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Seasonal changes in the epifaunal community on the shallow-water gorgonian *Melithaea flabellifera*

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Periodic surveys of the subtidal epifaunal community on the gorgonian *Melithaea flabellifera* were conducted over a five year period at the Izu Peninsula, southern Japan. The occurrence patterns of epifaunal species on *M. flabellifera* were examined. The epifauna consisted of 16 species representing five phyla. The amphipod *Incisocalliope symbioticus* dominated (usually >80%) and occurred throughout the study.

Associated communities on gorgonians were reported by Patton (1972), Wendt et al. (1985), Spotte & Bubucis (1996) and Goh et al. (1999). In these previous studies, however, samplings have been conducted only once or over short periods at least. Such short-term sampling is clearly insufficient to detect temporal patterns in epifaunal communities of gorgonians. Therefore, monthly or fortnightly field samplings of the epifauna on *Melithaea flabellifera* (Kükenthal) were conducted over a five year period at a subtidal rocky area of Oura Bay, Shimoda, Izu Peninsula, Japan (34°40′N 138°57′E). The species is one of the most abundant gorgonians on the south-east coast of Japan. So far, regarding the epifauna on *M. flabellifera*, only taxonomic studies have been made for the species such as the flatworm *Apidioplana okadai* Kato, the polychaete *Alcyonosyllis glasbyi* San Martín & Nishi and the amphipod *Incisocalliope symbioticus* (=*Pleusymtes symbiotica* Gamo & Shinpo) (correction and revision of the genus name were by S. Ishimaru, personal communication and Bousfield & Hendrycks (1995)). *Incisocalliope symbioticus* has been found to be host-specific to melithaeid gorgonians on the basis of N.H.K.'s field samplings, field experiments and Gamo & Shinpo (1992).

Periodic collections were made from May 1998 to April 2003, fortnightly from March 1999 to April 2000 and from February to August 2002, and monthly in the other periods. Twenty gorgonians were haphazardly selected at each sampling time and a piece (about 4 cm maximum width) was sampled from each. For each sample, all epifauna larger than 500 m were carefully separated from the gorgonian branches under a binocular microscope. Dry weight was measured after drying the gorgonian sample at 80°C for over 48 h to constant weight. Water temperature recorded at the study site varied from 13.2°C on 19 February 2000 to 27.0°C on 9 September 2002.

In the 1600 periodically collected gorgonian samples, totalling 283.30 g dry weight, 16 epifaunal species representing five phyla were identified. The species consisted of 14 mobile and two sessile species: a bryozoan (0.01%) and the bivalve *Pteria brevialata* (Dunker) (0.05%). No algae occurred in the samples. Crustaceans made up 96.0% which was largely due to the occurrence of the amphipod *Incisocalliope symbioticus*, which accounted for 84.9% of the total. Monthly and yearly changes in the density were evident for the combined total species and each of the seven species that made up more than 1% (Figure 1, Table 1). The amphipod *Caprella californica* Stimpson was particularly abundant on 7 July 1998, mainly due to the presence of numerous juveniles. However, its occurrence was restricted to around summer in 1998, 1999 and 2002 (Figure 1B). The amphipod *Incisocalliope symbioticus* occurred throughout the study period, increased from January to March and decreased thereafter from August to September (Figure 1C). The amphipod *Microjassa cumbrensis* (Stebbing & Robertson) had one notable peak from July to October 1999, but was seldom found in other years (Figure 1D). The copepod *Enalcyonium* sp. occurred intermittently but was present on more than half of the sampling occasions (Figure 1E). The copepod *Oncaea venusta* Philippi was recorded from late August to April but was collected in less than one-third of the sampling times (Figure 1F). The flatworm *Apidioplana okadai* almost continuously occurred throughout the study period (Figure 1G). The ophiuroid *Ophiothela danae* Verrill was present almost throughout the year and occurred at the highest densities from September to December, except for 1998 (Figure 1H). Other species that made up less than 1% were the polychaete *Alcyonosyllis glasbyi*, the gastropod *Primovula rhodia* (A. Adams), a trochid gastropod, the amphipod *Caprella scaura* Templeton, *Dulichia* sp., and asellot isopods. There was a tendency that host-specific species such as *I. symbioticus* occurred throughout the study period, whereas generalist species such as *Caprella californica*, *Microjassa cumbrensis* and *Oncaea venusta* occurred only in less than one-third of the total sampling times.

The epifaunal community on the gorgonian *Melithaea flabellifera* was less diverse than those in previous studies, both in terms of the species abundance and the number of phyla. The most remarkable feature was the overwhelming numerical dominance of a single amphipod species, *Incisocalliope symbioticus*. This phenomenon has not been known in other studies of gorgonian epifauna. The low species diversity in the epifauna on *M. flabellifera* may result from the limited occurrence of sessile animals and algae, which can enhance the complexity of microhabitats for mobile species. It is probable that antifouling agents from gorgonians known to work against sessile animals, algae and protists (see Coll, 1992 for review) are also present and work in *M. flabellifera*.

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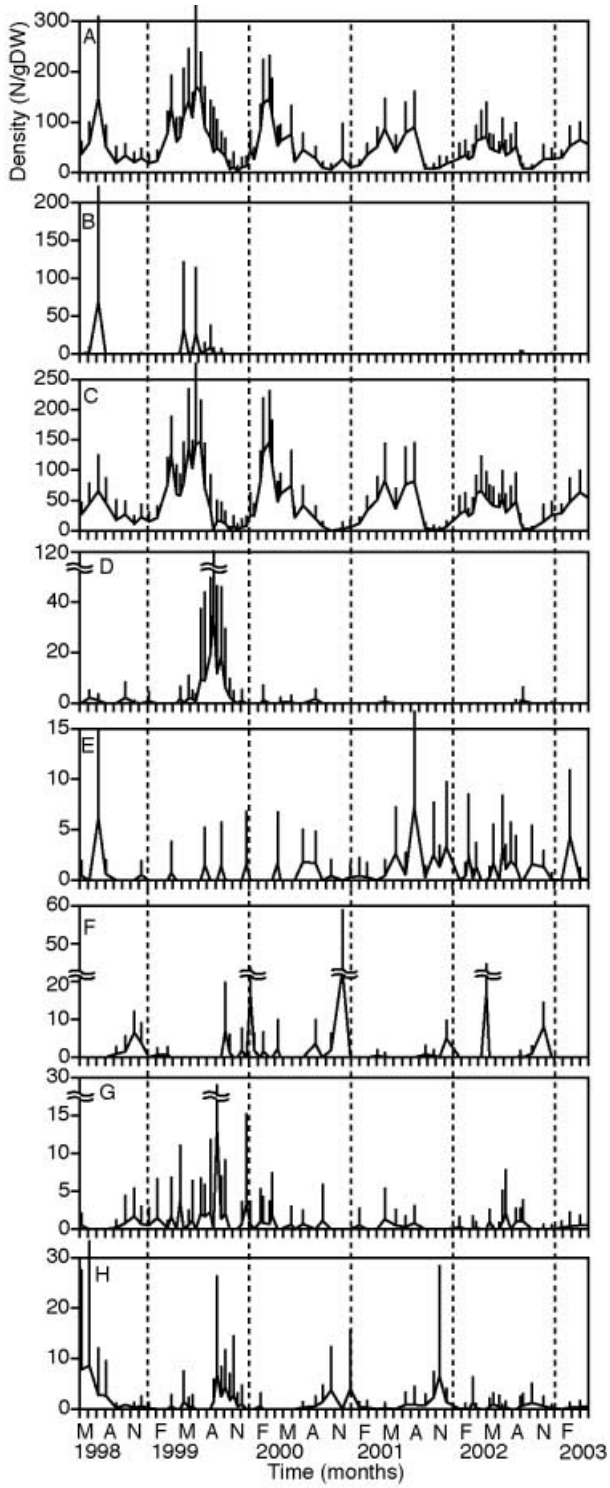

Figure 1. Mean density of total and each epifaunal species on *Melithaea flabellifera* (number of individuals per gram of gorgonian dry weight). Error bar: standard deviation. (A) Total epifaunal animals; (B) *Caprella californica*; (C) *Incisocalliope symbioticus*; (D) *Microjassa cumbrensis*; (E) *Enalcyonium* sp.; (F) *Oncaea venusta*; (G) *Apidioplana okadai*; (H) *Ophiothela danae*.

Table 1. *Two-way analyses of variance for yearly or monthly changes in the density of the total species and for each of the seven species shown in Figure 1. Numerical values indicate the* F*-value. Monthly data were combined into two-monthly intervals. df: 4 for year, 5 for month. Residual: 1570.*

Species	T	CC	IS	MC	ES	OD	OV	AO
Year	28.7*	3.7†	26.5*	10.8*	13.0*	2.4	1.7	5.4*
Month	45.7*	4.5*	63.0*	3.5†	12.5*	4.1†	12.7*	1.3
Year×month	7.1*	4.0*	7.5*	4.4*	3.5*	4.1*	5.3*	2.6*

*, $P<0.001$; †, $P<0.01$. AO, *Apidioplana okadai*; CC, *Caprella californica*; ES, *Enalcyonium* sp.; IS: *Incisocalliope symbioticus*; MC, *Microjassa cumbrensis*; OD, *Ophiothela danae*; OV, *Oncaea venusta*; T, total epifaunal animals.

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REFERENCES

Bousfield, E.L. & Hendrycks, E.A., 1995. The amphipod family Pleustidae on the Pacific coast of North America: part III. *Amphipacifica*, **2**, 65–133.

Coll, J.C., 1992. The chemistry and chemical ecology of octocorals (Coelenterata, Anthozoa, Octocorallia). *Chemical Reviews*, **92**, 613–631.

Gamo, S. & Shinpo, Y., 1992. A new gammaridean amphipod, *Pleusymtes symbiotica*, ectosymbiotic with a Japanese gorgonacean octocoral, *Melithaea flabellifera* (Kükenthal) from Sagami Bay. *Science Reports of the Yokohama National University*, Sec. II, **39**, 1–11.

Goh, N.K.C., Ng, P.K.L. & Chou, L.M., 1999. Notes on the shallow water gorgonian-associated fauna on coral reefs in Singapore. *Bulletin of Marine Science*, **65**, 259–282.

Patton, W.K., 1972. Studies on the animal symbionts of the gorgonian coral, *Leptogorgia virgulata* (Lamarck). *Bulletin of Marine Science*, **22**, 419–431.

Spotte, S. & Bubucis, P.M., 1996. Diversity and abundance of caridean shrimps associated with the slimy sea plume *Pseudopterogorgia americana* at Pine Cay, Turks and Caicos Islands, British West Indies. *Marine Ecology Progress Series*, **133**, 299–302.

Wendt, P.H., Van Dolah, R.F. & O'Rourke, C.B., 1985. A comparative study of the invertebrate macrofauna associated with seven sponge and coral species collected from the South Atlantic Bight. *Journal of the Elisha Mitchell Scientific Society*, **101**, 187–203.

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