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SHELL SIZE AND MEAT WEIGHT IN PIPIS

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An important question when reconstructing prehistoric human diet is the relationship between animal size and meat weight (Nichol,1978: chapter 5). This kind of information is sometimes to be found in the zoological literature, but because the objectives of zoology and prehistory are different appropriate data on appropriate species are sometimes not available. This means that it can be necessary for archaeologists to collect data relevant to their own problems, and several studies of this kind have been carried out in New Zealand in the last few years (Shawcross,1967; Terrell,1967; Coutts,1971; Hamel,1977; Bay-Petersen,1979). This paper is written to make available some results for pipi (Paphies australe)from two Auckland beaches, and to suggest ways in which the study of shellfish at any rate can be made a little easier.

Method and results

The shellfish examined came from Cheltenham, just outside the North Head of the Waitemata Harbour, and Cornwallis, on the northern shore of the Manukau (see Fig.1).

Samples were collected from the two beaches during March and again in September, only one sample being collected on one day. In the laboratory the shells were rinsed in fresh water, then sorted into 1mm size classes using vernier calipers, and the animals in each class were counted. Taking one class at a time the animals were boiled open using an immersion heater in a pan, the meat was removed, and its weight found to an accuracy of 0.1g using a triple beam balance. Adjustments were made to the record of counts of animals where any shell were found to be empty. Finally, the average weight of meat (wet weight) in each class was calculated. The results are illustrated in Figure 2.

Discussion

It is clear that there are very major differences in the weight of meat to be expected from a pipi of a particular length, depending on the date and place of collection, March Cornwallis pipis being typically twice or more as heavy as September Cheltenham pipis. Factors Larcombe (1971) identified as being important determinants of the meat weight of cockles (Chione stutchburyi), including season, period of immersion, and access to water not previously strained by other filter feeders, seem to

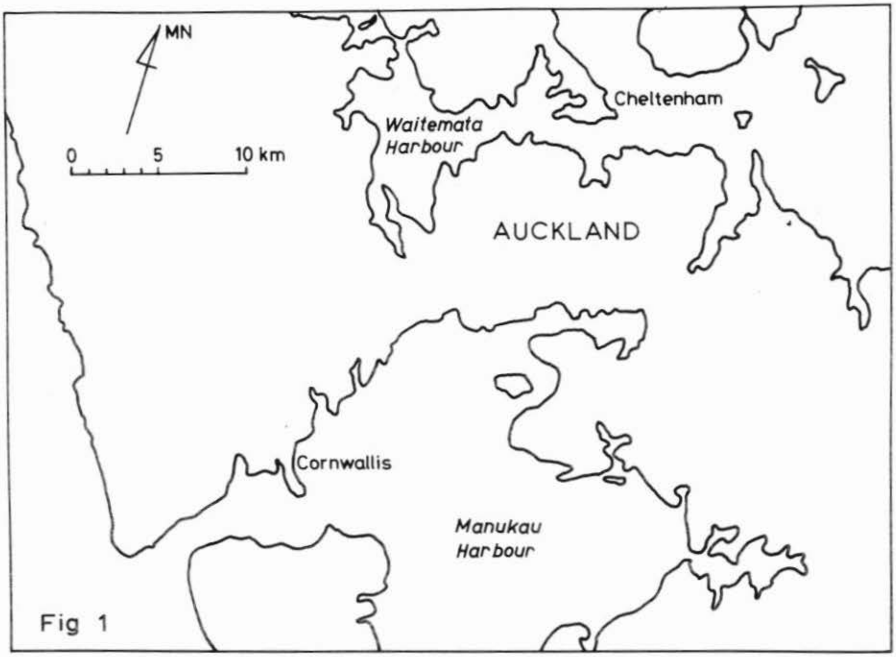

FIGURE 1. Location map of pipi collection sites.

be operating here too. The Cheltenham pipis come from a small population living in a narrow band of coarse sand almost at the high water mark at the back of a wide beach covered with a dense population of cockles, while those at Cornwallis come from a population living at about mid-tide. Also, the six months between the dates of collection would be just about the leanest of the year.

Improving the accuracy of an assessment of the importance of pipis in the food consumed at a site is clearly going to depend on work being done on the seasonal dating of the deposit concerned, which might not be all that much of a problem, but also on identifying the meat/shell growth pattern of the population of pipis being exploited, which almost certainly is going to call for a special study.

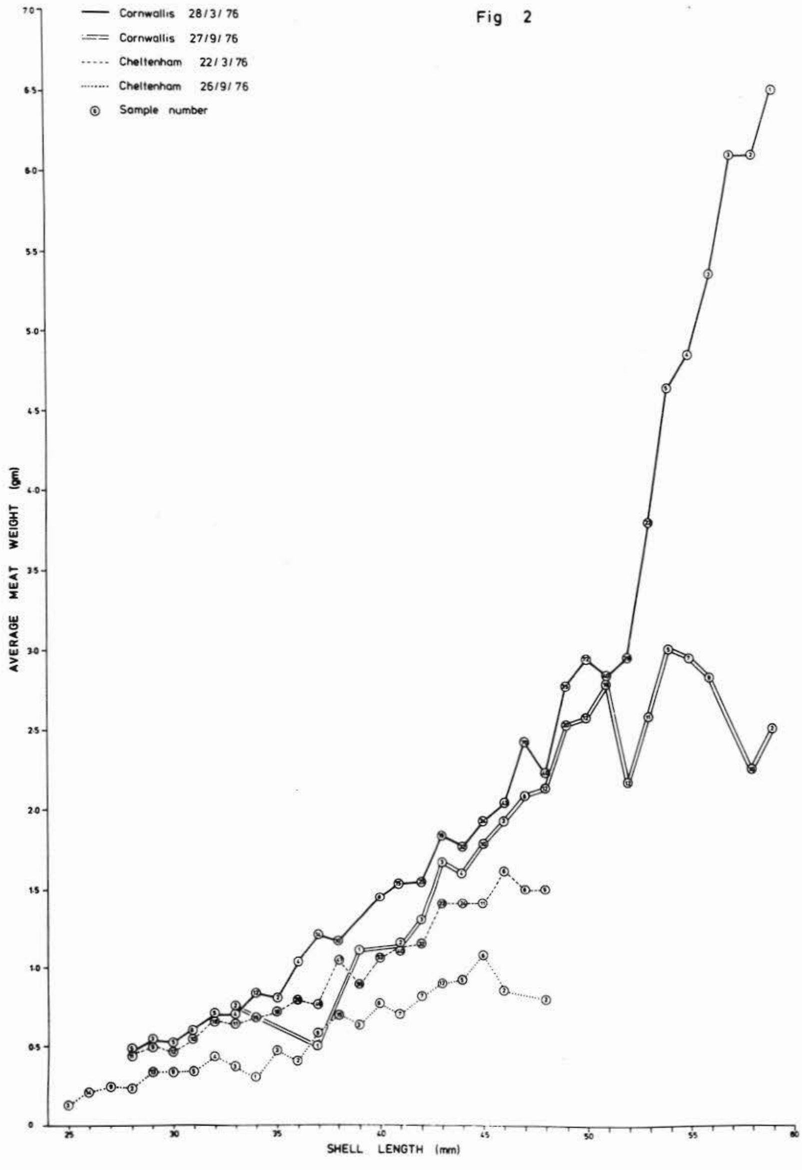

FIGURE 2. Pipi shell size and meat weight.

Simplifying the practical procedures

All we can do at this point is to suggest two ways in which the study of meat weight/shell length relationships can be simplified. One concerns the procedure used when measuring the shells. The method we have found the most efficient is as follows. First, the scattered specimens at the large end of the size range are measured individually. The calipers are then set at the 0.5mm mark just below the length of the largest individual remaining unmeasured - say 50.5mm. Any shell bridging the gap must be 51mm to the nearest mm. When the calipers are reset one mm closer together - here 49.5mm - the shells that can bridge this narrower gap must be in the next class down - 50mm to the nearest mm. This procedure can be repeated till all the shells are measured. As well, each time you start to collect the animals in a new size class, these are going to be the very largest animals remaining, and where animals in a class can be expected to be numerous - in a mode in the size frequency distribution - it isn't even necessary to compare all the animals with the preset calipers, as many can be easily picked out by eye.

A test of the results of this method showed that only 2% of animals were assigned to the wrong size class, and never by more than 2mm, and that the time spent measuring animals was reduced to less than a quarter of that needed when each animal was measured separately.

The second simplification concerns the form of meat weight adopted. 'Dry weight' is usual in zoological reports. This is obtained by keeping the meat at a temperature of a little below 100°C for a few days, checking the weight at intervals until it remains constant. Some archaeologists have gone to the trouble of reducing shellfish meat to dry weight (for example, Coutts, 1971; Hamel, 1977). However, an experiment we performed has shown that it is not necessary to carry out this lengthy procedure.

The meat in animals in twenty size classes over the range 28-63mm was weighed after being shaken to remove excess water ('wet weight'), rubbed between sheets of blotting paper and reweighed ('blotted weight') and then reduced to dry weight (Naus,n.d.). The correlations between wet and dry and between blotted and dry weights were found:

$$\text{Dry} = 0.23981\ \text{Wet} + 0.01067\ (R = 0.99143)$$
$$\text{Dry} = 0.25446\ \text{Blotted} + 0.01085\ (R = 0.99486)$$

It is no trouble to blot the animals, of course, and the correlation of blotted weight to dry weight is just about perfect, so the extra effort of finding dry weights produces no extra information.

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