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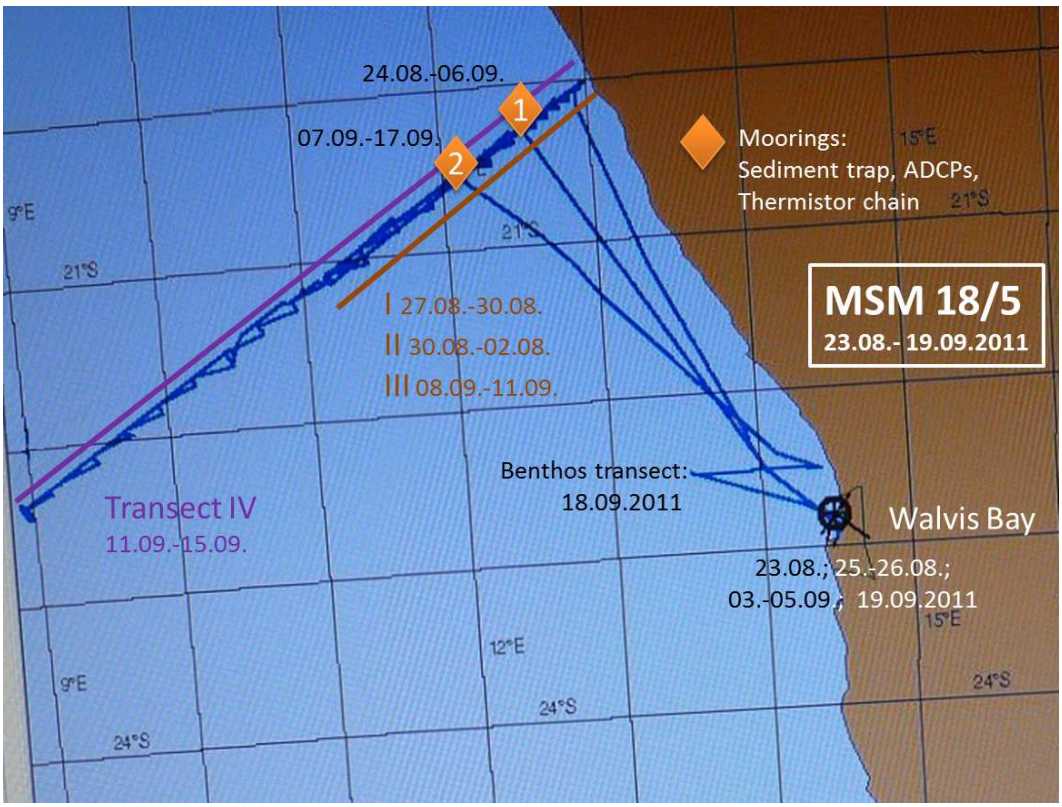
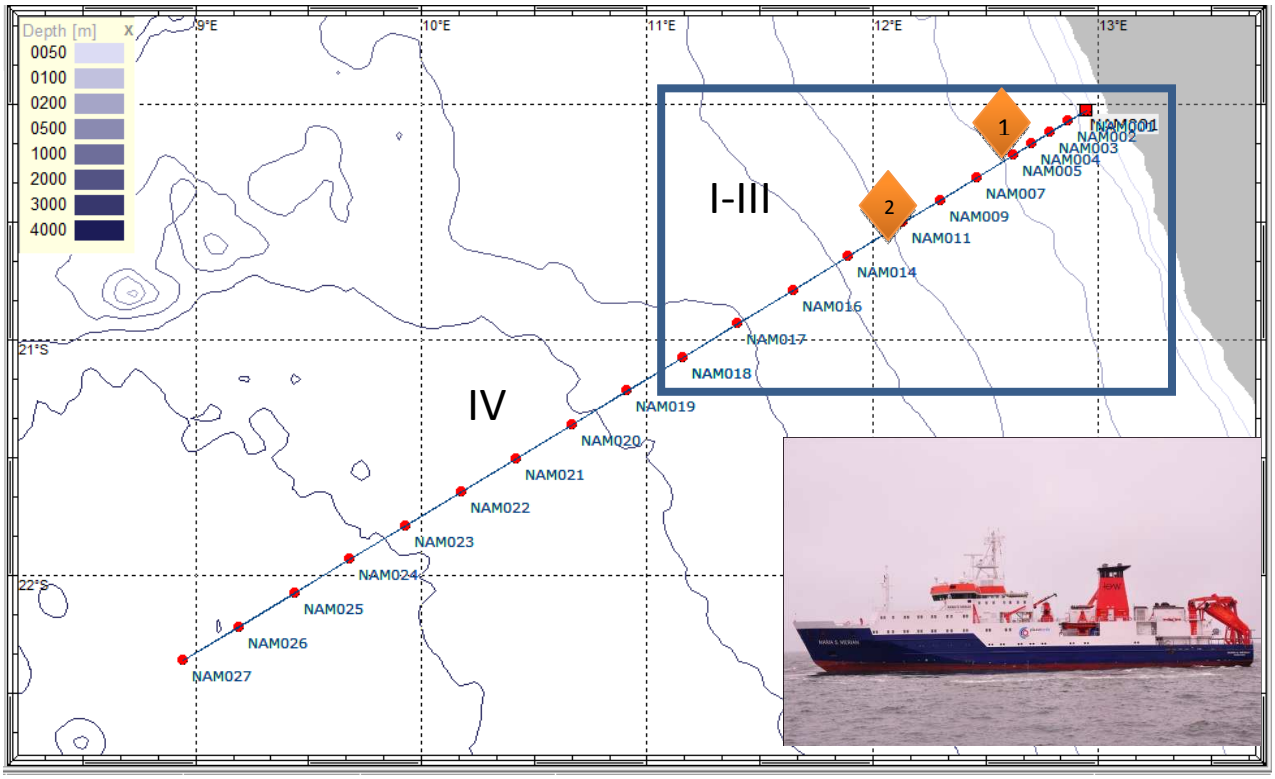
Short Cruise Report
RV MARIA S.MERIAN Cruise MSM18/5

Walvis Bay – Walvis Bay
23.08. – 19.09.2011
Chief Scientist: Lutz Postel
Captain: Friedhelm v. Staa



MSM 18/5 ship track



MSM 18/5 station map (transect I-III [box], transect IV, moorings and, sediment traps (1,2)

Objectives

The analysis of the interplay between the transfers of matter and structure of marine communities downstream an upwelling center in Northern Benguela region was the overall aim of the exercise.
The hydrographic investigations carried out along the repeated transects will contribute to answering the following questions:

- To what fraction do the coastal upwelling and curl driven upwelling contribute to the vertical transports on the shelf and how change this transports temporally and spatially during the evolution of an upwelling event?
- How do nutrient concentrations, their stoichiometric ratios as well as oxygen conditions change on horizontal and vertical direction down steam the upwelling center?

Marine biological objectives are focused on changes with increasing distance to the shore regarding

- Communities from microbes to macro-plankton and of benthic organisms
- Matter transfer, especially by new and regenerated production,
- N2 fixation,
- Autothrophic and heterotrophic processes,
- Vertical flux of organic carbon,
- Pelago-benthic coupling,
- Bottom up versus top down regulation in food web linkages,
- Importance of suboxic conditions, for community structure, and
- Potential co-limitation of phytoplankton growth by phosphate and iron in the oceanic waters.

Testing, verifying, and quantification of the conceptual model of Margalef (1978) (see following figure) is one of the ambitious aims.

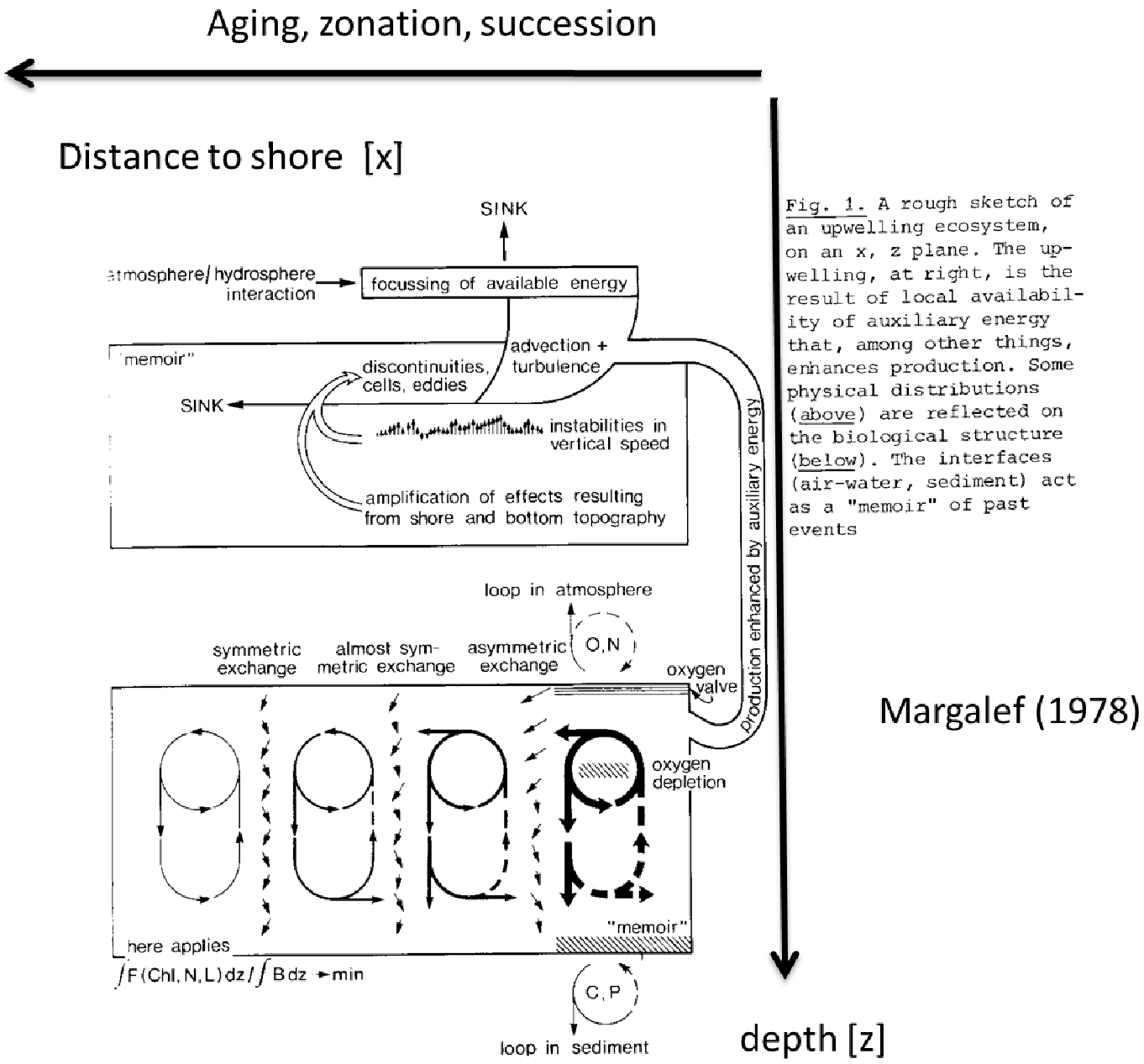


Fig. 1. A rough sketch of an upwelling ecosystem, on an x, z plane. The upwelling, at right, is the result of local availability of auxiliary energy that, among other things, enhances production. Some physical distributions (above) are reflected on the biological structure (below). The interfaces (air-water, sediment) act as a "memoir" of past events

Margalef (1978)

Margalef R (1978) What is an upwelling ecosystem?. In: Boje R, Tomczak M (eds) Upwelling Ecosystems. Springer Verlag, Berlin, Heidelberg, New York, p 12-14

Narrative

The working program of Leg MSM 18/5 was situated in the Northern Benguela upwelling region. The ship left Walvis Bay harbor at favorable weather conditions in the afternoon of August, 23rd. The situation in the working area at off Terrace Bay met the climatological characteristics e.g. in respect to coastal (Ekman) upwelling strength. The program started with benthos work at 25m isobath, setting up a mesocosm experiment on deck and deployment of the sediment trap at 20° 16,16' S; 12° 32,83' E (see schedule) close to a current meter mooring which was already deployed at the end of the pervious leg MSM18/4. After taking over a delayed container with important scientific equipment of WHOI in Walvis Bay at 25./26.08.2011, we started with vertical profiles on transects perpendicular to the coast located between 20°1.90´S, 12°57,22E and 21°4.86S, 11°9,81E four times (see ship track and schedule) deploying the CTD probe and multi plankton sampler (MPS midi). Benthologists used van Veen grab, box corer and occasionally a dredge. Station distances ranged from 5.6 n.m. to 11.2 n.m. in near shore areas and to 16.8 km seaward the shelf break (see MSM 18/5 station map). Transect IV was extended up to 22°22.12'S, 8°57,09'E in order to discover the seaward extention of upwelling phenomena. After the first two transects, we went to Walvis Bay harbor for bunkering (c.f. map of ship track). Returned in the working area, we replaced the current meter mooring and the sediment trap from the first position to 20°31,19'S, 12°8,47' E and collected samples for vertical flux measurements and benthos. Transect III started at Sept.,8th considering a 12h time shift in respect to the two first transects in order to diminish effects daily variability like vertical migration of organisms on average vertical (x-z-) patterns. Transect work always started at the innermost position. When returning, a Video-plankton-Recorder/CTD unit was towed undulating in the upper 150m in order to get highly resolved information on plankton and CTD-fluorescence patterns. At Sept., 18th we searched for a specific mussel (genus *Nuculana*) which is able to live in low oxygen conditions utilizing metabolits provided by symbiontic bacteria. For this purpose we took samples along an oxygen gradient at 22° 30'S (see MSM18/5 track). At Sept.,19th , we performed a final meeting shared first results like a poster imaging zooplankton distribution of transect II jointly compiled by participants of Namibia and Spain. We arrived Walvis Bay in the evening of Sept.,19th.

	MSM18/4	23.08.2011	24.08.2011	25.08.2011	26.08.2011	27.08.2011	28.08.2011	29.08.2011	30.08.2011	31.08.2011	01.09.2011	02.09.2011	03.09.2011	04.09.2011	05.09.2011	06.09.2011	07.09.2011	08.09.2011	09.09.2011	10.09.2011	11.09.2011	12.09.2011	13.09.2011	14.09.2011	15.09.2011	16.09.2011	17.09.2011	18.09.2011	19.09.2011
Walvis Bay				X									X	X	X														
Transect I																													
Transect II																													
Transect III																													
Transect IV																													
VPR II																													
Benthos sampling																													
Mooring 200m																													
Sedimenttrap 200m																													
Mooring 400m																													
Sedimenttrap 400m																													
Mesocosm experiments																													
Seminar																													

MSM 18/5 Schedule

Acknowledgements

We greatly acknowledge the constructive co-operation between all cruise members including master and the entire regular crew, the support provided by Meteor/ Maria S. Merian Leitstelle (University Hamburg), and by Briese Shipping Company. Cruise was funded by DFG and participating institutes.

Participants

1.	Lutz Postel	Cruise leader, zooplankton	IOW
2.	Günther Nausch	Dep.cruise leader, Mar. Chemistry/ Nutrients	IOW
3.	Birgit Sadkowiak	Mar. Chemistry/ Nutrients	IOW
4.	Ingo Schuffenhauer	Phys. Oceanography, CTD, data storage	IOW
5.	Günter Plüschke	Phys. Oceanography, CTD, salinometer	IOW
6.	Tim Junker	Phys. Oceanography, CTD, data storage	IOW
7.	Falk Pollehne	Sediment traps, CTD, Benthos	IOW
8.	Uwe Hehl	Sediment traps, MPS, Benthos	IOW
9.	Katja Becker	Microbiology	IOW
10.	Benjamin Bergen	Microbiology	IOW
11.	Monika Nausch	Phosphate cycle	IOW
12.	Christa Pohl	Trace Metals/ Iron	IOW
13.	Norbert Wasmund	Phytoplankton	IOW
14.	Asser Katunahange	Zooplankton, MPS	NatMIRC
15.	Gara Franchy Gil	Dilution experiments/ ZP sample treatment	ULPGC
16.	Annemarie Jetter	Zooplankton/ MPS	IOW
17.	Zettler, Michael	Benthos, MPS	IOW
18.	Igor Fernández Urruzola	ETS, GDH, ZP sample treatment	ULPGC
19.	Alicia Herrera Ulibarri	Carbon flux, ETS, ZP sample treatment	ULPGC
20.	Yeray Santana Falcón	Phytoplankton, new and regenerated production	ULPGC
21.	Cabell Davis	Planktology (Video Plankton Recorder)	WHOI
22.	John Bailey	Planktology (Video Plankton Recorder)	WHOI

Institutes:

IOW-Institute for Baltic Sea Research, Rostock-Warnemünde, Germany
ULPGC-University of Las Plamas,Gran Canaria, Spain
WHOI- Woods Hole Oceanographic Institution, Woods Hole, MA, USA
NatMIRC- National Marine Information and Research Centre, Swakopmund, Namibia

Stations list:

Transects:

(Hatched area → transect I-III)

Station	Lat	Latmin		Lon	Lonmin	
NAM001	20°	1,9022	S	12°	57,222	E
NAM002	20°	4,7637	S	12°	52,348	E
NAM003	20°	7,6253	S	12°	47,473	E
NAM004	20°	10,487	S	12°	42,599	E
NAM005	20°	13,348	S	12°	37,725	E
NAM007	20°	19,072	S	12°	27,976	E
NAM009	20°	24,795	S	12°	18,227	E
NAM011	20°	30,518	S	12°	8,4787	E
NAM014	20°	39,102	S	11°	53,856	E
NAM016	20°	47,687	S	11°	39,174	E
NAM017	20°	56,272	S	11°	24,492	E
NAM018	21°	4,8566	S	11°	9,8102	E
NAM019	21°	13,442	S	10°	55,086	E
NAM020	21°	22,026	S	10°	40,362	E
NAM021	21°	30,611	S	10°	25,639	E
NAM022	21°	39,196	S	10°	10,915	E
NAM023	21°	47,78	S	9°	56,191	E
NAM024	21°	56,365	S	9°	41,467	E
NAM025	22°	4,9498	S	9°	26,743	E
NAM026	22°	13,535	S	9°	11,917	E
NAM027	22°	22,119	S	8°	57,091	E

Benthosstations:

Station	Lat (S)	Long (E)
NAM-BE01	20° 01,290	12° 58,130
NAM-BE02	20° 00,760	12° 59,040
NAM-BE03	20° 00,060	13° 00,230
NAM-BE04	19° 59,870	13° 00,570
NAM-BE05	20° 30,000	13° 14,780
NAM-BE06	20° 30,000	13° 13,090
NAM-BE07	20° 30,000	13° 09,480
NAM-BE08	21° 00,000	13° 27,300
NAM-BE09	21° 00,000	13° 25,400
NAM-BE10	21° 00,000	13° 22,000
NAM-BE11	21° 30,000	13° 46,290
NAM-BE12	21° 30,000	13° 43,640
NAM-BE13	21° 30,000	13° 39,180
NAM-BE14	22° 00,000	14° 04,110
NAM-BE15	22° 00,000	14° 00,290
NAM-BE16	22° 00,000	13° 52,340
NAM-BE17	22° 30,000	14° 22,860
NAM-BE18	22° 30,000	14° 18,830
NAM-BE19	22° 30,000	14° 12,040