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Paloheimo J E & Dickie L M. Food and growth of fishes. I. A growth curve derived from experimental data. II. Effects of food and temperature on the relation between metabolism and body weight. III. Relations among food, body size, and growth efficiency. *J. Fish. Res. Board Can.* **22**:521-42, 1965; **23**:869-908, 1966; **23**:1209-48, 1966.

[Biological Station, Fisheries Research Board of Canada, St. Andrews, New Brunswick, Canada]

A general equation for the growth of fish in relation to their food supply was developed from experimental data. Analysis showed dependence of growth on both particle distribution and abundance as aspects of food availability. [The *SCI*® indicates that these papers have been cited over 325 times in 235 publications since 1965.]

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"In the 1960s, we were employed by the now disbanded Fisheries Research Board (FRB) of Canada, in St. Andrews, New Brunswick. The actual work took place in a dingy old office in the basement of the zoology department of the University of Toronto. We were, as our boss put it, on the longest sabbatical in FRB's history. Our excuse was a need to access a modern computer. The real reason was our desire for a closer association with D.B. DeLury and F.E.J. Fry.

"Our ambition, both of us being young at the time, was nothing short of finding a rationale for fisheries management away from the prevailing single species models with growth, mortality, and recruitment independent of density and of almost everything else as well.

"Observations that small fish convert food into biomass more efficiently than big fish seemed to contradict this 'all universal' principle of management. Nowadays, such interdependence within the ecosystem, as well as the downward trend in production efficiencies with increased size or position along trophic gradients, is well accepted. However, our characterization of the energetics is still controversial, although our T- and K-line terminology has come into common usage. The continuing controversy (and the high citation) stem from the gaps we left, from the preference of scientists for theoretical rather than empirical formulations, and also from persistent confusion between the net and gross growth efficiency.

"Subsequent work closed up some of the gaps at the low end of the feeding levels,[1] and justified our approach by showing that the annual somatic growth can be predicted from food availability.[2]

"It is also clear that production involves many compensatory physiological and behavioral interactions, supporting our view that growth is such an emergent process that a theoretical description may be too complicated for use in population models.

"Evolutionary selection factors promote compensatory changes in grazing and assimilation,[3] hence the regularity of the gross rather than net growth efficiency. That is why the idea of the K-line cannot be used to interpret results in artificial feeding conditions. It is rather a kind of population 'main sequence' of growth efficiencies for animals maintained at a given T-line of metabolism by a particular abundance level and distribution of food organisms."

1. **Iwata K.** Relationship between food and growth in young crucian carp, *Carassius auratus curvieri*, as determined by the nitrogen balance. *Jpn. J. Limnol.* **31**:129-51, 1970.
2. **Kerr S R.** Prediction of fish growth efficiency in nature. *J. Fish. Res. Board Can.* **28**:809-14, 1971.
3. **Calow P.** Conversion efficiencies in heterotropic organisms. *Biol. Rev.* **52**:385-409, 1977.