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Oceanography and Ecology of Seamounts –

Indications of Unique Ecosystems

# The benthic community of the Great Meteor Bank

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**Abstract**

This qualitative study is part of an interdisciplinary analysis of the ecology of the Great Meteor Seamount and it will answer the basic questions of composition and origin of the invertebrate faunal community.

During the cruise M42/3 in the subtropical north Atlantic to the "Great Meteor Bank" in 1998 a variety of benthic sampling gear was employed on 48 stations. Only the macrobenthic invertebrates were part of this study. In total 155 species from 18 different major invertebrate taxa have been identified. For 66 of these species it was the first record on the Seamount, 19 had already been known, nine of the species are endemic on the Bank. Six species are entirely new to science.

The dominating North-East-Atlantic faunal elements (64%), the low number of African elements (30%) and of endemic species (6%) contradict the general acceptance that the seamount's ecology is determined by a faunal community which evolved through isolation. Vagile, as well as sessile life forms, filter feeders, suspension feeders, carnivores and grazer were found at an approximately equal ratio. This hints at a food supply that does not support any kind of specialists.

The reason for this faunal community is the location of the seamount in the North Atlantic subtropical gyre and in the center of the drain of the Mediterranean water, as well as the presence of other islands and seamounts in that region. The water masses continuously transport invertebrate larvae from the shelf sea either directly, or indirectly - over the seamounts and islands - to the bank. These larvae colonize the seamount und build up a stable population.

**Keywords**: Great Meteor Seamount, Atlantic Ocean, Mediterranean Sea, benthic invertebrate community, endemic species, faunal elements, colonization

**Introduction**

In the Northeast Atlantic Ocean there are different topographical structures, which have a significant influence on the distribution of faunal elements from the northern- and southern regions and the Mediterranean Seas. Visible on the surface are the "Macronesian Islands"(Islas Canarias, Madeira, Azores) and to the south the isles of Cape Verde (Figure 1).

The North Atlantic is divided into the North-American-Abyssal-Plain on one side and the Iberian-Basin and Canary-Abyssal-Plain by the Mid-Atlantic-Ridge. This ridge forms a barrier to the distribution of organism. Furthermore there are a number of seamounts in the area between the Iberomorrocan Gulf and the Mid-Atlantic Ridge. The Great Meteor Bank (30°N, 28°30'W) is one of the largest Seamounts in the North Atlantic, rising from a depth of 4500 m up to 287 m below sea level. Its summit consists of an even plateau with an extension of about 50×28 km (Ulrich 1971, Dietrich et al. 1975) and forms a part of the Atlantis-Meteor-Seamount-Complex. These seamounts evolved out of volcanoes along a small fracture zone, independently from hot spots. The Great Meteor Bank is assumed to be 40-50 Mio. years old (Hinz 1969, Grevemeyer 1994). The Seamount is well separated from the European and African continents by a rift valley formed by branches of the Canary-Abyssal-Plain in the Iberian Basin. This rift valley is about 750 km wide and approximately 5500 m deep. The distance to the nearest African coast is about 1600 km.


Figure 1: The location of the Great Meteor Seamount, the Macronesian Isles and Cape Verde in the Atlantic.

Keeping these facts in mind, the Great Meteor Seamount can be considered to be spatially isolated. In this region of the Northeast Atlantic Ocean the boreal, Mediterranean and subtropical faunal communities meet. The communities in the north are adapted to low temperatures and relatively euthrophic conditions, while the ones in the south are adapted to high salinities, high temperatures and oligothrophic conditions (Dietrich et al. 1975, Bearman, 2001).

Previous studies indicate fundamental differences between the fauna of the European shelf and the one of the Great Meteor Seamount. Compared to the African coasts the abundance of fish larvae and Euphausiacea seems to be significantly reduced (Nellen 1973/74, Weigmann 1974). The fauna of the Meteor Bank appears to be poorer in the number of species and individuals than the fauna of similar depth regions (Hempel & Nellen 1972). Additionally the presence of species on the plateau appears to be strongly ephemeral (Emschermann 1971)

On these facts two working hypotheses are based. Due to the isolation it is presumed that the colonization by species from the surrounding deep sea is most likely. Moreover, long-lived pelagic larvae from the Islands and the northwestern African shelf will only reach the Seamount once in a while. The rather random resettlement of the Seamount by continental species leads to a strong fluctuation in the composition of the fauna throughout years or centuries. Furthermore the age and isolation of the seamount should support the evolution of a high percentage of endemic species. This hypothesis is confirmed by values for endemites of 12-15% on comparable Seamounts (Wilson & Kaufmann 1987, Rogers 1994, Koslow & Gowlett-Holmes 1998), in some cases even higher values were found (Berrisford 1969).

Further hypotheses suppose that the food supply for the invertebrate benthos of this remote oligotrophic province of the ocean is rather poor. The nutrients set free on the ground of the bank via remineralization are largely carried away by water currents and contribute little to the community on and above the Seamount (Genin et al. 1986, Boehlert & Genin 1987). The expected benthic community is hence dominated by slow-growing sessile suspension feeders, detritiphagous organisms and grazers are less important and major predators are missing.

**Materials and Methods**

On the expedition with the research vessel "Meteor" M42/3 from August 25 to September 23 in 1998, specimens were taken from the Great Meteor Bank around 30°N – 28°30'W (FAO Fishing Areas No. 27 / No. 34) in the northeastern Atlantic Ocean. The samples contained marine invertebrates, zooplankton, ichtyoplancton and fishes. The material was fixed in 75% alcohol and shipped to Germany.

During this project taxonomical and biogeographical data on macrobenthic invertebrates from 48 stations were evaluated. Plankton organisms, pelagic invertebrates and fishes have been analyzed separately. The stations were located on the summit plateau, the slope and in the surrounding deep-sea. Thirtyone stations were at depths less than 400 m, ten of them between 400 m and 1000 m and seven deeper than 1000 m. The sampled invertebrates were identified to species level. The species composition was compared to reference literature data on the faunal composition of the European and African shelf and the Macronesian Isles. The percentage of endemites was determined and the species were classified after life form types.

Since not all of the taxonomic work could be done at the Ruhr-Universität Bochum, part of the material was sent to other scientists and institutes.

Due to different efficiencies of the gears and composition of catch no quantitative analyses were done. After the completion of all studies the material will be given to museums for archivation. An overview of the stations and their position can be found in the appendix (Table 1).

**Results**

Approximately 2400 benthic invertebrates belonging to 18 major taxa were collected. The dominating taxon are the benthic Crustacea, which represent more than half of all specimens. Within the Crustacea the Peracarida is the biggest taxon with over 800 specimens, in particular the Isopods with 700 exemplars, followed by the Decapods with app. 600 specimens. Next in the priority are the Echinoderms, mainly Echinoidea, with 270 specimens, Mollusks with 160 and Cnidarians (Hydrozoa and Anthozoa) and Poriferans with over 100 specimens. The other specimens are spread among ten more taxa, counts of specimens are below 100 individuals (Figure 2).

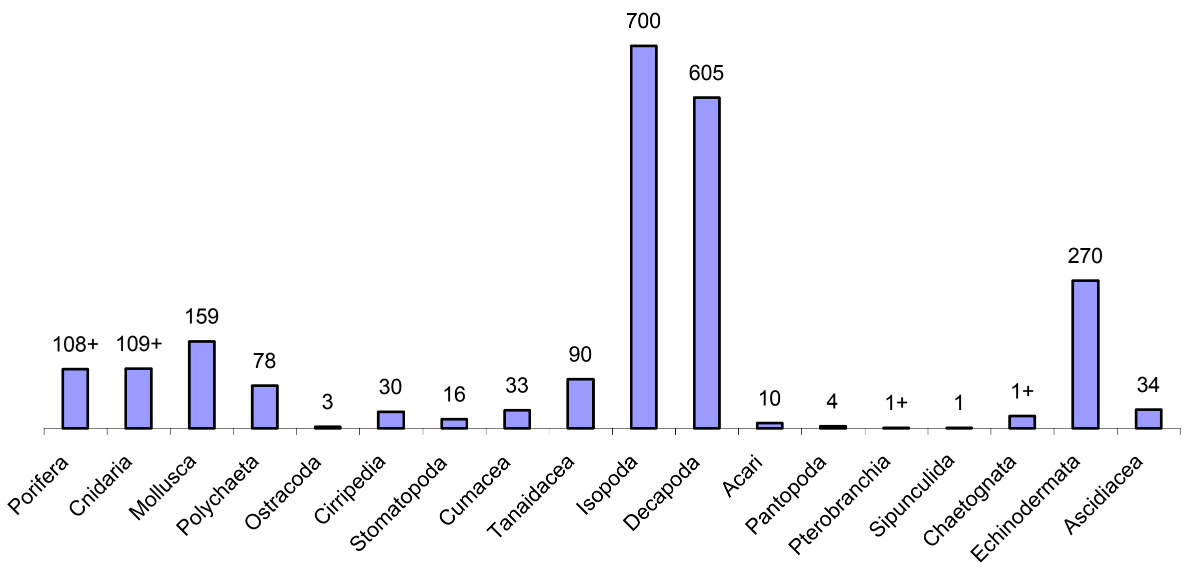


Figure 2: Number of specimens in the different taxa during M42/3

Currently 155 invertebrate species have been identified (Figure 3). For 66 of these species it was the first evidence on the Seamount, 19 were already known, nine of the species are endemic on the Seamount. Six of these endemic species are entirely new to science. For the taxa Tanaidacea, Porifera, Decapoda and Polychaeta the investigations are not completed yet and not all of the specimens could have been clearly identified.

The results on species level are as follows: The Crustaceans provide about a third of all identified species with specimens from 55 different species (35.5%). The below-mentioned chart of the subordinate taxa of the Crustaceans shows the decapods with 28 identified species (18%). A similarly richness of species could only be discovered in the Porifera. Following the

Decapods, Tanaids provide eleven species (7%), the Isopods nine (5.8%). Of the remaining Crustacea (Ostracoda, Cirripedia, Stomatopoda, Cumacea) only one or two species were found. Another divers group are the Cnidarians with 34 identified species (22%; 15 Hydrozoa and 19 Anthozoa). Mollusca are present with 25 species (16%). From this 25 species only 4 represent the taxon Bivalvia. The Echinodermata are still present with 6 species (4%). Of the remaining eleven taxa only one or two representatives could found. A list of species is shown in the appendix (Table 2).

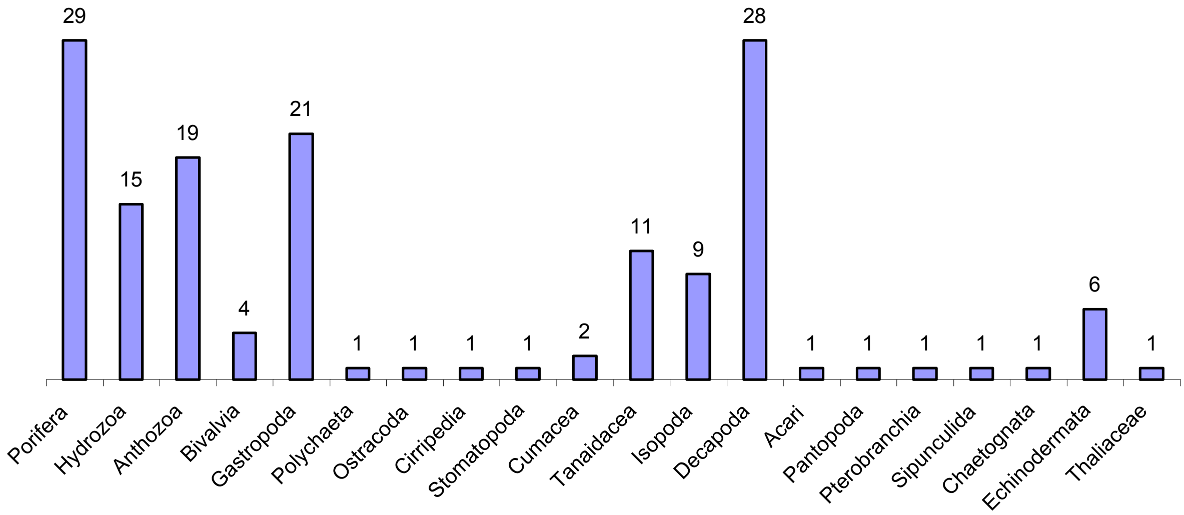


Figure 3: Numbers of species in the different taxa during M42/3.

Many of the species found on the Seamount are distributed in the northern Atlantic Ocean (Iceland - Greenland region), although in the Northeast Atlantic (European shores) the share in these faunal elements amounts to 31%. Animals, which are components of the fauna of the Iberomaroccan Gulf or the Mediterranean Sea form a similarly portion with 30%. The share in the fauna from Northwest Africa and the Cape Verde region also amounts to 30%. Only 3% of the species are amphiatlantic and only nine species (6%) are endemic on the Great Meteor Seamount (Figure 4).

38 species are filter feeders, 36 species of suspension feeders, 34 species predators (and/or carnivore) respectively scavengers. The group of grazers is represented with 12 species, the detritivore organisms with 23 species. Symbionts and parasites are represented with one species from the Crustacea. (Figure 5).

**Discussion**

The fauna of the Great Meteor Seamount is dominated by species from the North and Northeast - Atlantic Ocean and of the Mediterranean Sea (together 64%). Only 28% of the species also appear on the African Coasts (Figure. 4). Only a small number is amphiatlantic and similarly few species originate from the surrounding deep sea.

An explanation for the faunal community of the Great Meteor Seamount can be found in the surface current system of the northern Atlantic Ocean. The Great Meteor Seamount is located at 30°N and 28,5°W in the southeastern range of the subtropical gyre. The surface current system in this area is dominated by water masses of the Portugal- and Canary-Current. These currents have an average velocity of 0,5 kn (0,2-1 kn) southwestwards along the Iberian coast. Furthermore, the Great Meteor Seamount lies exactly in the center of the deep-water current from the Mediterranean Sea. The outflow of the Mediterranean Sea begins in the depths of the "Strait of Gibraltar" and moves - affected by the Coriolis force - to the southern coast of Spain and to northern Portugal. The upper border of the Mediterranean water is located in the Iberomaroccan Gulf at about 200-300 m depths. High temperatures and salinity characterize this water body. So the Mediterranean water is directed southwestwards to the Seamount by the Portugal Current coming from the north. The mean speed in 300 m depths still runs up to 0,1 kn. On its way to the west, based on the high salinity of 37,8 ‰, the Mediterranean water sinks to app. 1000 m and mixes with the colder North Atlantic Deep Water (NADW). On the Great Meteor Seamount the water body has a thickness of about 1200 m on the level of the bank and forms the "upper NADW" here. The upper boundary lies at 800 m and the lower at 2000 m, the salinity of the water measures 36,2‰ with 10-12 °C temperature (Bearman 2001, Tomczak & Godfrey 1994, Grasshof 1989, Dietrich et al. 1975). The mean current velocity below the thermocline above also lies at 0,1kn (Horn et al. 1971, Meincke 1971). The distance of the Seamount to the Canary Islands is 615 nautical miles (nm), to the Azores only 440 nm and to the African coast app. 800 nm. Between the continental coast, Madeira, the Azores and the Canary Islands there are 16 Seamounts including the Great Meteor Bank. Additionally to the islands there are a lot of shallow seamounts, which promote the distribution of the organisms. In those shallow waters the larvae have a possibility to settle down and to disseminate themselves with the current. The distance between Madeira and the East Islands of the Azores respectively the Cruiser Seamount (-293m) (see Figure 6) measures 500 nm. Larvae can cover this distance with help of the above-mentioned velocities in 40 to 60 days. Thus

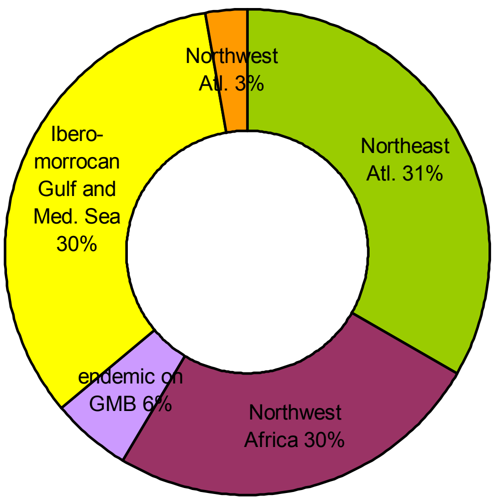


Figure 4: Faunal components of the Great Meteor Bank

Larvae can either directly, or indirectly reach the Seamount with the surface current or in the depths with the drain of the Mediterranean Water.

The deep sea can be excluded as the only permanent and continual resource for the settlement of the bank. Only some Isopods of the families of Desmosomatidae, Dendrotionidae and especially Ischnomesidae with vertical distribution between 0 and 6000 m depths (Kussakin 1973) seem to originate from the surrounding deep sea. Species of the latter taxons are quite rare in depths above 500m.

Hydrographic and oceanographic data taken during this expedition indicate a vertical current on the northwestern and the southeastern slopes of the Seamount. If the Asellota originate from the deep sea, these currents probably play a subordinate role for the emergence from the depth. The animals must immigrate actively from the surrounding deep sea, because the Asellota do not possess of pelagic larvae.

On the Great Meteor Seamount there is definitely a decrease in the total presence of species, since not all species have long lived larvae. However, a generic poverty of individuals cannot be proved with these data. This will only be possible after further systematic research recording of the Seamount fauna. However, it is certain that the South Atlantic has less influence than the North Atlantic. Uiblein et al. (1999) sees a comparable situation for the ichtyofauna of the seamount. He observed a mean number of endemites and the faunal composition is more comparable with the Northeast Atlantic. The low number of endemic invertebrates (only 6%) is a clear evidence for the settlement of the seamount from the outside. Comparable seamounts like the Vema Bank in the South Atlantic show a rate of endemites of 29% (Berrisford 1969). The low number of endemic species lets to the suspect that despite the age of the seamount of app. 45 Mio. years the evolution of endemites was not advanced by the isolation, but the ecological niches were occupied by immigrating species. Moreover, six of the endemites are new species. For these new species the distribution is not known and it is presumed that at least the Isopoda are also present in the surrounding deep sea. This would further reduce the percentage of endemites even further.

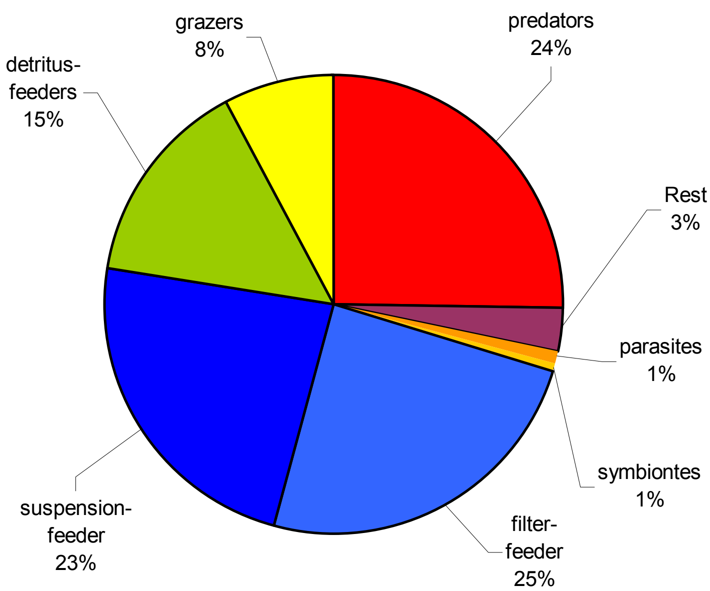


Figure 5: The rate of life forms types on the Great Meteor Bank.

There are indications for an almost non-variable faunal composition of the seamount. Many of the species were found on the bank. Almost all of the Gorgonaria (especially the Caryophyllidae and *Anomocora fecunda*) have already been recorded from the seamount in 1967, 1970 and 1980 (Thiel 1970, Emschermann 1971, Hempel & Nellen 1972, Grasshoff 1989). Hempel & Nellen (1972) had probably found *Hetealepas meteoensis* (Cirripedia) already in 1967 as well as the sea urchin *Echinus melo* and *Coelopleurus floridanus*. Also *Plesionika heterocarpus*, which was mentioned as a fish food by Ehrich (1977), and *Acanthohalacarus reticulatus* (Halacaridae) could have been found before. At least for a part of the seamount population a certain continuousness is recognizable. The hypothesis of an ephemeral fauna cannot be confirmed.

The "Taylor-columns", observed on seamounts (Owens & Hogg 1980, Chapman& Haidvogel 1992) and proven for the Great Meteor Bank, do not seem to have an negative influence on the diversity of the benthic fauna. All life form types are represented in a balanced relation: detritus feeders, filter feeders, suspension feeders and the predators and grazers. A community of slow growing sessile suspension feeders, which depend on a rare marine snow, cannot be proved. The presence of filter feeders and suspension feeders suggests that there must be enough particular organic matter in the water masses above the seamount, since nearly half of the organisms feed on the free water masses.

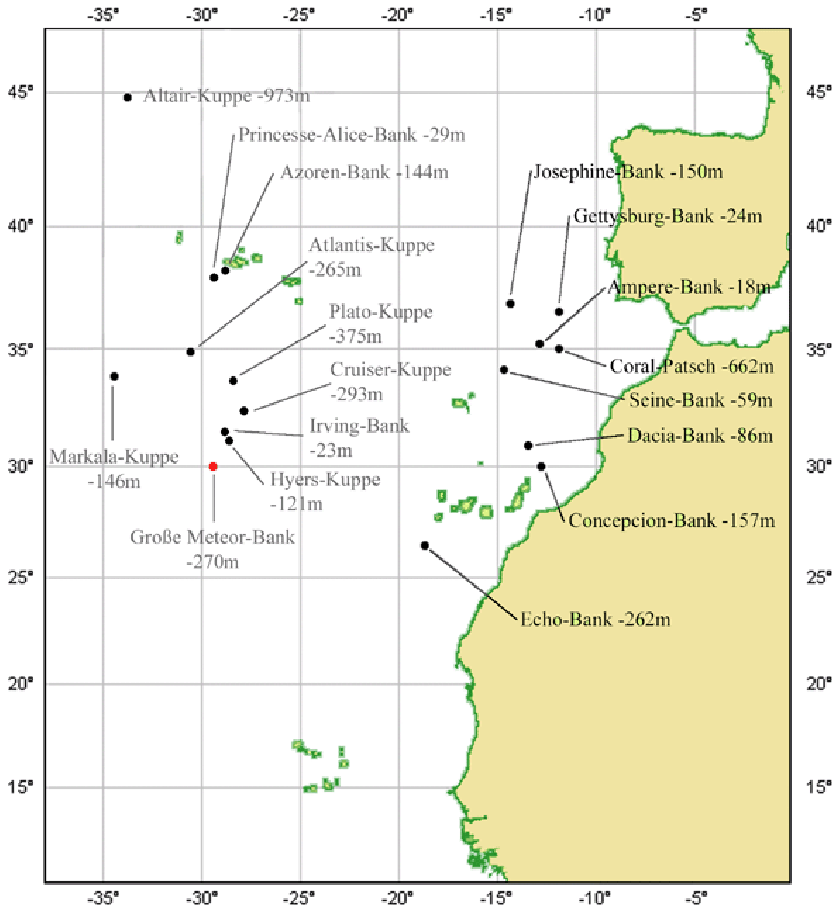


Figure 6: A map of the Northeast Atlantic Ocean and the location of Islands and the Seamounts

The distance from the Great Meteor Seamount to the African Coast or to the Cape Verde is 1600 km. An expansion of benthic invertebrate species over the seamount out to south west is almost impossible, because the expansion would have to take place against the main direction of the

Canary Current. Also, there are no further seamounts or islands south of the Great Meteor Seamount, thus forming a natural barrier to dispersal.

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FAO: Food and Agriculture Organization of the United Nations: http://www.fao.org/fi/body/rfb/index.htm

GEBCO: PANGAEA, Network for Geological and Environmental Data: http://www.pangaea.de

Mast: The European Register of Marine Species under the Mast (Marine Science and Technology) programme: http://erms.biol.soton.ac.uk/

Nmnh: World List of Marine, Freshwater and Terrestrial Isopod Crustaceans, Smithsonian National Museum on Natural History: http://www.nmnh.si.edu/iz/isopod/

Checklist of stomatopod crustaceans from the Atlantic and East Pacific Regions http://www.blueboard.com/mantis/taxon/list/cl1.htm

University of Southern Mississippi, Tanaidacea Home Page: http://tidepool.st.usm.edu/tanaids/index.html

## Appendix

Table 1: List of Stations from the expedition M42/3 from August 25 to September 23 in 1998. Abbreviations: GKG: Giant-Boxcorer, BO: Bongo, MUC: Mulitcorer, DG: Dredge, BT: Bottom-Trawl, EBS: Epibenthic-sledge, LL: Longline

| Stat. No. | Date | Time | Gear | Position Start | depth [m] |
|---|---|---|---|---|---|
| **451** | 01.09.98 | 23:35 | GKG 1 | 30°08,3'N-28°34,8'W | 455 |
| **452** | 02.09.98 | 06:32 | GKG 2 | 30°05,4'N-28°32,8'W | 297 |
| **454** | 02.09.98 | 19:02 | BO 1 | 29°37,1'N-28°22,2'W | 200 |
| **455** | 03.09.98 | 03:43 | GKG 3 | 29°42,9'N-28°22,7'W | 297 |
| **456** | 03.09.98 | 11:37 | GKG 4 | 29°48,2'N-28°29,7'W | 303 |
| **459** | 04.09.98 | 13:18 | MUC 1 | 29°45,7'N-28°44,3'W | 2722 |
| **461** | 05.09.98 | 03:44 | BO 2 | 29°47,7'N-28°38,2'W | 978 |
| **465** | 5-6.09.98 | 14:20 | bow-net 1 | 29°48,3'N-28°36,5'W | 303 |
| **466** | 05.09.98 | 17:04-17:34 | DG 1 | 29°53,5'N-28°36,6'W | 301 |
| **467** | 06.09.98 | 02:34 | GKG 5 | 30°02,1'N-28°32,6'W | 292 |
| **469** | 06.09.98 | 12:51-13:37 | BT 1 | 30°04,7'N-28°32,6'W | 302 |
| **470** | 06.09.98 | 12:51-13:37 | BT 2 | 30°03,4'N-28°32,7'W | 311 |
| **471** | 06.09.98 | 17:04-17:37 | BT 3 | 29°47,3'N-28°29,1'W | 301 |
| **480** | 07.09.98 | 12:18-12:39 | BT 5 | 29°45,4'N-28°22,6'W | 312 |
| **481** | 07.09.98 | 14:00-14:20 | BT 6 | 29°51,7'N-28°21,1'W | 370 |
| **482** | 07.09.98 | 15:43-16:01 | BT 7 | 29°54,8'N-28°23,4'W | 325 |
| **483** | 07.09.98 | 15:43-16:01 | BT 8 | 30°05,2'N-28°26,6'W | 332 |
| **484** | 07.09.98 | 05:07 | MUC 2 | 29°25,5'N-28°33,9'W | 4015 |
| **486** | 08.09.98 | 20:28-20:47 | BT 9 | 29°45,7'N-28°22,9'W | 310 |
| **487** | 08.09.98 | 22:21-22:38 | BT 10 | 29°54,1'N-28°22,6'W | 326 |
| **488** | 09.09.98 | 00:40-00:55 | BT 11 | 30°02,9'N-28°32,4'W | 297 |
| **489** | 09.09.98 | 04:41 | GKG 6 | 29°57,0'N-28°23,1'W | 323 |
| **492** | 09.09.98 | 15:41 | GKG 7 | 29°58,5'N-28°29,7'W | 294 |
| **494** | 10.09.98 | 01:57-02:30 | BT 12 | 29°46,7'N-28°28,3'W | 302 |
| **495** | 10.09.98 | 05:23-05:39 | BT 13 | 30°05,2'N-28°26,7'W | 332 |
| **496** | 10.09.98 | 08:09-08:30 | BT 14 | 29°56,1'N-28°37,6'W | 310 |
| **497** | 10.09.98 | 11:58-12:16 | BT 15 | 29°56,0'N-28°19,4'W | 435 |
| **505** | 11.09.98 | 16:38 | GKG 8 | 30°18,3'N-28°03,3'W | 4005 |
| **506** | 12.09.98 | 07:16 | MUC 3 | 30°12,2'N-28°14,2'W | 3009 |
| **513** | 10-13.9.98 | 16:40 | bow-net 2 | 29°57,4'N-28°22,2'W | 330 |
| **514** | 13.09.98 | 17:08-17:34 | EBS 1 | 29°57,5'N-28°21,7'W | 323 |
| **515** | 13.09.98 | 20:48-20:58 | EBS 2 | 29°48,9'N-28°29,0'W | 301 |
| **516** | 14.09.98 | 05:01-05:14 | EBS 3 | 29°49,6'N-28°36,7'W | 321 |
| **517** | 14.09.98 | 07:29-07:42 | EBS 4 | 30°05,9'N-28°32,2'W | 314 |
| **518** | 14.09.98 | 08:54-09:12 | EBS 5 | 30°02,0'N-28°32,0'W | 295 |
| **519** | 14.09.98 | 16:30-16:47 | EBS 6 | 30°06,1'N-28°24,5'W | 418 |
| **520** | 14.09.98 | 18:21-18:37 | EBS 7 | 30°06,0'N-28°24,3'W | 438 |
| **521** | 14.09.98 | 19:55-20:05 | EBS 8 | 30°06,0'N-28°23,3W | 496 |
| **522** | 14.09.98 | 21:34-21:49 | EBS 9 | 30°05,7'N-28°23,0'W | 553 |
| **548** | 17.09.98 | 14:13 | MUC 4 | 29°52,8'N-28°14,2'W | 2320 |
| **549** | 17.09.98 | 10:00-20:30 | LL 2 | 29°53,5'N-28°17,9'W | 1099 |
| **551a** | 18.09.98 | 05:30-05:40 | EBS 10.1 | 29°53,4'N-28°19,5'W | 490 |
| **551b** | 18.09.98 | 09:55-10:06 | EBS 10.2 | 29°52,5'N-28°22,0'W | 436 |
| **552** | 18.09.98 | 13:37-13:47 | EBS 11 | 29°53,9'N-28°22,0'W | 331 |
| **553** | 17-18.9.98 | 33 h | bow-net 3 | 29°56,3'N-28°22,6'W | 323 |
| **563** | 20.09.98 | 22:47-23:13 | BO 3 | 29°49,0'N-28°38,5'W | 408 |
| **565** | 21.09.98 | 02:45-02:55 | EBS 12 | 29°39,4'N-28°22,9'W | 315 |
| **566** | 21.09.98 | 06:15 | MUC 5 | 29°32,7'N-28°29,9'W | 3074 |

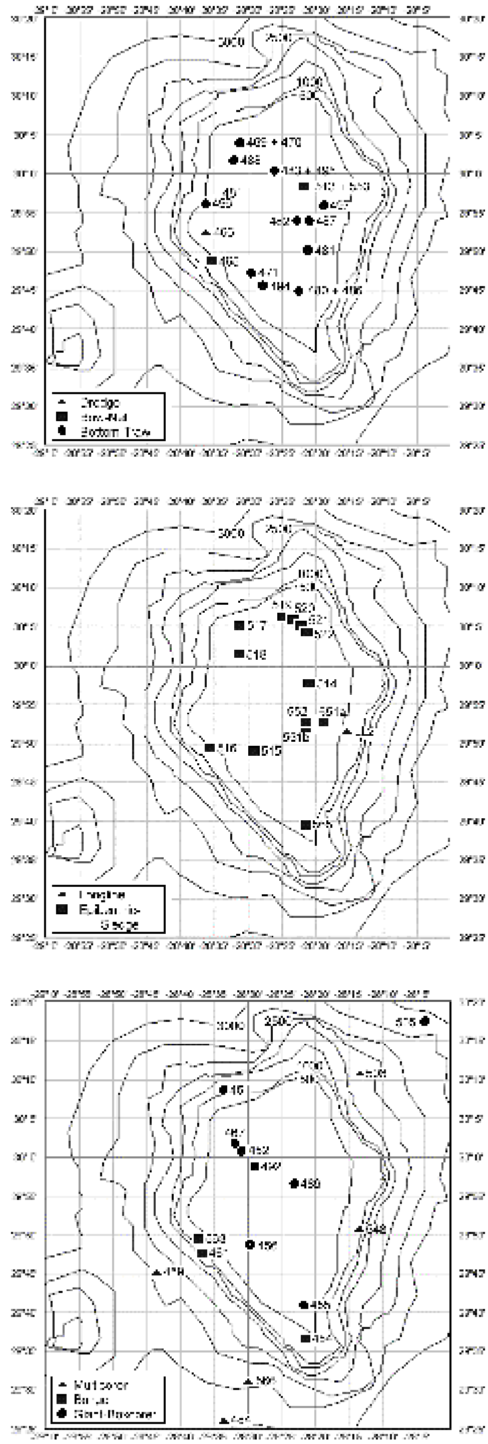

Figure 2: An overview about the location of the Stations on the Great Meteor Seamount.
Sources: GEBCO

# Table 2: Species list of the Great Meteor Seamount. August 2002

**Porifera**
*cf. Pseudaxinella sp*
*Auletta sycinularia* Schmidt,1870
*cf. Sigmatoxella sp. in. det.*
*Bubaris cf. n. sp.*
*Jaspis n. sp.*
*Corallistes nolitangere* Schmidt, 1870
*Myrmekioderma cf. n. sp*
*Esperiopsidae sp. in. det.*
*Tricheurypon viride* (Topsent,1889 as *Hymeraphia*)
*Erylus stellifer* Topsent ?
*Erylus euastrum* (Schmidt, 1868 as *Stellettinopsis*)
*Epipolasis sp. in. det.*
*Rhaphisia sp. in. det.*
*Haliclona sp. 1, sp. 2 sp. 3 in. det.*
*cf. Chiastosia pecquery*
*Hymedesmia sp. in. det.*
*Podospongia loveni* Du Bocage, 1869
*Leiodermatium lyncaeus* Schmidt, 1870
*Antho (Plocamia) sp. in. det.*
*Antho (Plocamia) cf. ornata*
*Pachastrella monilifera* Schmidt, 1868
*Petrosia ficiformis (Poiret ?)*
*Lithoplocamia atlantica (Lévi & Vacelet)*
*Suberitidae sp.1 in. det.*
*Thenea cf. muricata* (Bowerbank 1858)
*Discodermia ramifera* Topsent, 1892
*Discodermia sp.*

**Cnidaria - Hydrozoa**
*Modeeria rotunda* (Quoy & Gaimard, 1827)
*Acryptolaria conferta* (Allman, 1877)
*Cryptolaria pectinata* (Allman, 1888)
*Filellum serratum* (Clarke, 1879)
*Halecium* sp. *in. det.*
*Aglaophenia tubulifera* (Hincks, 1861)
*Antennella secundaria* (Gmelin, 1791)
*Antennella siliquosa* (Hincks, 1877)
*Nemertesia antennina* (Linnaeus, 1758)
*Nemertesia belini* Bedot, 1916
*Polyplumaria flabellata* G. O. Sars, 1874
*Diphasia nigra* (Pallas, 1766)
*Diphasia margareta* (Hassall, 1841)
*Sertularella gayi* (Lamouroux, 1821)
*Symplectoscyphus tricuspidatus* (Alder, 1856)

**Cnidaria - Anthozoa I**
*Anomocora fecunda* (Pourtalès, 1871)
*Caryphyllia cyathus* (Ellis & Solander, 1786)
*Caryphyllia sp. in. det.*
*Flabellum chunii* Marenzeller, 1904
*Madracia profunda*

**Cnidaria - Anthozoa II**
*Acanthogorgia armata* Verrrill, 1878
*Antipathes sp. in. det.*
*Callogorgia verticillata* (Pallas, 1786)
*Cirrhipathes cf. spiralis* (Linnaeus, 1758)
*Dentomuricea meteor* Grasshoff, 1977
*Leiopathes glaberrima* (Esper, 1792)
*Muriceides sceptrum* (Studer, 1890)
*Nicella granifera* (Kölliker, 1865)
*Paracalyptrophora josephinae* (Lindström, 1877)
*Paramuricea grayi* (Johnson, 1861)
*Parantipathes cf. larix* (Esper, 1790)
*Placogorgia terceira* Grasshoff, 1977
*Swiftia dubia* Thomson, 1929
*Viminella flagellum* (Johnson, 1863)

**Mollusca – Bivalvia**
*Asperarca nodulosa* (Mueller, 1776)
*Spondylus gussonii* (Costa, 1829)
*Pholadomya africana* Locard, 1898
*Verticordia acuticostata* (Philippi, 1844)

**Mollusca - Gastropoda**
*Belomitra quadruplex* (Watson, 1882)
*Bursa ranelloides* (Reeve, 1844)
*Halgyrineum louisae* (Lewis, 1974)
*Ranella olearia* (Linnaeus, 1758)
*Coralliophila (Lattiaxis) sentix* (Bayer, 1971)
*Opalia (Opaliopsis) atlantis* (Clench & Turner 1952)
*Emarginula multistriata* Jeffreys, 1882
*Gibberula abyssicola* Locard, 1897
*Janthina exigua* Lamarck, 1818
*Janthina janthina* (Linnaeus, 1758)
*Umbraculum mediterraneum* (Lam., 1819)
*Alvania cimicoides* (Forbes, 1844)
*Alvania sp.2 in. det*
*Rissoina sp. 1, sp. 2 in. det*
*Basilissopsis watsoni* (Dautzenberg & Fischer 1897)
*Strobiligera sp. in. det*
*Calliostoma sp. in. det*
*Gibbuls sp. in. det*
*Benthonellania sp. in. det*
*Laubierina sp. in. det (Larvalschale)*

**Annelida - Polychaeta**
*Hyalinoecia tubicola* (O.F. müller, 1776)

**Crustacea - Ostracoda**
Bairdiid sp. *in. det*

**Crustacea – Cirripedia**
*Heteralepas meteoensis* Carriol, 1998

**Crustacea - Stomatopoda**
*Pseudosquilla ceresii* (Roux, 1828)

**Crustacea - Cumacea**
*Campylaspis laticarpa* Hansen, 1920
*Platycuma holti* Calaman, 1905

**Crustacea - Tanaidacea**
*Libanius pulcher* Lang, 1971
*Collettea sp. in. det.*
*Leptognathia sp. 1, sp. 2, sp. 3 in. det.*
*Typhlotanais sp. 1, sp. 2*
*Paratyphlotanais sp. 1, sp. 2, sp. 3 in. det.*
*cf Macrinella sp. in. det.*

**Crustacea – Isopoda**
*Munna fabricii* Kröyer, "1849"
*Desmosoma intermedium* Hult, 1936
*Joeropsis montalentii* Fresi, 1968
*Janiropsis breviremis* Sars, 1899
*Stylomesus* n. sp.
*Dendrotium* n. sp.
Astacilla n. sp.
*Eyridice truncata* Norman, 1868
*Aega sp. in. det.*

**Crustacea - Decapoda "Anomura"**
*Cancer bellianus* Johason, 1861
*Dardanus arrosor* (Herbst, 1796)
*Dromia personata* (Linnaeus, 1758)
*Galathea sp. in. det.*
*cf. Pachygrapsus cf. marmoratus* (Fabricius, 1787)
*Homola barbata* (Fabricius, 1793)
*Latreillia elegans* Roux, 1830
*Parthenope cf. expansa* (Miers, 1879)
*Ebalia sp. cf. nux* A.M.Edwards, 1883
*Pisa tetraodon* Pennant, 1777
*Maja sp. in. det.*
*cf. Pagurus sp. in. det.*
*Euchirograpsus liguricus* H.M.Edwards, 1853
*Pilumnus hirtellus* (Linnaeus, 1761)
*Monodaeus couchi* Couch, 1851
*sp.1 in. det.*
*sp.2 in. det.*
*sp.3 in. det.*
*sp.4 in. det.*

**Crustacea - Decapoda "Natantia"**
*Lysmata seticaudata* Risso, 1816
*Heterocarpus ensifer A. Milne Edwards,1881*
*Metapenaeus monoceros* (Fabricius, 1798)
*Metapenaeus sp.* in. det.
*Pandalus sp. in. det.*
*Plesionika edwardsii* (Brandt, 1851)
*Plesionoka sp. in. det.*
*Parapeneus longirostris* (Lucas)
*Processa edulis* (Risso, 1816)

**Acari – Halacarinae**
*Acanthohalacarus reticulatus* Bartsch, 2001

**Pantopoda**
*Achelia cf. vulgaris* (Costa, 1861)

**Pterobranchia**
*Rhaddopleura normani* Allman, 1869?

**Sipunculida**
*Golfingia margaritacea (*Sars, 1851)

**Chaetognata**
sp. in. det.

**Echinodermata**
*Echinus melo* Lamarck, 1816
*Cidaris cidaris* (Linnaeus, 1761)
*Coelopleurus floridanus* A. Agassiz, 1872
*Spatangus purpureus* (O.F. Müller, 1776)
*cf. Echinocyamus pusillus* O.F. Müller, 1776
*Antedon mediterranea* (Lamarck, 1816)

**Ascidiacea- Thaliaceae**
*Pyrosoma atlanticum* (Person)