

Chemical composition and energy content of deep-sea calanoid copepods in the western North Pacific  
Ocean

深海性カラノイダかいあし類の化学組成とエネルギー含量

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Condition factor index [ $CFI=1000 \times DW/(PL)^3$ ], water content, carbon (C), nitrogen (N), ash and energy content were determined on a total of 69 copepod species caught from the mesopelagic (M: 500-1000 m), upper-bathypelagic (UB: 1000-2000 m), lower-bathypelagic (LB: 2000-3000 m) and abyssopelagic (AB: 3000-5000 m) zones of the western subarctic Pacific. Resultant data were grouped into four sampling zones (M, UB, LB and AB), four developmental stage/sex categories (C4, C5 and C6 females and males), three feeding types (carnivore, detritivore and suspension feeder), or two reaction speed groups by the presence/absence of myelinated sheath enveloping axons (fast and slow reacting species).

Zone-structured data showed the overall ranges were 3.8-4.6 mm for PL, 1.6-2.6 mg for DW, 21.4-25.0 for CFI, 75.0-78.6% of wet weight (WW) for water, 51.3-53.7% of DW for C, 7.7-8.8% of DW for N, 6.2-7.0 (by weight) for C/N, 6.9-9.6% of DW for ash and 25.3-27.4 J  $mg^{-1}$  DW for energy. Among these components, N and ash exhibited significant between-zone differences characterized by gradual decrease downward for the former, and only UB>AB for the latter. Stage/sex-structured data showed no significant differences among them, but energy content of C5 was higher than that of C6 females. From the analyses of feeding type-structured data, carnivores were shown to have lower water, N, ash, but higher C, C/N and energy contents than suspension feeders do. Reaction speed-structured data indicated that slow-reacting species have significantly higher water but lower CFI, C, N and energy contents than fast-reacting species. Designating these grouping criteria, PL and DW as independent variables, the attributes of these variables to the CFI, chemical composition or energy contents were evaluated by stepwise-multiple regression analysis, showing the most pronounced effect of suspension-feeder, followed by the presence of myelinated sheath, DW, C6 females and AB zone. Further analysis of zone-structured data, by adding epipelagic copepod data from identical thermal habitats (Arctic/Antarctic waters), revealed a more marked decline in N content from the E zone to the AB zone, accompanied by the increase in C/N ratios downward.

The decline in N (=protein or muscle) contents toward depth was discussed in the light of the "visual interactions" hypotheses being proposed for the metabolism of pelagic visual predators and "predation-mediated selection" hypothesis for the metabolism of pelagic copepods.

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