

On the basis of bedding-plane assemblages, results are still somewhat mixed in that both ecologic and biologic species groupings are recognized. The former includes larger numbers of elements in broader groups. For species whose element composition is known from bedding-plane assemblages, generally no more than three elements of a species have been grouped. The near mutual exclusion of *Cavusgnathus* and *Gnathodus* was obvious without the aid of a computer.

Recent Progress of Conodont Biostratigraphy in Japan.

By H. IGO

Institute of Geoscience, The University of Tsukuba, Ibaraki 305, Japan.

Since the first description of Carboniferous conodonts from the Omi Limestone, Central Japan by IGO and KOIKE (1964), many contributions concerning conodont biostratigraphy of Japan have been published. Our Paleozoic geologic columns are not entirely complete, but Silurian, Devonian, Carboniferous and Permian strata yield conodonts from limestone, chert, siliceous tuff and shale. Silurian conodonts have been reported from Shikoku, Hida and Kitakami Massifs. Although these faunas are rather poor, they contain characteristic cosmopolitan species. Devonian conodonts are also poor, but Lower Devonian *Icriodus woschmidti*–*Spathognathodus remscheidensis* fauna and some other sporadic occurrences of Lower and Middle Devonian conodonts have been reported. The uppermost Lower Carboniferous to Upper Carboniferous conodonts are rather rich in Japan and they are well zoned in the certain sections. Permian conodonts are also rich in Japan. Recent comprehensive investigation by Hisaharu IGO elucidated prolific conodont fauna and their zonation and correlation.

Triassic conodont-bearing chert and siliceous shale are widely distributed in Japan. Previously, these siliceous rocks are mostly thought as the Permian. Recently, zonation of Triassic conodonts came from both calcareous and siliceous facies has been established. These conodont study brought many new evidences concerning the geologic development of the Japanese Islands.

On Vicarious Lower Ordovician Simple Cone Conodonts. Problems in Lower Ordovician Conodont Taxonomy.

By D. J. KENNEDY

Department of Earth Sciences, University of Waterloo, Waterloo, Ontario, Canada N2L 3G1.

Vicarious: deputed, acting as a substitute; Latin = deputy

During the latest Cambrian-earliest Ordovician, the apparatus architecture (or type) and the simple cone elements which occupied the positions underwent considerable differentiation and specialization.

As is well known by post-Ordovician conodont workers in particular, some elements in an apparatus evolved slowly (e. g. ramiform elements) and some evolved rapidly (e. g. platforms). Similar if not identical elements, particularly conservative elements are found commonly, not only in apparatuses of related species, but also of unrelated genera. Many problems in Lower Ordovician conodont taxonomy have arisen because workers have not appreciated the vicarious nature of many of the elements and the different architectural types which evolved in different provinces.

The most common and variable vicarious element in Ordovician apparatuses is the oistodiform element. More form species have been erected for this form species than any other simple cone genus. *O. lanceolatus* s. f. illustrates best the concept of vicariousness for, as a form species, it has been identified in many faunas which do not contain the MES *O. lanceolatus*. The acotodiform element s. s. is a very conservative element which makes the identifications of multielement genera such as *Acodus*, *Diaphorodus*, *Oistodus* or *Triangulodus* that are based solely on such elements, very difficult. Oneotodiform elements s. l. have a simple morphology with rounded cross-sections and no ornamentation. Consequently, differentiation of form species in small faunas is extremely difficult. Taxa such as *Prooneotodus*, „O.“ *nakamurai*, „O.“ *ovatus*, „O.“ *variabilis* (in MES *Drepanoistodus acuminatus* sensu van WAMEL) and *Pseudooneotodus* are undoubtedly polyphyletic. Element types such as acodiform, scandodiform, drepanodiform and coelocerodontiform are commonly vicarious.

Although the apparatuses of North Atlantic species are reasonably well known, those from other areas are just becoming known. The construction of multielement species from the literature of poorly known faunas must be undertaken with caution for the vicarious nature of many elements leads to

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