Gulf of Aqaba Research and Monitoring Program – IET Recommendations

Addendum to Report 7b - Analysis of existing nutrient data sets for the Gulf of Aqaba (1975 – 2003).

Barak Herut and Yuval Cohen
Israel Oceanographic and Limnological Research

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Scope of this document

Project 7 of the IET Program involved two parallel studies that yielded two separate reports - Report 7a by Lazar & Erez, and Report 7b by Herut & Cohen. Both reports were included in the Final Report of the IET Program submitted on 14 July, 2004.

After the deadline for submission of the project reports of the IET Program, Lazar & Erez prepared a revised (3rd) version of Report 7a (hereafter –"*7aRev*"). The Committee of Chief Scientists in charge of the IET Program decided that this new report would be submitted to them and to the IET along with our comments. These comments, presented herein as an Addendum to Report 7b, focus on three issues: data quality; the ratios of nutrient elements in the northern GOA; nutrient and dissolved oxygen mass-balance calculations.

We emphasize that this Addendum does not change the findings and conclusions of Report 7b. In fact, in our opinion, the findings of other relevant projects of the IET Program lend further support to our main conclusion that the nutrients emitted from the Eilat fish farms are not retained in the northern GOA. In this context we note the conclusions of the following projects: Project 6 (net southward flow at depths of 250 – 400 m and the conclusion that it is rather unlikely that the deep layer in the northern GOA is stagnant); Project 8 (similar rate of nutrient release from a sediment core taken near the fish farms and cores taken from deep water in the northern GOA); Project 11 (a general trend of increase towards deep water in the concentrations of organic carbon and organic-bound P in the sediments of the northern GOA rather than a decreasing north-south trend).

The tables and figures in this Addendum are numbered sequentially to those in Report 7b. (Reference to figures and tables in report 7b and in this Addendum is made in **bold** type; reference to tables and figures in reports 7a and 7aRev is made in *italic* type).

1. Data quality issues

(1). In report 7b, we have shown unequivocally that the nitrate data recorded in the IUI Data Base for Station A during 1997 – January 1999 were erroneous (grossly underestimated). During a discussion of Project 7 on 27 June, J. Erez agreed with that conclusion. Report *7aRev* states that the "*disputed*" 1997/78 data is clearly marked and was not included in its calculations and estimations. However, this is not always the case. *Fig. 18* of Report 7a that highlighted the 1997/78 data, indeed was removed and not included in Report *7aRev* (that figure and earlier versions of it have been presented by Lazar & Erez on numerous occasions as the flagship "evidence" for the impact of the fish farms on the nutrient budget of the northern GOA). Despite this, Report *7aRev* repeats the claim about "the increase since 1997 to the present" of the dissolved inorganic nitrogen inventory in the northern GOA (*p. 8*). Even more puzzling is the statement based on the erroneous data on *page 9*: "*... the present (1999 – 2003) increase in the slope of nitrate versus phosphate water column inventories compare to that of* ***1997 – Jan. 1999*** *trend (Fig. 12b) may be the "fingerprint" of the fish farm emissions* ".

Moreover, several figures including the 1997/8 data remain in Report *7aRev* as they were in Report 7a (e.g. *Figs. 7 & 12b*). This is especially important considering the subjective methods of data analysis used (see Section 2 below).

(2). As will be explained below (Section 2.1), after re-examination of the IUI Data Base we have good reason to suspect that the phosphate measurements at Station A during 1975 – 1992 that were considered reliable by Lazar & Erez, were in fact unreliable.

(3). Report *7aRev* doubted the reliability of the Gordon et al (1994)[1] data set for Station A (4 profiles). However, the reliability of this data was questioned not on the basis of N and P concentrations but on N and P inventories. This is clearly not a proper test for data quality because of the inherent errors involved in the calculation of inventories. Our examination of the nitrate: phosphate concentration ratio (Section 2.1) indicates the reliability of the concentration data set. Note also that these nutrient measurements were performed by IOLR at the same time that a series of intercalibration exercises were made with European laboratories in the framework of the international POEM Program (see Kress et al, 2001).

2. Ratios of the nutrient elements in the northern GOA

Report *7aRev* claims that in recent years, N:P ratios in intermediate and deep waters of the northern GOA have increased and N:Si ratios have decreased and attributes these changes to the nutrient emissions from the fish farms. These claims are based on examination of the nutrient data from different time periods. However, the data were not analyzed by proper statistical tools. Instead, correlation lines were "*eyeballed*" or "*drawn manually to emphasize trends*". The use of such arbitrary methods coupled with the use of erroneous or suspicious data, have led to conclusions that in our opinion are wrong and misleading.

[1] The reference was omitted in Report 7b and is given in this Addendum.

2.1. Nitrate - Phosphate

According to report 7aRev, N:P ratios in intermediate and deep water (> 290 m) of the northern GOA have increased from ~ 12 prior to 1999 to ~18 after 1999. This conclusion was derived from *Fig. 7* which presents N and P data from Station A for four time intervals: 1975 – 1977, 1989 – 1992, 1997 -1978 and 1999 – 2003. However, we suggest that this conclusion is problematic because:

(1) The lines drawn in *Fig. 7* to indicate N:P ratios are not regression lines. Regression analysis for the 1999 – 2003 data revealed that the N:P ratio for that period was 16.2 (i.e. Redfield Ratio), not 18 (**Fig. 22a**).

(2) The slope of the line drawn in *Fig. 7* to indicate the pre-1999 N:P ratio was apparently strongly influenced by the erroneous nitrate data for the years 1997/98.

(3) As discussed in detail below, the MBL/IUI phosphate data for the years 1975 – 1977 and 1988 – 1992 is not trustworthy and is probably erroneous.

Appendix A of report 7a presents all the phosphate profiles from Station A measured at the MBL/IUI from 1975 to 2003. Evidently, most of the measurements in the years 1975 – 1977 and 1988 – 1992 were considered unreliable and therefore, were discarded and not included in the screened data base. The situation is summarized in **Tables 3 and 4** in terms of both whole water column profiles and discrete measurements.

Table. 3. Quality control of all MBL/IUI phosphate measurements at Station A during 1975 – 1994: monthly profiles accepted (A) and discarded (D) by Lazar & Erez. ***Sorce: Report 7a, App. 1.***

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
1975							A	D		D	D	D
1976	D	D	D		D	D	A	D	D	A	A	A
1977	A	D	A	D								
1988										D	D	D
1989	D	D		D		D		D/A[2]	D		D	A
1990	A		A	A	A		A	A		A		
1991		D	D/A[2]									
1992											A	
1994		D										

[2] Two profiles in these months: one accepted, one discarded.

Table. 4. Quality control of all MBL/IUI phosphate measurements at Station A during 1975 – 1994: number of measurements accepted and discarded by Lazar & Erez. *Sorce: Report 7a, App. 1.*

Year	**Accepted**	**Discarded**	**% Discarded (of total)**
1975	15	37	71
1976	37	64	63
1977	20	19	49
1988	0	49	100
1989	25	74	75
1990	91	3	3
1991	14	26	65
1992	9	0	0
1994	0	9	100

% Discarded 1975 – 1977: profiles = 65%, measurements = 63%
% Discarded 1988 – 1992: profiles = 39%, measurements = 52%

The above statistics of the data quality indicate inherent problems with the phosphate measurements during the years 1975 - 1994. Therefore, in our opinion even the phosphate data considered "reliable" for these years (by the very crude and subjective quality control procedure used), cannot constitute a sound basis for analysis of long-term trends in N:P ratios. In fact, examination of the data for 1990, the only year for which all phosphate profiles were considered reliable by Lazar and Erez, indicated that the phosphate measurements were erroneous (**Fig. 22b)** - the N:P ratio was 5.3, an unreasonably low value, less than a half of the ratio claimed in Report *7aRev* for the period 1988 – 1992. Note that this low N:P ratio indicates that the phosphate concentrations recorded were too high. From examination of the discarded phosphate profiles in Appendix 1 of Report 7a it is evident that the main problem was that the recorded concentrations were too high.

In contrast, examination of the data of Gordon et al (1994) from 1991 – 1993 (20 measurements) revealed a N:P ratio of 15.9, i.e. essentially the same as that for 1999 – 2003 (**Fig. 22a**). This indicates the reliability of this data set and suggests long-term stability of N:P ratios in the northern GOA.

We also examined the ratio of N and P water column inventories at Station A for the years 1999 – 2003. According to *Fig. 12b* in Report *7aRev*, this ratio has been ~20 since 1999 (again, based on lines "*drawn manually*") but regression analysis revealed a ratio of 12 (**Fig. 22c**). Considering the errors involved in the calculation of inventories, this ratio cannot be considered significantly different than the Redfield Ratio.

Conclusion: Since 1999 the N:P ratio in the deep water of the northern GOA has been essentially the Redfield Ratio. There is no sound basis for the claims in Report *7aRev* that the N:P ratio was much different in previous years and that its present value reflects the impact of the nutrient emissions from the fish farms.

2.2 Nitrate – Silicic acid

According to Report *7aRev*, N:Si ratios in the intermediate and deep water (> 250 m) of the northern GOA have decreased from 4.5 during the early 1990's (1989 – 1992) to 2 after the deep mixing event in 2000, as a result of changes in the phytoplankton populations induced by the nutrient emissions from the fish farms. This conclusion was derived from *Fig. 19a* and *19b* which compared the data from Station A for the two periods. Thus according to Fig. *19b*, during 1989 – 1992 the N:Si ratio was 4.5 for both shallow (< 250 m) and deep (> 250 m) water while after the deep mixing event in 2000 the ratio remained 4.5 for shallow water but dropped to 2 in the deep water. Note however, that these ratios were also derived from "*eyeballed*" correlation lines. Regression analysis revealed a totally different picture as follows:

(1) The N:Si ratio at depth > 250 m during 1989 – 1992 was 1.47 (including the data of Gordon et al)[3] or 2.1 (without the data of Gordon et al) (**Fig. 23a**).

(4) The N:Si ratio at depth > 250 m from May 2000 (after the deep mixing) to December 2003 was 1.59 (**Fig. 23b**).

The release of Si (dissolution) from sinking opal shells may take place at greater depths than the remineralization of N (oxidation of organic particles). As samples from depths > 600 m were taken during 2000 – 2003 but not during 1989 – 1992, the comparison of the two data sets may introduce some bias to the conclusions about N:Si ratios. Therefore, we also examined only the samples from the depth range of 250 – 600 m in the May 2000 – December 2003 data set. The N:Si ratio was 1.79 (**Fig. 23c**), again a ratio similar to the deep water ratio during 1989 – 1992.

Thus the deep water N:Si ratio after the mixing event in 2000 was not significantly different than the N:Si ratio during 1989 – 1992.

<u>Conclusion</u>: There is no basis for the claim in Report *7aRev* that the N:Si ratio in the deep water of the northern GOA has decreased drastically (~ two fold) after the mixing event in the year 2000 compared to the ratio during the early 1990's.

2.3 Nitrate – Dissolved oxygen

On the basis of examination of nitrate and. dissolved oxygen **inventories** in the northern GOA, Report *7aRev* (*p.3-4 and Fig. 12a*) claims that "*ΔDO:ΔN ratio of the present decade is higher than that of the last decade* " and that this represents some excess in "*oxygen demand*" (compared to Redfield ratio). For the reasons explained in **Section 2.4** of Report 7b, we think that calculated water column inventories of dissolved oxygen may introduce artifacts in the examination of nutrient vs. DO relationships. Indeed, examination of the actual concentrations of dissolved oxygen and nitrate measured at Station A (depths ≥ 250 m) (Fig. 24) revealed a totally different picture as follows:

[3] We examined the 1989 – 1992 data both with and without the Gordon et al data because it is not clear if these data were included in *Fig. 19b* of Report 7aRev.

(i) The slope of the DO vs. N regression line for the period 1999-2003 (-8.1) was similar to Redfield Ratio (-8.6), in contrast to the 'estimated' ratio of -15 depicted in *Fig. 12a* in Report *7aRev*.

(ii) The DO:N ratio during 1988-1992 (-6.4) was similar to the 1999 – 2003 ratio, hence there were no indications for significant decadal differences in "oxygen demand" in the northern GOA.

<u>Conclusion</u>: There is no sound basis for the claim in Report *7aRev* that the DO:N ratio in the northern GOA has decreased drastically (~ two fold) since 1999 compared to the ratio during the early 1990's.

3. Nutrients and dissolved oxygen mass – balance calculations

3.1 Area/volume of the northern GOA allegedly affected by the fish farms

Both reports 7a and *7aRev* present various mass-balance calculations for nutrients and dissolved oxygen in the northern GOA. The results of all calculations suggest a significant impact of the fish farms on the nutrient and oxygen budgets. Before discussing the substance of these calculations, we mention that their results depend on the area and water volume assumed to be affected by the fish farms. In this regard, note the following inconsistencies among the various calculations:

(i) For the nitrogen mass-balance on page 4 in Report 7a, the "*area deeper than 500 m*" was considered and was calculated to be ~ $\mathbf{90} \cdot 10^6$ m^2 ($25 \cdot 10^3$ m • $7 \cdot 10^3$ m · 0.5). But for a similar calculation on page 8, "*the area below 300 m*" was considered and was assumed to be $\mathbf{130} \cdot 10^6$ m^2.

(ii) In Report *7aRev* again the above two areas were considered for the nitrogen mass-balance, the former on page 5 and the latter on pages 9-10, but in that report the values used were different - $\mathbf{175} \cdot 10^6$ m^2 and $\mathbf{200} \cdot 10^6$ m^2, respectively.

(iii) For the mass-balance calculation of dissolved oxygen on page 9 of Report *7aRev*, the "affected area" was assumed to be only $\mathbf{100} \cdot 10^6$ m^2 (10 km·10 km), i.e.half of the area considered for the nitrogen mass-balance (why?).

Note also that in calculating the water volume below 500 m (*p. 5* in Report *7aRev*), the depth of the deep water column was taken as 200 m (i.e. to 700 m). However, at 25 km from the tip of the GOA (the length of the area considered) the water depth is ~ 900 m.

3.2 "Oxygen demand" in the northern GOA

Report 7a attempted to show that part of the apparent deficit of dissolved oxygen in the northern GOA in recent years was due to "excess" carbon emission from the fish farms. It was assumed that all of the carbon was in organic form available for oxidation. In response, we have shown that the calculation of organic carbon emission from the fish farms was erroneous (by an order of magnitude) and that most of the carbon was in the form of CO_2 (**Appendix 1** of Report 7b). Consequently, Report *7aRev* introduced a new argument: fish respiration in the farms is "*accumulating as an oxygen demand* " that mixes into the lower water column in the northern GOA during the mixing period. In our opinion this argument is unreasonable. Before explaining the problem, we note the erroneous estimate in Report *7aRev* of the amount of oxygen consumed by respiration in the fish farms.

The annual oxygen consumption by respiration in the fish farms was estimated in Report *7aRev* as **167· 10^6 mole O_2** on the basis of a calculation of the CO_2 produced and assuming a $CO_2 : O_2$ ratio of 1:1. In actuality, the average annual CO_2 production and hence oxygen consumption in the fish farms was **73· 10^6 mole** for the period 1992 – 2002 and **98·10^6 mole** for 1999 – 2002 (**Appendix 1** of Report 7b).

The main problem with the hypothesis made in Report *7aRev* regarding fish respiration is the neglect of oxygen exchange with the atmosphere. It was assumed that the area of the northern GOA affected by the oxygen consumption in the farms is 10 x 10 km =10^8 m^2. The invasion rate of atmospheric oxygen into the mixed layer (at 24^{o}C) is ~ 400 mol·m^{-2}·y^{-1} (Brocker and Peng, 1982, Table 3-4), i.e. ~ 400·10^8 mol·y^{-1} for the above area of 10^8 m^2. This amount is ~ 400 times larger than the oxygen deficit due to respiration in the fish farms. In fact, during most of the year surface waters in the northern GOA are saturated or supersaturated with oxygen (IUI Data base); the slight undersaturation observed sometimes during the winter months probably reflects the combined effects of surface cooling and upwelling of deep, oxygen deficient water.

An additional explanation in Report *7aRev* for the apparent oxygen deficit in the northern GOA in recent years is oxidation of the new production derived from nutrients emitted by the fish farms. The quantitative estimate of this process was based on the assumption that all this new production fluxes through the thermocline and consumes oxygen in the deep water column (*page 9*). In our opinion this assumption is also unreasonable. Even if we neglect horizontal southward transport of some (or most, in our opinion) of the particulate organic matter derived from the fish farm nutrients, it is highly unlikely that none of this material is recycled within the mixed layer of the northern GOA. In fact, on the same page in Report *7aRev* where the above assumption is made, it is stated that the change in the nitrogen inventory in the northern GOA in recent years corresponded to only ~ 50% of the nitrogen emitted from the fish farms.

Moreover, if as assumed in Report *7aRev*, all primary production derived from the fish farm nutrients would be removed from the mixed layer, the oxygen produced when it was formed would be left behind dissolved in the mixed layer. The amount of this oxygen was estimated as 185·10^6 mol·y^{-1}, i.e. about twice the amount of oxygen consumed in the mixed layer by respiration in the fish farms. Thus, even without oxygen exchange with the atmosphere, the oxygen deficit due to fish respiration would be fully compensated.

Conclusion: The attempt in Report *7aRev* to construct a mass-balance for dissolved oxygen in the northern GOA is based on unsound assumptions. Therefore, the conclusions relating the apparent decrease in the oxygen inventories in recent years to the operation of the fish farms are totally unfounded.

3.3 Nitrogen mass-balance for the northern GOA

Report *7aRev* also constructed a mass-balance (one-box model) for nitrogen in the northern GOA (*pages 10-11* and *Fig. 22*). The area considered was $200 \cdot 10^6$ m^2 (area below 300 m). The main conclusions derived from this mass-balance are: (i) nitrogen emissions from the fish farms are similar in magnitude to the nitrate flux from the sediments of the northern GOA; (ii) nitrogen emitted from the fish farms is bound to stay in the northern GOA for several years before being transported southwards. In our opinion both conclusions are baseless because of several serious errors in the calculations of this mass - balance.

A critical parameter in the mass-balance constructed was the flux of nitrate from the sediments of the northern GOA. This flux was taken in Report *7aRev* as **0.2 mol·m^{-2}·$year^{-1}$** for the year 2000. The source for this figure is cited as David (2002) and it is noted that this rate was derived from the water column nitrate gradients measured during the summer of 2000 and represented a maximal value, typical for years with deep winter mixing. However there are two errors in the above flux estimate:

(i) The calculation of the nitrate flux by David (2002) was based on data from the summer of 2001, not 2000. Unlike the situation in 2000, in 2001 the winter mixing was shallow.

(ii) The nitrate flux from the sediments calculated by David (2002) for 2001 was **0.001 mol·m^{-2}·day^{-1}** that is **0.365 mol·m^{-2}·$year^{-1}$** (almost twice the value used in Report *7aRev*)[4].

Furthermore, the mass-balance constructed for the year 2000 was in fact based on an equation with terms from two different years:

$$\mathbf{dN/dt}_{\ 2000} = \mathbf{F}_{\text{Fish farms}} - \mathbf{F}_{\text{Sediments } \mathbf{2001}} - \mathbf{F}_{\text{out of NGOA } \mathbf{2000}}$$

On one side of the equation was the change in the water column nitrate inventory (**dN/dt_{2000}**) during 2000 (a year with deep mixing) and on the other side was an erroneous value for the nitrate flux from the sediments (**$F_{\text{Sediments } 2001}$**) in 2001 (shallow mixing). This mismatch gave an erroneous result for the southward flux of N (**$F_{\text{out of NGOA } 2000}$**) leading the authors of Report *7aRev* to conclude (after further

[4] Apparently the source of the erroneous flux value in Report *7aRev* was that David (2002) reported a nitrate flux of 0.2 mol·m^{-2} during 200 days.

calculation) that during 2001 the flux of nitrate from the sediments was half of the flux during 2000.

In fact the entire conclusions presented in Report *7aRev* are based on a series of errors and wrong calculations as follows:

First, as noted above, the flux of N from the sediments during 2000 is not known (it was not reported in David (2002)). Second, the flux given in Report *7aRev* for 2001 (**0.1 mol·m^{-2}·year^{-1}**) is ~ 4-fold smaller than the flux which was calculated by David (2002) for that year. This datum was the base of the entire mass-balance calculation.

The above result for the nitrate flux from the sediments in 2001, which supposedly represents years with shallow winter mixing, is also inconsistent with the conclusion of IET Project 8. On the basis of pore water analysis in sediment cores, it was concluded in Project 8 that the N flux from the sediments during 2002 – 2003 (shallow winter mixing) was **0.365 mol·m^{-2}·year^{-1}** (i.e. the same as that calculated by David (2002) for 2001)[5].

Finally, we note that the total N emission from the fish farms in 2001 (**256 ton N**, or **0.09 mol·m^{-2}·year^{-1}** for the above area of $200\cdot10^6$ m^2) was 4 times less than the nitrate flux from the sediments calculated by David (2002) for the same year (**0.365 mol·m^{-2}·year^{-1}**). This contradicts the conclusion of Report *7aRev* that the N emission from the fish farms and the nitrate release from the sediments of the northern GOA are of the same magnitude.

In light of the above problems we do not discuss here other aspects of the nitrogen mass-balance presented in Report *7aRev*. We just note that in our opinion, the mass-balance constructed does not include all relevant N reservoirs and fluxes (e.g. exchange between organic and inorganic nitrogen pools (see *Table 1* in Report 7aRev) and N flux from the south of the GOA).

Conclusion: The mass-balance for inorganic nitrogen in the northern GOA given in Report *7aRev* is based on several erroneous calculations and therefore, the conclusions derived from it are baseless.

5. Conclusions

1. Since 1999 the N:P ratio in the deep water of the northern GOA has been essentially the Redfield Ratio. There is no sound basis for the claims in Report 7aRev that the N:P ratio was much different in previous years and that its present value reflects the impact of the nutrient emissions from the fish farms.

2. There is no basis for the claim in Report 7aRev that the N:Si ratio in the deep water of the northern GOA has decreased drastically (~ two fold) after the mixing event in the year 2000 compared to the ratio during the early 1990's.

[5] Note that J. Erez was co-author of Report 8.

3. In light of conclusions 1 and 2 above, there is no basis for the claim in Report 7aRev that the nutrient data for the northern GOA indicates a recent shift in the composition of the phytoplankton populations (allegedly due to the nutrient emissions from the fish farms).

4. There is no sound basis for the claim in Report *7aRev* that the DO:N ratio in the northern GOA has changed drastically (~ two fold) since 1999 compared to the ratio during the early 1990's.

5. The attempt in Report 7aRev to construct a mass-balance for dissolved oxygen in the northern GOA is based on unsound assumptions. Therefore, the conclusions relating the apparent decrease in the oxygen inventories in recent years to the operation of the fish farms are totally unfounded.

6. The mass-balance for inorganic nitrogen in the northern GOA given in Report *7aRev* is based on several erroneous calculations and therefore, the conclusions derived from it are baseless.

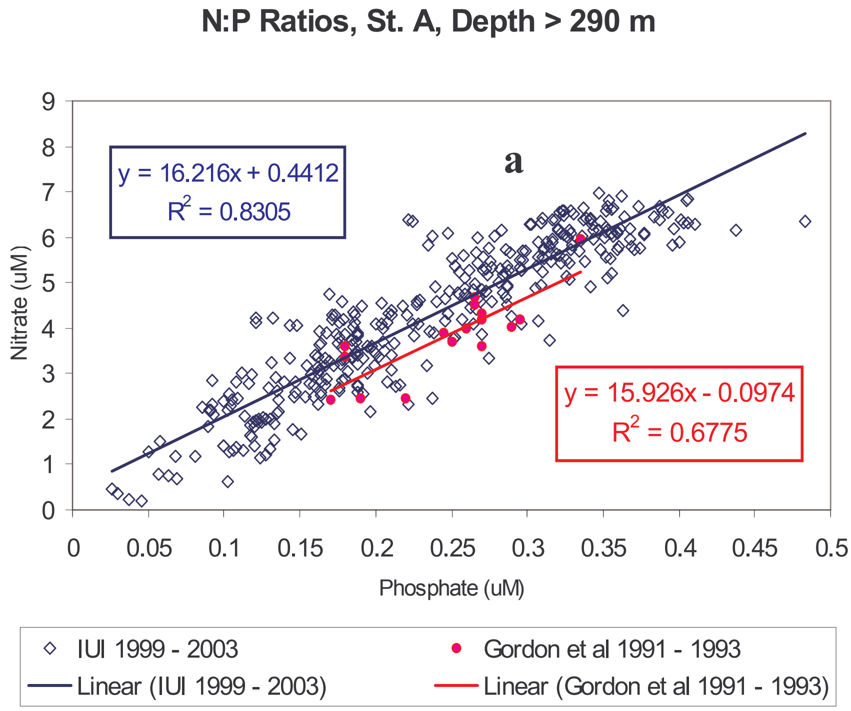
6. Reference

Broecker, W.S. and T.H. Peng (1982). Tracers In The Sea. Columbia University Publ., 690 pp.

David, E. (2002). Vertical Distribution and fluxes of dissolved inorganic nitrogen and phytoplankton in the northern Gulf of Aqaba (Elat). M.Sc. Thesis, Hebrew University of Jerusalem (supervised by A. Post and B. Lazar).

Gordon, N., Angel, D.L., Neori, A., Kress, N. and B. Kimor (1994). Heterotrophic dinoflagellates with symbiotic cyanobacteria and nitrogen limitation in the Gulf of aqaqba. Mar. Ecol. Prog. Ser. 107: 83-88

Addendum to IET Report 7b – Figures



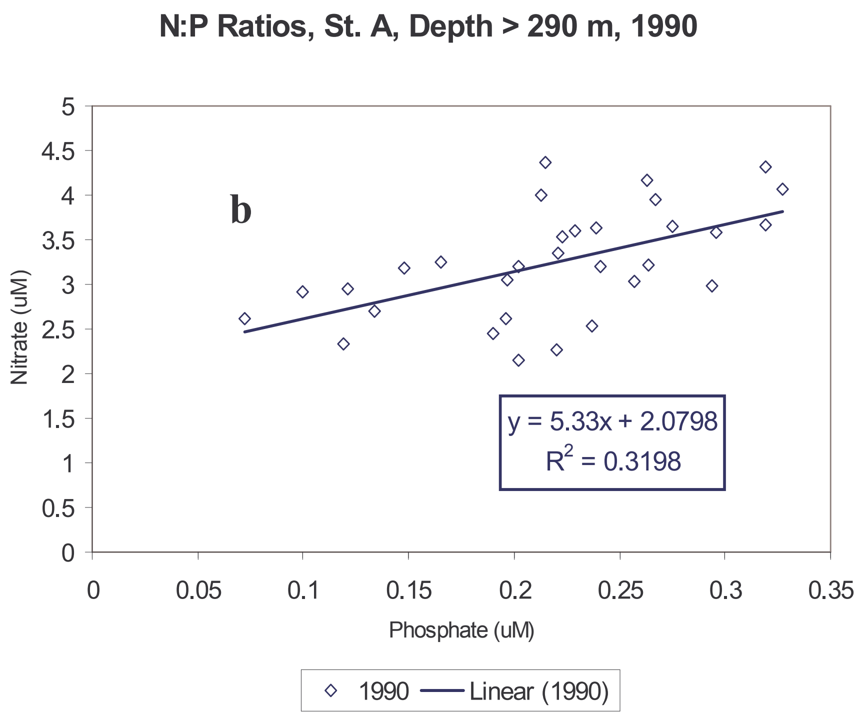


Fig. 22. Correlations of nitrate and phosphate concentrations at Station A, depth > 290 m. **a:** IUI data for 1999[6] – 2003 and Gordon et (1994) data for 1991 – 1993. **b:** IUI data for 1990.

[6] The 1999 data does not include the cast of 25 January (erroneous nitrate).

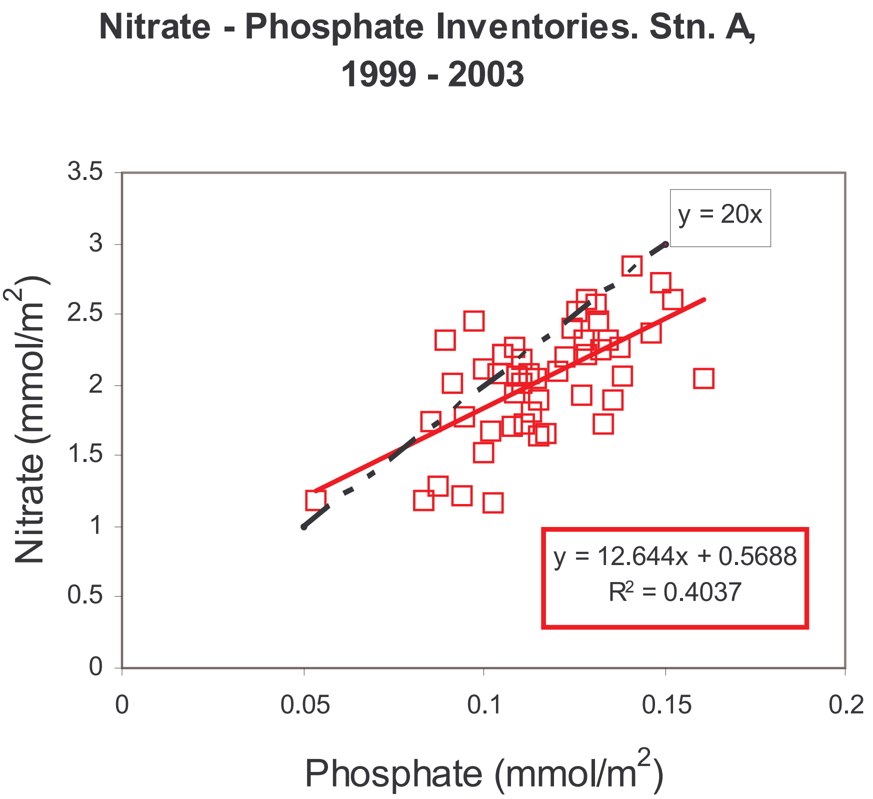
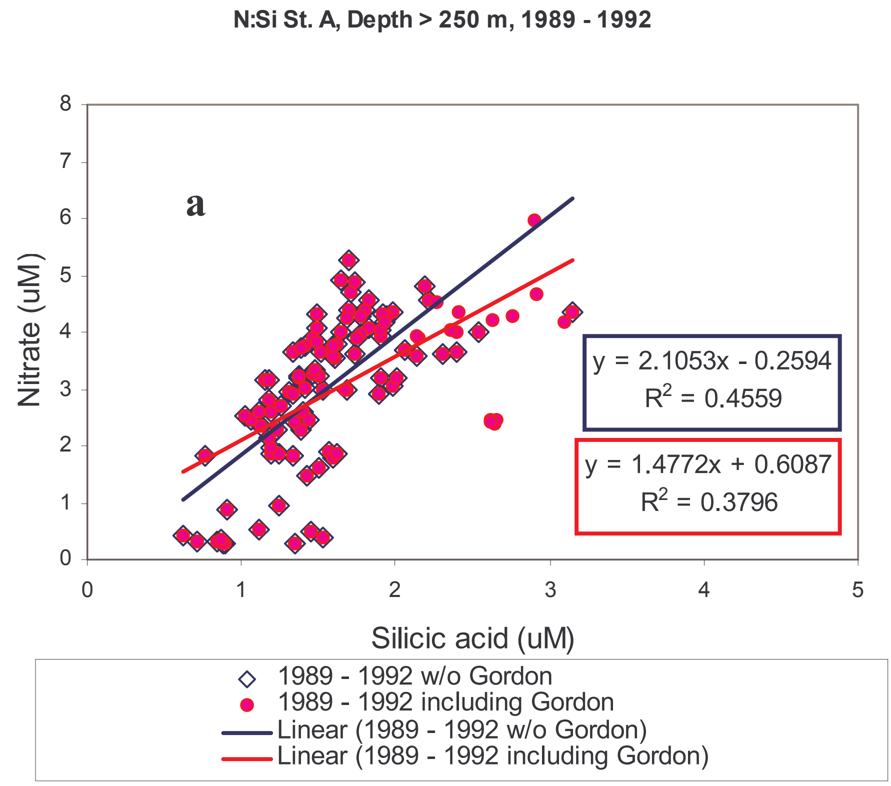


Fig. 22 Cont. **c**: Correlation of nitrate and phosphare inventories 1999[1] – 2003. Regression line (Red) and line *"drawn manually"* in *Fig. 12* of Report *7aRev* (Black).



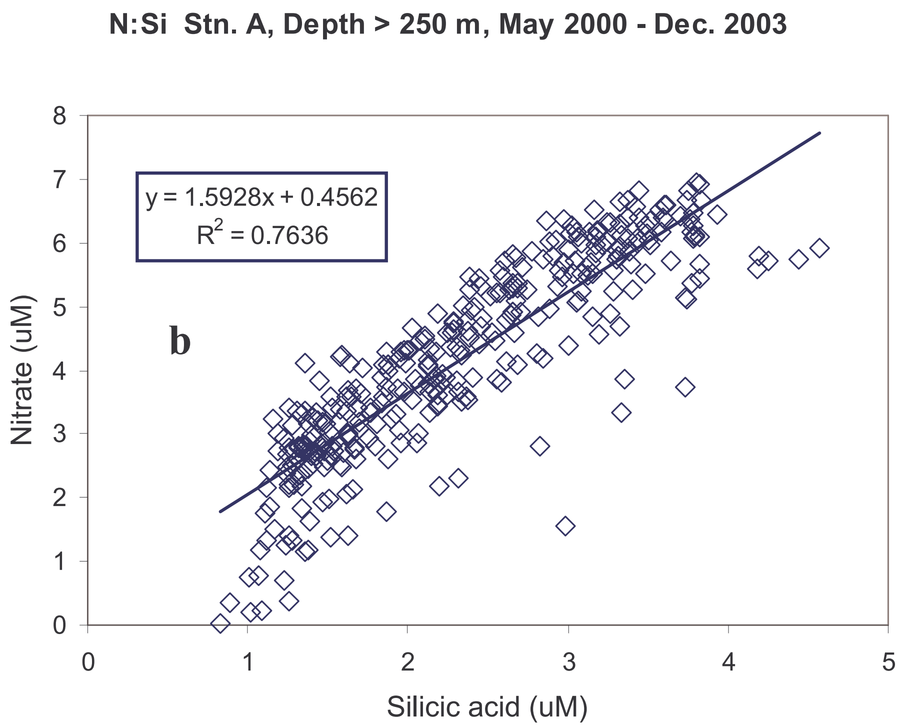


Fig. 23. Correlation of nitrate and silicic acid concentrations at Station A.
a: 1989 – 1992, depth > 250 m; **b:** May 2000 – December 2003, depth > 250 m.

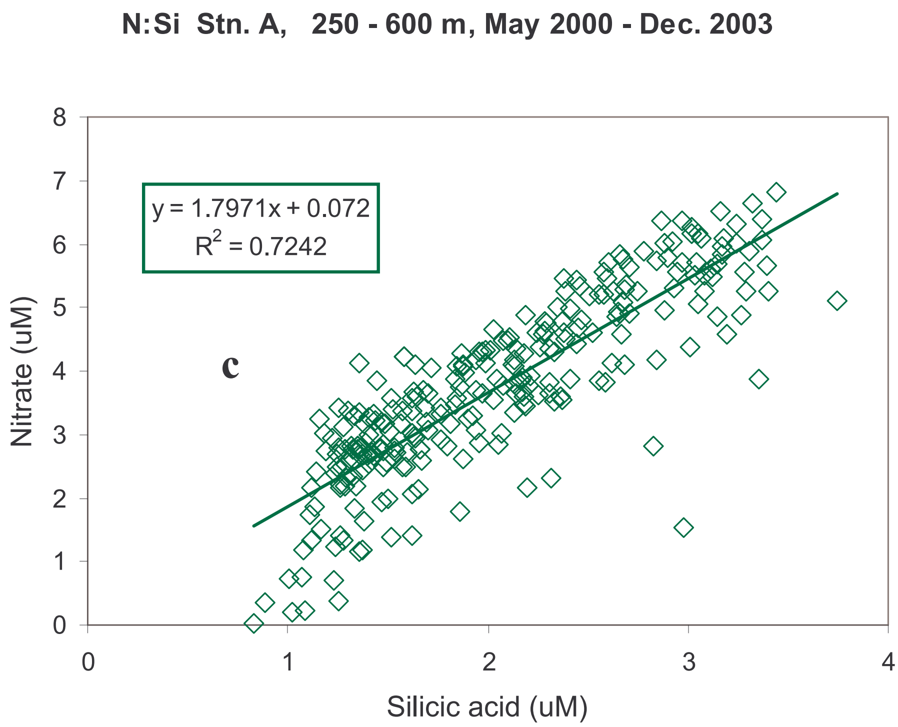


Fig. 23 Cont. c: May 2000 – December 2003, depth 250 – 600 m.

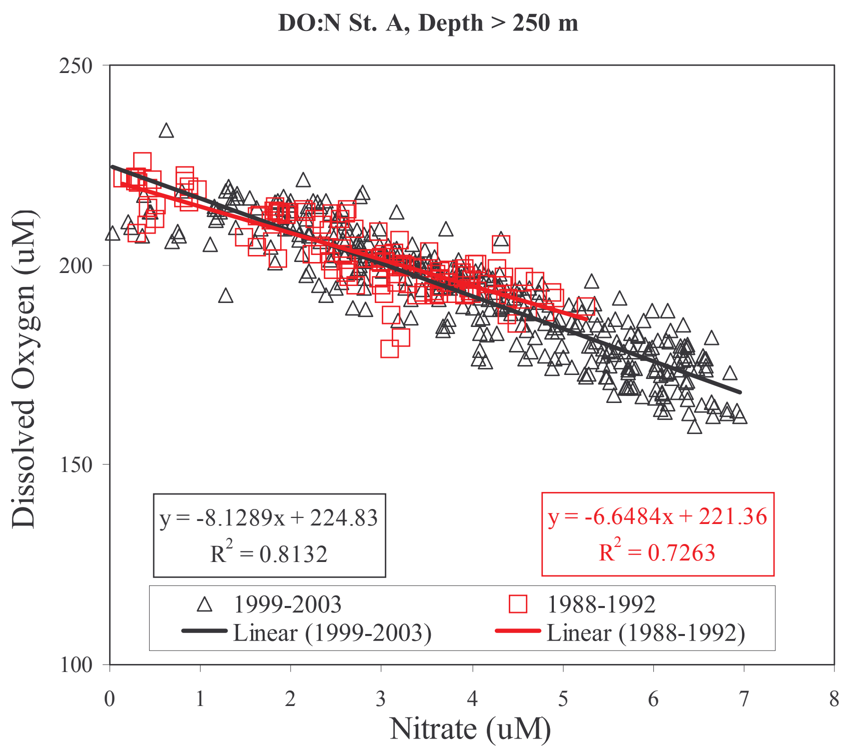


Fig. 24. Correlation of dissolved oxygen and nitrate concentrations at Station A, depth > 250m.