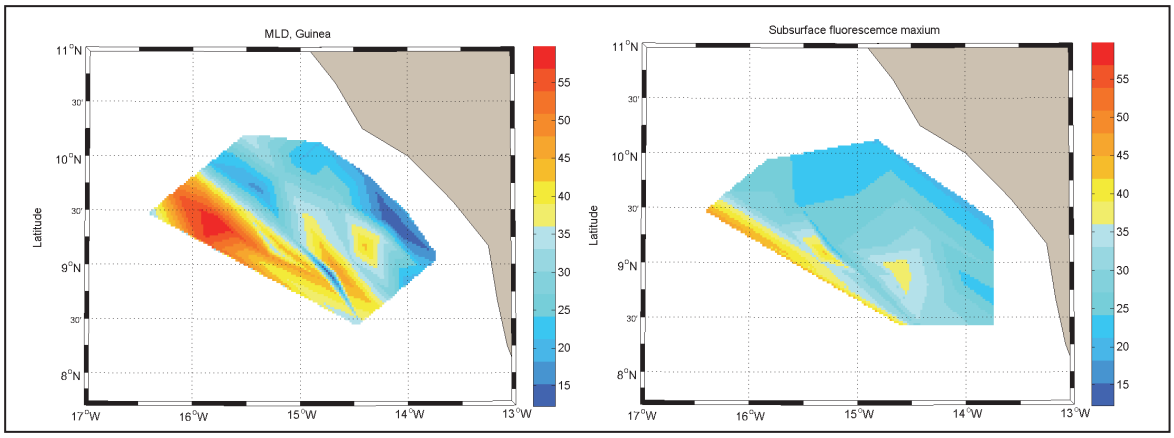

Figure 23. Mixed layer depth (left) and depth of subsurface chlorophyll maxima (m), where such maxima were present, in Guinea Conakry.

3.1.2.2 Surface horizontal distribution of hydrographic variables

The horizontal distribution of hydrographic variables in surface water is shown in Figure 24. Average temperature at 5 m depth was 28.0ºC (SD=0.31, min=27.4, max=28.6). In this small range of temperatures, the warmer waters occurred over the shelf. Salinity at 5 m depth was on average 33.5‰ (SD=1.6, min=29.6, max=35.2). The less saline water was found over the shallower part of the shelf (Figure 25). Oxygen concentrations at 5 m depth over the shelf was highest in the area with the less saline waters. The area with lower oxygen somewhat surprisingly had the highest concentrations of fluorescence (Figure 26). Fluorescence is a proxy for chlorophyll and phytoplankton biomass and hence was expected to be associated with higher oxygen concentrations.

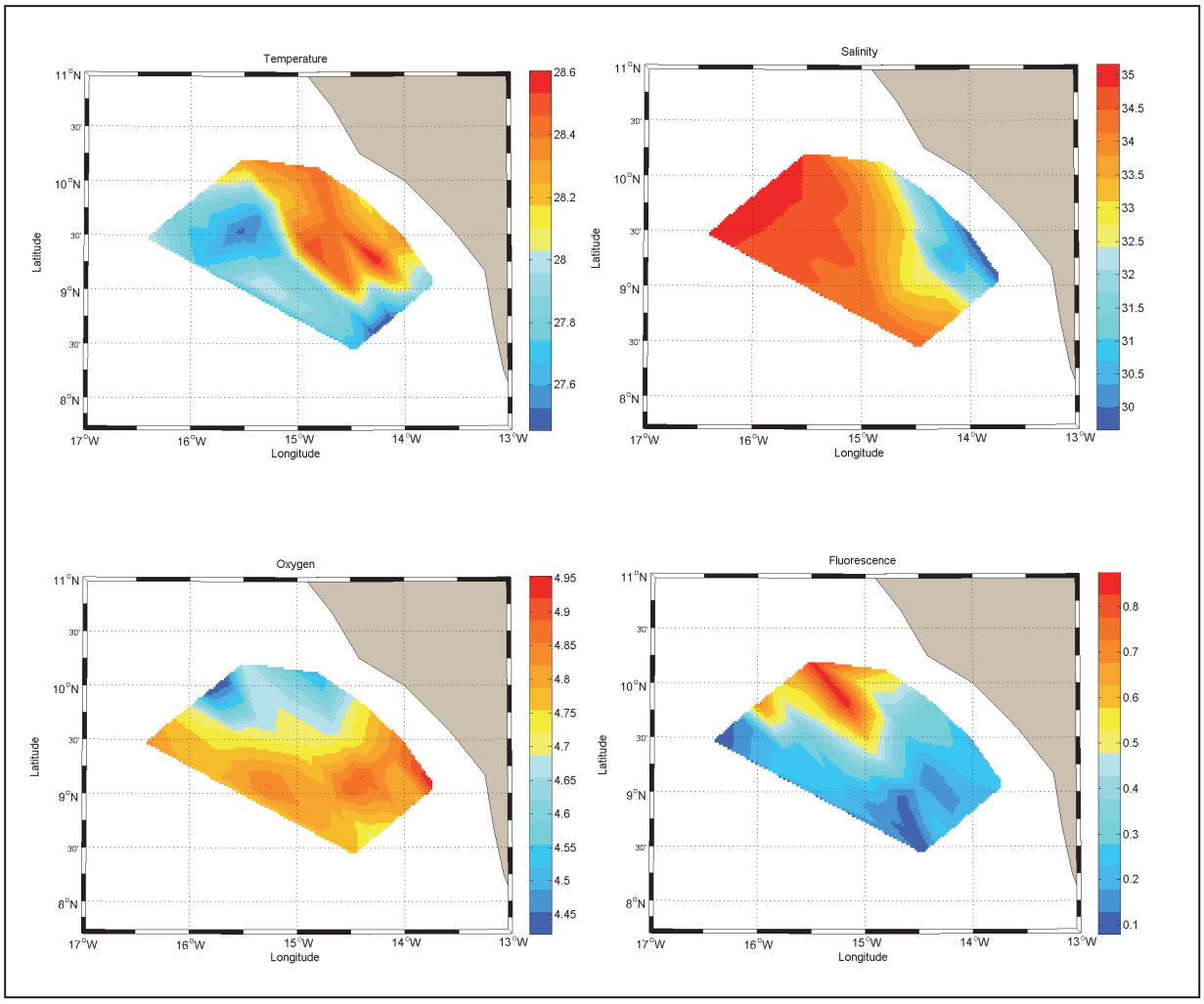

Figure 24. The horizontal distribution of sea surface temperature (ºC), salinity (‰), oxygen (ml/ml) and fluorescence in Guinea Conakry.

3.1.2.3 Vertical distributions of hydrographic variables determined from transects

Profiles of water samples were analysed along five transects on the Guinea Conakry continental shelf area, of which all but the fourth transect are shown in Figures 25 to 27.

At stations with depth less than 100 m, the average temperature in the mixed layer was 24.2ºC (SD=4.42, min=15.9, max=28.6), while at the stations deeper than 100 m, temperature was slightly higher in this stratum (average 27.5, SD=1.2, min=21.7, max=28.8). Temperature decreased with depth and temperatures below 500 m were less than 10ºC (Figure 25).

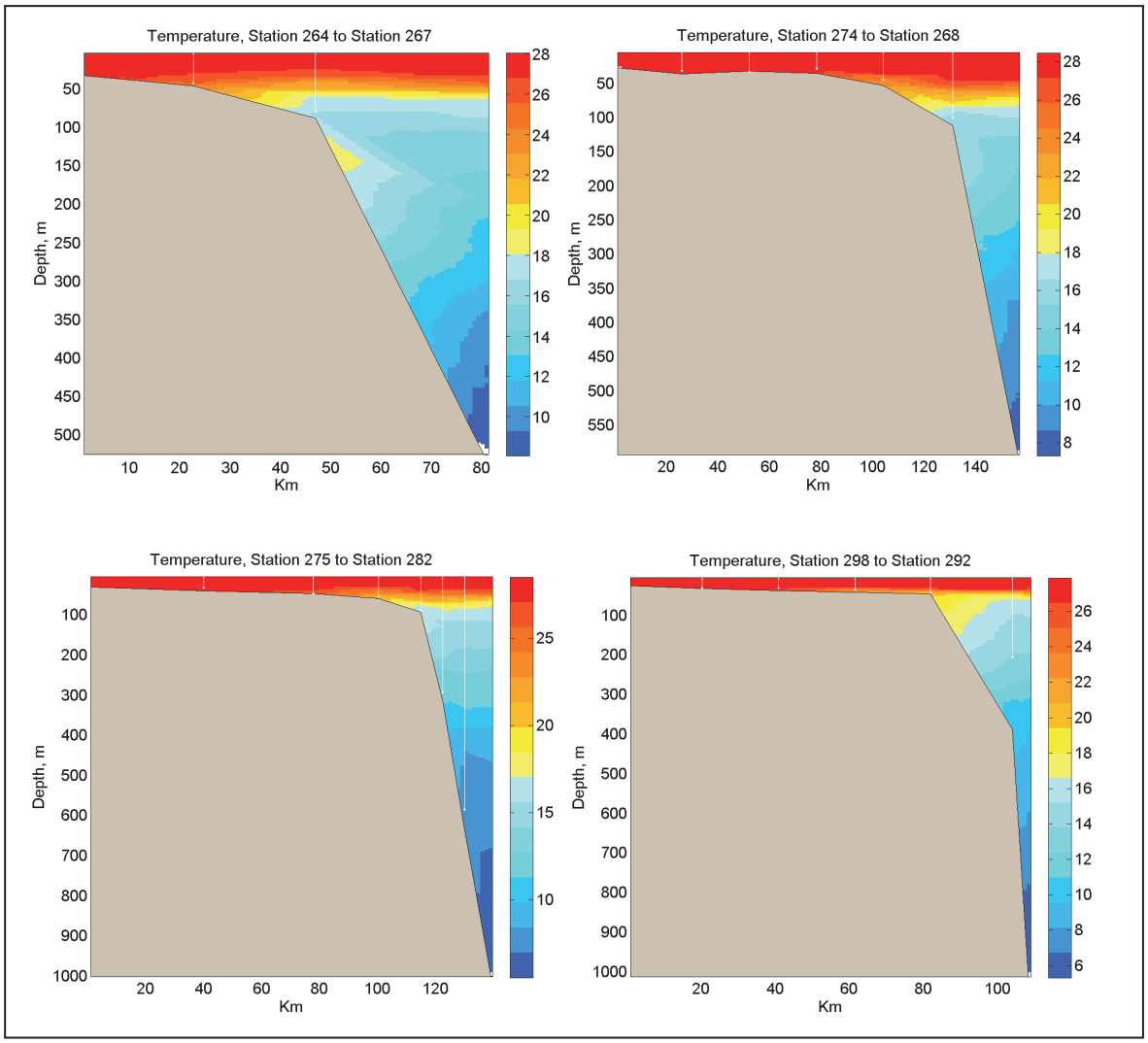

Figure 25. Temperature profiles in Guinea Conakry (°C).

Salinity characteristically showed maximum values between 50 and 100 m depth at the deep part of the transects. This salty water is less dense than the waters below because of the high temperatures (Figure 26).

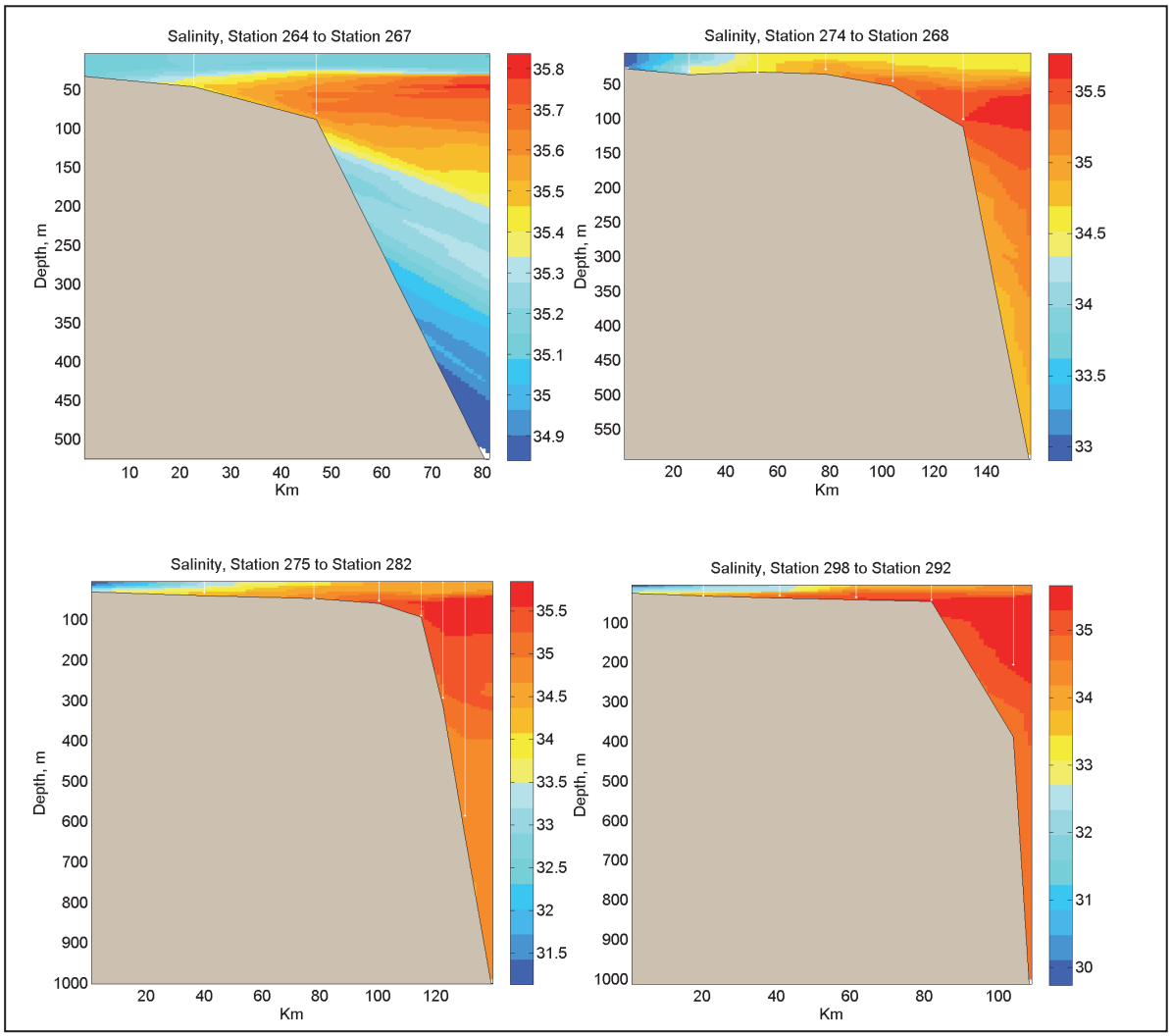

Figure 26. Salinity profiles in Guinea Conakry (‰).

The waters were well oxygenated at all stations examined (Figure 27). In shallow waters of less than 100 m deep, oxygen concentrations in the mixed layer averaged 3.3 ml/l (SD=1.0, min=1.6, max=4.7), while in deeper waters oxygen concentrations were only slightly lower. At stations deeper than 100 m the average oxygen concentration in the mixed layer was 4.4 ml/l (SD=1.5) slightly higher than in the shallower part of the transects.

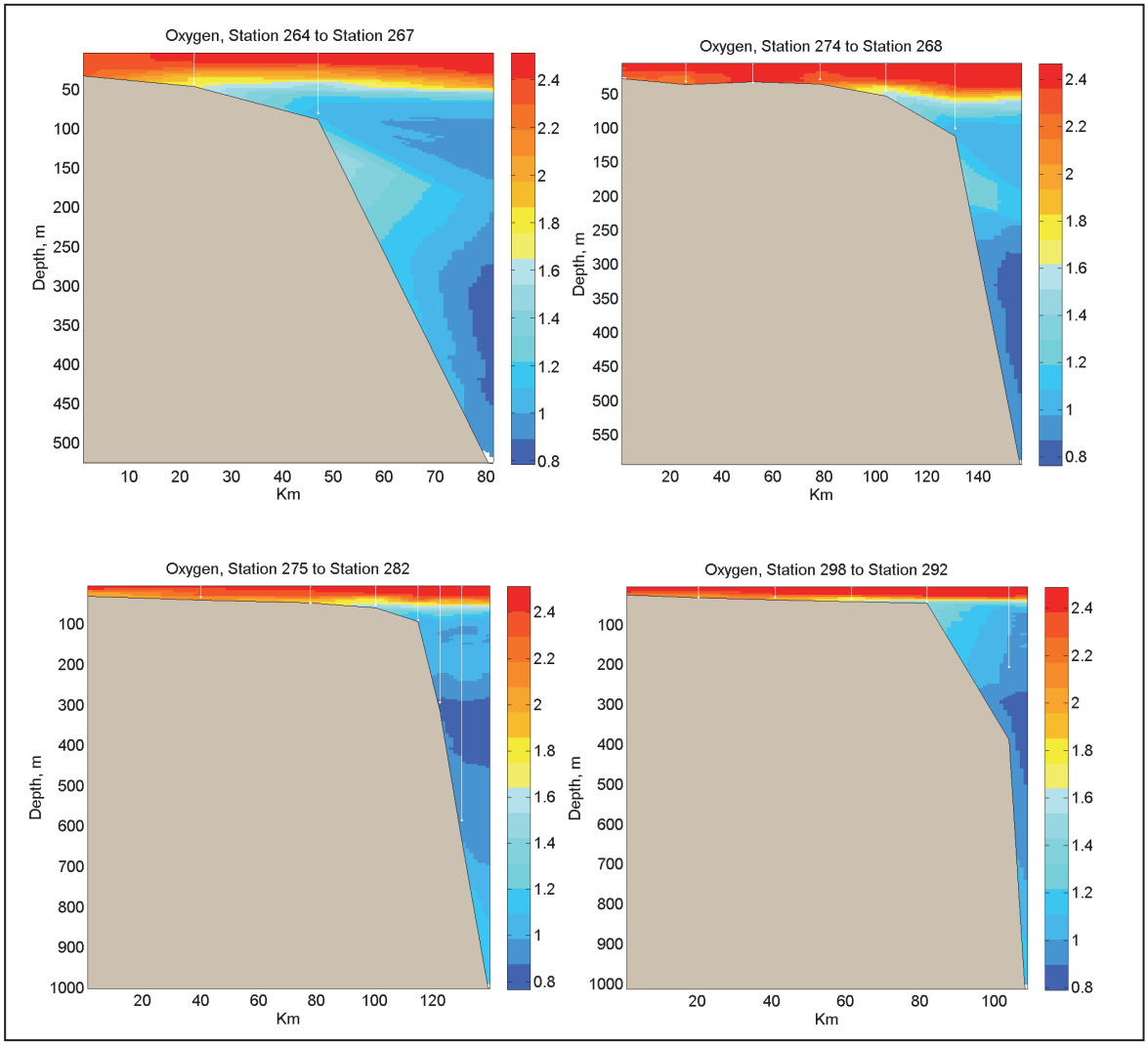

Figure 27. Oxygen profiles in Guinea Conakry (V).

Fluorescence showed high surface values in the sections from the north-western part of the area investigated, but were most intense at subsurface depths in the rest of the area. In the deep area off the shelf, maxima were present close to the depth of the pycnocline (Figure 28).

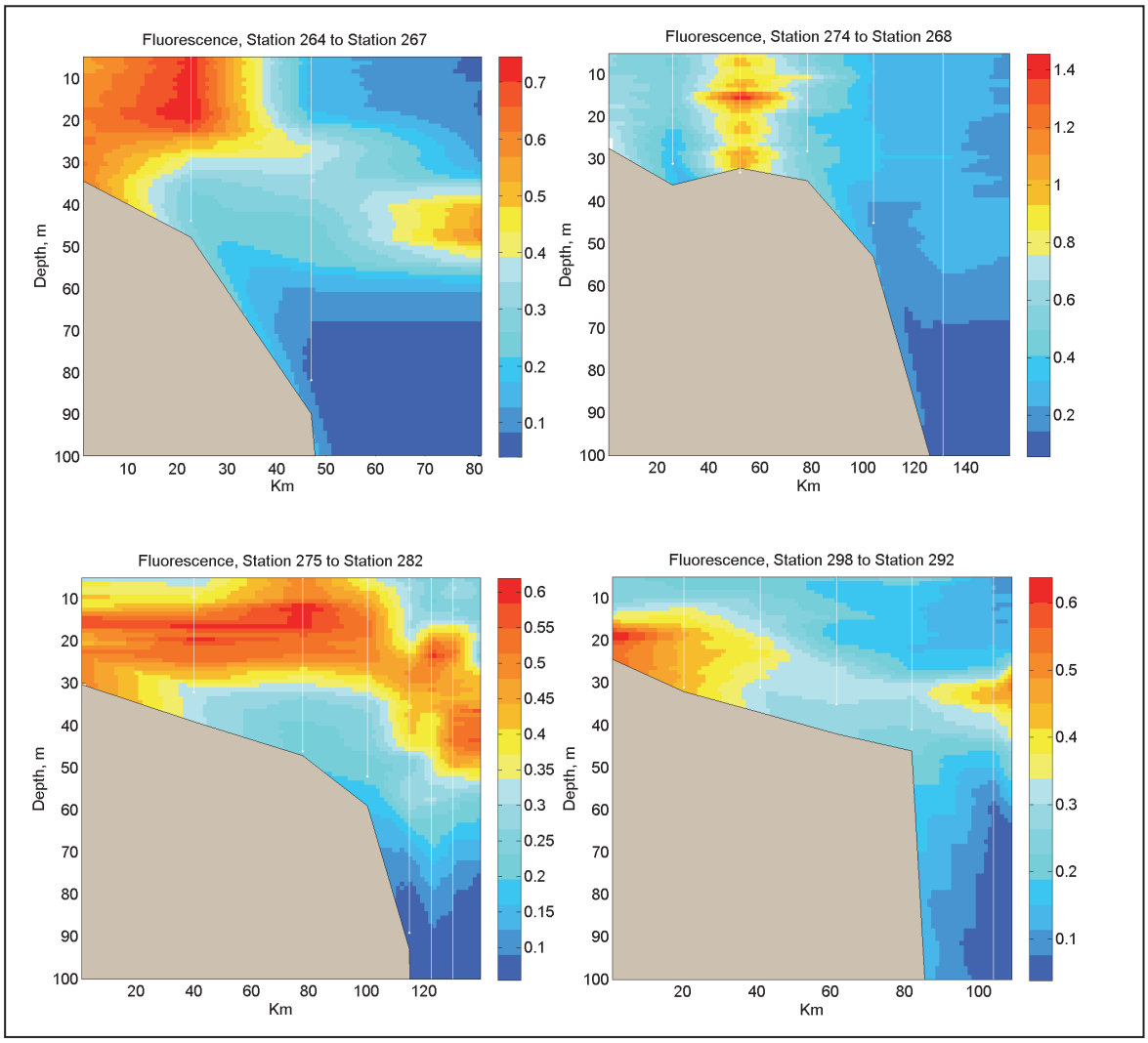

Figure 28. Fluorescence profiles in Guinea Conakry.

3.1.3 Sierra Leone

The north-western part of the continental shelf off Sierra Leone forms the south-eastern end of a large shallow continental shelf area, the width being over 100 NM, that extends from Senegal to Sierra Leone. At the south-eastern end of the Sierra Leone coast, the continental shelf is narrow; at approximately 45 NM from the coast the depth drops rapidly (Figure 29).

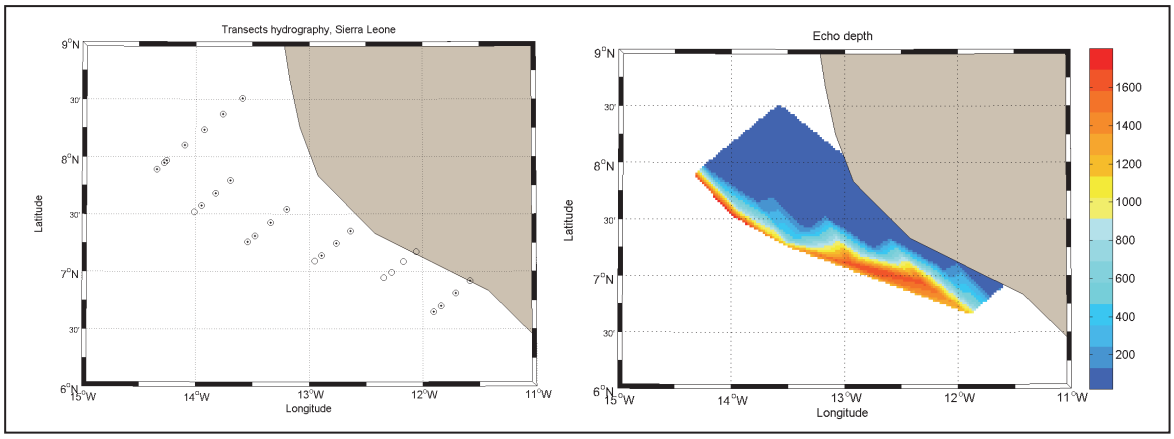

Figure 29. Positions of the CTD stations in waters off Sierra Leone (left). Circles mark stations sampled for hydrography, dotted circles mark stations also sampled for ocean acidification variables. Right panel shows bottom depth (m) as registered by the ship's sounder.

3.1.3.1 Surface mixed layer

At the shallowest stations the mixed layer depth was also very shallow (Figure 30). In the waters of Sierra Leone, such subsurface maxima developed mostly in the deep waters at the shelf break and further out (Figure 31).

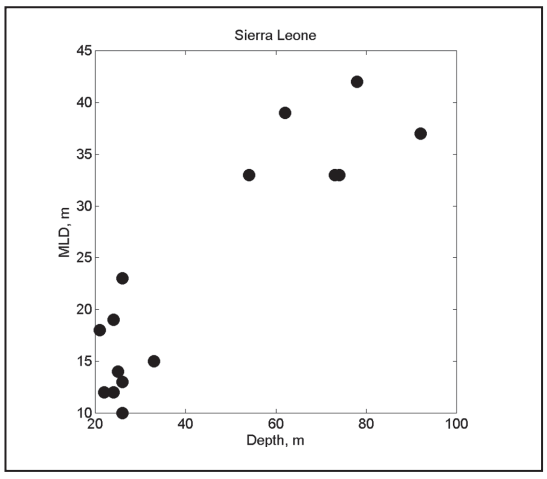

Figure 30. The relation between total depth and mixed layer depth (MLD) in stations less than 100 m deep in Sierra Leone.

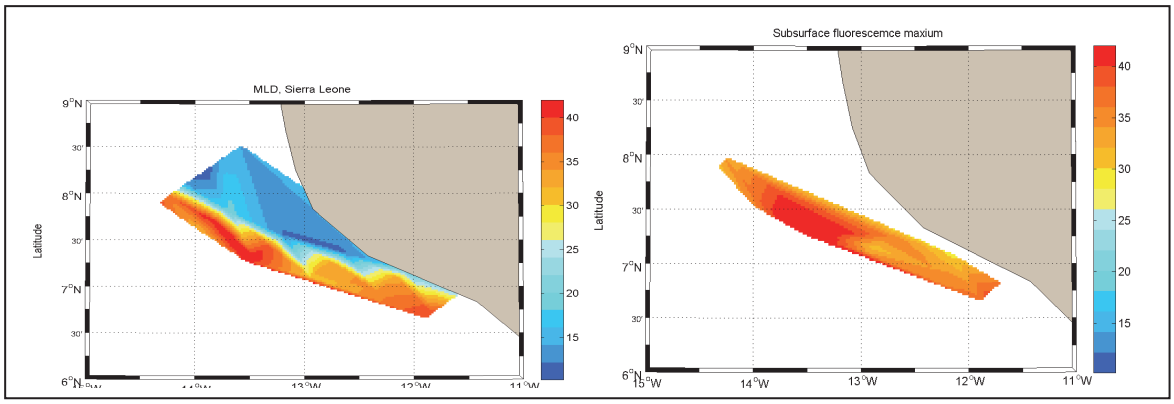

Figure 31. Mixed layer depth (left) and depth of subsurface chlorophyll maxima (m), where such maxima were present, in Sierra Leone.

3.1.3.2 Surface horizontal distribution of hydrographic variables

The horizontal distribution of hydrographic variables in surface water is shown in Figure 32. Average temperature at 5 m depth was 27.3ºC (SD=0.2, min=26.9, max=27.6). Within this small range of temperatures, the warmer waters were at the northern edge of the area investigated, and off the shelf.

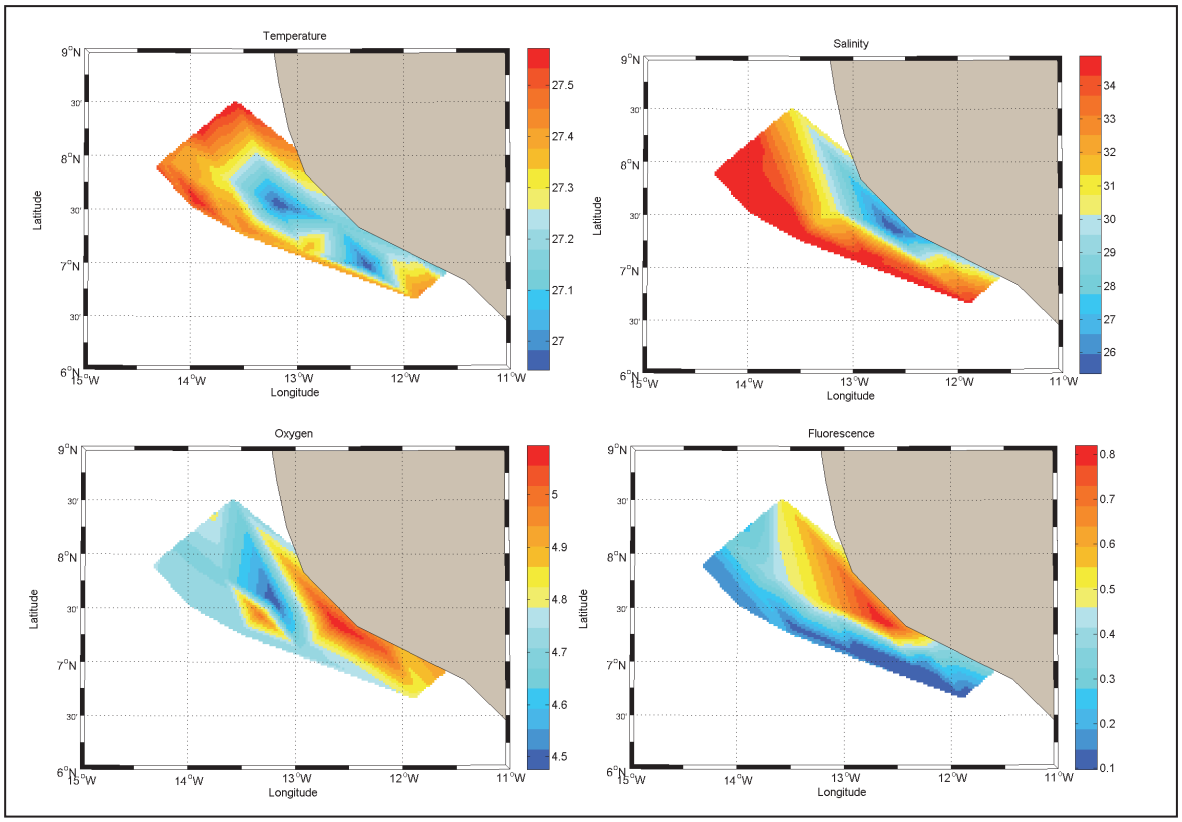

Figure 32. The horizontal distribution of sea surface temperature (ºC), salinity (‰), oxygen (ml/ml) and fluorescence in Sierra Leone.

Salinity at 5 m depth was on average 32.8‰ (SD=2.45, min=25.3, max=34.9). The less saline water was closest to the shore; it was assumed to be formed by fresh water runoff from the land mixed with ocean water. The less saline waters also held the highest concentrations of oxygen, and both the oxygen concentrations and fluorescence intensity increased closer to shore. High oxygen and high fluorescence indicate areas of high primary production.

3.1.3.3 Vertical distribution of hydrographic variables based on transect sampling

Profiles of water samples were analysed along six transects off the coast of Sierra Leone , of which four are shown in Figures 33 to 36.

Temperature in the mixed layer averaged 27.2ºC (SD=0.7, min=23.0, max=27.7) and decreased with depth (Figure 33).

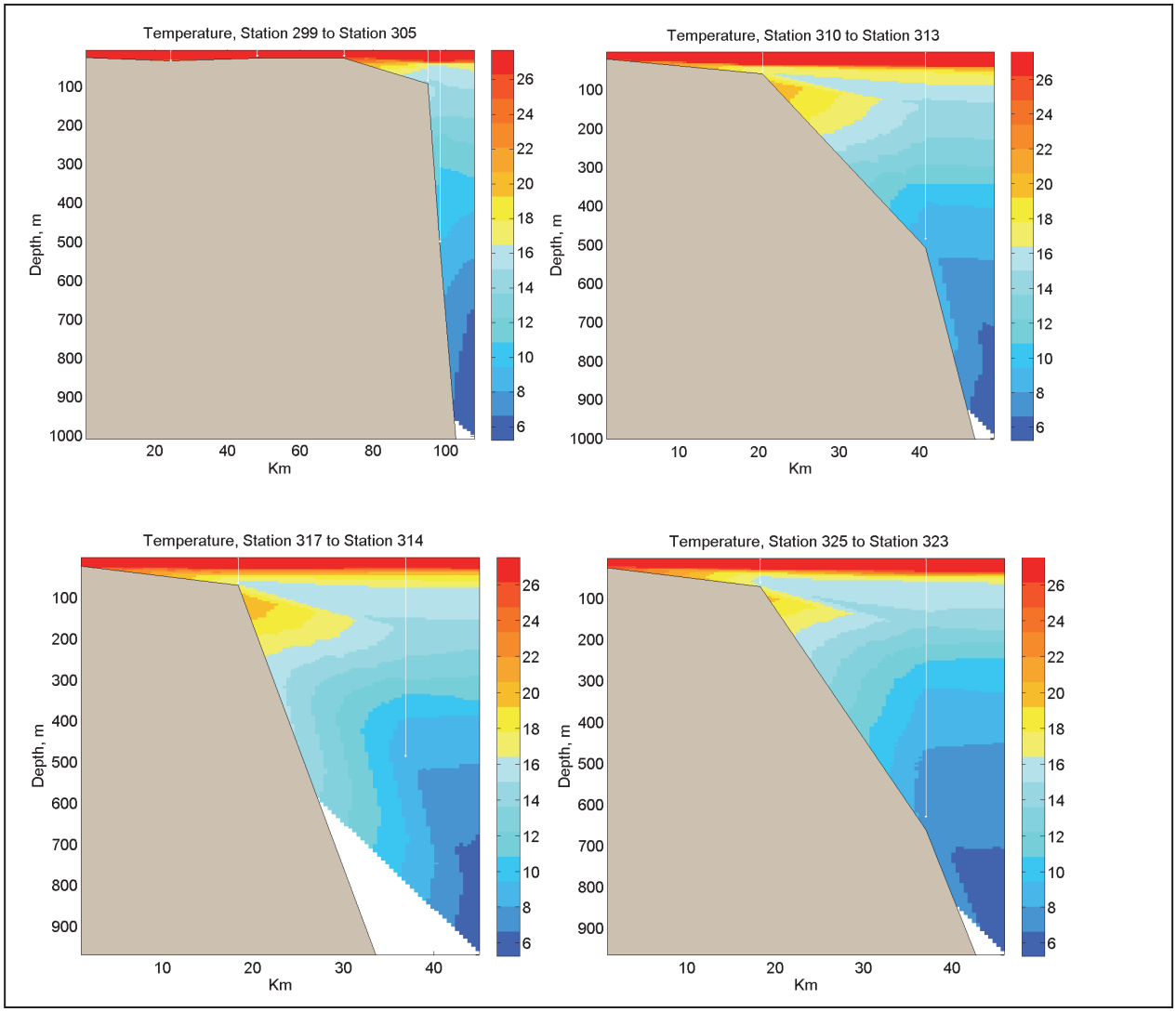

Figure 33. Temperature profiles in Sierra Leone (ºC).

Salinity showed a clear horizontal gradient, as also seen from the SST horizontal diagrams (Figure 33). Close to shore less saline water was present compared to the deeper part of the transects (Figure 34). As previously noted, this shallow lens of less saline water, of 10-20 m depth, was assumed to originate from rainwater runoff. The maximum salinity in the deep part of the waters was found between approximately 100 and 200 m depth. These saltier intermediate waters are less dense than the waters below because of the higher temperatures towards the surface.

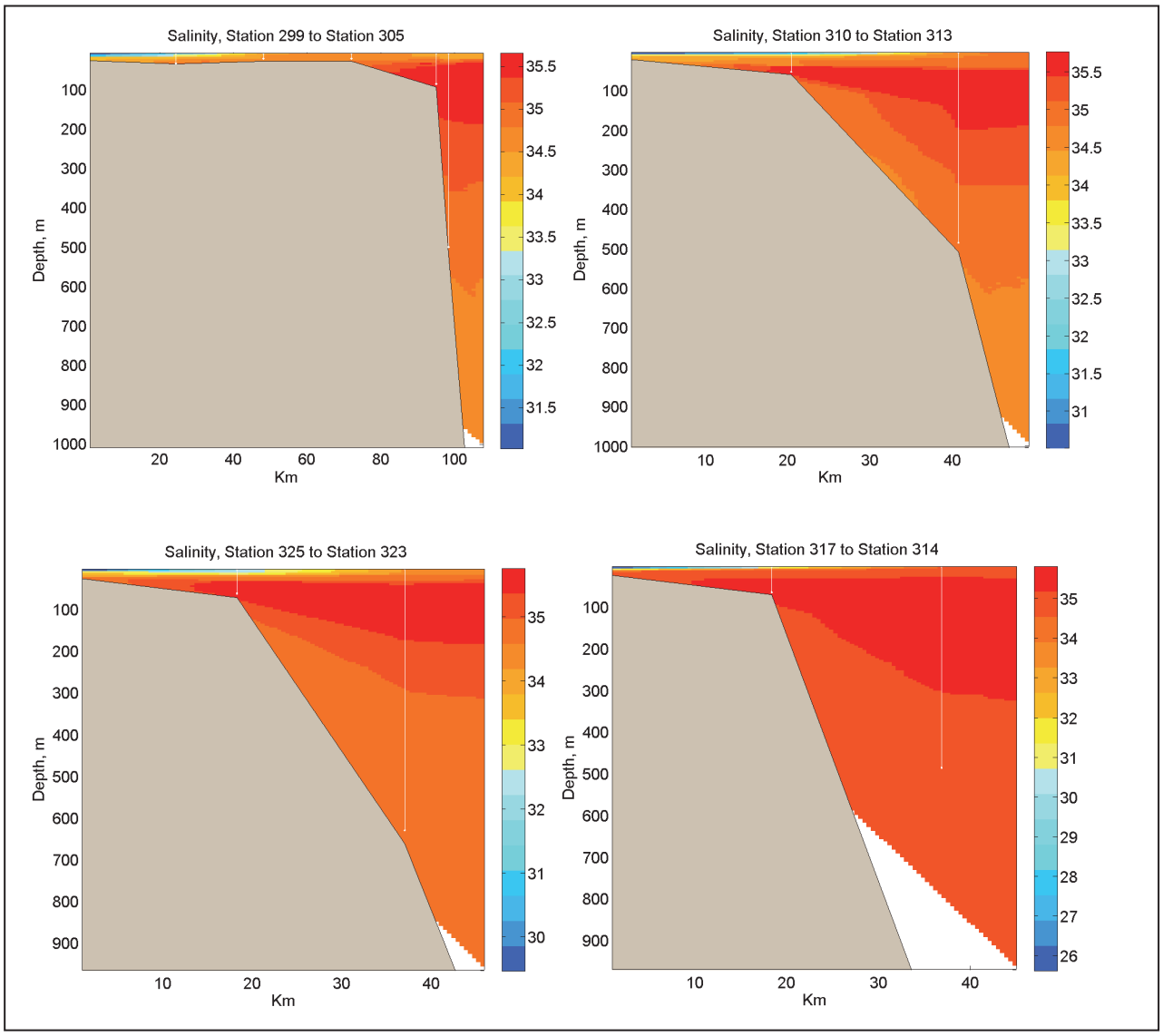

Figure 34. Salinity profiles in Sierra Leone (‰).

The waters were well oxygenated at all stations examined (Figure 35). In the shallow waters, less than 100 m deep, oxygen concentrations in the mixed layer averaged 4.5 ml/l (SD=0.5, min=2.4, max=5.4), while in deeper waters oxygen concentrations were lower, on average 2.6 ml/l (SD=1.1, min=1.5, max=4.7). As seen from the horizontal SST graphs (Figure 32), the deeper waters contained lower oxygen concentrations than the shallow stations. At stations deeper than 100 m, the average oxygen concentration was 2.82 ml/l (SD=1.4).

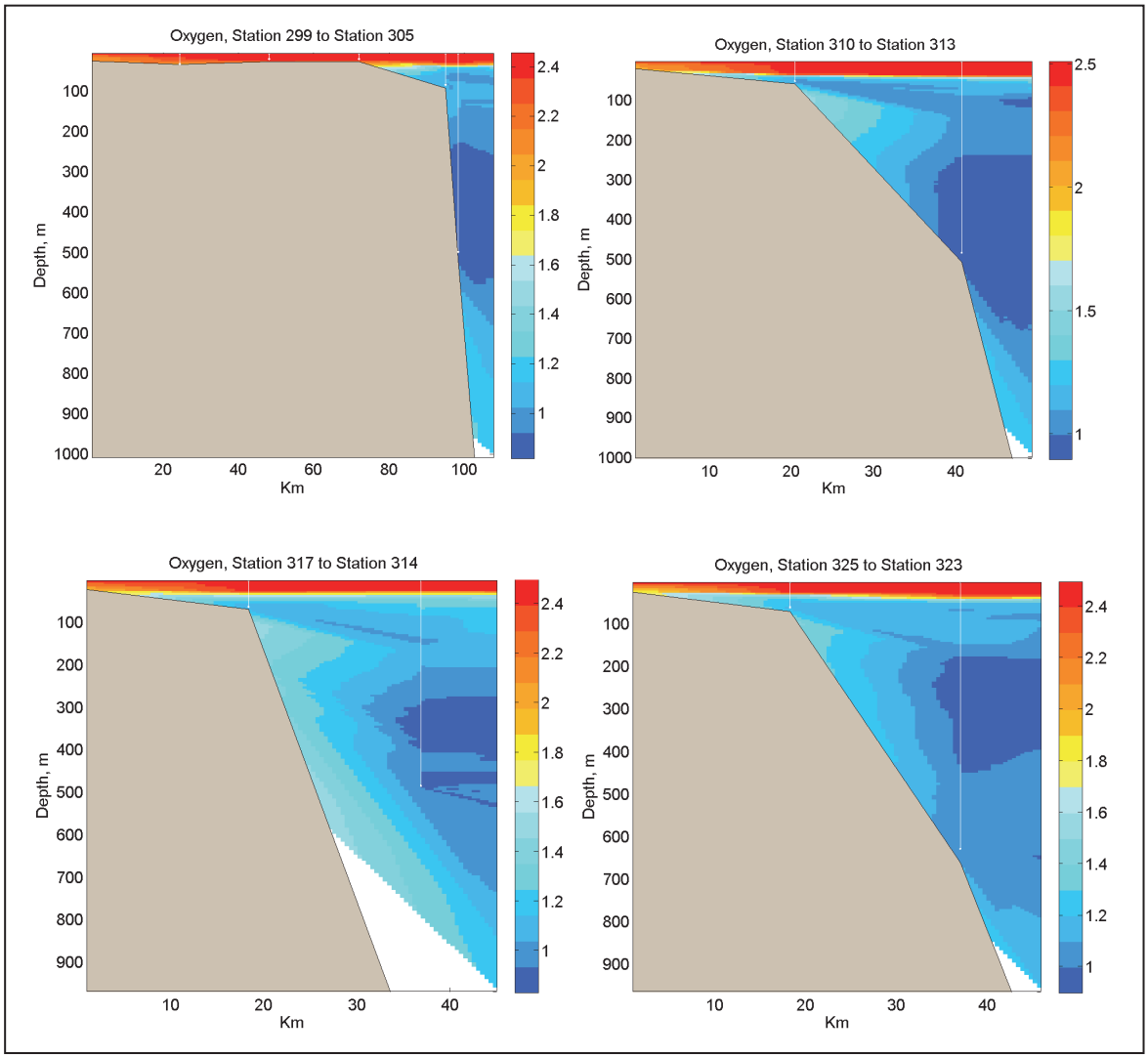

Figure 35. Oxygen concentrations in the Sierra Leone area (V).

The depth diagrams of fluorescence show high chlorophyll concentrations in the shallow waters on the continental shelf in the north-western part of the area investigated. Furthermore, in parts of the transects with depths more than 100 m, conspicuous layers of subsurface maximal concentrations were found (Figure 36).

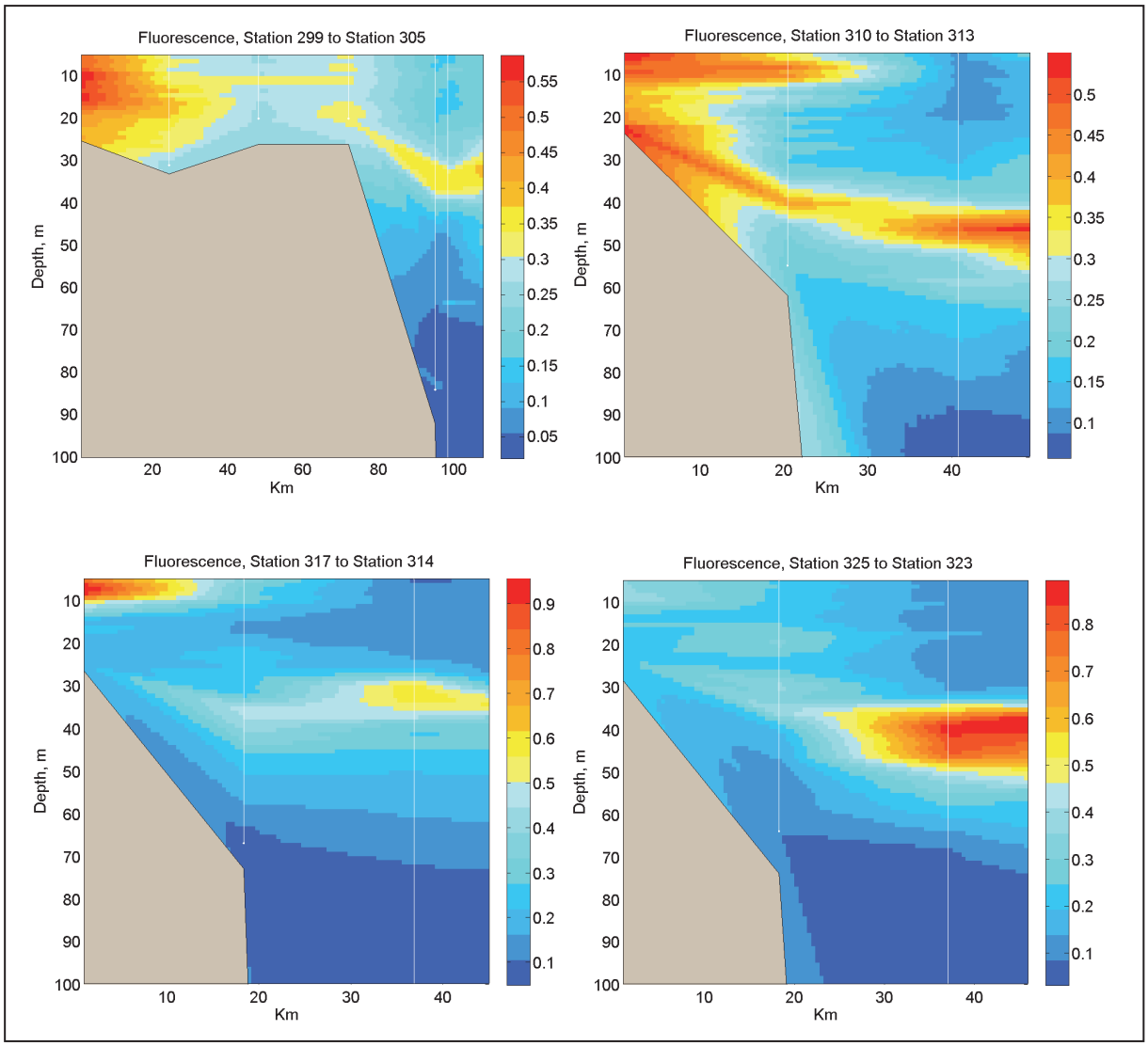

Figure 36. Fluorescence profiles in the upper 100 m of the water column in Sierra Leone.

3.1.4 Liberia

The continental shelf at the south-eastern part of the Liberia coast is very narrow; approximately 30 NM offshore the depth drops rapidly (Figure 37).

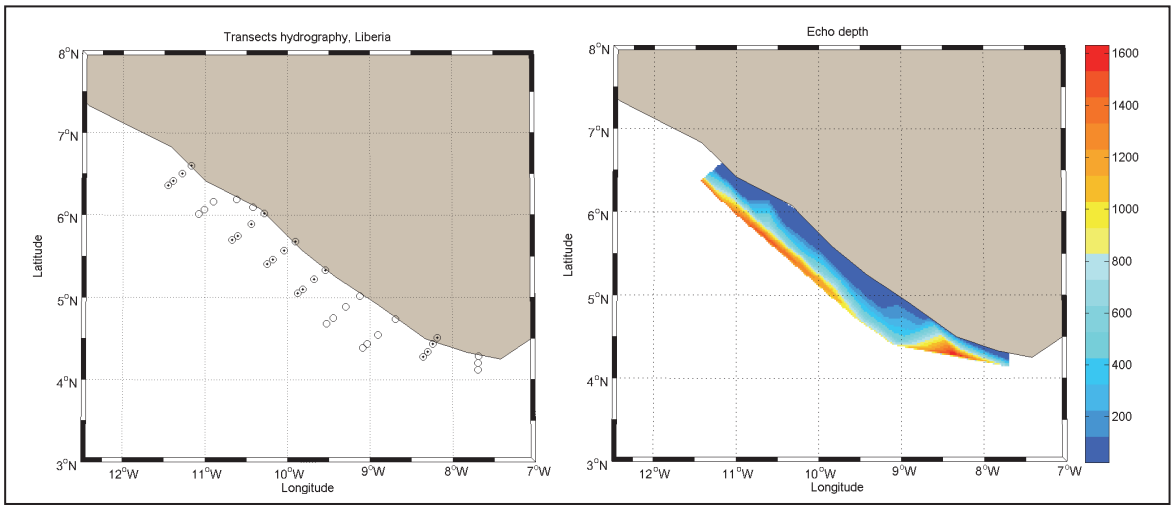

Figure 37. Positions of the CTD stations in waters off Liberia (left). Circles mark stations sampled for hydrography, dotted circles mark stations also sampled for ocean acidification variables. Right panel shows bottom depth (m) as registered by the ship's sounder.

3.1.4.1 Surface mixed layer

Profiles of water samples were analysed along nine transects on the Liberia continental shelf area (Figures 38 and 39). The upper 50 m of warm water was well oxygenated. A layer of saltier warm water occurred below 50 m depth off the shelf. At the top of this water where very high values of fluorescence were typically found, indicating an accumulation of primary producers below the bottom of the mixed water layer.

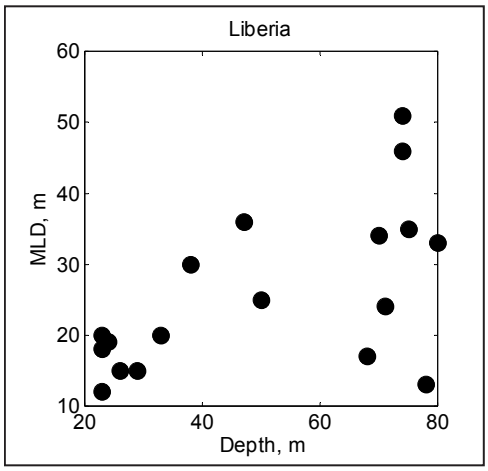

Figure 38. The depth of the mixed layer compared to the bottom depth in the shallower part of the area off the coast of Liberia.

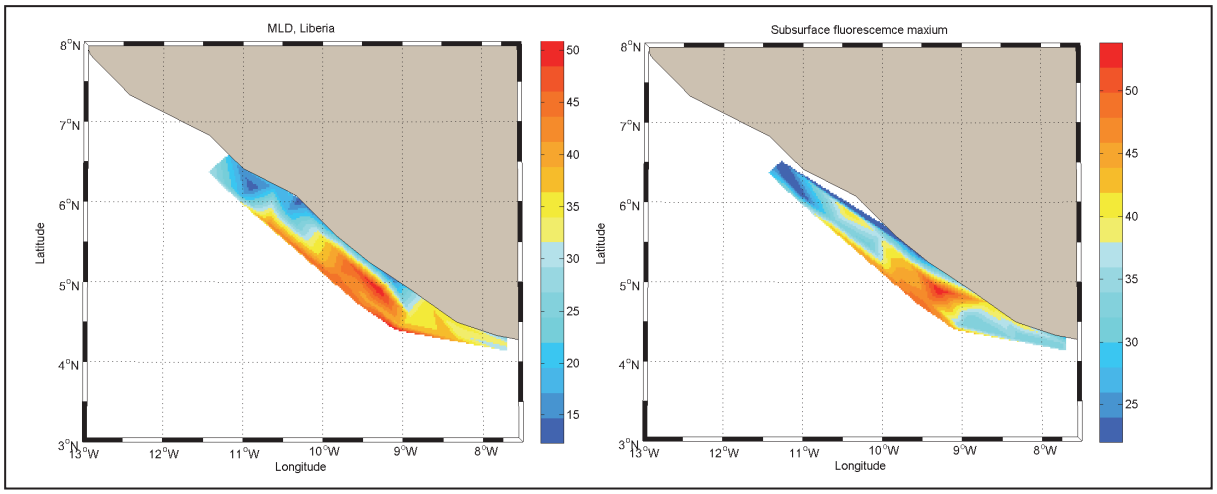

Figure 39. Mixed layer depth (left) and depth of subsurface chlorophyll maxima, where such maxima were present, in Liberia.

3.1.4.2 Surface horizontal distribution of hydrographic variables

The horizontal distribution of hydrographic variables in surface water is shown in Figure 40. Average temperature at 5 m depth was 25.0ºC (SD=0.3, min=26.2, max=27.5). Within this small range of temperatures, the warmer waters were at the edge of the continental shelf, with a further patch in middle of the area investigated.

Salinity at 5 m depth was on average 33.2‰ (SD=2, min=26.8, max=35.0). The less saline water was found close to the coast in the north, presumably created by freshwater runoff mixing into this area. Oxygen concentration at 5 m depth was relatively constant throughout area, showing a similar trend to fluorescence. The highest concentrations of oxygen and fluorescence were found in the north and close to the coast, co-occurring with the lowest salinities.

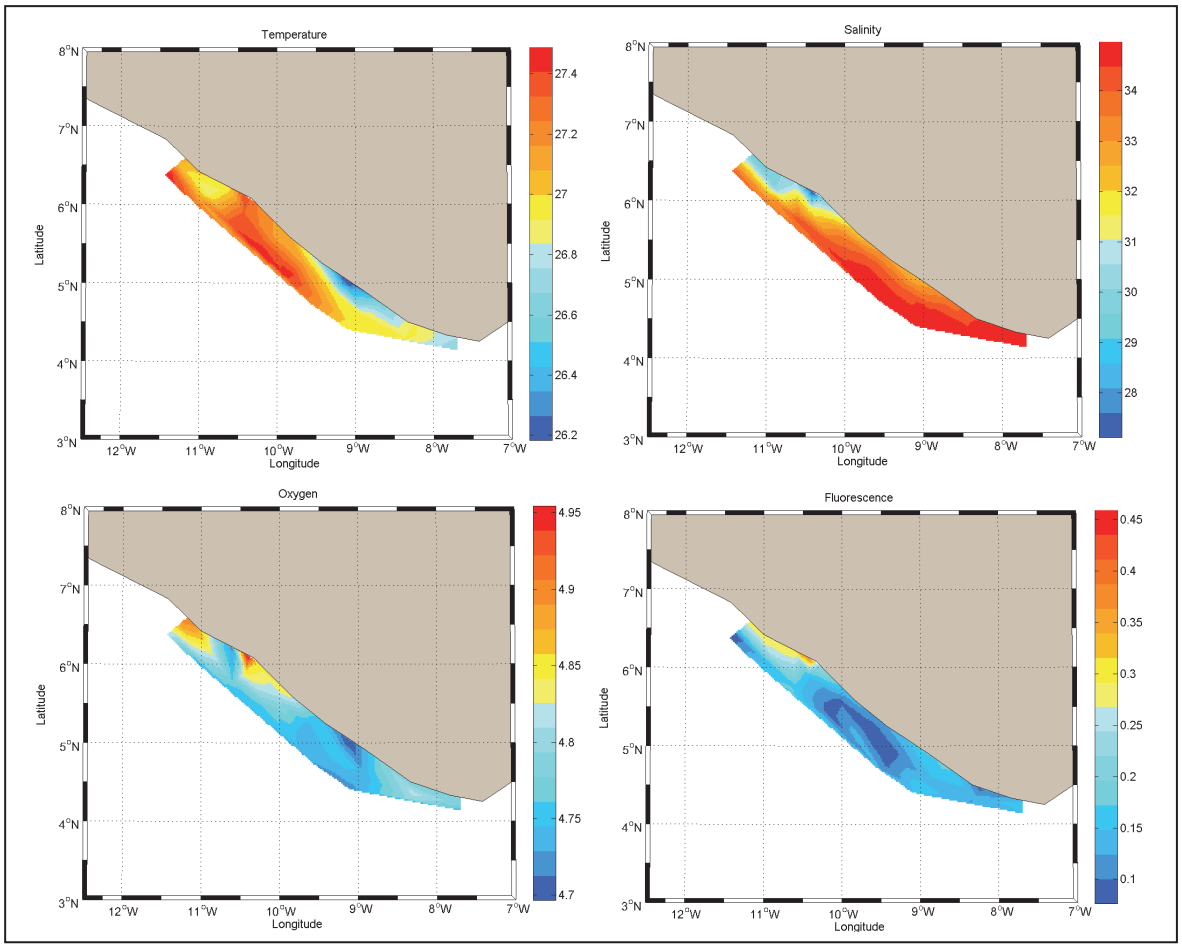

Figure 40. The horizontal distribution of sea surface temperature (ºC), salinity (‰), oxygen (ml/ml) and fluorescence in Liberia.

3.1.4.3 Vertical distributions of hydrographic variables determined from transects

Profiles of water samples were analysed along nine transects off the coast of Liberia, of which four are shown in Figures 41 to 44. Temperature in the mixed layer was on average 26.8ºC (SD=0.7, min=22.6, max=27.5). Temperature decreased with depth (Figure 41).

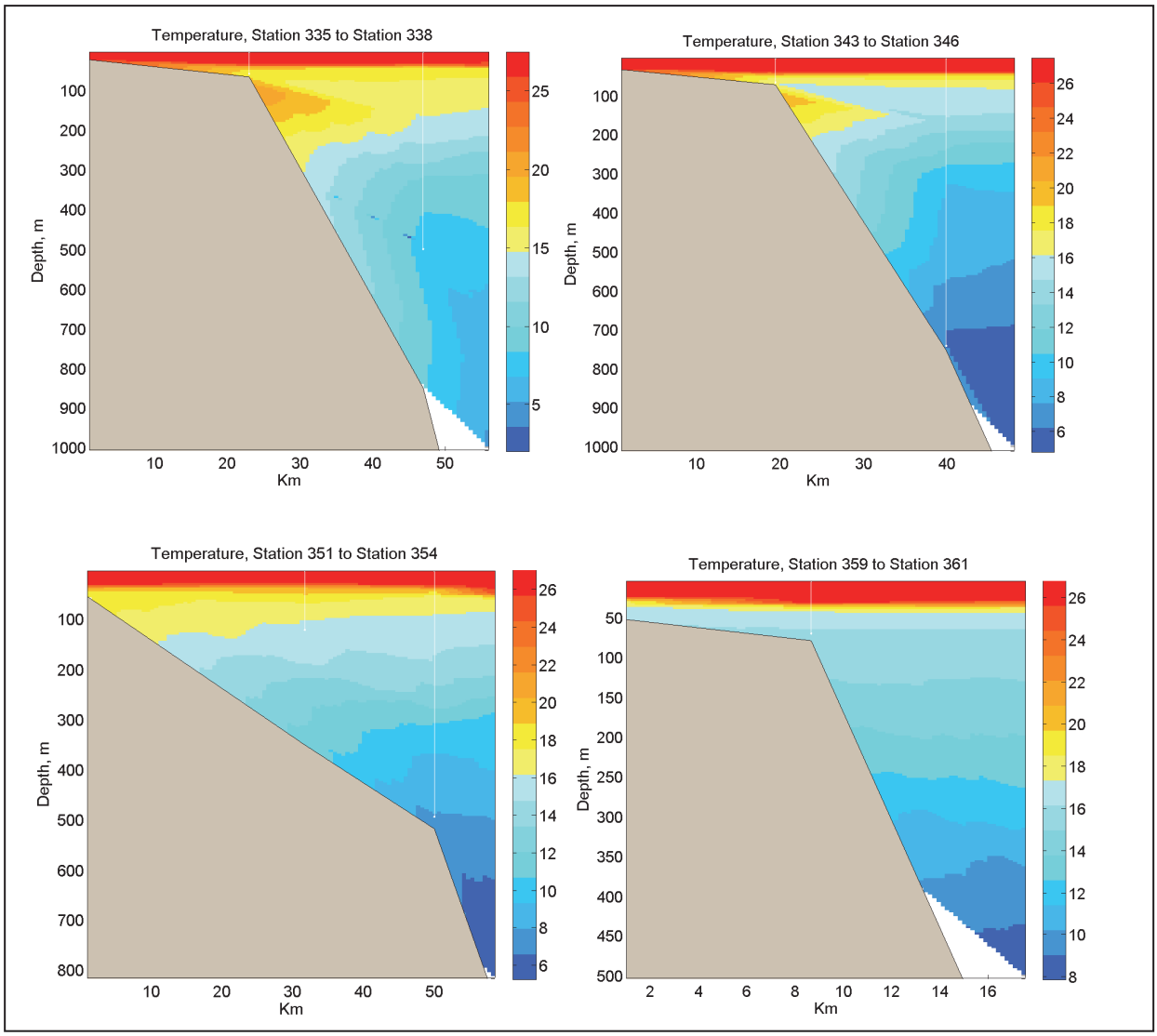

Figure 41. Temperature profiles in Liberia (ºC).

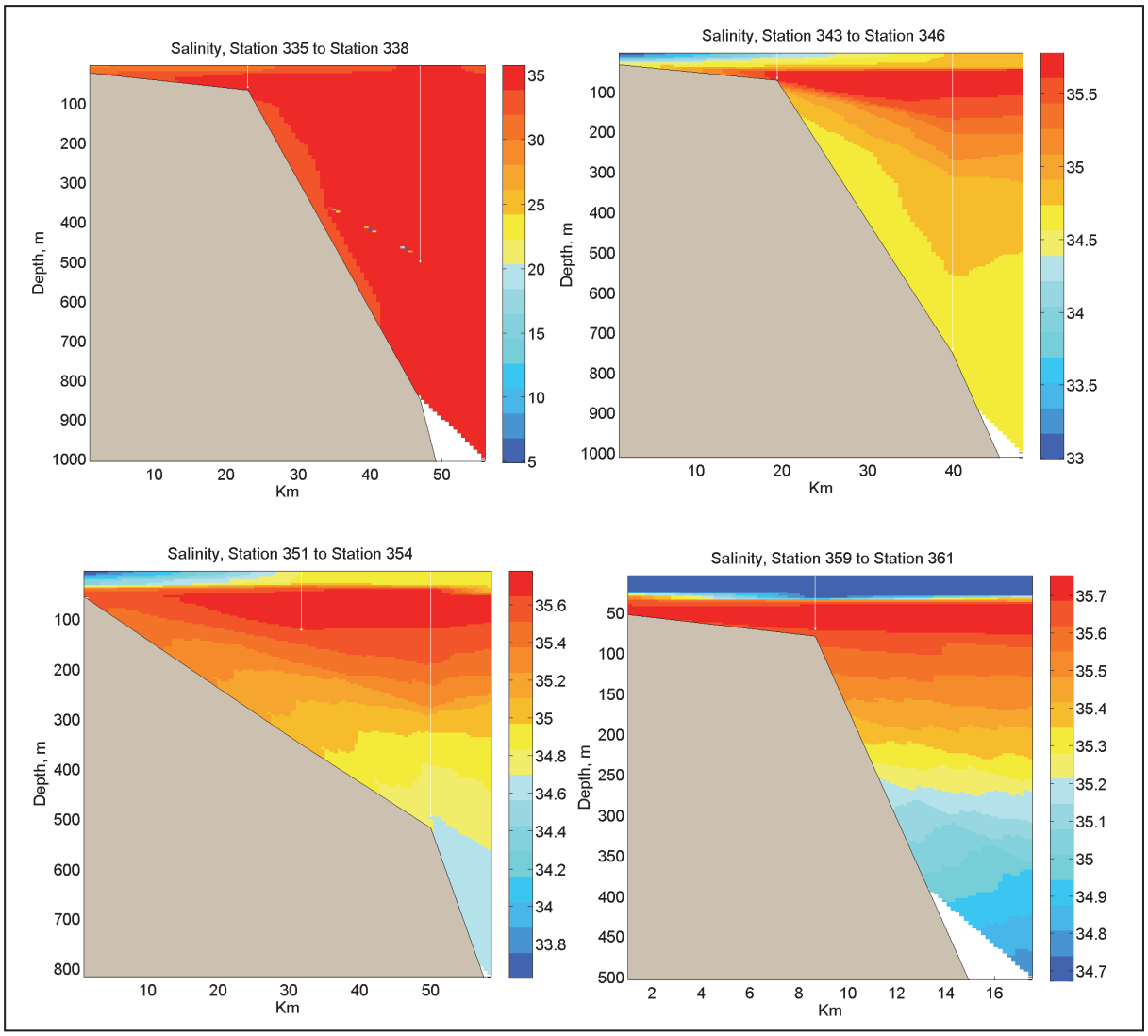

Figure 42. Salinity profiles in Liberia (□).

Salinity showed a clear horizontal gradient as indicated by the 5 m depth horizontal diagrams (Figure 42). Close to shore less saline water was present compared to the deeper part of the transects. The maximum salinity in the deep part of the transects was found approximately between 100 and 200 m depth. These higher salinity intermediate waters were less dense than the waters below because of the higher temperatures towards the surface.

The waters were well oxygenated at all stations examined (Figure 43). In shallow waters, less than 100 m deep, oxygen concentrations in the mixed layer averaged 4.6 ml/l (SD=0.3, min=3.2, max=5.1), at stations deeper than 100 m bottom depth the average oxygen concentration in the mixed layer was similar to the shallower part of the transects (average 4.6 ml/l, SD=0.35).

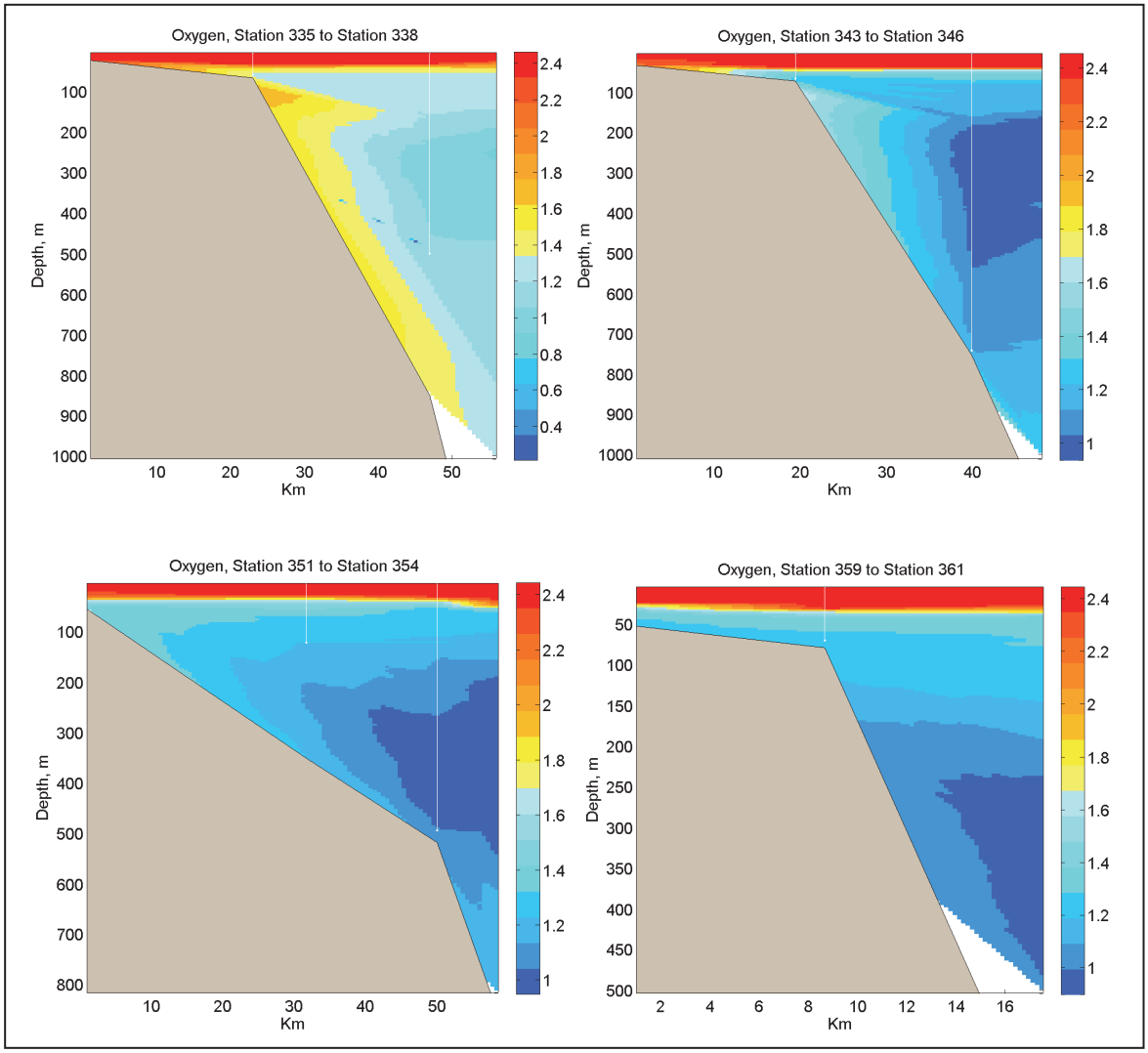

Figure 43. Oxygen profiles in Liberia (V).

Fluorescence levels in the upper mixed layer was homogenous (Figure 44). In the deeper parts of the transects, conspicuous layers of subsurface maximal concentrations were found.

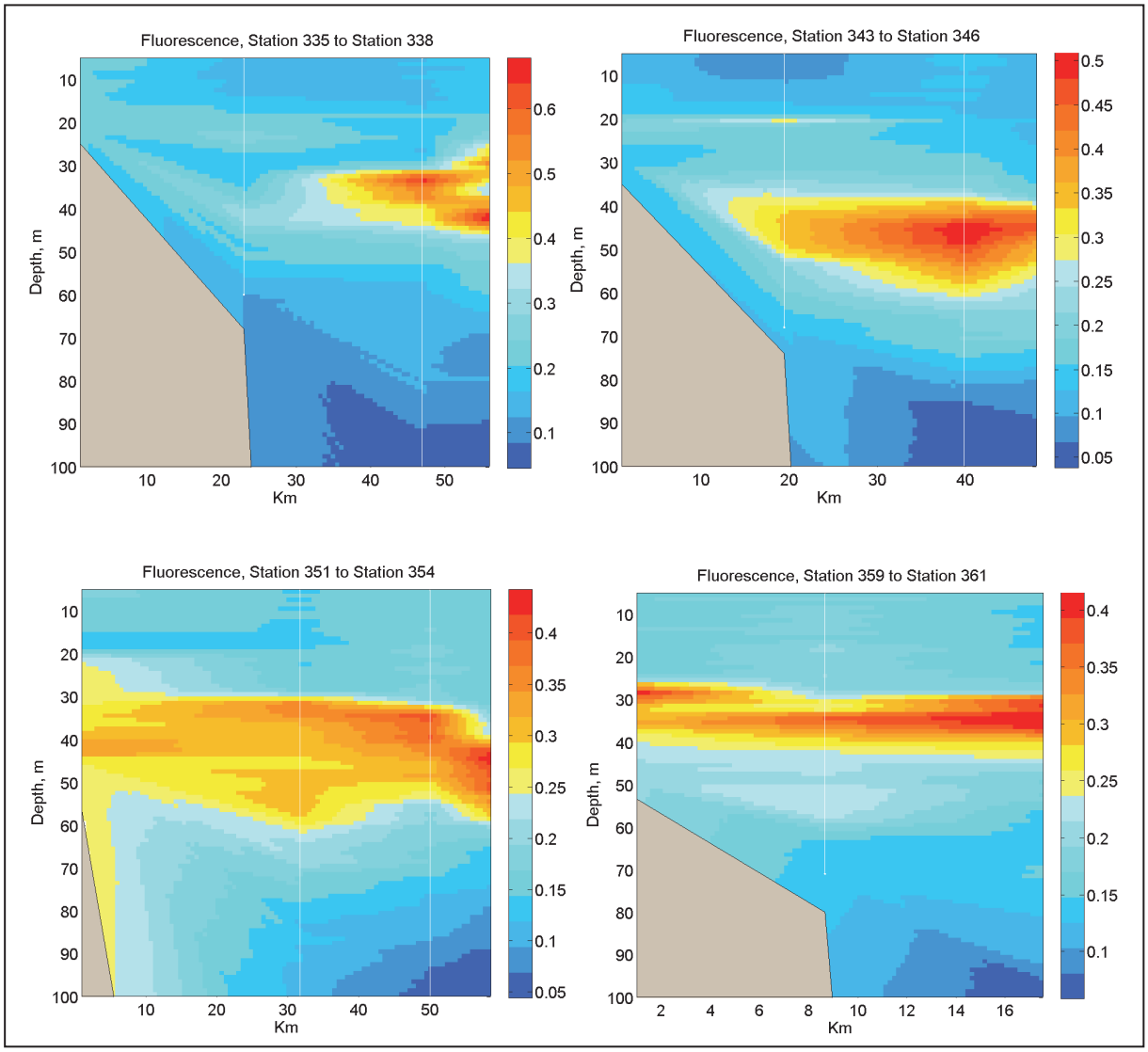

Figure 44. Profiles of fluorescence in the upper 100 metre from the transects in Liberia.

3.1.5 Deep water environmental transect

Data from this transect were collected at the end of the survey. They will be analysed after the survey and the results will be reported later.

3.2 Fish eggs and larvae

Most fish larvae were seen in the Manta trawl samples, but a few were also found in Multinet samples. Only the bigger fish larvae were photographed and counted (Figure 45). The rest were preserved for further examination after the survey. Table 6 provides preliminary results of counts of fish eggs and larvae.

Table 6. Summary of fish larvae sampling results**.**

Country	No. of sampling stations	No. of stations with fish larvae	Total No. of fish larvae	Samples preserved
Guinea Bissau	6	3	31	
Guinea Conakry	5	2	>300	7
Sierra Leone	9	5	84	22
Liberia	12	12	89	17
Deep-water transect	4	4	8	8
Total	36	26	/	54

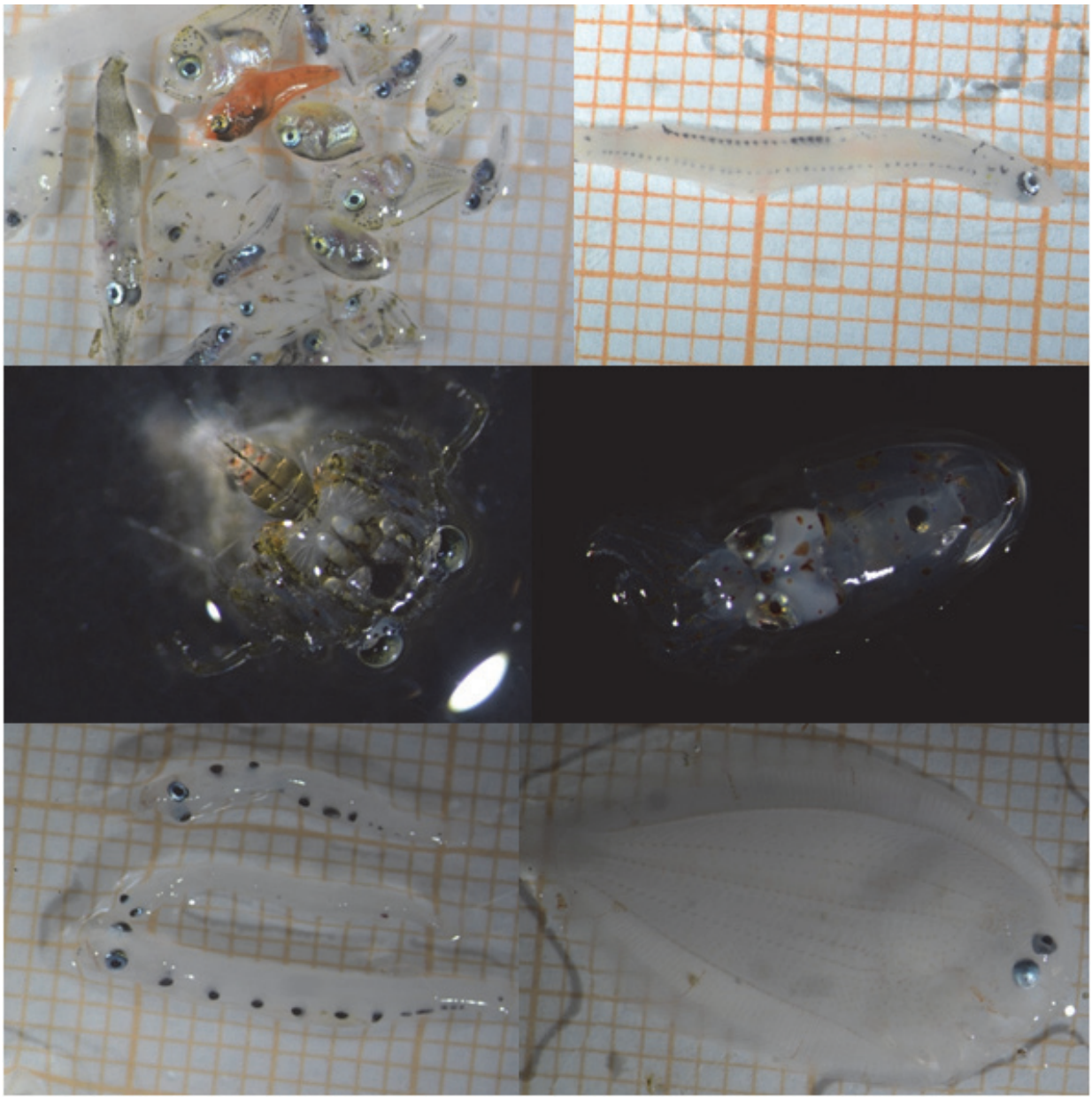

Figure 45. Examples of some of the larvae found in the Multinet and manta trawl samples: mixed fish larvae, fish larvae.

3.3 Phyto- and zooplankton

Samples containing phytoplankton and zooplankton from the phytoplankton vertical haul net and the vertical haul WP2 net will be analysed later and the results reported separately (Table 7).

Table 7. Number of samples of phyto- and zooplankton collected.

Sample	**Phytoplankton**	**Zooplankton from 200 m**		**Zooplankton from 25 m**	
Preservation	Formalin	Formalin	Freeze-fried	Formalin	Freeze-dried
Guinea Bissau	6	6	6	6	6
Guinea Conakry	6	4	4	5	5
Sierra Leone	9	6	6	9	9
Liberia	12	9	9	12	12
Deep-water transect	4	4	4	4	4
Total	37	29	29	36	36

3.4 Microplastics

The preliminary results of the on-board observations are presented in Table 8 (also see Figure 46). Detailed results will be reported separately.

Table 8. Summary of the results of microplastics sampling.

Country	**No. of sampling stations**	**No. of samples with visible microplastics**	**Total no. of plastic objects**	**No. of samples preserved in formaldehyde**	**No. of samples preserved by freezing**
Guinea Bissau	6	2	4	3	0
Guinea Conakry	6	3	18	6	8
Sierra Leone	9	7	28*	9	4
Liberia	11	3	3	17	0
Deep-water transect	4	0	0	0	0
Total	36	15	53	35	12

*6 of these contained red and yellow paint particles apparently originating from the sampling gear

Figure 46. A sample of microplastics and marine debris from a Manta trawl.

Throughout large parts of the survey numerous and extensive rafts of sargassum weed were encountered (see Figure 47). These rafts were first noticed in southern Guinea Bissau, but their frequency increased considerably in Guinea Conakry. Many of the rafts occurred in long strips, presumably scattered particles of weed that had become aggregated by converging currents. These rafts were generally several tens of meters long by a few meters wide and around 150 mm thick. On most days as many as 10 or more rafts could be seen at any one time within a visible distance of the vessel (approx. 500 m). In the central part of Guinea Conakry, the rafts were often as much as 100 m long and 10 m wide. Sightings of the weed continued through Sierra Leone, although these became less frequent in the southern part of the country. No sargassum weed was seen in the very southern part of Sierra Leone or Liberia.

One of the consequences of this floating weed was that at some stations fronds of weed were caught in the Manta net. These samples also contained many crabs, small fish, shrimps, amphipods etc. suggesting that the rafts were being used as a refuge (possibly from predation, UV light or turbulence) or as a feeding habitat (Figure 48). Some samples of the weed were frozen for more detailed examination onshore.

These rafts also contained large amounts of plastic. Clearly, some larger pieces had been caught in the same convergent currents and so drifted together with the weed, but many pieces were entangled with the weed. Some items were identified as small water bags, which are used by the crews of some of the fishing vessels operating in these countries.

It should also be noted that in some areas, especially close to major towns and cities, large plastic items, especially containers and plastic bags/sheets were frequently seen floating independently of these rafts of weed.

Figure 47. Typical raft of sargassum weed encountered in Guinea Conakry and Sierra Leone.

Figure 48. Close-up of the sargassum weed and a typical catch of some of the animals sheltering in the weed.

3.5 Food safety

Table 9 shows the number of samples collected for the various types of analysis of fish for the assessment of food safety. The analysis will be carried out at IMR (formerly NIFES), Bergen, Norway.

Table 9. The sampling done for analytical work for each species.

Species	No. of samples	No of positions	Tissue	Nutr.[1]	Cont.[2]	Other
Pseudupeneus prayensis	50	2	Fillet Liver	X	X	TBARS
Sardinella maderensis	24	1	Fillet Liver			TBARS
Sardinella maderensis small	3 x 25 3 x 25	2 2	Fillet w/skin + bone Whole fish	X	X	TBARS
Scomber colias	3 x 25 3 x 25	1 1	Fillet w/skin + bone Whole fish			TBARS
Sardinella aurita	3 x 25 3 x 25	1 1	Fillet w/skin + bone Whole fish	X	X	TBARS
Galeoides decadactylus	25	1	Fillet, liver, gut content	X	X	TBARS
Pseudotolithus senegalensis	50	2	Fillet, liver, gut content			TBARS
Drepane africana	25	1	Fillet, liver, gut content			TBARS
Sphyraena guachancho	25	1	Fillet, liver, gut content	X	X	TBARS

[1] Nutrition: Energy, water content, total fat, proteins, ash, fatty acids, cholesterol, amino acids, tryptophan, vitamins (D, A, E, K, C, thiamine, riboflavin, B6, B12, folate, niacin, pantotene, biotin), iodine, selenium and other minerals.

[2] Contaminants: Heavy metals, Inorganic arsenic, PAH, PBDE, PCB, dioxins, furans, PFAS, pesticides, HBCD, TBBPA.

TBARS = Thiobarbituric acid reactive substance

3.6 Top predator observations

Two observers scanned for cetaceans during most of the daylight hours of most days. The total time spent scanning, the nominal effort, was recorded each day (Table 10), although this includes time away from the deck for meals and other purposes. Scanning stopped when the weather was inclement, including on some days when the sea state was greater than Beaufort Force 3.

The observation platform was normally Deck 3, which is 11 m above sea level, although on a few days at the start of the survey the monkey deck (16 m a.s.l.) was used. The observers considered this deck too unsafe for use most days because of the rain, although it was rarely used even on dry days. The observation platform, which at 24.6 m a.s.l. would seem to be an ideal platform, was not used at it was considered by the observers to be too high, such that photographs of cetaceans would show the dorsal view rather than the lateral view, which is needed for photo identification.

Most groups sighted were photographed and the identification of the sightings still needs to be confirmed from these photos. A number of sightings were made by other members of the ship's crew, although photographs of most groups were taken by the observers. Only sightings observed by the observers are included in the results; Table 11 summarises the sightings.

Table 10. Cetacean sightings effort.

Deck	**Days sampled**	**Av. No. of hours/day***
Monkey deck	5	11
Fore-castle deck	22	9.55

*NB this value includes time not on deck including during inclement weather, meals, etc.

Table 11. Summary of sightings, with preliminary identifications.

	Total No. of animals sighted
Delphinus delphis	238
Tursiops truncatus	12
Megaptera novaengliae	40
Globucephalus macrorhynchus	64
Unidentified dolphin	6
Unidentified whale	3

Seabirds were monitored on an opportunistic, and highly sporadic, basis. However, some general qualitative observations on the species and numbers present are relevant.

The main observation was the paucity of seabirds throughout much of the region, while the species diversity was correspondingly low.

In Guinea Bissau, Guinea Conakry and Sierra Leone no birds were visible during almost all observation periods; sometimes several days would pass between sightings. In both Guinea Bissau and Guinea Conakry the total number of birds observed in each country was about 10 European storm petrels, several Arctic terns and a few unidentified "commic" tern[5]. Three

[5] The term ''commic tern'' is used for Artic and common terns, which are very similar and often difficult to distinguish in the field.

juvenile gannets, two brown boobies and one swift tern were also recorded. Even less birds were seen in Sierra Leone: eight Arctic terns, eight commic terns and a single unidentified skua. The numbers of Arctic and commic terns increased somewhat in Liberia with a few birds often within sight of the vessel. Of the other species observed only a single juvenile gannet and one skua were seen. A raft of many dozens of "small grey" birds were seen passing the vessel one night in Liberia, but were not identified. No birds were seen on the deep-water environmental transect or the transit to Monrovia, apart from a single white-fronted petrel which landed on the vessel during the transit to Monrovia.

3.7 Biology of target pelagic fish species

With the expanding scope of the research to be carried out in the context of the EAF-Nansen Programme, the survey objectives and related sampling strategy have been expanded to support research on life cycles, stock identities, and trophic relationships of pelagic fish. For these facets, special effort was made to sample several biological parameters (otoliths, fin clips, stomachs) and stage gonad maturity for post-survey age and growth, stock structure, population biology and trophic interaction studies. Annexes V and VI report the numbers of samples collected. These samples will be analysed later and the results reported separately (see Annex XII).

Mesopelagic fish were sampled at seven stations, and were preserved for subsequent analysis along with the crustaceans and squids in the same catches. Nine stations, with approximately 25 samples of jellyfish (for University of Cape Town) and 30 *Pomadasys sp*. from nine stations (for FAO) were also collected.

The on-board analysis of key biological parameters, notably length-weight, sex, maturity and stomach fullness, is presented below.

3.7.1 Guinea Bissau

3.7.1.1 Sex-ratio

Relatively few fish of the target species were recorded in Guinea Bissau and hence the sample sizes are small; just four *Sardinella aurita*, 74 *S. maderensis* and 30 *Scomber colias* were sampled. *S. maderensis* showed a skewing towards more males than females, while all *S. colias* were females (Figure 49).

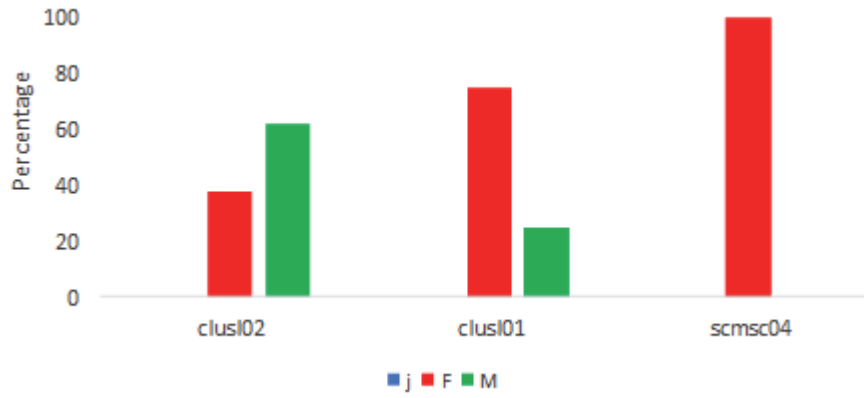

Figure 49. Sex-ratio of target species in Guinea Bissau, n=74, 4 and 30 respectively (clusl02=*Sardinella maderensis*, clusl01=*Sardinella aurita*, scmsc04=*Scomber colias, see Appendix IV for key to scales*).

3.7.1.2 Sexual maturity

All individuals of *S. colias* sampled were juveniles. Most *S. maderensis* were mature (stages 3 and 4), while too few *S. aurita* were sampled for the results to be meaningful (Figure 50).

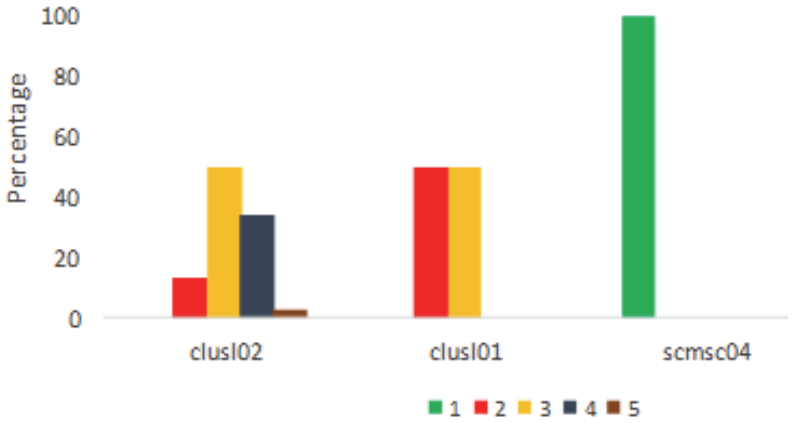

Figure 50. Sexual maturity of target species in Guinea Bissau, n=74, 4 and 30 respectively (clusl02=*Sardinella maderensis*, clusl01=*Sardinella aurita*, scmsc04=*Scomber colias, see Appendix IV for key to scales*)

3.7.1.3 Stomach fullness

The *S. maderensis* examined had mostly partly full to full stomachs, while the few *S. aurita* sampled had empty stomachs (Figure 51).

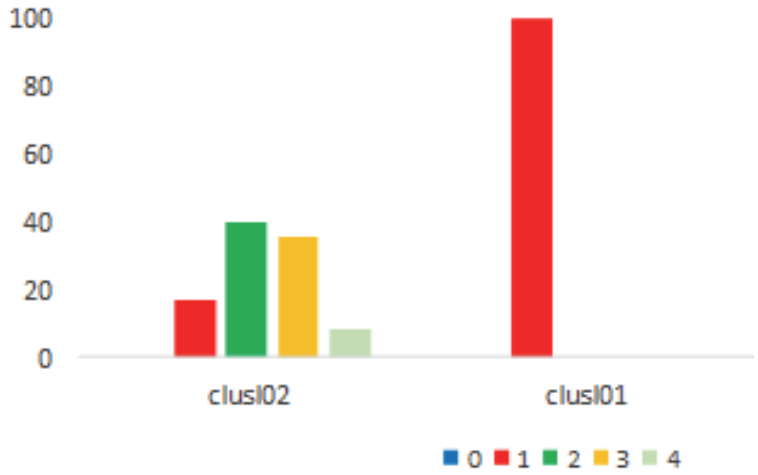

Figure 51. Stomach fullness of target species in Guinea Bissau, n=71 and 4 respectively (clusl02=*Sardinella maderensis*, clusl01=*Sardinella aurita, see Appendix IV for key to scales).*

3.7.2 Guinea Conakry

3.7.2.1 Sex-ratio

The majority of *Scomber colias* analysed were males, while the sardinellas and *Decapterus spp.* were more evenly distributed (Figure 52). Around 40% of *Decapterus punctatus* and 85% of *D. rhonchus* were juveniles.

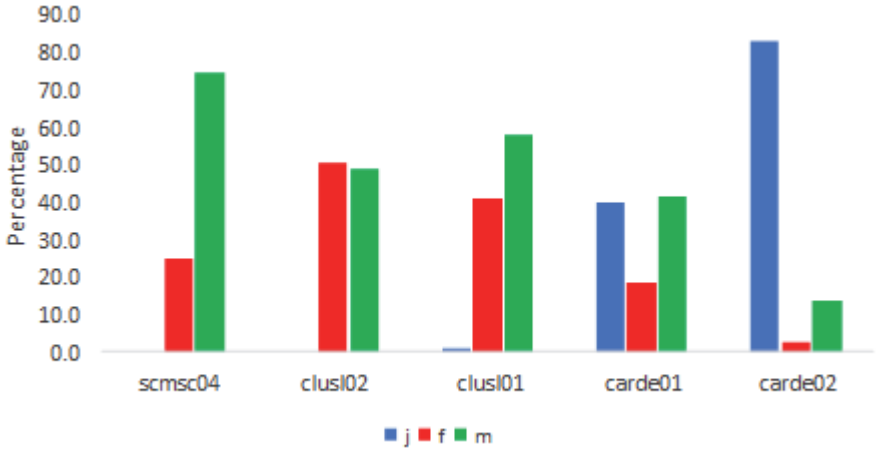

Figure 52. Sex-ratio of target species in Guinea Conakry, n=116, 252, 331, 70 and 36 respectively (scmsc04=*Scomber colias,* clusl02=*Sardinella maderensis*, clusl01=*Sardinella aurita*, carde01=*Decapterus punctatus*, carde02= *Decapterus rhonchus*).

3.7.2.2 Sexual maturity

S. colias and *S. aurita* showed a range of maturity stages from immature to pre-spawning, but *S. maderensis* were more advanced with a significant proportion being ripe. *D. punctatus* were mostly immature fish, with some immatures and pre-spawners, while *D. rhonchus* were almost entirely immature fish (Figure 53).

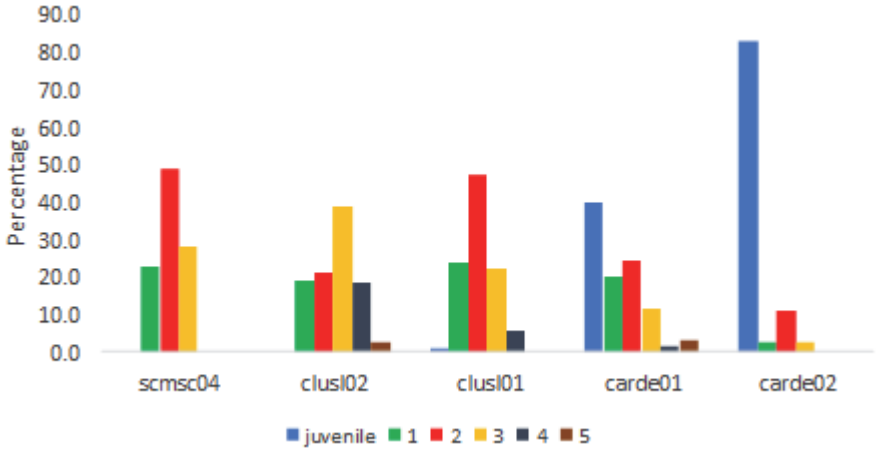

Figure 53. Sexual maturity of target species in Guinea Conakry, n=116, 251, 331, 70 and 36 respectively (scmsc04=*Scomber colias,* clusl02=*Sardinella maderensis*, clusl01=*Sardinella aurita*, carde01=*Decapterus punctatus*, carde02= *Decapterus rhonchus, see Appendix IV for key to scales*).

3.7.2.3 Stomach fullness

Most samples of all species had partially full stomachs, while all species had a small proportion with full stomachs, apart from *Decapterus* sp., which had more than 60% "empty" or "very little content" stomachs (Figure 54).

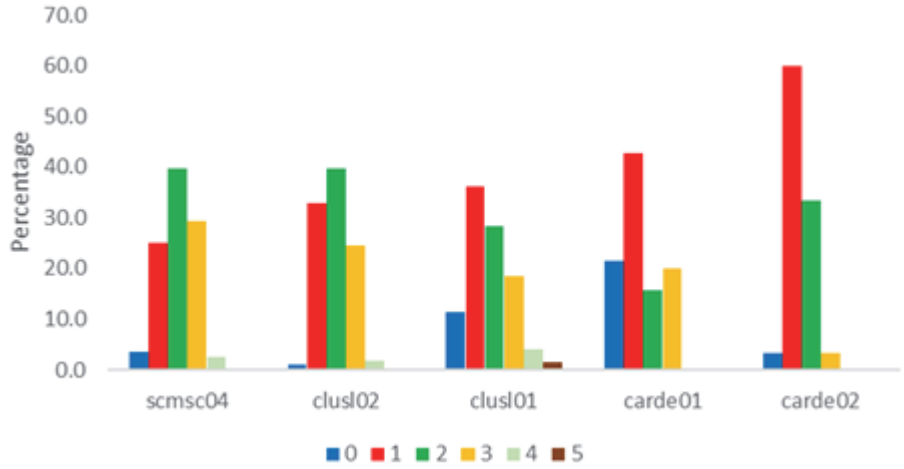

Figure 54. Stomach fullness of target species in Guinea Conakry, n=116, 244, 329, 70 and 30 respectively (scmsc04=*Scomber colias,* clusl02=*Sardinella maderensis*, clusl01=*Sardinella aurita*, carde01=*Decapterus punctatus*, carde02= *Decapterus rhonchus, see Appendix IV for key to scales).*

3.7.3 Sierra Leone

3.7.3.1 Sex-ratio

Most of the *S. maderensis* sampled in Sierra Leone were juveniles, while the *S. aurita* were adults. Interestingly most of the *D. punctatus* were females (Figure 55).

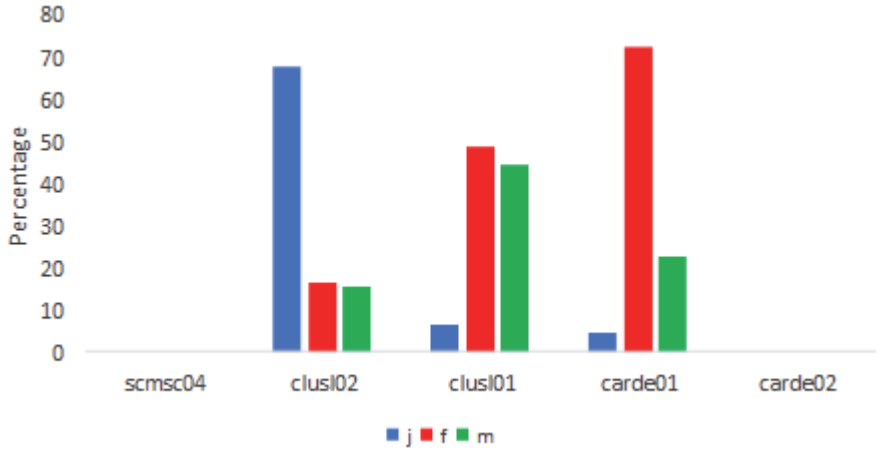

Figure 55. Sex-ratio of target species in Sierra Leone, n=0, 229, 45, 22 and 0 respectively (scmsc04=*Scomber colias,* clusl02=*Sardinella maderensis*, clusl01=*Sardinella aurita*, carde01=*Decapterus punctatus*, carde02= *Decapterus rhonchus*).

3.7.3.2 Sexual maturity

As noted above the *S. maderensis* were mostly juveniles. Some of the *S. aurita,* and most *D. rhonchus* were close to spawning (Figure 56). *S. aurita* are reported by Sierra Leonian scientists to have two spawning periods; August to October and February to April. This survey was conducted in the early part of the former period and therefore the high proportion of fish in pre-spawning condition was to be expected.

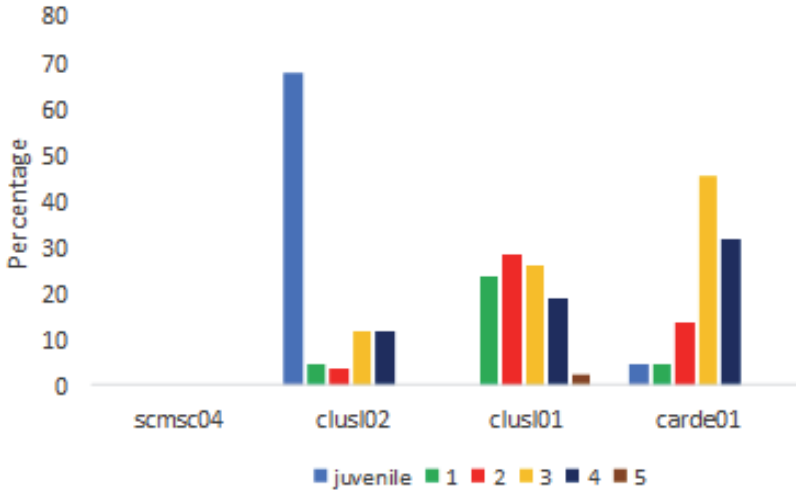

Figure 56. Sexual maturity of target species in Sierra Leone, n=0, 229, 42 and 22 respectively (scmsc04=*Scomber colias,* clusl02=*Sardinella maderensis*, clusl01=*Sardinella aurita*, carde01=*Decapterus punctatus, see Appendix IV for key to scales*).

3.7.3.3 Stomach fullness

For all species, most of the samples had “some content” or “full” stomachs (Figure 57).

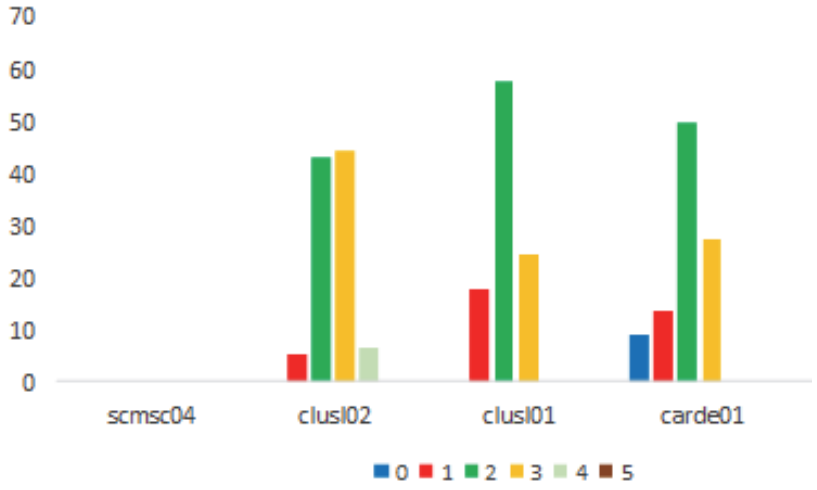

Figure 57. Stomach fullness of target species in Sierra Leone, n=0, 74, 45 and 22 respectively (scmsc04=*Scomber colias,* clusl02=*Sardinella maderensis*, clusl01=*Sardinella aurita*, carde01=*Decapterus punctatus, see Appendix IV for key to scales*).

3.7.4 Liberia

3.7.4.1 Sex-ratio

The sex ratio of all species sampled in Liberia ranged from about 40-60% males (and consequently 60-40% females) with the exception of Sardinella maderensis where over 60% of the fish sampled were juveniles (Figure 58).

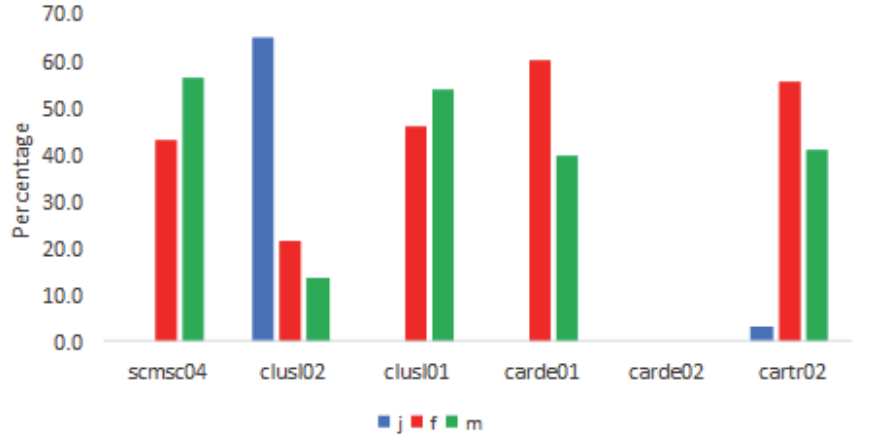

Figure 58. Sex-ratio of target species in Liberia, n=90, 89, 104, 15, 0 and 61 respectively (scmsc04=*Scomber colias,* clusl02=*Sardinella maderensis*, clusl01=*Sardinella aurita*, carde01=*Decapterus punctatus*, carde02= *Decapterus rhonchus, cartr02=Trachurus trecae*).

3.7.4.2 Sexual maturity

As already noted *S. maderensis* were mostly juveniles, but of the sexually mature many of the fish sampled were "ripening" or "ripe" (Figure 59).

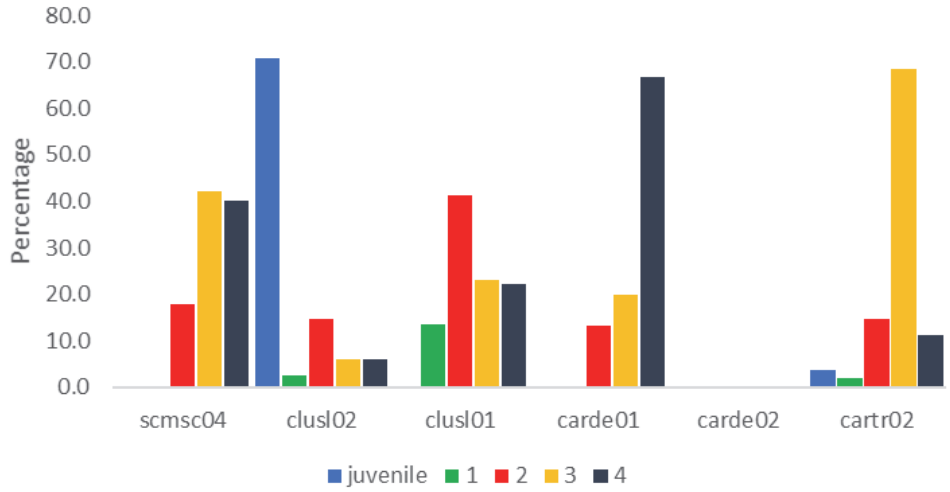

Figure 59. Sexual maturity of target species in Liberia, n=90, 82, 104, 15, 0 and 54 respectively (scmsc04=*Scomber colias,* clusl02=*Sardinella maderensis*, clusl01=*Sardinella aurita*, carde01=*Decapterus punctatus*, carde02= *Decapterus rhonchus, cartr02=Trachurus trecae, see Appendix IV for key to scales*).

3.7.4.3 Stomach fullness

Scomber colias and *Sardinella maderensis* had a range of stomach fullesses, but most samples of the other species were empty (Figure 60).

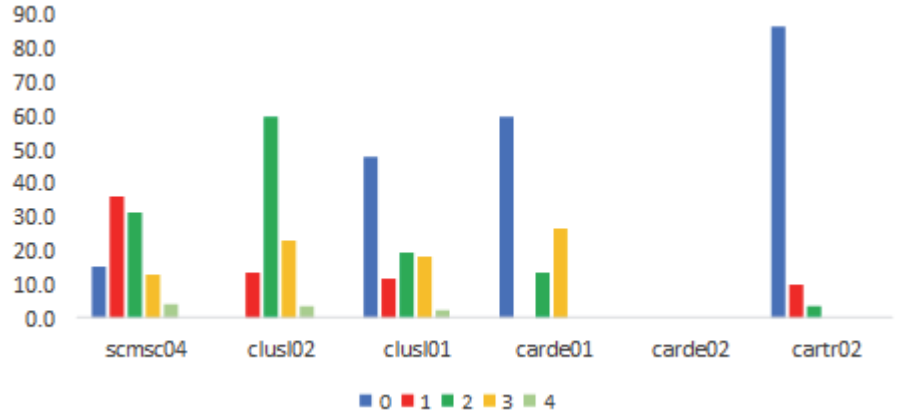

Figure 60. Stomach fullness of target species in Liberia, n=77, 30, 87, 15, 0 and 59 respectively (scmsc04=*Scomber colias,* clusl02=*Sardinella maderensis*, clusl01=*Sardinella aurita*, carde01=*Decapterus punctatus*, carde02= *Decapterus rhonchus, cartr02=Trachurus trecae, see Appendix IV for key to scales*).

3.8 Distribution and size of pelagic fish

This chapter contains details of the distribution of the various target species and some brief comments on the size of the fish, especially sardinella. Length frequency graphs of both sardinella species are included here while the length frequency graphs of the other species are to be found in Annex IX.

3.8.1 Guinea Bissau

Of the main target species (see Table 5) only sardinellas were found over an extended area. One small region of *S. colias* was found, with another region containing mixed pelagic species. *Trachurus trecae* were caught in one trawl, but only 0.5 kg. It was not possible to generate a biomass estimate from this. No *Engraulis encrasicolus* were found.

3.8.1.1 Sardinellas

Sardinella aurita and *S. maderensis* occurred along much of the coastline in relatively shallow waters, mostly in less than 50 m depth (Figure 62). They occurred at a low density throughout this region. *S. maderensis* dominated the catches, indeed 97% of the sardinellas caught in Guinea Bissau were *S. maderensis* (based on the total catch of all the trawls). These fish were mostly adults with a modal length of 23 cm (Figure 61). The few *S. aurita* caught were in the northern nearshore part of the distribution range of the sardinellas. The density of sardinellas was low in all parts of the distribution range.

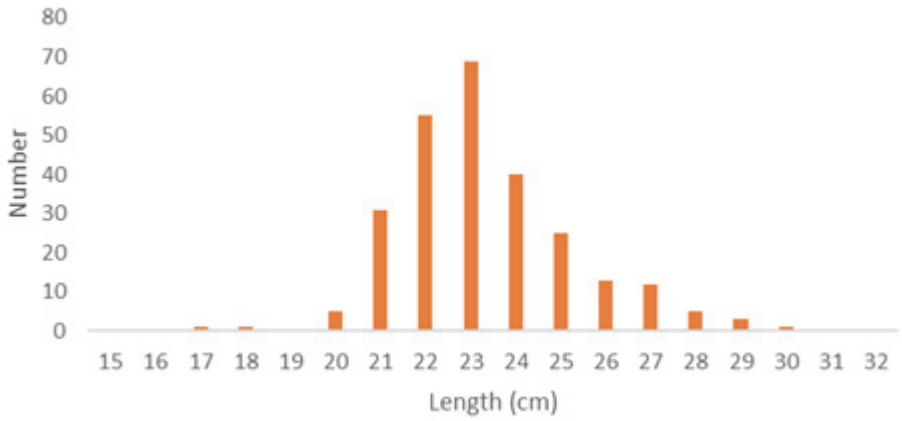

Figure 61. Length frequency distribution of *Sardinella maderensis* in Guinea Bissau (n=261).

3.8.1.2 Horse mackerel

No horse mackerel were caught in Guinea Bissau.

3.8.1.3 Pelagic I fish

Small amounts of *Ethmalosa fimbriata* and *Illisha* africana were recorded in a single trawl (0.74 kg and 4.7 kg respectively), indicating that the distribution and abundance of these species were extremely limited, while no *Engraulis encrasicolus* were caught.

3.8.1.4 Pelagic II fish

Scomber colias and *Decapterus* sp. (both *D. rhonchus* and *D. punctatus*) were found in small areas in Guinea Bissau waters. They were sufficiently clearly separated that it was possible to define their distributions and abundances separately. *S. colias* occurred in one small patch in about 165 m water depth (Figure 63). These fish were found close to the seabed mixed with a typical community of demersal fishes (*Antigonia capros*, *Ariomma bondi*, *Synagrops microlepsis* and others). They had a length frequency between 18 and 22 cm (Annex IX). Juvenile *D. punctatus* and mixed adult and juvenile *D. rhonchus* occurred along the final transect in Guinea Bissau, close to the border with Guinea Conakry (Figure 64).

Trichiurus lepturus, Chloroscombrus chrysurus, Trachinotus ovatus and *Selene dorsalis* were widespread in the northern and central waters of Guinea Bissau. The total catches of these species were of 73 kg (6 trawls), 6 kg (4 trawls), 18 kg (3 trawls) and 22 kg (4 trawls) respectively. Other Pelagic II species caught were *Caranx rhonchus* (catch rate 1 kg – 1 trawl), *Caranx crysos* (1 kg – 2 trawls), *Trachinotus maxillosus* (2 kg – 1 trawl) and *Euthynnus alletteratus* (1 kg – 1 trawl). This suggests that much of the total biomass of Pelagic II fish was made up of the former four species

3.8.1.5 Other fish

Many other semi-pelagic and demersal species were also caught in Guinea Bissau, but several had high catch rates and are therefore mentioned here.

Brachydeuterus auritus was caught in three trawls, but two had a particularly high catches (124 and 34 kg). *Pagellus bellottii* and *Pseudupeneus prayensis* were each caught in three trawls, *Sphyraena guachancho* was caught in one trawl and while *Antigonia capros* was only caught in one trawl the catch was particularly high (65 kg). The length frequencies of many of these species are presented in Annex IX.

Figure 62. Distribution of sardinellas, Guinea Bissau (density units=mm^2/nm^2 of acoustic backscatter). Depth contours as in Figure 3.

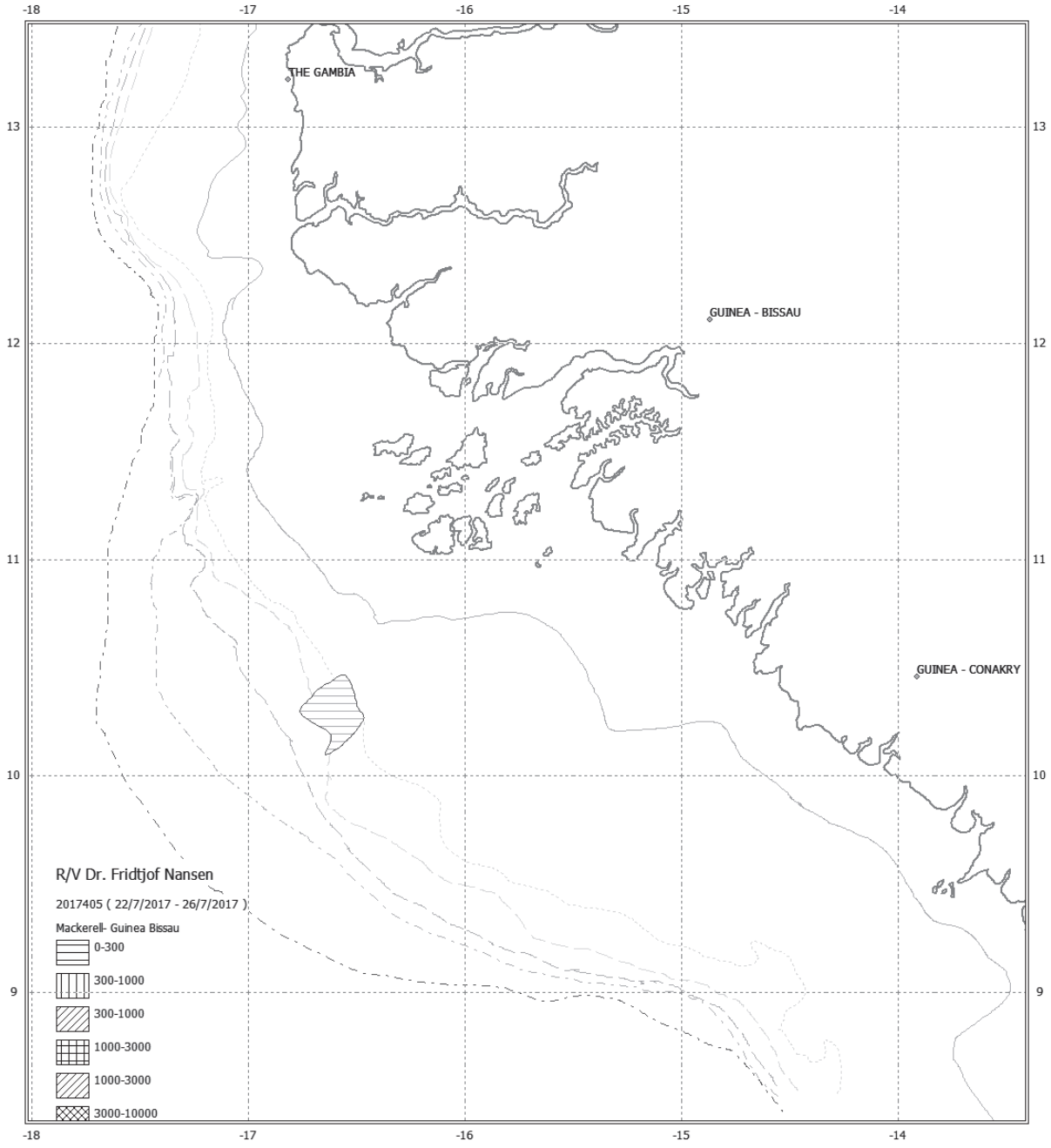

Figure 63. Distribution of *Scomber colias* in Guinea Bissau (density units=mm^2/nm^2 of acoustic backscatter). Depth contours as in Figure 3.

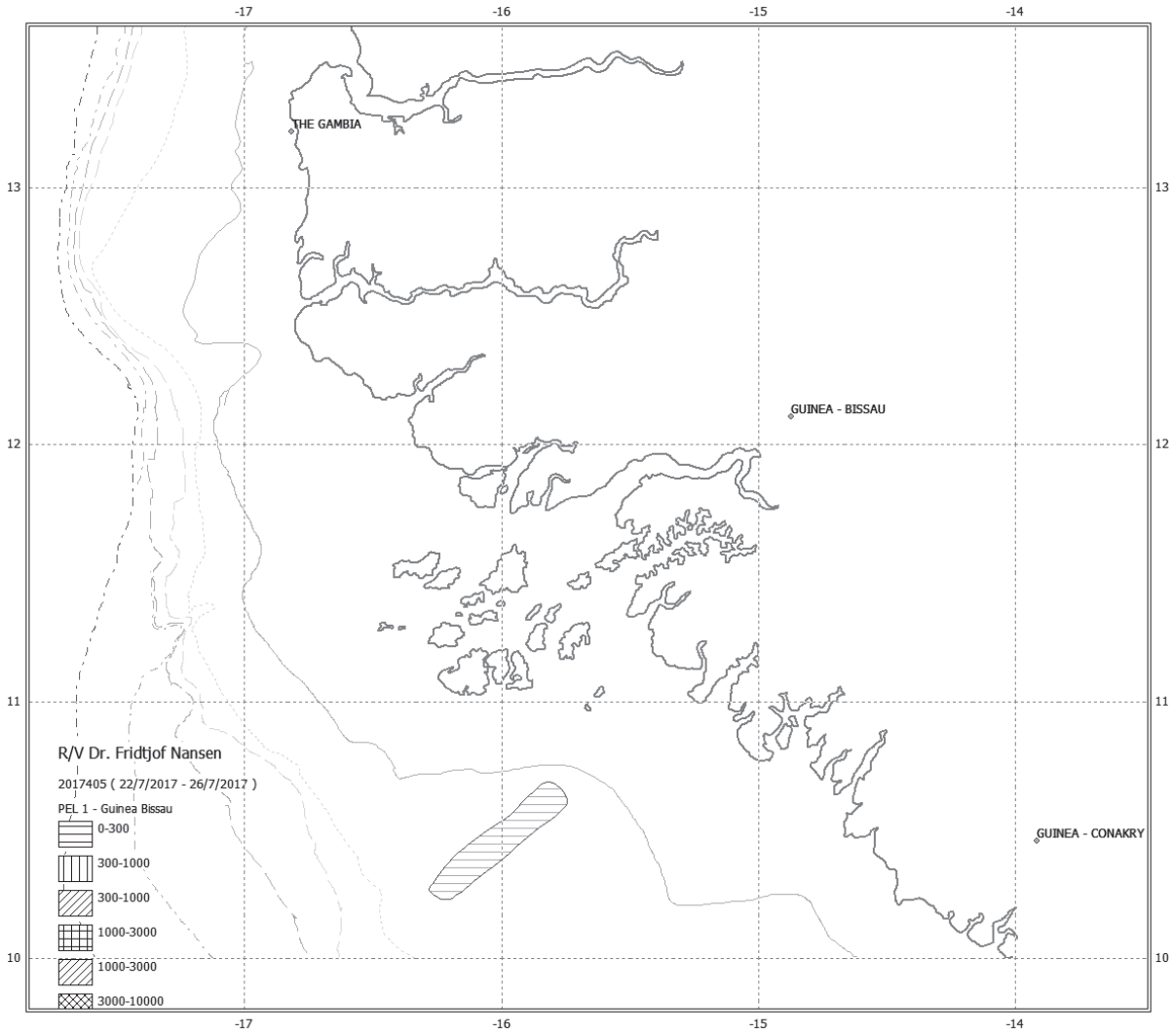

Figure 64. Distribution of *Decapterus* sp. in Guinea Bissau (density units=mm^2/nm^2 of acoustic backscatter). Depth contours as in Figure 3.

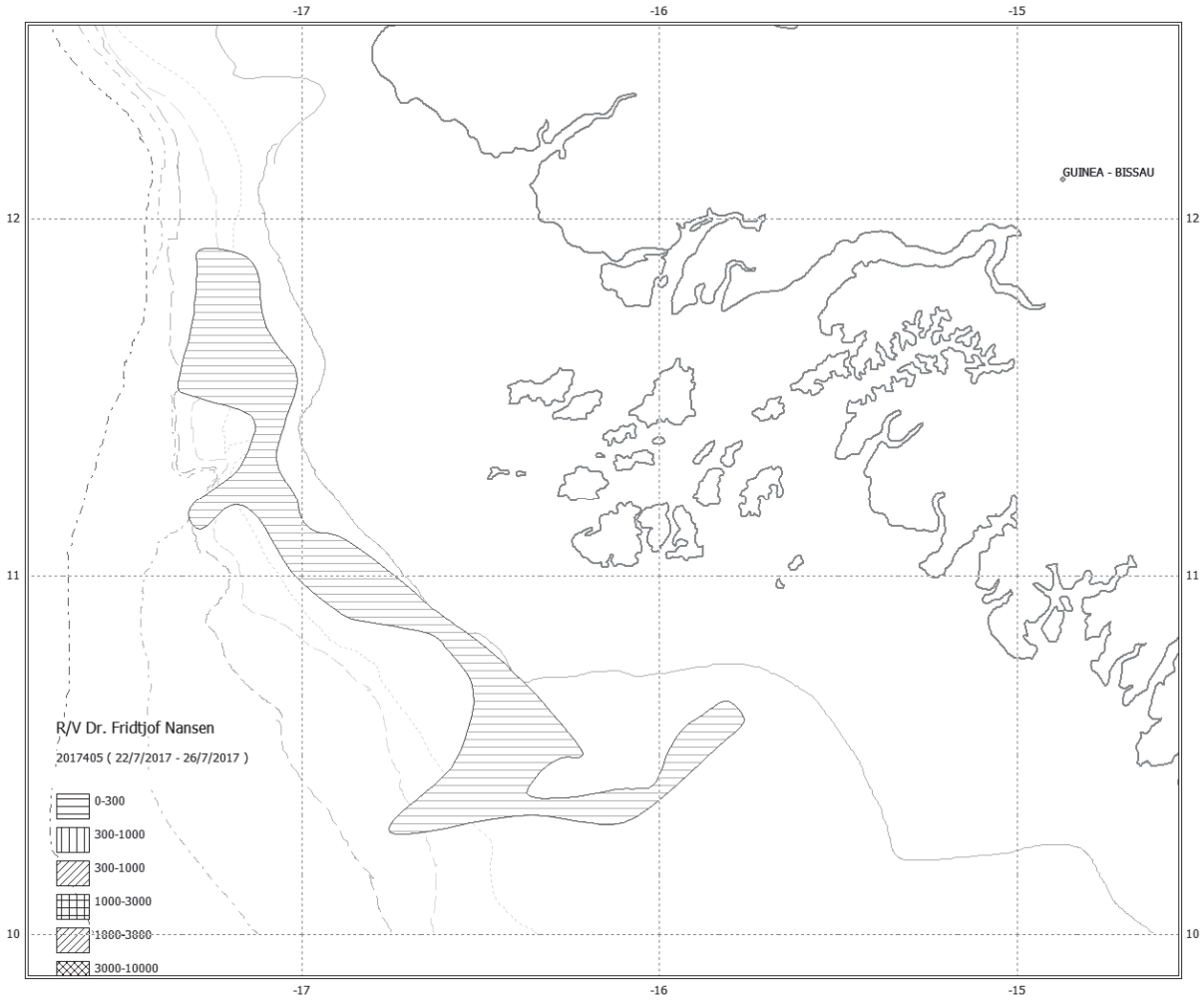

Figure 65. Distribution of other Pelagic II fish, Guinea Bissau (density units=mm^2/nm^2 of acoustic backscatter). Depth contours as in Figure 3.

3.8.2 Guinea Conakry

As in Guinea Bissau, sardinellas were the only target species that were found in any abundance. Small amounts of *S. colias* and *Decapterus* sp. were found in regions containing mixed pelagic species. No *Engraulis encrasicolus* or *Trachurus* sp. were found.

3.8.2.1 Sardinellas

Sardinella aurita and *S. maderensis* were found throughout much of the Guinea Conakry shelf waters, from close inshore to the 100 m shelf break (Figure 68). The densities were often low, but in some extensive areas the density was moderately high, especially on the outer shelf in the southern part of the country. *S. maderensis* dominated the catches in the large inshore strata (Strata 2, 6 and 7), while *S. aurita* was the main species caught in the offshore area in the southern part of the country (Stratum 4, Table 12).

Stratum 2, which was in the north, was mostly *S. maderensis* but a few *S. aurita* were caught in almost all trawls that contained sardinella. Mixed juvenile and adult *S. maderensis* occurred

in this stratum. Stratum 4 was a large area on the outer edge of the shelf. The trawls in this stratum caught almost entirely *S. aurita* including some sub-adult fish. Stratum 5 was along the inshore area and contained a mixture of both species; some trawls were entirely *S. aurita*, some *S. maderensis* while others had both species. A small proportion of juveniles of both species occurred in this stratum. Two strata were positioned in the central part of the shelf, Stratum 6 in the south and Stratum 7 further north. Stratum 6 contained a mixture of both species; with the *S. aurita* being relatively small fish with length frequency modes at 15 and 19 cm. Stratum 7 contained almost entirely *S. maderensis*.

The catches indicates that overall *S. aurita* comprised 61% of the stock (see Table 17 in Chapter 3.9).

Table 12. Total catch and proportions of sardinellas in the various strata in Guinea Conakry.

	No. of trawls	***S. aurita***		***S. maderensis***	
		Total catch (kg)	**Proportion**	**Total catch (kg)**	**Proportion**
Stratum 2	8	41	5%	811	95%
Stratum 4	4	66	98%	1	2%
Stratum 5	7	3 240	47%	3 685	53%
Stratum 6	1	8	14%	49	86%
Stratum 7	1	2	2%	110	98%

The length-frequency of *S. maderensis* was largely unimodal around 20 cm, but with some larger individuals (>26 cm) and very few smaller fish (13-15 cm) (Figure 66). In contrast, two cohorts were clearly present in the *S. aurita* population, one with a modal length of 21-22 cm and a second of juvenile fish with a modal length of 14 cm (Figure 67).

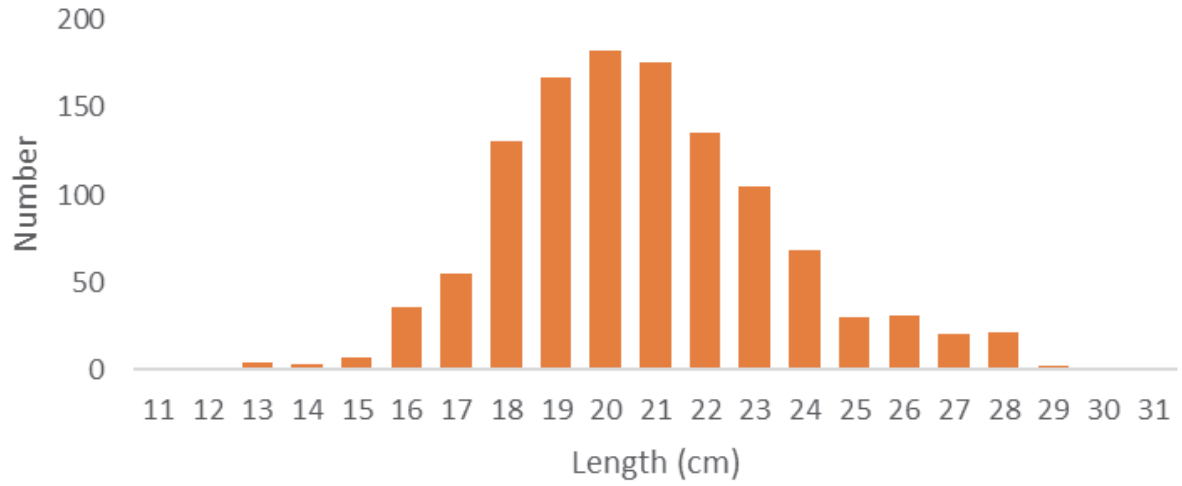

Figure 66. Length frequency distribution of *Sardinella maderensis* in Guinea Conakry (n=1178).

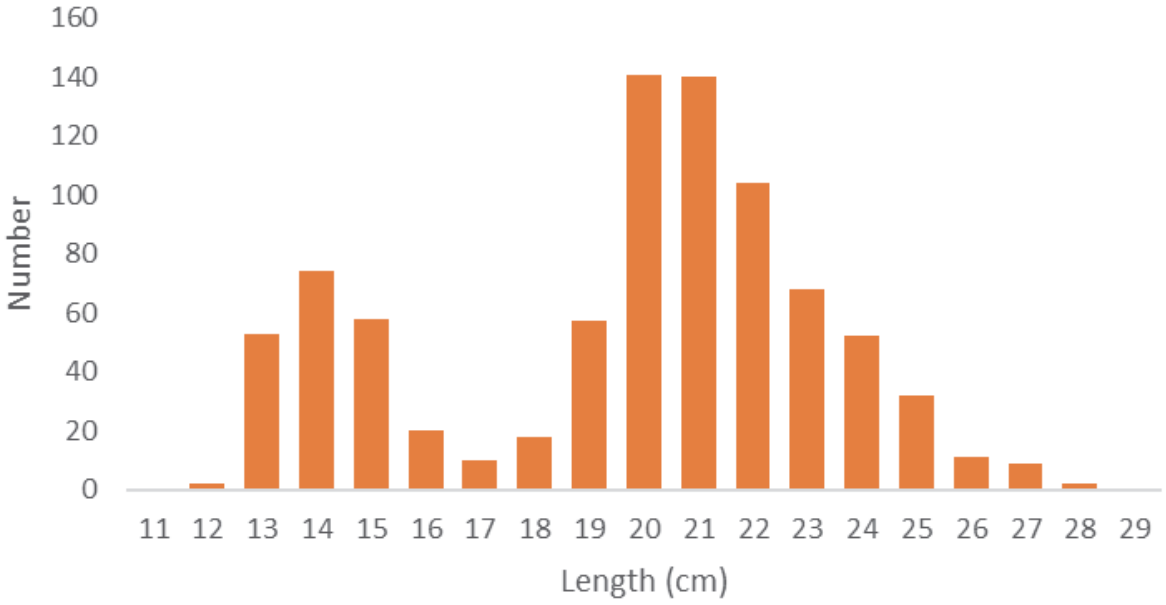

Figure 67. Length frequency distribution of *Sardinella aurita* in Guinea Conakry (n=851).

3.8.2.2 Horse mackerel

No horse mackerel were caught in Guinea Conakry.

3.8.2.3 Pelagic I fish

No *Engraulis encrasicolus* or *Ethmalosa fimbriata* were found, while *Illisha africana* occurred in just 2 trawls, insufficient to generate a biomass estimate (total catch of 1.3 kg).

3.8.2.4 Pelagic II fish

Pelagic II fish were widely distributed in Guinea Conakry waters, but generally in low densities (Figure 70).

Decapterus sp. (both *D. rhonchus* and *D. punctatus*) and *Scomber colias* were widespread but nowhere abundant (Figure 69), as indicated in the catches; *D. rhonchus* – a total catch of 114 kg in 16 trawls, *D. punctatus* - 11 kg in 13 trawls and *S. colias* - 17 kg in 9 trawls (88% *Decapterus* sp : 12% *Scomber colias*).

Chloroscombrus chrysurus was by far the most frequently caught of the Pelagic II fish (3 165 kg, 19 trawls). *Caranx crysos* (54 kg, 14 trawls), *Selene dorsalis* (33 kg, 11 trawls) and *Trichiurus lepturus* (22 kg, 4 trawls) also occurred throughout the region. *Trachinotus maxillosus* (7 kg, 1 trawl), and *Euthynnus alletteratus* (0.4 kg) were also caught, but in very low quantities. Based on these catch rates it is concluded that *Chloroscombrus chrysurus* accounted for around 90% of the Pelagic II fish (excluding *Decapterus* sp. and *Scomber colias*, whose biomasses were estimated separately).

3.8.2.5 Other fish

Brachydeuterus auritus (733 kg, 13 trawls), *Sphyraena guachancho* (313 kg, 11 trawls), *Pseudupeneus prayensis* (154 kg, 11 trawls), *Antigonia capros* (2 595 kg, 3 trawls), *Ariomma bondi* (500 kg, 7 trawls), *Galeoides decadactylus* (291 kg, 8 trawls), *Pagrus caeruleostictus* (182 kg, 10 trawls) and *Pagellus bellottii* (40 kg, 10 trawls) were the most commonly caught other species (noting that many of these are primarily demersal fish and were caught in widespread dispersed layers occurring in close association with the seabed).

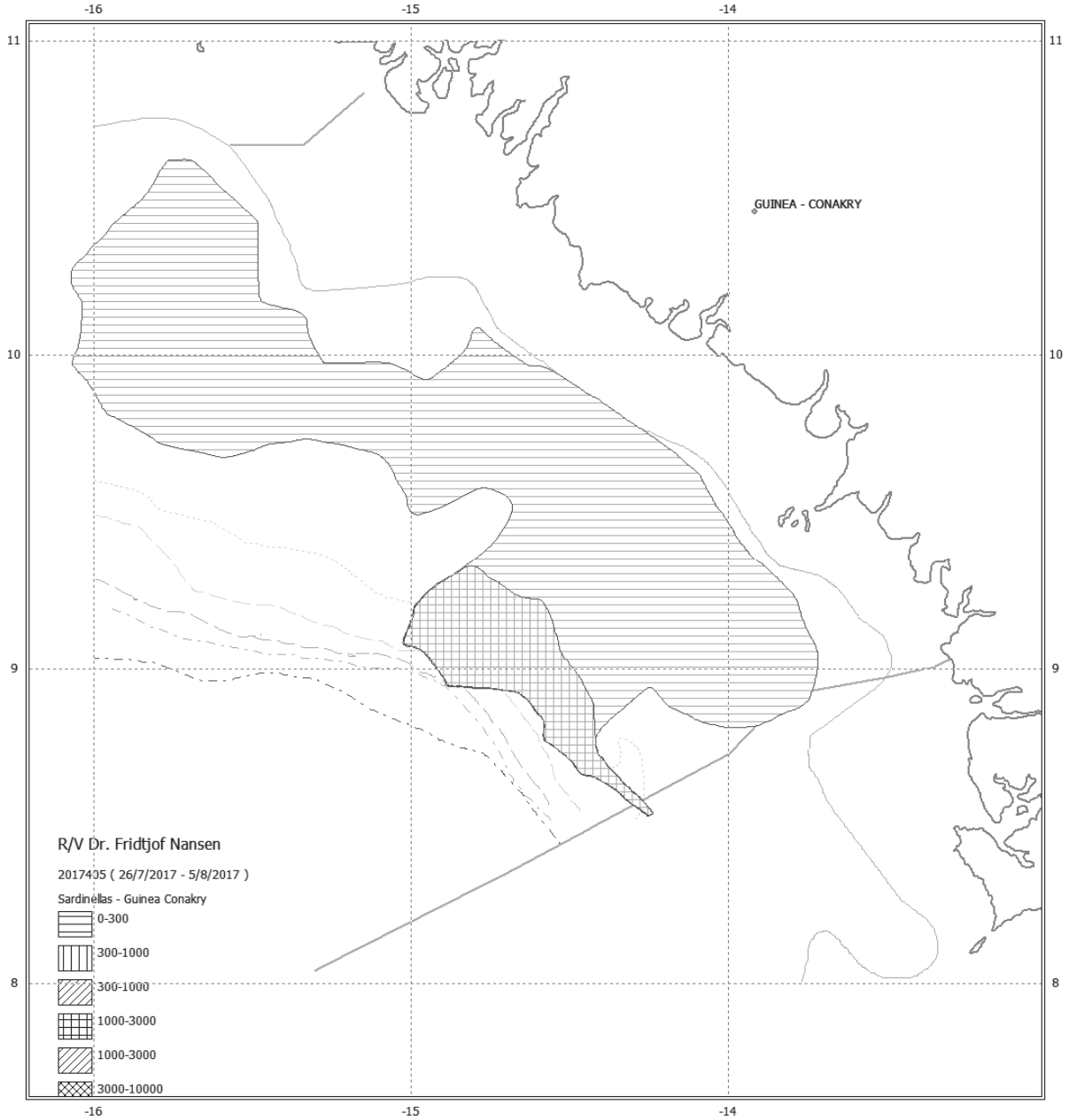

Figure 68. Distribution of sardinellas, Guinea Conakry (density units=mm^2/nm^2 of acoustic backscatter). Depth contours as in Figure 3.

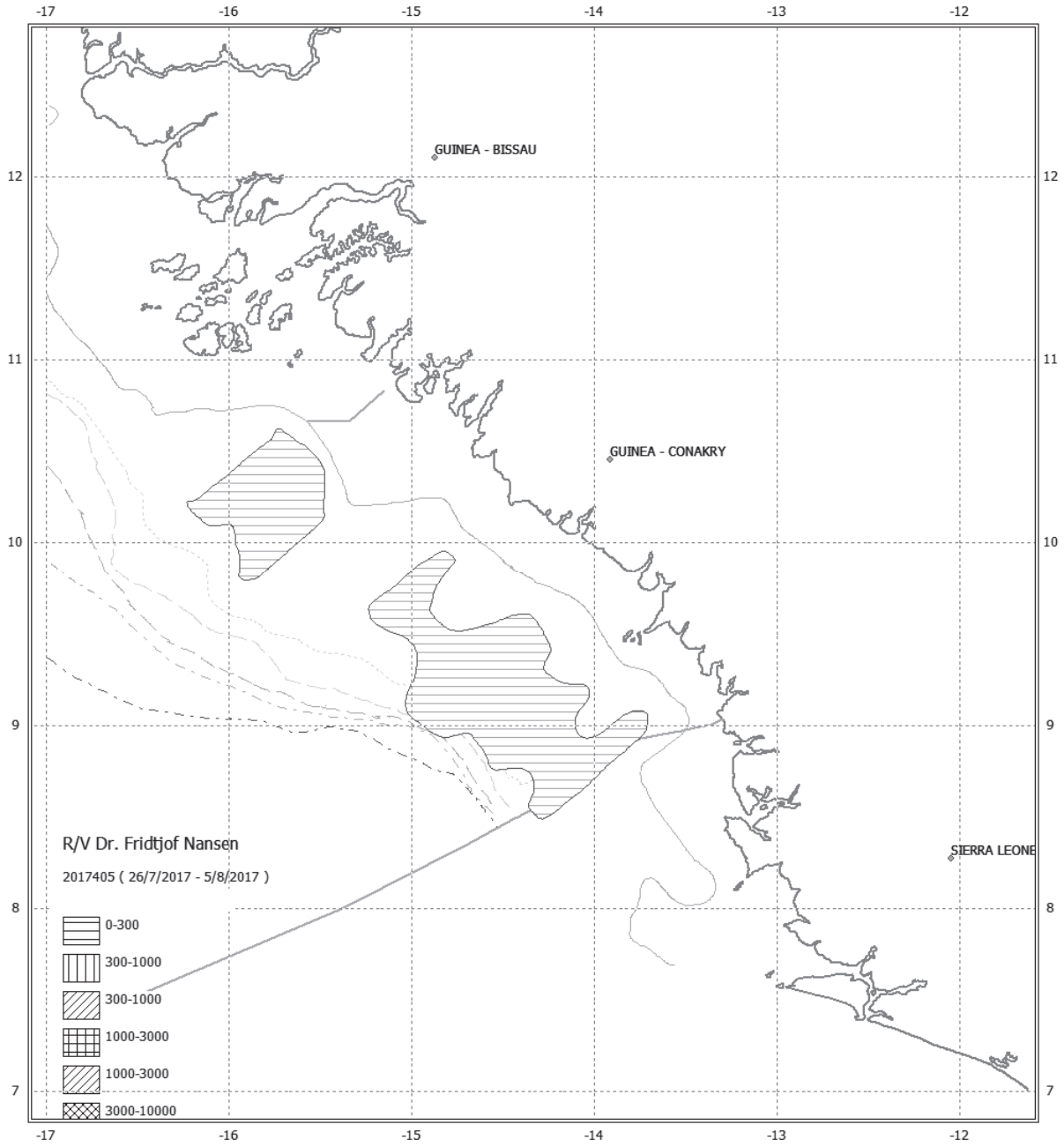

Figure 69. Distribution of *Scomber colias* and *Decapterus* sp. in Guinea Conakry (density units=mm^2/nm^2 of acoustic backscatter). Depth contours as in Figure 3.

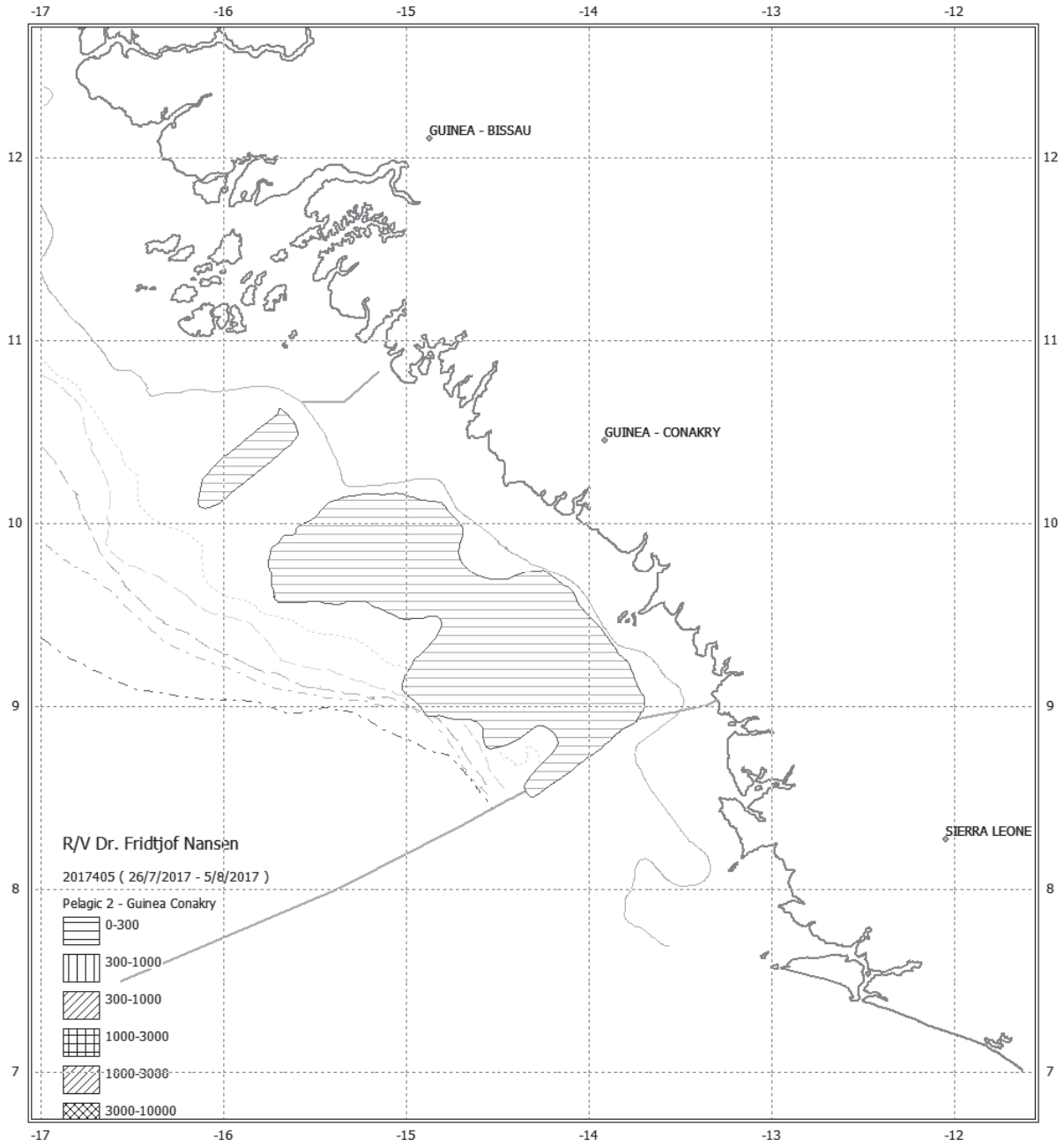

Figure 70. Distribution of Pelagic II fish, Guinea Conakry (density units=mm^2/nm^2 of acoustic backscatter). Depth contours as in Figure 3.

3.8.3 Sierra Leone

Sierra Leone has two distinct forms of continental shelf. To the north of Sherbro Island (7° 32' N, 12° 30' W, 85 NM south of Freetown) the shelf is wide and shallow. The 25 m isobath, the minimum depth to which the R/V *Dr Fridtjof Nansen* could work, was often 30 NM or so from the coast, leaving large areas where it was not possible to assess the pelagic stocks. As in Guinea Conakry, the width of the shelf between the 25 m and 100 m isobaths was often 50 NM or more after which the bottom fell steeply such that the 500 m isobath was just a few

NM beyond this. South of Sherbro Island the continental shelf is steep and narrow with the distance between the 25 m and 500 m isobaths generally around 25 NM.

3.8.3.1 Sardinellas

Sardinella were widely dispersed in the northern part of Sierra Leone, and were especially dense at the inshore end of transects. Transects were extended as far inshore as possible, usually to 20 m, but it must be assumed that significant amounts of sardinella occurred in waters too shallow for the R/V *Dr Fridtjof Nansen* and therefore the distribution and biomass estimates are likely to be somewhat greater than reported here.

The southern part of Sierra Leone was largely devoid of sardinellas, although a few were found in dispersed layers of largely Pelagic II fish; these were mostly juveniles.

Stratum 1 in the north contained both species, with 57% S. *maderensis* in catches, mainly adult fish (Table 13). Stratum 2, which was also in the region where the shelf is very shallow and wide, contained 99.6% *S. maderensis*, almost entirely adults. Stratum 3 was in the southern area where the shelf is narrow and steeply sloping. The seabed was too steep and hard to permit trawling, but as the topography there was very similar to the adjacent Stratum 4 it was assumed to contain the same species composition of sardinellas. The southernmost stratum in Sierra Leone, Stratum 4, contained 100% *S. maderensis*. Both species had two cohorts; *S. maderensis* at 11 cm and 19 cm, of which 91% were juveniles (Figure 72), and *S. aurita* around 15-17 cm and 20 cm (Figure 71).

Table 13. Average catch rate and assumed proportions of sardinellas in the four strata in Sierra Leone.

	No. of trawls	***S. aurita***		***S. maderensis***	
		Total catch (kg)	**Proportion**	**Total catch (kg)**	**Proportion**
Stratum 1	2	25	43%	34	57%
Stratum 2	4	1	0,4%	212	99.6%
Stratum 3	0	Adjacent to Stratum 4, therefore assume same species composition			
Stratum 4	4	0		20	100%

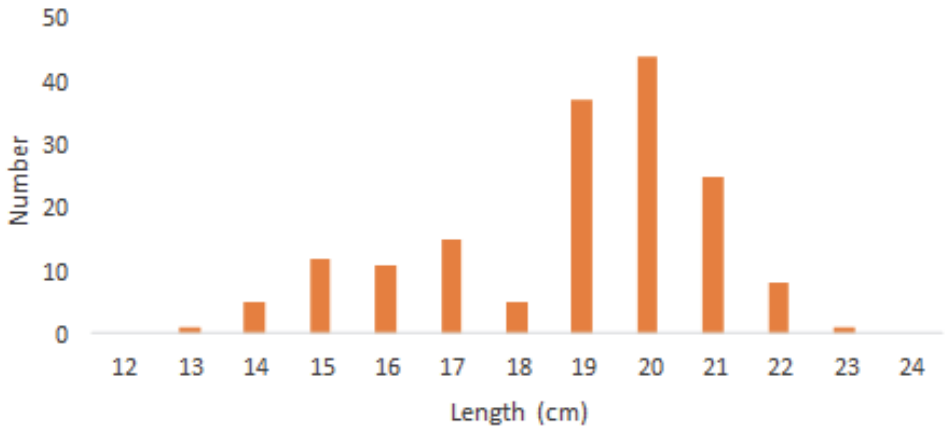

Figure 71. Length frequency distribution of *Sardinella aurita* in Sierra Leone (n=164).

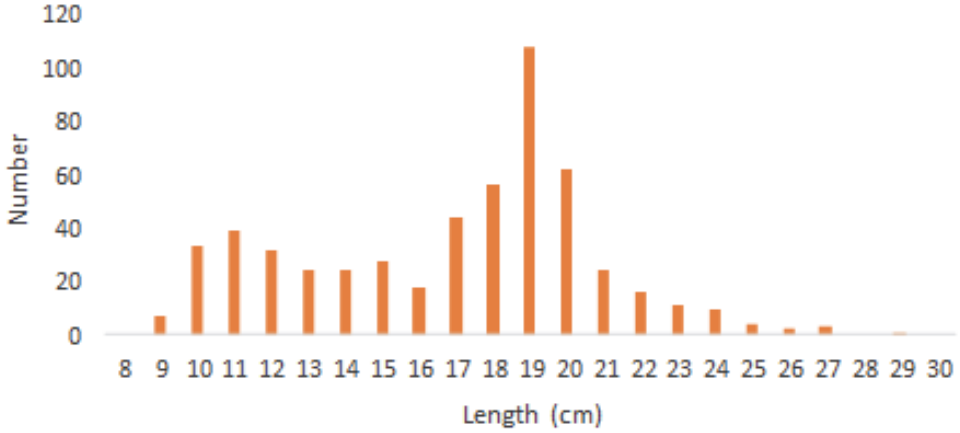

Figure 72. Length frequency distribution of *Sardinella maderensis* in Sierra Leone.

3.8.3.2 Horse mackerel

No horse mackerel were found in Sierra Leone.

3.8.3.3 Pelagic I fish

Illisha africana was widely distributed in the central and eastern part of Sierra Leonean waters, mixed with *Chloroscombrus chrysurus, Selene dorsalis, Trichiurus lepturus, Selar crumenophthalmus* and *Caranx crysos* as indicated in Table 14.

Table 14. Total catch and proportions of the *Illisha africana* and Pelagic II fish in Sierra Leone.

	Trawls	**Total catch (kg)**	**%**
Illisha africana	6	140	29
Chloroscombrus chrysurus	9	162	34
Selene dorsalis	10	103	22
Trichiurus lepturus	5	48	10
Selar crumenophthalmus	6	23	5
Caranx crysos	6	3	1

No *Engraulis encrasicolus, Scomber colias* or *Ethmalosa fimbriata* were found.

3.8.3.4 Pelagic II fish

Decapterus sp. (both *D. rhonchus* and *D. punctatus*) were widespread but nowhere abundant (Figure 74). The catches suggest that *D. punctatus*, with a total catch 21 kg (5 trawls), formed the largest proportion and that *D. punctatus* (3 kg, 1 trawl) occurred in lesser amounts.

As in the other countries the other species of Pelagic II fish were widely distributed in Sierra Leonean waters (Figure 75), but *Chloroscombrus chrysurus* and *Selene dorsalis* were the most abundantly caught of Pelagic II fish (see Table 14 above). Other Pelagic II fish included *Selar crumenophthalmus*, *Trichiurus lepturus* and *Caranx crysos*.

3.8.3.5 Other fish

Brachydeuterus auritus (190 kg, 7 trawls) was the other most commonly caught pelagic species. *Sphyraena* sp. (100 kg, 9 trawls), *Scomberomorus tritor* (42 kg, 7 trawls) and *Pseudupeneus prayensis* (40 kg, 4 trawls) were also commonly caught, while the demersal species, *Galeoides decadactylus* (154 kg, 7 trawls) and *Pagrus* sp. (46 kg, 7 trawls) were also frequently encountered when using the bottom trawl targeting pelagic species near the seabed.

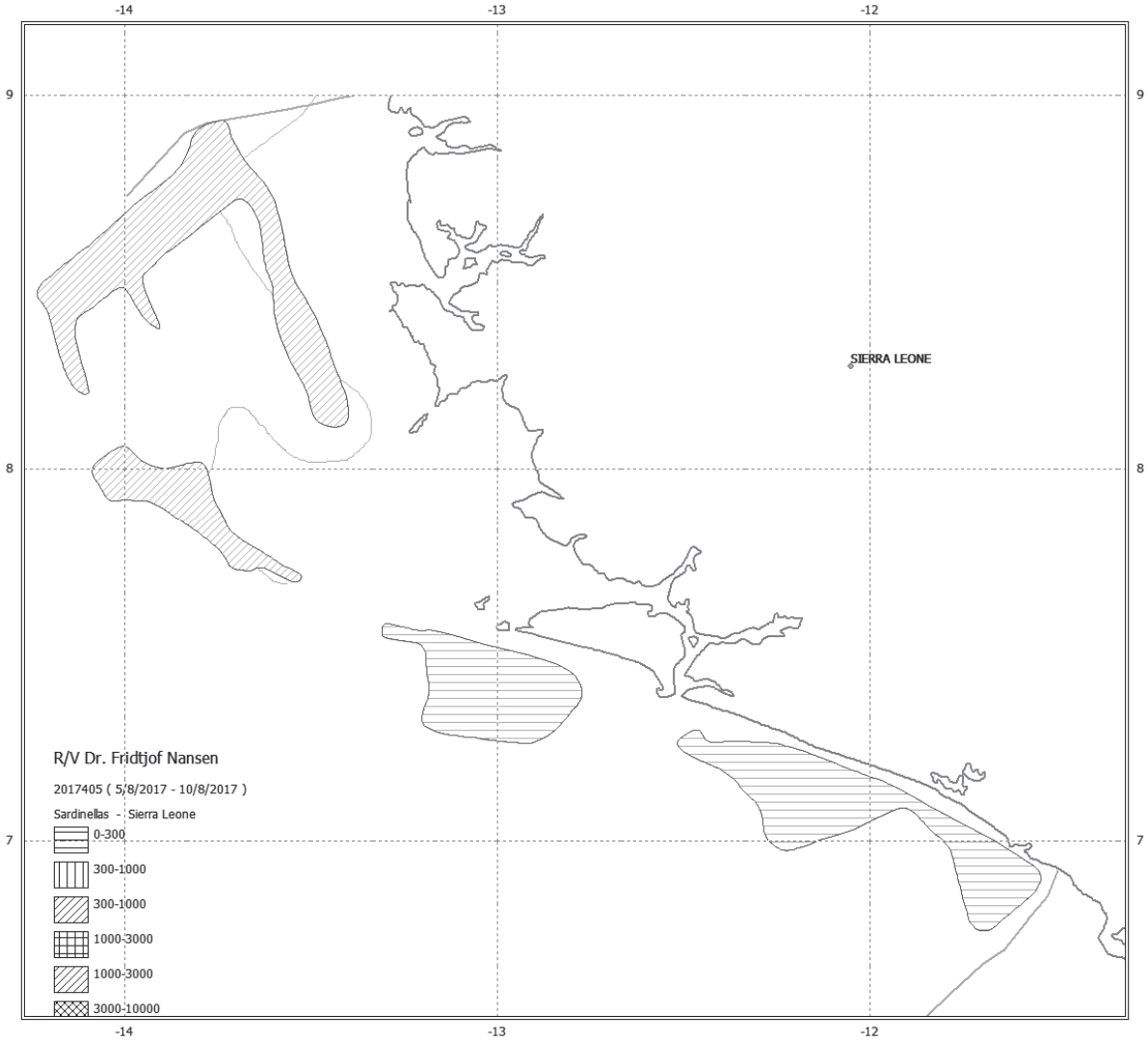

Figure 73. Distribution of sardinella, Sierra Leone (density units=mm^2/nm^2 of acoustic backscatter).

Figure 74. Distribution of *Decapterus* sp., Sierra Leone (density units=mm^2/nm^2 of acoustic backscatter).

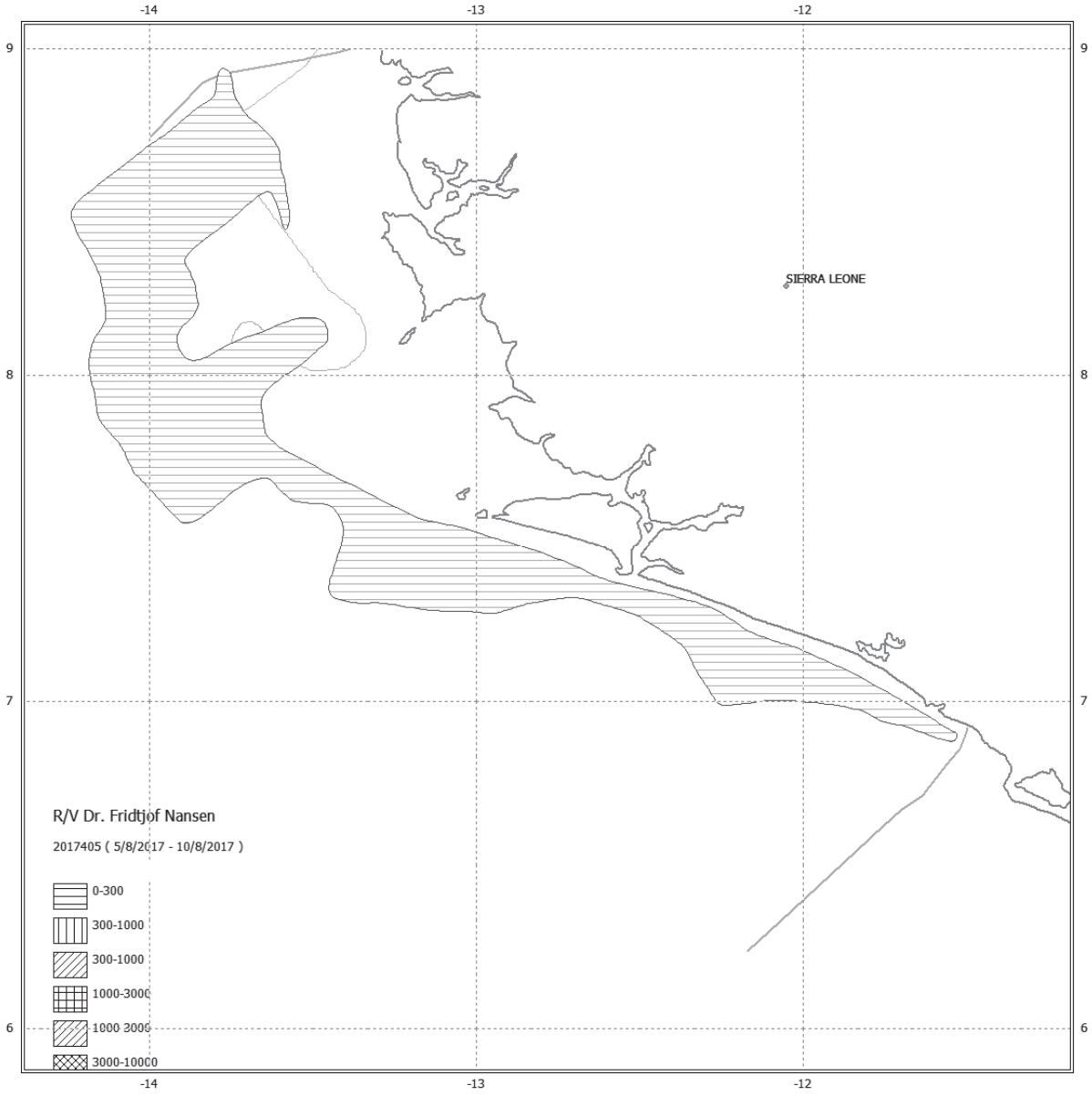

Figure 75. Distribution of *Illisha africana* and Pelagic II fish, Sierra Leone (density units=mm^2/nm^2 of acoustic backscatter).

3.8.4 Liberia

The Liberian shelf was narrow and steep. The shallower part of the shelf (from around 30 m and shorewards) had a very hard seabed with numerous pinnacles rising 10 or more meters from the bottom; these were often visible near the surface as waves broke over them just inshore of the survey area. Many transects had to be cut short, at around 30-35 m, and trawling along this nearshore region was not possible. However, there were few signs of pelagic fish at the ends of transects, or along the transits between transects, and so it seems reasonable to assume that large amounts of fish were not missed.

3.8.4.1 Sardinellas

Sardinella occurred along much of the Liberian shelf, mostly concentrated around the mid-shelf (approx. 40 – 70 bottom depth), but also extending to the 100 m isobath in some parts. Scattered sardinellas were also found closer inshore but in very low densities (Figure 78). Sardinella tended to occur on the bottom during the day and in a near-surface scattering layer at night. Few dense shoals were seen, and none occurred on the transects (those that were seen were encountered while trawling off the transect). All catches of sardinella were mixed with other pelagic species, mostly *T. trecae* and *S. colias*.

Sardinella maderensis occurred in the northern part of the country and tended to be in waters of around 60 m depth and shallower. *Sardinella aurita* occurred in the southern stratum and in deeper waters, mostly 70-90 m. Both species contained a mixture of juvenile fish and adults (Figures 76 and 77).

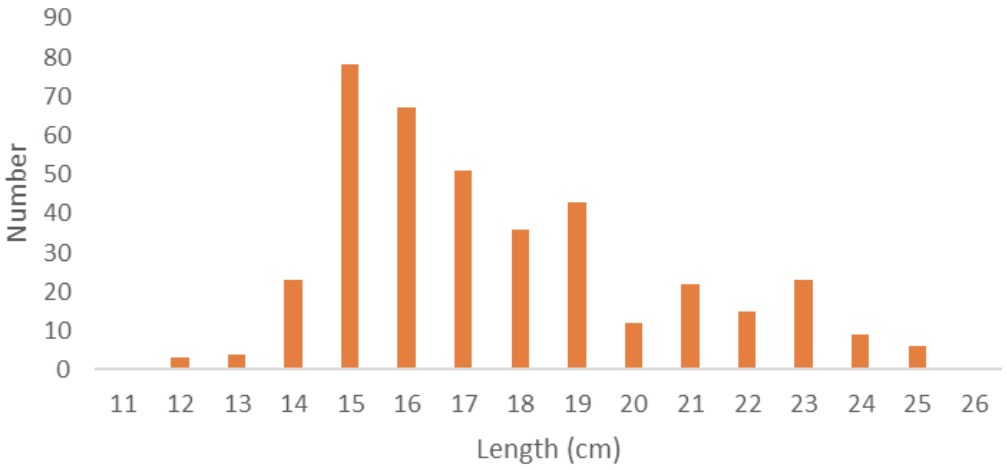

Figure 76. Length frequency distribution of *Sardinella aurita* in Liberia (n=392).

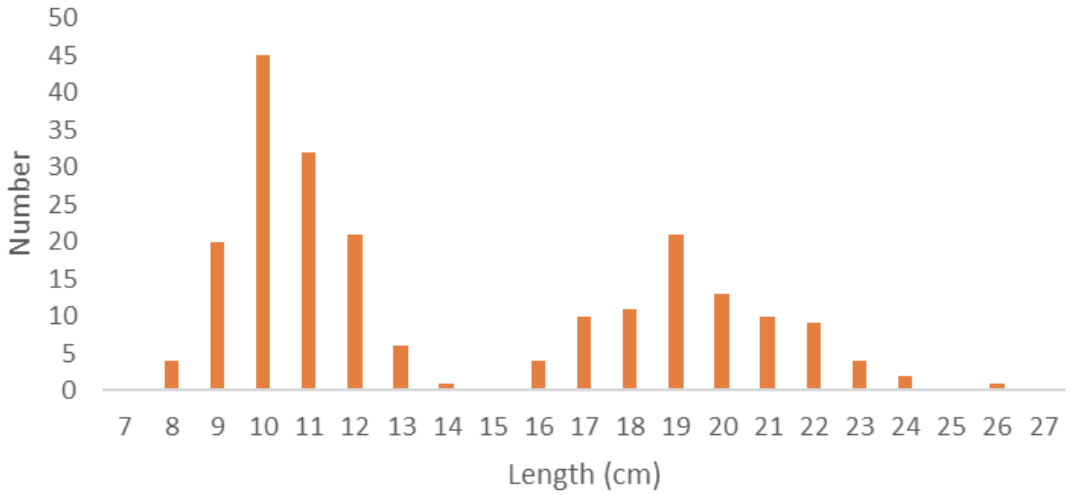

Figure 77. Length frequency distribution of *Sardinella maderensis* in Liberia (n=214).

3.8.4.2 Horse mackerel

Trachurus trecae occurred in two areas in Liberia (Figure 79). The first was in the central region; a small area where the proportion of horse mackerel in the pelagic mix was low. A second area was in the south-eastern part, close to the border with the Ivory Coast, where horse mackerel occurred as a higher proportion of the pelagic mix (37%).

3.8.4.3 Pelagic I fish

Ethmalosa fimbriata was caught in one trawl (Trawl 72) at the shallow end of a transect in the north. It occurred in such a restricted area and the acoustic backscatter allocated to this species was so low (mean sA 1 m^2/nm^2) that it was not possible to calculate a biomass estimate. It is likely that more E. fimbriata occurred further inshore of the survey coverage.

Illisha africana occurred widely in the northern and central part of Liberia, dispersed in a scattering layer with a variety of Pelagic II species, notably *Selene dorsalis, Trichiurus lepturus, Chloroscombrus chrysurus, Selar crumenophthalmus* and *Caranx crysos* (Figure 81). Based on the total catches the biomass estimate is likely to have been composed primarily of *I. africana* with lesser amounts of the remaining species (Table 15).

Table 15. Total catch and proportions of the *Illisha africana* and Pelagic II fish in Liberia.

	Trawls	**Total catch (kg)**	**%**
Illisha africana	6	243	62
Selene dorsalis	6	89	23
Trichiurus lepturus	7	39	10
Chloroscombrus chrysurus	4	19	5

3.8.4.4 Pelagic II fish

Scomber colias was found from inshore to the shelf-break, mixed with *S. aurita* and *T. trecae*, mostly between the 50 and 90 m isobaths (Figure 80). This species occurred in slightly denser concentrations in Stratum 1, in the south-eastern part of country towards the border with the Ivory Coast, but was still dispersed. As with *S. aurita* and *T. trecae* with which it was mixed, it occurred on the bottom during day rising into the midwater at night.

Decapterus punctatus was caught in two trawls, but based on the total catch accounted for an insignificant part of the total biomass of Pelagic II fish.

Selene dorsalis, Trichiurus lepturus and *Chloroscombrus chrysurus* were widely dispersed in the northern and central area (Figure 81). Table 15 indicates the proportions of each species, based on the total catches.

3.8.4.5 Other species

A number of other semi-pelagic and demersal species were also captured during the trawling. Species such as *Ariomma bondi* (2 455 kg, 6 trawls), *Brachydeuterus auritus* (41 kg, 7

trawls), *Sphyraena* sp. (105 kg, 12 trawls), *Scomberomorus tritor* (45 kg, 7 trawls) were the other most commonly caught semi-pelagic species. *Galeoides decadactylus* (46 kg, 5 trawls), *Drepane africana* (160 kg, 3 trawls), *Pseudotolithus spp*. (538 kg, 3 trawls), *Pomadasys* spp. (122 kg, 3 trawls), *Pseudupeneus prayensis* (28 kg, 6 trawls) *Pagrus* sp. (51 kg, 4 trawls), and *Priacanthus* spp. (55 kg, 6 trawls) were also frequently encountered when using the bottom trawl targeting pelagic species near the seabed.

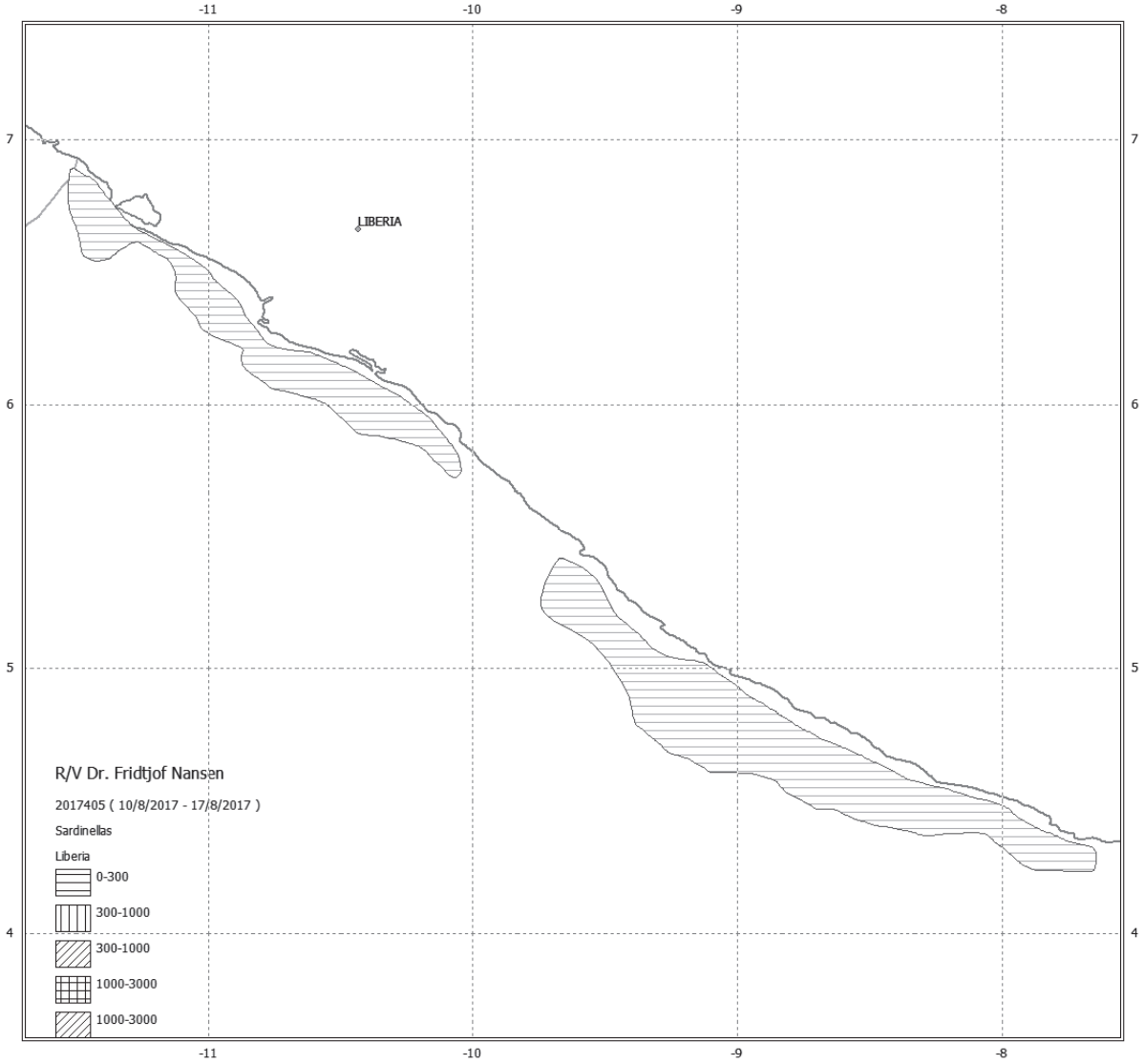

Figure 78. Distribution of sardinellas, Liberia (density units=mm^2/nm^2 of acoustic backscatter).

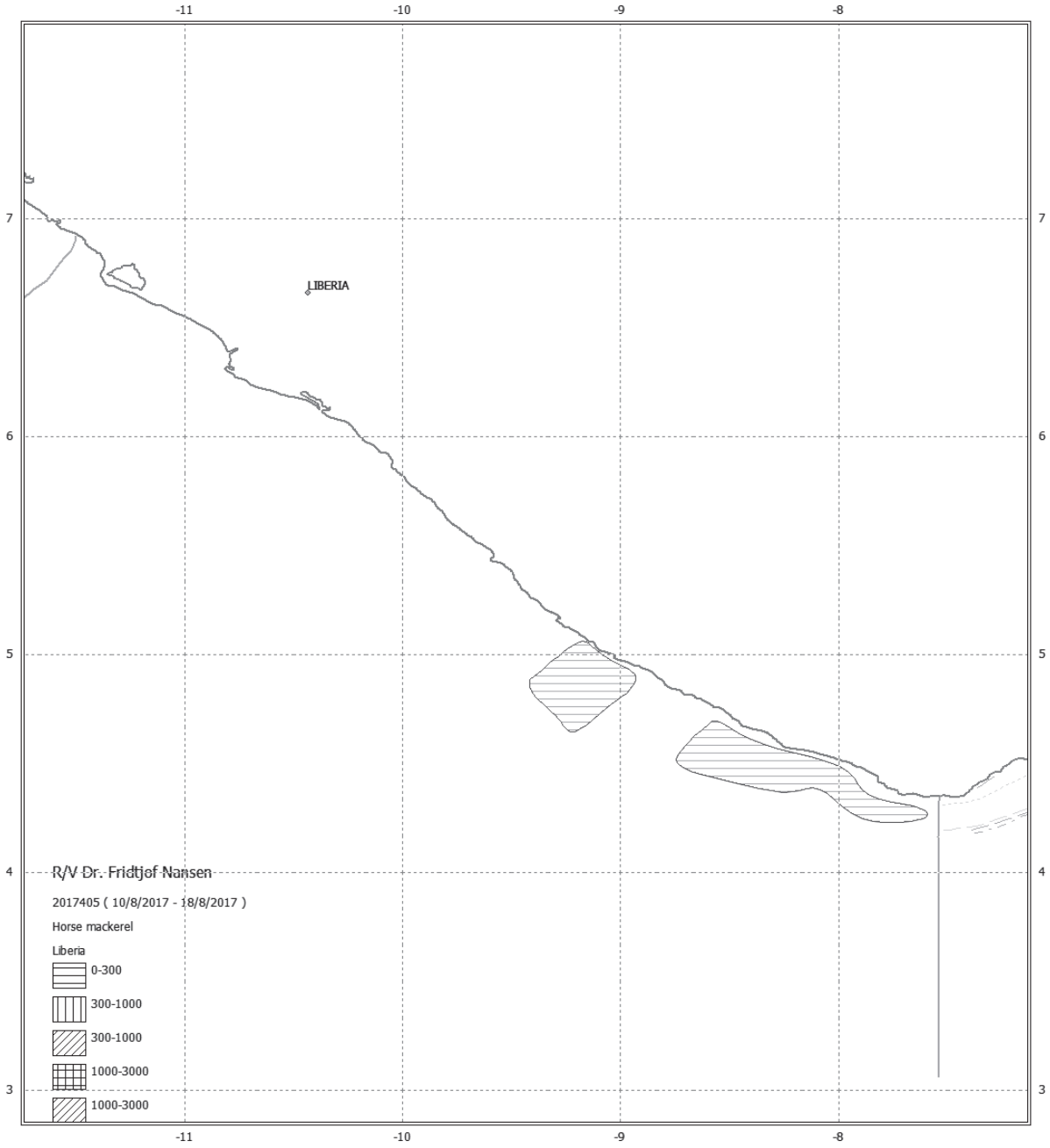

Figure 79. Distribution of *Trachurus trecae*, Liberia (density units=mm^2/nm^2 of acoustic backscatter).

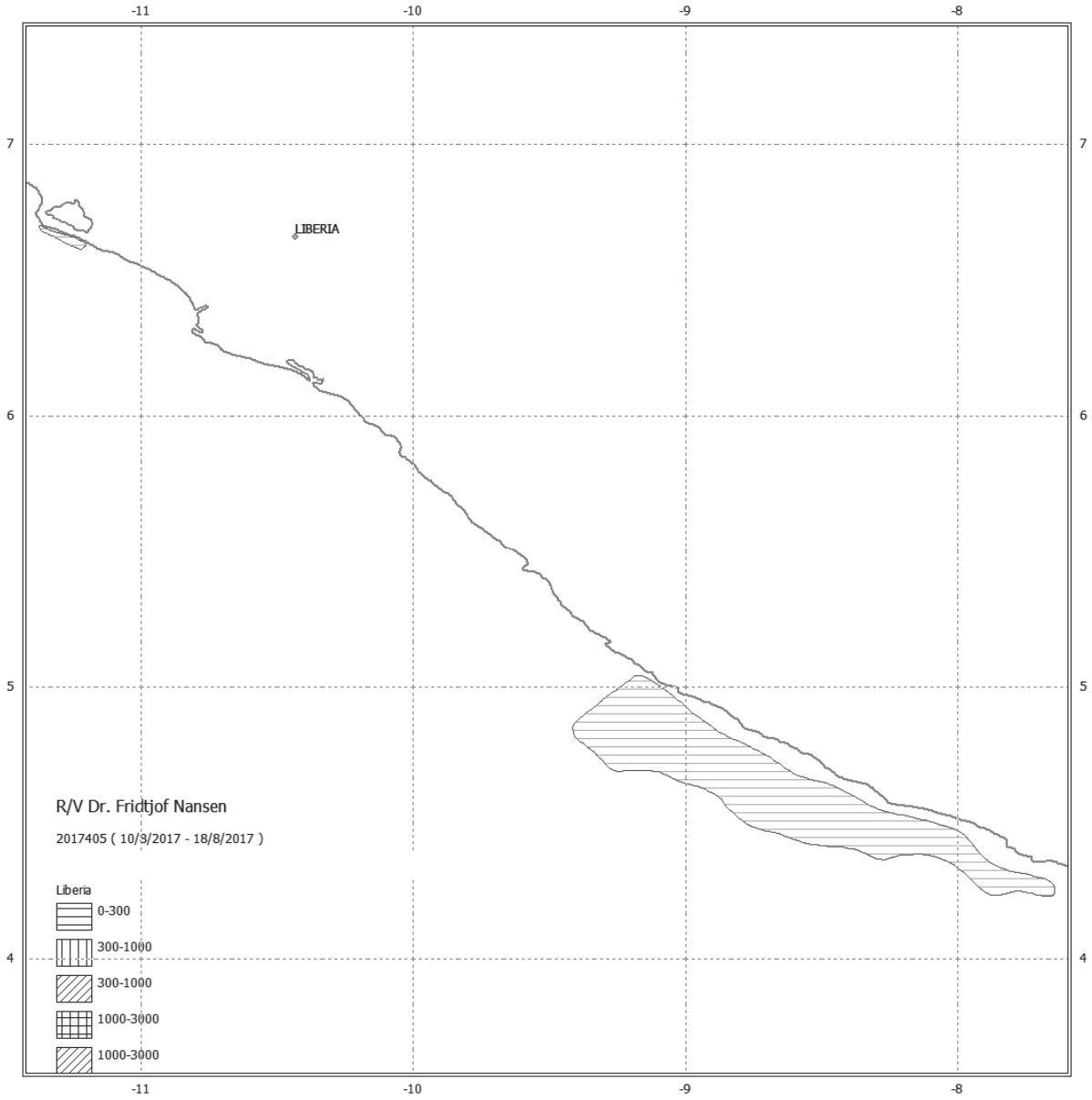

Figure 80. Distribution of *Scomber colias*, Liberia (density units=mm^2/nm^2 of acoustic backscatter).

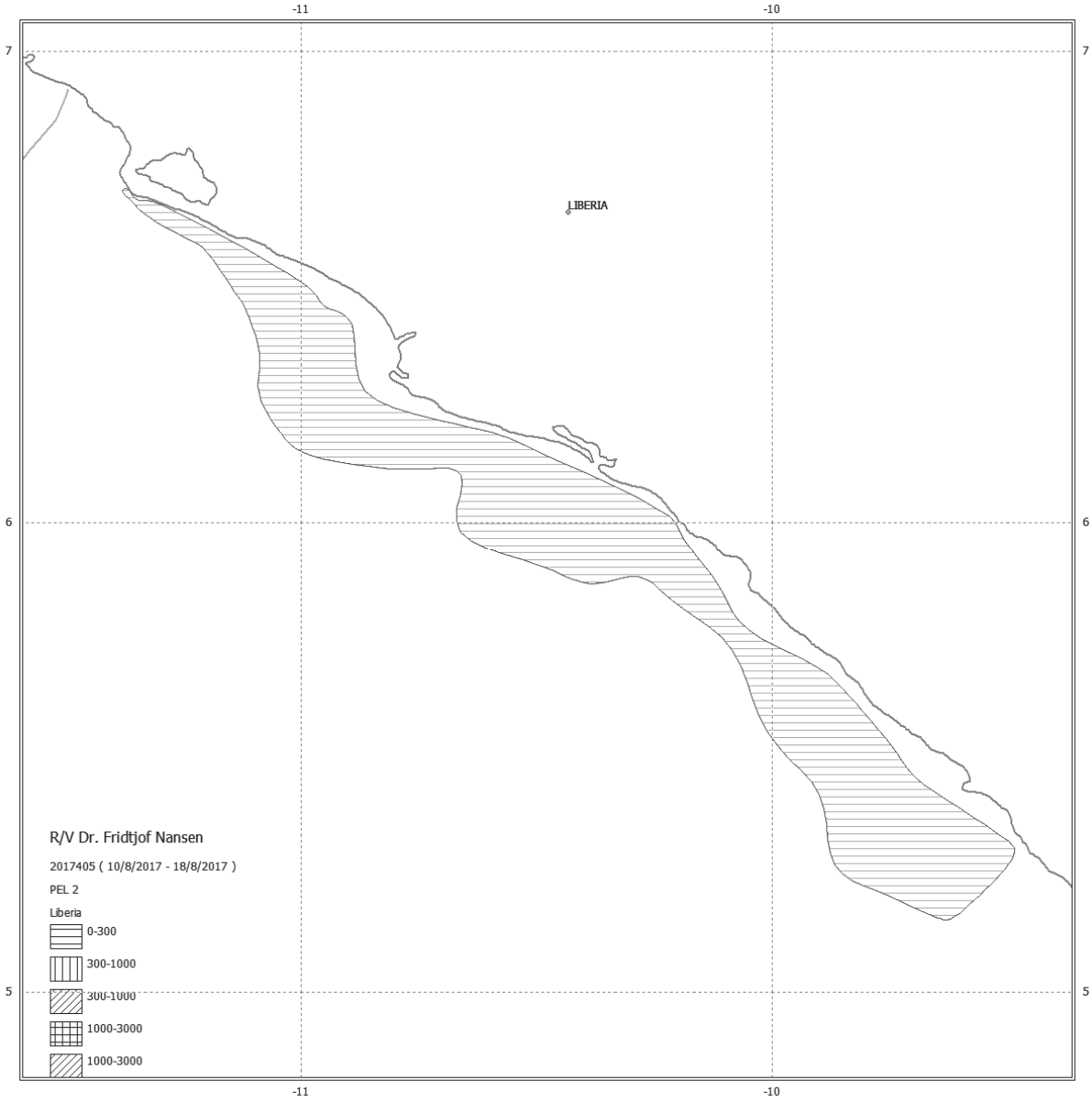

Figure 81. Distribution of *Illisha africana* and Pelagic II fish, Liberia (density units=mm^2/nm^2 of acoustic backscatter).

3.9 Biomass estimates

A summary of the biomass estimates is given in Table 16. Biomass per stratum and length-weight relationships obtained from biological samples and used for biomass estimation are provided in Annex X. The number and biomass by length are presented in Annex XI.

Table 16. Summary of biomass estimates of pelagic fish (tonnes).

Country	Sardinellas	Horse mackerel	*Illisha africana*	*Decapterus* sp.	*Scomber colias*	Other Pelagic II fish
Guinea Bissau	32 401	/	/	3 957	10 000	19 159
Guinea Conakry	436 287	/	/	33 710	4 585	66 573
Sierra Leone	115 285	/	9 352	6 150	/	22 646
Liberia	16 434	2 552	5 179	59	1 909	3 174
Totals	600 407	2 552	14 531	43 876	16 494	114 552

The main component of the pelagic community in the four countries assessed was *Sardinella aurita* and *S. maderensis*, each with a total biomass of close to 300 000 t (Table 17). Very little *Trachurus trecae* or *Illisha africana* was found, insufficient *Ethmalosa fimbriata* to calculate a biomass and no *Engraulis encrasicolus*. Almost 100 000 t of *Decapterus* sp. and *Scomber colias* combined and over 100 000 t of other Pelagic II fish were also recorded.

Table 17. Approximate biomass of the two sardinella species, based on catches (tonnes).

	S. aurita		*S. maderensis*	
	Proportion	Tonnes	Proportion	tonnes
Guinea Bissau	3%	1 000	97%	31 000
Guinea Conakry	61%	266 000	39%	170 000
Sierra Leone	29%	33 000	71%	82 000
Liberia	14%	2 000	86%	14 000
	50%	302 000	50%	297 000

The wide and shallow shelf of Guinea Conakry and the northern part of Sierra Leone held the main part of the pelagic biomass, with the narrow and steep shelf of southern Sierra Leone and Liberia having a much smaller part.

CHAPTER 4. REGIONAL SUMMARY

In this phase of the programme the surveys with the RV *Dr Fridtjof Nansen* are planned regionally to provide synoptic coverages of resources that may be shared. In this summary results from Leg 2.1 and 2.2 (Ivory Coast and Ghana) are presented jontly to provide such a regional overview, with emphasis on the pelagic resources.

Sardinella (Sardinella aurita and S. maderensis): Low densities were recorded in all the regions, with the exception of Guineé. In the southern part of the area sardinella was only found off Ghana, consisting only of juveniles.

In the case of *S. aurita*, it was mostly found beyond the 100 m isobaths which confirms the species higher affinity for more saline water.

Anchovies (*Engraulis encrasicolus*) were only recorded in small to high densities in Côte d'Ivoire and Ghana, respectively.

Horse mackerel (*T. trecae*) was mostly found in the southern part of the area (Figure 83).

Atlantic chub mackerel (*S. colias*): Generally, this species was absent in all the region except for Liberia and Guinea Bissau where they were found in small densities.

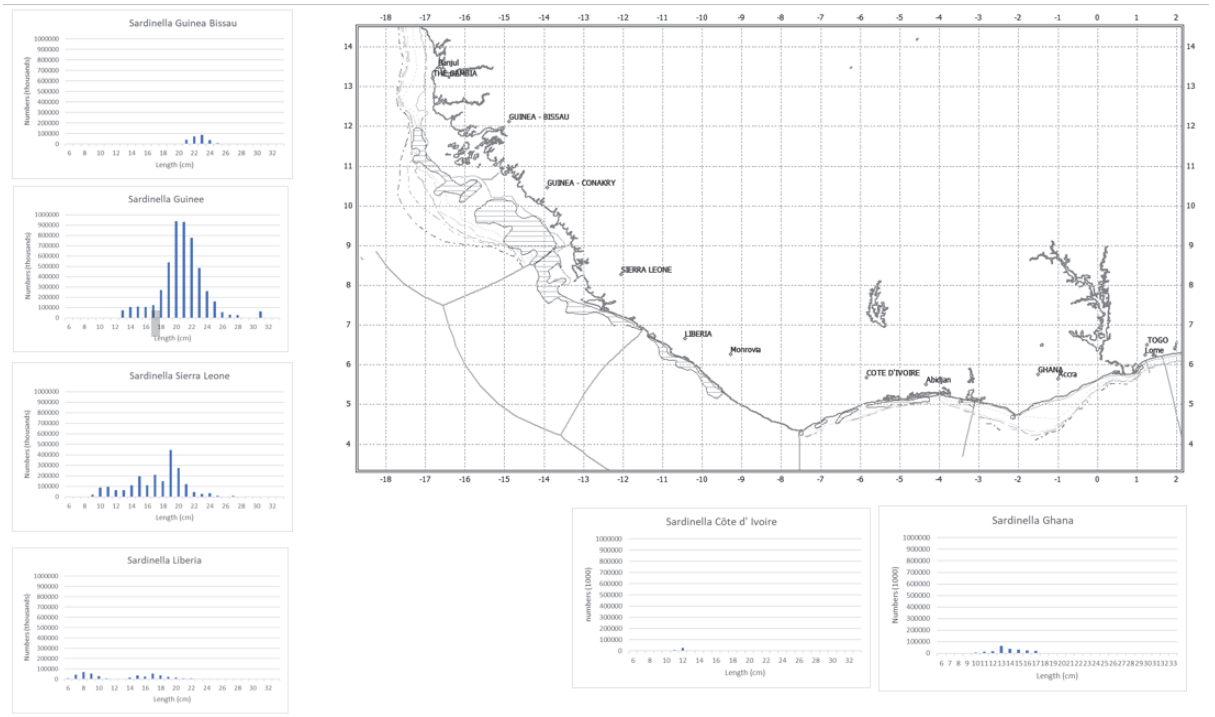

Figure 82. Distribution and length-frequency of sardinella, Legs 2.1 and 2.2.

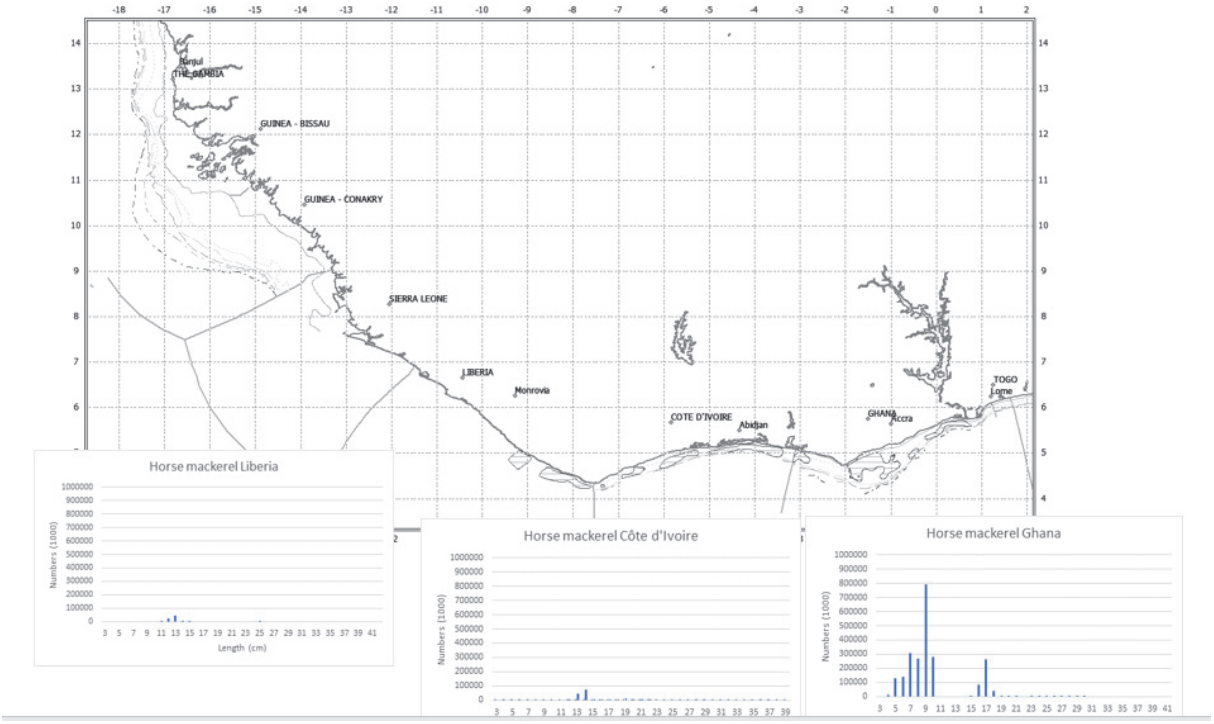

Figure 83. Distribution and length-frequency for horse mackerel, Legs 2.1 and 2.2.

The total biomass of small pelagic fish in Legs 2.1 and 2.2 is estimated at 915 562 tonnes (Table 18). The biomass of pelagic fish is largely dominated by sardinella (66% of the total biomass) followed by other pelagic II fish with 14%. Sardinella is mainly located in the area of Guinea Bissau to Sierra Leone.

Table 18. Biomass estimates (tonnes).

Period survey	**Country**	**Sardinellas**	**Horse mackerel**	***Illisha africana***	***Decapterus* sp.**	***Scomber colias***	***Anchovy***	**Other Pelagic II fish**	***Total***
21/07 – 20/08/17	Guinea Bissau	32 401	/	/	3 957	10 000	/	19 159	65 517
21/07 – 20/08/17	Guinea	436 287	/	/	33 710	4 585	/	66 573	541 155
21/07 – 20/08/17	Sierra Leone	115 285	/	9 352	6 150	/	/	22 646	153 433
21/07 – 20/08/17	Liberia	16 434	2 552	5 179	59	1 909	/	3 174	29 307
22/08 – 13/09/17	Côte d'Ivoire	750	5 150	/	/	/	610	10 700	17 210
22/08 – 13/09/17	Ghana	4 000	29 400	/	/	/	73 140	2 400	108 940
	Totals	**605 157**	**37 102**	**14 531**	**43 876**	**16 494**	**73 750**	**124 652**	**915 562**

Many samples and much data remains to be analysed; the results of which will be disseminated in separate reports. See Annex XII for a full list of the samples and data which still needs to be analysed. Catch and biological data on demersal fish species were collected in

both bottom and deep pelagic trawls. These data are not presented in this report but are available on the NANSIS database.

The hydrographic data suggested a well stratified system with no signs of active upwelling; such stability is expected at this time of year. Long-term SST data from coastal monitoring stations in Liberia suggest that the conditions found during the survey may be within the expected range (https://www.seatemperature.org/africa/liberia/monrovia.htm). However, a lack of comparable previous data from the open ocean and other countries in the region means that no conclusions can be made.

Phytoplankton was concentrated around at the bottom of the mixed layer, forming much higher densities than in the mixed layer above.

While the microplastics samplings remain to be analysed, a visual inspection indicated that the highest densities of microplastics, and certainly marine debris, were recorded around population centres and fishing grounds.

Large rafts of sargassum weed were found throughout and appears to represent a dramatic increase in recent years warrants investigation.

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ANNEX I. DESCRIPTION OF INSTRUMENTS AND FISHING GEAR

Acoustic instruments

The Simrad EK80/18, 38, 70, 120, 200 and 333 kHz scientific sounder was run throughout the survey. Scrutinizing was done in LSSS using data from the 38-kHz transducer. The last standard sphere calibrations were checked on the 23.01.2017 in Sandviksflaket, Bergen, Norway using a Cu64 sphere for the 18 kHz, Cu60 for the 38 kHz, WC38.1 for the 70, 120 and 200 kHz, and the WC22 for the 333 kHz. The details of the settings used during the survey for the 38-kHz echo sounder were as follows:

Transceiver 2 menu (38 kHz)	
Transducer depth	5.8 m
Absorption coeff.	8.3 dB/km
Pulse duration	Medium (1,024 ms)
Bandwidth	2.43 kHz
Max power	2000 Watt
2-way beam angle	20,6 dB
Gain	26,95 dB
$_{S}$A correction	0.03 dB
Angle sensitivity	21.9
3 dB beamwidth	6.22º alongship
	6.28° athwartship
Alongship offset	0.10º
Athwartship offset	0.06º
Bottom detection menu	Minimum level 50 Db

Fishing gear

The vessel has one small four-panel 'Åkrahamn' pelagic trawl, one MultPelt 624 trawl (Figure 1, new in 2017) and one 'Gisund super bottom trawl'. All trawls were used during the survey until 2nd August when one of the trawl winch motors failed. Thereafter there was only sufficient power to deploy the small pelagic and bottom trawls.

The smallest pelagic trawl has 8 to 12 m vertical opening under normal operation, whereas the MultPelt 624 trawl has 25 to 35 m opening. The bottom trawl has a 31 m headline and a 47 m footrope fitted with a 12" rubber bobbins gear. The codend has 20 mm meshes, plus an inner net with 10 mm mesh size. The vertical opening is about 5.5 m. The distance between the wing tips is about 18 m during towing. The sweeps are 40 m long. The trawl doors are 8 m^2 'Thyborøen' combi and weigh 2 000 kg. Trawling was conducted for species identification only and no restraining rope was used during the survey.

The SCANMAR system was used during all trawl hauls. This equipment consists of sensors, a hydrophone, a receiver, a display unit and a battery charger. Communication between sensors and ship is based on acoustic transmission. The doors are fitted with sensors to

provide information on their interdistance and angle, while a height sensor is fitted on the bottom trawl to measure the trawl opening and provide information on clearance and bottom contact.

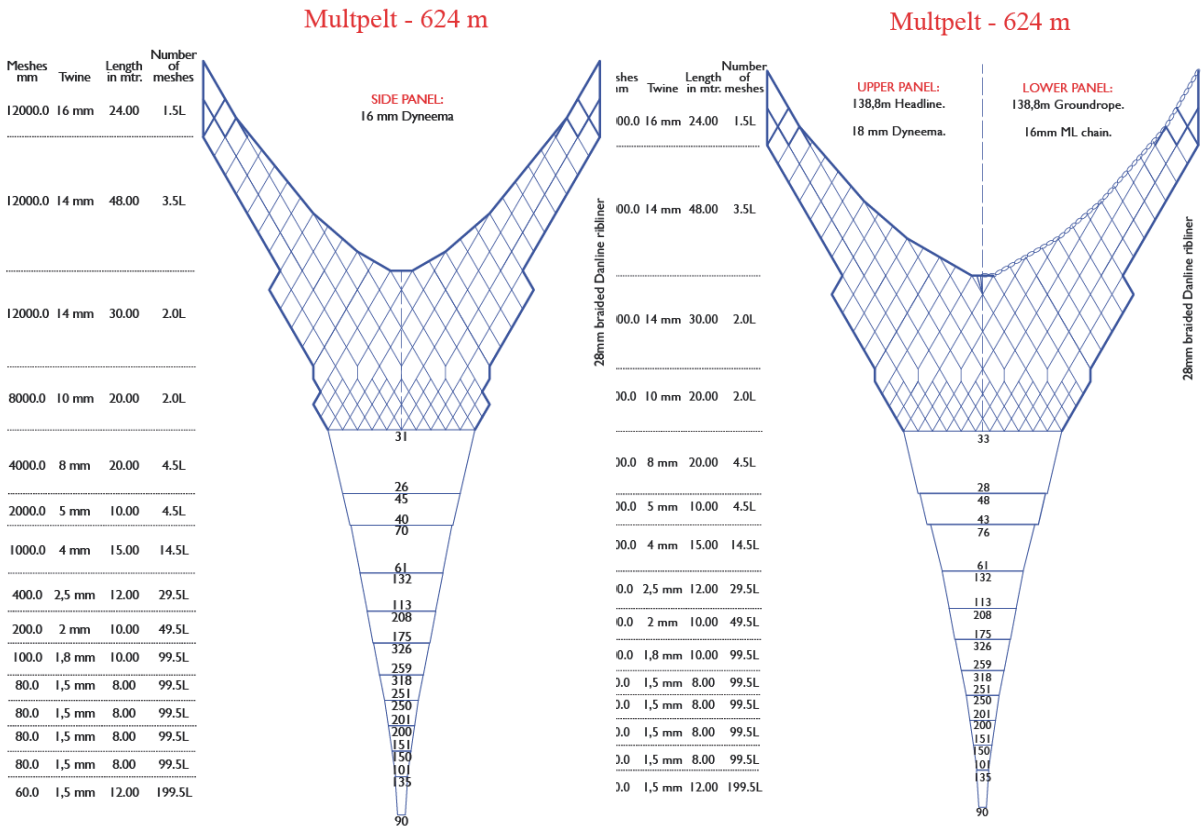

Figure 1. Schematic drawing of the MultPelt 624.

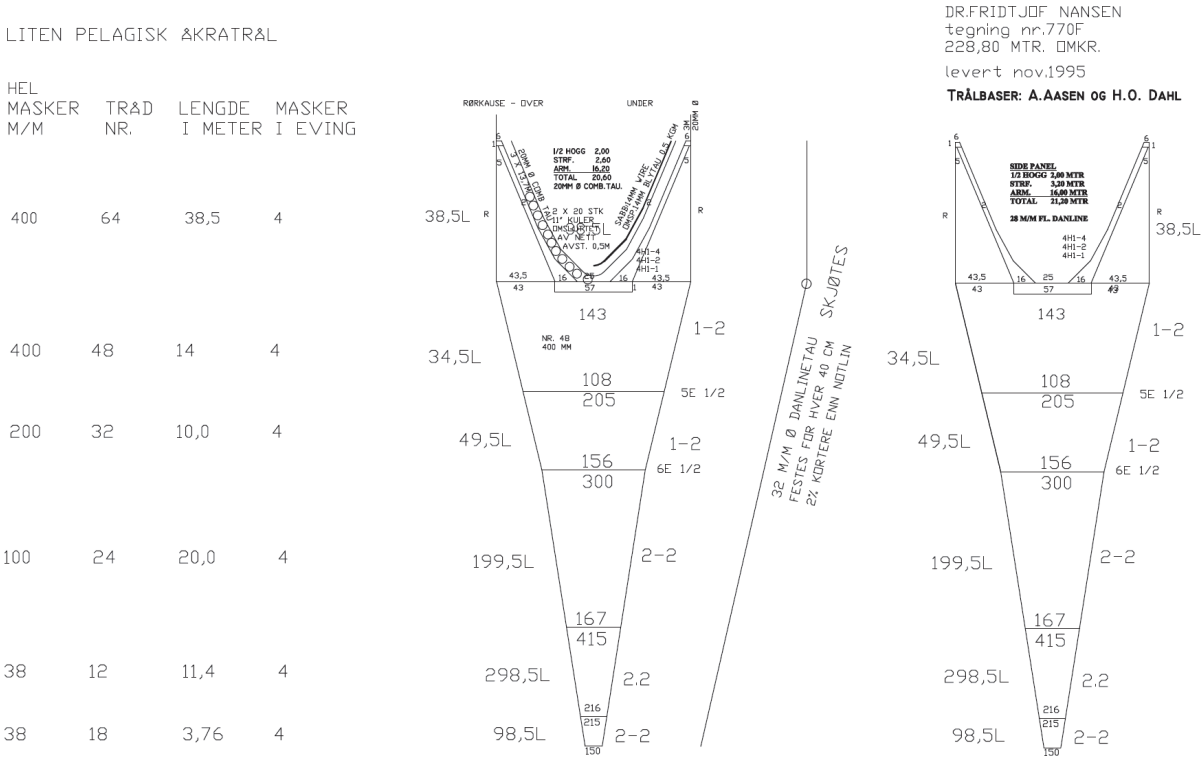

Figure 2. Schematic drawing of the small pelagic Åkratrawl.

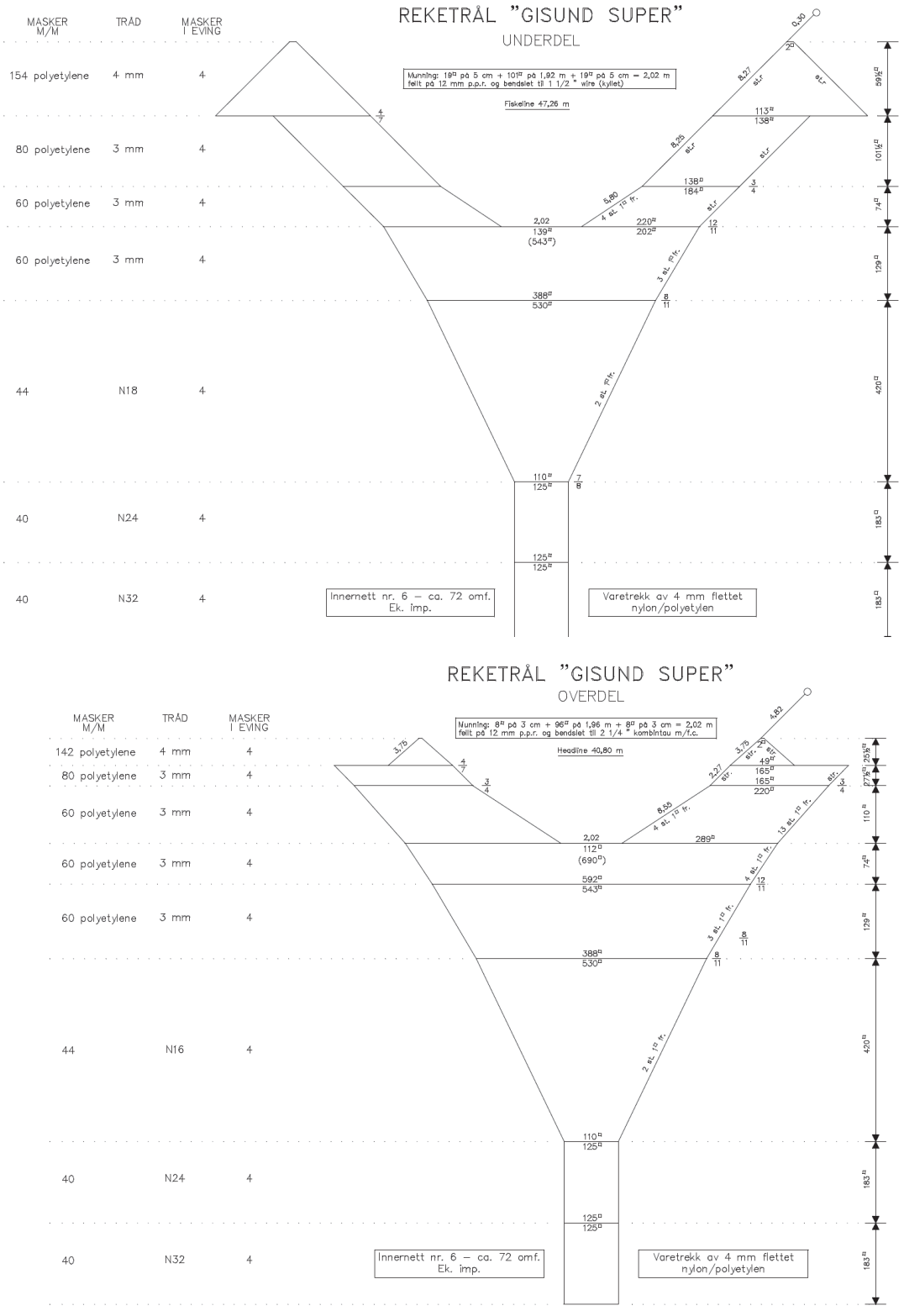

Figure 3. Schematic drawing of the Super Gisund bottom trawl.

ANNEX II. RECORDS OF FISHING STATIONS

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 1
DATE :22/07/17 GEAR TYPE: BT NO: 0 POSITION:Lat N 12°18.00
start stop duration Lon W 17°16.80
TIME :09:10:00 09:40:00 30.0 (min) Purpose : 1
LOG : 1761.10 1762.88 1.7 Region : 1300
FDEPTH: 44 46 Gear cond.: 0
BDEPTH: 44 46 Validity : 0
Towing dir: 0° Wire out : 160 m Speed : 2.5 kn
Sorted : 153 Total catch: 153.11 Catch/hour: 306.22

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Chloroscombrus chrysurus	103.80	942	33.90	1
Pseudupeneus prayensis	66.88	504	21.84	
Dactylopterus volitans	38.20	184	12.47	
Chilomycterus reticulatus	37.80	8	12.34	
Selene dorsalis	13.28	76	4.34	
Chaetodon hoefleri	7.08	58	2.31	
Trichiurus lepturus	6.28	22	2.05	
Eucinostomus melanopterus	5.28	48	1.72	
Lagocephalus laevigatus	4.44	8	1.45	
Sphyraena afra	4.00	2	1.31	
Fistularia tabacaria	3.64	2	1.19	
Pomadasys incisus	3.08	12	1.01	
Balistes capriscus	2.12	2	0.69	
Pagellus bellottii	2.00	18	0.65	
Octopus vulgaris	1.64	2	0.54	
Trachinocephalus myops	1.24	6	0.40	
Fistularia petimba	1.24	12	0.40	
Caranx rhonchus	1.08	4	0.35	
Sphyraena guachancho	1.00	2	0.33	
Scarus hoefleri	0.92	4	0.30	
Chilomycterus spinosus mauretanicus	0.56	2	0.18	
Syacium micrurum**	0.42	2	0.14	
Calappa sp.	0.08	2	0.03	
Bembrops greyi	0.08	4	0.03	
Sphoeroides marmoratus	0.08	2	0.03	
Fishing gears	0.00	2	0.00	
Total	306.22		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 2
DATE :22/07/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 11°41.40
start stop duration Lon W 17°7.80
TIME :21:58:38 22:41:43 42.0 (min) Purpose : 1
LOG : 1862.26 1864.66 2.4 Region : 1300
FDEPTH: 10 25 Gear cond.: 0
BDEPTH: 40 35 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 2.5 kn
Sorted : 78 Total catch: 221.77 Catch/hour: 316.82

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	177.00	1506	55.87	
Sardinella maderensis	90.74	666	28.64	2
Sphyraena guachancho	14.34	80	4.53	
Selene dorsalis	11.73	229	3.70	
Ilisha africana	4.71	107	1.49	
Trichiurus lepturus	4.69	90	1.48	
Sardinella aurita	4.57	34	1.44	
Chloroscombrus chrysurus	3.20	30	1.01	3
Trachinotus ovatus	1.37	11	0.43	
Penaeus notialis	1.37	30	0.43	
Euthynnus alletteratus	1.06	3	0.33	
Caranx crysos	0.69	4	0.22	
Elops lacerta	0.51	1	0.16	
Galeoides decadactylus	0.46	3	0.14	
Eucinostomus melanopterus	0.21	7	0.06	
Dactylopterus volitans	0.09	4	0.03	
Penaeus kerathurus	0.08	19	0.02	
Total	316.82		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 3
DATE :23/07/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 11°13.47
start stop duration Lon W 17°1.39
TIME :08:49:40 09:14:15 24.6 (min) Purpose : 1
LOG : 1944.13 1945.35 1.2 Region : 2100
FDEPTH: 31 31 Gear cond.: 0
BDEPTH: 31 31 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.0 kn
Sorted : 10 Total catch: 9.54 Catch/hour: 23.29

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Lagocephalus laevigatus	7.03	17	30.19	
Sepia officinalis	6.59	10	28.30	
Ephippion guttifer	3.91	2	16.77	
Balistes capriscus	1.76	2	7.55	
Pagellus bellottii	1.32	5	5.66	
Trichiurus lepturus	1.03	2	4.40	
Fistularia petimba	0.93	10	3.98	
Galeoides decadactylus	0.63	2	2.73	
Xyrichtys novacula	0.10	2	0.42	
Total	23.29		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 4
DATE :23/07/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 11°0.52
start stop duration Lon W 16°46.57
TIME :21:36:33 21:57:24 20.9 (min) Purpose : 1
LOG : 2022.11 2023.12 1.0 Region : 2100
FDEPTH: 20 20 Gear cond.: 0
BDEPTH: 29 33 Validity : 0
Towing dir: 0° Wire out : 125 m Speed : 2.9 kn
Sorted : 56 Total catch: 56.32 Catch/hour: 162.07

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	93.64	696	57.78	
Selene dorsalis	37.53	380	23.15	5
Sardinella maderensis	22.33	141	13.78	4
Sardinella aurita	2.19	14	1.35	
Trichiurus lepturus	2.13	6	1.31	
Trachurus trecae	1.44	12	0.89	
Echeneis naucrates	1.09	3	0.67	
Trachinotus ovatus	0.98	6	0.60	
Caranx crysos	0.75	3	0.46	
Total	162.07		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 5
DATE :24/07/17 GEAR TYPE: PT NO: 8 POSITION:Lat N 10°36.17
start stop duration Lon W 17°0.62
TIME :08:27:17 08:59:30 32.2 (min) Purpose : 1
LOG : 2117.55 2120.05 2.5 Region : 2100
FDEPTH: 20 60 Gear cond.: 0
BDEPTH: 213 221 Validity : 0
Towing dir: 0° Wire out : 350 m Speed : 4.7 kn
Sorted : 78 Total catch: 78.24 Catch/hour: 145.70

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Diodon holocanthus	139.48	3436	95.73	
Echeneis naucrates	6.22	11	4.27	
Total	145.70		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 6
DATE :24/07/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 10°45.79
start stop duration Lon W 16°30.00
TIME :13:36:41 14:07:18 30.6 (min) Purpose : 1
LOG : 2157.88 2159.78 1.9 Region : 2100
FDEPTH: 15 15 Gear cond.: 0
BDEPTH: 28 32 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.7 kn
Sorted : 18 Total catch: 17.64 Catch/hour: 34.57

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachinotus ovatus	32.49	133	93.99	
Sardinella aurita	1.21	8	3.51	6
Trichiurus lepturus	0.86	2	2.49	
Total	34.57		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 7
DATE :24/07/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 10°43.84
start stop duration Lon W 16°30.42
TIME :14:41:06 15:11:16 30.2 (min) Purpose : 1
LOG : 2161.36 2163.06 1.7 Region : 2100
FDEPTH: 33 30 Gear cond.: 0
BDEPTH: 33 30 Validity : 0
Towing dir: 0° Wire out : 160 m Speed : 3.4 kn
Sorted : 88 Total catch: 88.30 Catch/hour: 175.60

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trichiurus lepturus	133.88	372	76.24	
Arius parkii **	18.22	50	10.37	
Lagocephalus laevigatus	2.94	10	1.68	
Balistes capriscus	2.74	2	1.56	
Eucinostomus melanopterus	2.43	22	1.38	
Sardinella maderensis	1.99	10	1.13	8
Sphyraena afra	1.99	2	1.13	
Epinephelus aeneus	1.55	4	0.88	
Alloteuthis africana	1.43	668	0.82	
Selene dorsalis	1.31	14	0.75	7
Torpedo nobiliana	0.99	2	0.57	
Arius latiscutatus **	0.80	2	0.45	
Mugil bananensis	0.80	6	0.45	
Dasyatis marmorata	0.80	2	0.45	
Pseudupeneus prayensis	0.60	4	0.34	
Syacium micrurum**	0.60	4	0.34	
Echeneis naucrates	0.48	2	0.27	
Sepia officinalis	0.44	2	0.25	
Mugil curema	0.44	2	0.25	
Paraconger notialis	0.36	2	0.20	
Scarus hoefleri	0.28	2	0.16	
Xyrichtys novacula	0.20	2	0.11	
Chloroscombrus chrysurus	0.20	2	0.11	
Bothus podas	0.16	2	0.09	
Total	175.60		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 8
DATE :25/07/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 10°31.89
start stop duration Lon W 16°15.40
TIME :10:44:46 11:20:31 35.8 (min) Purpose : 1
LOG : 2314.39 2316.53 2.2 Region : 2100
FDEPTH: 30 29 Gear cond.: 0
BDEPTH: 30 29 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.6 kn
Sorted : 45 Total catch: 44.77 Catch/hour: 75.14

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Pseudupeneus prayensis	13.76	86	18.32	9
Sepia officinalis	11.11	40	14.79	
Balistes capriscus	8.46	12	11.26	
Lagocephalus laevigatus	6.28	10	8.35	
Chloroscombrus chrysurus	5.14	39	6.83	13
Sardinella maderensis	4.50	23	5.99	10
Trachinotus maxillosus	4.03	2	5.36	
Ephippion guttifer	3.86	2	5.14	
Pagrus caeruleostictus	3.69	22	4.91	11
Eucinostomus melanopterus	3.32	23	4.42	
Acanthurus monroviae	3.22	5	4.29	
Balistes punctatus	2.35	3	3.13	
Epinephelus aeneus	1.81	5	2.41	
Albula vulpes	1.54	3	2.05	
Pagrus africanus	0.94	2	1.25	
Pagellus bellottii	0.77	5	1.03	12
Echeneis naucrates	0.17	2	0.22	
Sphoeroides marmoratus	0.03	0	0.04	
Coris julis	0.03	2	0.04	
Trachinocephalus myops	0.03	3	0.04	
Decapterus punctatus	0.03	7	0.04	14
Penaeus kerathurus	0.03	3	0.04	
Alloteuthis africana	0.02	3	0.02	
Fishing gears	0.00	2	0.00	
Small squids	0.00	18	0.00	
Total	75.14		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 9
DATE :25/07/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 10°17.26
start stop duration Lon W 16°29.41
TIME :15:33:50 15:59:20 25.5 (min) Purpose : 1
LOG : 2350.90 2352.26 1.4 Region : 2100
FDEPTH: 58 54 Gear cond.: 0
BDEPTH: 58 54 Validity : 0
Towing dir: 0° Wire out : 180 m Speed : 3.2 kn
Sorted : 34 Total catch: 34.10 Catch/hour: 80.24

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Pseudupeneus prayensis	24.14	141	30.09	15
Epinephelus aeneus	19.11	2	23.81	
Dactylopterus volitans	12.80	92	15.95	
Lagocephalus laevigatus	12.14	19	15.13	
Fistularia petimba	8.66	33	10.79	
Seriola rivoliana	1.60	2	1.99	
Trachinocephalus myops	1.18	7	1.47	
Trigla lyra	0.61	5	0.76	
Total	80.24		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 10
DATE :25/07/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 10°8.13
start stop duration Lon W 16°37.44
TIME :17:59:18 18:24:58 25.7 (min) Purpose : 1
LOG : 2366.63 2368.01 1.4 Region : 2100
FDEPTH: 165 165 Gear cond.: 0
BDEPTH: 165 165 Validity : 0
Towing dir: 0° Wire out : 460 m Speed : 3.2 kn
Sorted : 155 Total catch: 425.25 Catch/hour: 993.96

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Scomber colias	632.63	9499	63.65	16
Antigonia capros	153.63	2389	15.46	
Ariomma bondi	101.00	2134	10.16	
Synagrops microlepis	56.52	4915	5.69	
Squatina oculata	21.27	2	2.14	
Priacanthus arenatus	9.82	194	0.99	
Helicolenus dactylopterus ***	6.40	28	0.64	
Brotula barbata	5.19	2	0.52	
Illex coindetii	2.62	56	0.26	
Trigla lyra	1.17	30	0.12	
Trichiurus lepturus	1.08	9	0.11	
Raja miraletus	0.98	2	0.10	
Synodus sp.**	0.33	2	0.03	
Zenopsis conchifer	0.28	5	0.03	
Bembrops greyi	0.26	2	0.03	
Dentex angolensis	0.23	2	0.02	
Pontinus accraensis	0.21	2	0.02	
Syacium micrurum**	0.14	2	0.01	
Scorpaena normani	0.14	2	0.01	
Peristedion cataphractum	0.07	2	0.01	
Total	993.96		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 11
DATE :26/07/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 10°2.90
start stop duration Lon W 16°29.86
TIME :05:14:08 05:34:11 20.1 (min) Purpose : 1
LOG : 2435.96 2437.03 1.1 Region : 2100
FDEPTH: 58 58 Gear cond.: 0
BDEPTH: 58 58 Validity : 0
Towing dir: 0° Wire out : 210 m Speed : 3.2 kn
Sorted : 49 Total catch: 184.46 Catch/hour: 552.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Dactylopterus volitans	351.92	2415	63.75	
Mustelus mustelus	84.99	12	15.40	
Trigla lyra	38.78	350	7.03	
Trachinus armatus	24.96	386	4.52	
Lagocephalus laevigatus	23.16	27	4.20	
Balistes capriscus	9.88	9	1.79	
Trachinocephalus myops	7.72	36	1.40	
Bothus podas	4.85	99	0.88	
Paraconger notialis	3.77	18	0.68	
Scorpaena scrofa	1.08	9	0.20	
Sepia officinalis	0.90	18	0.16	
Total	552.00		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 12
DATE :26/07/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 10°3.42
start stop duration Lon W 16°30.66
TIME :06:22:24 06:52:30 30.1 (min) Purpose : 1
LOG : 2440.48 2442.19 1.7 Region : 2100
FDEPTH: 15 17 Gear cond.: 0
BDEPTH: 61 60 Validity : 0
Towing dir: 0° Wire out : 150 m Speed : 3.4 kn
Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
N O C A T C H	0.00	0	0.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 12
DATE :26/07/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 10°3.42
start stop duration Lon W 16°30.66
TIME :06:22:24 06:52:30 30.1 (min) Purpose : 1
LOG : 2440.48 2442.19 1.7 Region : 2100
FDEPTH: 15 17 Gear cond.: 0
BDEPTH: 61 60 Validity : 0
Towing dir: 0° Wire out : 150 m Speed : 3.4 kn
Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
N O C A T C H	0.00	0	0.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 13
DATE :26/07/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 10°36.79
start stop duration Lon W 15°47.59
TIME :15:57:06 16:16:32 19.4 (min) Purpose : 1
LOG : 2503.26 2504.38 1.1 Region : 2100
FDEPTH: 27 27 Gear cond.: 0
BDEPTH: 27 27 Validity : 0
Towing dir: 0° Wire out : 140 m Speed : 3.5 kn
Sorted : 120 Total catch: 119.68 Catch/hour: 369.57

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	219.19	1803	59.31	18
Decapterus rhonchus**	97.46	868	26.37	20
Epinephelus aeneus	32.42	6	8.77	
Scomberomorus tritor	5.87	9	1.59	17
Pagrus caeruleostictus	4.45	25	1.20	
Decapterus punctatus	3.21	803	0.87	19
Pomadasys incisus	2.78	90	0.75	
Eucinostomus melanopterus	1.73	40	0.47	
Chaetodipterus goreensis**	0.86	3	0.23	
Ethmalosa fimbriata	0.74	6	0.20	
Chloroscombrus chrysurus	0.56	6	0.15	
Selene dorsalis	0.25	6	0.07	
Brachydeuterus auritus**	0.06	3	0.02	
Total	369.57		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 14
DATE :26/07/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 10°33.64
start stop duration Lon W 15°40.43
TIME :20:30:53 21:02:07 31.2 (min) Purpose : 1
LOG : 2540.27 2542.26 2.0 Region : 2200
FDEPTH: 25 24 Gear cond.: 0
BDEPTH: 25 24 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.8 kn
Sorted : 105 Total catch: 227.46 Catch/hour: 437.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus**	205.69	3748	47.07	
Sardinella maderensis	116.85	1495	26.74	21
Decapterus rhonchus**	85.82	2127	19.64	22
Eucinostomus melanopterus	7.76	192	1.78	
Caranx crysos	4.50	29	1.03	
Trachinotus teraia	2.73	2	0.62	
Galeoides decadactylus	2.46	33	0.56	
Sphyraena guachancho	2.31	4	0.53	
Chloroscombrus chrysurus	2.21	33	0.51	
Sepia officinalis	1.56	12	0.36	
Pagellus bellottii	1.23	359	0.28	
Lethrinus atlanticus	1.11	2	0.25	
Batrachoides liberiensis	0.98	12	0.22	
Scomberomorus lineolatus	0.61	2	0.14	
Decapterus punctatus	0.50	188	0.11	
Pseudupeneus prayensis	0.17	12	0.04	
Selene dorsalis	0.17	4	0.04	
Ilisha africana ***	0.17	8	0.04	
Penaeus kerathurus	0.17	58	0.04	
Plastic	0.00	0	0.00	
Total	437.00		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 15
DATE :27/07/17 GEAR TYPE: PT NO: 2 POSITION:Lat N 9°36.09
start stop duration Lon W 16°29.21
TIME :09:06:53 09:24:31 17.6 (min) Purpose : 1
LOG : 2650.81 2651.99 1.2 Region : 2200
FDEPTH: 270 310 Gear cond.: 0
BDEPTH: 381 376 Validity : 0
Towing dir: 0° Wire out : 900 m Speed : 4.0 kn
Sorted : 35 Total catch: 734.52 Catch/hour: 2499.78

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Diaphus sp.	2498.56	854508	99.95	
Sphoeroides marmoratus	0.68	7	0.03	
Diodon holocanthus	0.54	10	0.02	
Total	2499.78		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 16
DATE :27/07/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 9°41.72
start stop duration Lon W 16°22.55
TIME :11:32:01 11:54:04 22.1 (min) Purpose : 1
LOG : 2664.62 2665.80 1.2 Region : 2200
FDEPTH: 179 164 Gear cond.: 0
BDEPTH: 179 164 Validity : 0
Towing dir: 0° Wire out : 450 m Speed : 3.2 kn
Sorted : 287 Total catch: 286.91 Catch/hour: 780.71

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Antigonia capros	581.90	21309	74.54	
Ariomma bondi	166.97	4210	21.39	
Illex coindetii	19.10	177	2.45	
Squalus megalops	3.70	3	0.47	
Priacanthus arenatus	3.16	22	0.40	
Squatina oculata	2.34	3	0.30	
Scorpaena stephanica	1.03	3	0.13	
Raja miraletus	0.71	3	0.09	
Spicara alta	0.65	3	0.08	
Trigla lyra	0.60	8	0.08	
Decapterus rhonchus**	0.27	3	0.03	
Zenopsis conchifer	0.16	3	0.02	
Arnoglossus imperialis	0.11	3	0.01	
Total	780.71		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 17
DATE :27/07/17 GEAR TYPE: PT NO: 1 POSITION:Lat N 9°58.40
start stop duration Lon W 16°2.02
TIME :15:46:53 16:17:29 30.6 (min) Purpose : 1
LOG : 2696.60 2698.41 1.8 Region : 2200
FDEPTH: 45 48 Gear cond.: 0
BDEPTH: 46 46 Validity : 0
Towing dir: 0° Wire out : 170 m Speed : 3.6 kn
Sorted : 29 Total catch: 29.10 Catch/hour: 57.06

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Pseudupeneus prayensis	16.59	124	29.07	28
Pagellus bellottii	15.02	137	26.32	27
Selene dorsalis	5.57	47	9.76	24
Balistes capriscus	4.24	4	7.42	
Pagrus caeruleostictus	3.18	18	5.57	25
Lagocephalus laevigatus	2.35	6	4.12	
Chloroscombrus chrysurus	2.20	20	3.85	23
Eucinostomus melanopterus	1.45	14	2.54	
Raja miraletus	1.45	4	2.54	
LOLIGINIDAE	1.25	4	2.20	
Syacium micrurum**	1.22	8	2.13	
Aluterus heudelotii	0.71	2	1.24	
Sardinella maderensis	0.63	4	1.10	26
Trachinocephalus myops	0.59	4	1.03	
Priacanthus arenatus	0.43	2	0.76	
Alloteuthis africana	0.12	92	0.21	
Peristedion cataphractum	0.04	2	0.07	
Synchiropus phaeton	0.04	2	0.07	

Plastic	0.00	0.00
Total	57.06	100.00

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 18
DATE :27/07/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 10°2.51
start stop duration Lon W 15°57.47
TIME :17:39:47 18:14:31 34.7 (min) Purpose : 1
LOG : 2707.58 2709.52 1.9 Region : 2200
FDEPTH: 42 42 Gear cond.: 0
BDEPTH: 42 42 Validity : 0
Towing dir: 0° Wire out : 170 m Speed : 3.4 kn
Sorted : 299 Total catch: 299.33 Catch/hour: 517.13

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Dasyatis centroura	362.80	12	70.16	29
Pagellus bellottii	35.42	256	6.85	
Chloroscombrus chrysurus	34.66	356	6.70	
Pseudupeneus prayensis	22.80	143	4.41	30
Pagrus caeruleostictus	15.00	107	2.90	32
Eucinostomus melanopterus	12.23	93	2.37	
Selene dorsalis	8.71	88	1.68	31
Pomadasys rogeri	3.28	5	0.63	
Priacanthus arenatus	3.08	12	0.59	
Balistes capriscus	2.73	3	0.53	
Sepia officinalis	2.25	9	0.43	
Sardinella maderensis	2.04	12	0.39	
Epinephelus aeneus	1.66	2	0.32	
Trichiurus lepturus	1.66	3	0.32	
Trachinocephalus myops	1.55	7	0.30	
Caranx crysos	1.35	7	0.26	
Stephanolepis hispidus	1.21	9	0.23	
Lagocephalus laevigatus	1.00	3	0.19	
Galeoides decadactylus	0.69	5	0.13	
Decapterus punctatus	0.69	5	0.13	
Scarus hoefleri	0.52	3	0.10	
Chaetodon hoefleri	0.45	5	0.09	
Scorpaena scrofa	0.38	5	0.07	
Octopus vulgaris	0.35	2	0.07	
Syacium micrurum**	0.31	2	0.06	
Dactylopterus volitans	0.28	3	0.05	
Brachydeuterus auritus	0.22	2	0.04	
Total	517.30		100.03	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 19
DATE :27/07/17 GEAR TYPE: PT NO: 1 POSITION:Lat N 10°4.21
start stop duration Lon W 15°56.22
TIME :19:01:41 19:19:59 18.3 (min) Purpose : 1
LOG : 2711.97 2712.99 1.0 Region : 2200
FDEPTH: 42 38 Gear cond.: 0
BDEPTH: 43 39 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.4 kn
Sorted : 35 Total catch: 95.82 Catch/hour: 314.16

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	216.52	1984	68.92	33
Sardinella aurita	97.64	911	31.08	34
Total	314.16		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 20
DATE :27/07/17 GEAR TYPE: PT NO: 1 POSITION:Lat N 10°17.92
start stop duration Lon W 15°39.32
TIME :23:05:39 23:49:12 43.5 (min) Purpose : 1
LOG : 2744.88 2746.74 1.9 Region : 2200
FDEPTH: 15 15 Gear cond.: 0
BDEPTH: 51 43 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 2.6 kn
Sorted : 65 Total catch: 342.02 Catch/hour: 471.21

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	454.53	4961	96.46	35
Sepia officinalis	5.21	14	1.11	
Sardinella aurita	3.76	65	0.80	36
Decapterus punctatus	2.31	260	0.49	37
Decapterus rhonchus**	2.17	94	0.46	38
Sphyraena guachancho	1.93	4	0.41	
Ilisha africana	1.30	14	0.28	
Total	471.21		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 21
DATE :28/07/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 9°39.78
start stop duration Lon W 16°12.91
TIME :09:43:02 10:11:33 28.5 (min) Purpose : 1
LOG : 2829.50 2830.96 1.5 Region : 2200
FDEPTH: 129 136 Gear cond.: 0
BDEPTH: 129 136 Validity : 0
Towing dir: 0° Wire out : 350 m Speed : 3.1 kn
Sorted : 65 Total catch: 1380.82 Catch/hour: 2904.95

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Antigonia capros	2626.91	4418	90.43	
Trachinus armatus	113.10	1900	3.89	
Sepia officinalis	42.41	265	1.46	
Torpedo torpedo	27.39	44	0.94	
Ariomma bondi	20.32	309	0.70	
Trigla lyra	19.44	265	0.67	
Raja miraletus	16.79	44	0.58	
Illex coindetii	11.49	88	0.40	
Scomber colias	8.96	156	0.31	39
Pagellus bellottii	6.19	177	0.21	
Lagocephalus laevigatus	4.42	44	0.15	
Fistularia petimba	4.21	6	0.14	
Sphoeroides marmoratus	2.65	2	0.09	
Scorpaena scrofa	0.67	2	0.02	
Total	2904.95		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 22
DATE :28/07/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 9°53.44
start stop duration Lon W 15°35.40
TIME :19:50:08 20:12:29 22.4 (min) Purpose : 1
LOG : 2913.38 2914.60 1.2 Region : 2200
FDEPTH: 32 31 Gear cond.: 0
BDEPTH: 33 31 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.3 kn
Sorted : 69 Total catch: 282.38 Catch/hour: 758.07

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Chloroscombrus chrysurus	493.96	6977	65.16	43
Sardinella maderensis	232.91	3184	30.72	40
Sardinella aurita	11.81	118	1.56	41
Sphyraena guachancho	9.40	24	1.24	42
Selene dorsalis	7.09	75	0.93	48
Euthynnus alletteratus	1.13	5	0.15	47
Sepia officinalis	0.91	8	0.12	
Caranx crysos	0.38	3	0.05	45
Penaeus kerathurus	0.27	5	0.04	
Decapterus punctatus	0.21	3	0.03	46
Total	758.07		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 23
DATE :29/07/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 9°53.80
start stop duration Lon W 15°22.15
TIME :01:32:42 02:08:50 36.1 (min) Purpose : 1
LOG : 2959.14 2961.42 2.3 Region : 2200
FDEPTH: 20 20 Gear cond.: 0
BDEPTH: 28 28 Validity : 0
Towing dir: 0° Wire out : 125 m Speed : 3.8 kn
Sorted : 31 Total catch: 31.44 Catch/hour: 52.21

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Caranx crysos	22.29	153	42.68	49
Sardinella maderensis	13.85	141	26.53	50
Trachinotus maxillosus	6.94	3	13.30	61
Chloroscombrus chrysurus	3.39	48	6.49	52
Decapterus punctatus	2.39	40	4.58	51
Sardinella aurita	1.86	25	3.56	54
Sepia officinalis	0.76	3	1.46	
Decapterus rhonchus**	0.60	10	1.15	53
Stephanolepis hispidus	0.07	2	0.13	
Penaeus kerathurus	0.03	2	0.06	
Sphoeroides marmoratus	0.03	2	0.06	
Total	52.21		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 24
DATE :29/07/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 9°47.02
start stop duration Lon W 15°29.77
TIME :04:11:01 04:48:40 37.6 (min) Purpose : 1
LOG : 2975.22 2977.73 2.5 Region : 2200
FDEPTH: 20 20 Gear cond.: 0
BDEPTH: 33 35 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 4.0 kn
Sorted : 62 Total catch: 343.41 Catch/hour: 547.27

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Chloroscombrus chrysurus	391.79	5829	71.59	56
Sardinella maderensis	141.99	1920	25.95	55
Sardinella aurita	4.21	35	0.77	58
Brachydeuterus auritus	4.21	35	0.77	
Sphyraena guachancho	2.26	8	0.41	57
Caranx crysos	1.40	88	0.26	
Lagocephalus laevigatus	1.23	88	0.22	
Sepia officinalis	0.18	88	0.03	
Total	547.27		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 25
DATE :29/07/17 GEAR TYPE: PT NO: 8 POSITION:Lat N 9°26.39
start stop duration Lon W 15°54.87
TIME :09:42:35 10:21:51 39.3 (min) Purpose : 1
LOG : 3015.75 3018.94 3.2 Region : 2200
FDEPTH: 90 115 Gear cond.: 0
BDEPTH: 124 102 Validity : 0
Towing dir: 0° Wire out : 570 m Speed : 4.9 kn
Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
N O C A T C H	0.00	0	0.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 26
DATE :29/07/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 9°21.89
start stop duration Lon W 16°0.57
TIME :12:59:01 13:30:33 31.5 (min) Purpose : 1
LOG : 3037.44 3039.15 1.7 Region : 2200
FDEPTH: 218 224 Gear cond.: 0
BDEPTH: 218 224 Validity : 0
Towing dir: 0° Wire out : 625 m Speed : 3.3 kn
Sorted : 124 Total catch: 1772.06 Catch/hour: 3372.14

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Antigonia capros	2156.61	34232	63.95	
Ariomma bondi	808.11	28860	23.96	
Squalus megalops	206.62	152	6.13	59
Chlorophthalmus atlanticus	82.45	3298	2.45	
Illex coindetii	55.81	443	1.66	
Mustelus mustelus	24.51	6	0.73	
Squatina oculata	9.02	2	0.27	
Zenopsis conchifer	8.87	63	0.26	
Raja clavata	7.65	6	0.23	
Scomber colias	6.17	93	0.18	60
Merluccius senegalensis	3.81	63	0.11	
Epigonus telescopus**	1.26	63	0.04	
Trigla lyra	1.26	63	0.04	
Total	3372.14		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 27
DATE :30/07/17 GEAR TYPE: PT NO: 2 POSITION:Lat N 9°50.52
start stop duration Lon W 15°9.52
TIME :02:09:15 02:40:55 31.7 (min) Purpose : 1
LOG : 3123.76 3125.32 1.6 Region : 2200
FDEPTH: 20 20 Gear cond.: 0
BDEPTH: 33 34 Validity : 0
Towing dir: 0° Wire out : 135 m Speed : 3.0 kn
Sorted : 67 Total catch: 203.24 Catch/hour: 385.05

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	321.12	3751	83.40	62
Chloroscombrus chrysurus	59.56	773	15.47	63
Paraconger notialis	1.29	2	0.33	
Sardinella aurita	1.14	11	0.30	64
Decapterus punctatus	0.68	23	0.18	65
Caranx crysos	0.57	6	0.15	67
Decapterus rhonchus**	0.34	6	0.09	66
Aequorea forskalea	0.34	6	0.09	
Plastic	0.00	0	0.00	
Total	385.05		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 28
DATE :30/07/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 10°4.81
start stop duration Lon W 14°48.35
TIME :07:24:28 07:50:45 26.3 (min) Purpose : 1
LOG : 3153.88 3155.34 1.5 Region : 2200
FDEPTH: 30 26 Gear cond.: 0
BDEPTH: 28 27 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.3 kn
Sorted : 4 Total catch: 3.96 Catch/hour: 9.04

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	6.99	68	77.27	68
Scomberomorus tritor	1.92	2	21.21	
Echeneis naucrates	0.14	2	1.52	
Plastic	0.00	50	0.00	
Fishing gears	0.00	5	0.00	
Total	9.04		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 29
DATE :30/07/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 10°2.76
start stop duration Lon W 14°46.91
TIME :08:47:50 09:38:20 50.5 (min) Purpose : 1
LOG : 3160.29 3163.17 2.9 Region : 2200
FDEPTH: 26 26 Gear cond.: 0
BDEPTH: 26 26 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.4 kn
Sorted : 147 Total catch: 146.88 Catch/hour: 174.51

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Decapterus rhonchus**	55.15	1491	31.60	72
Sardinella aurita	28.99	9059	16.61	74
Sphyraena afra	25.02	1	14.34	75
Pseudupeneus prayensis	13.31	171	7.63	79
Pagrus caeruleostictus	11.36	238	6.51	
Brachydeuterus auritus	9.48	132	5.43	71
Chloroscombrus chrysurus	9.22	176	5.28	70
Decapterus punctatus	3.47	269	1.99	73
Caranx crysos	3.11	21	1.78	
Sepia officinalis	3.02	7	1.73	
Aluterus heudelotii	2.52	6	1.44	
Arius latiscutatus **	2.28	7	1.31	
Sardinella maderensis	1.35	109	0.78	69
Ephippion guttifer	1.31	2	0.75	
Stephanolepis hispidus	1.00	20	0.57	
Psettodes belcheri	0.86	1	0.49	
Scomberomorus tritor	0.81	1	0.46	
Lagocephalus laevigatus	0.69	4	0.39	
Epinephelus aeneus	0.52	1	0.30	
Sphyraena guachancho	0.43	1	0.25	
Sphoeroides marmoratus	0.21	2	0.12	
Synodus saurus	0.19	1	0.11	
Pagellus bellottii	0.14	2	0.08	
Cynoglossus canariensis	0.07	1	0.04	
Plastic	0.00	24	0.00	
Total	174.51		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 30
DATE :30/07/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 9°53.63
start stop duration Lon W 14°50.49
TIME :11:42:48 12:12:07 29.3 (min) Purpose : 1
LOG : 3179.30 3181.01 1.7 Region : 2200
FDEPTH: 32 29 Gear cond.: 0
BDEPTH: 32 29 Validity : 0
Towing dir: 0° Wire out : 140 m Speed : 3.5 kn
Sorted : 62 Total catch: 61.90 Catch/hour: 126.66

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Pseudupeneus prayensis	67.24	776	53.09	77
Chloroscombrus chrysurus	28.16	446	22.23	76
Scomberomorus tritor	10.23	8	8.08	78
Balistes capriscus	6.97	8	5.50	
Pagrus caeruleostictus	4.48	47	3.54	
Psettodes belcheri	3.41	4	2.69	
Balistes punctatus	3.32	2	2.62	
Aluterus heudelotii	0.77	2	0.61	
Lagocephalus laevigatus	0.57	4	0.45	
Decapterus rhonchus**	0.51	2	0.40	
Brachydeuterus auritus	0.41	4	0.33	
Bothus podas	0.16	2	0.13	
Synodus saurus	0.16	2	0.13	
Decapterus punctatus	0.12	2	0.10	
Saurida brasiliensis	0.12	2	0.10	
Plastic	0.00	37	0.00	
Total	126.66		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 31
DATE :30/07/17 GEAR TYPE: PT NO: 1 POSITION:Lat N 9°6.48
start stop duration Lon W 15°41.93
TIME :20:47:24 21:16:13 28.8 (min) Purpose : 1
LOG : 3257.31 3258.81 1.5 Region : 2200
FDEPTH: 26 31 Gear cond.: 0
BDEPTH: 612 633 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.1 kn
Sorted : 2 Total catch: 2.07 Catch/hour: 4.31

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Ariomma bondi	2.21	54	51.21	80
Synagrops bellus	1.42	110	32.85	86
Diaphus sp.	0.52	181	12.13	
Diaphus sp.	0.06	50	1.38	0
Promethichthys prometheus	0.05	2	1.12	
Lestrolepis intermedia	0.04	8	0.97	
Abralia sp.	0.01	4	0.20	
Diplophos taenia	0.01	21	0.14	
Total	4.31		99.99	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 32
DATE :31/07/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 9°32.82
start stop duration Lon W 14°59.21
TIME :03:37:29 04:10:12 32.7 (min) Purpose : 1
LOG : 3312.19 3314.16 2.0 Region : 2200
FDEPTH: 25 25 Gear cond.: 0
BDEPTH: 42 39 Validity : 0
Towing dir: 0° Wire out : 135 m Speed : 3.6 kn
Sorted : 70 Total catch: 140.04 Catch/hour: 256.80

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	201.20	1348	78.35	81
Selene dorsalis	25.60	330	9.97	85
Chloroscombrus chrysurus	21.49	260	8.37	83
Sardinella aurita	4.18	29	1.63	82
Decapterus punctatus	2.35	191	0.91	84
Caranx crysos	1.17	7	0.46	89
Decapterus rhonchus**	0.66	4	0.26	88
Brachydeuterus auritus	0.15	4	0.06	
Total	256.80		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 33
DATE :31/07/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 9°31.57
start stop duration Lon W 14°44.56
TIME :13:29:28 13:59:54 30.4 (min) Purpose : 1
LOG : 3390.91 3392.51 1.6 Region : 2200
FDEPTH: 25 25 Gear cond.: 0
BDEPTH: 39 38 Validity : 0
Towing dir: 0° Wire out : 135 m Speed : 3.1 kn
Sorted : 0 Total catch: 0.40 Catch/hour: 0.79

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Echeneis naucrates	0.79	2	100.00	
Total	0.79		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 34
DATE :01/08/17 GEAR TYPE: PT NO: 1 POSITION:Lat N 9°5.62
start stop duration Lon W 15°0.65
TIME :00:44:44 01:15:19 30.6 (min) Purpose : 1
LOG : 3465.81 3467.93 2.1 Region : 2200
FDEPTH: 35 25 Gear cond.: 0
BDEPTH: 92 80 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 4.1 kn
Sorted : 13 Total catch: 12.86 Catch/hour: 25.23

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	21.98	432	87.09	91
Ariomma bondi	2.00	53	7.93	
Scomber colias	0.78	12	3.11	90
Dactylopterus volitans	0.35	2	1.40	
Erythrocles monodi	0.12	12	0.47	
Plastic	0.00	2	0.00	
Fishing gears	0.00	2	0.00	
Total	25.23		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 35
DATE :01/08/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 9°40.91
start stop duration Lon W 14°11.48
TIME :08:26:56 08:57:25 30.5 (min) Purpose : 1
LOG : 3530.63 3532.54 1.9 Region : 2200
FDEPTH: 21 24 Gear cond.: 0
BDEPTH: 21 24 Validity : 0
Towing dir: 0° Wire out : 125 m Speed : 3.8 kn
Sorted : 113 Total catch: 324.36 Catch/hour: 638.50

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Chloroscombrus chrysurus	246.14	6183	38.55	95
Pagrus caeruleostictus	98.58	417	15.44	
Sphyraena guachancho	63.43	0	9.93	92
Galeoides decadactylus	53.07	608	8.31	
Cymbium pepo	29.37	8	4.60	
Sardinella maderensis	27.09	0	4.24	96
Pseudupeneus prayensis	21.57	0	3.38	97
Ephippion guttifer	17.99	14	2.82	
Brachydeuterus auritus	17.64	268	2.76	94
Drepane africana	14.02	24	2.20	
Albula vulpes	9.13	31	1.43	
Aluterus heudelotii	8.35	16	1.31	
Chaetodipterus goreensis**	5.04	24	0.79	
Eucinostomus melanopterus	4.25	39	0.67	
Lagocephalus laevigatus	4.25	8	0.67	
Balistes punctatus	4.02	2	0.63	
Trichiurus lepturus	3.70	14	0.58	93
Epinephelus aeneus	2.91	2	0.46	
Chaetodipterus lippei	2.83	8	0.44	
Pagellus bellottii	1.89	31	0.30	
Selene dorsalis	1.57	24	0.25	98
Lethrinus atlanticus	1.18	2	0.18	
Decapterus rhonchus**	0.47	8	0.07	
Plastic	0.00	47	0.00	
Total	638.50		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 36
DATE :01/08/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 9°23.12
start stop duration Lon W 14°22.54
TIME :12:40:40 13:10:52 30.2 (min) Purpose : 1

LOG : 3564.47 3566.19 1.7 Region : 2200
FDEPTH: 25 25 Gear cond.: 0
BDEPTH: 36 43 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.4 kn
Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
N O C A T C H	0.00	0	0.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 37
DATE :01/08/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 9°23.04
start stop duration Lon W 14°21.21
TIME :13:54:19 14:20:07 25.8 (min) Purpose : 1
LOG : 3569.63 3571.16 1.5 Region : 2200
FDEPTH: 25 25 Gear cond.: 0
BDEPTH: 33 33 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.6 kn
Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Plastic	0.00	7	0.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 38
DATE :01/08/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 9°21.00
start stop duration Lon W 14°21.84
TIME :14:59:08 15:53:55 54.8 (min) Purpose : 1
LOG : 3573.82 3577.23 3.4 Region : 2200
FDEPTH: 34 36 Gear cond.: 0
BDEPTH: 34 36 Validity : 0
Towing dir: 0° Wire out : 150 m Speed : 3.7 kn
Sorted : 81 Total catch: 143.46 Catch/hour: 157.13

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Chloroscombrus chrysurus	41.05	616	26.13	105
Pagrus caeruleostictus	32.53	289	20.70	99
Galeoides decadactylus	31.41	267	19.99	
Pseudupeneus prayensis	18.01	163	11.46	100
Lagocephalus laevigatus	7.67	21	4.88	
Balistes capriscus	6.88	13	4.38	
Decapterus rhonchus**	5.56	35	3.54	101
Caranx crysos	5.43	44	3.46	102
Chilomycterus spinosus mauretanicus	1.66	2	1.06	
Psettodes belcheri	1.34	1	0.85	
Xyrichtys novacula	1.14	7	0.72	
Aluterus heudelotii	1.12	2	0.71	
Sepia officinalis	1.12	2	0.71	
Pagellus bellottii	0.79	7	0.50	103
Stephanolepis hispidus	0.59	4	0.38	
Decapterus punctatus	0.48	7	0.31	104
Selene dorsalis	0.18	2	0.11	
Bothus podas	0.18	4	0.11	
Plastic	0.00	4	0.00	
Total	157.13		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 39
DATE :01/08/17 GEAR TYPE: PT NO: 1 POSITION:Lat N 9°12.22
start stop duration Lon W 14°36.45
TIME :19:24:24 19:52:13 27.8 (min) Purpose : 1
LOG : 3599.24 3600.93 1.7 Region : 2200
FDEPTH: 24 28 Gear cond.: 0
BDEPTH: 48 46 Validity : 0
Towing dir: 0° Wire out : 110 m Speed : 3.7 kn
Sorted : 4 Total catch: 4.32 Catch/hour: 9.32

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Sardinella aurita	4.66	47	50.00	106
Sardinella maderensis	2.44	19	26.16	107
Decapterus punctatus	2.05	24	21.99	109
Scomber colias	0.17	2	1.85	108
Plastic	0.00	6	0.00	
Total	9.32		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 40
DATE :01/08/17 GEAR TYPE: PT NO: 1 POSITION:Lat N 9°2.62
start stop duration Lon W 14°49.11
TIME :22:19:56 22:50:07 30.2 (min) Purpose : 1
LOG : 3619.81 3621.53 1.7 Region : 2200
FDEPTH: 24 30 Gear cond.: 0
BDEPTH: 86 83 Validity : 0
Towing dir: 0° Wire out : 110 m Speed : 3.4 kn
Sorted : 9 Total catch: 8.58 Catch/hour: 17.06

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Sardinella aurita	10.02	155	58.74	110
Scomber colias	4.69	60	27.51	111
Ariomma bondi	1.03	20	6.06	112
Dactylopterus volitans	0.91	2	5.36	
Hirundichthys speculiger	0.20	2	1.17	
Lagocephalus laevigatus	0.20	2	1.17	
Plastic	0.00	4	0.00	
Total	17.06		100.0	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 41
DATE :02/08/17 GEAR TYPE: PT NO: 1 POSITION:Lat N 9°8.55
start stop duration Lon W 14°54.00
TIME :00:21:34 00:52:27 30.9 (min) Purpose : 1
LOG : 3628.98 3631.06 2.1 Region : 2200
FDEPTH: 35 25 Gear cond.: 0
BDEPTH: 64 70 Validity : 0
Towing dir: 0° Wire out : 115 m Speed : 4.0 kn
Sorted : 4 Total catch: 3.56 Catch/hour: 6.92

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Sardinella aurita	4.70	68	67.98	114
Scomber colias	2.22	27	32.02	113
Total	6.92		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 42
DATE :02/08/17 GEAR TYPE: PT NO: 8 POSITION:Lat N 8°50.00
start stop duration Lon W 14°54.25
TIME :04:01:20 04:31:22 30.0 (min) Purpose : 1

LOG : 3656.00 3657.77 1.8 Region : 2200
FDEPTH: 430 415 Gear cond.: 0
BDEPTH: 821 968 Validity : 0
Towing dir: 0° Wire out : 1260 m Speed : 3.5 kn
Sorted : 16 Total catch: 16.30 Catch/hour: 32.57

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Invertebrate	9.92	0	30.46	
Fish small non. comm.	8.14	0	25.00	
Miscellaneous fishes	5.61	0	17.24	
Squid unidentified	4.46	0	13.68	
Aequorea forskalea	2.48	0	7.61	
J E L L Y F I S H	0.76	0	2.32	
Shrimps unidentified	0.51	0	1.58	
Centroscymnus crepidater	0.45	2	1.37	
Chrysaora hysoscella	0.26	0	0.80	
Total	32.59		100.06	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 43
DATE :02/08/17 GEAR TYPE: PT NO: 2 POSITION:Lat N 8°54.65
start stop duration Lon W 14°37.69
TIME :11:29:47 12:34:27 64.7 (min) Purpose : 1
LOG : 3677.36 3682.94 5.6 Region : 2200
FDEPTH: 57 57 Gear cond.: 0
BDEPTH: 113 103 Validity : 0
Towing dir: 0° Wire out : 300 m Speed : 5.2 kn
Sorted : 118 Total catch: 117.64 Catch/hour: 109.14

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Istiophorus albicans	109.01	2	99.89	115
Echeneis naucrates	0.13	2	0.11	
Total	109.14		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 44
DATE :03/08/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 9°12.57
start stop duration Lon W 13°47.96
TIME :15:25:33 15:41:44 16.2 (min) Purpose : 1
LOG : 3891.67 3892.53 0.9 Region : 2200
FDEPTH: 33 34 Gear cond.: 0
BDEPTH: 33 34 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.2 kn
Sorted : 127 Total catch: 127.18 Catch/hour: 471.62

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Chloroscombrus chrysurus	144.40	0	30.62	116
Pagrus caeruleostictus	104.80	894	22.22	120
Pseudupeneus prayensis	62.67	946	13.29	117
Alectis alexandrinus	35.67	70	7.56	
Caranx crysos	22.84	0	4.84	119
Drepane africana	20.32	30	4.31	
Ephippion guttifer	19.13	15	4.06	
Aluterus heudelotii	16.17	48	3.43	
Eucinostomus melanopterus	13.05	119	2.77	
Pagellus bellottii	6.90	0	1.46	122
Psettodes belcheri	4.97	7	1.05	
Balistes punctatus	4.38	4	0.93	
Dactylopterus volitans	4.30	48	0.91	
Brachydeuterus auritus	3.34	41	0.71	
Caranx senegallus	2.30	4	0.49	
Lagocephalus laevigatus	1.93	7	0.41	
Sepia officinalis	1.56	4	0.33	
Galeoides decadactylus	1.04	7	0.22	
Aluterus monoceros	0.74	7	0.16	
Selene dorsalis	0.74	19	0.16	121
Decapterus rhonchus**	0.37	4	0.08	
Plastic	0.00	22	0.00	
Total	471.62		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 45
DATE :03/08/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 9°12.08
start stop duration Lon W 13°49.78
TIME :16:23:24 16:35:05 11.7 (min) Purpose : 1
LOG : 3895.55 3896.30 0.8 Region : 2200
FDEPTH: 31 31 Gear cond.: 0
BDEPTH: 31 31 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.8 kn
Sorted : 58 Total catch: 173.28 Catch/hour: 890.14

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Chloroscombrus chrysurus	452.16	10300	50.80	124
Brachydeuterus auritus	93.08	1248	10.46	128
Pseudupeneus prayensis	87.84	986	9.87	127
Pagrus caeruleostictus	79.21	570	8.90	125
Caranx crysos	61.34	509	6.89	126
Galeoides decadactylus	21.88	262	2.46	
Alectis alexandrinus	21.58	46	2.42	
Lagocephalus laevigatus	20.96	15	2.35	
Drepane africana	16.95	15	1.90	
Decapterus rhonchus**	14.49	108	1.63	129
Eucinostomus melanopterus	4.62	46	0.52	
Dactylopterus volitans	3.70	31	0.42	
Sardinella maderensis	3.70	41	0.42	123
Acanthurus monroviae	3.39	15	0.38	
Sphyraena guachancho	3.08	15	0.35	130
Pagellus bellottii	2.16	15	0.24	131
Plastic	0.00	5	0.00	
Total	890.14		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 46
DATE :03/08/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 9°11.28
start stop duration Lon W 13°54.52
TIME :20:06:01 20:33:15 27.2 (min) Purpose : 1
LOG : 3924.86 3926.51 1.6 Region : 2200
FDEPTH: 10 25 Gear cond.: 0
BDEPTH: 39 35 Validity : 0
Towing dir: 0° Wire out : 110 m Speed : 3.6 kn
Sorted : 96 Total catch: 3119.67 Catch/hour: 6874.04

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Sardinella maderensis	4442.58	89183	64.63	133
Sardinella aurita	1258.19	19003	18.30	132
Chloroscombrus chrysurus	922.78	17780	13.42	134
Brachydeuterus auritus	187.14	0	2.72	136
Sphyraena guachancho	38.87	73	0.57	139
Caranx crysos	17.28	143	0.25	135

Decapterus rhonchus**	5.75	143	0.08	138
Decapterus punctatus	1.43	73	0.02	137
Plastic	0.00	2	0.00	
Total	6874.02		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 47
DATE :04/08/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 9°32.57
start stop duration Lon W 14°3.53
TIME :00:50:14 01:22:42 32.5 (min) Purpose : 1
LOG : 3958.12 3960.62 2.5 Region : 2200
FDEPTH: 0 26 Gear cond.: 0
BDEPTH: 0 26 Validity : 0
Towing dir: 0° Wire out : 110 m Speed : 3.6 kn
Sorted : 111 Total catch: 370.95 Catch/hour: 685.68

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	315.75	9597	46.05	
Galeoides decadactylus	68.98	1499	10.06	
Pagrus caeruleostictus	59.45	616	8.67	141
Eucinostomus melanopterus	35.49	466	5.18	
Ephippion guttifer	33.27	28	4.85	
Pseudupeneus prayensis	24.40	344	3.56	140
Drepane africana	23.59	68	3.44	143
Arius latiscutatus **	21.74	83	3.17	
Dasyatis centroura	20.33	2	2.97	
Pseudotolithus senegalensis	17.74	61	2.59	147
Sardinella aurita	12.31	693	1.80	145
Stephanolepis hispidus	12.09	216	1.76	
Dasyatis margarita	5.99	22	0.87	
Trichiurus lepturus	5.77	55	0.84	
Pomadasys perotaei	4.55	6	0.66	144
Penaeus kerathurus	3.92	104	0.57	
Arius parkii **	3.66	28	0.53	
Sphyraena guachancho	2.70	4	0.39	142
Dactylopterus volitans	2.66	39	0.39	
Chloroscombrus chrysurus	2.33	61	0.34	
Dicologoglossa hexophthalma	1.89	22	0.27	
Sepia officinalis	1.66	22	0.24	
Cynoglossus canariensis	1.22	6	0.18	
Sardinella maderensis	1.22	50	0.18	146
Syacium micrurum**	1.11	11	0.16	
Ilisha africana ***	0.55	50	0.08	
Sphoeroides marmoratus	0.55	28	0.08	
Bothus podas	0.55	11	0.08	
MURAENIDAE	0.21	6	0.03	
Total	685.68		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 48
DATE :04/08/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 9°35.52
start stop duration Lon W 14°19.25
TIME :03:29:47 04:01:00 31.2 (min) Purpose : 1
LOG : 3974.45 3976.07 1.6 Region : 2100
FDEPTH: 25 25 Gear cond.: 0
BDEPTH: 35 34 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.1 kn
Sorted : 107 Total catch: 2961.11 Catch/hour: 5690.79

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	3135.80	69684	55.10	149
Chloroscombrus chrysurus	1454.18	24571	25.55	151
Sphyraena guachancho	471.91	1282	8.29	150
Brachydeuterus auritus	467.64	9742	8.22	
Sardinella aurita	149.46	2723	2.63	148
Decapterus rhonchus**	10.67	54	0.19	
Selene dorsalis	1.06	54	0.02	
Total	5690.72		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 49
DATE :04/08/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 9°36.88
start stop duration Lon W 14°19.89
TIME :05:22:49 06:03:22 40.5 (min) Purpose : 1
LOG : 3982.79 3985.28 2.5 Region : 2100
FDEPTH: 25 25 Gear cond.: 0
BDEPTH: 32 41 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.7 kn
Sorted : 82 Total catch: 3765.10 Catch/hour: 5571.05

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	3788.45	69385	68.00	152
Chloroscombrus chrysurus	1736.32	30786	31.17	154
Sardinella aurita	46.28	817	0.83	153
Total	5571.05		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 50
DATE :04/08/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 9°22.00
start stop duration Lon W 14°22.74
TIME :08:50:34 09:24:08 33.6 (min) Purpose : 1
LOG : 4005.03 4006.87 1.9 Region : 2100
FDEPTH: 34 40 Gear cond.: 0
BDEPTH: 34 40 Validity : 0
Towing dir: 0° Wire out : 150 m Speed : 3.3 kn
Sorted : 145 Total catch: 436.26 Catch/hour: 779.73

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Galeoides decadactylus	342.16	2833	43.88	
Brachydeuterus auritus	157.86	357	20.24	155
Rachycentron canadum	76.19	4	9.77	
Trichiurus lepturus	28.31	50	3.63	
Pseudupeneus prayensis	23.88	357	3.06	
Arius parkii **	18.87	29	2.42	
Arius latiscutatus **	16.44	29	2.11	
Sphyraena guachancho	14.16	36	1.82	
Balistes capriscus	12.01	7	1.54	
Chloroscombrus chrysurus	11.58	143	1.49	156
Scomberomorus tritor	9.26	5	1.19	159
Lagocephalus laevigatus	9.15	29	1.17	
Pagellus bellottii	8.29	64	1.06	
Pseudotolithus senegalensis	7.86	29	1.01	
Psettodes belcheri	7.72	7	0.99	
Pagrus caeruleostictus	7.01	57	0.90	
Stephanolepis hispidus	6.58	29	0.84	
Decapterus rhonchus**	4.86	29	0.62	158
Selene dorsalis	4.15	64	0.53	157
Zanobatus shoenleinii **	2.57	7	0.33	
Caranx crysos	2.57	14	0.33	
Dasyatis margarita	2.43	7	0.31	
Trachinocephalus myops	2.29	7	0.29	
Cynoglossus senegalensis	1.86	7	0.24	
Dicologoglossa hexophthalma	1.29	14	0.17	
Penaeus kerathurus	0.29	7	0.04	
Bothus podas	0.14	14	0.02	
Plastic	0.00	29	0.00	
Total	779.79		100.01	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 51
DATE :04/08/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 9°2.95
start stop duration Lon W 14°31.23
TIME :12:44:50 13:14:57 30.1 (min) Purpose : 1
LOG : 4032.01 4033.92 1.9 Region : 2100
FDEPTH: 25 25 Gear cond.: 0
BDEPTH: 52 45 Validity : 0
Towing dir: 0° Wire out : 135 m Speed : 3.8 kn
Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
N O C A T C H	0.00	0	0.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 52
DATE :04/08/17 GEAR TYPE: PT NO: 1 POSITION:Lat N 8°57.30
start stop duration Lon W 14°31.68
TIME :14:57:02 15:33:47 36.8 (min) Purpose : 1
LOG : 4044.39 4046.86 2.5 Region : 2100
FDEPTH: 42 35 Gear cond.: 0
BDEPTH: 68 59 Validity : 0
Towing dir: 0° Wire out : 125 m Speed : 4.0 kn
Sorted : 12 Total catch: 12.22 Catch/hour: 19.94

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Invertebrate	19.59	0	98.23	
Echeneis naucrates	0.35	2	1.77	
Plastic	0.00	3	0.00	
Total	19.94		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 53
DATE :04/08/17 GEAR TYPE: PT NO: 1 POSITION:Lat N 8°55.52
start stop duration Lon W 14°28.87
TIME :19:51:47 20:13:14 21.4 (min) Purpose : 1
LOG : 4063.64 4064.99 1.4 Region : 2100
FDEPTH: 30 40 Gear cond.: 0
BDEPTH: 59 64 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.8 kn
Sorted : 69 Total catch: 172.00 Catch/hour: 481.12

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	466.71	5348	97.01	
Scomber colias	10.91	84	2.27	
Decapterus rhonchus**	2.24	20	0.47	
Sardinella maderensis	1.26	6	0.26	
Total	481.12		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 54
DATE :04/08/17 GEAR TYPE: PT NO: 1 POSITION:Lat N 8°41.07
start stop duration Lon W 14°32.44
TIME :23:16:54 23:46:02 29.1 (min) Purpose : 1
LOG : 4087.30 4088.96 1.7 Region : 2200
FDEPTH: 25 30 Gear cond.: 0
BDEPTH: 90 94 Validity : 0
Towing dir: 0° Wire out : 110 m Speed : 3.4 kn
Sorted : 62 Total catch: 62.38 Catch/hour: 128.49

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Invertebrate	123.58	0	96.18	
Ariomma bondi	2.80	64	2.18	164
Scomber colias	1.36	16	1.06	163
Caranx crysos	0.74	4	0.58	165
Total	128.49		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 55
DATE :05/08/17 GEAR TYPE: PT NO: 1 POSITION:Lat N 8°50.34
start stop duration Lon W 14°35.58
TIME :01:24:35 02:05:05 82.5 (min) Purpose : 1
LOG : 4098.85 4101.50 2.7 Region : 2200
FDEPTH: 40 35 Gear cond.: 0
BDEPTH: 92 110 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 4.8 kn
Sorted : 67 Total catch: 66.52 Catch/hour: 48.38

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	32.79	525	67.77	166
Invertebrate	14.55	0	30.07	
Scomber colias	0.80	9	1.65	167
Dactylopterus volitans	0.19	1	0.39	
Decapterus punctatus	0.06	2	0.12	168
Total	48.38		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 56
DATE :05/08/17 GEAR TYPE: PT NO: 1 POSITION:Lat N 8°48.40
start stop duration Lon W 14°0.71
TIME :11:07:13 11:33:03 25.8 (min) Purpose : 1
LOG : 4162.29 4163.91 1.6 Region : 2200
FDEPTH: 30 40 Gear cond.: 0
BDEPTH: 44 46 Validity : 0
Towing dir: 0° Wire out : 100 m Speed : 3.8 kn
Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
N O C A T C H	0.00	0	0.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 57
DATE :05/08/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 8°43.14
start stop duration Lon W 13°52.74
TIME :21:28:05 22:09:37 41.5 (min) Purpose : 1
LOG : 4214.18 4216.75 2.6 Region : 2300

FDEPTH: 10 30 Gear cond.: 0
BDEPTH: 33 35 Validity : 0
Towing dir: 0° Wire out : 110 m Speed : 3.7 kn
Sorted : 76 Total catch: 203.90 Catch/hour: 294.58

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Chloroscombrus chrysurus	186.76	3072	63.40	172
Sardinella maderensis	49.44	657	16.78	169
Decapterus punctatus	24.86	574	8.44	170
Brachydeuterus auritus	11.20	150	3.80	
Sardinella aurita	8.12	173	2.76	177
Decapterus rhonchus**	4.74	52	1.61	171
Euthynnus alletteratus	4.16	14	1.41	175
Scomberomorus tritor	2.63	3	0.89	174
Caranx crysos	1.36	7	0.46	173
Auxis thazard	1.33	4	0.45	176
Total	294.60		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 58
DATE :06/08/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 8°33.38
start stop duration Lon W 13°48.05
TIME :10:25:54 10:43:05 17.2 (min) Purpose : 1
LOG : 4320.35 4321.41 1.1 Region : 2300
FDEPTH: 29 31 Gear cond.: 0
BDEPTH: 29 31 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.7 kn
Sorted : 53 Total catch: 53.36 Catch/hour: 186.36

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Pagrus caeruleostictus	81.02	807	43.48	181
Pseudupeneus prayensis	70.48	601	37.82	180
Decapterus punctatus	12.92	210	6.93	178
Lagocephalus laevigatus	10.27	21	5.51	
Galeocerdo cuvier	5.31	3	2.85	
Pagellus bellottii	2.51	17	1.35	179
Sepia officinalis	1.96	3	1.05	
Chloroscombrus chrysurus	1.33	17	0.71	
Dactylopterus volitans	0.56	3	0.30	
Total	186.36		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 59
DATE :06/08/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 8°42.27
start stop duration Lon W 13°37.22
TIME :13:02:06 13:23:15 21.1 (min) Purpose : 1
LOG : 4338.62 4339.76 1.1 Region : 2300
FDEPTH: 23 23 Gear cond.: 0
BDEPTH: 23 23 Validity : 0
Towing dir: 0° Wire out : 115 m Speed : 3.2 kn
Sorted : 129 Total catch: 129.06 Catch/hour: 366.11

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Balistes capriscus	96.11	125	26.25	
Sphyraena afra	84.26	6	23.01	
Sardinella aurita	56.06	928	15.31	182
Pagrus caeruleostictus	42.78	389	11.68	185
Pseudupeneus prayensis	41.25	627	11.27	184
Chloroscombrus chrysurus	22.24	556	6.07	183
Ephippion guttifer	8.91	9	2.43	
Balistes punctatus	5.05	6	1.38	
Epinephelus aeneus	3.23	6	0.88	
Scarus hoefleri	1.19	9	0.33	
Diodon holocanthus	1.13	14	0.31	
Aluterus heudelotii	1.08	3	0.29	
Sardinella maderensis	0.68	9	0.19	
Eucinostomus melanopterus	0.57	9	0.15	
Caranx crysos	0.57	6	0.15	
Xyrichtys novacula	0.40	6	0.11	
Brachydeuterus auritus	0.40	6	0.11	
Pagellus bellottii	0.11	3	0.03	
Penaeus kerathurus	0.06	3	0.02	
Anthias anthias**	0.04	3	0.01	
Total	366.11		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 60
DATE :07/08/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 7°56.50
start stop duration Lon W 14°2.06
TIME :06:34:21 07:04:20 30.0 (min) Purpose : 1
LOG : 4445.44 4447.18 1.7 Region : 2300
FDEPTH: 20 20 Gear cond.: 0
BDEPTH: 34 33 Validity : 0
Towing dir: 0° Wire out : 125 m Speed : 3.5 kn
Sorted : 38 Total catch: 38.30 Catch/hour: 76.65

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Dactylopterus volitans	33.98	82	44.33	
Sardinella maderensis	25.30	368	33.00	189
Selene dorsalis	7.00	56	9.14	187
Scomberomorus tritor	4.44	4	5.80	188
Caranx crysos	2.88	4	3.76	186
Acanthurus monroviae	0.92	2	1.20	
Echeneis naucrates	0.80	4	1.04	
Alectis alexandrinus	0.80	2	1.04	
Sepia officinalis	0.52	2	0.68	
Total	76.65		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 61
DATE :07/08/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 7°53.64
start stop duration Lon W 13°54.83
TIME :18:52:36 19:22:24 29.8 (min) Purpose : 1
LOG : 4541.59 4543.24 1.6 Region : 2300
FDEPTH: 28 26 Gear cond.: 0
BDEPTH: 28 26 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.3 kn
Sorted : 100 Total catch: 199.76 Catch/hour: 402.20

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	177.18	0	44.05	
Galeoides decadactylus	67.17	823	16.70	
Selene dorsalis	28.03	503	6.97	197
Sphyraena guachancho	18.12	81	4.51	190
Dactylopterus volitans	15.62	56	3.88	
Arius parkii **	13.85	48	3.44	
Pseudupeneus prayensis	8.21	0	2.04	199
Mustelus mustelus	7.77	6	1.93	
Acanthurus monroviae	6.44	8	1.60	
Selar crumenophthalmus	6.20	52	1.54	
Pomadasys perotaei	6.12	10	1.52	192
Aluterus monoceros	5.36	4	1.33	
Sardinella maderensis	5.23	0	1.30	194
Bothus podas	5.07	105	1.26	
Pagellus bellottii	4.31	28	1.07	198
Pagrus caeruleostictus	4.27	20	1.06	196
Diodon holocanthus	4.03	12	1.00	
Trachinocephalus myops	3.06	20	0.76	
Paraconger notialis	2.82	16	0.70	
Balistes capriscus	2.46	4	0.61	
Pomadasys incisus	2.01	16	0.50	191
Sardinella aurita	1.41	30	0.35	193
Eucinostomus melanopterus	1.25	16	0.31	
Balistes punctatus	0.93	2	0.23	
Chilomycterus reticulatus	0.89	4	0.22	
Decapterus punctatus	0.81	28	0.20	195
Penaeus kerathurus	0.68	12	0.17	
Dasyatis margarita	0.68	4	0.17	
Dicologoglossa hexophthalma	0.64	8	0.16	
Calappa rubroguttata	0.52	2	0.13	
Lagocephalus laevigatus	0.40	4	0.10	
Aluterus heudelotii	0.32	4	0.08	
Chloroscombrus chrysurus	0.32	4	0.08	
Plastic	0.00	6	0.00	
Total	402.20		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 62
DATE :08/08/17 GEAR TYPE: PT NO: 1 POSITION:Lat N 7°38.32
start stop duration Lon W 13°51.57
TIME :01:57:54 02:28:05 30.2 (min) Purpose : 1
LOG : 4585.27 4587.05 1.8 Region : 2300
FDEPTH: 30 41 Gear cond.: 0
BDEPTH: 88 82 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.5 kn
Sorted : 4 Total catch: 3.64 Catch/hour: 7.24

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Invertebrate	2.98	0	41.21	
Ariomma bondi	2.58	83	35.71	200
Selene dorsalis	0.72	8	9.89	201
Sardinella aurita	0.32	6	4.40	203
Dactylopterus volitans	0.32	2	4.40	
Caranx crysos	0.24	2	3.30	202
Decapterus punctatus	0.08	2	1.10	204
Total	7.24		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 63
DATE :08/08/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 7°44.92
start stop duration Lon W 13°45.94
TIME :04:27:17 05:09:39 41.0 (min) Purpose : 1
LOG : 4598.53 4600.93 2.4 Region : 2300
FDEPTH: 25 25 Gear cond.: 0
BDEPTH: 38 40 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.3 kn
Sorted : 96 Total catch: 297.18 Catch/hour: 434.89

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	287.18	6837	66.03	205
Selene dorsalis	70.60	1307	16.23	209
Scomberomorus tritor	31.61	25	7.27	206
Selar crumenophthalmus	12.06	117	2.77	208
Stromateus fiatola	7.02	12	1.62	
Sphyraena guachancho	6.03	59	1.39	207
Trichiurus lepturus	5.50	35	1.27	210
Dactylopterus volitans	5.15	12	1.18	
Rhizoprionodon acutus	4.98	3	1.14	
Ilisha africana ***	1.87	41	0.43	
J E L L Y F I S H	1.64	6	0.38	
Chloroscombrus chrysurus	0.70	12	0.16	
Echeneis naucrates	0.35	6	0.08	
Saurida brasiliensis	0.12	59	0.03	
Decapterus punctatus	0.08	6	0.02	
Total	434.89		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 64
DATE :08/08/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 7°42.38
start stop duration Lon W 13°31.81
TIME :08:18:30 08:48:20 29.8 (min) Purpose : 1
LOG : 4620.44 4621.91 1.5 Region : 2300
FDEPTH: 22 22 Gear cond.: 0
BDEPTH: 22 22 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.0 kn
Sorted : 144 Total catch: 143.67 Catch/hour: 288.98

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Galeoides decadactylus	118.35	1599	40.95	
Arius parkii **	49.92	239	17.28	
Selene dorsalis	30.85	428	10.68	213
Ilisha africana ***	15.69	408	5.43	212
Sphyraena guachancho	9.98	143	3.45	
Pseudotolithus senegalensis	9.57	32	3.31	
Brachydeuterus auritus	7.08	151	2.45	
Ephippion guttifer	5.67	4	1.96	
Trichiurus lepturus	5.55	30	1.92	
Pagrus caeruleostictus	5.43	24	1.88	
Rhinobatos rhinobatos	5.15	6	1.78	
Dasyatis margarita	4.30	18	1.49	
Chloroscombrus chrysurus	4.10	68	1.42	214
Caranx senegallus	2.53	10	0.88	
Sardinella maderensis	1.85	38	0.64	215
Cynoglossus senegalensis	1.73	6	0.60	
Lethrinus atlanticus	1.41	6	0.49	
Lagocephalus laevigatus	1.41	4	0.49	
Scomberomorus tritor	1.13	4	0.39	
Selar crumenophthalmus	1.13	10	0.39	
Stromateus fiatola	1.05	2	0.36	
Eucinostomus melanopterus	0.89	10	0.31	
Pseudupeneus prayensis	0.84	8	0.29	

Sepia officinalis	0.72	2	0.25
Pteroscion peli	0.64	8	0.22
Balistes punctatus	0.56	2	0.19
Calappa rubroguttata	0.48	2	0.17
Pomadasys incisus	0.46	4	0.16
Bothus podas	0.20	6	0.07
Penaeus kerathurus	0.12	2	0.04
Chaetodipterus lippei	0.12	4	0.04
Fistularia petimba	0.04	2	0.01
Total	288.98		100.00

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 65
DATE :09/08/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 7°16.80
start stop duration Lon W 12°26.72
TIME :16:12:05 16:42:14 30.1 (min) Purpose : 1
LOG : 4843.54 4845.22 1.7 Region : 2300
FDEPTH: 33 32 Gear cond.: 0
BDEPTH: 33 32 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.3 kn
Sorted : 41 Total catch: 249.08 Catch/hour: 495.67

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Galeoides decadactylus	77.85	350	15.71	
Pseudotolithus senegalensis	75.50	239	15.23	
Ilisha africana ***	55.24	1409	11.15	217
Sphyraena guachancho	53.77	207	10.85	216
Chloroscombrus chrysurus	39.64	569	8.00	223
Trichiurus lepturus	33.11	685	6.68	
Selene dorsalis	22.61	476	4.56	224
Callinectes amnicola	20.06	1122	4.05	
Pomadasys perotaei	18.63	48	3.76	222
Brachydeuterus auritus	14.97	334	3.02	219
Pteroscion peli	14.97	295	3.02	
Cynoponticus ferox	11.94	12	2.41	
Cynoglossus senegalensis	11.62	24	2.34	
Pentanemus quinquarius	8.44	295	1.70	
Selar crumenophthalmus	4.62	16	0.93	
Ephippion guttifer	4.46	215	0.90	
Nematopalaemon hastatus	3.98	3980	0.80	
Panulirus regius	2.99	8	0.60	
Parapenaeus longirostris	2.91	199	0.59	
Cynoglossus canariensis	2.87	16	0.58	
Dasyatis margarita	2.07	16	0.42	
Pomadasys rogeri	1.91	10	0.39	221
Elops lacerta	1.91	6	0.39	
Portunus validus	1.50	8	0.30	
Scomberomorus tritor	1.27	8	0.26	
Pagrus caeruleostictus	1.15	2	0.23	
Stromateus fiatola	0.88	2	0.18	
Sardinella maderensis	0.80	24	0.16	220
Pisodonophis semicinctus	0.72	6	0.14	
Penaeus notialis	0.68	30	0.14	
Squilla acuelata calmani	0.64	32	0.13	
Batrachoides liberiensis	0.48	48	0.10	
Eucinostomus melanopterus	0.48	8	0.10	
Calappa rubroguttata	0.40	2	0.08	
Sepia officinalis	0.32	32	0.06	
Penaeus kerathurus	0.16	6	0.03	
Alectis alexandrinus	0.16	8	0.03	
Total	495.67		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 66
DATE :09/08/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 7°11.55
start stop duration Lon W 12°18.12
TIME :20:38:41 21:08:45 30.1 (min) Purpose : 1
LOG : 4878.65 4880.22 1.6 Region : 2300
FDEPTH: 5 20 Gear cond.: 0
BDEPTH: 46 38 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.1 kn
Sorted : 44 Total catch: 44.44 Catch/hour: 88.67

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	31.41	1594	35.42	226
Elops lacerta	14.53	44	16.38	230
Sphyraena guachancho	14.17	52	15.98	227
Selar crumenophthalmus	9.26	62	10.44	229
Scomberomorus tritor	7.46	16	8.42	231
Caranx senegallus	5.71	18	6.44	225
Selene dorsalis	4.23	32	4.77	
Ilisha africana ***	1.00	0	1.13	
Caranx crysos	0.52	2	0.59	
Fodiator acutus	0.40	2	0.45	
Total	88.67		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 67
DATE :10/08/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 7°4.15
start stop duration Lon W 12°11.19
TIME :02:37:57 03:08:08 30.2 (min) Purpose : 1
LOG : 4908.34 4909.80 1.5 Region : 2300
FDEPTH: 15 15 Gear cond.: 0
BDEPTH: 62 71 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 2.9 kn
Sorted : 18 Total catch: 18.06 Catch/hour: 35.91

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Scomberomorus tritor	21.35	22	59.46	232
Selar crumenophthalmus	7.71	83	21.48	235
Selene dorsalis	1.79	14	4.98	234
Alloteuthis africana	1.67	2728	4.65	
Euthynnus alletteratus	1.59	2	4.43	
Sardinella maderensis	1.55	64	4.32	233
Ariomma bondi	0.24	4	0.66	
Caranx crysos	0.00	2	0.01	
Total	35.91		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 68
DATE :10/08/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 7°3.37
start stop duration Lon W 11°49.19
TIME :11:19:11 11:48:34 29.4 (min) Purpose : 1
LOG : 4959.43 4961.14 1.7 Region : 2300
FDEPTH: 25 23 Gear cond.: 0
BDEPTH: 25 23 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.5 kn
Sorted : 63 Total catch: 317.73 Catch/hour: 648.87

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Drepane africana	161.13	347	24.83	241
Pseudotolithus senegalensis	137.44	582	21.18	
Ilisha africana ***	133.76	541	20.61	237
Trichiurus lepturus	37.37	643	5.76	
Brachydeuterus auritus	33.90	929	5.22	
Sphyraena guachancho	31.65	133	4.88	236
Pseudotolithus elongatus	26.14	102	4.03	
Galeoides decadactylus	23.08	163	3.56	
Selene dorsalis	12.46	255	1.92	238
Pentanemus quinquarius	6.94	235	1.07	
Sardinella maderensis	5.92	562	0.91	240
Chloroscombrus chrysurus	5.11	194	0.79	239
Scomberomorus tritor	4.94	6	0.76	
Portunus validus	3.68	10	0.57	
Callinectes amnicola	3.68	102	0.57	
Pteroscion peli	3.68	71	0.57	
Arius parkii **	3.27	31	0.50	
Caranx hippos	3.06	10	0.47	
Torpedo marmorata	2.65	2	0.41	
Cynoponticus ferox	2.25	10	0.35	
Penaeus notialis	2.04	31	0.31	
Pseudotolithus moorii	1.88	2	0.29	
Parapenaeus longirostris	1.43	133	0.22	
Chaetodipterus goreensis**	0.49	2	0.08	
Alloteuthis africana	0.41	153	0.06	
Ephippion guttifer	0.20	10	0.03	
Batrachoides liberiensis	0.20	10	0.03	
Sepia officinalis	0.10	10	0.02	
Total	648.87		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 69
DATE :10/08/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 6°57.21
start stop duration Lon W 11°45.46
TIME :13:57:41 14:27:50 30.1 (min) Purpose : 1
LOG : 4977.72 4979.42 1.7 Region : 2300
FDEPTH: 39 38 Gear cond.: 0
BDEPTH: 39 38 Validity : 0
Towing dir: 0° Wire out : 135 m Speed : 3.4 kn
Sorted : 53 Total catch: 112.25 Catch/hour: 223.38

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	132.78	726	59.44	
Cynoponticus ferox	32.64	10	14.61	
Trichiurus lepturus	13.47	185	6.03	
Galeoides decadactylus	7.42	60	3.32	
Pseudotolithus brachygnathus	7.00	6	3.14	
Pterothrissus belloci	6.15	111	2.75	
Arius parkii **	5.31	6	2.38	
Sphyraena guachancho	3.72	6	1.67	
Torpedo marmorata	3.08	6	1.38	
Selene dorsalis	2.77	38	1.24	243
Parapenaeus longirostris	1.91	334	0.86	
Ilisha africana ***	1.81	38	0.81	242
Callinectes amnicola	1.33	6	0.60	
Cynoglossus senegalensis	0.96	6	0.43	
Balistes capriscus	0.74	6	0.33	
Raja miraletus	0.68	2	0.30	
Chloroscombrus chrysurus	0.54	6	0.24	
Sardinella aurita	0.54	6	0.24	
Pseudotolithus typus	0.32	6	0.14	
Drepane africana	0.22	12	0.10	
Penaeus notialis	0.04	6	0.02	
Total	223.42		100.02	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 70
DATE :10/08/17 GEAR TYPE: PT NO: 1 POSITION:Lat N 6°40.57
start stop duration Lon W 11°51.93
TIME :19:01:44 19:31:04 29.3 (min) Purpose : 1
LOG : 5011.89 5013.30 1.4 Region : 2300
FDEPTH: 250 270 Gear cond.: 0
BDEPTH: 930 1341 Validity : 0
Towing dir: 0° Wire out : 500 m Speed : 2.9 kn
Sorted : 3 Total catch: 2.52 Catch/hour: 5.16

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Invertebrate	2.45	0	47.54	
UNIDENTIFIED FISH	1.17	248	22.74	
Shrimps, small, non comm.	0.82	777	15.85	
J E L L Y F I S H	0.51	41	9.90	
Small squids	0.20	123	3.96	
Unidentified	0.00	2	0.08	
Plastic	0.00	4	0.00	
Total	5.17		100.08	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 71
DATE :11/08/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 6°45.08
start stop duration Lon W 11°30.50
TIME :02:10:06 02:41:15 31.1 (min) Purpose : 1
LOG : 5058.35 5059.85 1.5 Region : 2400
FDEPTH: 15 15 Gear cond.: 0
BDEPTH: 57 65 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 2.9 kn
Sorted : 32 Total catch: 32.02 Catch/hour: 61.68

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Lutjanus goreensis	21.34	2	34.60	
Scomberomorus tritor	18.30	27	29.67	244
Caranx senegallus	10.02	13	16.24	246
Sardinella maderensis	6.82	0	11.06	245
Selar crumenophthalmus	2.31	12	3.75	
Caranx hippos	1.31	2	2.12	
Sphyraena guachancho	1.27	1	2.06	
Ariomma bondi	0.31	6	0.50	
Fishing gears	0.00	2	0.00	
Total	61.68		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 72
DATE :11/08/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 6°36.10
start stop duration Lon W 11°10.08
TIME :08:53:07 09:27:19 34.2 (min) Purpose : 1
LOG : 5109.29 5111.24 2.0 Region : 2400
FDEPTH: 23 23 Gear cond.: 0
BDEPTH: 23 23 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.4 kn
Sorted : 215 Total catch: 700.82 Catch/hour: 1229.50

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Ilisha africana ***	315.51	702	25.66	247
Pseudotolithus typus	243.09	751	19.77	
Drepane africana	155.51	260	12.65	
Pseudotolithus senegalensis	123.23	351	10.02	
Polydactylus quadrifilis	87.16	7	7.09	
Pomadasys rogeri	64.70	91	5.26	
Pseudotolithus elongatus	57.68	316	4.69	
Chloroscombrus chrysurus	27.09	295	2.20	251
Pteroscion peli	22.88	428	1.86	
Trichiurus lepturus	18.67	428	1.52	248
Selene dorsalis	16.70	428	1.36	249
Brachydeuterus auritus	15.86	646	1.29	250

Sphyraena guachancho	15.58	98	1.27	252
Pentanemus quinquarius	12.91	239	1.05	
Galeoides decadactylus	12.91	70	1.05	
Ephippion guttifer	9.68	14	0.79	
Dasyatis margarita	6.04	7	0.49	
Arius latiscutatus **	5.96	2	0.49	
Arius parkii **	4.77	28	0.39	
Scomberomorus tritor	3.79	14	0.31	253
Parapenaeus longirostris	3.23	421	0.26	
Ethmalosa fimbriata	3.09	7	0.25	
Lagocephalus laevigatus	2.25	7	0.18	
Penaeus notialis	0.98	21	0.08	
Sardinella maderensis	0.14	28	0.01	
Batrachoides liberiensis	0.10	7	0.01	
Total	1229.50		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 73
DATE :11/08/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 6°25.65
start stop duration Lon W 11°1.18
TIME :19:52:01 20:22:16 30.3 (min) Purpose : 1
LOG : 5173.47 5174.96 1.5 Region : 2400
FDEPTH: 5 20 Gear cond.: 0
BDEPTH: 46 49 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.0 kn
Sorted : 63 Total catch: 62.76 Catch/hour: 124.48

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Lutjanus goreensis	65.14	8	52.33	254
Ilisha africana ***	25.75	645	20.68	258
Scomberomorus tritor	10.04	16	8.06	257
Sphyraena guachancho	5.99	20	4.81	256
Selene dorsalis	5.87	54	4.72	259
Trachinotus goreensis	4.80	12	3.86	260
Sardinella maderensis	3.61	177	2.90	255
Trichiurus lepturus	2.78	192	2.23	
Selar crumenophthalmus	0.52	2	0.41	
Plastic	0.00	8	0.00	
Total	124.48		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 74
DATE :11/08/17 GEAR TYPE: PT NO: 1 POSITION:Lat N 6°23.97
start stop duration Lon W 11°0.82
TIME :21:04:13 21:35:35 31.4 (min) Purpose : 1
LOG : 5177.50 5179.42 1.9 Region : 2400
FDEPTH: 25 32 Gear cond.: 0
BDEPTH: 51 57 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.7 kn
Sorted : 8 Total catch: 7.72 Catch/hour: 14.77

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	6.35	143	43.01	262
Trichiurus lepturus	2.52	287	17.10	
Sardinella maderensis	1.99	48	13.47	261
Parapenaeus longirostris	1.72	2056	11.66	
J E L L Y F I S H	1.34	23	9.07	
Ilisha africana ***	0.50	11	3.37	263
Sphyraena guachancho	0.19	2	1.30	
Galeoides decadactylus	0.15	6	1.04	
Plastic	0.00	2	0.00	
Total	14.77		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 75
DATE :12/08/17 GEAR TYPE: PT NO: 1 POSITION:Lat N 6°14.48
start stop duration Lon W 11°4.95
TIME :00:51:14 01:25:54 34.7 (min) Purpose : 1
LOG : 5204.21 5206.37 2.1 Region : 2400
FDEPTH: 40 35 Gear cond.: 0
BDEPTH: 110 426 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.7 kn
Sorted : 3 Total catch: 3.41 Catch/hour: 5.90

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trichiurus lepturus	4.46	74	75.64	
UNIDENTIFIED FISH	0.69	1004	11.73	
Parapenaeus longirostris	0.42	772	7.04	
Small squids	0.23	50	3.84	
J E L L Y F I S H	0.05	10	0.91	
Saurida brasiliensis	0.03	7	0.50	
Lestrolepis intermedia	0.02	5	0.35	
Plastic	0.00	9	0.00	
Total	5.90		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 76
DATE :12/08/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 6°8.16
start stop duration Lon W 10°38.84
TIME :10:22:00 10:52:49 30.8 (min) Purpose : 1
LOG : 5262.42 5264.10 1.7 Region : 2400
FDEPTH: 42 38 Gear cond.: 0
BDEPTH: 42 38 Validity : 0
Towing dir: 0° Wire out : 140 m Speed : 3.3 kn
Sorted : 0 Total catch: 54.92 Catch/hour: 106.92

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Pteroscion peli	28.11	818	26.29	
Pseudotolithus senegalensis	15.11	160	14.13	
Trichiurus lepturus	13.08	681	12.24	
Pomadasys perotaei	8.88	23	8.30	
Shrimps, small, non comm.	8.57	0	8.01	
Brachydeuterus auritus	8.49	265	7.94	265
Selene dorsalis	4.44	51	4.15	267
Cynoglossus senegalensis	3.50	8	3.28	
Galeoides decadactylus	3.08	62	2.88	
Raja miraletus	2.88	4	2.69	
Sphyraena guachancho	2.57	4	2.40	266
Penaeus notialis	2.30	35	2.15	
Pisodonophis semicinctus	2.26	10	2.11	
Chloroscombrus chrysurus	2.18	8	2.04	
Portunus validus	0.39	4	0.36	
Drepane africana	0.31	16	0.29	
Panulirus regius	0.27	2	0.25	
Ilisha africana ***	0.23	8	0.22	
Parapenaeus longirostris	0.19	265	0.18	
Grammoplites gruveli	0.08	8	0.07	
Plastic	0.00	467	0.00	
Fishing gears	0.00	4	0.00	
Total	106.92		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 77
DATE :12/08/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 6°7.40
start stop duration Lon W 10°27.30
TIME :17:27:12 18:05:00 37.8 (min) Purpose : 1
LOG : 5322.43 5324.59 2.2 Region : 2400
FDEPTH: 22 21 Gear cond.: 0
BDEPTH: 22 21 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.4 kn
Sorted : 90 Total catch: 309.05 Catch/hour: 490.56

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Pseudotolithus typus	79.81	424	16.27	
Ilisha africana ***	60.19	2352	12.27	270
Drepane africana	49.52	129	10.10	
Pomadasys perotaei	49.14	24	10.02	275
Polydactylus quadrifilis	38.03	3	7.75	271
Arius parkii **	37.43	81	7.63	
Galeoides decadactylus	29.71	257	6.06	
Shrimps, small, non comm.	20.57	0	4.19	
Pteroscion peli	20.48	610	4.17	
Pseudotolithus senegalensis	20.25	2	4.13	272
Trichiurus lepturus	18.48	610	3.77	
J E L L Y F I S H	15.33	133	3.13	
Brachydeuterus auritus	8.19	19	1.67	
Arius latiscutatus **	7.90	5	1.61	
Dasyatis margarita	6.57	19	1.34	
Cynoglossus senegalensis	5.33	19	1.09	
Parapenaeus longirostris	5.24	638	1.07	
Selene dorsalis	4.86	38	0.99	274
Panulirus regius	2.94	5	0.60	
Sphyraena guachancho	2.57	24	0.52	268
Ephippion guttifer	1.62	5	0.33	
Chloroscombrus chrysurus	1.52	48	0.31	269
Cynoponticus ferox	1.14	5	0.23	
Pentanemus quinquarius	0.95	19	0.19	
Lagocephalus laevigatus	0.76	5	0.16	
Penaeus kerathurus	0.67	19	0.14	
Torpedo marmorata	0.67	10	0.14	
Sardinella maderensis	0.29	43	0.06	273
Callinectes amnicola	0.19	5	0.04	
Sepia officinalis	0.19	10	0.04	
Plastic	0.00	6	0.00	
Total	490.56		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 78
DATE :12/08/17 GEAR TYPE: PT NO: 4 POSITION:Lat N 5°58.24
start stop duration Lon W 10°21.46
TIME :21:40:13 22:10:14 30.0 (min) Purpose : 1
LOG : 5342.48 5344.22 1.8 Region : 2400
FDEPTH: 5 20 Gear cond.: 0
BDEPTH: 48 55 Validity : 0
Towing dir: 0° Wire out : 110 m Speed : 3.5 kn
Sorted : 64 Total catch: 63.79 Catch/hour: 127.50

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sphyraena guachancho	65.76	224	51.58	280
Ilisha africana ***	24.86	899	19.50	277
Selene dorsalis	13.27	100	10.41	276
Scomberomorus tritor	10.11	22	7.93	
Small squids	3.32	0	2.60	
Chloroscombrus chrysurus	2.68	28	2.10	
Caranx crysos	1.96	2	1.54	
Brachydeuterus auritus	1.44	24	1.13	279
Alectis alexandrinus	1.24	2	0.97	
Trichiurus lepturus	0.96	56	0.75	
Sardinella maderensis	0.72	82	0.56	278
Selar crumenophthalmus	0.64	4	0.50	
Saurida brasiliensis	0.32	56	0.25	
Galeoides decadactylus	0.20	2	0.16	
Lagocephalus laevigatus	0.02	8	0.02	
Plastic	0.00	6	0.00	
Total	127.50		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 79
DATE :13/08/17 GEAR TYPE: PT NO: 1 POSITION:Lat N 5°45.34
start stop duration Lon W 10°21.00
TIME :06:32:36 07:02:42 30.1 (min) Purpose : 1
LOG : 5390.18 5392.01 1.8 Region : 2400
FDEPTH: 35 45 Gear cond.: 0
BDEPTH: 76 73 Validity : 0
Towing dir: 0° Wire out : 140 m Speed : 3.6 kn
Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
N O C A T C H	0.00	0	0.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 79
DATE :13/08/17 GEAR TYPE: PT NO: 1 POSITION:Lat N 5°45.34
start stop duration Lon W 10°21.00
TIME :06:32:36 07:02:42 30.1 (min) Purpose : 1
LOG : 5390.18 5392.01 1.8 Region : 2400
FDEPTH: 35 45 Gear cond.: 0
BDEPTH: 76 73 Validity : 0
Towing dir: 0° Wire out : 140 m Speed : 3.6 kn
Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
N O C A T C H	0.00	0	0.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 80
DATE :13/08/17 GEAR TYPE: PT NO: 1 POSITION:Lat N 5°26.88
start stop duration Lon W 10°9.59
TIME :15:42:43 16:14:50 32.1 (min) Purpose : 1
LOG : 5453.87 5455.17 1.3 Region : 2400
FDEPTH: 200 230 Gear cond.: 0
BDEPTH: 497 509 Validity : 0
Towing dir: 0° Wire out : 450 m Speed : 2.4 kn
Sorted : 2 Total catch: 38.27 Catch/hour: 71.48

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Diaphus sp.	71.43	28123	99.93	
Argyropelecus aculeatus	0.05	7	0.07	
Total	71.48		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 81
DATE :13/08/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 5°33.34
start stop duration Lon W 10°6.41
TIME :18:19:56 18:54:14 34.3 (min) Purpose : 1
LOG : 5470.23 5471.99 1.8 Region : 2400
FDEPTH: 75 73 Gear cond.: 0
BDEPTH: 75 73 Validity : 0
Towing dir: 0° Wire out : 230 m Speed : 3.1 kn
Sorted : 95 Total catch: 1069.82 Catch/hour: 1871.41

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	827.02	12343	44.19	283
Scomber colias	505.29	6478	27.00	281
Boops boops	245.91	5080	13.14	
Ariomma bondi	127.38	3201	6.81	
Epinephelus aeneus	38.80	7	2.07	
Dentex angolensis	32.33	520	1.73	287
Dentex congoensis	26.55	327	1.42	286
Chromis cadenati	14.62	269	0.78	
Scorpaena scrofa	10.01	38	0.53	
Umbrina canariensis	9.62	58	0.51	
Decapterus punctatus	6.93	192	0.37	282
Priacanthus arenatus	6.54	96	0.35	
Chilomycterus spinosus mauretanicus	4.23	19	0.23	
Trachurus trecae	3.85	58	0.21	285
Pseudupeneus prayensis	3.46	58	0.19	
Pagrus caeruleostictus	3.08	19	0.16	
Sargocentron hastatum	2.69	19	0.14	
Sphyraena guachancho	2.31	19	0.12	
Fistularia petimba	0.77	19	0.04	
Total	1871.41		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 82
DATE :13/08/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 5°33.32
start stop duration Lon W 10°6.26
TIME :21:07:38 21:39:40 32.0 (min) Purpose : 1
LOG : 5482.74 5484.44 1.7 Region : 2400
FDEPTH: 75 79 Gear cond.: 0
BDEPTH: 75 79 Validity : 0
Towing dir: 0° Wire out : 230 m Speed : 3.2 kn
Sorted : 77 Total catch: 246.76 Catch/hour: 462.24

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Boops boops	201.92	4037	43.68	
Mustelus mustelus	75.94	17	16.43	288
Dentex congoensis	45.46	725	9.84	
Ariomma bondi	34.26	860	7.41	
Trigla lyra	19.78	869	4.28	
Dentex angolensis	18.68	240	4.04	
Pseudupeneus prayensis	16.58	369	3.59	
Scorpaena scrofa	16.48	84	3.57	
Priacanthus arenatus	7.59	111	1.64	
Pontinus kuhlii	5.99	140	1.30	
Umbrina canariensis	4.20	30	0.91	
Arnoglossus imperialis	3.60	395	0.78	
Trachurus trecae	3.00	30	0.65	289
Dactylopterus volitans	2.10	15	0.45	
Fistularia petimba	1.59	9	0.34	
Chilomycterus spinosus mauretanicus	0.99	6	0.21	
Grammoplites gruveli	0.90	30	0.19	
Trachinus armatus	0.69	21	0.15	
Sepia officinalis	0.51	9	0.11	
Dicologoglossa hexophthalma	0.51	9	0.11	
Mystriophis rostellatus	0.39	6	0.09	
Pagrus caeruleostictus	0.39	6	0.09	
Illex coindetii	0.30	6	0.06	
Blennius normani	0.13	6	0.03	
Sphoeroides marmoratus	0.09	6	0.02	
Sargocentron hastatum	0.09	9	0.02	
Cepola pauciradiatus	0.02	6	0.00	
Total	462.19		99.9	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 83
DATE :14/08/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 5°19.97
start stop duration Lon W 9°34.74
TIME :10:37:24 10:57:11 19.8 (min) Purpose : 1
LOG : 5586.17 5587.20 1.0 Region : 2400
FDEPTH: 53 61 Gear cond.: 0
BDEPTH: 53 61 Validity : 0
Towing dir: 0° Wire out : 170 m Speed : 3.1 kn
Sorted : 20 Total catch: 20.18 Catch/hour: 61.21

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Pagrus caeruleostictus	17.35	15	28.34	291
J E L L Y F I S H	13.77	0	22.50	
Squatina oculata	10.86	3	17.74	
Pagrus auriga	10.31	6	16.85	
Scomberomorus tritor	2.73	3	4.46	
Selene dorsalis	2.18	21	3.57	290
Torpedo torpedo	1.94	3	3.17	
Dentex congoensis	0.73	3	1.19	
Dentex angolensis	0.49	3	0.79	
Illex coindetii	0.49	455	0.79	
Penaeus notialis	0.24	12	0.40	
Trichiurus lepturus	0.12	73	0.20	
Alloteuthis africana	0.00	9	0.00	
Total	61.21		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 84
DATE :14/08/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 5°13.33
start stop duration Lon W 9°39.35
TIME :13:55:13 14:26:56 31.7 (min) Purpose : 1
LOG : 5602.23 5604.10 1.9 Region : 2400
FDEPTH: 73 73 Gear cond.: 0
BDEPTH: 73 73 Validity : 0
Towing dir: 0° Wire out : 225 m Speed : 3.5 kn
Sorted : 34 Total catch: 33.84 Catch/hour: 64.01

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	19.67	352	30.73	292
Decapterus punctatus	17.70	322	27.66	293
Ariomma bondi	8.55	265	13.36	
Dentex angolensis	7.04	66	10.99	
Sardinella aurita	6.32	189	9.87	294
Dentex maroccanus	1.10	11	1.71	
Priacanthus arenatus	0.76	13	1.18	
Raja miraletus	0.68	2	1.06	
Sphyraena guachancho	0.38	2	0.59	
Selar crumenophthalmus	0.34	4	0.53	
Squatina oculata	0.34	2	0.53	
Fistularia petimba	0.34	4	0.53	
Scomber colias	0.30	4	0.47	
Illex coindetii	0.19	15	0.30	
Octopus vulgaris	0.19	2	0.30	
Pseudupeneus prayensis	0.08	2	0.12	
Boops boops	0.04	4	0.06	
Total	64.01		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 85
DATE :15/08/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 4°43.83
start stop duration Lon W 9°12.58
TIME :13:16:51 13:42:24 25.6 (min) Purpose : 1
LOG : 5768.20 5769.69 1.5 Region : 2400
FDEPTH: 85 83 Gear cond.: 0
BDEPTH: 85 83 Validity : 0
Towing dir: 0° Wire out : 265 m Speed : 3.5 kn
Sorted : 55 Total catch: 111.84 Catch/hour: 262.63

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Boops boops	105.68	2968	40.24	
Sardinella aurita	63.22	2377	24.07	295
Dentex maroccanus	53.35	1010	20.32	
Scomber colias	13.43	211	5.11	296
Trachurus trecae	11.27	474	4.29	297
Pagellus bellottii	4.70	52	1.79	298
Squalus megalops	3.42	2	1.30	
Priacanthus arenatus	2.44	28	0.93	
Scorpaena scrofa	2.35	5	0.89	
Pseudupeneus prayensis	1.22	14	0.46	
Dentex angolensis	0.94	9	0.36	
Illex coindetii	0.42	5	0.16	
Trigla lyra	0.42	5	0.16	
Total	262.87		100.09	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 86
DATE :15/08/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 4°34.53
start stop duration Lon W 9°6.57
TIME :17:24:18 18:00:58 36.7 (min) Purpose : 1
LOG : 5799.50 5801.26 1.8 Region : 2400
FDEPTH: 152 151 Gear cond.: 0
BDEPTH: 152 151 Validity : 0
Towing dir: 0° Wire out : 400 m Speed : 2.9 kn
Sorted : 70 Total catch: 1480.42 Catch/hour: 2422.29

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Ariomma bondi	2286.35	68858	94.39	304
Antigonia capros	32.99	3161	1.36	
Dentex congoensis	29.55	584	1.22	302
Priacanthus arenatus	19.93	275	0.82	
Dentex angolensis	15.81	172	0.65	303
Squalus megalops	13.71	13	0.57	301
Mustelus mustelus	13.12	5	0.54	300
Squatina oculata	6.71	3	0.28	299
Spicara alta	2.75	34	0.11	
Illex coindetii	1.37	103	0.06	
Total	2422.29		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 87
DATE :15/08/17 GEAR TYPE: PT NO: 1 POSITION:Lat N 4°42.48
start stop duration Lon W 8°58.41
TIME :19:49:41 20:27:39 38.0 (min) Purpose : 1
LOG : 5814.74 5817.04 2.3 Region : 2400
FDEPTH: 28 35 Gear cond.: 0
BDEPTH: 75 72 Validity : 0
Towing dir: 0° Wire out : 110 m Speed : 3.6 kn
Sorted : 21 Total catch: 21.01 Catch/hour: 33.20

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	28.51	0	85.87	305
Sphyraena guachancho	2.18	3	6.57	307
Dactylopterus volitans	0.98	13	2.95	
Sepia officinalis	0.76	2	2.28	
J E L L Y F I S H	0.66	0	2.00	
Scomber colias	0.09	2	0.29	
Illex coindetii	0.01	3	0.04	
Total	33.20		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 88
DATE :16/08/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 4°29.46
start stop duration Lon W 8°37.81
TIME :10:16:48 10:51:49 35.0 (min) Purpose : 1
LOG : 5902.52 5904.27 1.8 Region : 2400
FDEPTH: 86 85 Gear cond.: 0
BDEPTH: 86 85 Validity : 0
Towing dir: 0° Wire out : 260 m Speed : 3.0 kn
Sorted : 0 Total catch: 581.00 Catch/hour: 995.43

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	237.40	0	23.85	308
Sardinella aurita	230.27	685	23.13	309
Scomber colias	178.60	685	17.94	310
Dentex angolensis	126.24	137	12.68	
Dentex congoensis	93.75	137	9.42	
Boops boops	33.31	1796	3.35	
Epinephelus aeneus	22.38	2	2.25	
Priacanthus arenatus	18.37	206	1.85	
Pagrus africanus	18.23	27	1.83	
Scorpaena scrofa	10.97	27	1.10	
Mustelus mustelus	6.61	2	0.66	
Pagellus bellottii	5.89	14	0.59	
Sepia officinalis	3.43	7	0.34	
Sphyraena guachancho	3.43	14	0.34	
Pagrus caeruleostictus	3.29	7	0.33	
Pseudupeneus prayensis	1.78	21	0.18	
Trigla lyra	0.41	14	0.04	
Citharus linguatula	0.41	7	0.04	
Ariomma bondi	0.27	2	0.03	
Anthias anthias**	0.27	34	0.03	
Trachinotus goreensis	0.14	7	0.01	
Syacium micrurum**	0.00	7	0.00	
Total	995.43		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2017405 STATION: 89
DATE :16/08/17 GEAR TYPE: BT NO: 2 POSITION:Lat N 4°26.33

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        start    stop    duration                          Lon   W 8°15.73
TIME  :19:05:08 19:35:01  29.9 (min)          Purpose   : 1
LOG   : 5966.42  5968.13   1.7                Region    : 2400
FDEPTH:      77       76                      Gear cond.: 0
BDEPTH:      77       76                      Validity  : 0
Towing dir:   0°     Wire out   : 230  m      Speed     : 3.4 kn
Sorted    :  28      Total catch: 76.17       Catch/hour: 152.96

   SPECIES                                    CATCH/HOUR    % OF TOT. C   SAMP
                                           weight   numbers
   Dentex angolensis                         39.36      598      25.73
   Trigla lyra                               30.02      482      19.63
   Pagellus bellottii                        24.10      402      15.75     312
   Umbrina canariensis                       10.04       50       6.56
   Pseudupeneus prayensis                     6.33       66       4.14     311
   Scorpaena scrofa                           6.02       10       3.94
   Octopus vulgaris                           5.86        2       3.83
   Raja miraletus                             5.82       16       3.81
   Brotula barbata                            3.92       20       2.56
   Squatina oculata                           3.33        2       2.18
   Epinephelus aeneus                         3.01        2       1.97
   Sepia officinalis                          2.71       66       1.77
   Branchiostegus semifasciatus ***           2.61       10       1.71
   Chilomycterus spinosus mauretanicus        2.01        6       1.31
   Citharus linguatula                        1.81       86       1.18
   Priacanthus arenatus                       1.61       16       1.05
   Sphyraena guachancho                       1.61        6       1.05
   Illex coindetii                            1.20      207       0.79
   Boops boops                                0.80       70       0.53
   Arnoglossus imperialis                     0.20       16       0.13
   Sardinella aurita                          0.20        6       0.13
   Sphoeroides marmoratus                     0.20       10       0.13
   Nettastoma parviceps                       0.14        6       0.09
   Cepola pauciradiatus                       0.05        6       0.03
                                           ________             ________
   Total                                     152.96              100.00
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R/V Dr. Fridtjof Nansen       SURVEY:2017405        STATION:   90
DATE  :17/08/17          GEAR TYPE: PT NO:  1  POSITION:Lat   N 3°46.88
        start    stop    duration                          Lon   W 7°40.64
TIME  :11:23:03 11:53:20  30.3 (min)          Purpose   : 1
LOG   : 6067.73  6069.11   1.4                Region    : 2400
FDEPTH:     350      380                      Gear cond.: 0
BDEPTH:    3600     3657                      Validity  : 0
Towing dir:   0°     Wire out   : 700  m      Speed     : 2.7 kn
Sorted    :   6      Total catch: 5.67        Catch/hour: 11.23

   SPECIES                                    CATCH/HOUR    % OF TOT. C   SAMP
                                           weight   numbers
   Unidentified                               5.28        0      47.01
   Invertebrate                               4.24        0      37.78
   J E L L Y F I S H                          1.19        0      10.59
   Shrimps, small, non comm.                  0.34        0       3.04
   Squid unidentified                         0.18        0       1.59
                                           ________             ________
   Total                                     11.23              100.00
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R/V Dr. Fridtjof Nansen       SURVEY:2017405        STATION:   91
DATE  :17/08/17          GEAR TYPE: PT NO:  1  POSITION:Lat   N 3°15.64
        start    stop    duration                          Lon   W 7°41.60
TIME  :22:06:34 22:11:24  4.8  (min)          Purpose   : 1
LOG   : 6101.75  6101.98   0.2                Region    : 2400
FDEPTH:      60       70                      Gear cond.: 0
BDEPTH:    4595     4599                      Validity  : 0
Towing dir:   0°     Wire out   : 100  m      Speed     : 2.8 kn
Sorted    :   0      Total catch: 0.00        Catch/hour: 0.00

   SPECIES                                    CATCH/HOUR    % OF TOT. C   SAMP
                                           weight   numbers
   N O   C A T C H                            0.00        0       0.00
                                           ________             ________
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R/V Dr. Fridtjof Nansen       SURVEY:2017405        STATION:   92
DATE  :17/08/17          GEAR TYPE: PT NO:  1  POSITION:Lat   N 3°14.82
        start    stop    duration                          Lon   W 7°41.66
TIME  :22:27:37 23:00:04  32.5 (min)          Purpose   : 1
LOG   : 6102.56  6104.01   1.5                Region    : 2400
FDEPTH:      45       60                      Gear cond.: 0
BDEPTH:    4610     4490                      Validity  : 0
Towing dir:   0°     Wire out   : 105  m      Speed     : 2.7 kn
Sorted    :  10      Total catch: 40.27       Catch/hour: 74.46

   SPECIES                                    CATCH/HOUR    % OF TOT. C   SAMP
                                           weight   numbers
   Invertebrate                              53.43    23780      71.76
   Unidentified                              19.32    13235      25.94
   Shrimps, small, non comm.                  0.97     4783       1.30
   Squid unidentified                         0.75       96       1.00
                                           ________             ________
   Total                                     74.46              100.00
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R/V Dr. Fridtjof Nansen       SURVEY:2017405        STATION:   93
DATE  :18/08/17          GEAR TYPE: PT NO:  1  POSITION:Lat   N 2°30.92
        start    stop    duration                          Lon   W 7°42.49
TIME  :11:52:17 12:23:15  31.0 (min)          Purpose   : 1
LOG   : 6147.41  6148.67   1.3                Region    : 2400
FDEPTH:     388      363                      Gear cond.: 0
BDEPTH:    4889     4895                      Validity  : 0
Towing dir:   0°     Wire out   : 665  m      Speed     : 2.4 kn
Sorted    :   3      Total catch: 2.84        Catch/hour: 5.51

   SPECIES                                    CATCH/HOUR    % OF TOT. C   SAMP
                                           weight   numbers
   UNIDENTIFIED FISH                          2.81        0      50.99
   J E L L Y F I S H                          2.01        0      36.59
   C E P H A L O P O D A                      0.62        0      11.33
   C R U S T A C E A N S                      0.06        0       1.09
                                           ________             ________
   Total                                      5.51              100.00
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ANNEX III. SUMMARY OF TRAWLS

No.	Date	Time start	Transect No.	Trawl type	Net depth start	Bottom depth start	Target	Success	Sard	HM	P1	P2	Other pel	Dem	Meso
									% composition						
1	22-Jul	9.10		BT	44	44	Test trawl en route to start of survey	Yes				41	1	58	
2	22-Jul	21.58	2	S.pel	10	40	Small dense mark	No	30		1.5	4.5	62	2	
3	23-Jul	8.49	4	BT	31	31	Few small marks on bottom	Yes				4		96	
4	23-Jul	21.36	7	S.pel	20	29	Blind surface trawl	Yes	15	1		24	58	2	
5	24-Jul	8.27	8	S.pel	15	28	Near-surface layer - not dense	Yes						100	
6	24-Jul	13.36	8	S.pel	15	32	Small shoals near surface on sonar	Yes	4			2	94		
7	24-Jul	14.41	8	BT	33	30	Repeat of Tr 6 with BT	Yes	1			77	1	21	
8	25-Jul	10.44	10	BT	30	30	Dense marks, net torn so can't repeat	No	6		0.04	7	2	85	
9	25-Jul	15.33	11	BT	58	58	Fish schools close to bottom	No						100	
10	25-Jul	17.59	11	BT	165	165	Similar marks to Tr 9	Yes				64		36	
11	26-Jul	5.14	12	BT	58	58	Dense marks near bottom	Yes						100	
12	26-Jul	6.22	12	S.pel	15	61	Blind surface trawl	Yes							
13	26-Jul	15.57	12	BT	27	27	Schools	Yes	59			29	12		
14	26-Jul	20.30	12	BT	25	25	Schools	No	27			21	5		
15	27-Jul	9.06	14	L.pel	270	381	Midwater layer	Yes							100
16	27-Jul	11.32	14	BT	179	179	Marks on bottom	Yes						100	
17	27-Jul	15.46	14	BT	45	46	Schools near bottom	No	1			14		85	
18	27-Jul	17.39	14	BT	42	42	Schools near bottom	No				9		91	
19	27-Jul	19.01	14	S.pel	42	43	Schools in midwater	Yes	100						
20	27-Jul	23.05	14	S.pel	15	51	Schools in midwater	Yes	97		0.3	1			
21	28-Jul	9.43	15	BT	129	129	Marks close to and on bottom	Yes						100	
22	27-Jul	19.50	16	S.pel	32	33	Schools in midwater	sort of	32			66	1		

No.	Date	Time start	Transect No.	Trawl type	Net depth start	Bottom depth start	Target	Success	Sard	HM	P1	P2	Other pel	Dem	Meso
									% composition						
23	28-Jul	1.32	17	S.pel	20	28	Schools in midwater	no	30			67			
24	29-Jul	4.11	17	S.pel	20	33	Schools in midwater	yes	27			72	1		
25	29-Jul	9.42	17	L.pel	90	124	Marks on bottom with schools to 50m	No							
26	29-Jul	12.59	17	BT	218	218	Marks on bottom with schools to 50m	yes				0.2		36	
27	30-Jul	2.09	18/19	S.pel	2	30	Schools in midwater	Yes	84			16			
28	30-Jul	7.24	18/19	S.pel	30	28	Schools in midwater	Yes	100						
29	30-Jul	8.47	18/19	BT	26	26	Schools in midwater	Yes	17			41	15	28	
30	30-Jul	11.42	19	BT	32	32	Fuzz - no schools	Yes				23	12	65	
31	30-Jul	20.47	19/20	S.pel	26	612	Meso layer 20-40 m	Yes							47
32	31-Jul	3.37	20	S.pel	25	42	V dense large schools	Yes	80			20			
33	31-Jul	13.29	21	S.pel	25	39	No schools, some background fuzz	Yes							
34	01/8	0.44	22	S.pel	35	92	Meso-type layer	Yes	87			3		10	
35	01/8	8.26	22/23	BT	21	21	Layer near and on bottom	Yes	4			39	13	48	
36	01/8	12.40	23	S.pel	25	36	Dense sardinella-like schools	No							
37	01/8	13.54	23	S.pel	25	33	Dense sardinella-like schools	No							
38	01/8	14.59	23	BT	34	34	Dense sardinella-like schools	??				34		66	
39	01/8	19.24	23	S.pel	24	48	Scattered layer	Yes	76			24			
40	01/8	22.19	23	S.pel	24	86	Scattered layer-similar to PT34	Yes	59			28		13	
41	02/8	0.21	22	S.pel	35	64	Scattered layer-same place as PT34	Yes	68			32			
42	02/8	4.01	22/23	L.pel	430	821	Meso layer	Yes							100
43	02/8	11.29	24	L.pel	57	113	Marks on bottom -gear failed	No							
44	03/8	15.25	26	BT	33	33	Test winches. Small mark on bottom	Yes				36	1	64	
45	03/8	16.23	26	BT	31	31	Small dense schools, mostly scattered	Yes	0.4			60	10		

No.	Date	Time start	Transect No.	Trawl type	Net depth start	Bottom depth start	Target	Success	Sard	HM	P1	P2	Other pel	Dem	Meso
									% composition						
46	03/8	20.06	25/26	S.pel	10	39	V.dense schools	Yes	83			14	3	0	
47	04/8	0.50	23	BT	26	26	Dispersed layer at bottom	Yes	2			1	37	61	
48	04/8	3.29	22	S.pel	25	35	Dispersed layer in midwater	Yes	58			26	17	0	
49	04/8	5.22	22	S.pel	25	32	Dense schools and layer	Yes	69			31			
50	04/8	8.50	23	BT	34	34	Fairly dense schools near bottom	Yes				7	23	70	
51	04/8	12.44	24	S.pel	25	52	Dense schools from 15m to bottom	No							
52	04/8	14.57	24	S.pel	42	68	Fairly dense schools, diving under net	No							
53	04/8	19.51	24/25	S.pel	30	59	Same target as 52, but after sunset	Yes	97			3			
54	04/8	23.16	25/26	S.pel	25	90	Plankton-type layer	Yes				43		57	
55	05/8	1.24	24/25	S.pel	40	92	Plankton-type layer, grainy	Yes	97			2			
56	05/8	11.07	27	S.pel	30	44	Layer in mid-water, grainy								
57	05/8	21.28	28	S.pel	10	30	Midwater layer		20			75	4	2	
58	06/8	10.25	29	BT	29	29	Not dense schools near bottom	Yes				8		92	
59	06/8	13.02	29	BT	23	23	Schools near bottom	Yes	15			6	23	55	
60	07/8	6.34	31	S.pel	20	34	Sardinella-like schools		33			9	6	52	
61	07/8	18.52	32	BT	28	28	Diffuse layer near bottom	Yes	2			7	49	43	
62	08/8	1.57	33	S.pel	30	88	Midwater layer		4			14		81	
63	08/8	4.27	33	S.pel	25	38	Dense schools	Yes	66		0.4	18	9	7	
64	08/8	8.18	34	BT	22	22	Dense midwater layer		1		5	19	2.5	63	
65	09/9	16.12	40	BT	33	33	Dense scattered layer on bottom	Yes	0.2		11	30	4	55	
66	09/8	20.38	41	S.pel	5	40	Nothing visible but sonar yellow	Yes	35		1	47		17	
67	10/8	2.37	42	S.pel	15	62	Blind trawl at surface -	Yes	4			86		10	
68	10/8	11.19	43/44	BT	25	25	Small dense marks on sonar	??	1		21	13	6	59	

No.	Date	Time start	Transect No.	Trawl type	Net depth start	Bottom depth start	Target	Success	Sard	HM	P1	P2	Other pel	Dem	Meso
									% composition						
69	10/8	13.57	44	BT	39	39	Dense scattering layer, cf BT65	Yes	0.2		1	18	61	20	
70	10/8		45	S.pel			Meso layer	Yes						100	
71	11/8	2.1	45/46	S.pel	15	57	Blind trawl at surface	Yes	11				35	54	
72	11/8	8.53	48	BT	23	23	Dense scattering layer, cf BT69	Yes	0.01		26	5	3	56	
73	11/8	19.52	49/50	S.pel	5	46	Blind trawl at surface	Yes	3 / 6		21	7	13	56	
74	11/8	21.04	49/50	S.pel	25	51	Target fairly dense midwater layer	Yes	13		3	17	44	23	
75	12/8	0.51	50	S.pel	40	110	Layer	Yes				76		24	
76	12/8	10.22		BT	42	42	Layer on bottom close inshore	Yes			0.2	19	10	71	
77	12/8	17.27	53	BT	22	22	Layer on bottom close inshore	Yes	0.06		12	5	2	81	
78	12/8	21.4	54	Small pel	5	48	Blind near-surface trawl	Yes	0.6		20	14	10	55	
79	13/8	6.32	55	S.pel	35	76	Trawl on layer at 35 m	Yes							
80	13/8	15.42	56/57	S.pel	200	497	Meso layer	Yes							100
81	13/8	18:19	57	BT	75	75	Deep bottom layer, school at surface	Yes	44	0.2		27	1	28	
82	13/8	21.07	57	BT	75	75	Repeat of 81	Yes		1				99	
83	14/8	10.37	60	BT	53	53	Scattered fish on rocky ground	No				0.2	4	96	
84	14/8	13.55	60	BT	73	73	Scatter fish, same depth as BT81 & 82	No	10			29	32	30	
85	15/8	13.16	64	BT	85	85	Scatter fish on bottom 80-100 m	Yes	24	4		5		67	
86	15/8	17.24	65	BT	152	152	Scatter fish on bottom around 150 m	Yes						100	
87	15/8	19.49	65	BT	28	75	Midwater layer	yes	86			7		7	
88	16/8	10.16	67	BT	86	86	Scatter fish on bottom 80-100 m	Yes	23	24		18	0.3	35	
89	16/8	19.25	69	BT	77	77	Scatter fish on bottom 80-100 m	yes	0.1				1	99	
90	17/8	11.23	72	S.pel	350	3600	V. weak meso layer	yes							100
91	17/8	22.06	72	S.pel	60	4595	V. weak meso layer	No							

No.	Date	Time start	Transect No.	Trawl type	Net depth start	Bottom depth start	Target	Success	Sard	HM	P1	P2	Other pel	Dem	Meso
									% composition						
92	17/8	22.27	72	S.pel	45	4610	V. weak meso layer	yes							100
93	18/8	11.52	72	S.pel	388	4889	V. weak meso layer	yes							100

ANNEX IV. FISH BIOLOGICAL STATES

Sexual maturity

Stage	State	Description
I	Immature	Ovary and testis about 1/3rd length of body cavity. Ovaries pinkish, translucent, testis whitish. Ova not visible to naked eye.
II	Maturing virgin and recovering spent	Ovary and testis about ½ length of body cavity. Ovary pinkish, translucent, testis whitish, symmetrical. Ova not visible to naked eye.
III	Ripening	Ovary and testis is about 2/3rds length of body cavity. Ovary pinkish yellow colour with granular appearance, testis whitish to creamy. No transparent or translucent ova visible.
IV	Ripe	Ovary and testis from 2/3rds to full length of body cavity. Ovary orange-pink in colour with conspicuous superficial blood vessels. Large transparent, ripe ova visible. Testis whitish-creamy, soft.
V	Spent	Ovary and testis shrunken to about ½ length of body cavity. Walls loose. Ovary may contain remnants of disintegrating opaque and ripe ova, darkened or translucent. Testis bloodshot and flabby

Stomach content

Scale	Designation	Description
0	Empty	Stomach empty except for water.
1	Very little content	Stomach is almost empty. Only traces of small organisms can be found.
2	Some content	Stomach not completely full and not dilated.
3	Stomach full	Stomach full, but not bloated/dilated.
4	Bloated/dilated	The stomach is visibly expanded and tight. Content can be observed from the outside.

ANNEX V. CRUISE SUMMARY REPORT

SHIP Name: ***Dr Fridtjof Nansen*** **Call Sign: LDLG**
Type of ship: **Research ship**

CRUISE NO. / NAME **2017405. Survey of the pelagic fish resources and ecosystem off west Africa - Leg 2.1. Guinea Bissau, Guinea Conakry, Sierra Leone and Liberia. 21 July - 20 August 2017**

CRUISE PERIOD start **21/07/2017** to **20/08/2017** end

PORT OF DEPARTURE **Dakar, Senegal**
PORT OF RETURN **Monrovia, Liberia**

RESPONSIBLE LABORATORY

Name: **Institute of Marine Research**

Address: **P.O. Box 1870 Nordnes, N-5817 Bergen**

Country: **Norway**

CHIEF SCIENTIST(S)

David Boyer

Institute of Marine Research

OBJECTIVES AND BRIEF NARRATIVE OF CRUISE

Survey objectives

- To map the hydrographic/environmental conditions in the survey area
- To establish as far as possible, the distribution, abundance and composition of phyto- and zooplankton, and species composition of fish eggs and larvae
- To obtain information on abundance, distribution (also by size) of *Sardinella aurita, S. maderensis, Engraulis encrasicolus, Trachurus trecae*, *Scomber colias, Ethmalosa fimbriate* and *Decapterus rhoncus* using acoustic methods and a systematic grid survey strategy
- To collect samples for genetic analysis and for morphometric studies, both for stock identification of *S. aurita, S. maderensis, E. encrasicolus, T. trecae*, *S. colias* and *E. fimbriate*.
- To obtain information on maturity stages, and to collect stomach samples for analysis of contents and otoliths of *S. aurita, S. maderensis, E. encrasicolus, T. trecae*, *S. colias* and *E. fimbriate*
- To collect samples for levels of nutrients and environmental contaminants, including microplastics, and with regards to food safety and pollution.
- To identify the main species and collect samples for identification and isotope analysis.
- To collect samples for levels of nutrients and contaminants including microplastics.
- To record occurrence of top predators.
- To record occurrence of marine debris (surface).
- To map occurrence of microplastics and describe associated neustonic communities
- To collect samples of fish species consumed locally for analysis of content of contaminants

PROJECT

Project name: Strengthening the Knowledge Base for and Implementing an Ecosystem Approach to Marine Fisheries in Developing Countries (EAF-Nansen GCP/INT/003/NOR)

Coordinating body: Centre for Development Cooperation in Fisheries

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PRINCIPAL INVESTIGATORS: The letter assigned below against each Principal Investigator is used on pages 2 and 3, under the column heading 'PI', to identify the data sets for which he/she is responsible

A. Diana Zaera. IMR

B. Yngve Børsheim. IMR

C. Jorunn Sanden. IMR

D. Teclu Habtemariam Weldegebriel. IMR (formerly NIFES)

E. Jan Frode Wilhelmsen. IMR

SUMMARY OF MEASUREMENTS AND SAMPLES TAKEN

PI see page 2	NO see above	UNITS see above	DATA TYPE Enter code(s) from list on cover page	DESCRIPTION Identify, as appropriate, the nature of the data and of the instrumentation/sampling gear and list the parameters measured. Include any supplementary information that may be appropriate, e. g. vertical or horizontal profiles, depth horizons, continuous recording or discrete samples, etc. For samples taken for later analysis on shore, an indication should be given of the type of analysis planned, i.e. the purpose for which the samples were taken.
A	5	Trawls	B14	Guinea Bissau-Bottom trawls targeting pelagic fish for identification
A	6	Trawls	B14	Guinea Bissau-Pelagic trawls targeting pelagic fish for identification
A	1	Trawls	B14	Guinea Bissau-Pelagic trawl for mesopelagic fish for identification
A	867	Fish	B14	Guinea Bissau-samples of pelagic fish for length-frequency
A	113	Fish	B14	Guinea Bissau-samples of pelagic fish for sex, maturity and stomach fullness
A	113	Fish	B14	Guinea Bissau-samples of *Sardinella aurita and S. maderensis* frozen for later analysis of liver stomach contents and morthophometric (fin clip) analysis
A	1	Samples	B14	Guinea Bissau-mesopelagic fish samples frozen, for identification by University of Western Cape
B	83	Samples	H22	Guinea Bissau-phosphate samples from CTD rosette water sampler
B	83	Samples	H24	Guinea Bissau-nitrate samples from CTD rosette water sampler
B	83	Samples	H25	Guinea Bissau-nitrite samples from CTD rosette water sampler
B	83	Samples	H26	Guinea Bissau-silicate samples from CTD rosette water sampler
B	84	Samples	H27	Guinea Bissau-alkalinity samples from CTD rosette water sampler
B	84	Samples	H28	Guinea Bissau-pH samples from CTD rosette water sampler
B	16	Stations	H09	Guinea Bissau-water bottle stations using CTD rosette water sampler
B	24	Stations	H10	Guinea Bissau-CTD stations
C	6	Bottles	B08	Guinea Bissau-phytoplankton samples in formalin from phytoplankton vertical net haul, for later analysis
C	6	Bottles	B09	Guinea Bissau-zooplankton samples in formalin from WP2 200m vertical net haul, for later analysis

C	6	Trays	B09	Guinea Bissau-zooplankton samples freeze-dried from WP2 200m vertical net haul, for later analysis
C	6	Bottles	B09	Guinea Bissau-zooplankton samples in formalin from WP2 25m vertical net haul, for later analysis
C	6	Trays	B09	Guinea Bissau-zooplankton samples freeze-dried from WP2 25m vertical net haul, for later analysis
C	3	Bottles	B13	Guinea Bissau-Egg and Larvae samples in formalin from Multinet sampler hauled obliquely from 100 m, for later analysis
C	3	Bottles	P01	Guinea Bissau-Samples of plastics from Manta trawl in formalin hauled at surface for 15 minutes, for later analysis
C	1	Tray	P01	Guinea Bissau-Samples of plastics freeze-dried from Manta trawl hauled at surface for 15 minutes, for later analysis
D	50	Fish	B14	Guinea Bissau-Samples of *Pseudupeneus prayensis* freeze-dried from trawl, for later analysis for contaminants
D	22	Fish	B14	Guinea Bissau-Samples of *Sardinella maderensis* freeze-dried from trawl, for later analysis for contaminants
D	150	Fish	B14	Guinea Bissau-Samples of *Scomber colias* freeze-dried from trawl, for later analysis for contaminants
E	694	NM	M06	Guinea Bissau-Wind direction and speed, air temperature, air pressure, relative humidity logged automatically every 60 sec. throughout survey
E	694	NM	H71	Guinea Bissau-underway thermosalinograph throughout survey measuring salinity, temperature, turbidity and chlorophyll-a
E	694	NM	D71	Guinea Bissau-Two—hull-mounted Acoustic Doppler Current Profiler (VMADCP) run continuously during the survey
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A	14	Trawls	B14	Guinea Conakry-Bottom trawls targeting pelagic fish for identification
A	25	Trawls	B14	Guinea Conakry -Pelagic trawls targeting pelagic fish for identification
A	3	Trawls	B14	Guinea Conakry -Pelagic trawl for mesopelagic fish for identification
A	5831	Fish	B14	Guinea Conakry -samples of pelagic fish for length-frequency
A	1021	Fish	B14	Guinea Conakry -samples of pelagic fish for sex, maturity and stomach fullness
A	969	Fish	B14	Guinea Conakry -samples of *Sardinella aurita and S. maderensis* frozen for later analysis of liver and stomach contents
A	117	Fish	B14	Guinea Conakry -samples of *Sardinella aurita and S. maderensis* otoliths for later ageing analysis
A	629	Fish	B14	Guinea Conakry -samples of *Sardinella aurita and S. maderensis* fin-clips frozen for later morthophometric analysis
A	3	Samples	B14	Guinea Conakry -mesopelagic fish samples frozen, for identification by University of Western Cape
B	94	Samples	H22	Guinea Conakry -phosphate samples from CTD rosette water sampler
B	94	Samples	H24	Guinea Conakry -nitrate samples from CTD rosette water sampler
B	94	Samples	H25	Guinea Conakry -nitrite samples from CTD rosette water sampler
B	94	Samples	H26	Guinea Conakry -silicate samples from CTD rosette water sampler
B	94	Samples	H27	Guinea Conakry -alkalinity samples from CTD rosette water sampler
B	94	Samples	H28	Guinea Conakry -pH samples from CTD rosette water sampler
B	26	Stations	H09	Guinea Conakry -water bottle stations using CTD rosette water sampler
B	35	Stations	H10	Guinea Conakry -CTD stations
C	6	Bottles	B08	Guinea Conakry -phytoplankton samples in formalin from phytoplankton vertical net haul, for later analysis
C	4	Bottles	B09	Guinea Conakry -zooplankton samples in formalin from WP2 200m vertical net haul, for later analysis
C	4	Trays	B09	Guinea Conakry -zooplankton samples freeze-dried from WP2 200m vertical net haul, for later analysis
C	5	Bottles	B09	Guinea Conakry -zooplankton samples in formalin from WP2 25m vertical net haul, for later analysis
C	5	Trays	B09	Guinea Conakry -zooplankton samples freeze-dried from WP2 25m vertical

				net haul, for later analysis
C	5	Bottles	B13	Guinea Conakry -Egg and Larvae samples in formalin from Multinet sampler hauled obliquely from 100 m, for later analysis
C	6	Bottles	P01	Guinea Conakry -Samples of plastics from Manta trawl in formalin hauled at surface for 15 minutes, for later analysis
C	3	Tray	P01	Guinea Conakry -Samples of plastics freeze-dried from Manta trawl hauled at surface for 15 minutes, for later analysis
C	3	Bags	B17	Guinea Conakry – bags of sargassum weed and associated organisms from Manta trawl, for later analysis at University of Western Cape
D	50	Fish	B14	Guinea Conakry -Samples of *Pseudupeneus prayensis* freeze-dried from trawl, for later analysis for contaminants
D	346	Fish	B14	Guinea Conakry -Samples of *Sardinella maderensis* freeze-dried from trawl, for later analysis for contaminants
D	150	Fish	B14	Guinea Conakry -Samples of *Scomber colias* freeze-dried from trawl, for later analysis for contaminants
D	150	Fish	B14	Guinea Conakry -Samples of *Sardinella aurita* freeze-dried from trawl, for later analysis for contaminants
D	25	Fish	B14	Guinea Conakry -Samples of *Decapterus rhonchus* freeze-dried from trawl, for later analysis for contaminants
E	1690	NM	M06	Guinea Conakry -Wind direction and speed, air temperature, air pressure, relative humidity logged automatically every 60 sec. throughout survey
E	1690	NM	H71	Guinea Conakry -underway thermosalinograph throughout survey measuring salinity, temperature, turbidity and chlorophyll-a
E	1690	NM	D71	Guinea Conakry -Two—hull-mounted Acoustic Doppler Current Profiler (VMADCP) run continuously during the survey
A	7	Trawls	B14	Sierra Leone-Bottom trawls targeting pelagic fish for identification
A	6	Trawls	B14	Sierra Leone -Pelagic trawls targeting pelagic fish for identification
A	1	Trawls	B14	Sierra Leone -Pelagic trawl for mesopelagic fish for identification
A	1895	Fish	B14	Sierra Leone -samples of pelagic fish for length-frequency
A	187	Fish	B14	Sierra Leone -samples of pelagic fish for sex, maturity and stomach fullness
A	104	Fish	B14	Sierra Leone -samples of *Sardinella aurita and S. maderensis* frozen for later analysis of liver stomach contents and morthophometric (fin clip) analysis
A	15	Fish	B14	Guinea Conakry -samples of Sardinella aurita and S. maderensis fin-clips frozen for later morthophometric analysis
B	127	Samples	H22	Sierra Leone -phosphate samples from CTD rosette water sampler
B	127	Samples	H24	Sierra Leone -nitrate samples from CTD rosette water sampler
B	127	Samples	H25	Sierra Leone -nitrite samples from CTD rosette water sampler
B	127	Samples	H26	Sierra Leone -silicate samples from CTD rosette water sampler
B	127	Samples	H27	Sierra Leone -alkalinity samples from CTD rosette water sampler
B	127	Samples	H28	Sierra Leone -pH samples from CTD rosette water sampler
B	21	Stations	H09	Sierra Leone -water bottle stations using CTD rosette water sampler
B	27	Stations	H10	Sierra Leone -CTD stations
C	9	Bottles	B08	Sierra Leone -phytoplankton samples in formalin from phytoplankton vertical net haul, for later analysis
C	9	Bottles	B09	Sierra Leone -zooplankton samples in formalin from WP2 200m vertical net haul, for later analysis
C	6	Trays	B09	Sierra Leone -zooplankton samples freeze-dried from WP2 200m vertical net haul, for later analysis
C	9	Bottles	B09	Sierra Leone -zooplankton samples in formalin from WP2 25m vertical net haul, for later analysis
C	9	Trays	B09	Sierra Leone -zooplankton samples freeze-dried from WP2 25m vertical net haul, for later analysis
C	12	Bottles	B13	Sierra Leone -Egg and Larvae samples in formalin from Multinet sampler hauled obliquely from 100 m, for later analysis

C	9	Bottles	P01	Sierra Leone-Samples of plastics from Manta trawl in formalin hauled at surface for 15 minutes, for later analysis
C	8	Tray	P01	Sierra Leone -Samples of plastics freeze-dried from Manta trawl hauled at surface for 15 minutes, for later analysis
C	3	Bags	B17	Guinea Conakry – bags of sargassum weed and associated organisms from Manta trawl, for later analysis at University of Western Cape
D	25	Fish	B14	Sierra Leone -Samples of *Pseudupeneus prayensis* freeze-dried from trawl, for later analysis for contaminants
D	25	Fish	B14	Sierra Leone -Samples of *Galeoides decadactylus* freeze-dried from trawl, for later analysis for contaminants
E	848	NM	M06	Sierra Leone -Wind direction and speed, air temperature, air pressure, relative humidity logged automatically every 60 sec. throughout survey
E	848	NM	H71	Sierra Leone -underway thermosalinograph throughout survey measuring salinity, temperature, turbidity and chlorophyll-a
E	848	NM	D71	Sierra Leone -Two-hull-mounted Acoustic Doppler Current Profiler (VMADCP) run continuously during the survey
A	12	Trawls	B14	Liberia-Bottom trawls targeting pelagic fish for identification
A	6	Trawls	B14	Liberia -Pelagic trawls targeting pelagic fish for identification
A	5	Trawls	B14	Liberia -Pelagic trawl for mesopelagic fish for identification
A	2045	Fish	B14	Liberia -samples of pelagic fish for length-frequency
A	270	Fish	B14	Liberia -samples of pelagic fish for sex, maturity and stomach fullness
A	210	Fish	B14	Liberia -samples of pelagic fish frozen for later analysis of liver and stomach contents analysis
A	105	Fish	B14	Liberia -samples of pelagic fish frozen for later analysis of fin clips
A	210	Fish	B14	Liberia -samples of *Sardinella aurita and S. maderensis* frozen for later analysis of otoliths
A	48	Samples	B14	Liberia -mesopelagic fish samples frozen, for identification by University of Western Cape
B	190	Samples	H22	Liberia -phosphate samples from CTD rosette water sampler
B	190	Samples	H24	Liberia -nitrate samples from CTD rosette water sampler
B	190	Samples	H25	Liberia -nitrite samples from CTD rosette water sampler
B	190	Samples	H26	Liberia -silicate samples from CTD rosette water sampler
B	190	Samples	H27	Liberia -alkalinity samples from CTD rosette water sampler
B	190	Samples	H28	Liberia -pH samples from CTD rosette water sampler
B	26	Stations	H09	Liberia -water bottle stations using CTD rosette water sampler
B	42	Stations	H10	Liberia -CTD stations
C	12	Bottles	B08	Liberia -phytoplankton samples in formalin from phytoplankton vertical net haul, for later analysis
C	9	Bottles	B09	Liberia -zooplankton samples in formalin from WP2 200m vertical net haul, for later analysis
C	9	Trays	B09	Liberia -zooplankton samples freeze-dried from WP2 200m vertical net haul, for later analysis
C	12	Bottles	B09	Liberia -zooplankton samples in formalin from WP2 25m vertical net haul, for later analysis
C	12	Trays	B09	Liberia -zooplankton samples freeze-dried from WP2 25m vertical net haul, for later analysis
C	17	Bottles	B13	Liberia -Egg and Larvae samples in formalin from Multinet sampler hauled obliquely from 100 m, for later analysis
C	5	Bottles	P01	Liberia -Samples of plastics from Manta trawl in formalin hauled at surface for 15 minutes, for later analysis

C	0	Tray	P01	Liberia -Samples of plastics freeze-dried from Manta trawl hauled at surface for 15 minutes, for later analysis

D	25	Fish	B14	Liberia -Samples of *Pseudutolithus senegalensis* freeze-dried from trawl, for later analysis for contaminants
D	25	Fish	B14	Liberia -Samples of *Drepane africana* freeze-dried from trawl, for later analysis for contaminants
D	25	Fish	B14	Liberia -Samples of *Sphyraene guanchancho* freeze-dried from trawl, for later analysis for contaminants
E	1121	NM	M06	Liberia -Wind direction and speed, air temperature, air pressure, relative humidity logged automatically every 60 sec. throughout survey
E	1121	NM	H71	Liberia -underway thermosalinograph throughout survey measuring salinity, temperature, turbidity and chlorophyll-a
E	1121	NM	D71	Liberia -Two–hull-mounted Acoustic Doppler Current Profiler (VMADCP) run continuously during the survey

ANNEX VI. BIOLOGICAL SAMPLES COLLECTED FOR FUTURE ANALYSIS

Summary

Region	Length	Length/ weight	Biology (sex, maturity & stomach fullness)	Liver samples frozen	Stomach samples frozen	Otoliths collected	Fin clips preserved and frozen	Frozen individuals
Guinea Bissau		867	113	113	113	0	113	
Guinea Conakry	58	5831	1021	969	969	117	629	291
Sierra Leone		1895	187	104	104	0	15	1
Liberia	11	2045	270	210	210	48	105	713
TOTAL	**69**	**10638**	**1591**	**1396**	**1396**	**165**	**862**	**1005**

Guinea Bissau

Station	Species code	Species name	Length/ weight	Biology (sex, maturity & stomach fullness)	Liver samples frozen	Stomach samples frozen	Otoliths collected	Fin clips preserved and frozen
1 (Senegal)	CARCH01	*Chloroscombrus chrysurus*	100					
2	CLUSL02	*Sardinella maderensis*	100					
2	CARCH01	*Chloroscombrus chrysurus*	7					
4	CLUSL02	*Sardinella maderensis*	30	30	30	30		30
4	CARSL01	*Selene dorsalis*	50					
6	CLUSL01	*Sardinella aurita*	4	4	4	4		4
7	CLUSL02	*Sardinella maderensis*	5	5	5	5		5
8	CLUSL02	*Sardinella maderensis*	14	14	14	14		14
8	MULPS01	*Pseudopeneus prayensis*	51					
8	SPAPR07	*Pagrus caeroleostictus*	13					
8	CARCH01	*Chloroscombrus chrysurus*	23					
8	SPAPA02	*Pagellus bellottii*	3					
8	CARDE01	*Decapterus punctatus*	4					
9	MULPS01	*Pseudopeneus prayensis*	60					
13	SCMSM01	*Scomberomorus tritor*	3					
13	CLUSL02	*Sardinella maderensis*	100	30	30	30		30
13	CARDE01	*Decapterus punctatus*	100					
13	CARDE02	*Decapterus rhonchus*	100					
10	SCMSC04	*Scomber colias*	100	30	30	30		30
Total number of individuals			**867**	**113**	**113**	**113**	**0**	**113**

Guinea Conakry

Stn	Species code	Species name	length	length/ weight	Biology (sex, maturity & stomach fullness)	liver samples frozen	stomach samples frozen	otoliths collected	fin clips preserved and frozen	frozen individuals
14	CLUSL02	*Sardinella maderensis*		30	30	30	30		30	
14	CARDE02	*Decapterus rhonchus*	53							
15	MYCDI00	*Diaphus sp*								200
17	CARCH01	*Chloroscombrus chrysurus*		10						
17	CARSL01	*Selene dorsalis*		24						
17	SPAPR07	*Pagrus caueroliticus*		9						
17	CLUSL02	*Sardinella maderensis*		2	2	2	2		2	
17	SPAPA02	*Pagellus bellottii*		70						
17	MULPS01	*Pseudupeneus prayensis*		63						
18	MULPS02	*Pseudupeneus prayensis*		47						
18	SPAPR07	*Pagrus caueroliticus*		51						
18	CARSL01	*Selene dorsalis*		51						
18	RAYDA19	*Dasyatis centroura*		7						
19	CLUSL02	*Sardinella maderensis*		92	30	30	30		30	
19	CLUSL01	*Sardinella aurita*		98	30	30	30		30	
20	CLUSL02	*Sardinella maderensis*		100	30	30	30		30	
20	CLUSL01	*Sardinella aurita*		9	8					
20	CARDE01	*Decapterus punctatus*		36	30					
20	CARDE02	*Decapterus rhonchus*		13	13					
21	SCMSC04	*Scomber colias*		74	74	74	74		74	
22	CLUSL02	*Sardinella maderensis*		100	30	30	30		30	
22	CLUSL01	*Sardinella aurita*		11	11	11	11		11	
22	SPHSP01	*Sphyraena guanchanco*		9						
22	CARCH01	*Chloroscombrus chrysurus*		100						
22	CARCA02	*Caranx crysus*		1						
22	CARDE01	*Decapterus punctatus*		1	1					
22	CARSL01	*Selene dorsalis*		7						
22	SCMEU01	*Euthynnus alletteratus*		2						
23	CARCA02	*Caranx crysus*		92						
23	CARCH01	*Chloroscombrus chrysurus*		29						
23	CARDE01	*Decapterus punctatus*		24	24	24	24		24	
23	CARDE02	*Decapterus rhonchus*		6	6	6	6		6	
23	CLUSL01	*Sardinella aurita*		21	21	21	21		21	
24	CLUSL01	*Sardinella aurita*		4	4	4	4		4	
24	CLUSL02	*Sardinella maderensis*		100	30	30	30		30	
24	CARCH01	*Chloroscombrus chrysurus*		100						
24	SPHSP01	*Sphyraena guanchanco*		5						
26	SCMSC04	*Scomber colias*		49	30	30	30		30	
26	SHASQ82	*Squalus megalops*		78						
27	CARCH01	*Chloroscombrus chrysurus*		100						
27	CLUSL02	*Sardinella maderensis*		100	30	30	30		30	
27	CLUSL01	*Sardinella aurita*		2	2	2	2		2	
27	CARCA02	*Caranx crysus*		1						

27	CARDE02	*Decapterus rhonchus*		1						
27	CARDE01	*Decapterus punctatus*		4	4	4	4		4	
28	CLUSL02	*Sardinella maderensis*		62	30	30	30	30	30	
29	CLUSL02	*Sardinella maderensis*		17	17	17	17	17	17	
29	HARBR01	*Brachydeuterus auritus*		47						
29	CARCH01	*Chloroscombrus chrysurus*		102						
29	HARBR01	*Brachydeuterus auritus*		30						
29	CARDE01	*Decapterus punctatus*		104	30	30	30		30	
29	CARDE02	*Decapterus rhonchus*		100	30	30	30		30	
29	CLUSL01	*Sardinella aurita*		100	30	30	30		30	
29	SPHSP03	*Sphyraena afra*	1							
30	CARCH01	*Chloroscombrus chrysurus*		100						
30	MULPS01	*Pseudupeneus prayensis*		100						
30	SCMSM01	*Scomberomorus tritor*	4							
31	GONDI01	*Diplophos taenia*								10
31	SQUEN40	*Abralia veranyi*								2
31	PARLP01	*Lestrolepis intermedia*								4
31	SEMPR01	*Prometichtys prometheus*								1
31	MYCDI00	*Diapus Sp 2*								24
31	MYCDI00	*Diapus Sp 1*								20
31	ARMAR01	*Arioma bondi*		26						10
31	ACRSY04	*Synagrops bellus*		52						10
32	CLUSL02	*Sardinella maderensis*		100	30	30	30		30	
32	CLUSL01	*Sardinella aurita*		8	8	8	8		8	
32	CARCA02	*Caranx crysus*		2						
32	CARDE02	*Decapterus rhonchus*		1						
32	CARSL01	*Selene dorsalis*		79						
32	CARDE01	*Decapterus punctatus*		51	30	30	30		30	
32	CARCH01	*Chloroscombrus chrysurus*		74						
34	SCMSC04	*Scomber colias*		6	6	6	6	3	6	
34	CLUSL01	*Sardinella aurita*		100	30	30	30	30	30	
34		*Sea weed*								10
35	SPHSP01	*Sphyraena guanchanco*		99						
35	TRITR01	*Trichiurus lepturus*		5						
35	HARBR01	*Brachydeuterus auritus*		34						
35	CARCH01	*Chloroscombrus chrysurus*		100						
35	CLUSL02	*Sardinella maderensis*		59	30	30	30			
35	MULPS01	*Pseudupeneus prayensis*		41						
35	CARSL01	*Selene dorsalis*		3						
38	SPAPR07	*Pagrus caueroliticus*		40						
38	MULPS01	*Pseudupeneus prayensis*		30						
38	CARDE02	*Decapterus rhonchus*		16	16	16	16			
38	CARCA02	*Caranx crysus*		20						
38	SPAPA02	*Pagellus bellottii*		3						
38	CARDE01	*Decapterus punctatus*		3	3	3	3			

38	CARCH01	*Chloroscombrus chrysurus*		120						
39	CLUSL01	*Sardinella aurita*		22	22	22	22	22		
39	CLUSL02	*Sardinella maderensis*		9	9	9	9			
39	CARDE01	*Decapterus punctatus*		11	11	11	11			
39	SCMSC04	*Scomber colias*		1						
40	SCMSC04	*Scomber colias*		30	30	30	30			
40	CLUSL01	*Sardinella aurita*		78	30	30	30			
40	ARMAR01	*Arioma bondi*		10						
41	SCMSC04	*Scomber colias*		14						
41	CLUSL01	*Sardinella aurita*		35						
44	CARCH01	*Chloroscombrus chrysurus*		100						
44	MULPS01	*Pseudupeneus prayensis*		100						
44	HARBR01	*Brachydeuterus auritus*		0						
44	CARCA02	*Caranx crysus*		68						
44	SPAPR07	*Pagrus caueroliticus*		101						
44	CARSL01	*Selene dorsalis*		5						
44	SPAPA02	*Pagellus bellottii*		21						
45	CLUSL02	*Sardinella maderensis*		8	8	8	8			
45	CARCH01	*Chloroscombrus chrysurus*		66						
45	SPAPR07	*Pagrus caueroliticus*		37						
45	CARCA02	*Caranx crysus*		33						
45	MULPS01	*Pseudupeneus prayensis*		64						
45	HARBR01	*Brachydeuterus auritus*		81						
45	CARDE02	*Decapterus rhonchus*		7						
45	SPAPA02	*Pagellus bellottii*		1						
45	SPHSP01	*Sphyraena guanchanco*		1						
46	CLUSL01	*Sardinella aurita*		98	15	15	15			
46	CLUSL02	*Sardinella maderensis*		100	15	15	15			
46	CARCH01	*Chloroscombrus chrysurus*		50						
46	CARCA02	*Caranx crysus*		2						
46	HAEBR01	*Brachydeuterus auritus*		41						
46	CARDE02	*Decapterus rhonchus*		2						
46	CARDE01	*Decapterus punctatus*		1						
46	SPHSP01	*Sphyraena guanchanco*		1						
47	CLUSL01	*Sardinella aurita*		100	15	15	15			
47	CLUSL02	*Sardinella maderensis*		9	9	9	9			
47	DREDR01	*Drepane africana*		37						
47	MULPS01	*Pseudupeneus prayensis*		62						
47	PODPO03	*Pomadasys peroteti*		3						
47	SCIPS02	*Pseudotolithus senegalensis*		33						
47	SPAPR07	*Pagrus caueroliticus*		111						
47	SPHSP01	*Sphyraena guanchanco*		2						
48	SPHSP01	*Sphyraena guanchanco*		24						
48	CARCH01	*Chloroscombrus chrysurus*		49						
48	CLUSL01	*Sardinella aurita*		100	15	15	15			

48	CLUSL02	*Sardinella maderensis*		51	15	15	15			
49	CARCH01	*Chloroscombrus chrysurus*		100						
49	CLUSL01	*Sardinella aurita*		12	12	12	12			
49	CLUSL02	*Sardinella maderensis*		100	15	15	15			
50	SCMSM01	*Scomberomorus tritor*		3						
50	CARDE02	*Decapterus rhonchus*		4	4	4	4			
50	CARSL01	*Selene dorsalis*		9						
50	CARCH01	*Chloroscombrus chrysurus*		20						
50	HAEBR01	*Brachydeuterus auritus*		50						
53	CLUSL01	*Sardinella aurita*		100	15	15	15	15		
53	CARDE02	*Decapterus rhonchus*		3	3	3	3			
53	SCMSC04	*Scomber colias*		12	12	12	12			
54	ARMAR01	*Arioma bondi*		31						
54	SCMSC04	*Scomber colias*		8	8	8	8			
54	CARCA02	*Caranx crysus*		2						
55	CLUSL01	*Sardinella aurita*		15	15	15	15			
55	SCMSC04	*Scomber colias*		13	13	13	13			
55	CARDE01	*Decapterus punctatus*		3						
		TOTAL	**58**	**5831**	**1021**	**969**	**969**	**117**	**629**	**291**

Sierra Leone

Station	Species code	Species name	length	length/ weight	Biology (sex, maturity & stomach fullness)	liver samples frozen	stomach samples frozen	otoliths collected	fin clips preserved and frozen	frozen individuals
57	CLUSL01	*Sardinella aurita*		46	15	15	15			
57	CLUSL02	*Sardinella maderensis*		100	15	15	15			
57	CARDE01	*Decapterus punctatus*		54						
57	CARDE02	*Decapterus rhonchus*		14						
57	CARCH01	*Chloroscombrus chrysurus*		50						
57	CARCA02	*Caranx crysus*		2						
57	SCMSM01	*Scomberomorus tritor*		2						
57	SCMEU01	*Euthynnus alletteratus*		10						
57	SCMAU01	*Auxis thazard*		3						
59	CLUSL01	*Sardinella aurita*		100	15	15	15		15	
59	CARCH01	*Chloroscombrus chrysurus*		50						
59	CARCA02	*Caranx crysus*		2						
59	SPAPR07	*Pagrus cauerolicticus*		50						
59	MULPS01	*Pseudupeneus prayensis*		50						
61	SPAPR07	*Pagrus cauerolicticus*		5						
61	MULPS01	*Pseudupeneus prayensis*		15						
61	CLUSL01	*Sardinella aurita*		15	15	15	15			
61	CLUSL02	*Sardinella maderensis*		44	15	15	15			
61	CARDE01	*Decapterus punctatus*		7						
61	CARSL01	*Selene dorsalis*		50						
61	SPAPA02	*Pagellus bellottii*		7						
61	HAEPO02	*Pomadasys incisus*		8						
61	HAEPO03	*Pomadasys perotaei*		5						
61	SPHSP01	*Sphyraena guanchanco*		20						
62	ARMAR01	*Ariomma bondi*		42						
62	CARDE01	*Decapterus punctatus*		1						
62	CARSL01	*Selene dorsalis*		4						
62	CLUSL01	*Sardinella aurita*		3						
62	CARCA02	*Caranx crysus*		1						
63	CLUSL02	*Sardinella maderensis*		100	14	14	14			
63	CARSL01	*Selene dorsalis*		50						
63	SPHSP01	*Sphyraena guanchanco*		40						
63	CARSA01	*Selar crumenophthalmus*		17						
63	JELLY00	*jellyfish*								1
63	SCMSM01	*Scomberomorus tritor*		17						
63	TRITR01	*Trichiurus lepturus*		6						
64	CARCH01	*Chloroscombrus chrysurus*		34						
64	CARSL01	*Selene dorsalis*		50						
64	CLUIL01	*Ilisha africana*		50						
64	CLUSL02	*Sardinella maderensis*		19						
65	CARCH01	*Chloroscombrus chrysurus*		50						
65	CARSL01	*Selene dorsalis*		50						
65	CLUIL01	*Illisha africana*		50						
65	CLUSL02	*Sardinella maderensis*		4						
65	SPHSP01	*Sphyraena guanchanco*		47						
65	HAEBR01	*Brachydeuterus auritus*		42						
65	HAEPO03	*Pomadasys perotaei*		24						
65	HAEPO04	*Pomadasys rogeri*		5						
66	SCMSM01	*Scomberomorus tritor*		8						
66	CLUSL02	*Sardinella maderensis*		93	15	15	15			
66	CARSA01	*Selar crumenophthalmus*		31						
66	CARCA03	*Caranx senegallus*		9						
66	ELOEL03	*Elops lacerta*		22						

66	SPHSP01	*Sphyraena guanchanco*		26						
67	CARSL01	*Selene dorsalis*		7						
67	CLUSL02	*Sardinella maderensis*		32	28					
67	SCMSM01	*Scomberomorus tritor*		11						
67	CARSA01	*Selar crumenophthalmus*		42						
68	SPHSP01	*Sphyraena guanchanco*		13						
68	DREDR01	*Drepana africana*		34						
68	CLUSL02	*Sardinella maderensis*		55	55					
68	CLUSL01	*Sardinella aurita*		53						
68	CARSL01	*Selene dorsalis*		25						
68	CARCH01	*Chloroscombrus chrysurus*		19						
	TOTAL			**1895**	**187**	**104**	**104**	**0**	**15**	**1**

Liberia

Stn	Species code	Species name	Length	Length/ weight	Biology (sex, maturity & stomach fullness)	Liver samples frozen	Stomach samples frozen	Otoliths collected	Fin clips preserved and frozen	Frozen individuals
71	CLUSL02	*Sardinella maderensis*		51	15	15	15			
71	CARCA14	*Caranx senegalis*		7						
71	SCMSM01	*Scomberomorus tritor*		14						
72	SPHSP01	*Sphyraena guanchanco*		14						
72	CLUIL01	*Ilisha africana*		100						
72	TRITR01	*Trichiurus lepturus*		50						
72	CARCH01	*Chloroscombrus chrysurus*		42						
72	CARSL01	*Selene dorsalis*		50						
72	SCMSM01	*Scomberomorus tritor*		2						
72	HAEBR01	*Brachydeuterus auritus*		50						
73	SCMSM01	*Scomberomorus tritor*		8						
73	CLUIL01	*Ilisha africana*		50						
73	CARSL01	*Selene dorsalis*		27						
73	CLUSL02	*Sardinella maderensis*		89						
73	SPHSP01	*Sphyraena guanchanco*		10						
73	CARSA01	*Trachinotus goreensis*		6						
73	LUTLU01	*Lutjanus goreensis*		4						
74	HAEBR01	*Brachydeuterus auritus*		50						
74	CLUSL02	*Sardinella maderensis*		25	15	15	15		15	
74	CLUIL01	*Ilisha africana*		7						
75	SQUAA01	*Small squids*								29
75	UNIDE00	*Unidentified fish*								580
76	CARSL01	*Selene dorsalis*		8						
76	HAEBR01	*Brachydeuterus auritus*		8						
76	SPHSP01	*Sphyraena guanchanco*		1						
77	SPHSP01	*Sphyraena guanchanco*		5						
77	CARCH01	*Chloroscombrus chrysurus*		11						
77	CLUIL01	*Ilisha africana*		100						
77	PLNPD01	*Polydactylus quadrifilis*		2						
77	SCIPS02	*Pseudotolithus senegalsis*		1						
77	CLUSL02	*Sardinella maderensis*		9						
77	CARSL01	*Selene dorsalis*		8						
77	HAEPO03	*Pomadasys perotaei*		5						
78	CARCH01	*Chloroscombrus chrysurus*		14						
78	CLUIL01	*Ilisha africana*		48						
78	CLUSL02	*Sardinella maderensis*		40						
78	CARSL01	*Selene dorsalis*		50						
78	SPHSP01	*Sphyraena guanchanco*		50						
80	MYCDI00	*Diaphus sp.*								100
80	STEAR01	*Argyropelecus aculeatus*								4
81	SCMSC04	*Scomber colias*		100	30	15	15	3	15	
81	CLUSL01	*Sardinella aurita*		100	30	15	15	15	15	
81	CARDE01	*Decapterus punctatus*		10						
81	CARTR02	*Trachurus trecae*		3						
81	SPADE01	*Dentex angolensis*		27						
81	SPADE04	*Dentex congolensis*		17						
82	CARTR02	*Tracurus trecae*		6						
82	SHATR21	*Mustelus mustelus*		9						
85	SPAPA02	*Pagellus bellottii*	11							
85	CLUSL01	*Sardinella aurita*		101	30	30	30			
85	CARTR02	*Tracurus trecae*		101	30					
85	SCMSC04	*Scomber colias*		45						
86	SHAST11	*Squatina oculata*		2						

86	SHATR21	*Mustelus mustelus*		3						
86	SHASQ82	*Squalus megalops*		8						
86	SPADE03	*Dentex congolensis*		17						
86	SPADE01	*Dentex angolensis*		5						
86	ARMAR01	*Ariomma bondi*		50						
87	CLUSL01	*Sardinella aurita*		30	30	30	30	30	30	
87	SPHSP01	*Sphyraena guanchanco*		2						
88	CLUSL01	*Sardinella aurita*		100	30	30	30		30	
88	CARTR02	*Tracurus trecae*		100	30	30	30			
88	SCMSC04	*Scomber colias*		100	30	30	30		30	
89	SPAPA02	*Pagellus bellottii*		80						
89	MULPS01	*Pseudupeneus prayensis*		13						
	TOTAL		**11**	**2045**	**270**	**210**	**210**	**48**	**105**	**713**

ANNEX VII. SCRUTINISATION OF SARDINELLA ACOUSTIC BACKSCATTER

Scrutinisation of the acoustic backscatter is especially challenging in tropical waters, largely due to the high levels of background plankton masking the fish. As described in the main body of this report, while not a perfect method, the sV threshold was adjusted to filter out plankton.

Few trawl hauls taken during the day successfully sampled the targeted fish, primarily because densely shoaling pelagic fish are particularly adept at avoiding the trawl net. This was further complicated once one of the trawl winches failed, meaning that from 2nd August it was not possible to use the large pelagic trawl (Multpelt), the only net that was somewhat successful at catching these fish, although due to its size it could only be used in waters deeper than about 50 m. The mix of pelagic species in the night trawl hauls also made scrutinisation challenging.

In most situations at night the backscatter was identified based on the trawl catch of the nearest trawl or a trawl from a similar depth on an adjacent or nearby transect. However, in Guinea Conakry in particular a number of trawls provided multiple samples of the same targets and hence the average catch of these trawls could be used, a much more robust method for allocating backscatter.

The following criteria were used during scrutinisation:

Guinea Bissau

Day

As was to become the theme of this survey, and is common for sardinella surveys elsewhere, few sardinella were caught during the day, although one trawl, BT13, was successful. From night-time trawls in the same vicinity, and the experience of the on-board scientists, all dense schools encountered during the day were confidently identified as sardinella.

Night

Several trawls targeting rather dispersed shoals in the same area that sardinella-like schools had been recorded during the day caught a mixture of sardinella with other pelagic species. Areas with high backscatter values were assumed to come from sardinella shoals while less intense backscatter from the water column outside of shoals was allocated to other pelagic species based on the trawl catches after any sardinella had been removed.

Guinea Conakry

Day

No catches of sardinella were made during the day, despite numerous attempts. However, based on catches made in the same vicinity at night and the typical appearance of marks any very dense, well-defined marks were classified as 100% sardinella.

Night – waters less than 35 m deep

Fairly dense marks were classified (based on PT46) as;

84% sardinella
0,1% Pelagic I
14% Pelagic II
2% Other

Layers with a distinct grainy appearance, containing some red and yellow echoes, were classified (based on PT48, PT49) as:

59% sardinella
0,2% Pelagic I
33% Pelagic II
8% Other

Night – waters between 35 m and 45 m deep

Fairly dense marks were classified (based on PT32) as:

80% sardinella
1% Pelagic I
19% Pelagic II

Night – waters deeper than 45 m

Layers with a distinct grainy appearance, containing some red and yellow echoes, were classified (based on PT34, PT39, PT40, PT41, PT55) as:

75% sardinella
13% Pelagic I
9% Pelagic II
3% Other

Sierra Leone

Sardinella were found in dense schools in the northern part of the country. Elsewhere the few sardinella that were recorded were mixed in scattering layers of Pelagic II fish and other pelagics where the acoustic backscatter was allocated according to the trawl samples.

Day

Several attempts to catch sardinella schools during daylight were unsuccessful and so all identification of daytime schools was based on night-time catches in the same area; typically dense sardinella-like schools were all classified as sardinella. Backscatter from fish outside of these dense schools was based on the trawl/trawls in the same vicinity.

Night

In general, the acoustic backscatter was allocated according the nearest trawls that had successfully targeted the same layer. However, on a few occasions small but dense schools of what was presumed to be sardinella occurred in the scattering layer. These schools were either isolated and the entire backscatter given to sardinella, or if they were too numerous to isolate individually the sV threshold was lowered to -45 dB. The remaining backscatter was assumed to be from sardinella. The threshold was then raised to -50 dB and the difference between these two levels was allocated to the remainder of the trawl catch, with sardinella removed.

Liberia

In general, all pelagic fish (sardinellas, horse mackerel, Pelagic I and Pelagic II) occurred close to or on the bottom during the day and dispersed in the midwater at night. A few small, but dense schools of sardinella-like fish were found in small areas, and sardinella were caught. However, none of these schools were intercepted by an acoustic transect. Identification of the dispersed fish, whether on the bottom or in the midwater, was based entirely on the species composition of nearby trawls that had targeted the same type of scatter, both in terms of time of day and depth.

ANNEX VIII. pH, ALKALINITY AND ARGONITE SATURATION STATE

Water samples were collected from the whole water column at stations on most of the transects. These were analysed on board for pH and alkalinity, while nutrients will be analysed later on shore. Preliminary calculations are shown here; final results will only be calculated when nutrient concentrations are known. These variables will be used to characterize the inorganic carbon components of the waters, which will also indicate the status of ocean acidification.

Deep water has a low pH because of the high CO_2 content, which is produced by degradation of sinking organic material. Water that has been upwelled along the shelf consequently had low pH values, and pH decreased gradually with depth.

Alkalinity is more related to the salinity of the waters, and a low alkaline layer was found around 50 m depth, consisting of warm high salinity water with a lower alkalinity than the surrounding waters.

The saturation state of calcium carbonates is an indicator used for monitoring the development of ocean acidification in seawater. A saturation state value below one for a calcium carbonate mineral means the water is under-saturated. Under-saturation predicts that over time the mineral will dissolve. The aragonite saturation state was well above one in the waters studied, but below 250 m depth the values were rather low, as would be expected in upwelling waters. For some marine organisms that construct shells of aragonite, a saturation state below 2 has been shown to slow down the process of shell formation. Such organisms are therefore not expected to be successful in upwelled water. Such a low saturation state of aragonite was not found in the waters investigated.

Guinea Bissau

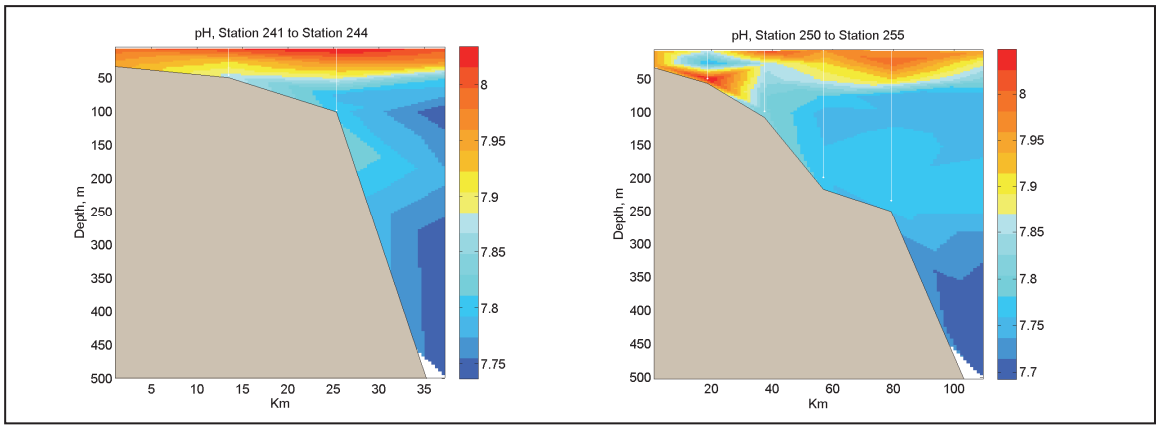


Figure (a). Profiles of pH off Guinea Bissau.

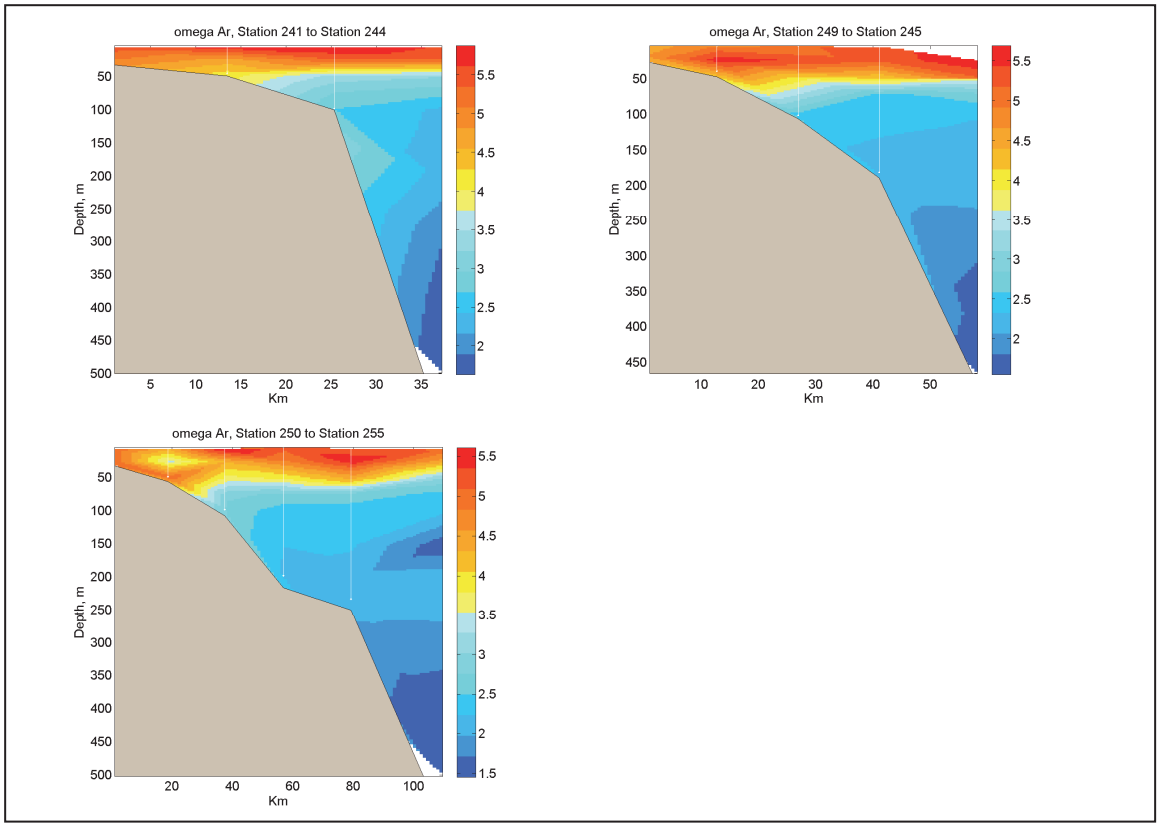


Figure (b). Profiles of the saturation state of the calcium carbonate mineral aragonite off Guinea Bissau.

Guinea Conakry

The pH in water above 10 m depth varied between 7.89 and 8.08 in the area investigated, with an average value of 7.99. The pH decreased with depth.

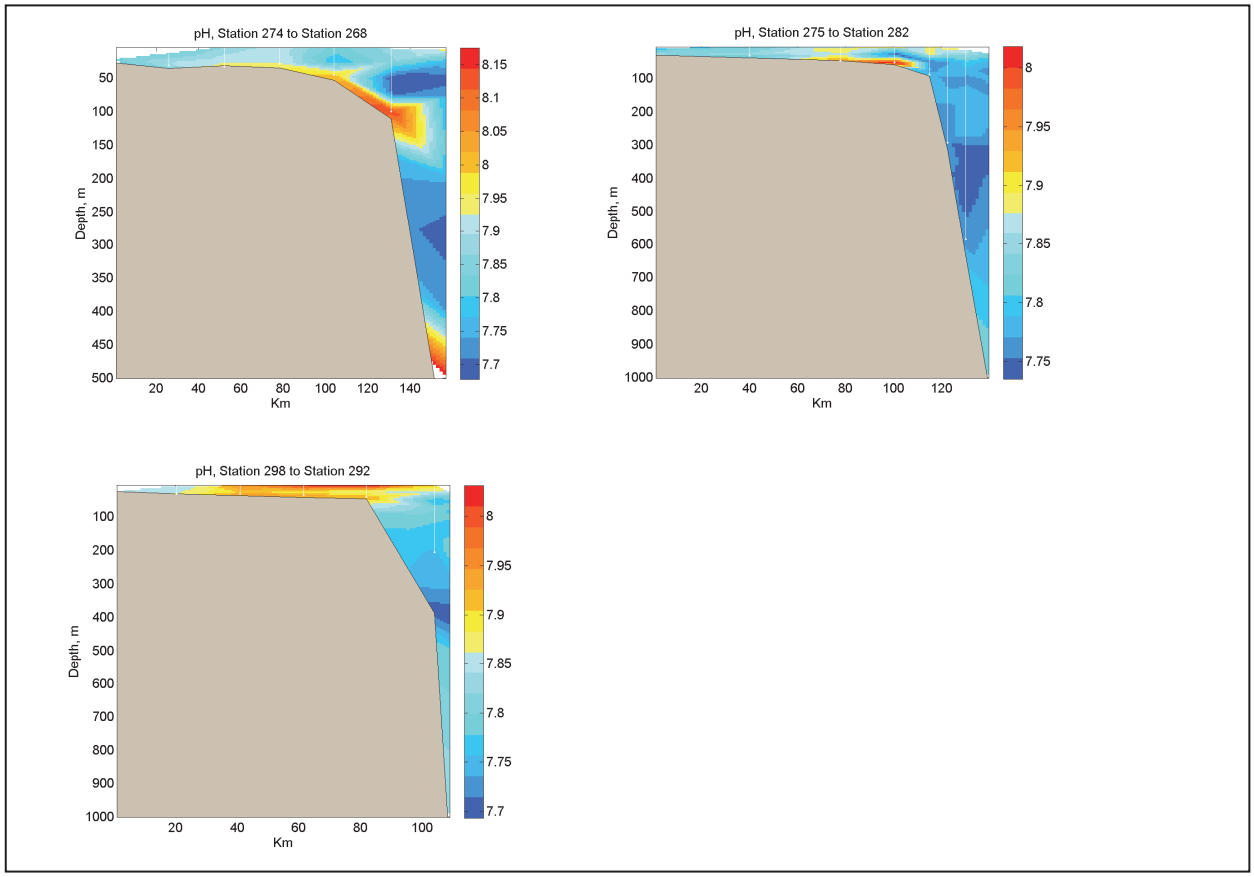


Figure (c). Profiles of the pH off Guinea Conakry.

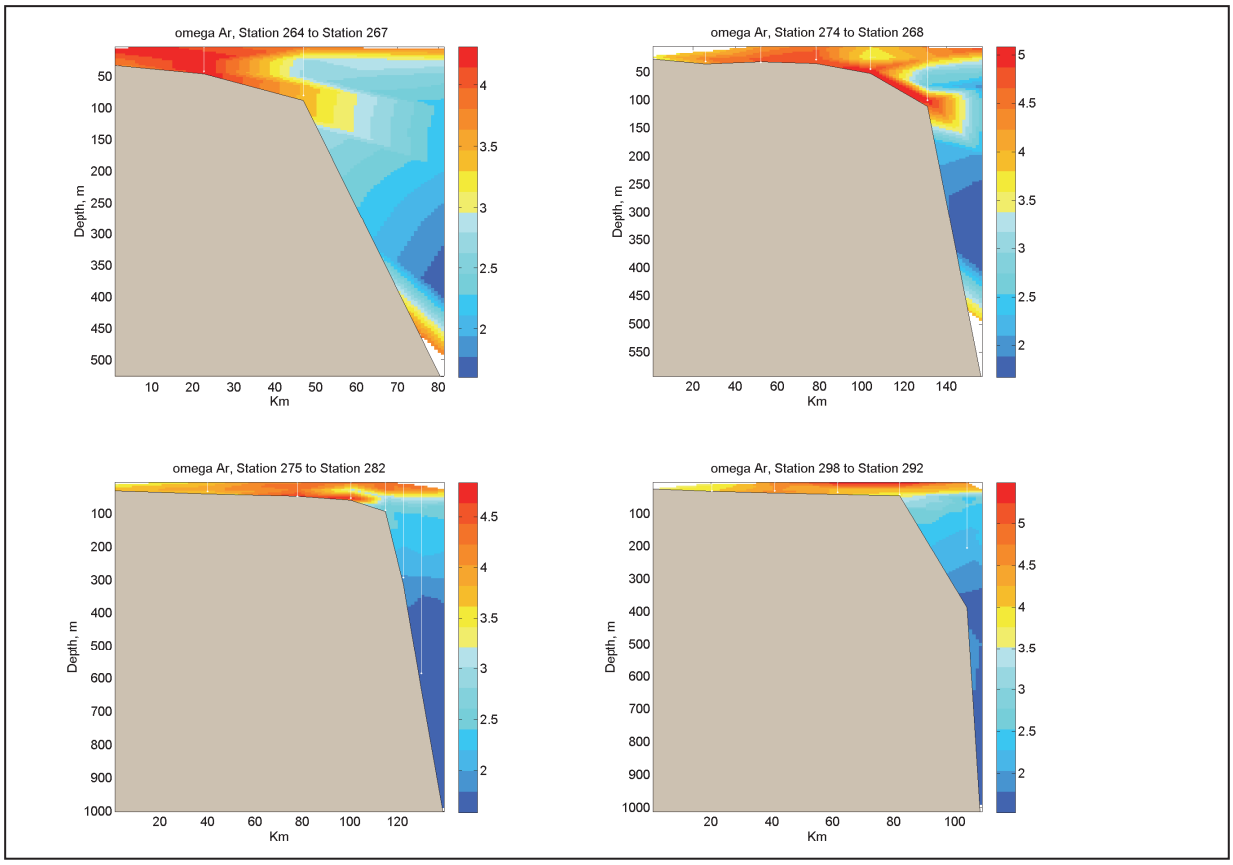


Figure (d). Profiles of the saturation state of the calcium carbonate mineral aragonite off Guinea Conakry.

Sierra Leone

The pH in water above 10 m depth was on average 7.93 (std=0.05).

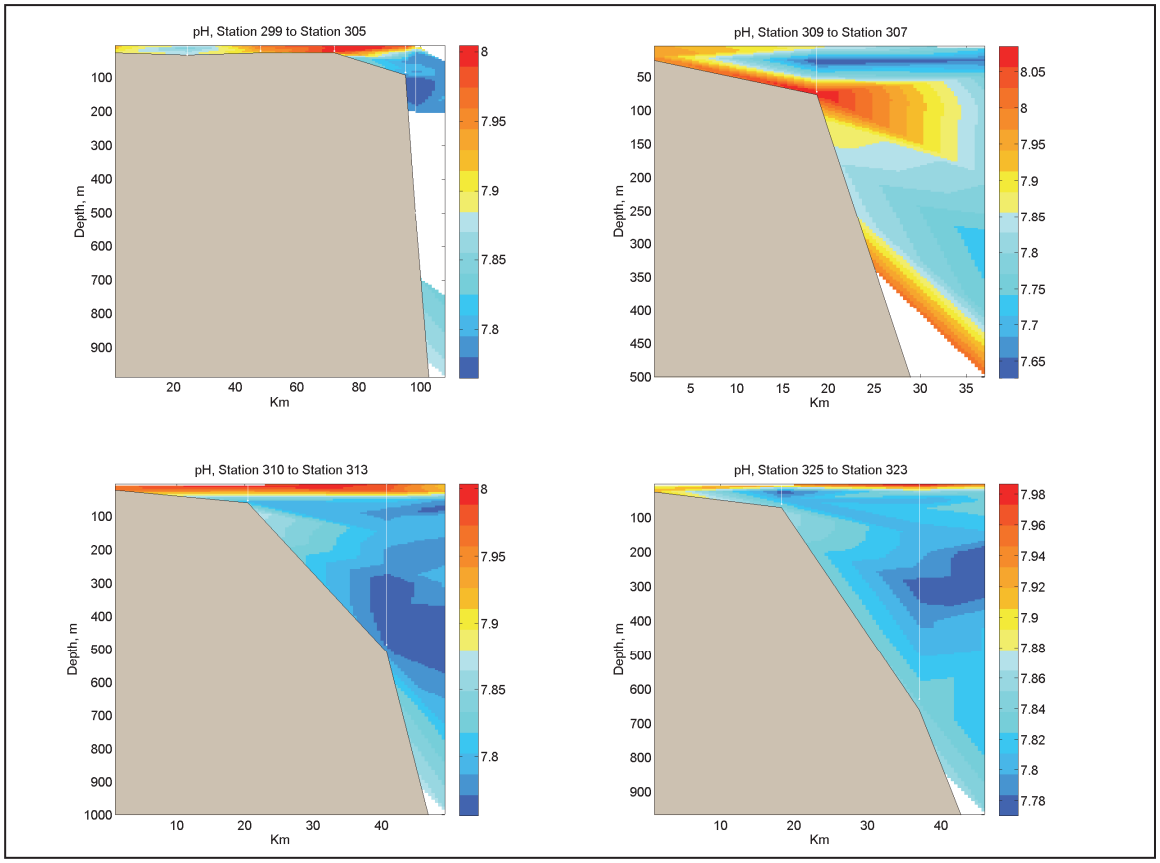


Figure (e). Profiles of the pH off Sierra Leone.

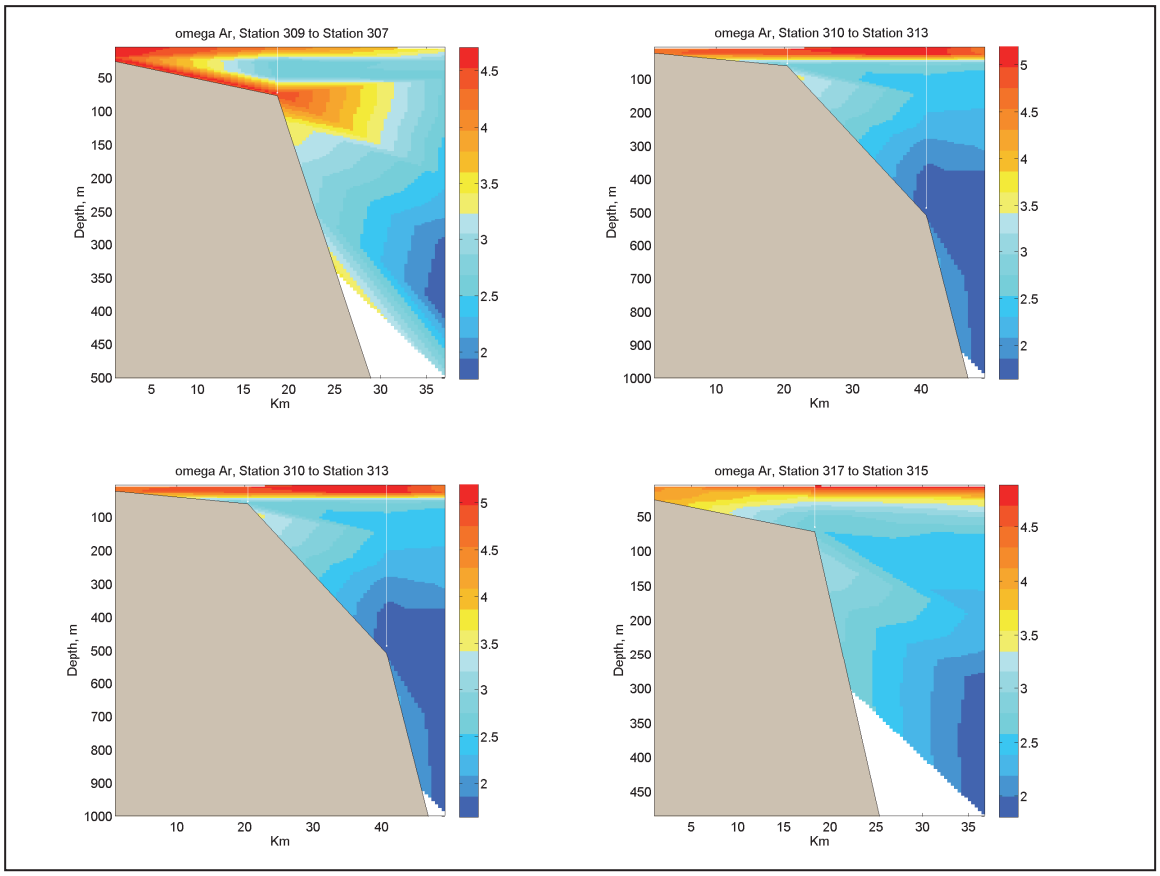


Figure (f). Profiles of the saturation state of the calcium carbonate mineral aragonite off Sierra Leone.

Liberia

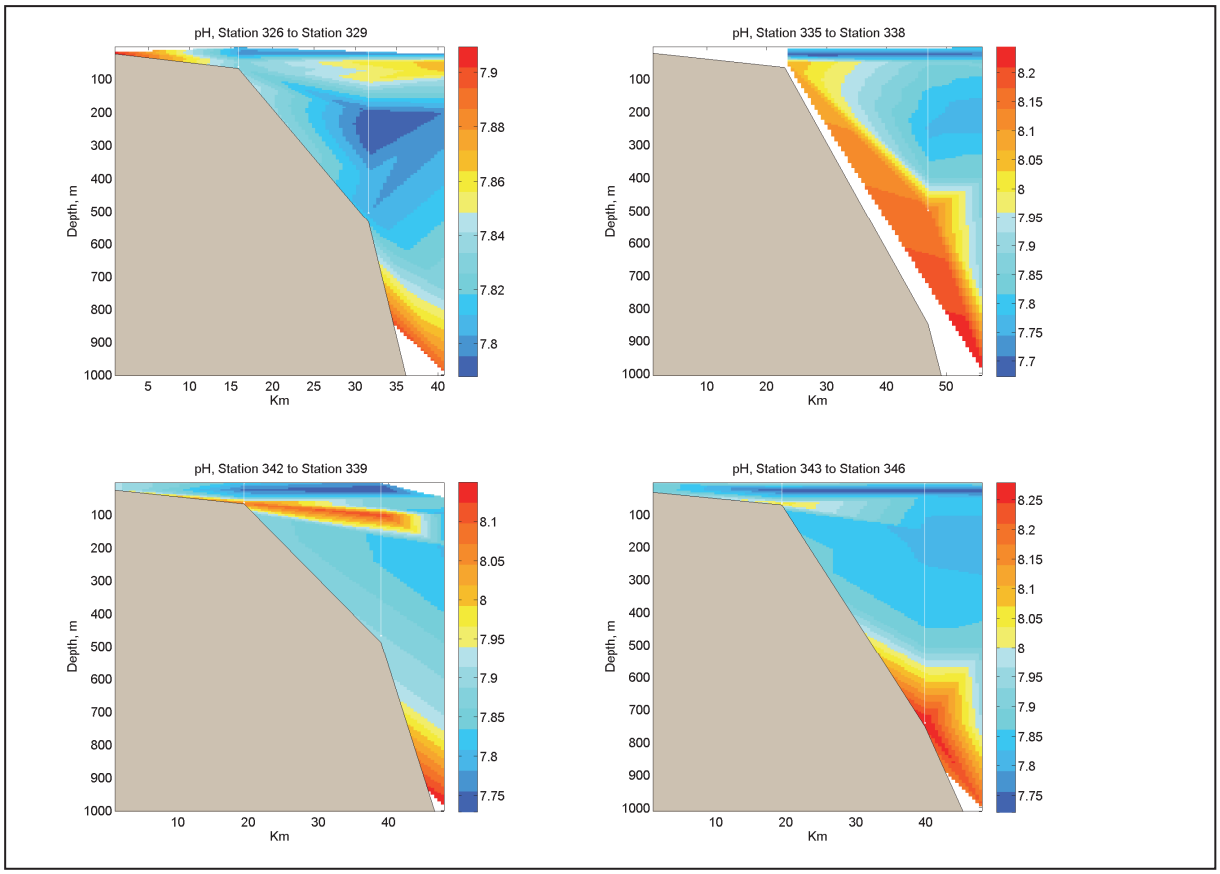


Figure (g). Profiles of the pH off Liberia.

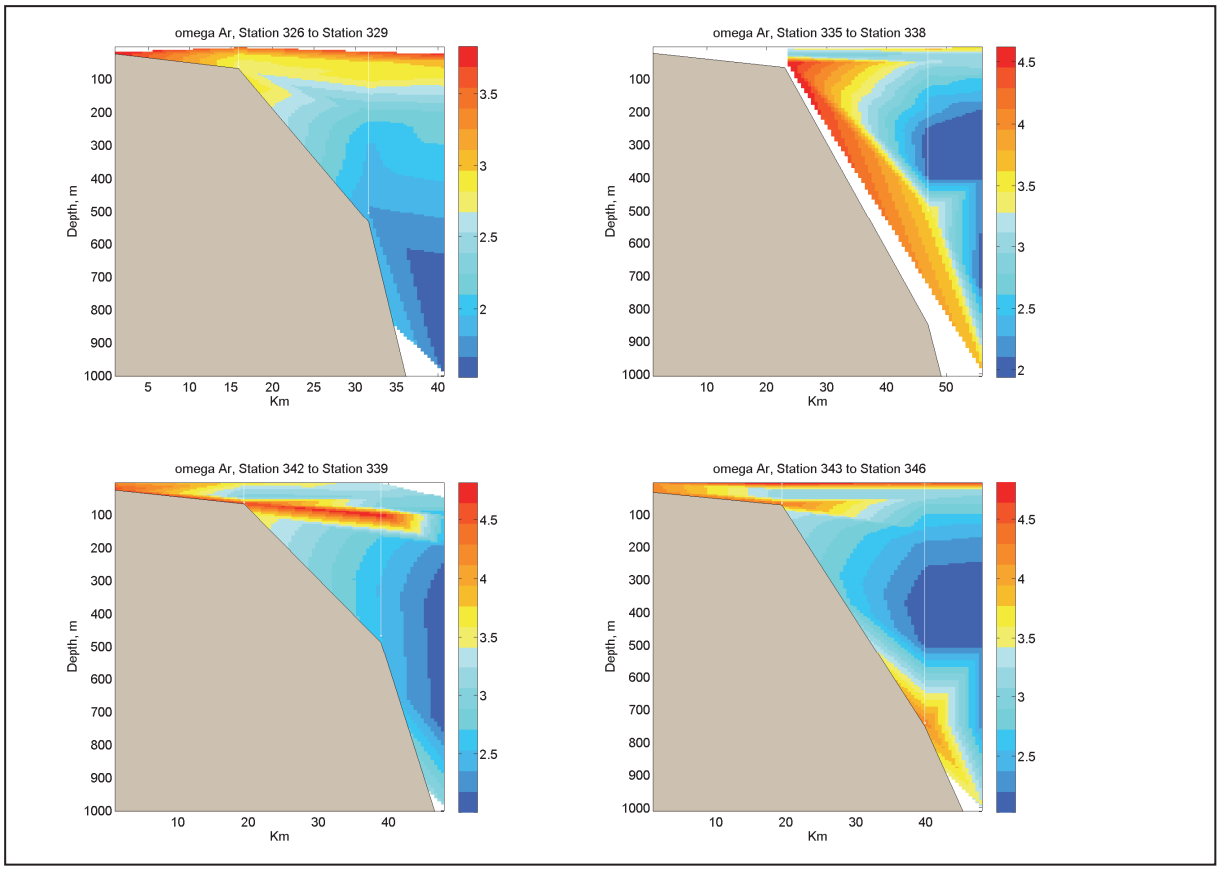


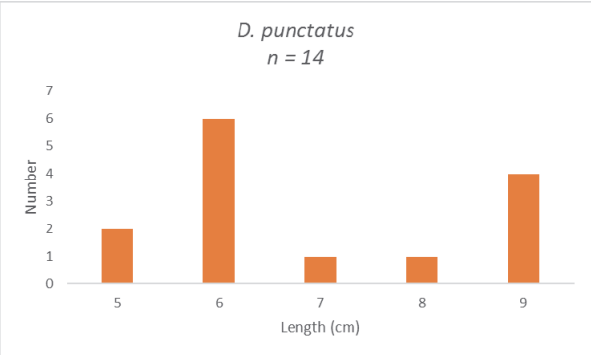
Figure (h). Profiles of the saturation state of the calcium carbonate mineral aragonite off Liberia.

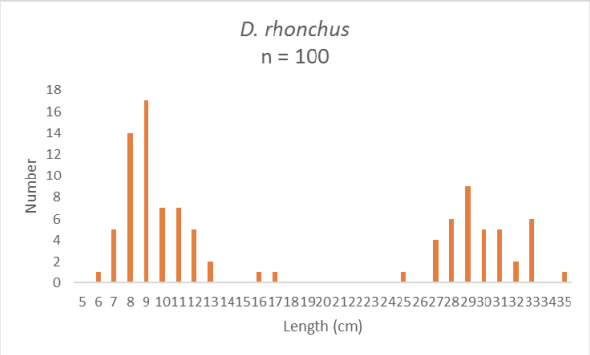
ANNEX IX. LENGTH DISTRIBUTIONS OF "PELAGIC II" AND "OTHER PELAGIC" SPECIES AND SELECTED DEMERSAL FISH

NB Length distributions of sardinella are described within the main body of the report and insufficient numbers of Pelagic I fish were caught

Guinea Bissau

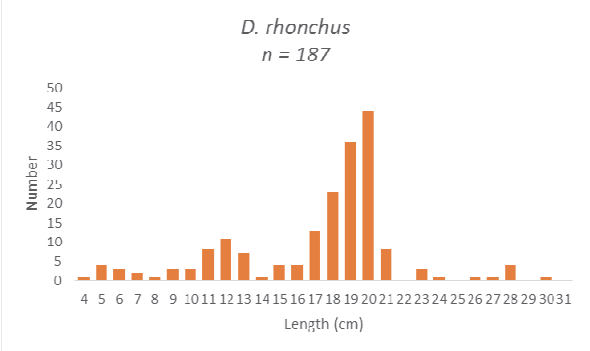
Pelagic II fish

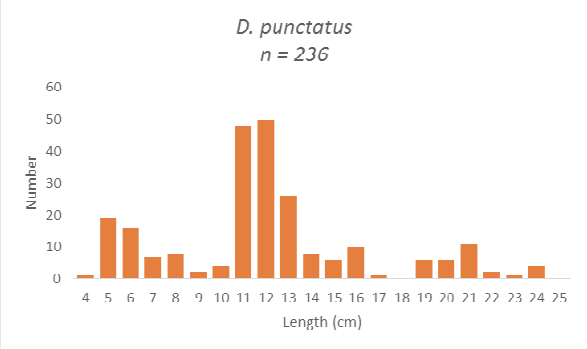


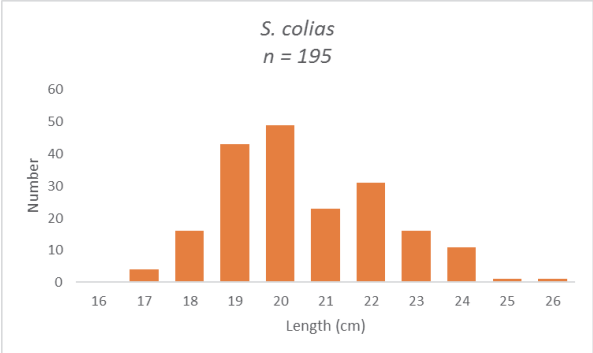


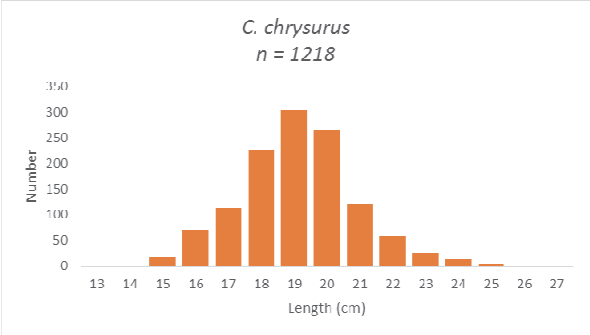
Guinea Conakry

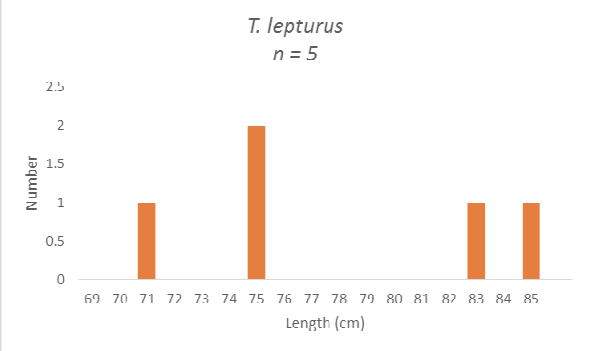
Pelagic II fish

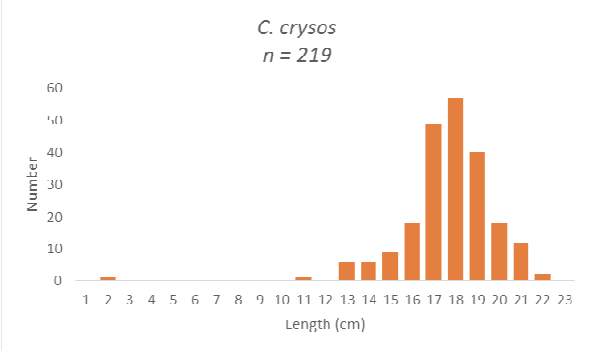


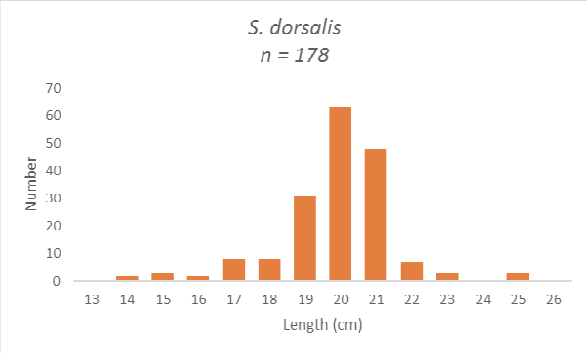




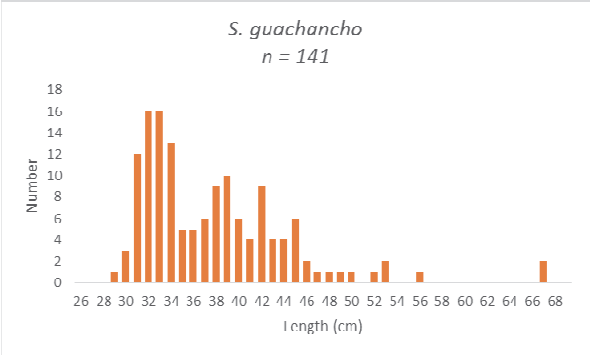


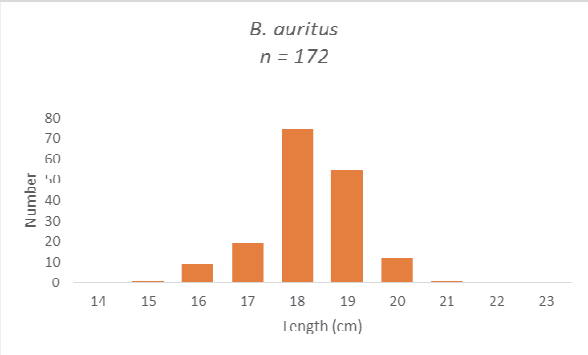






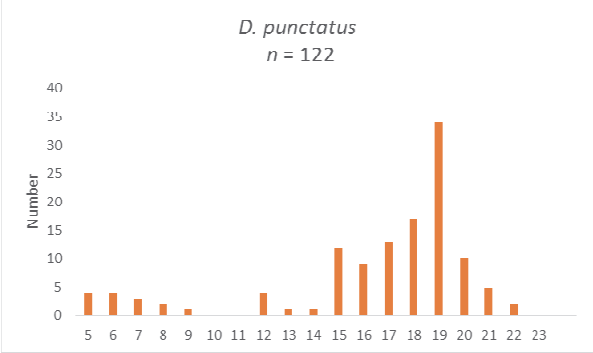
Other pelagic fish

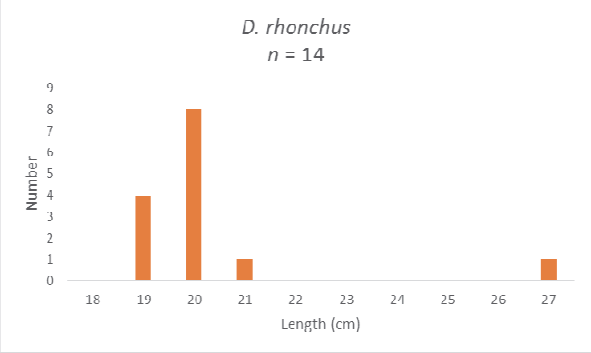


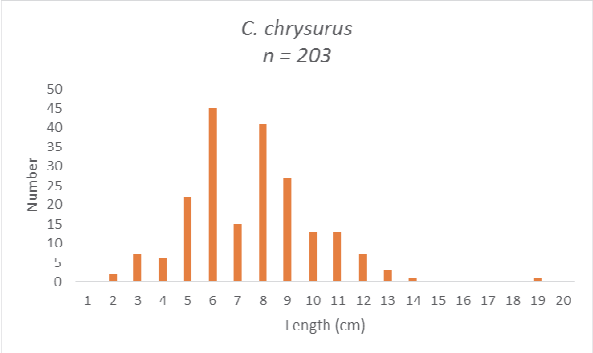


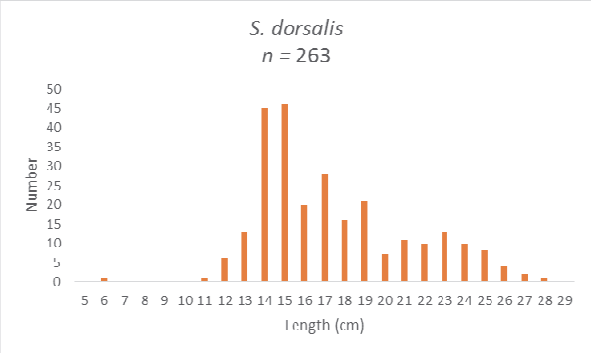
Sierra Leone

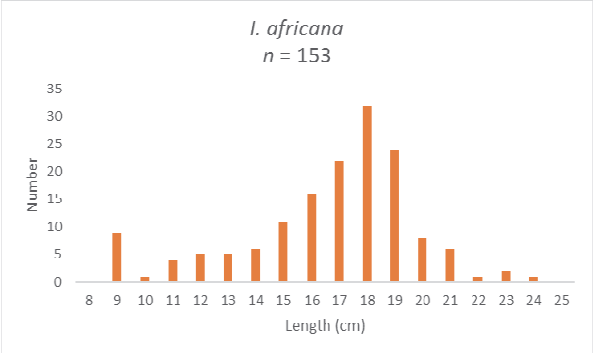
Pelagic II fish



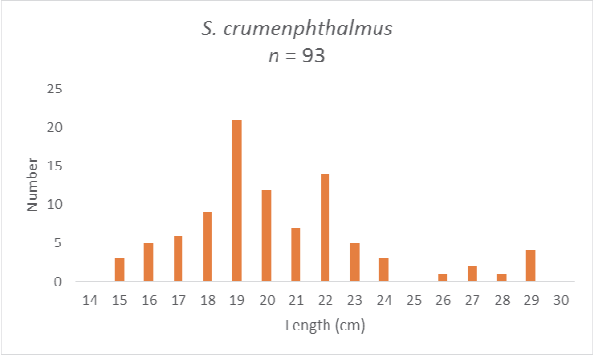


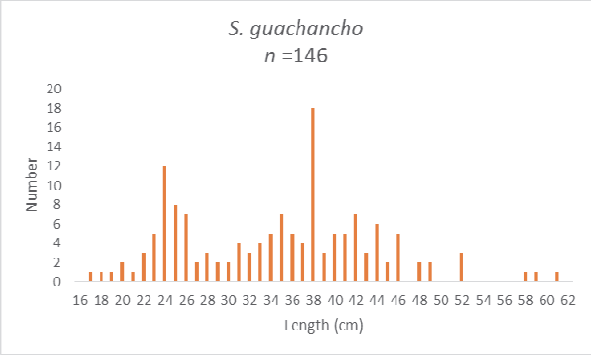


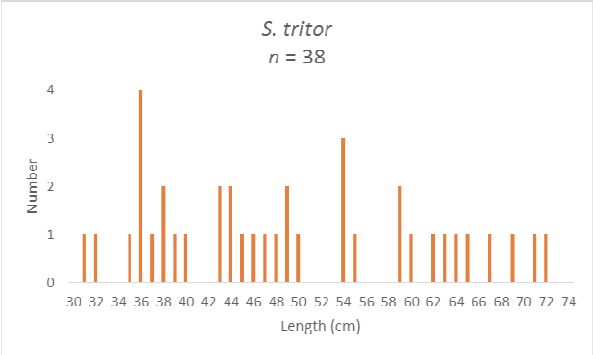


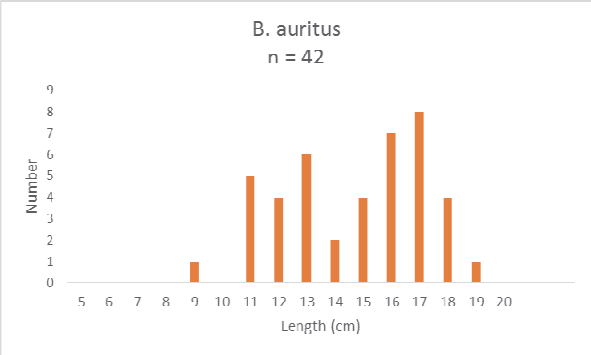


Other pelagic fish

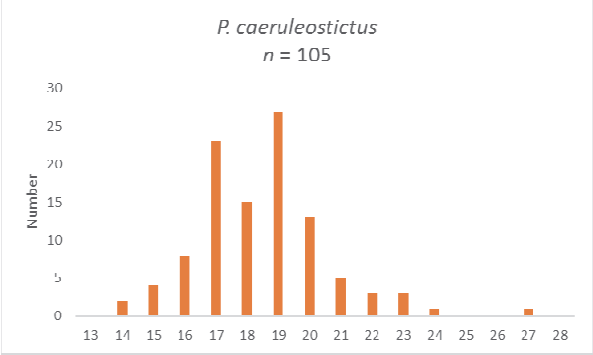


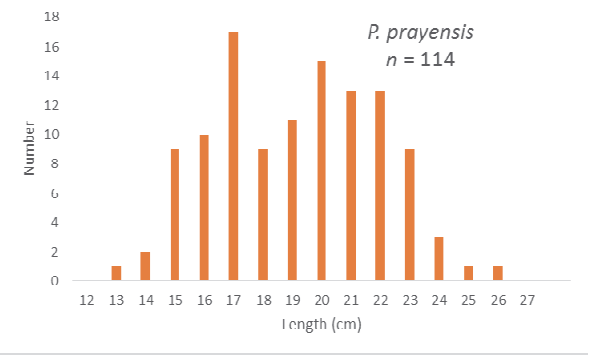


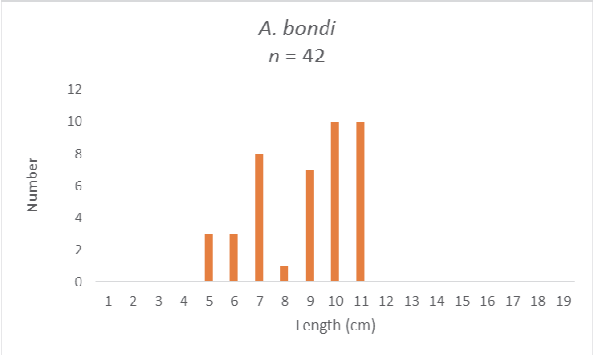




Demersal fish

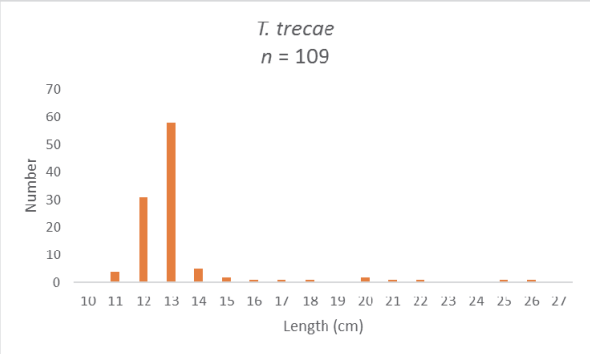




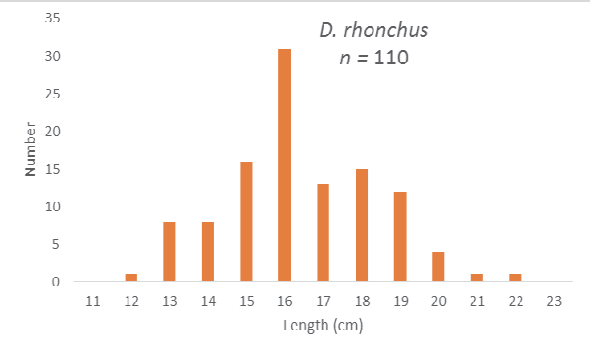


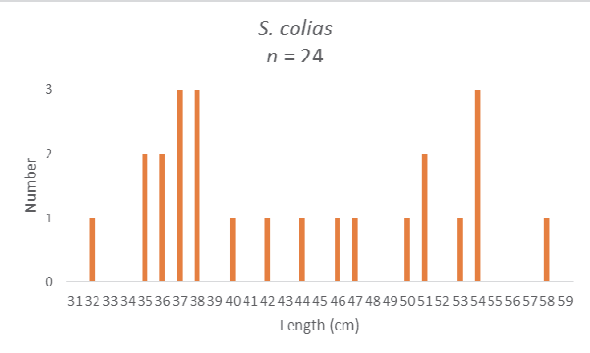
Liberia

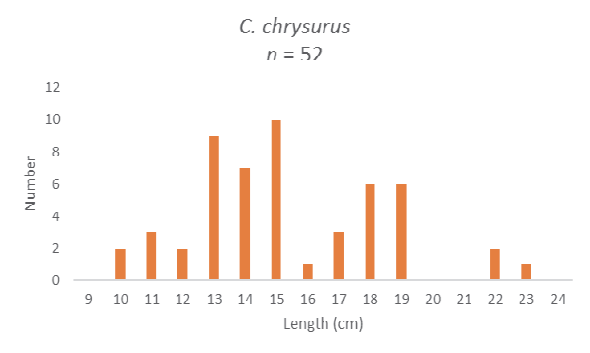
Horse mackerel

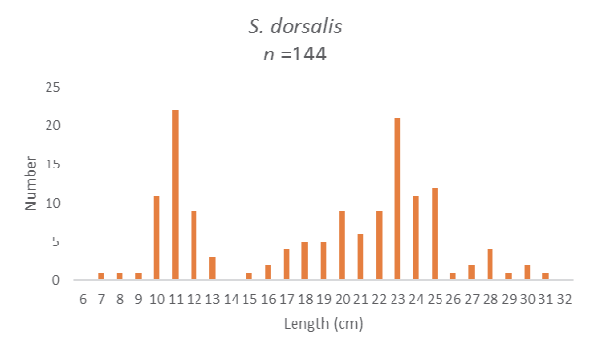


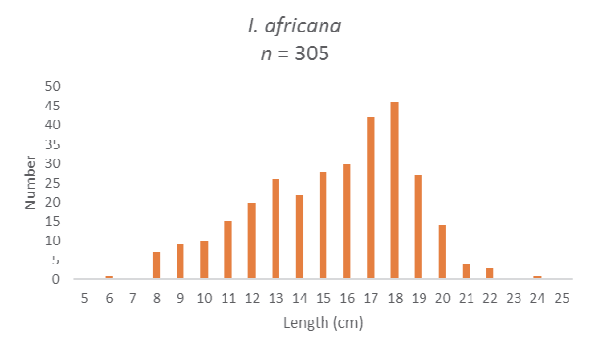
Pelagic II fish

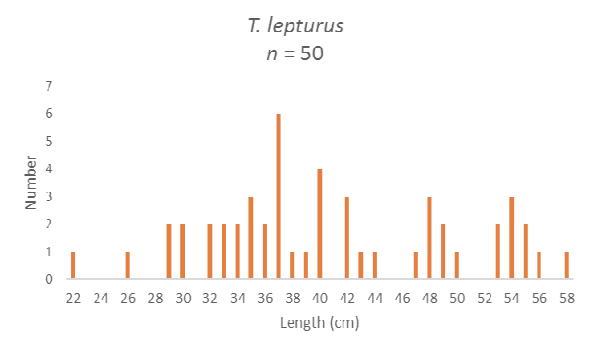




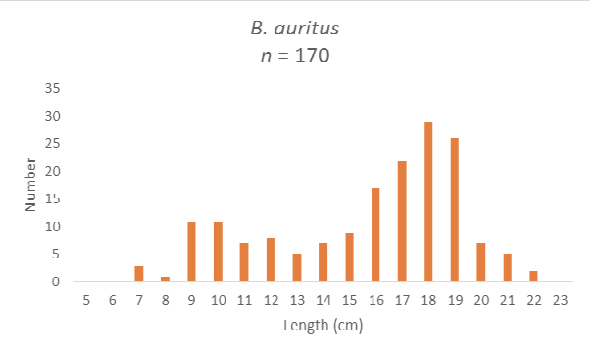


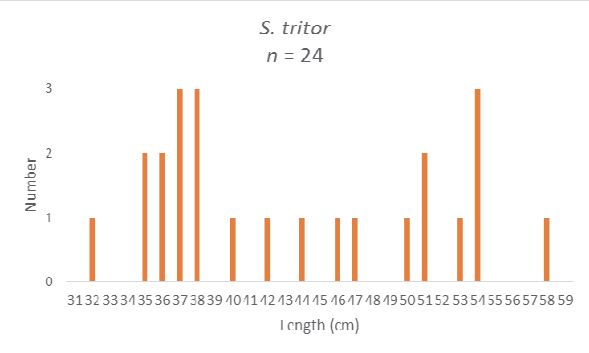


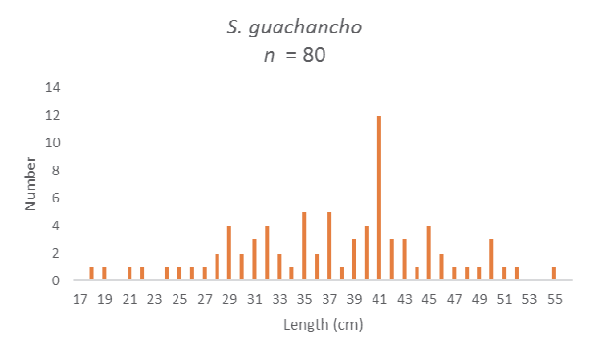




Other pelagic fish







ANNEX X. CRITICAL VALUES AND PARAMETERS USED IN THE ESTIMATION OF NUMBERS AND ABUNDANCE

a) Sardinellas

	Guinea Bissau	Guinea Conakry				
Stratum	1	2	4	5	6	7
Mean s_A	87	225	1113	335	191	102
Area (nm^2)	1 294	2050	869	891	270	620
L-W factor a	0.0166	0.0078	0.0078	0.0078	0.0078	0.0078
L-W factor b	2.83	3.03	3.03	3.03	3.03	3.03
r^2	0.87	0.95	0.95	0.95	0.95	0.95
Number	266 744	1 133 785	2 548 952	1 090 663	176 592	113 879
Tonnes	32 401	116 006	230,075	61 057	10 889	18 260

	Sierra Leone				Liberia	
Stratum	1	2	3	4	1	3
Mean s_A	537	583	68	83	12	35
Area (nm^2)	668	202	351	518	918	1 801
L-W factor a	0.0185	0.0185	0.0185	0.0185	0.0333	0.0130
L-W factor b	2.75	2.75	2.75	2.75	2.55	2.94
r^2	0.95	0.95	0.95	0.95	0.97	0.79
Number	1 181 193	476 580	166 667	269 792	42 095	403 357
Tonnes	78 891	23 970	4 340	8 084	2 243	14 191

b) Horse mackerel

	Liberia	
Stratum	1	2
Mean s_A	16	1
Area (nm^2)	653	420
L-W factor a	0.1399	0.1399
L-W factor b	2.109	2.109
r^2	0.80	0.80
Number	73 590	3 167
Tonnes	2 447	105

c) Pelagic II fish – *Decapterus* sp. and *Scomber colias* combined

	Guinea Bissau		Guinea Conakry	
Stratum	*Decapterus*	*Scomber*	2	3
Mean s_A	29	166	40	53
Area (nm^2)	263	286	1 192	2 980
L-W factor a	0,0269	0.0088	0.0094	0.0094
L-W factor b	2.6632	2.9742	3.0049	3.0049
r^2	0.88	0.64	0.97	0.97
Number	38 344	141.868	266 785	651 013
Tonnes	3 957	10.000	10 300	38 295

	Sierra Leone		Liberia
Stratum	*Decapterus* 1	*Decapterus* 2	*Scomber*
Mean s_A	23	3	7
Area (nm^2)	1 315	240	1 369
L-W factor a	0.1217	0.1217	0.057
L-W factor b	2.09	2.09	2.3468
r^2	0.81	0.81	0.77
Number	123 765	3 260	35 521
Tonnes	6 150	162	1 969

d) Other Pelagic II fish, including *Illisha africana*

	Guinea Bissau	Guinea Conakry	
Stratum	1	1	2
Mean s_A	63	5	105
Area (nm^2)	2 025	398	5 283
L-W factor a	0.005	0.005	0.005
L-W factor b	3.0	3.0	3.0
r^2	-	-	
Number	289 117	7 229	2 004 555
Tonnes	19 159	239	66 334

	Sierra Leone	Liberia
Stratum	1	1
Mean s_A	84	50
Area (nm^2)	3 150	1 340
L-W factor a	0.005	0.005
L-W factor b	3.0	3.0
r^2	-	
Number	987 704	261 333
Tonnes	31 998	8 353

ANNEX XI. ABUNDANCE ESTIMATE BY NUMBER AND BIOMASS BY LENGTH CLASS

Sardinellas - numbers (thousands)

Length cm	G. Bissau Stratum 1	G.Conakry Stratum 2	G.Conakry Stratum 4	G.Conakry Stratum 5	G.Conakry Stratum 6	G.Conakry Stratum 7	S. Leone Stratum 1	S. Leone Stratum 2	S. Leone Stratum 3	S. Leone Stratum 4	Liberia Stratum 1	Liberia Stratum 3	TOTAL
6												7563	7563
7												42981	42981
8												69466	69466
9									10606	11446		53762	75814
10									42913	46310		31034	120257
11									45813	49440	84	7642	102979
12				1363					27843	35668	1033	1133	67040
13		5999		66803	1919		8559		12545	41641	2603		140070
14				98160	9597		42797	14297	9303	43763	3713	13234	234863
15			4998	85836	19195		93468	85784	1792	15986	6179	29578	342816
16		5999	30188	66275	2811		32223	76253	896	967	4969	20797	241378
17	1334	11038	14994	83813	15976		83054	128677			6748	47583	393216
18	1334	31494	30088	193029	15298		72153	76253			5996	29340	454984
19		127596	182645	164136	65359		374134	71487			3784	18928	1008070
20	6669	166554	586816	156922	26679		260710	14297			1263	14418	1234328
21	41345	209904	597132	118357	4595	1139	114986	4766	896	967	1003	7909	1103000
22	73355	184033	555394	32158	2676	4555	39492		1792	4744	1511	6011	905720
23	86692	138398	311488	22404	2676	9110	15869		6272	6769	1845		601523
24	38678	146231	93740	1405	7135	10249	31817		1792	1934	1027	1977	335986
25	10670	28178	111668		1784	17082	7954		1792	1934	337		181397
26	5335	6427	23267			26192			896	3777			65895
27	1334	6402	6536		892	18221	3977	4766		2810			44937
28		2545				23915							26460
29						2278			1515	1635			5428
30						1139							1139
31		62988											62988
Sum	266744	1133785	2548952	1090663	176592	113879	1181193	476580	166667	269792	42095	403357	7870298

Sardinellas – biomass (tonnes)

Length cm	G. Bissau Stratum 1	G.Conakry Stratum 2	G.Conakry Stratum 4	G.Conakry Stratum 5	G.Conakry Stratum 6	G.Conakry Stratum 7	S. Leone Stratum 1	S. Leone Stratum 2	S. Leone Stratum 3	S. Leone Stratum 4	Liberia Stratum 1	Liberia Stratum 3	TOTAL
5													
6												24	24
7												210	210
8												490	490
9									96	103		527	725
10									510	550		408	1,468
11									699	754	1	131	1,585
12				22					534	684	22	25	1,287
13		124		1384	40		203		297	987	67		3,101
14				2524	247		1234	412	268	1262	114	450	6,512
15			157	2702	604		3238	2972	62	554	225	1223	11,737
16		228	1148	2521	107		1326	3137	37	40	212	1034	9,790
17	73	502	682	3810	726		4017	6223			335	2813	19,181
18	86	1694	1619	10384	823		4066	4297			343	2043	25,353
19		8051	11524	10356	4124		24365	4655			247	1539	64,861
20	573	12228	43082	11521	1959		19481	1068			94	1358	91,362
21	4068	17802	50643	10038	390	97	9794	406	76	82	84	857	94,337
22	8208	17912	54058	3130	260	443	3812		173	458	142	744	89,342
23	10971	15367	34587	2488	297	1012	1726		682	736	194		68,061
24	5508	18422	11809	177	899	1291	3881		219	236	120	315	42,876
25	1702	4007	15880		254	2429	1083		244	263	44		25,906
26	949	1027	3718			4185			136	572			10,586
27	263	1144	1168		159	3257	666	799		471			7,929
28		507				4763							5,270
29						504			308	332			1,144
30						279							279
31		16990											16,990
Sum	32401	116006	230075	61057	10889	18260	78891	23970	4340	8084	2243	14191	600405

Horse mackerel – numbers (thousands) and biomass (tonnes)

Length cm	Liberia Stratum 1	Liberia Stratum 2	TOTAL
10			
11	2944	127	3070
12	22813	982	23795
13	42682	1837	44519
14	3679	158	3838
15	736	32	768
16			
17			
18			
19			
20			
21			
22			
23			
24			
25	736	32	768
26			
27			
Sum	73590	3167	76757

Liberia Stratum 1	Liberia Stratum 2	TOTAL
71	3	74
657	28	685
1445	62	1,507
145	6	151
33	1	35
95	4	99
2447	105	2552

Pelagic II fish – *Decapterus* sp. and *Scomber colias* – numbers (thousands)

Length cm	G.Bissau Decapterus	G.Bissau Scomber	G.Conakry-Stratum 1 Decapterus & Scomber	G.Conakry-Stratum 2 Decapterus & Scomber	S.Leone-Stratum 1 Decapterus	S.Leone-Stratum 2 Decapterus	Liberia Decapterus & Scomber	TOTAL
4				3191				3191
5			44464	3191	4584	121		52360
6	387		24702	19147	4584	121		48942
7	1937		4148	19147	2292	60		27584
8	5422		1678	25530	2292	60		34982
9	6584		7504	3191	1146	30		18456
10	2711		5034	7932				15676
11	2711		18364	72779				93854
12	1937		16779	90346	3438	91	71	112661
13	775		10067	58837	1146	30	639	71494
14			9089	7901	1146	30	568	18734
15			7504	3160	7907	208	2629	21408
16	387		6712	1580	8595	226	9235	26736
17	387		9115	11393	13637	359	3994	38885
18		1419	19681	19530	17877	471	3173	62152
19		29792	36052	56964	36786	969	3931	164493
20		79446	37730	68293	10658	281	3726	200132
21		28374	4807	22179	5386	142	5375	66263
22		2837		41167	2292	60	1452	47809
23				55879			513	56392
24				54251				54251
25	387			5425			71	5883
26			1678				71	1749
27	1549		1678					3227
28	2324							2324
29	3486						71	3557
30	1937							1937
31	1937							1937
32	775							775
33	2324							2324
34								
35	387							387
Sum	38344	141868	266785	651013	123765	3260	35521	1260555

Pelagic II fish – *Decapterus* sp. and *Scomber colias* – biomass (tonnes

Length cm	G.Bissau Decapterus	G.Bissau Scomber	G.Conakry-Stratum 1 Decapterus & Scomber	G.Conakry-Stratum 2 Decapterus & Scomber	S.Leone-Stratum 1 Decapterus	S.Leone-Stratum 2 Decapterus	Liberia Decapterus & Scomber	TOTAL
4				3				3
5			70	5	20	1		95
6	2		64	50	28	1		145
7	11		17	77	19	0		124
8	44		10	149	25	1		228
9	71		61	26	16	0		174
10	38		55	87				181
11	49		266	1053				1,367
12	43		312	1679	83	2	2	2,121
13	21		236	1378	32	1	16	1,685
14			264	229	38	1	17	549
15			266	112	299	8	93	779
16	18		287	68	371	10	379	1,133
17	21		466	582	666	18	188	1,941
18		73	1188	1179	981	26	170	3,618
19		1801	2550	4029	2253	59	239	10,930
20		5572	3101	5613	725	19	254	15,284
21		2293	456	2103	405	11	410	5,678
22		262		4476	189	5	123	5,056
23				6923			48	6,971
24				7618				7,618
25	58			859			8	925
26			298				9	307
27	284		333					617
28	468							468
29	770						11	781
30	467							467
31	509							509
32	221							221
33	720							720
34								
35	140							140
Sum	3957	10000	10300	38298	6150	162	1969	70838

Other Pelagic II fish, including *Illisha africana* – numbers (thousands) and biomass (tonnes)

	N (thousands)						Biomass (tonnes)					
Length cm	G.Bissau Stratum 1	G.Conakry Stratum 1	G.Conakry Stratum 2	Sierra Leone Stratum 1	Liberia Stratum 1	TOTAL	G.Bissau Stratum 1	G.Conakry Stratum 1	G.Conakry Stratum 2	Sierra Leone Stratum 1	Liberia Stratum 1	TOTAL
6				2,822	327	3,149				4	0	4
7												
8					2,287	2,287					7	7
9				11,980	3,593	15,574				51	15	67
10				1,331	11,356	12,687				8	66	73
11				6,736	21,537	28,272				51	164	215
12				18,024	14,677	32,700				176	143	319
13				39,253	17,068	56,321				483	210	693
14		22	6,168	106,180	11,429	123,799		0	94	1,619	174	1,887
15		180	49,846	100,600	17,111	167,737		3	928	1,873	319	3,123
16		360	99,945	90,887	17,115	208,307		8	2,245	2,041	384	4,679
17	1,156	1,724	478,198	141,096	24,158	646,333	31	46	12,814	3,781	647	17,320
18	8,260	2,253	624,653	94,262	34,115	763,543	262	71	19,775	2,984	1,080	24,172
19	28,251	1,717	476,184	135,350	22,786	664,288	1,047	64	17,654	5,018	845	24,628
20	36,346	531	147,242	71,177	12,639	267,935	1,566	23	6,343	3,066	544	11,541
21	45,267	302	83,770	43,800	6,433	179,572	2,249	15	4,163	2,177	320	8,923
22	4,626	83	23,129	38,438	8,844	75,121	263	5	1,317	2,189	504	4,278
23	32,902	56	15,420	35,758	14,172	98,308	2,135	4	1,001	2,320	920	6,379
24	29,705			24,411	7,463	61,580	2,184			1,795	549	4,528
25	54,182			14,614	7,840	76,636	4,492			1,212	650	6,354
26	24,110			5,644	1,256	31,010	2,243			525	117	2,885
27	15,436			2,520	653	18,609	1,605			262	68	1,935
28	4,626			1,411	653	6,690	535			163	76	774
29	4,249				653	4,902	545				84	629
30				1,411	1,910	3,321				200	271	471
31					1,256	1,256					196	196
Sum	289,117	7,229	2,004,555	987,704	261,333	3,549,937	19,159	239	66,334	31,998	8,353	126,083

ANNEX XII. OVERVIEW OF SAMPLES AND DATA TO BE ANALYSED FROM LEG 2

Sample category	Institution	Contact person	Proposed follow-up activity for analysis	Current status of sample
Nutrients	IMR		• Marine carbonates	• CDCF checking if samples received and status
Nutrients	IMR		• Nitrite, silicate and phosphate	"
Chlorophyll a	IMR			"
Phytoplankton	FSSD	Hawa Bint Yaqub	• Analyze samples • Consider organization of a workshop	• Samples for both surveys at FSSD. Not yet processed • A workshop is under consideration
Zooplankton	IMR	Bjørn Kraft, Espen Bagøien	• Estimation of zooplankton biomass	
	FSSD	Hawa Bint Yaqub	• Species identification and quantification • Consider organization of a workshop	• Samples for both surveys at FSSD. Not yet processed • A workshop was discussed and is under consideration
Jellyfish	UWC	Mark Gibbons	• Species identification • Genetic analysis • Students to be involved (e.g. from UWC)	• 22 samples are at UWC but not yet analysed • A workshop to involve other institutions in the analysis has been requested
Fish eggs/ larvae	IMR	Espen Bagøien, Bjørn Kraft,	• Larvae identification	• CDCF checking if samples received and status
Microplastics	IMR	Bjørn Einar Grøsvik	• Further studies • Possible workshop in Norway?	• CDCF checking if samples received and status • A workshop to involve other institutions in the analysis has been requested
Neuston (from manta trawl)		Mark Gibbons	• UWC checking whether microplastic still present in the samples	• 96 samples are at UWC but not yet analysed • A workshop to involve other institutions in the analysis has been requested
Food safety	IMR	Annette Kausland	• Analysis for nutrients and contaminants	• Processing and analysis to be agreed

Sample category	Institution	Contact person	Proposed follow-up activity for analysis	Current status of sample
			• Occurrence of parasite Kudoa	with partners
Mesopelagic fish	UWC IMR	Mark Gibbons & Carl vd Lingen Rupert W	• Stable isotope analysis • Parasites • Species ID	• Samples not received by UWC • CDCF checking if samples received and status
Cetacean data	Senegal IMR has copies of sightings forms	Njiba	• Relative abundance • Confirm ID	• Senegal has confirmed ID, but no plans for abundance analysis • IMR to confirm if any more analysis to be conducted
Fish stomach samples	FSSD gave samples to Morocco at Oct workshop	Malika Chlaida Fatima Wahbi Manchih Khalid	• Stomach contents. • Also samples collected locally post-survey during Oct 2017 workshop	• Samples given to Moroccans. • Need to find out status
Fish liver (mainly from 2.1)	FSSD gave samples to Morocco at Oct workshop	Malika Chlaida Fatima Wahbi Manchih Khalid	• Workshop with IMR (NIFES)?	• Samples given to Moroccans. • CDCF checking status • A workshop to involve other institutions in the analysis has been requested
Fin clips for genetic analysis	IMR	Geir Dahle	• SNP analysis? • Workshop/training in Bergen	• Not yet analysed.
Frozen fish samples for morphometrics Countries in region also brought own samples for analysis	FSSD gave samples to Morocco at Oct workshop	Malika Chlaida Fatima Wahbi Manchih khalid	• Workshop in Oct 2017 held for morphometric analysis	• Analysed at October workshop. • Results still to be analysed
Otoliths. Additional otoliths collected from frozen fish at October workshop	FSSD gave samples to Morocco at Oct workshop	Malika Chlaida Fatima Wahbi Manchih khalid	• Age	• Still to be analysed