Preliminary Observations on benthic communities in a Submarine cave influenced by hydrothermal springs

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Typical submarine caves exhibit very poor and scattered benthic communities (CINELLI *et al.*, 1978; BALDUZZI *et al.*, 1989), with gradual decrease in species numbers and organism cover along the outside-inside gradient (GILI *et al.*, 1986). Absence of light and poor water exchanges are considered as the major reasons for oligotrophy and severe reduction in organism cover and biomass (FICHETZ, 1990).

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The Grotta Azzurra marine cave opens in the carbonatic rock of Capo Palinuro (Tyrrhenian Sea). The cave has a volume of about 120000 m^3 and a maximum depth of 33 m (ALVISI *et al.*, in press). A peculiarity of the Grotta Azzurra is the presence of underwater sulphurous springs which form a thermo- and chemocline below the roof of the cave.

Preliminary surveys in the Grotta Azzurra led to the identification of 5 major biological zones (fig.2):

1- immediately outside. Photophilic algal assemblages, dominated by *Dictyota dichotoma*, occur;

2- entrance. Light is severely reduced and crustose coralline species are present;

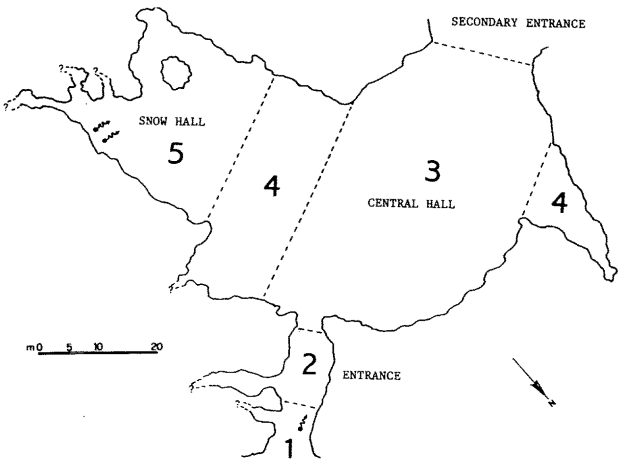
3- central hall. It is virtually dark. Dense faunal assemblages are dominated by passive filter-feeders like *Eunicella cavolinii* and *Eudendrium* sp. This might be explained by efficient water exchanges;

4- completely dark belts. Organism cover is reduced and fauna impoverished as typical of caves with a complete confinement gradient;

5- "Sala della Neve" (Snow Hall). It is the innermost part ot the cave, completely dark and extremely confined in terms of hydrodynamic conditions and trophic alloctonous inputs. Warm sulphur-rich waters accumulate to the vault where a complex of *Beggiatoa*-like filamentous forms and gelatinous colonies develop. White flakes of organic matter detach from the bacterial mats and fall to the bottom. Below, very rich and dense faunal assemblages occur on both the walls (sponges, bivalves, scleractinia) and the sediment floor (sabellid polychaetes, *Pinna nobilis*, *Antedon mediterranea*, *Ophioderma longicaudum*). Estimated biovolumes of specimens of the sponge *Geodia cydonium* and of the scleractinian coral *Astroides calycularis* resulted significantly larger for organisms collected here than in other parts of the cave.

These data provide a strong proof of enhanced trophic conditions, in contrast with the cave trophic depletion hypothesis.

Fig. 1. Biological zonation in the Grotta Azzurra: for explanation see text. (Plan of the cave re-drawn from ALVISI *et al.*, in press)



It appears that the unusual launal richness of the Grotta Azzurra is correlated with the presence of sulphide springs. Areas interested by chemosynthesis, in fact, appear to be biologically complex and very productive habitats (TARASOV *et al.*, 1990). Preliminary analysis of stable carbon isotopes by Dr. M.C. Kennicutt of Texas A. & M. University in organisms collected from the Sala della Neve seem to support this hypothesis (SOUTHWARD & SOUTHWARD, 1992). More investigations will be carried out during future research, which will assess organic carbon fluxes in the cave and trophic transfers to the benthos.

REFERENCES

ALVISI M., BARBIERI F., BRUNI R., CINELLI F., COLANTONI P., GRANDI G. & MALTONI P., in press.- *Atti Speleomar* '91.

BALDUZZI A., BIANCHI C.N., BEORO F., CATTANEO VIETTI R., PANSINI M. & SARA M., 1989.- *Topics in Marine Biology*. J.D. Ros (Ed.). *Scient.Mar.*, 53 (2-3): 387-395.

CINELLI F., FRESI E., MAZZELLA L., PANSINI M., PRONZATO R., SVOBODA A., 1978.- *Biology of benthic organisms*. B.F. Keegan, O. Ceidigh and P.J.S. Boaden (Eds.). Pergamon press, London: 173-184.

GILI J.M., RIERA T., ZABALA M., 1986.- *Mar. Biol.*, 90: 291-297.

FICHETZ R., 1990.-*Hydrobiologia*, 207: 61-69.

TARASOV V.G., PROPP M.V., PROPP L.N., ZHIRMUNSKY A.V., NAMSARAEV B.B., GORLENKO V.M. & STARYNIN D.A., 1990.- *P.S.Z.N.I Mar. Ecol.*, 1 : 11-23.

SOUTHWARD A.J. & SOUTHWARD E., 1992.- *M.B.A.U.K Annual Report 1991*: 35-37.