Major contribution of prokaryotes to carbon fluxes in the pelagic microbial food webs of the Mediterranean Sea

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SUPPLEMENTARY MATERIAL
INTRODUCTION

Details of the dilution experiments analysed for the samples from the sub-surface and in mesopelagic and bathypelagic layers.

Samples V1, V2, V3, V4, V6, V7, V10, VA and VIERA were taken during the Transmed oceanographic cruise on board of the R.V. Urania and the R.V. Universitatis, with analyses published in Fonda Umani et al. (2010) and Di Poi et al. (2013). The cruise was part of the Vector (Vulnerability of Coasts and Marine Italian Ecosystems to Climate Change and Their Role in the Mediterranean Carbon Cycles) project.

Samples O_36, O_37B, CF_16, MS_03A and OL_107 were taken during Obama oceanographic cruise on board of the R.V. Urania; the cruise was part of the Obama (Osservatorio off-shore per ricerche ecologiche a lungo termine (L-TER) sulla Biodiversità e funzionamento degli ecosistemi marini profondi in Mar Mediterraneo) project.

All of the remaining samples were collected at station C1 (13.710 E, 45.701 N; depth, 17 m) in the Gulf of Trieste (northern Adriatic Sea) from autumn 1998 to summer 2005. These data were analysed in Fonda Umani and Beran (2003) and Fonda Umani et al. (2012).
**SUPPLEMENTARY TAB. 1.** Chlorophyll \(a\) and biomasses data for all of the dilution experiments carried out at the sub-surface. The stations are grouped according to the trophic conditions, and ordered according to the chlorophyll \(a\) levels.

| Trophic condition | Station code | Sampling date (dd/mm/yy) | Chl \(a\) (mg L\(^{-1}\)) | Biomass (µg C L\(^{-1}\)) | Microzooplankton | Microphytoplankton | Nanoplankton | Heterotrophic prokaryotes | Autotrophic prokaryotes |
|-------------------|--------------|--------------------------|---------------------------|---------------------------|------------------|-------------------|---------------|---------------------------|------------------------|
| Oligotrophic      | VIERA        | 24/6/07                  | 0.04                      | 0.46 ±0.08                | -                | 1.40 ±0.37         | 4.87 ±0.22    | 0.42 ±0.06                |                        |
|                   | C1           | 15/12/99                 | 0.46                      | 3.48 ±0.57                | 0.13 ±0.02       | 1.59 ±0.03         | 21.02 ±1.45  | 0.57 ±0.11                |                        |
|                   | C1           | 10/3/04                  | 0.60                      | 1.23 ±0.07                | 0.12 ±0.28       | 13.35 ±0.35        | 5.84 ±0.12   | 0.94 ±0.04                |                        |
|                   | V3           | 5/6/07                   | 0.08                      | 0.42 ±0.20                | 0.57 ±0.18       | 5.00 ±0.79         | 10.85 ±0.30  | 0.44 ±0.05                |                        |
|                   | MS_03A       | 1/4/11                   | 0.04                      | 0.72 ±0.03                | 0.15 ±0.02       | 8.04 ±1.16         | 4.71 ±0.51   | 2.60 ±0.10                |                        |
|                   | C1           | 5/4/04                   | 1.37                      | 8.79 ±0.47                | 1.01 ±0.65       | 9.81 ±0.57         | 5.13 ±0.19   | 1.86 ±0.09                |                        |
|                   | V4           | 1/6/07                   | 0.11                      | 0.39 ±0.07                | 0.50 ±0.11       | 5.72 ±1.39         | 11.70 ±0.08  | 0.82 ±0.09                |                        |
|                   | V1           | 6/6/07                   | 0.22                      | 0.32 ±0.10                | 1.06 ±0.24       | 8.70 ±1.07         | 13.15 ±0.69  | 0.70 ±0.05                |                        |
|                   | V2           | 8/6/07                   | 0.10                      | 0.24 ±0.12                | 0.52 ±0.07       | 2.47 ±0.75         | 9.84 ±0.16   | 0.88 ±0.09                |                        |
|                   | VA           | 30/5/07                  | 0.07                      | 0.84 ±0.27                | 1.46 ±0.27       | 4.59 ±1.01         | 11.70 ±0.39  | 0.62 ±0.19                |                        |
|                   | V10          | 22/6/07                  | 0.06                      | 0.50 ±0.09                | -                | 1.05 ±0.19         | 6.14 ±0.01   | 0.64 ±0.12                |                        |
|                   | O_37B        | 27/3/11                  | 0.08                      | 1.17 ±0.28                | 0.08 ±0.01       | 5.19 ±0.66         | 5.80 ±0.41   | 3.91 ±0.22                |                        |
|                   | V6           | 14/6/07                  | 0.06                      | 0.54 ±0.12                | -                | 1.28 ±0.39         | 7.49 ±0.56   | 0.49 ±0.09                |                        |
|                   | O_36         | 26/3/11                  | 0.08                      | 3.73 ±2.17                | 0.28 ±0.07       | 4.39 ±0.86         | 6.32 ±0.41   | 4.43 ±0.15                |                        |
|                   | CF_16        | 2/4/11                   | 0.06                      | 0.96 ±0.24                | 0.16 ±0.01       | 4.45 ±0.20         | 4.49 ±0.07   | 4.71 ±0.51                |                        |
|                   | V7           | 16/6/07                  | 0.05                      | 0.88 ±0.03                | -                | 2.04 ±0.53         | 5.89 ±0.67   | 0.45 ±0.12                |                        |
| Meso-eutrophic    | C1           | 29/9/03                  | 0.67                      | 7.21 ±0.41                | 0.41 ±0.10       | 6.24 ±0.20         | 32.07 ±2.35  | 14.91 ±0.90               |                        |
|                   |              | 20/11/00                 | 0.80                      | 3.48 ±0.38                | 15.00 ±0.81      | 2.86 ±0.06         | 23.93 ±1.21  | 0.69 ±0.07                |                        |
|                   |              | 15/11/01                 | 0.74                      | 5.41 ±0.28                | 11.51 ±0.28      | 2.63 ±0.06         | 19.71 ±1.22  | 5.76 ±0.13                |                        |
|                   |              | 9/8/05                   | 0.19                      | 1.98 ±0.30                | 3.27 ±0.24       | 6.53 ±0.30         | 24.41 ±1.47  | 15.37 ±0.48               |                        |
| Date   | Value | Value_1 ± Standard Deviation | Value_2 ± Standard Deviation | Value_3 ± Standard Deviation | Value_4 ± Standard Deviation | Value_5 ± Standard Deviation | Value_6 ± Standard Deviation |
|--------|-------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| 12/3/03 | 0.70  | 12.04 ± 1.44                 | 18.42 ± 0.83                 | 3.64 ± 0.22                  | 3.66 ± 0.18                  | 3.93 ± 0.20                  |
| 7/5/01  | 0.36  | 2.88 ± 0.35                  | 10.17 ± 0.38                 | 4.13 ± 0.18                  | 24.69 ± 0.99                 | 15.97 ± 0.48                 |
| 7/8/02  | 0.29  | 6.10 ± 0.16                  | 5.99 ± 0.47                  | 2.91 ± 0.19                  | 25.41 ± 1.80                 | 28.85 ± 0.60                 |
| 18/8/99 | 0.35  | 5.90 ± 0.41                  | 23.05 ± 0.53                 | 3.25 ± 0.09                  | 23.86 ± 3.08                 | 23.34 ± 0.48                 |
| 13/2/02 | 0.87  | 14.04 ± 0.41                 | 49.38 ± 1.09                 | 3.55 ± 0.16                  | 25.29 ± 1.07                 | 2.78 ± 0.11                  |
| 14/5/02 | 1.15  | 7.49 ± 0.82                  | 53.35 ± 2.45                 | 10.11 ± 0.52                 | 15.81 ± 1.64                 | 2.79 ± 0.17                  |
| 7/8/01  | 0.45  | 5.86 ± 0.31                  | 21.37 ± 0.96                 | 3.81 ± 0.13                  | 28.67 ± 2.17                 | 40.56 ± 1.20                 |

Eutrophicated C1

| Date   | Value | Value_1 ± Standard Deviation | Value_2 ± Standard Deviation | Value_3 ± Standard Deviation | Value_4 ± Standard Deviation | Value_5 ± Standard Deviation | Value_6 ± Standard Deviation |
|--------|-------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| 17/11/98 | 1.64 | 6.43 ± 1.01                  | 124.95 ± 7.54                | 0.86 ± 0.08                  | 45.34 ± 1.25                 | 5.79 ± 0.12                  |
| 12/5/99  | 1.15 | 8.46 ± 1.66                  | 145.25 ± 4.41                | 3.33 ± 0.23                  | 10.18 ± 0.69                 | 2.79 ± 0.23                  |
| 12/2/01  | 3.39 | 4.40 ± 0.33                  | 157.17 ± 3.17                | 2.83 ± 0.16                  | 23.98 ± 0.75                 | 7.70 ± 0.16                  |
| 15/5/00  | 0.61 | 4.72 ± 0.12                  | 201.17 ± 10.33               | 10.71 ± 0.59                 | 10.23 ± 0.39                 | 2.47 ± 0.15                  |
| 7/8/00   | -    | 4.87 ± 0.76                  | 255.09 ± 7.72                | 3.79 ± 0.08                  | 23.51 ± 3.43                 | 6.66 ± 0.95                  |
| 7/2/00   | 2.90 | 8.48 ± 0.47                  | 300.68 ± 9.05                | 4.20 ± 0.18                  | 4.21 ± 0.32                  | 0.02 ± 0.00                  |
| 8/2/99   | 5.94 | 9.63 ± 0.86                  | 1104.25 ± 23.42              | 2.75 ± 0.18                  | 6.99 ± 0.33                  | 0.15 ± 0.01                  |

Data are means ± standard deviation (n = 3; for prokaryotes n = 9); -, not detected.
**SUPPLEMENTARY TAB. 2.** Overview of the ingestion rates and potential production rates estimated for the microzooplankton dilution experiments and the potential ingestion rates estimated in nanoplanckton dilution experiments. The stations are grouped and ordered according to Supplementary Tab. 1.

| Trophic condition | Station code | Sampling date (dd/mm/yy) | Microzooplankton dilution experiments (µg C L⁻¹ d⁻¹) | NP dilution experiments (µg C L⁻¹ d⁻¹) |
|-------------------|--------------|--------------------------|-----------------------------------------------------|--------------------------------------|
|                   |              |                          | Ingestion rates | Potential production rates | Ingestion rates |
|                   |              |                          | MPP  NP  HP  AP | MPP  NP  HP  AP | MPP  NP  HP  AP |
| Oligotrophic      | VIERA        | 24/6/07                  | -              | 1.19                | -              | 11.63       | -              | 2.88       | -              |
|                   | C1           | 15/12/99                 | 0.08           | -                    | 0.08           | -            | -              | 15.13      | -              |
|                   | C1           | 10/3/04                  | 0.05           | 0.89                 | 0.94           | 0.01         | 0.54          | 4.28       | 0.85          |
|                   | V3           | 5/6/07                   | 0.44           | 3.36                 | 0.33           | 0.40         | -             | 0.47       | 0.26          |
|                   | MS_03A       | 1/4/11                   | 0.20           | 13.93                | -              | 1.15         | 9.28          | -          | 0.84          |
|                   | C1           | 5/4/04                   | -              | 4.65                 | 0.61           | -            | 5.22          | 2.44       | 0.68          |
|                   | C1           | 8/6/07                   | 0.62           | 23.75                | 0.33           | 0.43         | -             | 22.29      | 0.14          |
|                   | V3           | 30/5/07                  | 0.56           | 4.48                 | 0.43           | 0.19         | 0.15          | 1.22       | 0.75          |
|                   | V10          | 22/6/07                  | -              | 13.20                | -              | 0.56         | 16.60         | -          | 3.97          |
|                   | O_37B        | 27/3/11                  | 0.18           | 2.22                 | 3.83           | 0.14         | 1.63          | 1.16       | 4.67          |
|                   | V6           | 14/6/07                  | -              | 8.65                 | -              | 0.48         | 11.59         | -          | 4.79          |
|                   | O_36         | 26/3/11                  | 0.19           | -                    | 0.42           | -            | -             | 3.62       | 4.39          |
|                   | CF_16        | 2/4/11                   | 0.73           | 3.50                 | 0.11           | -            | 2.95          | -          | 2.78          |
|                   | V7           | 16/6/07                  | -              | 1.26                 | 9.42           | -            | 1.87          | 11.17      | 3.08          |
| Meso-eutrophic    | C1           | 29/9/03                  | -              | 0.79                 | 44.04         | 10.48        | 0.33          | 28.60      | 6.71          |
|                   | C1           | 20/11/00                 | 10.52          | 40.12                | 3.01          | 49.58        | -             | 33.49      | -             |
|                   | C1           | 15/11/01                 | 3.38           | 11.34                | 2.20          | 4.11         | -             | 9.95       | 1.45          |
|                   | C1           | 9/8/05                   | 2.60           | 3.65                 | 29.82         | 12.87        | 8.53          | 2.17       | 16.10         |
|                   | C1           | 12/3/03                  | 9.39           | 1.86                 | 4.59          | -            | 4.71          | 0.70       | 4.70          |
|                   | C1           | 7/5/01                   | 2.43           | 1.09                 | 32.17         | 7.21         | 4.02          | 0.39       | 35.60         |
|                   | C1           | 7/8/02                   | 4.53           | 4.68                 | 37.77         | 18.01        | 5.93          | 9.33       | 24.22         |
|                   | C1           | 18/8/99                  | 0.56           | -                    | 39.43         | -            | 0.33          | 46.14      | -             |
|                   | C1           | 13/2/02                  | 6.06           | -                    | 35.47         | 1.55         | 1.69          | 23.38      | 0.85          |
|                   | C1           | 14/5/02                  | 23.78          | 2.25                 | 27.64         | 1.59         | 49.53         | 1.65       | 30.28         |
|                   | C1           | 7/8/01                   | 18.22          | 0.99                 | 53.54         | 28.18        | 36.25         | 3.58       | 47.14         |

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| Eutrophicated | C1 | 17/11/98 | 72.82 | 0.58 | - | - | 45.05 | 0.30 | - | - | 19.50 | 0.38 |
| 12/5/99 | 69.93 | 0.88 | 10.47 | - | 99.15 | 0.33 | 24.06 | - | 11.01 | 0.61 |
| 12/2/01 | 83.63 | 1.71 | 9.83 | 3.02 | 59.52 | 0.74 | 2.99 | 2.86 | - | 0.38 |
| 15/5/00 | 156.08 | 7.43 | 23.71 | 1.43 | 330.87 | 5.71 | 42.33 | 0.93 | 8.65 | - |
| 7/8/00 | 177.90 | - | 66.90 | 5.58 | 72.32 | - | 64.53 | 1.12 | 23.38 | 0.42 |
| 7/2/00 | 113.78 | 1.01 | 2.25 | - | 206.88 | 0.48 | 1.55 | - | - | 0.01 |
| 8/2/99 | - | 1.27 | 5.16 | 0.08 | - | 0.43 | 9.79 | 0.04 | 11.46 | - |

Data are means ± standard deviation (n = 3; for prokaryotes n = 9); MPP, microphytoplankton; NP, nanoplankton; HP, heterotrophic prokaryotes; AP, autotrophic prokaryotes; -, not detected.
**SUPPLEMENTARY TAB. 3.** Biomass, ingestion rates and potential production rates estimated in the nanoplankton dilution experiments carried out for the mesopelagic and bathypelagic layers.

| Station code | Biomass (µg C L⁻¹) | Ingestion rates (µg C L⁻¹ d⁻¹) | Potential production rates (µg C L⁻¹ d⁻¹) |
|--------------|---------------------|-------------------------------|---------------------------------|
|              | Nanoplankton        | Heterotrophic prokaryotes    | Heterotrophic prokaryotes      |
| O_36         | 0.08                | 0.57                          | 0.19                           | -                 |
| O_37B        | 0.11                | 0.75                          | 1.02                           | 0.84              |
| CF_16        | 0.31                | 7.24                          | 16.74                          | 10.61             |
| MS_03A       | 0.30                | 0.97                          | 1.10                           | 1.49              |
| OL_107       | 0.19                | 6.45                          | 13.29                          | 9.94              |
| VA           | 0.32                | 0.14                          | 0.05                           | 0.00              |
| V4           | 0.24                | 0.16                          | 0.20                           | 0.14              |
| V3           | 0.38                | 0.23                          | 0.91                           | 0.87              |
| V1           | 0.34                | 0.17                          | 1.00                           | 1.22              |
| V2           | 1.35                | 0.89                          | 3.20                           | 2.57              |
| V6           | 0.36                | 0.18                          | 0.59                           | 1.52              |
| V7           | 0.65                | 0.14                          | 1.27                           | 2.96              |
| VIERA        | 0.26                | 0.38                          | 2.51                           | 8.90              |
| V10          | 0.30                | 0.41                          | 1.18                           | 2.28              |

Data are means ±standard deviation (n = 3 for nanoplankton and n = 9 for heterotrophic prokaryotes); -, not detected.