Bivalve-growth Patterning as a Method for Seasonal Dating in Archaeology

ARCHAEOLOGICAL evidence is often found for the exploitation of marine resources. In New Zealand, one of the most widespread species exploited was the intertidal bivalve *Chione stutchburyi*, and its growth dynamics form the basis of the technique described here, the purpose of which is to determine at what time of the year shells were collected.

Following the approach of other workers, studies of living populations of *Chione* indicated that, in general, the bands or rings on the surface of the shells (macro-rings) were the result of winter growth recession[1-4]. Further, when cross-sections of the shells were photomicrographed (Fig. 1) two major types of banding (micro-rings or bands) were observed—fine black bands and relatively broad white bands. The latter sometimes contain faint dark lines, indicating two growth phases between each black band. In a sample of twelve modern shells the number of major black rings between the two major winter rings varied from 300 to 420 with a mean of 358, suggesting that the black bands may be formed daily.

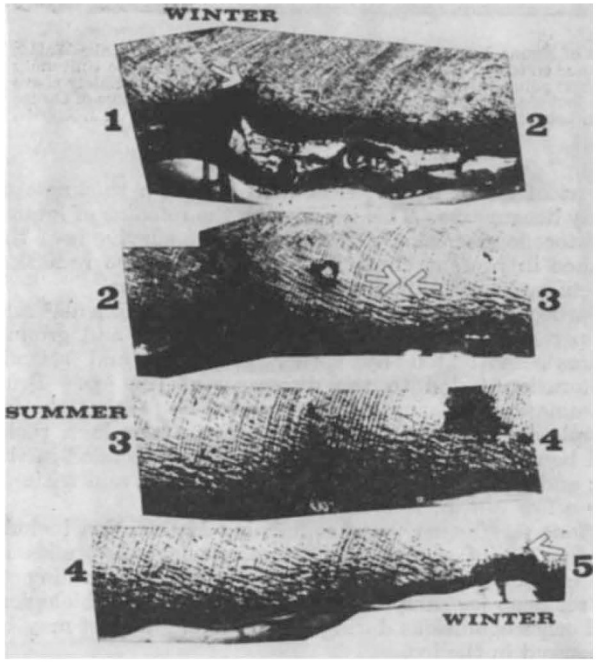

Fig. 1. Photomicrograph of a transverse section through the umbo of *Chione stutchburyi*. Daily micro bands are clearly discernible between the annual growth rings (macro bands). The latter are indicated in the photo by the vertical arrows. The horizontal arrows indicate the position of a pair of bidaily bands.

There is also considerable variation in the width of the bands throughout the year; they are very much wider in summer and spring.

An approximate estimate of the season of death of both modern and archaeological shell samples may be made, first by examining the variation in the thickness of the daily bands from the last macro-ring to the shell margin, and then by counting the number of daily growth bands from the last macro-ring to the shell margin. Provided that the approximate date when the macro-rings are formed is known, the date of death of individual shellfish may be estimated. For *Chione* this was determined by observing the growth dynamics of living populations over a period of twelve months.

A comparison between the known and estimated dates of death in twelve modern specimens (Table 1) suggested that an accuracy within a range of three months can be obtained.

Table 1. COMPARISON OF ESTIMATED DATES OF DEATH OF *Chione stutchburyi* WITH KNOWN DATES OF DEATH FROM THREE COLLECTING AREAS

Locality	Date of collection	Sample No.	Average No. of black bands from last winter rings to shell margin	Season of collection based on variations in the width of the bands
Area B Doctors Point	20/4/69	4	234 ± 20	Autumn
Area B Doctors Point	23/5/69	4	275 ± 20	Autumn
Tiwai Point	9/4/69	4	220 ± 15	Autumn

The method has been applied to shells from several coastal sites in New Zealand and the estimated seasonal dates, along with those obtained from other faunal data, are shown in Table 2.

Table 2. ESTIMATED DATES OF DEATH OF SHELLS FROM THREE ARCHAEOLOGICAL SITES IN SOUTHERN NEW ZEALAND COMPARED WITH SEASONAL DATES DEDUCED FROM OTHER EVIDENCE

Location of archaeological sites and stratigraphic position	Shell species considered	Average No. of black bands from last winter ring to shell margin	Estimated months during which shells were collected (by microscopic technique)	Estimated period of year when site was occupied from other faunal evidence
Tiwai Point TW PQ/40	*Chione stutchburyi*	110 ± 10	Dec–Feb	Oct–April
Tiwai Point P/30	,, ,,	90 ± 10	Nov–Jan	Oct–April
SP/1 TR B, sq 3, spit 1. Concentrated midden (SP = Southport)	,, ,,	146 ± 15	Dec–Mar	Nov–June
SP/1 TR C, sq 1. Concentrated midden	,, ,,	120 ± 15	Dec–Feb	Nov–June
SP/4 TR C and D, sq 2 and 3. Cockle	,, ,,	128 ± 25	Nov–Mar	Nov–June
SP/5 TR H, sq −5. Spit 2. Organic	,, ,,	101 ± 20	Dec–Feb	Nov–June
SP/5 TR E, sq, −7. Spit 2	,, ,,	103 ± 10	Dec–Feb	Nov–June
Wakapatu	*Protothaca crassicosta*	200 ± 20	Mar–April	Oct–April

Thus in New Zealand, at sites such as Tiwai Point and Wakapatu, the relatively thin midden deposits and presence of the bones of migratory birds suggest temporary occupation during the summer. In advancing a hypothesis that the sites were occupied at this time of the year for the exploitation of seasonal food sources, it must nevertheless be remembered that both fish and birds were dried and transported over fairly great distances during the protohistoric period in southern New Zealand. A means of checking this hypothesis is necessary. Although shells were also carried quite far during the protohistoric period in New Zealand, the number and weight of the shells that constitute the coastal middens in question rule out the possibility that they were transported to the sites from elsewhere. Shellfish were dried and stored during the protohistoric period[5], though there is no evidence that large quantities of the shells themselves were carried over any distance from the point of collection.

The implications of these results for the prehistorian are clear. The technique described provides not only a check but also a fairly refined estimate of the season at which the sites were occupied.

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