



Securing our Future
... 1949 - 2009 ...
Garantir l'avenir de notre sécurité

The NATO Science for Peace
and Security Programme

NATO Science for Peace

Project Number 982381

**Societal security and environmental impacts
concerning mariculture in the Red Sea**

Background

- The Gulf is a regional major tourist attraction.
- Aqaba is the only sea port for the Hashemite Kingdom of Jordan.
- New projects for regional development and security is in progress
 - e.g. Red to Dead Sea Canal



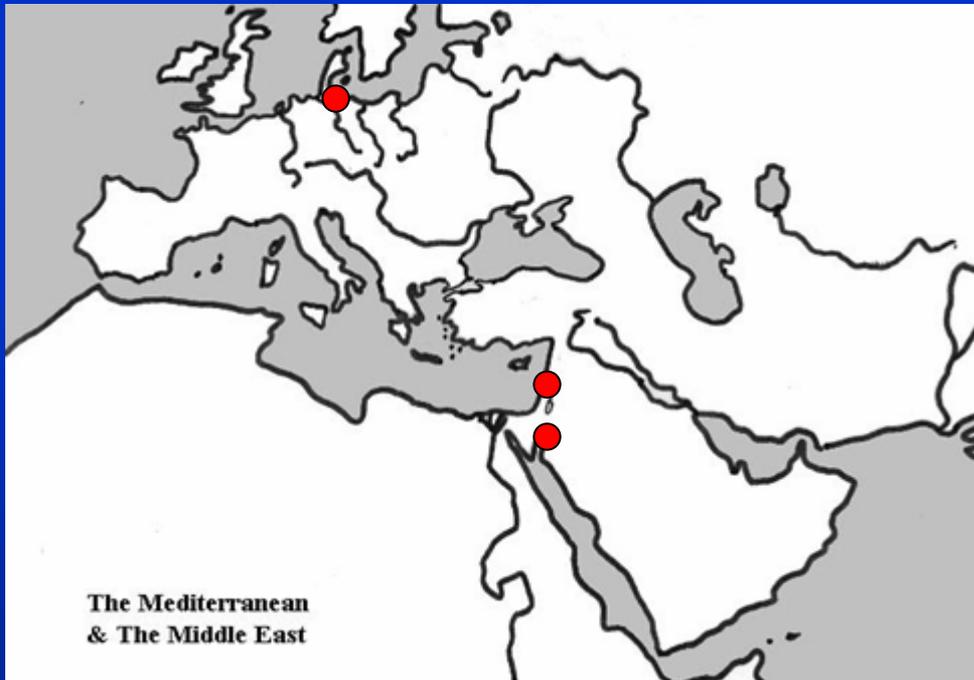
Risks vs. Opportunities

- Damage to sensitive ecosystem from introduced agents.
- Damage to sensitive ecosystem due to other anthropogenic stressors
- Increased international tensions due to trans-border environmental disputes
- Joint response to threats to Gulf
- Cooperate to sustainably manage Gulf's resources - strengthen economy of Jordan and Israel
- Cooperation in basic marine science - research and education – e.g. studying processes in the area that might be important to climate change

Fundamental challenge is that: The Gulf can only be managed/protected by group efforts of all surrounding countries

NATO *Science for Peace*

Societal security and environmental impacts concerning mariculture in the Red Sea



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Project Executive Summary

- Purpose of this document
 - To summarize the objectives & main findings of our work
 - To present these findings to local authorities in order to get their reaction or response
- Should be sent to:
 - Eilat municipality, Eilat regional council, Ministry of Interior, Ministry of Agriculture and Ministry of Environmental Protection, NGOs...
 - Aqaba municipality, Ministry of Commerce, Min of Env, ...???
- Initial plans regarding aquaculture in *Gulf of Aqaba*

Project Executive Summary

- Change in plans: Envir response & socio-econ
- Protocols for envir aspects: work in Eilat, work in Aqaba
- Protocols for socio-econ work
- Envir effects Results:
 - The analysis of the Eilat data indicated that: a, b, c, d
 - The analysis of Aqaba samples indicated: a, b, c
- Socio-econ data
 - Data from Aqaba...
 - Data from Eilat...

July 2007



July 2008



September 2008



Ardag Fish Farm

Organic matter profiles

80E

40E

0

20W

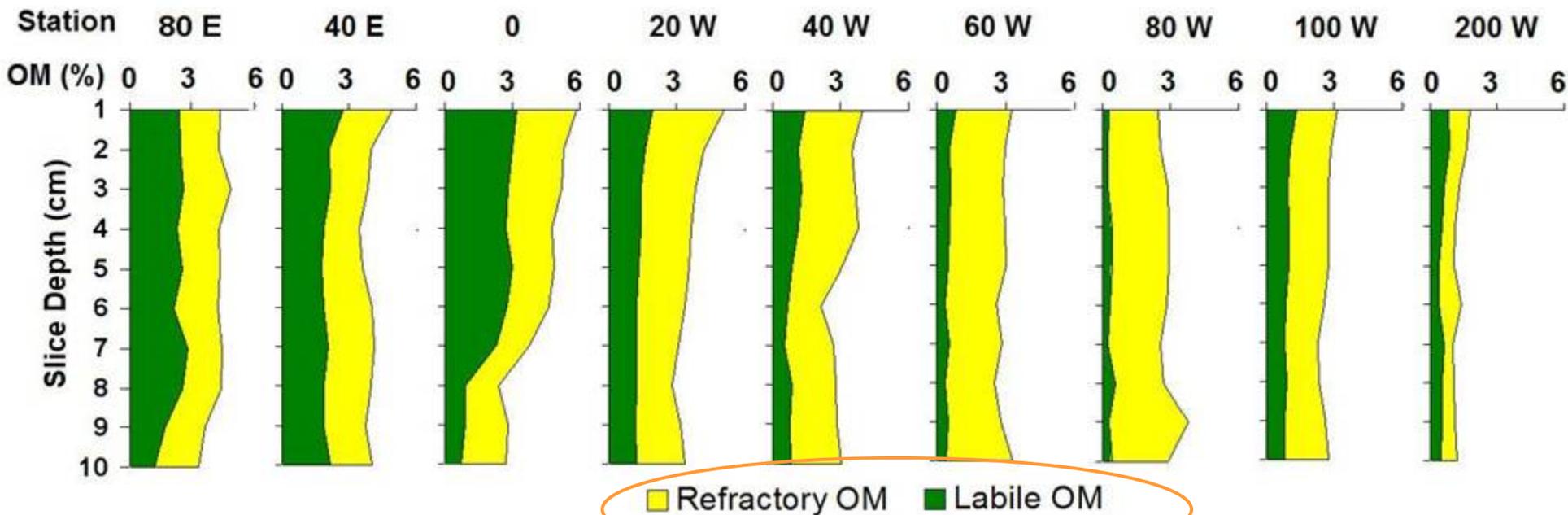
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60W

80W

100W

200W



July 2007

Data analyses

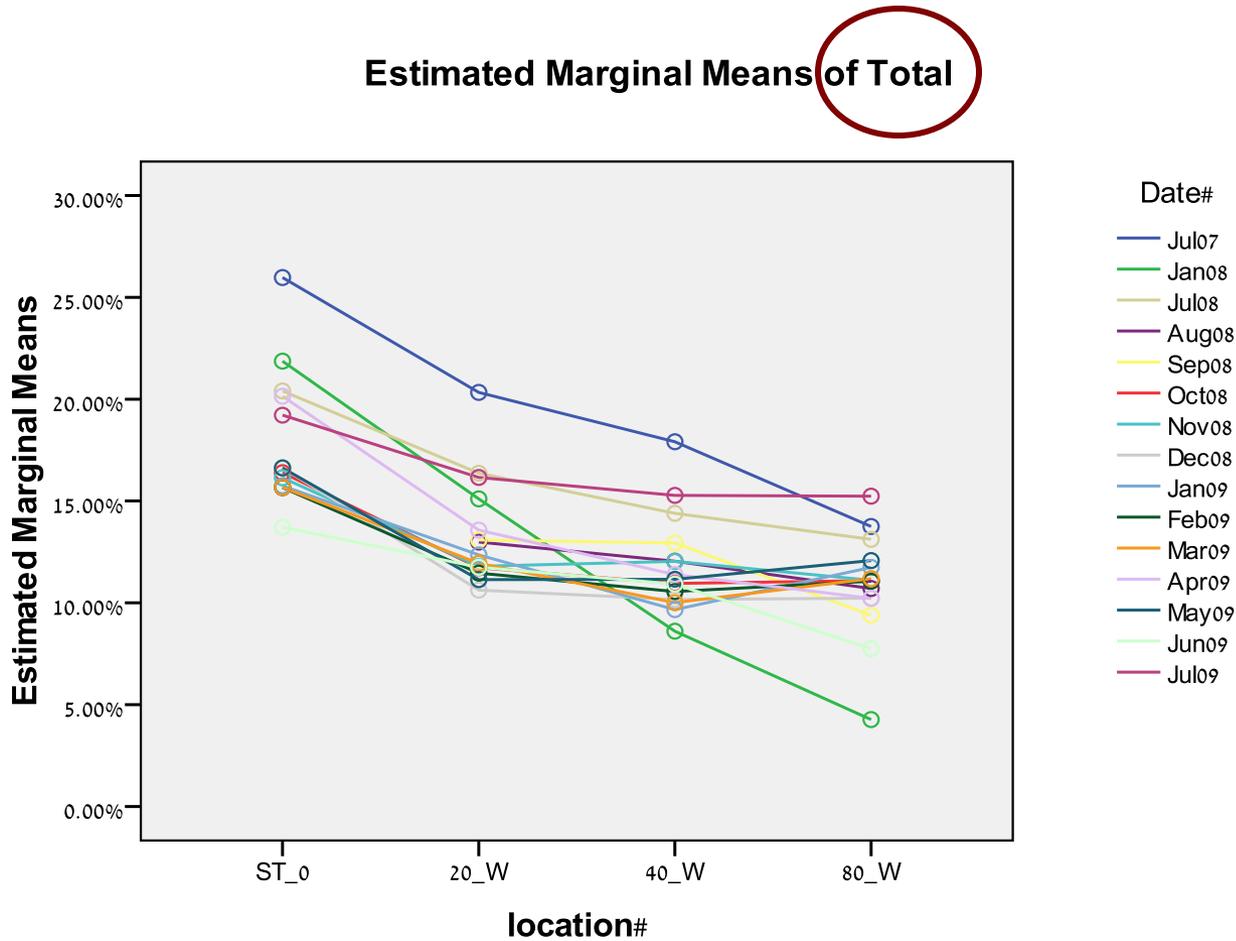
2. Total – 4 stations * 15 times

Tests of Between-Subjects Effects

Dependent Variable: Total

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2252.994 ^a	57	39.526	11.565	.000
Intercept	30878.437	1	30878.437	9034.650	.000
location#	1146.831	3	382.277	111.850	.000
Date#	727.617	14	51.973	15.207	.000
location# * Date#	390.326	40	9.758	2.855	.000
Error	389.627	114	3.418		
Total	32936.290	172			
Corrected Total	2642.621	171			

Sums Loss on Ignition (total) 0-5 cm



Total LOI = labile + refractory

Data analyses

3. Total – 6 stations * 4 times

Tests of Between-Subjects Effects

Dependent Variable: Total

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2768.711 ^a	23	120.379	20.127	.000
Intercept	13646.602	1	13646.602	2281.650	.000
location#	2114.562	5	422.912	70.709	.000
Date#	229.203	3	76.401	12.774	.000
location# * Date#	348.566	15	23.238	3.885	.000
Error	263.165	44	5.981		
Total	16616.981	68			
Corrected Total	3031.876	67			

a. R Squared = .913 (Adjusted R Squared = .868)

Ardag Fish Farm

Pore water nutrients

80E

40E

0

20W

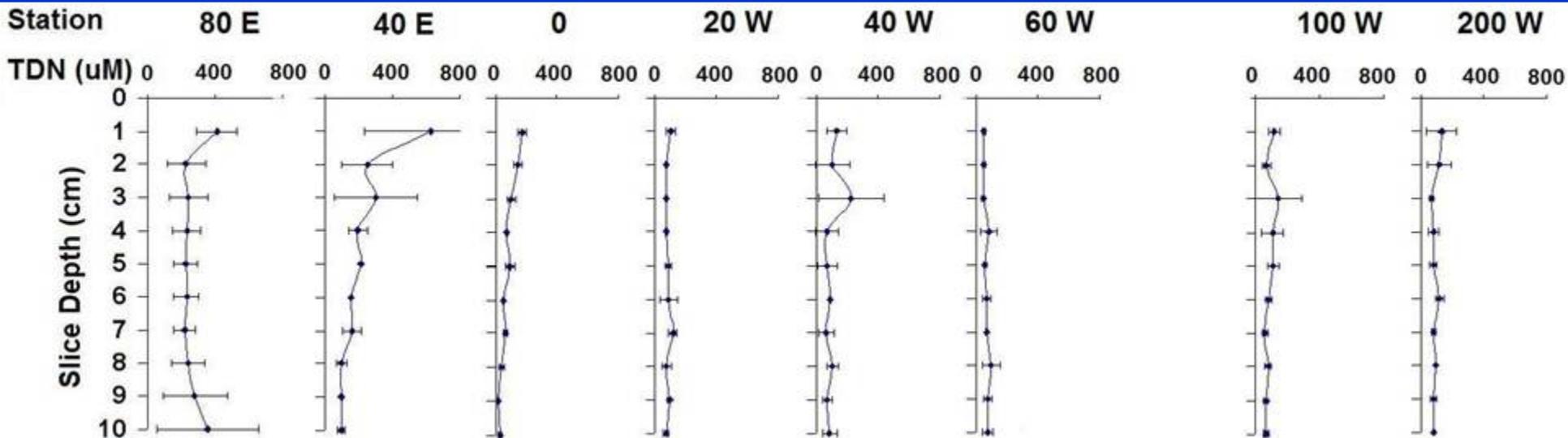
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200W



Total Dissolved Nitrogen, July 2007

Ardag Fish Farm

Pore water nutrients

80E

40E

0

20W

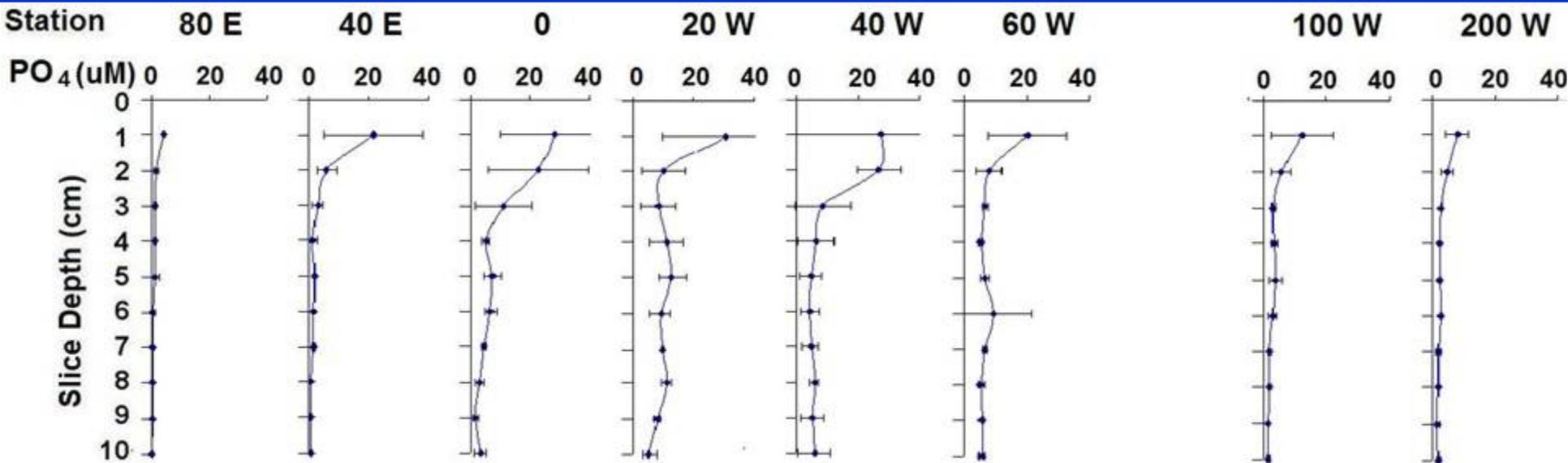
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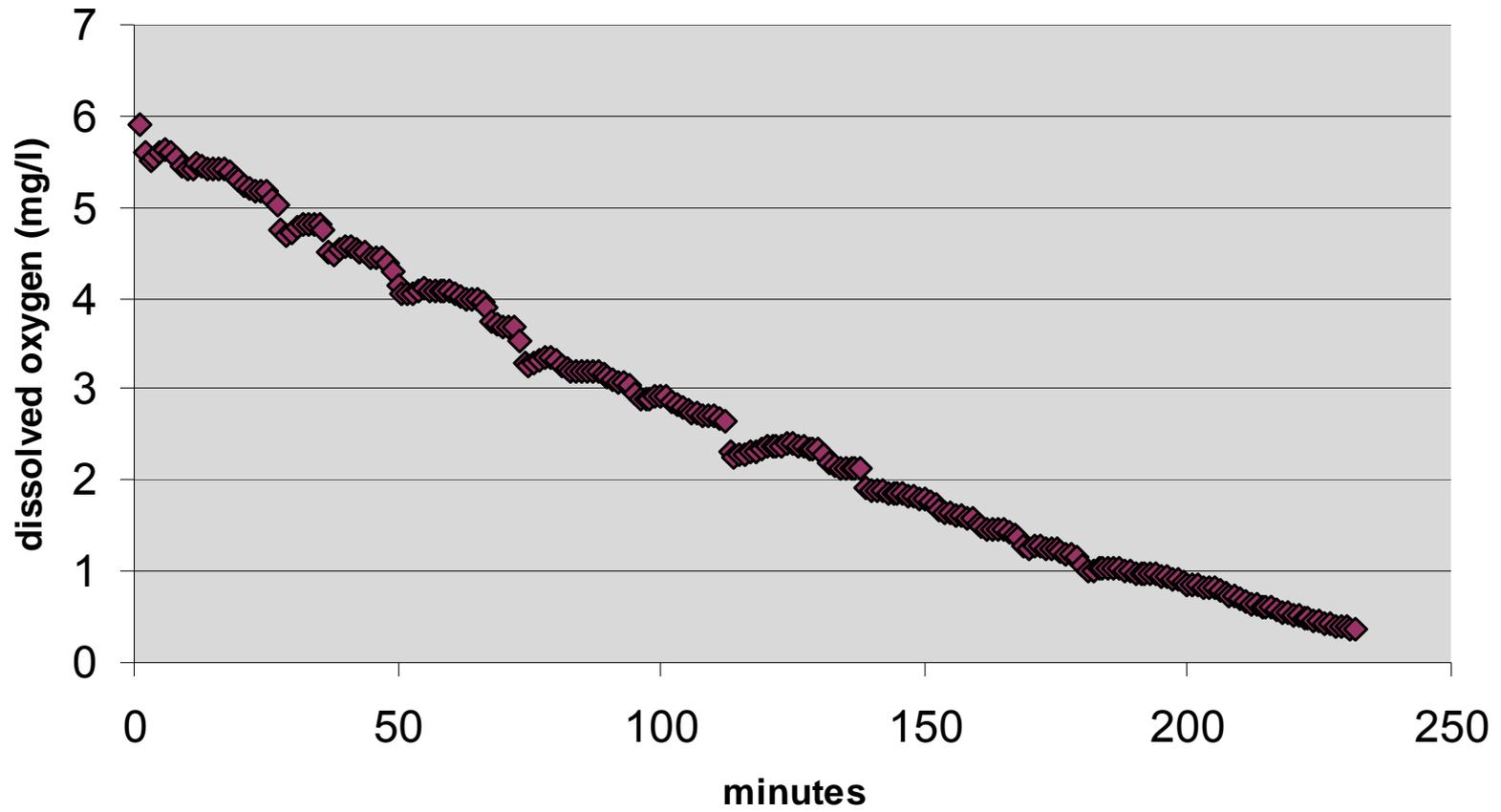


Soluble Reactive Phosphate, July 2007

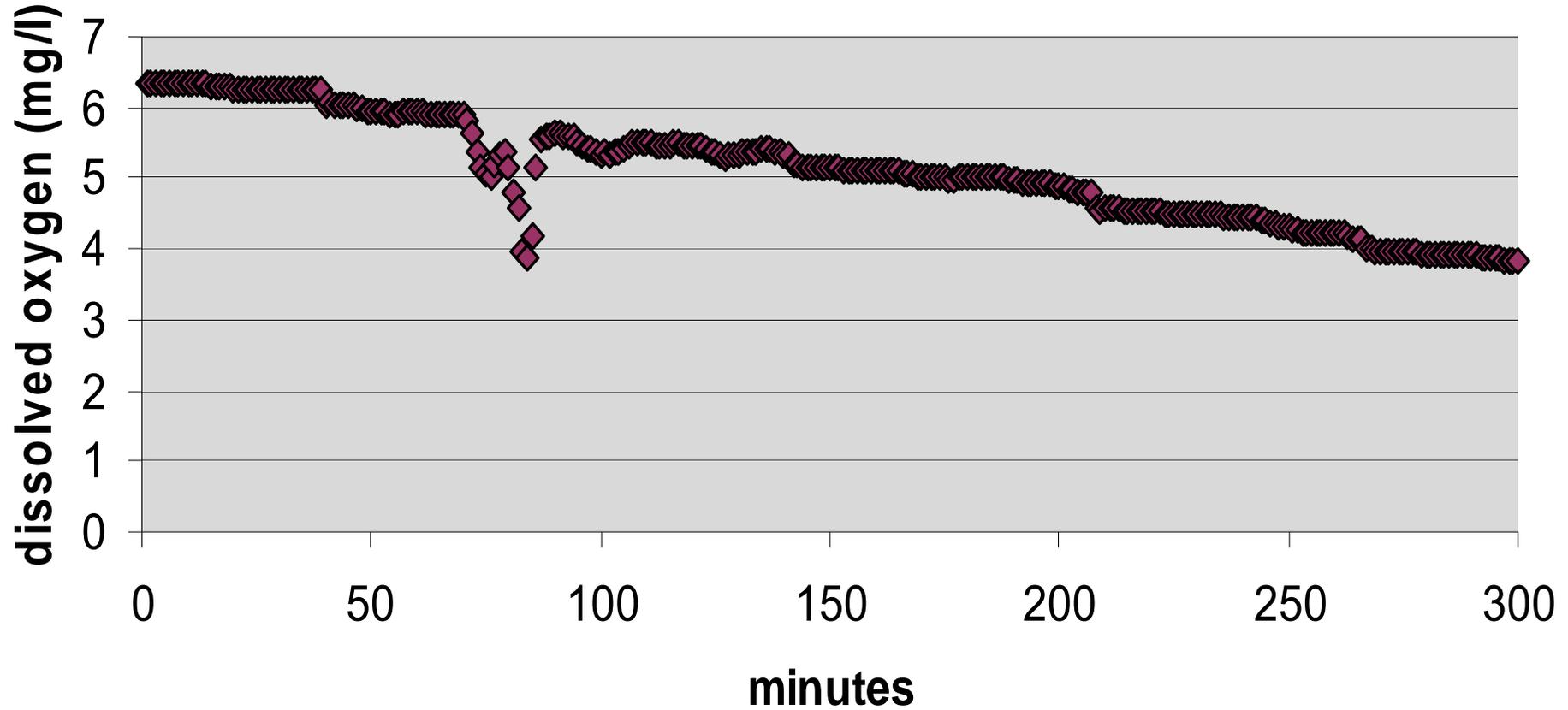




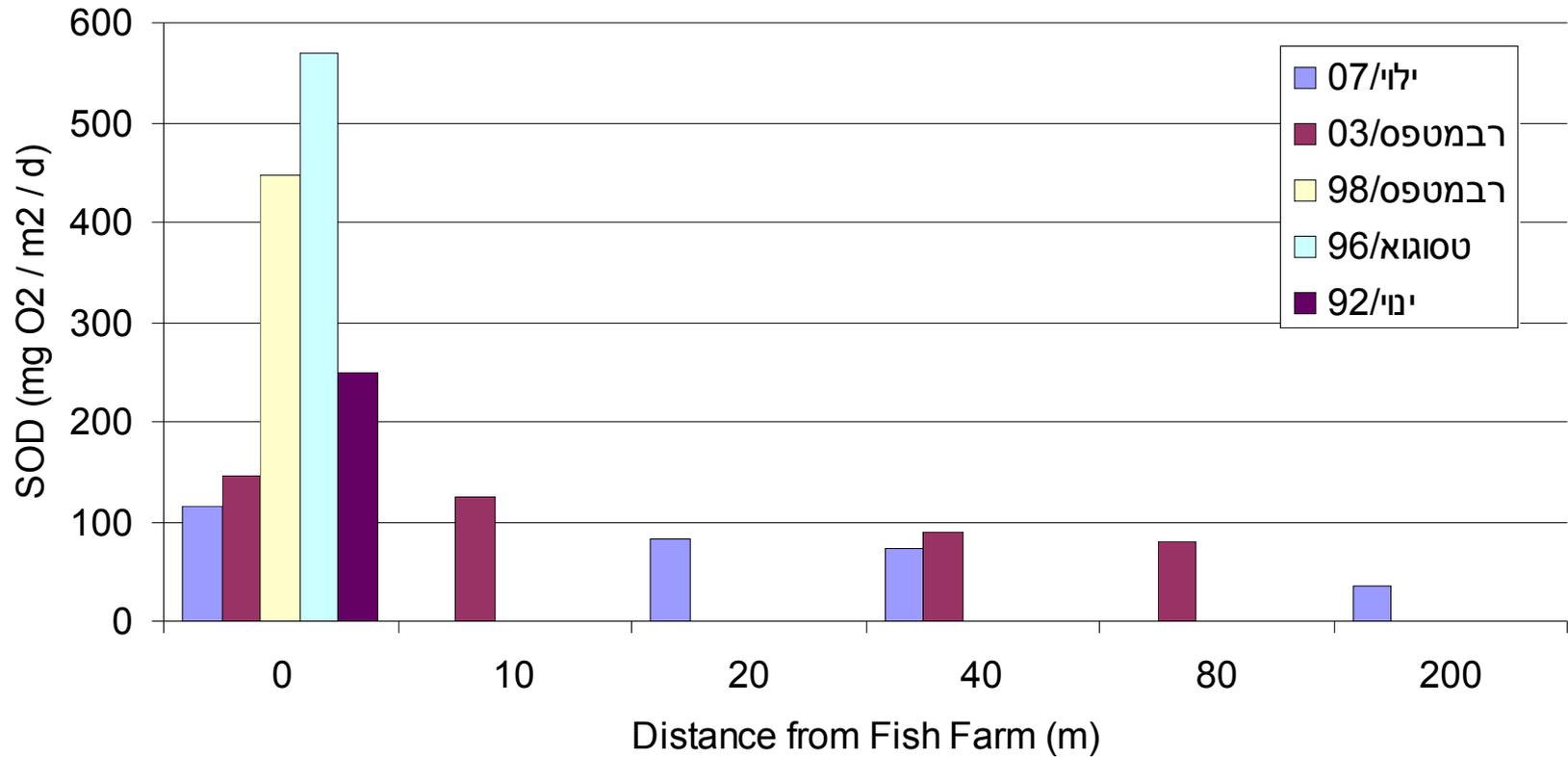
SOD - 7/07 - under cages



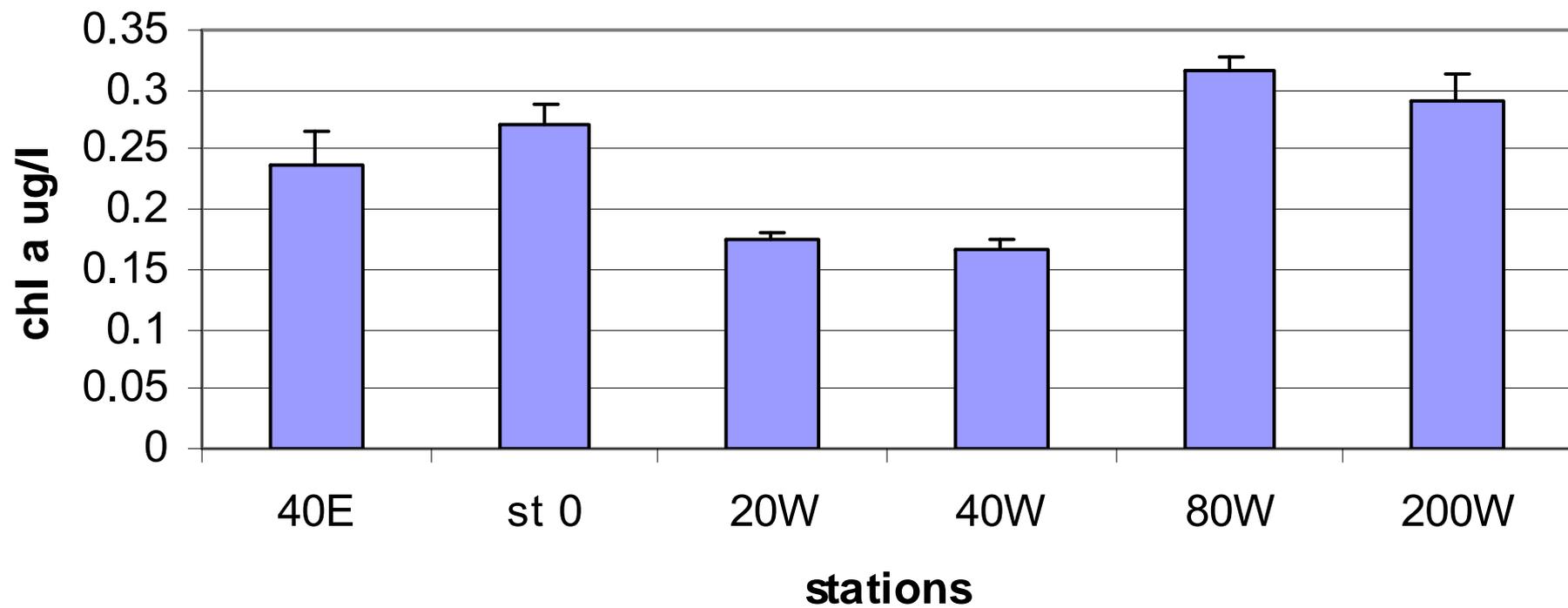
SOD - 7/07 - 200m West of cages



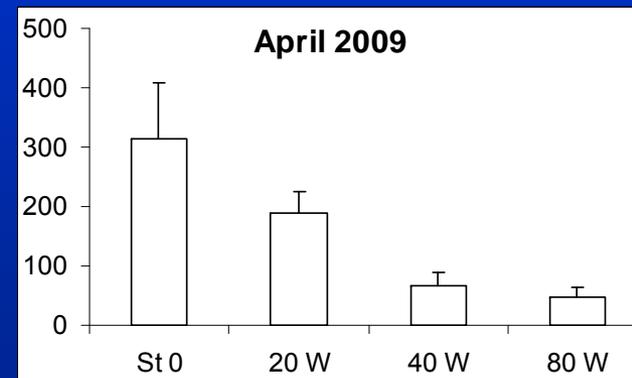
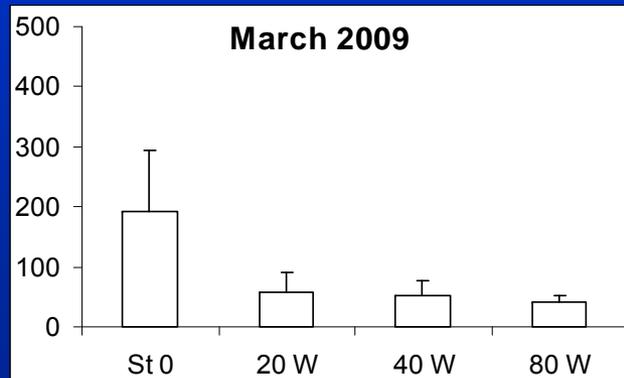
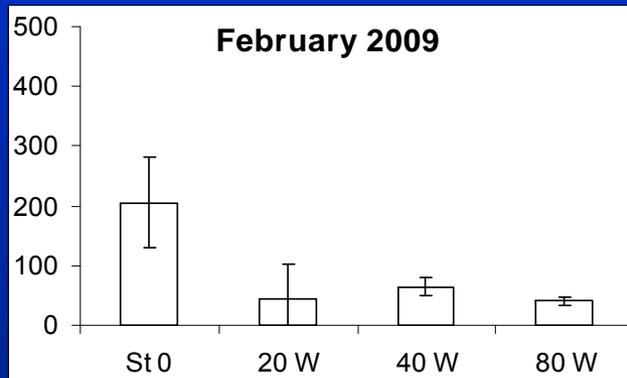
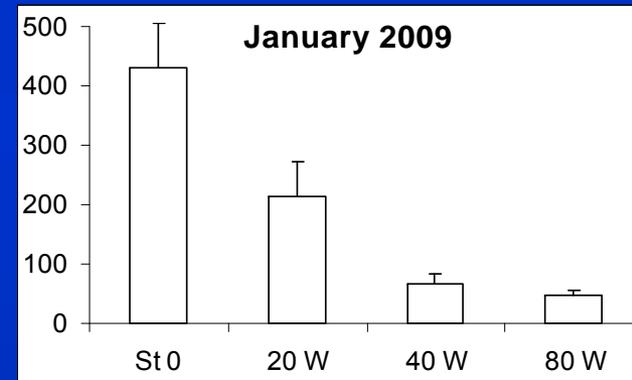
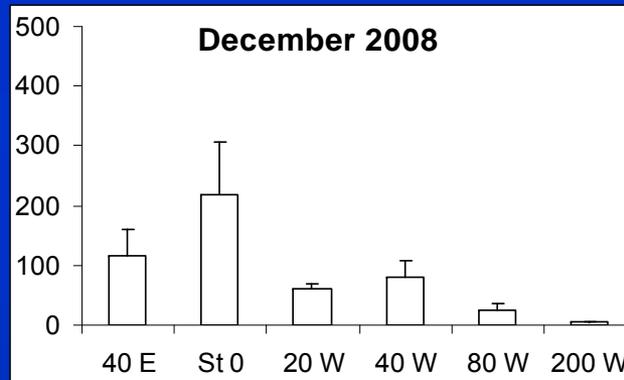
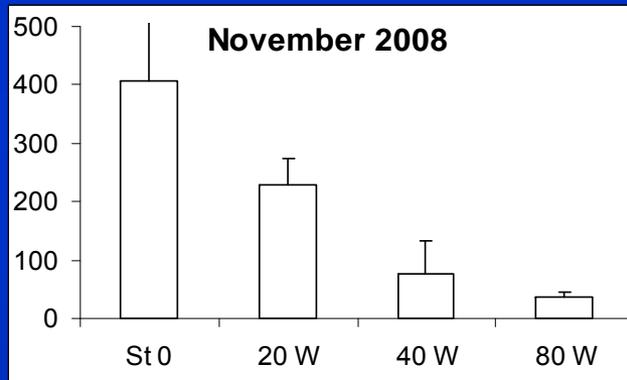
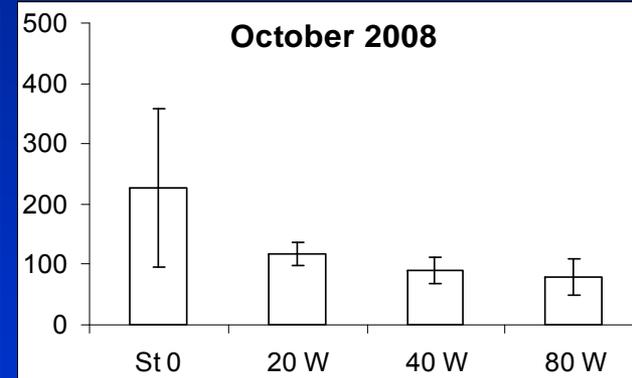
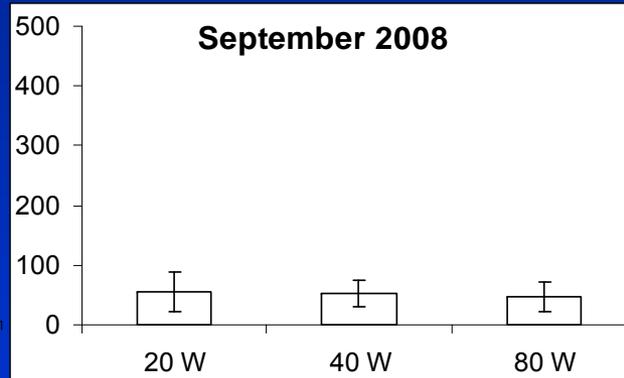
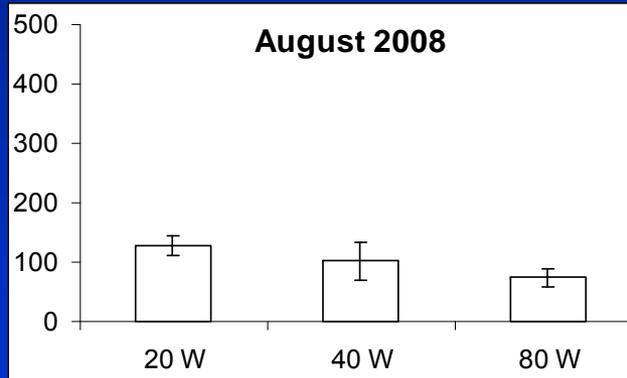
Sediment Oxygen Demand (mg O₂/m²/d)



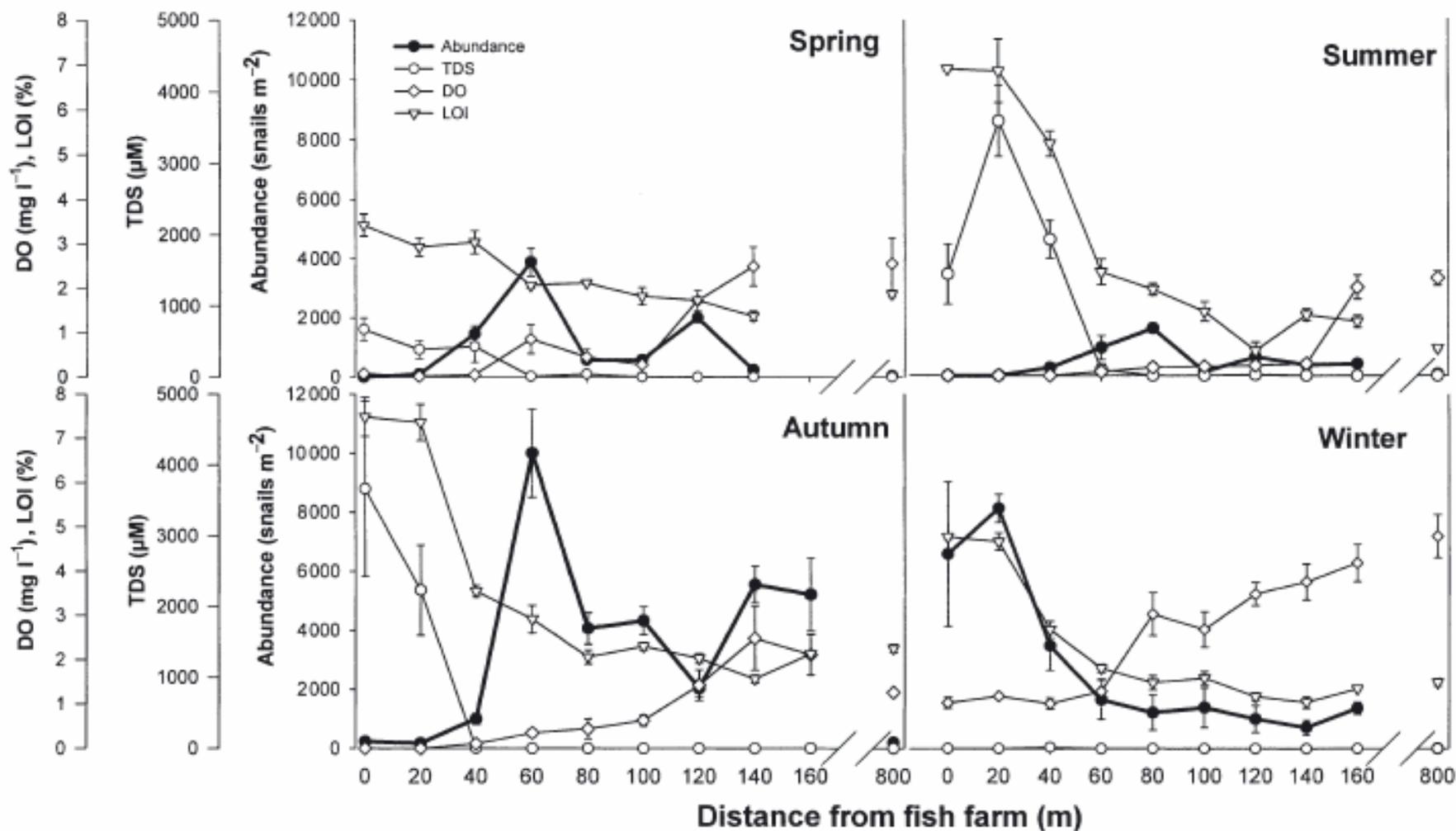
benthic chl a, 29.7.2009



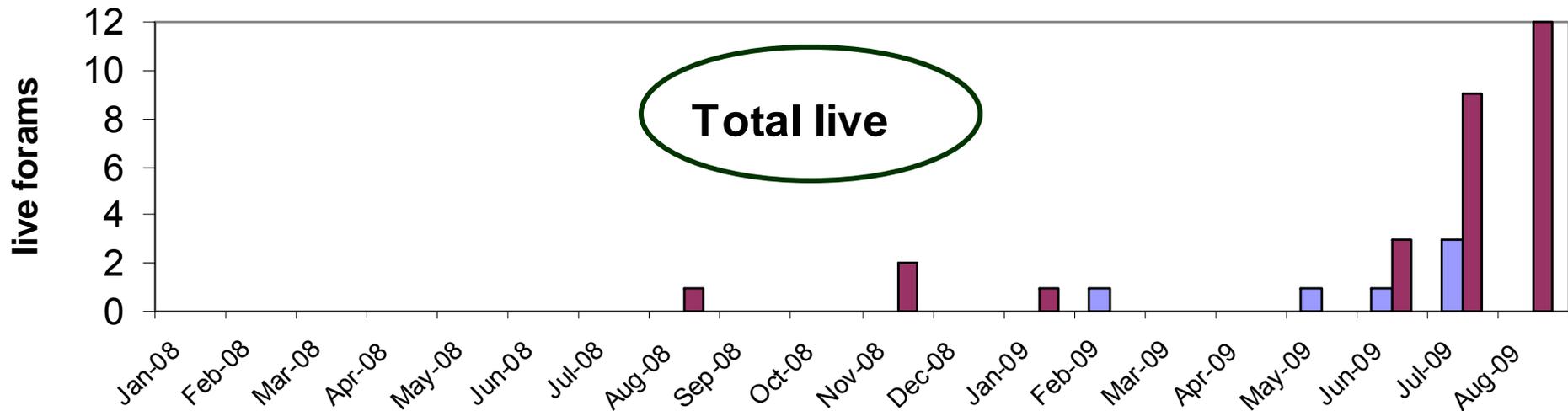
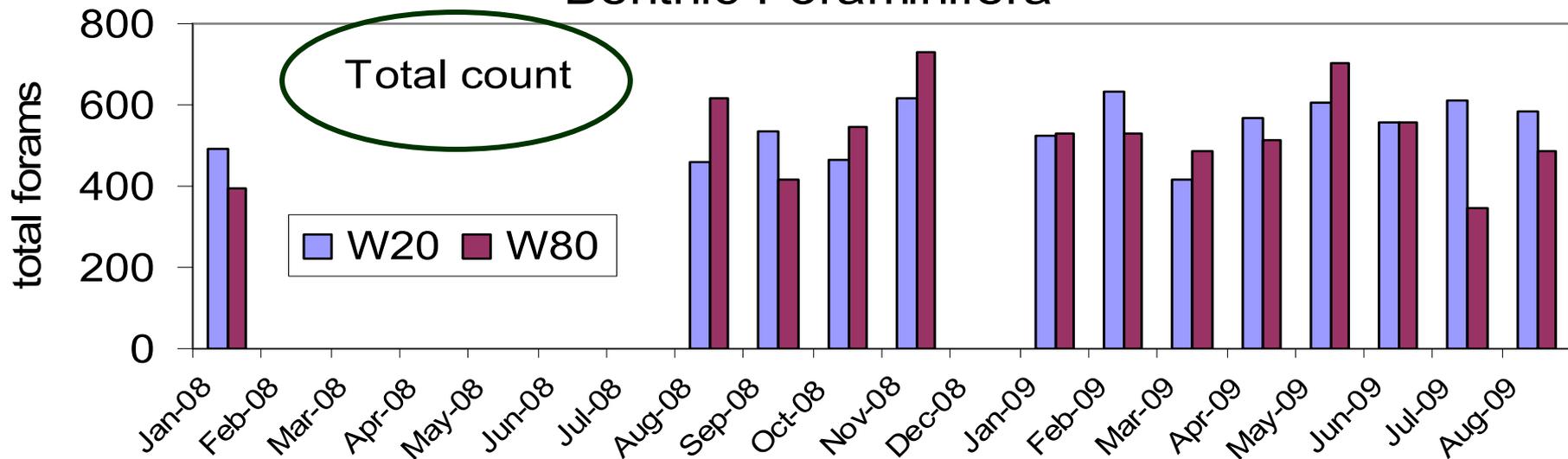
Nassarius sinusigerus abundances



Dynamic response of a mud snail *Nassarius sinusigerus* to changes in sediment biogeochemistry



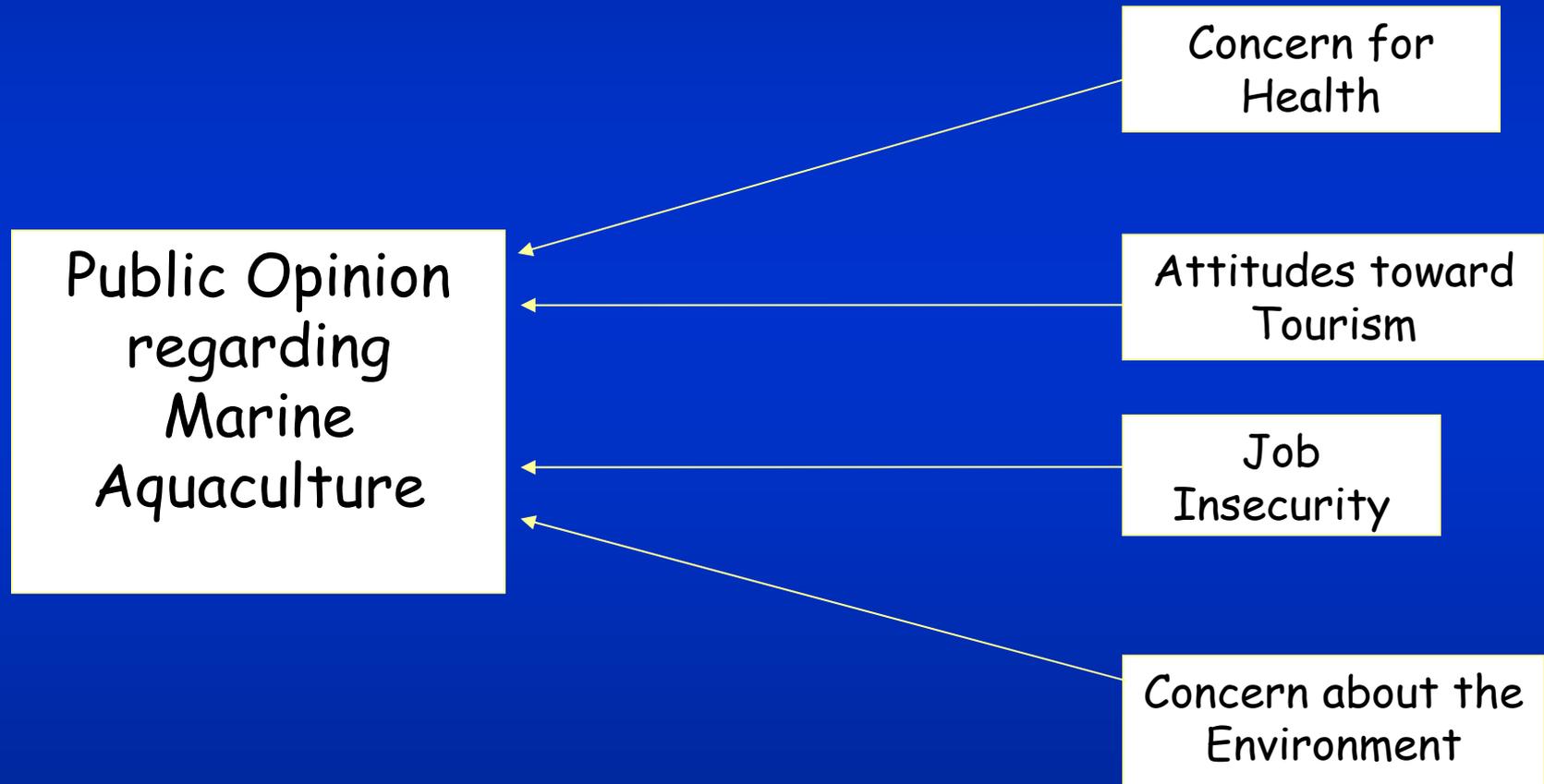
Benthic Foraminifera



Socio-Economic Aspects

- What are the public attitudes toward mariculture??
- Basis for our study is Mazur and Curtis (2006) model - public attitudes towards mariculture in Australia
- Which factors influence the formation of these attitudes toward mariculture
 - health care (Health Behavior)
 - environmental concern (Conservation behavior)
 - lack of job security (Job Insecurity)
 - attitudes toward tourism (Tourism Attitudes).

Conceptual model underlying this study



Public Opinion Study

- **Null hypotheses:**
- People with **job insecurity** will tend to support mariculture more than those with job security.
- People concerned with **preserving the environment** will tend to have more negative attitudes towards mariculture than those who don't.
- People who **care about their health** will tend to form more positive attitudes towards mariculture than those who don't.
- People who **support tourism** will tend to form more positive attitudes towards mariculture than those that do not.
- **Results:**
 - All of the above hypotheses were supported
 - most of the Israeli and Jordanian public **supports** the idea of mariculture, although most are not familiar with the implications of mariculture on tourism and on environmental issues

Aqaba Projects (NATO-SPS program) Partner Country Priorities

1. Real Time Surface Current Measurements To Protect The Gulf Of Aqaba (Eilat) Against Man-induced Or Accidental Oil And Other Toxic Spills
2. Societal Security And Environmental Impacts Concerning Mariculture In The Red Sea
3. The Protection Of The Gulf Of Aqaba From The Anthropogenic And Natural Stress In The Face Of Global Climate Change
4. Monitoring Natural And Anthropogenic Aerosol Pollution And Its Impact On Ecosystem In The Gulf Of Aqaba

Impact of NATO funding on research in partner institutes.

Current NATO Projects partner countries are:

Germany, Turkey, USA, Israel and Jordan)

1. Training and exchange of students
2. Investment in advanced equipment
3. Opportunity for long-term collaborations in research and education

Projects contribute to stability, security and peace:

- Nurtures regional co-operation between scientists on both sides of the Gulf, collaboration that is important to building a sustainable peace in the region
- Provide tools in the area that can help to mitigate unprecedented damage to the economical interests of Israel and Jordan as a result of intentional or accidental threats, that may harm the unique ecosystem of Gulf of Aqaba.

REGIONAL SCIENTIFIC NEEDS

It is of high priority to the region that NATO

would continue to focus on

Environmental, socioeconomic and food security

THANK YOU...