Patella vulgata l: an ecological study in relation to marine pollution by heavy metals

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PATELLA VULGATA L., AN ECOLOGICAL STUDY IN RELATION TO MARINE POLLUTION BY HEAVY METALS

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ABSTRACT

An attempt has been made to ascertain the validity of the use of a eulittoral mollusc - P.vulgata L., - as a monitor of inshore pollution.

To this end, the biogeochemical composition of this organism has been investigated at one site, in relation to its size, habitat on the shore and season of collection.

A further study has been undertaken at several sites covering a variety of conditions of salinity, degree of exposure, type of bedrock and intensity of man-made pollution.

The results of these studies indicate that there is an advantage in choosing this organism for work of this kind as it has shown a marked ability to "sample" the total geochemistry of its environment.

It should be noted however, that this ability could distort the overall interpretation of comparative studies unless there are both a standardized sampling technique and a detailed knowledge of the local geology.

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INTRODUCTION

In recent years much concern has been expressed over the deterioration of our physical environment, owing to contamination by the products and by-products of "The Affluent Society". The general term "pollution" has been used to describe this situation but the term has never been satisfactorily defined.

Public concern with regard to pollution has, in the main, stemmed from incidents in which human health and welfare have been put at risk, and legislation to halt the escalation of fresh water and atmospheric pollution has existed for several years.

On the other hand, pollution of the marine environment has always seemed much more remote. The enormous volume of the oceans and the fact that no country has specific responsibility for any large part of them, have allowed them to be regarded as the proverbial carpet, into which pollutants may be conveniently swept.

The main sources of marine pollution can be summarised as follows:

(a) Products of natural erosion and weathering coming from run-off from land or wave action on the coasts.

(b) Suspended substances in the air, entering the sea, mainly with the rain.

(c) Oil from sea wells or from tanker spillage and dredging, and oil emulsifiers.

(d) Thermal pollution caused by heated water discharge.

(e) Domestic wastes and sewage, including non bio-degradable matter such as some detergents.

(f) Industrial wastes, which may include both organic and inorganic pollutants.

It was the Torrey Canyon disaster in 1967 (Bellamy <u>et al.</u> 1967; O'Sullivan & Richardson 1967; Nelson-Smith 1968; Simpson 1968; Smith

1968; Marstrand 1974) which first focussed the attention of the public on the fact that the sea could become polluted, putting the amenities of the coastal resorts, if not public health, at risk.

Since then, reports of oil pollution, such as the Santa Barbara oilwell seepage (Straugham 1972), have become almost daily occurences and world-wide legislation (Moore 1972; Cuperus 1972; Mensah 1974) now attempts to control willful oil pollution of the high seas.

The list of potential pollutants has also grown, the greatest concern being shown, and most immediate action being taken, against substances harming man, for example Aldrin, Deldrin, and D.D.T.

In the Minimata Bay incident (Takeuchi et al. 1959; Matsumoto et al. 1965; Sweeney 1970; Shigeto Tsuru 1970; Goldberg 1971; Takeuchi 1966, 1968; Ackefors 1971) forty five people were killed, and many more incapacitated for life. This was the result of fish and shellfish, which formed part of their staple diet, being contaminated by methyl-mercury of industrial origin. This incident brought heavy metal pollution to the fore and linked man with marine pollution via the food-chain.

Post Minimata concern followed the usual pattern, and the columns of both newspapers and scientific journals became filled with facts and figures relating to pollution of the sea by toxic heavy metals*. Some of them are extremely important with regard to toxicity because they show an ever-increasing build-up and long term persistance in the marine environment (Halstead 1972). Because of this, many workers have concentrated on the toxicity problem of heavy metals. In the FAO Technical Conference on Marine Pollution and its Effects on Living Resources and Fishing, held in Rome in 1970, many such papers were presented (Halstead op.cit; Mitrovic 1972; Miettinen et al. 1972; Portmann 1972a; d; Tillander et al. 1972; Ünlü et al. 1972).

Many other papers were concerned with heavy metal accumulation problems.

*The term heavy metal is generally held to describe metals having a density greater than five (Passow et al. 1961).

1.1. HEAVY METAL TOXICITY

i. Effect on man

Among the most studied heavy metal toxicity effects on man are those of lead and mercury. Lead is known to cause cellular alteration of erythrocytes and changes in blood enzymes (Yaverbaum 1963; Pernis et al. 1964). Lead poisoning is also associated with a kind of sclerosis (Falkowska et al. 1964) a reduction in fertility and increase of miscarriages (Gillet 1955; Potter 1961; Muro et al. 1969) as well as anomalies of neuromuscular function (Silbergeld et al. 1974). According to Nathanson et al. (1975) lead inhibits the brain adenyl-cyclase, while it is known to increase the frequen cy of chromosome aberrations in human lymphocytes (Schwanitz et al. 1970). Neuropsychic disorders also occur as a result of lead poisoning (Bryce-Smith 1971).

Among the worst examples of heavy metal contamination is undoubtedly the Minimata Bay "disease" in Japan, and it appears that the mercury "pattern" seen there may be repeated with respect to cadmium. In 1970, the Japanese proved that cadmium caused the disease "itai-itai" of which two hundred cases have been reported, half of them being fatal. (Kobayashi 1971; Fishbein 1974). Flick et al.(1971) reported numerous cases of cadmium toxicity and stated that it could be associated with carcinogenesis.

ii. Effects on marine organisms

The concentration of a heavy metal, which will kill an aquatic organism, is dependant both on the metal and on the organism. Generally, according to Bryan (1971) mercury, silver and copper are the most toxic metals, followed by cadmium, zinc, lead, chromium, nickel, cobalt. This order of toxicity, though, is not rigid and is different in different species.

Information on lethal effects of heavy metals was given by several workers (Carpenter 1927; Barnes et al. 1948; Corner & Sparrow 1956 ;

Raymont & Shields 1964; Wisely & Blick 1967; Shuster & Pringle 1969; Eisler 1971; O'Hara 1973). While Wurtz (1962) stated that in the case of heavy metal pollution of environmental water, molluscs, having a relatively low resistance to high concentration of heavy metals, could be the first to disappear among the aquatic animals. Poisoning effects of zinc and copper on several organisms were reported by Wurtz op. cit Fujiya (1960), Sprague 1964ab, Wilson (1972) as well as of other elements (Raymont & Shields op.cit Pringle et al. 1968; Coleman et al. 1971; Eisler 1971; Halstead 1972; Mitrovic 1972; Portmann 1972a; 1972d, Keckes 1972; Ünlü et al. 1972; Sellers et al. 1975; Betzer & Yevish 1975).

Heavy metals can produce a variety of recognisable effects such as

(a) Morphological changes (Boyce & Herdman 1898; Shuster & Pringle op. cit; Crandall & Goodnight 1963; Rulon 1957; Lallier 1959; Wilson & Armstrong 1961; Hubschmann 1967; Brown et al. 1968; Timourian 1968; Baker 1969; Skidmore & Towell 1972; Nitta 1972).

(b) Growth inhibition (Dilling et al. 1926; Soyer 1963; Bougis 1965; Bryan 1969; Mandelli 1969; Brown & Ahsanullah 1971; Scott & Major 1972; Gray and Ventilla 1973).

(c) Behaviour changes (Sprague et al. 1965).

iii. Factors influencing toxicity

Bowen (1966) stated that it is difficult to summarize exactly what toxicity implies, since there are many factors involved. Among the numerous factors influencing toxicity of heavy metals are:

I. Salinity: several workers have found that toxicity of zinc, copper, mercury, cadmium is influenced by salinity (Herbert & Wakeford 1964; O'Hara 1973; Macleese 1974; Jones 1974).

II. Size of organism (Skidmore 1967).

III. Activity of organism (Herbert & Shurben 1963).

IV. Acclimatization to metals (Edwards & Brown 1967; Bryan & Hummerstone 1971; 1973a; b)

V. Dissolved oxygen (Lloyd 1961)

VI. Temperature also may influence the toxicity of zinc, copper, mercury, cadmium (O'Hara op.cit; Jones op.cit; Macleese op.cit; Hodson & Sprague 1975)

1.2. HEAVY METAL ACCUMULATION

Uptake of heavy metals which produces an internal concentration higher than that in the external environment, appears to be widespread in marine organisms.

A number of works refer to an index of accumulation which is the ratio of the element content in the organism in dry weight basis to the element content of the water (Brooks & Rumsby, 1965; Harvey & Patrick 1967).

Riley and Segar (1970) stated that little is known about the mechanisms by which trace elements are concentrated, or about the manner in which they are held in the tissue of marine organisms. However, several mechanisms have been proposed including:

(1) particulate ingestion of suspended material from sea water (Armstrong & Atkins 1950)

(2) ingestion of elements via their preconcentration in food consumed (Bowen and Sutton 1951).

(3) complexing of metals with organic molecules (Schubert 1954).

(4) uptake by exchange (Korringa 1952).

It seems probable that the factors influencing accumulation are similar to those influencing toxicity (Whitton & Say 1975). The work of Bachmann(1963) Mandelli (1969), Bryan (1971) Pringle et al. (1968) Coleman et al. (1971), O'Hara (1973) showed an influence of pH, salinity, temperature, and ionic environmental concentration on the accumulation.

1.3 PURPOSE OF THIS STUDY

Many accounts have been published providing results of chemical analysis of a variety of marine organisms; the results obtained being correlated with subjectively assessed measures of pollution (Riley & Segar 1970; Portmann 1972c; Segar et al. 1971; Bellamy et al. 1972; Bellamy 1972; Preston et al. 1972; Windom 1972; Jones et al. 1972; Knauer & Martin 1972; Topping 1972b,c; Chow 1972; Robertson et al. 1972; Miettinen et al. 1972; Leatherland et al. 1973; Preston 1973; Eustace 1974; Windom et al. 1973; Huggett 1973; Jones et al. 1973; Stenner & Nickless 1974; Leatherland & Burton 1974; Sheppard & Bellamy 1974; Jones 1975; see also below).

Many of the papers discuss

(1) the problems related to the great natural variations of the inshore marine environment, both over short distances and short time-scales (Butterworth et al. 1972; Nickless et al. 1972; Lewis 1964; 1968; 1970; 1972; Talbot 1972; Ireland 1974; Moore 1974).

(2) the fact that the concentration of many metals within living tissues may vary with the natural physiological state of the organism concerned (Pringle et al. 1968; Lewis op.cit; Bryan 1971; Nickless et al. 1972; Ansell 1972; Folsom et al. 1972; Schulz-Baldes 1973; Peden et al. 1973; Boyden 1974; Betzer et al. 1974).

(3) the problems of interpreting heavy metal load in excess of the supposed norm as an effect of pollution, rather than of local geology (Bellamy 1972; Bellamy et al. 1972; Sheppard & Bellamy 1974; Navrot et al. 1975).

The present work was thus designed

(1) to investigate the levels of some trace and major elements in the eulittoral zone along the north-east coast of Britain, as previous research in the same area has been concerned mainly with the effect of pollution on sublittoral ecosystems (John 1968; Bellamy & Whittick 1968; Jones 1970; 1971; Bellamy et al. 1972; Bellamy

1972; Moore 1971a,b, 1972, 1973a,b,c, 1974; Burrows & Pybus 1971; Edwards 1972.) Also to establish if there is a scale of pollution which may coincide with any already reported for the same area.

(2) to investigate if the position on the shore and hence the duration of submergence of the organism, bears any relation to the concentration of the elements found in its tissues.

(3) to establish if the chosen organism P.vulgata L. reflects the intersite environmental differences already known (a priori), i.e. to establish the validity of this organism as an indicator of heavy metal pollution in the inshore marine environment.

1.4. REASONS FOR CHOOSING PATELLA VULGATA

Patella vulgata, the common limpet, was chosen as a study organism for the following reasons:

(1) as is well known, molluscs tend to accumulate elements in their tissues, in concentrations higher than those of elements in excess in their aquatic environment. (Vinogradov 1953; Goldberg 1957; Mullin & Riley 1956; Bowen 1966; Preston et al. 1972; Peden et al. 1973; Eisler et al. 1972.)

(2) having a more or less constant "home" in the eulittoral zone (see Appendix 1) it was considered to be suitable for an investigation of the relationship between level of "pollution" and immersion in the water.

(3) the simple form of the shell makes it easy to remove the flesh, free from the contamination of the shell material.

(4) the biology and ecology is well known (see Appendix 1).

(5) it has been used in a number of other studies of inshore marine pollution, such as oil and oil-detergents (Nelson-Smith 1968; Smith 1968; Crapp 1971; Cowell et al. 1972; Dicks 1973), and

heavy metals (see Ref. in Section II).

(6) it is easy to find, easy to recognize and easy to collect.

1.5. PRESENTATION OF THE STUDY

The work is divided into:

(a) a study of the pattern (if any) of distribution of the following elements: lead (Pb), cadmium (Cd), nickel (Ni), copper (Cu), zinc (Zn), iron (Fe), potassium (K), sodium (Na), magnesium (Mg), calcium (Ca), in the limpet flesh at one site, Marsden Bay, (Grid Ref. Ordn.Surv.NZ36 398657) in relation to the size of the organism and its position on the shore over a nine month period. Marsden Bay was chosen simply because of its accessibility from Durham. This part of the work is presented in Section II.

(b) on the basis of the above results, a comparison is made of the heavy metal content of P.vulgata at a range of sites covering differences in 1) geographical location 2) substrate type 3) degree of exposure 4) intensity and type of pollution. This part of the work is presented in Section III.

(c) conclusions from the overall study are presented in Section IV.

SECTION II

STUDY OF THE PATELLA VULGATA POPULATION AT MARSDEN BAY

Marsden Bay (Grid Ref., Ordnance Survey NZ36 398657)*, the main area of study, lies between the mouths of the Rivers Tyne and Wear, being about 2.5 km to the south of Tynemouth and about 8 km north of the mouth of the River Wear (see Fig.III.4)

The lower valleys of the Tyne and Wear are densely populated areas and are the site of shipbuilding and many heavy engineering and chemical industries.

The marine environment therefore receives large amounts of "polluting" materials, either directly, or indirectly via the rivers.

Evidence of pollution, and of its effects on the littoral and sublittoral ecosystems to the north and south of Marsden Bay, has been put forward by several authors (Bellamy et al. 1967; 1968; Bellamy 1972; John 1968; Jones 1970; 1971; Starkie 1970; Head & James 1970; Moore 1971a, b, 1972, 1973a, b, c, 1974).

II.1. DESCRIPTION OF THE STUDY AREA

This study concentrated on the northern part of Marsden Bay, an exposed area consisting of dolomite and concretionary limestone of the Permian Upper Magnesian Limestone series (Johnson 1970).

The flora is typical of a rocky shore, though somewhat impoverished. *Enteromorpha* and *Pelvetia canaliculata* predominate around the high-tide mark, whilst the mid-tidal area is relatively bare. At the low-tide mark there is a strong growth of *Fucus serratus* and some *Fucus vesiculosis*. *Laminaria digitata*, and *L.hyperborea* provide a fairly dense, sublittoral "forest" of kelp which was studied by Jones (1970;1971;1973) John (1968); Moore (1971, 72, 73a, 73b, 73c, 74) and Sheppard (pers. comm.).

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*All 6 digit Grid References refer to locations marked on the relevant 1:25,000 maps on the Ordnance Survey. 4 digit references are used for general locations marked on the 1:63,360 maps of the Ordnance Survey.

The fauna is dominated by limpets P.vulgata, the subject of this study, also barnacles Balanus balanoides, dog whelks Nucella lapillus, winkles Littorina littorea, L.saxalis, L.neritoides, plus starfish Asterias rubens and a few shore crabs Carcinus maenas.

The slope of the area is gentle and is illustrated in Figure II.1

II.2. INVESTIGATION METHODS

i) Sampling

The shore was divided into three zones (see Fig.II.1, II.2) and 100 individuals were collected from the same level within each zone each month. Each zone sample consisted of animals of different sizes. Thus, the sample was as representative of the population as was possible. Samples were taken within two or three days of the end of each month, depending on the tide, for nine months from October 1974 to June 1975.

Unfortunately, sampling from all three zones was impossible some months, owing to adverse weather.

ii) Laboratory techniques

More than 2,400 individuals were collected from Marsden Bay, but finally 2,176 were studied because several specimens were damaged (broken shells etc).

The samples were washed and the flesh removed from the shell. The shells were then measured (length, breadth and height)* both flesh and shell washed again with distilled water and placed separately in transparent paper bags. They were left for twenty four hours at 103^{o} centigrade. The flesh and the shell were then weighed (with an accuracy of three decimal places). The specimens from each zone were divided into six classes based on the dry flesh weight. Each class was called A, B, C, etc. as follows:

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* All the measurements concerning the shell length, breadth, height, flesh weight, and shell weight are presented in Appendix 11.

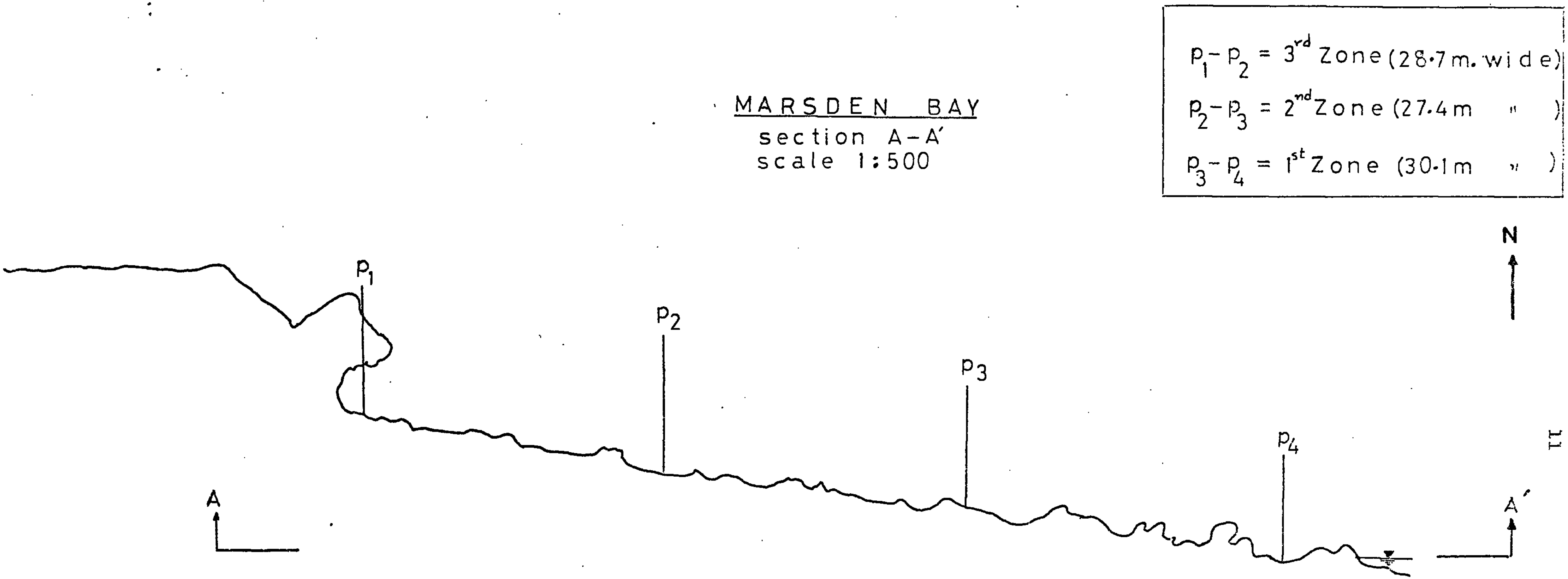


Fig. II.1 Profile of the study area

(i)

(ii)

Fig. II.2: Showing the Zones 1 and 2 (i) and Zone 3 (ii) at the main study area: Marsden Bay

A		$\leq$	200	mg
B	201	-	400	mg
C	401	-	600	mg
D	601	-	800	mg
E	801	-	1000	mg
F	1001	-	1200	mg

Representatives of all six classes were not usual in Zones 2 and 3, as the animal tends to become progressively smaller from low- to high-water mark, a fact that has also been reported by previous investigators (Fischer-Piette 1948; Jones 1948; Norman,quoted by Step 1945; Lewis & Bowman, 1975).

Each specimen was alloted to a weight class and the tissue from each class was bulk ground to a find powder in a mortar and pestle. The powder was dried to constant weight and 0.5 g were weighed (accuracy of five decimal places) and placed into polythene bottles for analysis; five replicas were analysed for each size class.

Analyses for Pb, Cu, Ni, Fe, Cd, Zn, Mg, Ca, K, and Na, using a Perkin Elmer 403 Atomic Absorption Spectrophotometer, were carried out after digestion using the wet-Pressure Digestion Method, described by Adrian (1973). The results of the chemical analyses were corrected for Ca, Mg, K, Na interference after personnal communication with J. Vaughman and T. Brett of Durham University. The corrections used are shown in Appendix 4.

II.3. ANALYSIS OF RESULTS

i) Size parameters data

Although the main purpose of this work was to study the variation in the content of certain elements in the flesh of the organism, it was felt that further analysis of the size-class data would be advantageous in the interpretation of the overall results.

Correlations of several characters of P.vulgata, such as the height, length, and breadth of the shell, and the total body weight etc. have been carried out in the past, in order to investigate the influence of different environments on the size and shape of the animal (Russell 1907; 1909; Orton 1928a, b, 1933;) or to study its growth and growth -rate (Orton 1928b; Hamai 1937; Blackmore 1969; Branch 1974b; Lewis & Bowman 1975).

To this end, the data from the samples collected in October and November 1974, were analysed and the following relationships were plotted (see Figs. II.3, II.4, II.5, II.6)

1. Shell weight against flesh weight
2. Shell length against flesh weight
3. Shell breadth against flesh weight
4. Shell height against flesh weight
5. The frequency of shell parameters and flesh and shell weight in the three zones, illustrated by histograms.

Correlation between shell length and flesh weight gave a similar result to that of Orton (1933). Lewis and Bowman (1975) who plotted mean shell length against total flesh weight, also found a similar relationship.

Figure II.5 shows clearly that there is a greater frequency of taller shells in Zone 3, a fact also recorded by previous workers (Russell 1907; Orton 1929; 1933; Moore 1934; Branch 1971; see also Appendix 1).

Norman, quoted by Step (1945); Fisher-Piette (1948); Branch (op.cit); Lewis & Bowman (op.cit) have shown that the shell length and breadth decreases progressively from Zone 1 to Zone 3 and Figure II.5 shows a similar relationship.

There appeared to be a linear relationship between the dry shell weight and the dry flesh weight (see Fig II.3.) and this was fully confirmed by a Statistical Package for the Social Sciences (SPSS) computer analysis.

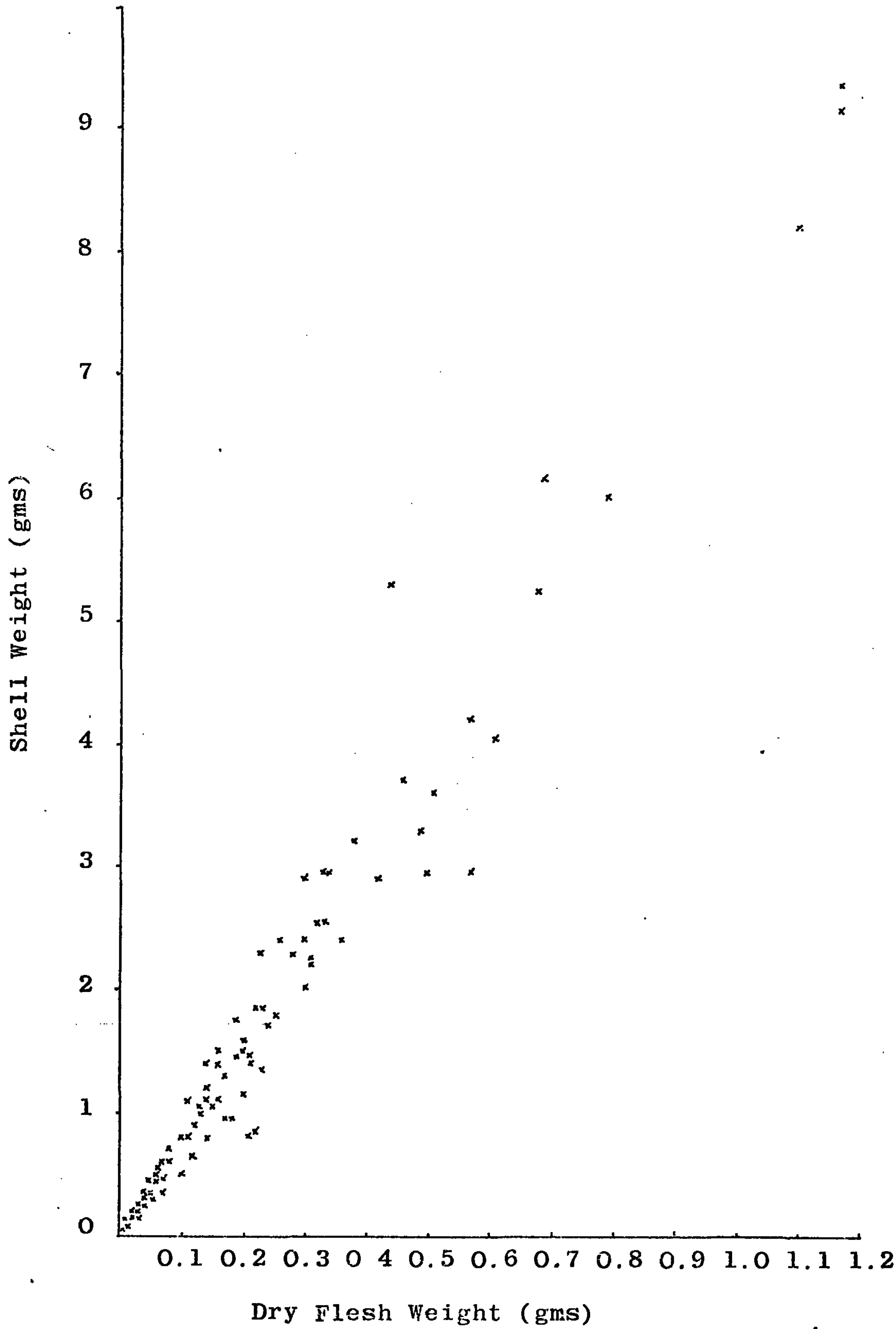


Fig. II.3 Graph showing shell weight/flesh weight relationship.

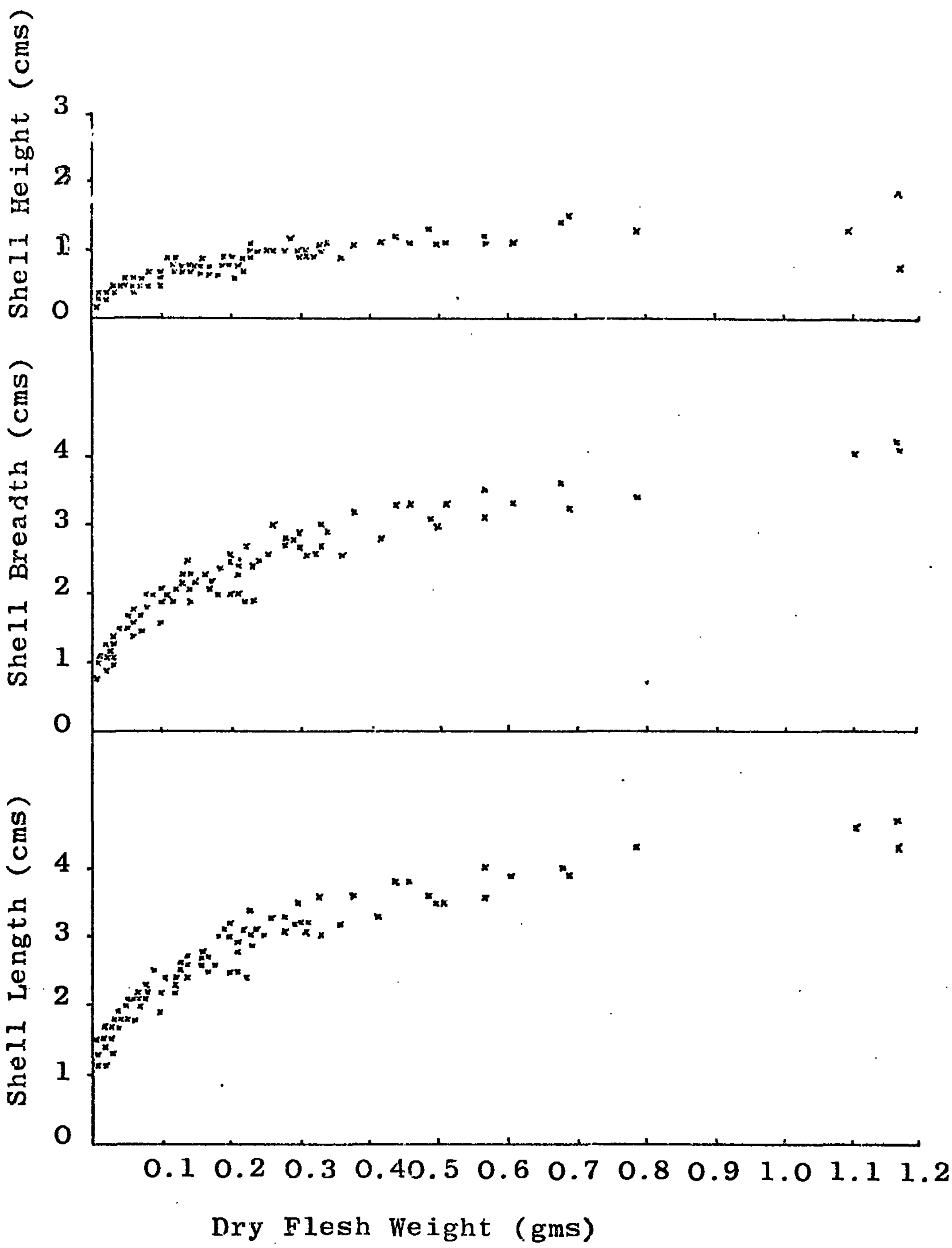


Fig. II.4 Shell length, breadth, height/flesh weight ... relationship.

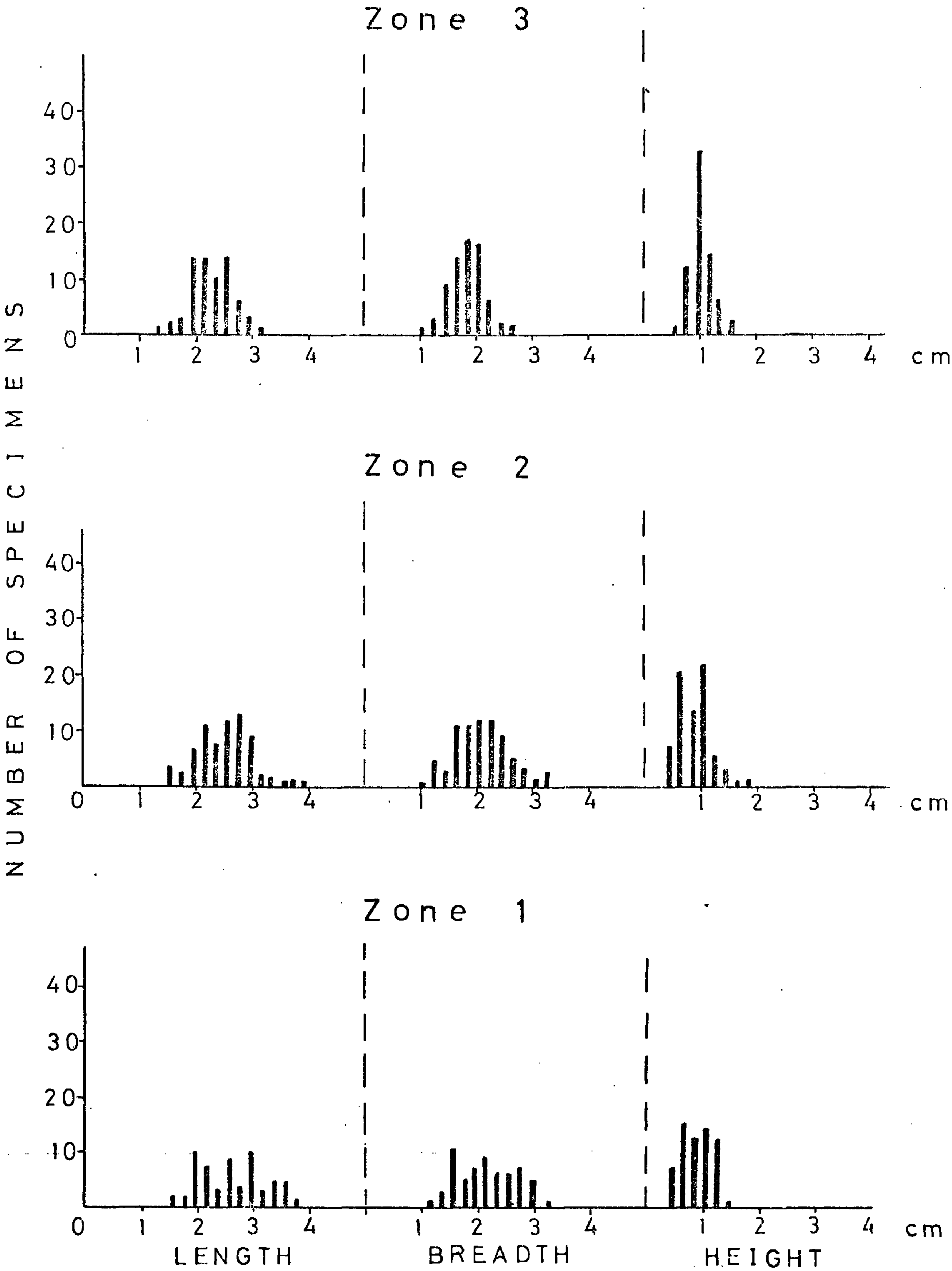


Fig. II.5 Shell parameters at different levels on the shore.

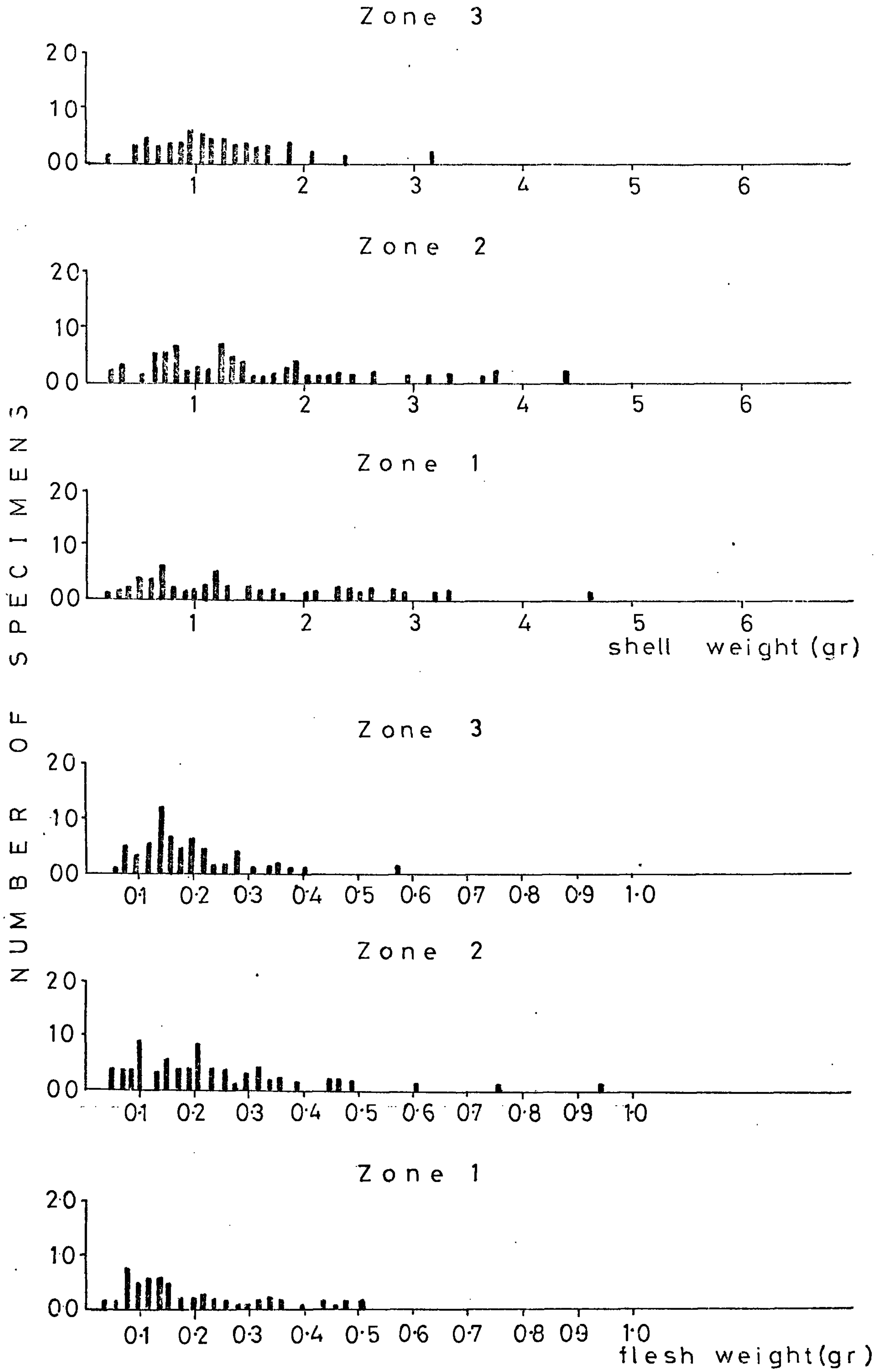


Fig. II.6 Flesh weight, shell weight at different levels on the shore.

Therefore, it was decided to subject all the shell weight/flesh weight data to analysis in this way, using this as a background to the subjectively assessed size classes for the analytical work; scattergrams of this analysis are shown in Appendix 2.

The relationship between flesh weight and shell weight may be expressed by the equation $x = A + By$, where

x = dry flesh weight

y = dry shell weight

A = intercept

B = slope of the regression line

For each Zone sub-population at each sampling period (monthly), a computer statistical analysis was carried out. This analysis gave the regression lines, the values of A and B, the correlation factor, and the standard error of estimation. All these calculations were made to a significance level of 0.00001.

The best correlations are given for the sub-populations of Zone 1 and the poorest usually for Zone 3. Zone 2 correlations are intermediate. (See Table II.1).

Table II.1

MARSDEN BAY CORRELATIONS

Month	Zone 1	Zone 2	Zone 3
October	0.98108	0.98132	-
November	0.92427	0.96071	0.90836
December	0.92235	-	-
January	0.96129	0.93620	0.89654
February	0.94525	0.91451	0.93051
March	0.97272	0.95034	0.83533
April	0.96588	0.90467	0.91918
May	0.95415	0.93148	0.92854
June	0.95961	0.96970	0.90885

Thus, it seems that the relationship between the flesh weight and the shell weight is more variable towards Zone 3, making Zone 1 the best zone for comparative studies. Less variation in Zone 1 may be readily explained by the shorter time of exposure to the more varied conditions of "land" life experienced by the organisms on the lower shore. The regressions of Zones 1, 2 and 3 sub-populations, collected throughout the study, are presented in Figures II.7, II.8, II.9.

The slopes of the regression lines of all the Marsden Bay sub-populations range between $34^\circ 40'$ - $60^\circ 0'$, emphasizing the variation at this one site. To illustrate this, the monthly variations of the regressions at fixed shell weight values (y) are presented in Figures, II.10, II.11, II.12.

It is clear from these graphs that the sub-populations of Zones 1 and 2 show a similar pattern of variation over the period of study. In essence, the value of the dry flesh weight (x) falls from November to February, fluctuates in March and April, and then rises steadily until the termination of the study in June. By contrast, the more variable sub-populations of Zone 3, show their main period of increase in dry flesh weight between January and February, and a minimum value in June.

Although it is difficult to reach a positive conclusion about the implications of these variations, it is of interest to note that Branch (1974b) pointed out that while shell length is the easiest parameter to measure when analysing growth, flesh weight - having an exponential relationship to shell length - is of equal importance as a growth indicator. The conclusion reached by Branch (op.cit.) was vertified by the results of a computer "Factor" analysis (Principal components analysis) of the samples used in this investigation. The analysis revealed a high correlation between the dry flesh weight and the shell length (Appendix 3)

Blackmore (1969) studied in detail, over a three year period, the growth-rate of P.vulgata, based on shell length. His results showed a similar, but not identical pattern to that shown in Figures II.10, II.11, II.12. It seems reasonable to assume however, that the differences are due to a different sampling technique: Blackmore (op.cit.) presented the average variation in growth-rate of specimens from several zones, corresponding to Zones 1, 2, 3 of this investigation.

Several factors will affect the weight of the flesh; temperature, food availability, development of sex organs and the gonad cycle. A closer examination of the gonad cycle shows a remarkable correlation between the "resting period" of the animal (Branch 1974a,b) and the fall in the flesh weight shown in Figures II.10, II.11, II.12. This is followed by an acceleration of flesh weight through the summer, towards the main period of "gonad maturation" (Blackmore 1969; Branch 1974a,b, Lewis & Bowman 1975).

The varying pattern shown in the Zone 3 sub-population is of interest, but is more difficult to explain. The earlier "spurt" of "growth" in January could be due to a greater abundance of food on the higher shore where shorter periods of immersion by the very turbid, "polluted" water provides a more advantageous light regime for the growth of the epilithic communities. A more extensive study would be required in order to substantiate this hypothesis.

It is of interest to note here that Fisher-Piette (1948) recorded a similar pattern to that of Zone 3. He presented the monthly variation of the flesh volume to shell volume ratio, which showed an increase in November-December and a fall in January. This was followed by a further increase in February, March, April and either a fall or rise in May and June, depending on the habitat of the organism.

More detailed investigations in this aspect of the present study should be undertaken before firm conclusions could be drawn.

However, the results of this work clearly indicate that if comparative studies are to be valid, care must be exercised to ensure that comparisons are made between samples taken from the same zone, at the same physiological "time".

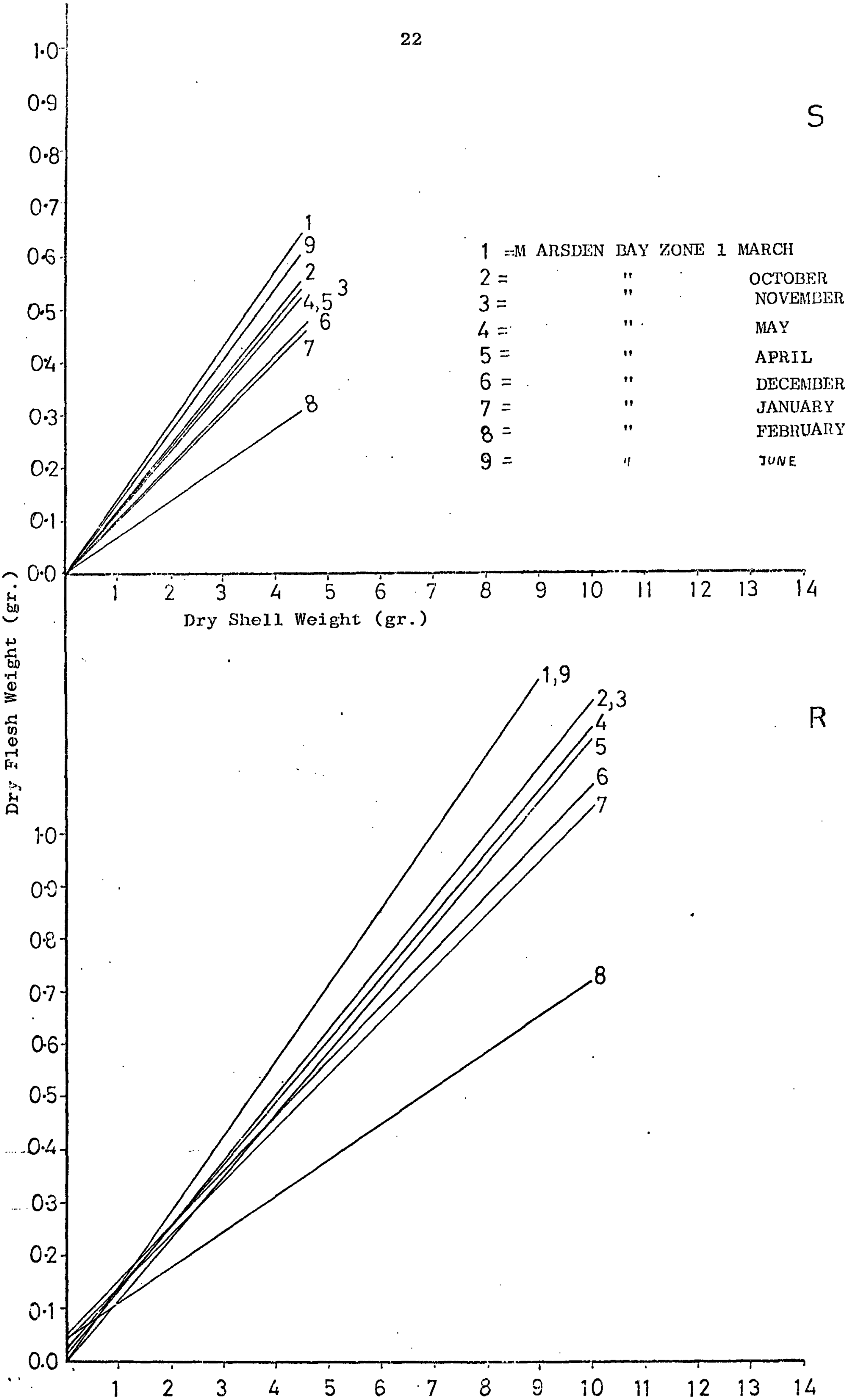


Fig. II.7: Regressions of flesh weight/shell weight relationship of all the Zone 1 subpopulations collected throughout the study period. R = Regression, S = Slope of Regression.

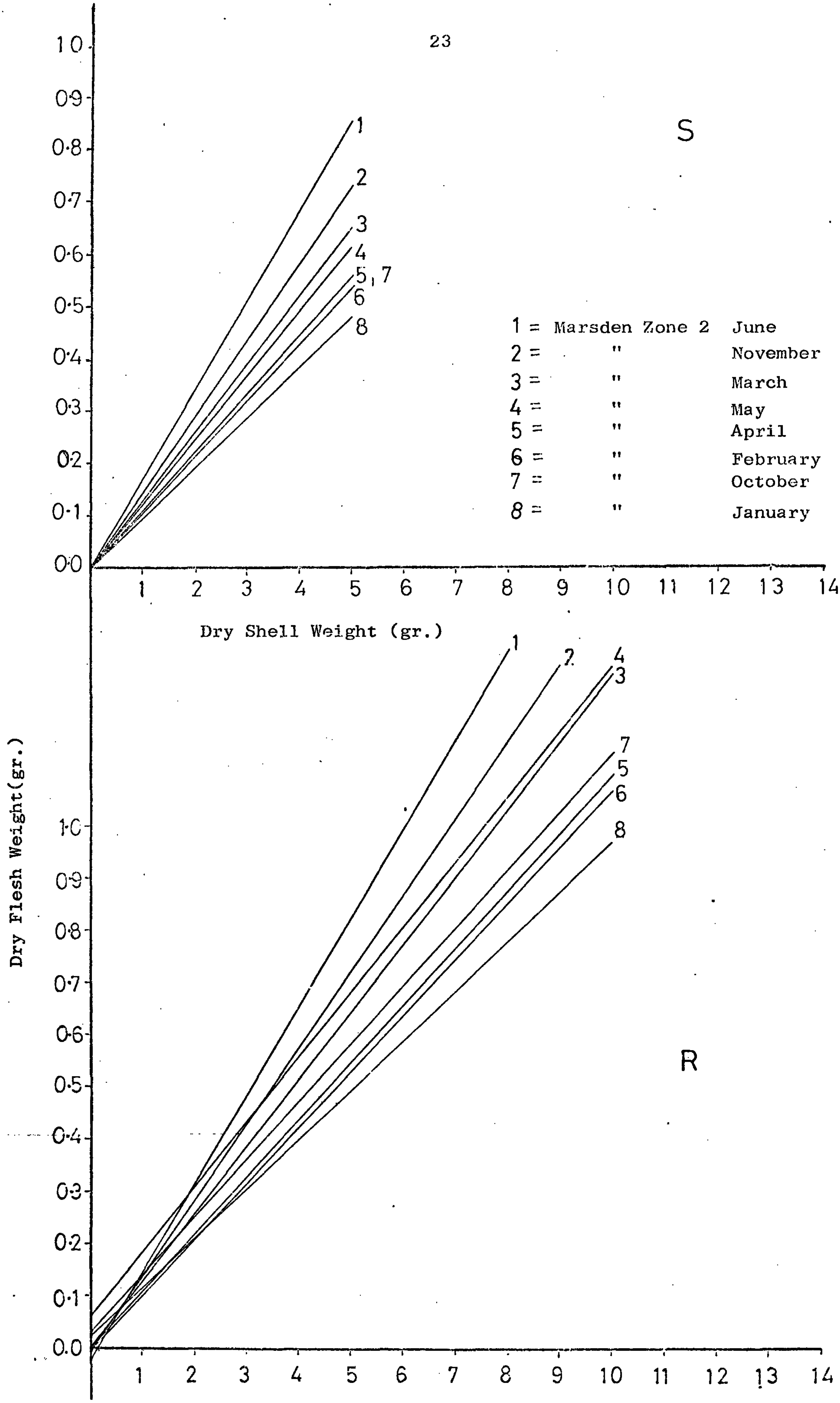


Fig. II.8: Regressions of flesh weight/shell weight relationship of all the Zone 2 subpopulations collected throoghout the study period. R = Regression, S = Slope of Regression.

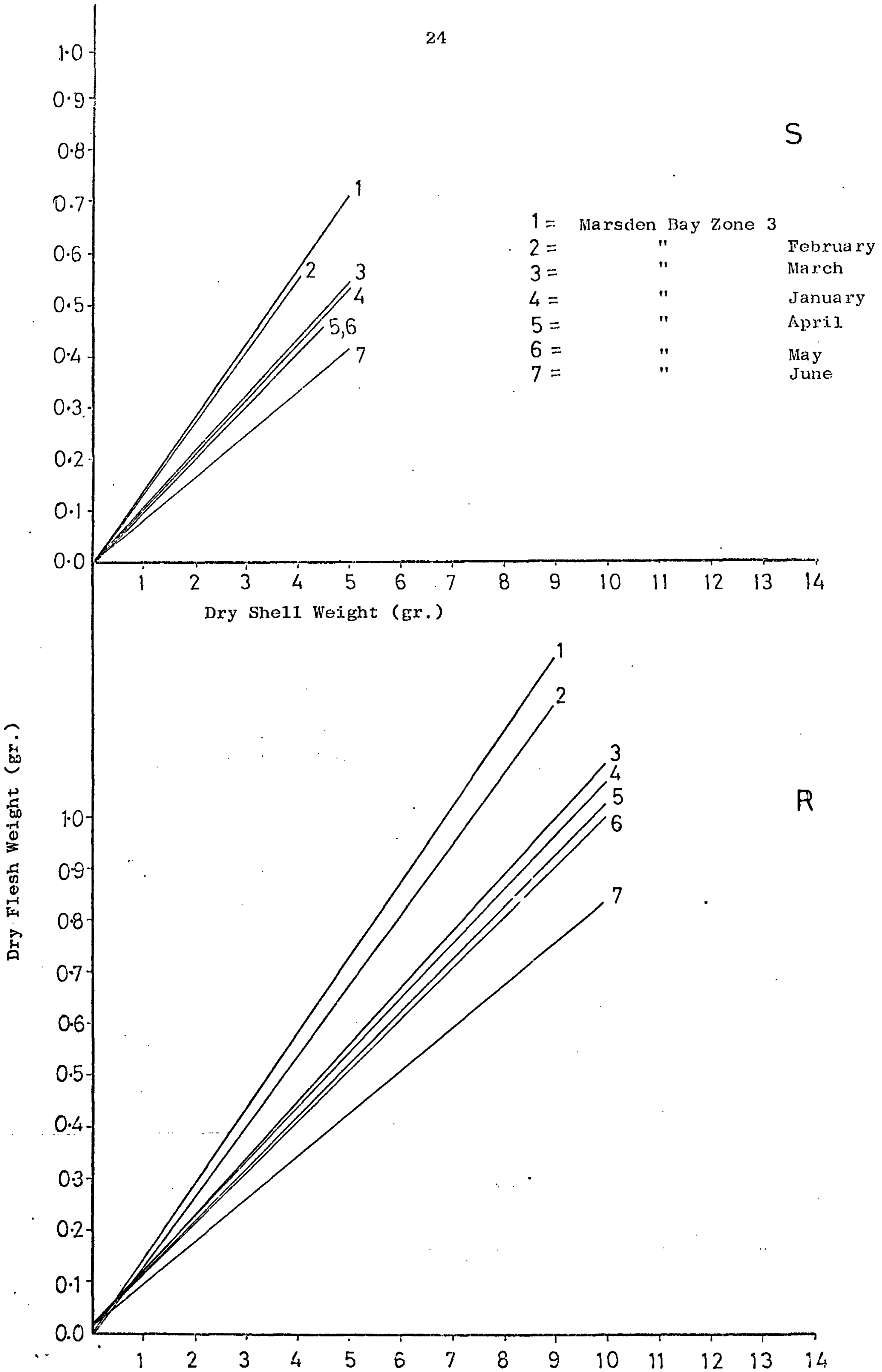


Fig. II.9: Regressions of flesh weight/shell weight relationship of all the Zone 3, subpopulations collected throughout the study period. R = Regression, S = Slope of Regression.

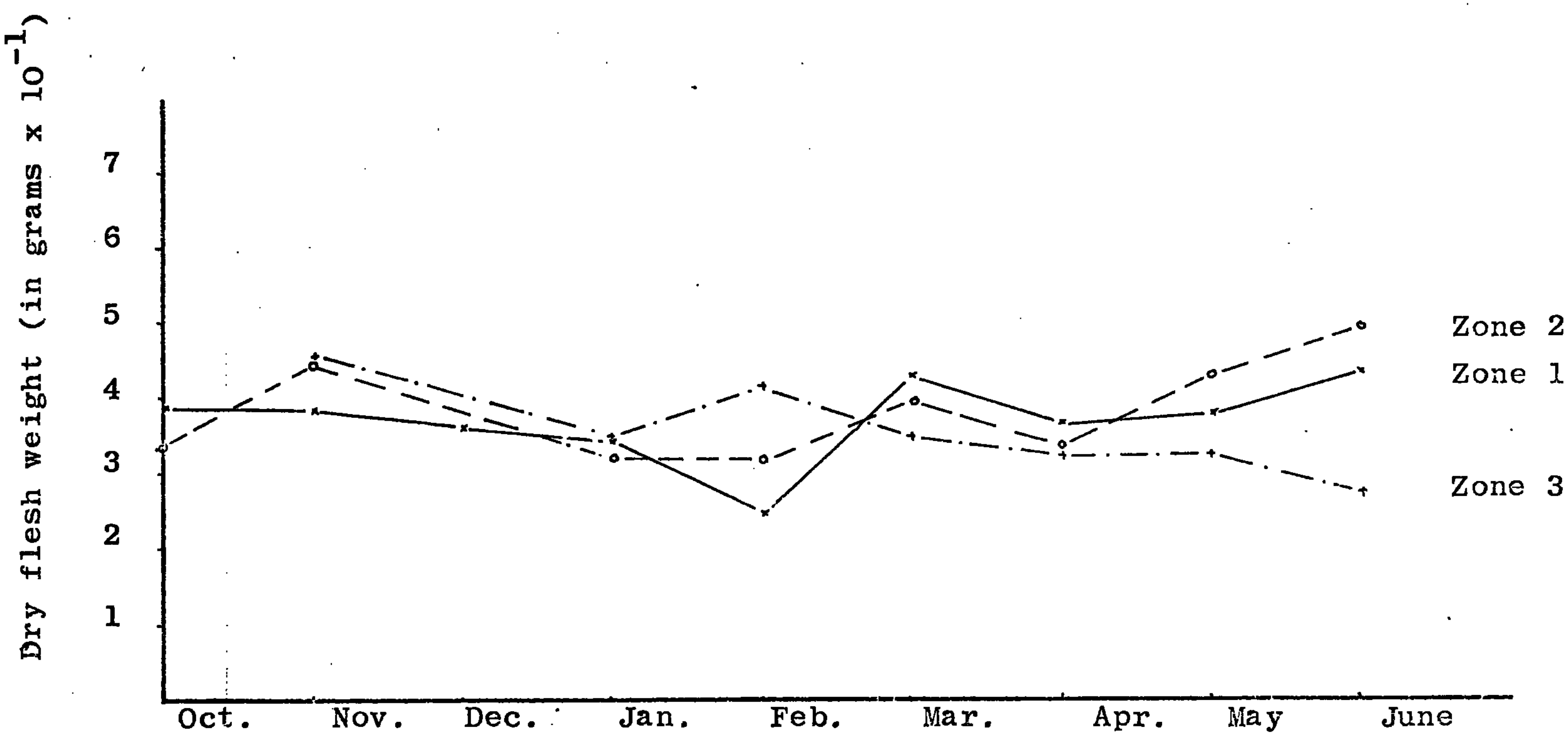


Fig. II.10: Monthly variation of flesh weight at fixed value of shell weight (shell weight = 3 gr.) in Zones 1, 2, and 3.

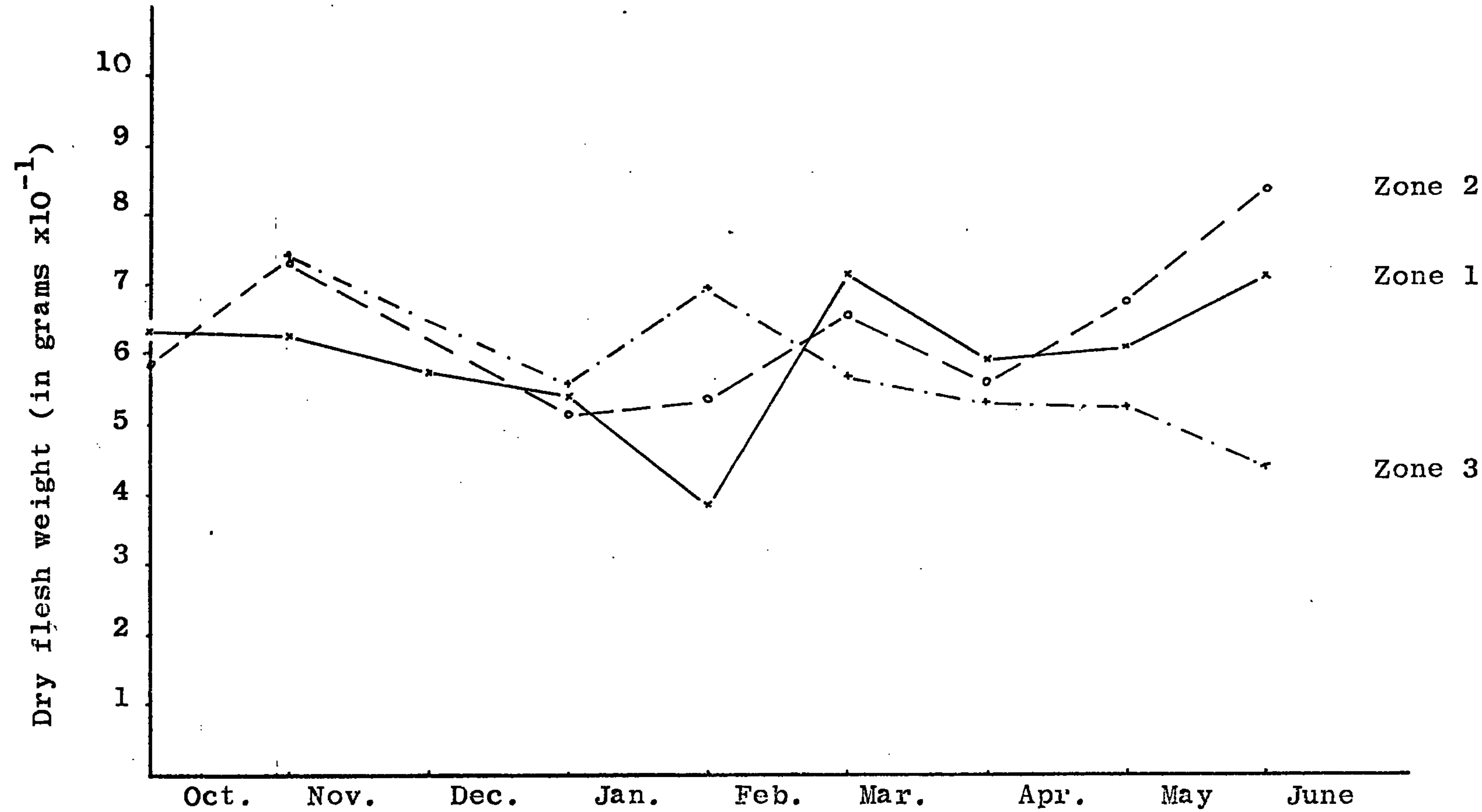


Fig. II.11: Monthly variation of flesh weight at fixed value of shell weight (shell weight = 5 gr.) in Zones 1, 2, and 3.

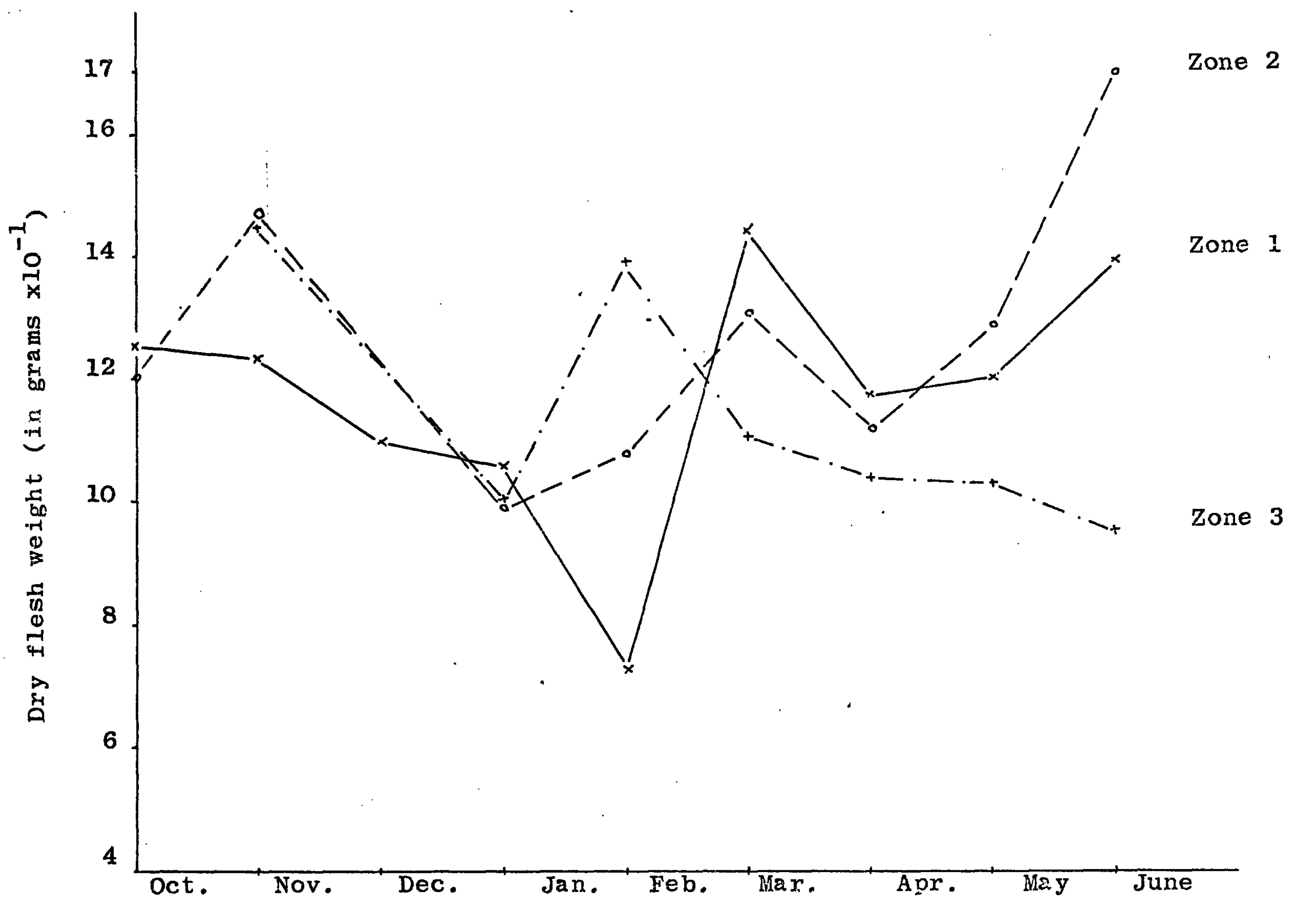


Fig. II.12: Monthly variation of flesh weight at fixed value of shell weight (shell weight = 10 gr.) in Zones 1, 2 and 3.

ii) Chemical analysis

The results of the chemical analyses are shown in Tables A5.1, A5.2, A5.3, (Appendix 5) and summarized in histograms (Figures II.13 to II.24).

The relationship of each element to size-class and zone is discussed (1) and a comparison made with the results obtained by other workers (2) also studying P.vulgata

A. Cadmium

A.1. Cadmium concentrations are shown in Figure II.13 In all the results from Zone 1 there is an increase in cadmium concentration with increase in size of the limpet. A similar relationship has been reported by other workers, (Nickless et al. 1972; Peden et al. 1973; Boyden 1974). This trend is not as obvious in Zones 2 and 3. Considering this, and the incompleteness of sampling, an interzone comparison is best based on size-classes A and B. The data relating to class A indicate higher concentrations of cadmium in Zone 3, a trend that is only partly shown by the results from size-class B.

This zonal distribution of cadmium contrasts with the results of studies made in the Bristol Channel area by Nickless et al.(op.cit.) and Peden et al. (1973), who stated that limpets from Zone 1 contained the highest concentrations of cadmium.

A.2. Cadmium concentrations from Marsden Bay (Fig.II.13). range from 2.5 - 21 ppm (mean values). Full details are shown in Appendix 5.

These values are not as high as those obtained by some previous investigators from other sites.

Mullin and Riley (1956), in their work in the Irish Sea area, found a value of 16.4 ppm, on analysing the whole animal. They stated that this element is strongly extracted from seawater by marine organisms and especially molluscs (P.vulgata and Nucella lapillus). They also found that cadmium concentrations were particularly low in the gonads and muscle, and was concentrated in the digestive glands and renal organs.

According to Preston (1973) and Abdullach et al. (1972), cadmium concentrations in the coastal waters of the east coast of the British Isles are higher than those from coastal waters of the west coast, except in Cardigan Bay and Bristol Channel, which have particularly high levels. This perhaps explains the fact that other studies on limpet flesh report extremely high values of cadmium concentrations from the west coast (see Table II.2.).

Schroeder and Balassa (1961) give the concentrations of cadmium in a wide variety of foodstuffs. Their figures of molluscs, not including limpets, seem to be higher than those they found in other animals, grain and vegetables. However, their values are considerably lower than those found as a result of this study and previous studies, being only 1 - 2 ppm.

Table II.2.

VALUES OF Cd CONCENTRATIONS REPORTED BY OTHER WORKERS

Location	Cadmium concentration (p.p.m.)	Comments	Author
Seven Estuary	30 - 550	mid-tidal zone	Butterworth et al. (1972)
Bristol Channel	9 - 500		Nickless et al. (1972)
Bristol Channel	13.9 - 116.5	wet weight	Peden et al.(1973)
Somerset	67 - 440	dry weight	Stenner & Nickless (1974)
Beer (Dorset)	3.5 - 28	" "	"
Lundy	22	similar to Marsden values	Jones (1975)
Irish Sea (Port Erin)	32	dry weight	Segar et al.(1971)
Irish Sea	8.4 - 13.1		Preston et al.(1972)
Southampton Water			Leatherland & Burton (1974)
Solent			
St.David's (Pembs)	6		
Portland (Dorset)	8.1		

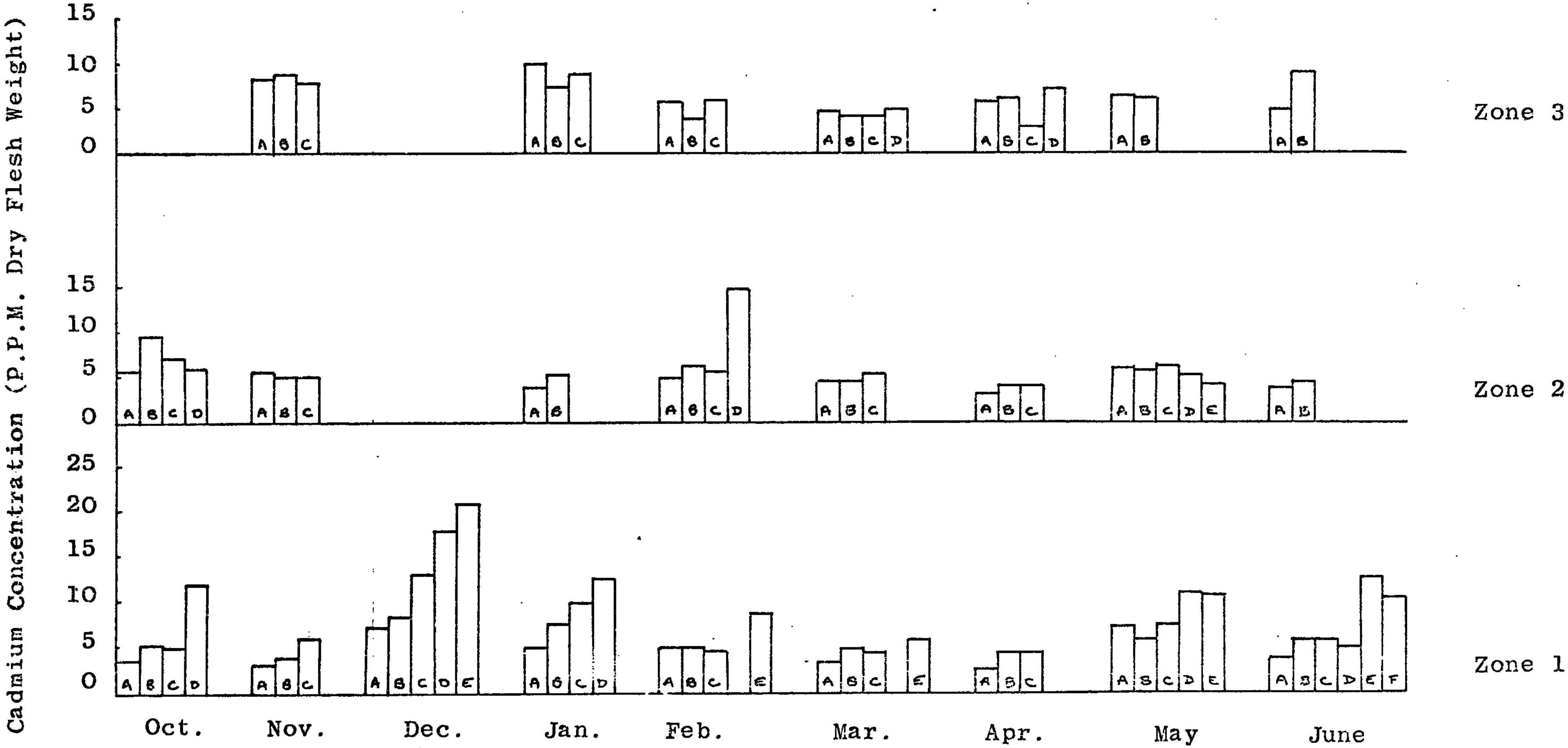


Fig. II.13: Histograms showing the cadmium content (mean values) of all size classes of limpets (A,B,C,...) in Zones 1, 2 and 3.

B. Nickel

B.1. The values obtained for nickel show no clear indication of an increase with size-class. On the contrary, among the 24 collections made from Marsden Bay, 19 show the reverse relationship, the lower nickel content being found in larger specimens. There is, however, enough variation to warn against inadequate sampling.

Apart from the fact that in some cases in Zone 1 the nickel content was almost not detectable, an interzonal comparison shows such a wide variation that no general pattern could be detected. (See Fig.II.14).

B.2. The largest mean values found at Marsden Bay range between 8-11 ppm d.w. These values are quite high when compared with those obtained from the west coast of England; Segar et al. (1971), working in the Irish Sea area, gave a mean value of 2.5 ppm d.w., Preston et al. (1972), studying Fucus sp. Porphyra and P.vulgata from two sites in the Irish Sea, gave mean values of nickel concentrations in P.vulgata of 7.3 and 7.0 ppm. Navrot et al. (1975), who used P. vulgata as a monitor of coastal pollution in Israel, reported nickel concentrations ranging from 5.2 - 11.9 ppm d.w., which are the closest to those from Marsden Bay.

C. Copper

C.1. Copper is an important metabolite in many molluscs, including gastropods. It is a component of the respiratory pigment, hemocyanin, which is a copper protein of high molecular weight (Vinogradov 1953; Ghiretti 1966; Betzer & Pilson 1974).

Variation in the concentration of copper in the Marsden Bay samples is shown between size-class, Zone, and date of sampling. The most marked trend is a higher concentration of copper in the smallest size-classes and in the mid-tide sub-population. (See Fig. II.15).

A periodicity of copper in the sub-population of each Zone is observed in February, March, April, and May. Namely, a decrease occurs in March in the three zones (See Fig. II.15).

It is of interest to note that (Marks 1938) has found the same size-concentration relationship in Mytilus californica tissue.

C.2. Copper values found at Marsden Bay vary from 10-27.7 ppm (d.w.). These values compare favourably with those reported by other workers (See Table II.3.).

Table II.3.

VALUES OF Cu CONCENTRATIONS REPORTED BY OTHER WORKERS

Location	Copper concentration (ppm)	Comments	Author
Isle of Man	7.7	dry weight	Segar *et al.* (1971)
Irish Sea (two sites)	9.9 - 14.4	dry weight	Preston *et al.*(1972)
Bristol Channel	2 - 12	fresh weight	Peden *et al.* (1973)
Seven Estuary	20 - 50	dry weight	Boyden (1974)
Beer (Dorset)	3 - 12	unpolluted area dry weight	Stenner & Nickless (1974)
North Somerset	very low levels -50	dry weight	"
Israel coast; shoreline	5.5 - 11.2	dry weight polluted and unpolluted sites	Navrot *et al.*(1975)
British Isles, east coast	20 - 21	dry weight. Polluted site	Malachtari(1973)
	14.3	dry weight. Unpolluted site	

D. Lead

D.1. Among the 24 collections made from Marsden Bay, 19 show higher concentrations of lead in the smaller limpets, as was the case with nickel and copper content. Schulz-Baldes (1973) found a similar pattern occurring in Mytilus edulis. Interzone comparison reveals no stable pattern, while the seasonal peaks occur at different lines in each Zone (see Fig. II.16).

Fig. II.14: Histograms showing the nickel content (mean values) of all size classes of limpets (A,B,C,....) in Zones 1, 2 and 3.

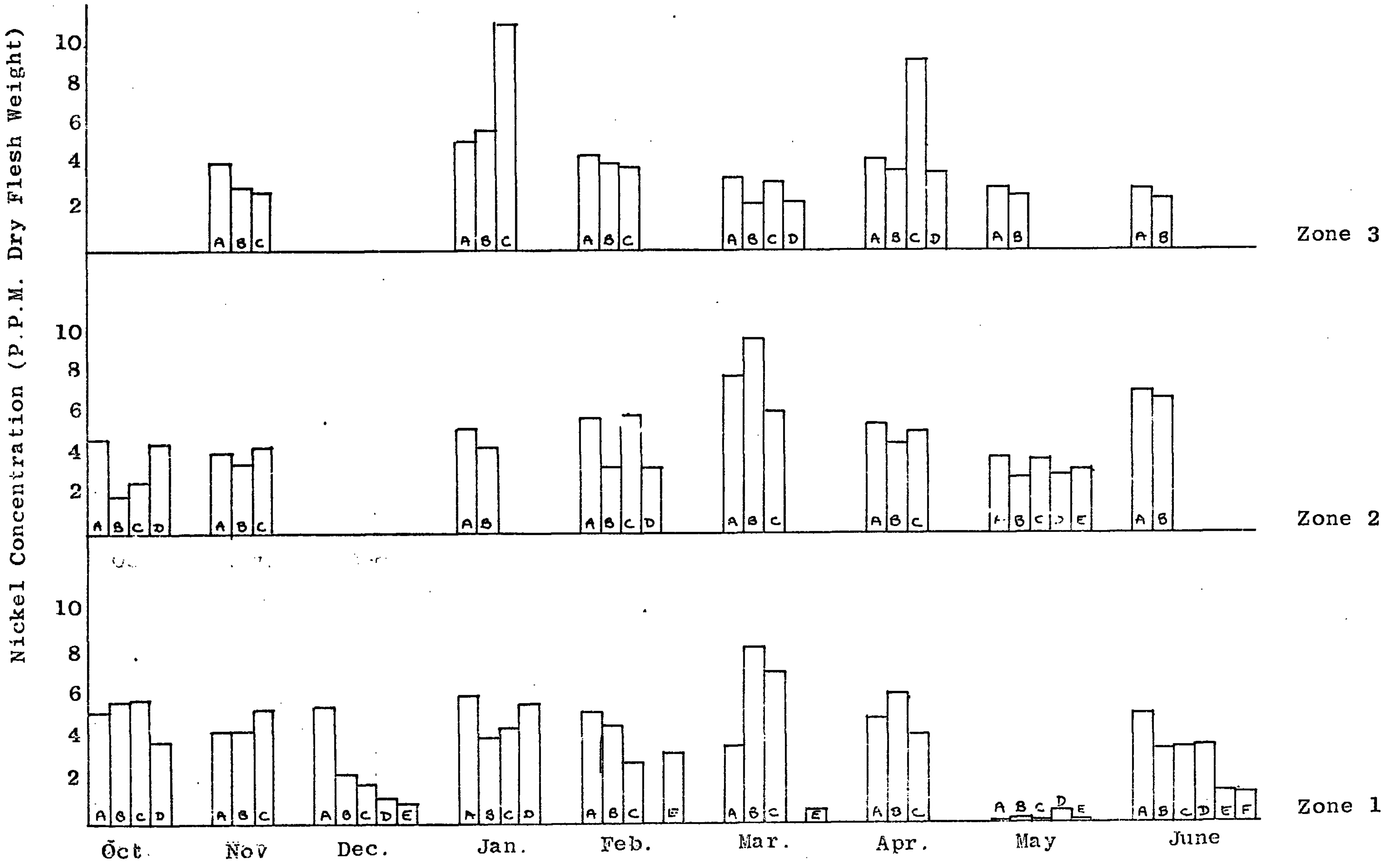
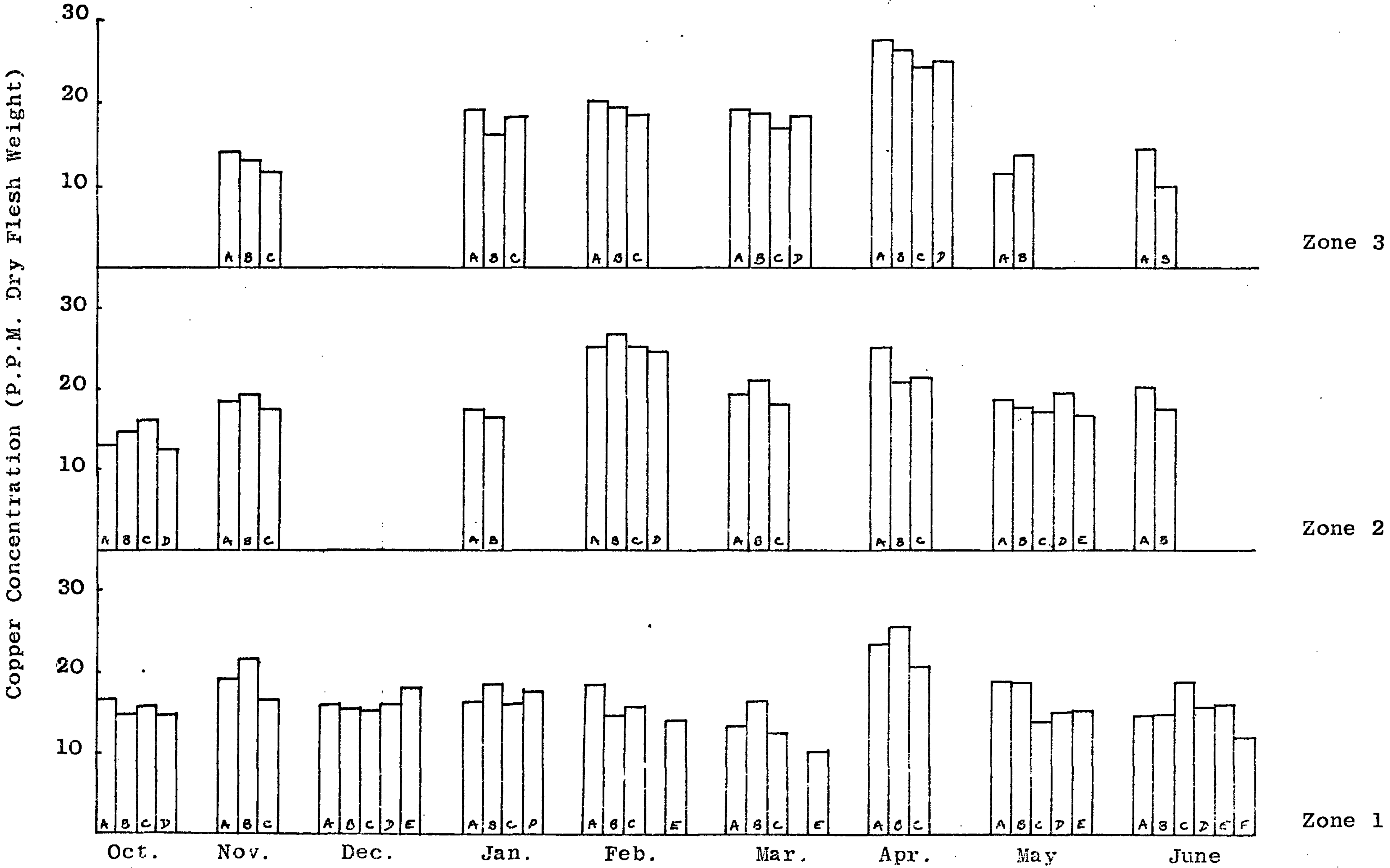


Fig. II.15: Histograms showing the copper content (mean values) of all size classes of limpets (A,B,C,...) in Zones 1, 2 and 3.



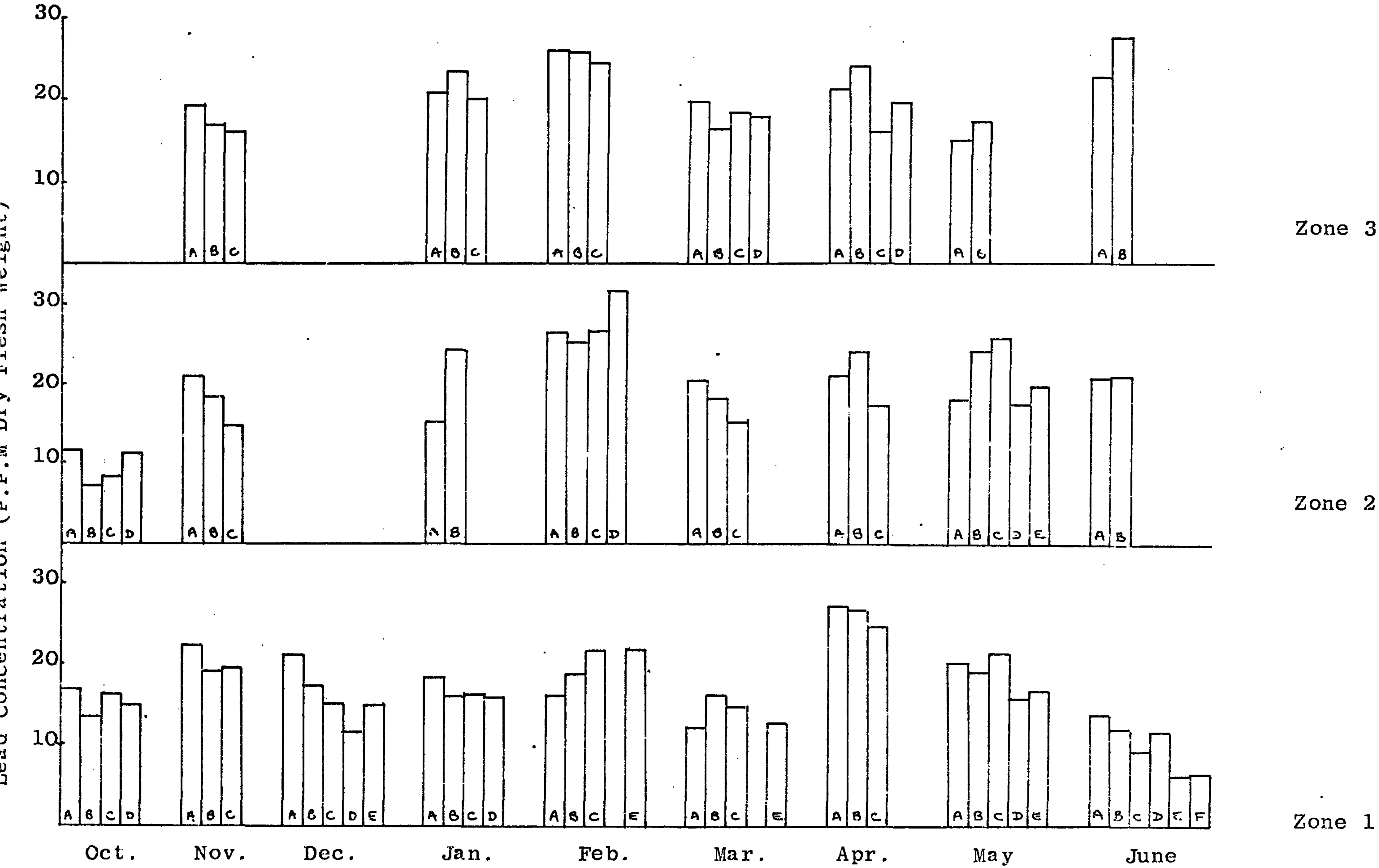


Fig. II.16: Histograms showing the lead content (mean values) of all size classes of limpets (A,B,C,...) in Zones 1, 2 and 3.

It is worthwhile to note here, that from a collection made in November or April, it could be concluded that Zone 3 shows the highest lead concentration. However, the opposite conclusion could be drawn from a collection made in January, February, March or June. Peden et al. (1973) also found no interzone pattern for lead content.

A similar periodicity is observed over the three Zones in January, February, March, and April.

D.2. The detected levels lie between 6 and 31.8 ppm (d.w.). Results obtained by previous investigators from different areas are given in Table II.4.

Table II.4

VALUES OF LEAD CONCENTRATIONS REPORTED BY OTHER WORKERS

Location	Lead Concentrations (p.p.m.)	Comments	Author
Irish Sea	7.8 - 7.9	dry weight	Preston et al. (1972)
Port Erin (Irish Sea)	32		Segar et al. (1971)
	3 - 9.5		Butterworth et al.1972
Seven Estuary	2 - 27	dry weight	Nickless et al. (1972)
Seven Estuary (Watchet)	0.18 - 0.42	wet weight	Peden et al. (1973)
Seven Estuary (Portishead)	8 - 50	dry weight	Boyden (1974)
South Shields	17 - 23	Dry weight limpets collected from pools on the shore	Malachtari (1973)

E. Iron

E.1. The iron concentration appears to show an inverse relationship with size-class this is most evident in Zone 1, and to a lesser degree in Zones 2 and 3. The highest concentrations appear to be in limpets of Zone 2. The iron loads varied greatly over the period of sampling and no clear pattern emerges within, or between, Zones (see Fig. II.17).

E.2. A range of 600 - 3,400 ppm (d.w.) was found in this study. Vinogradov (1953) quoted that Wang-Tai-Si (1928) detected levels of more than 1000 ppm (d.w.) from P. vulgata. Vinogradov (op cit.) also pointed out that among the Gastropods, P.vulgata is relatively rich in iron content, especially in the liver and hepatopancreas.

Previous investigations in the Irish Sea area have shown values of 2,450 ppm and 2,060 ppm (Preston et al. 1972) while Segar et al. (1971) found an iron content of 150 ppm for P.vulgata. Unfortunately, neither authors give data concerning the levels from which they collected their samples.

F. Zinc

F.1. Concentrations of zinc vary greatly, and in all Zones the extreme values, whether high or low, are shown in the largest individuals. In some months there seems to be a trend in which higher concentrations are seen in the largest limpets, while in other months the opposite trend seems to occur. Possibly this has led to confusion in the literature, where one group says that the higher concentrations of zinc are found in the smallest limpets (Peden et al. 1973), while another group says the opposite, stating that the highest concentrations are found in those organisms which contain elevated amounts of cadmium (Leatherhead and Burton 1974).

Similar variations are shown both between Zones and sampling periods, while there is a tendency of higher concentrations to be found in limpets collected from higher levels on the shore, (see Fig II. 18, 19, 20)

Peden et al. (1973) examined the zinc content of limpets in relation to different habitats, also did not report any pattern although their results indicated a tendency of higher values, in higher levels on the shore.

F.2. The concentrations of zinc lie between 80 and 300 ppm (d.w.). Values of zinc concentrations in P.vulgata given in previous literature are given in Table II.5.

Table II.5.

VALUES OF ZINC CONCENTRATIONS REPORTED BY OTHER WORKERS

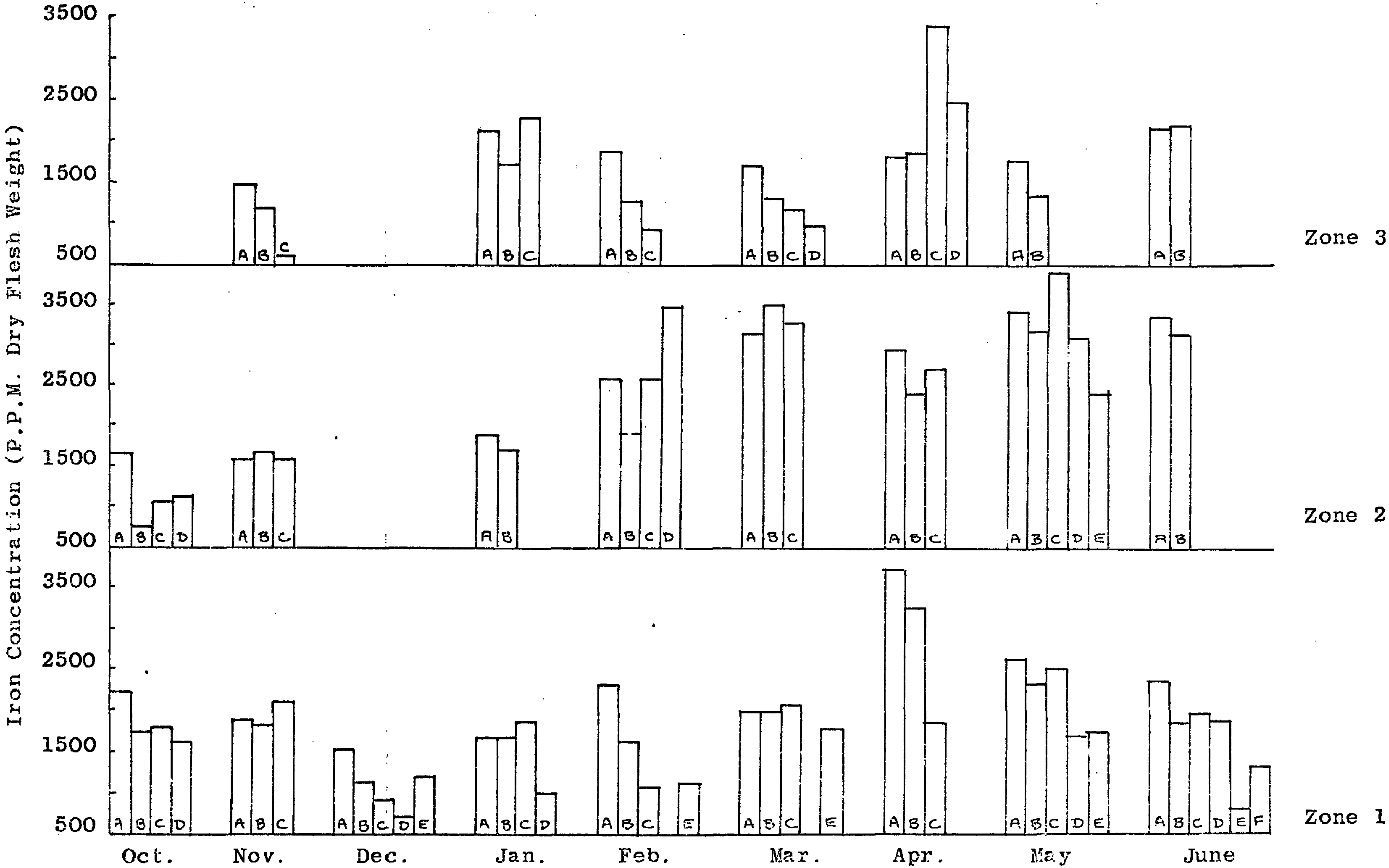
Location	Zinc concentration (ppm)	Comments	Author
Port Erin (Irish Sea)	84	dry weight	Segar et al. (1971)
Irish Sea	56 - 274		Preston et al.(1972)
Seven Estuary	100 - 580	mid-tide zone	Butterworth (1972)
Seven Estuary	65 - 375		Nickless et al.(1972)
Bristol Channel	68 - 260	wet weight	Peden et al. (1973)
Somerset	53 - 340		Stenner & Nickless (1974)
Seven Estuary	400 - 600	dry weight	Boyden (1974)
Portland, Dorset	95	dry weight	Leatherhead & Burton (1974)
Netley	229	dry weight	
Israel	53 - 86.7	dry weight	Navrot et al.(1975)
British Isles (north-east coast)	58	unpolluted site	Malachtari (1973)
	118	polluted site	

G. Magnesium

G.1. There is an evident trend for the smallest limpets to contain higher magnesium concentrations, and in Zone 3 sub-populations also a higher magnesium content. Zone 2 sub-populations show a tendency to maintain an intermediate position between those of Zone 1 and 2 individuals, (see Fig. II.21)

G.2. The mean values for the Marsden Bay samples range from 2,900 ppm to 9,200 ppm. Previous works have reported values for other sites from the west coast of Britain, about 5,600 ppm. (Segar et al. 1971). Vinogradov (1953) records values of 668 ppm (wet weight). He also states that the magnesium content in molluscs generally, is lower than that of calcium and the results of this study substantiates this.

Fig. II.17: Histograms showing the iron content (mean values) of all size classes of limpets (A,B,C,....) in Zones 1, 2 and 3.



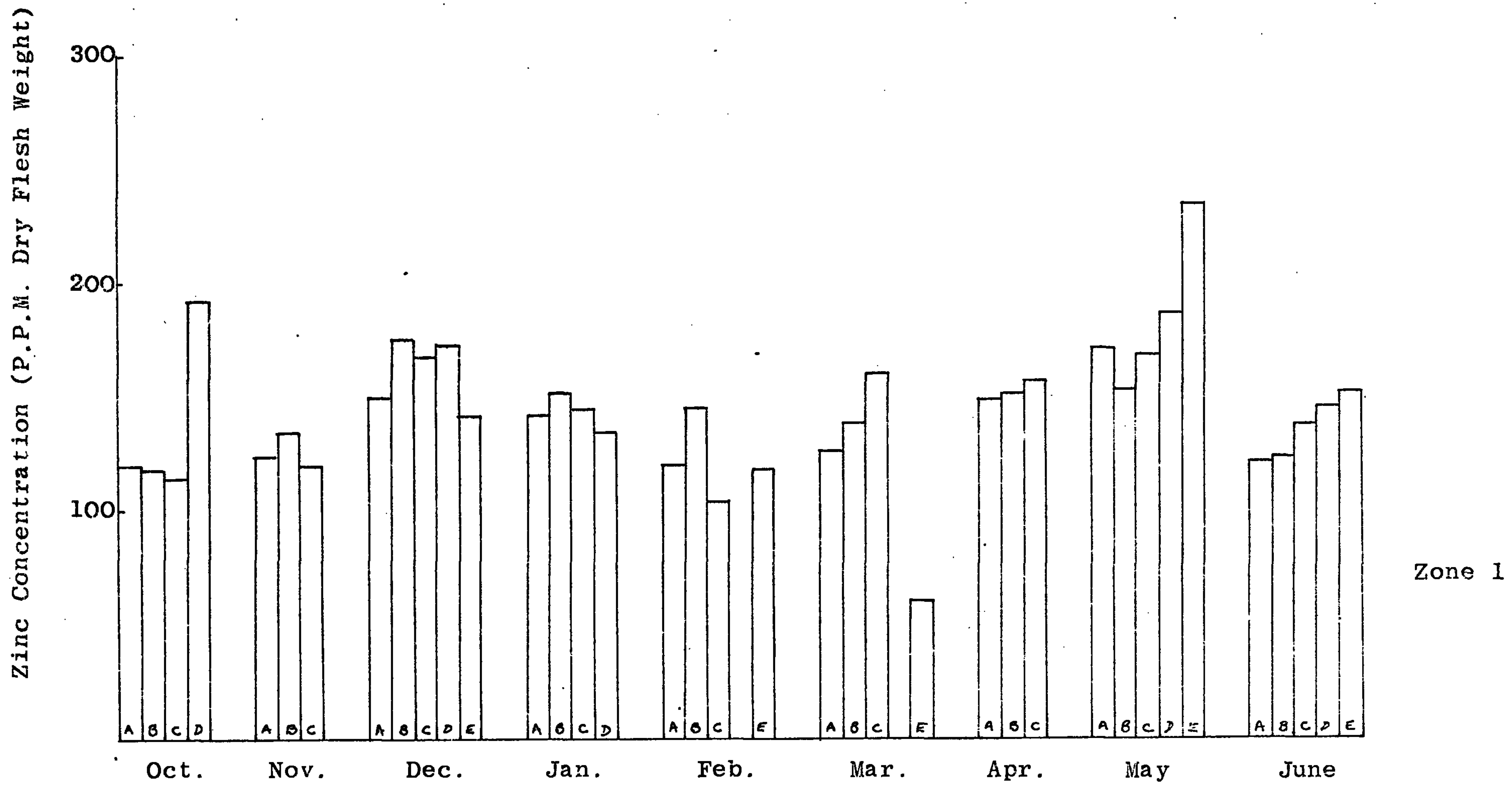


Fig. II.18: Histograms showing the zinc content (mean values) of all size classes of limpets (A,B,C,...) in Zone 1.

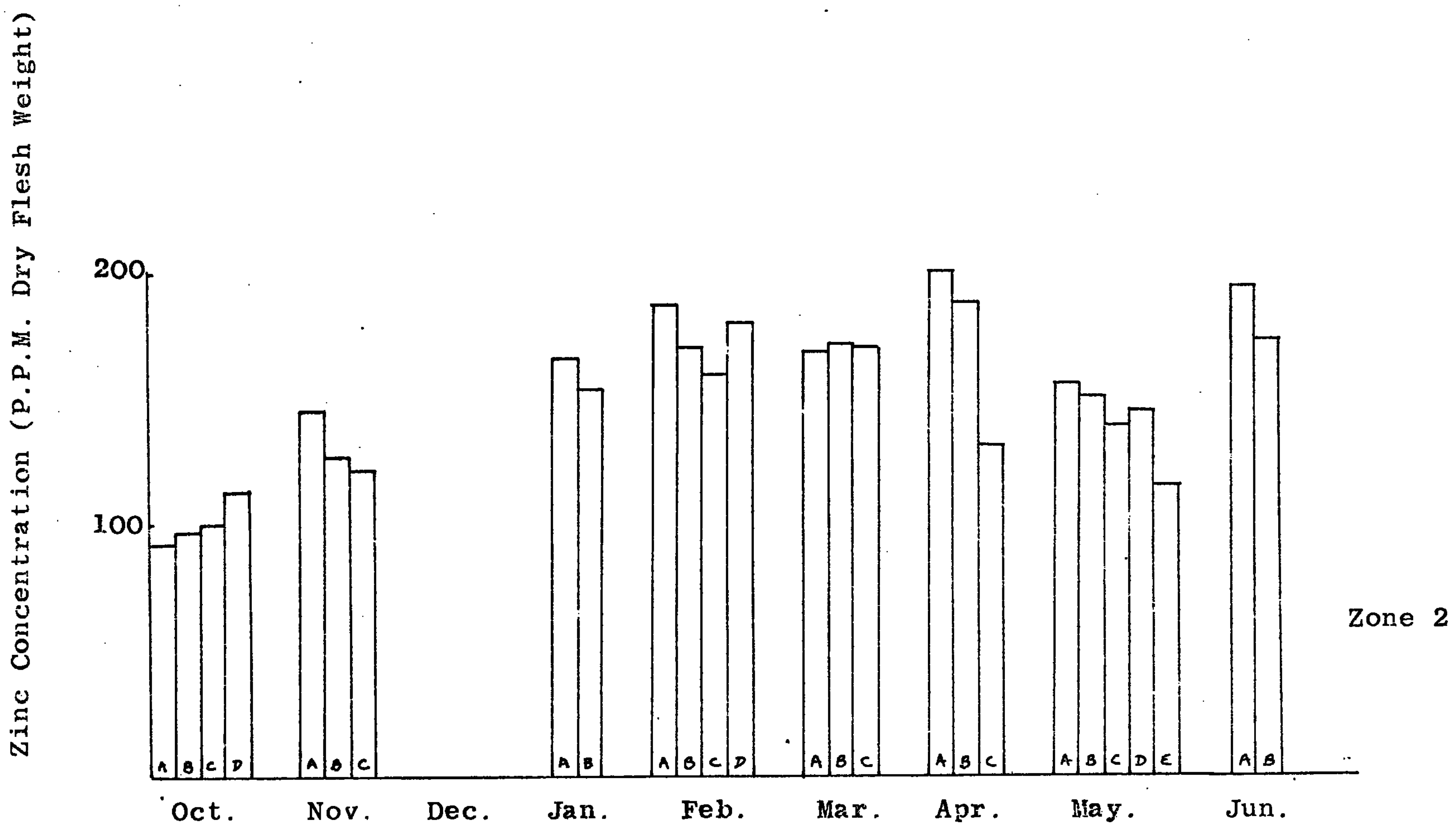


Fig. II.19: Histograms showing the zinc content (mean values) of all size classes of limpets (A,B,C, ...) in Zone 2.

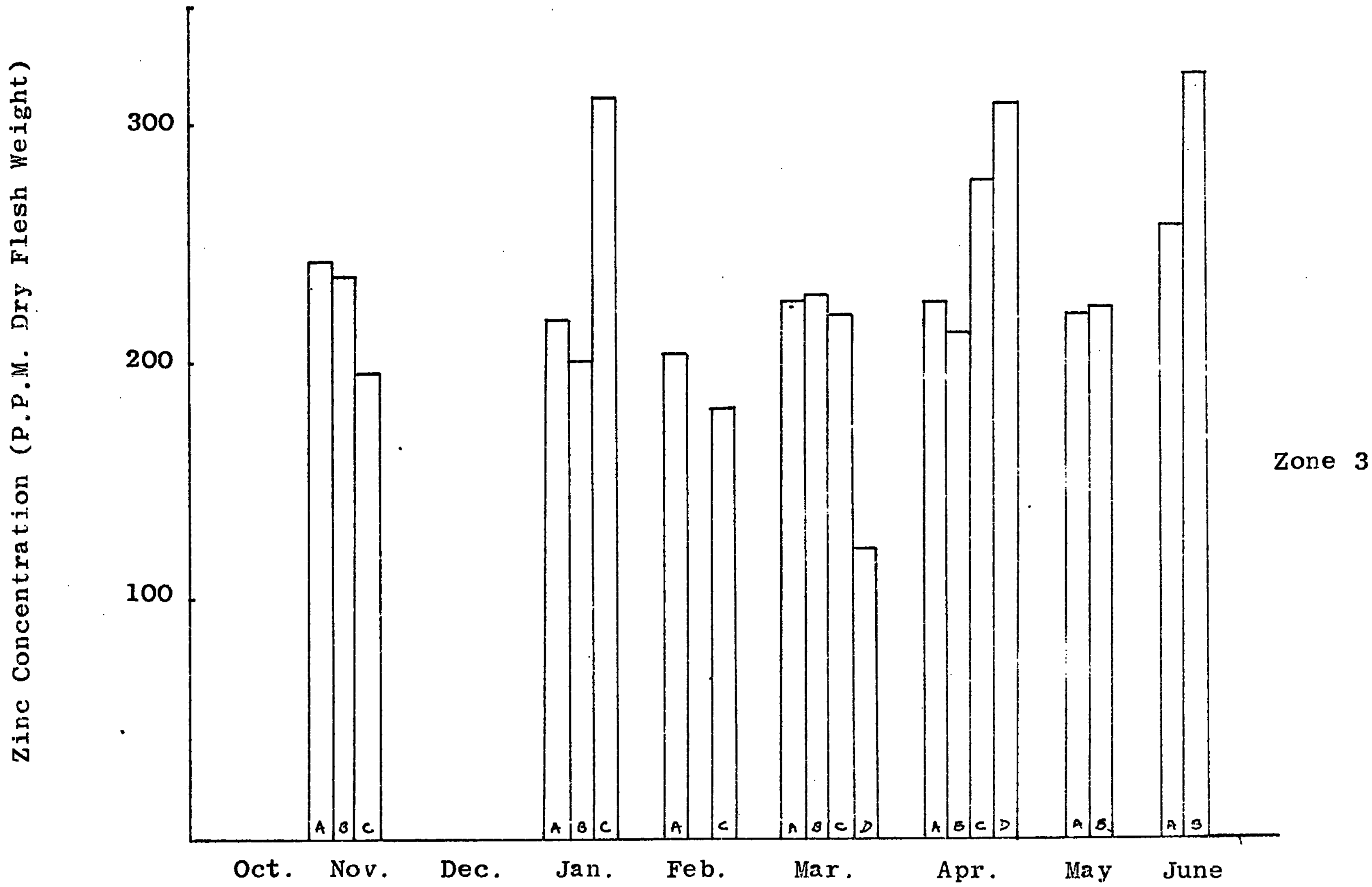


Fig. II.20: Histograms showing the zinc content (mean values) of all size classes of limpets (A,B,C,...) in Zone 3.

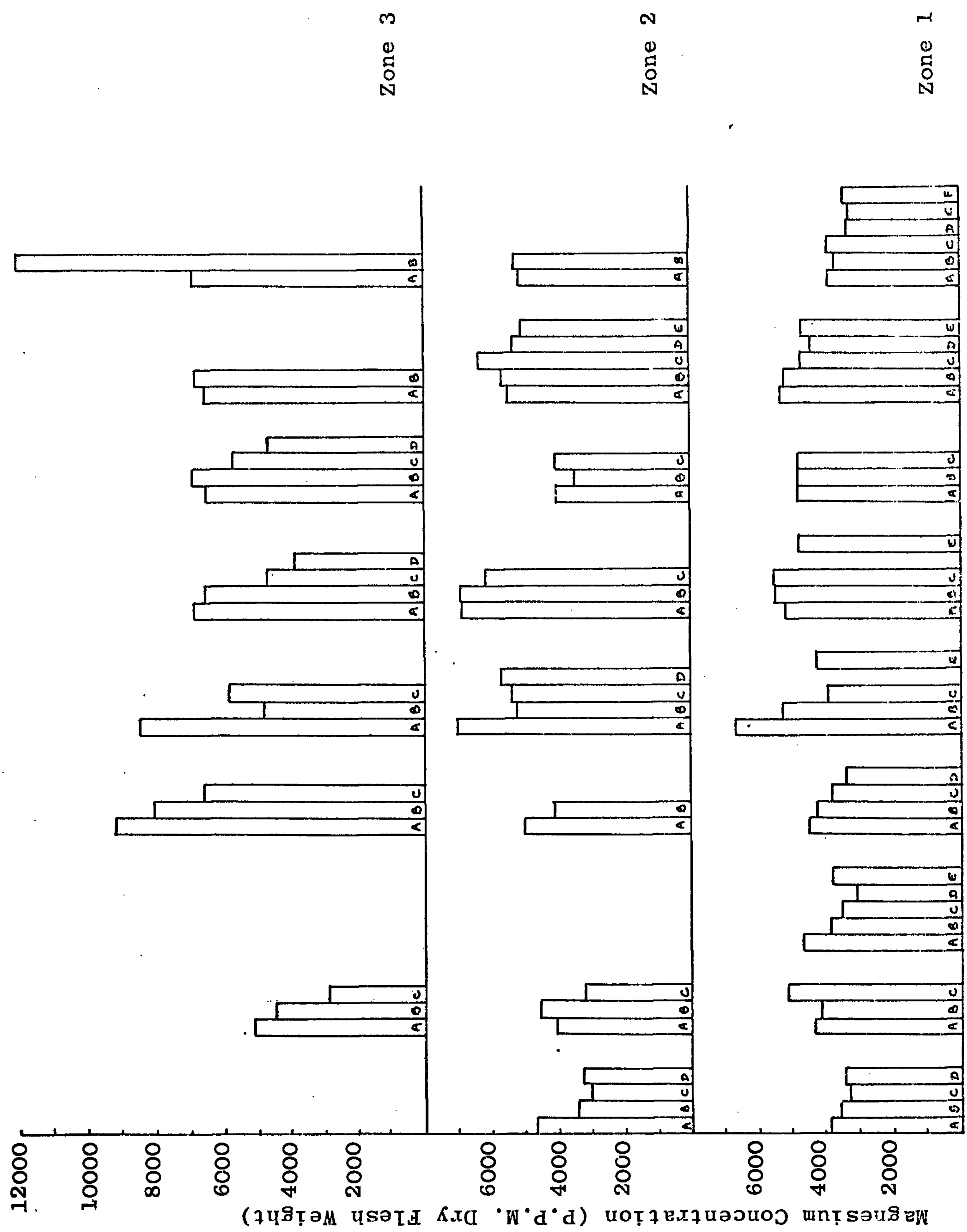

Zone 3
Zone 2
Zone 1
Oct.
Nov.
Dec.
Jan.
Feb.
Mar.
Apr.
May
June
Magnesium Concentration (p.p.M. Dry Flesh Weight)
12000
10000
8000
6000
4000
2000
6000
4000
2000
6000
4000
2000

Fig. II.21

H. Calcium

H.1. There is a marked trend for the smallest individuals to contain higher concentrations of this element in all three Zones. An interzone comparison of similar size-classes shows that Zone 2 sub-populations contain the highest concentrations of calcium, though there are exceptions (see Fig II.22)

There does not appear to be any stable pattern of seasonal variations in the three Zones.

H.2. The values of calcium concentration from the Marsden Bay samples lie in a range of 5,700 - 42,000 ppm (d.w.), varying between size-class, Zone, and period of sampling.

According to Vinogradov (1953), many investigators have noted the considerable fluctuations in calcium in the tissues of molluscs, while the magnesium content seems to be more stable. Vinogradov (op cit.) suggests that these fluctuations may be explained by the fact that the calcium in the liver becomes mobilized when there is increased growth or formation of new shell. He also stated that there is much more fluctuation of calcium content when the animal is exposed to the air. This is well reflected in Zone 3 samples.

McCance & Masters (1937) found in P.vulgata tissue, levels of Ca of 3,340 ppm (d.w.) (about 12,000 ppm d.w.). Recent literature reports values such as 12,000 ppm (d.w.). (Segar et al. 1971).

I. Potassium

I.1. There is no clear pattern of a stable relationship between potassium content and size-class, although the lowest values are shown by either the largest or smallest individuals. An interzone comparison shows that the Zone 1 limpets contain the highest concentrations of potassium, the other two Zones show similar lower levels. However, there is not a wide variation between the size-class and Zones. (See Fig. II.23)

Fig. II.22: Histograms showing the calcium content (mean values) of all size classes of limpets (A,B,C,...) in Zones 1, 2 and 3.

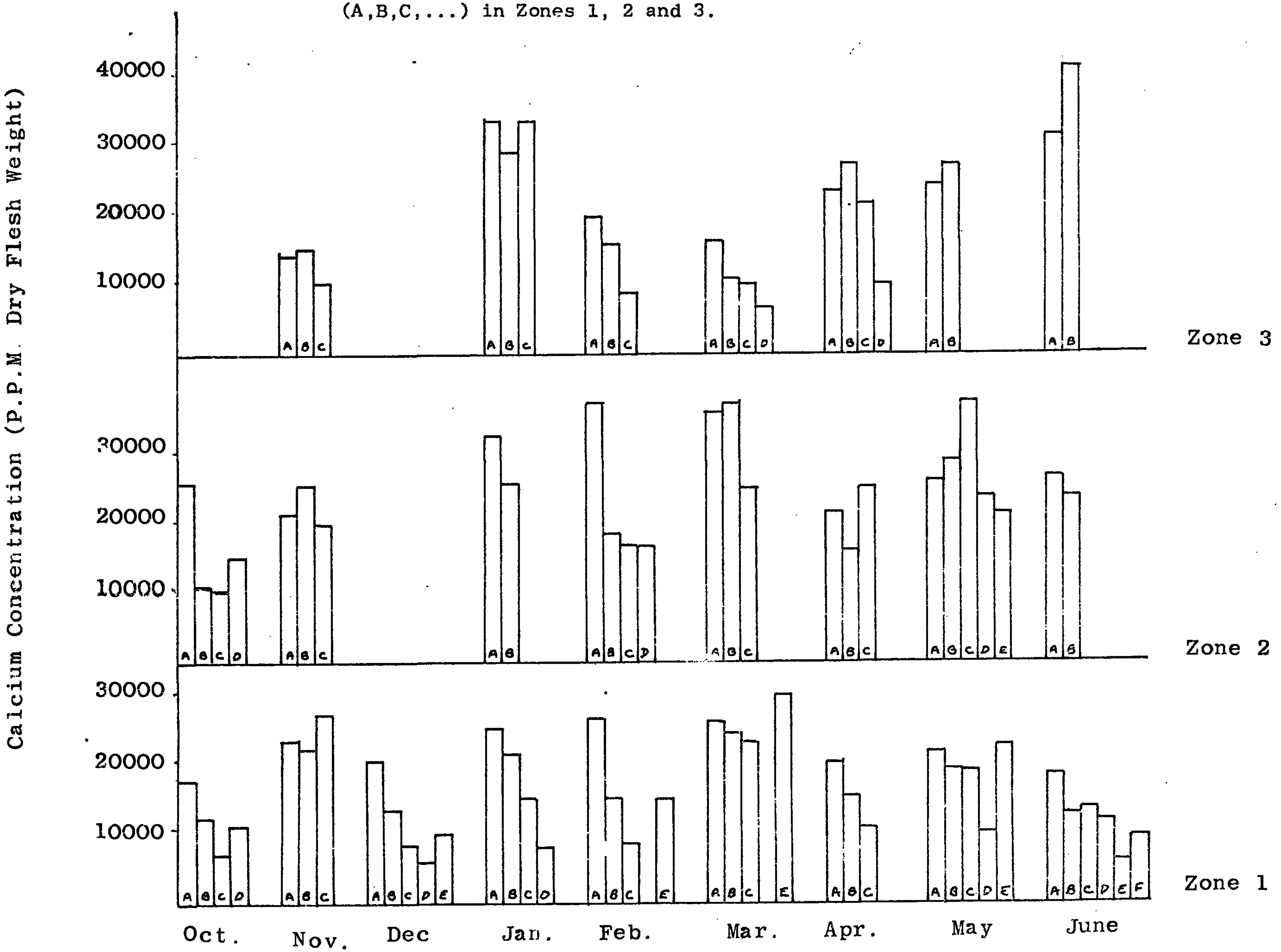


Fig. II.23: Histograms showing the potassium content (mean values) of all size classes of limpets (A,B,C,...) in Zones 1, 2 and 3.

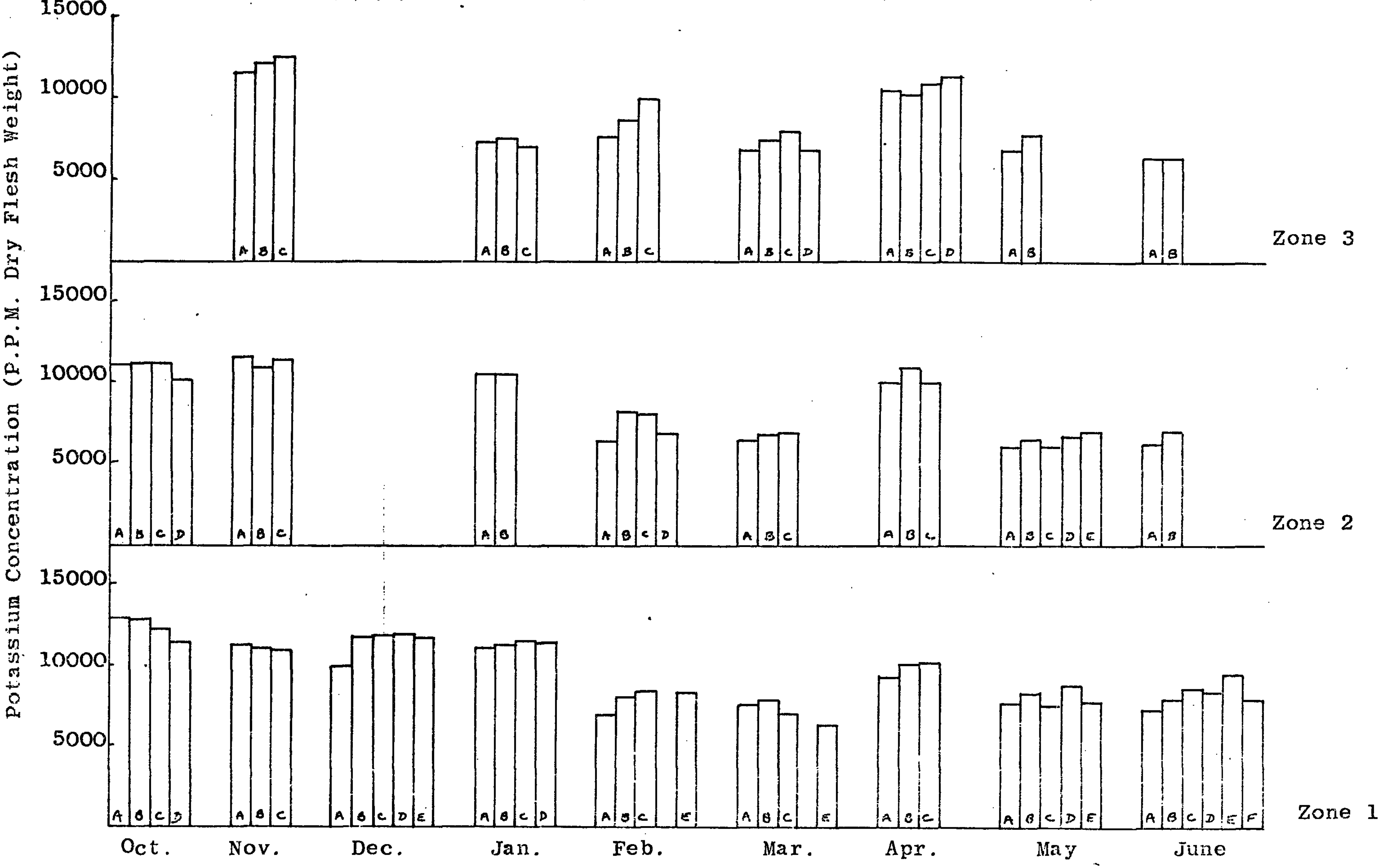
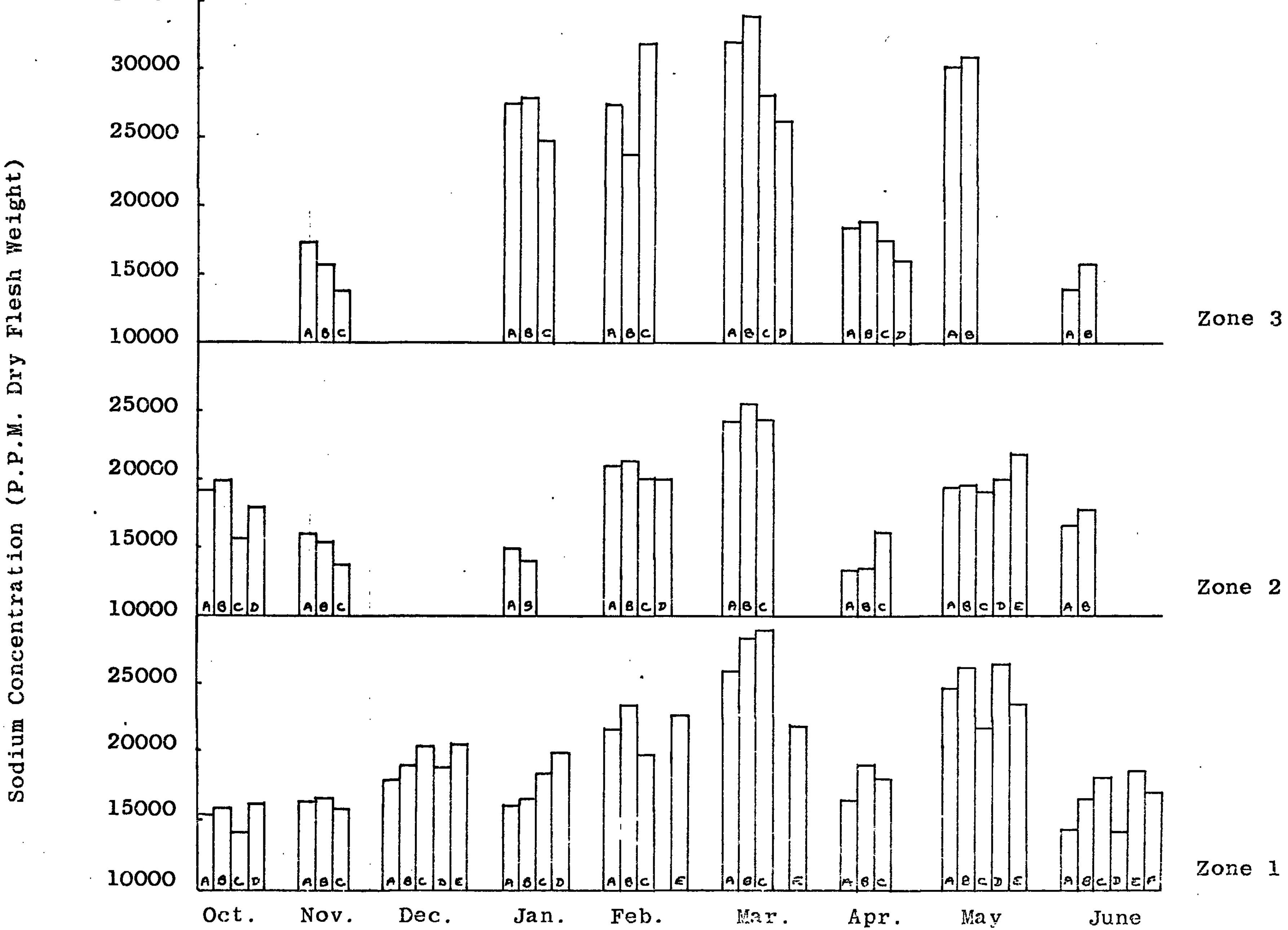


Fig. II:24: Histograms showing the sodium content (mean values) of all size classes of limpets (A B,C,...) in Zones 1, 2 and 3.



On the other hand, simultaneous seasonal variations are observed in all three Zones.

I.2. Potassium values from the Marsden Bay samples lie in a range between 6,200 - 13,500 ppm (d.w.). McCance & Masters (1937) reported values of 4,450 ppm (wet weight), which are much higher than the Marsden Bay results. However, in more recent work (Segar et al. 1971) values of 12,000 ppm (d.w.), have been reported, results which are not at variance to those from Marsden Bay.

J. Sodium

J.1. Although there is a large variation between size-class and level of concentration, no evidence of any pattern exists. Similar variations occur beteen Zone sub-populations, but it is clear that the Zone 3 limpets contain the highest sodium concentrations, followed by those of Zone 1, where a gradual increase reaches a peak in March, fluctuates in April and May and falls again in June. This seasonal variation is seen clearly in both Zone 2 and 3, (see Fig. II.24).

J.2. The values of sodium concentration found at Marsden Bay lie between 13,000 ppm and 34,000 ppm. Values within this range are also reported from Vinogradov (1953).

Recent work by Segar et al. (1971) reports 43,000 ppm d. weight which is significantly higher than that of this study.

II.4 SUMMARY

From a total of 24 comparative sets of analyses the elements, which exhibit either increases or decreases in concentration in relation to flesh weight (size) are presented in Table II.6.

Table II.6

PERCENTAGE OF CASES WHERE ELEMENT CONCENTRATION INCREASES OR DECREASES WITH SIZE OF THE ORGANISM

Increase with size	Decrease with size	No pattern
Cd 75%	Pb 80% Ni 80% Cu 80% Fe 71% Mg 75% Ca 71%	Zn Na K

Owing to the lack of any overall pattern, related to the distribution of the elements in relation to the size-class, Zone, or season, it must be concluded that each element must be considered and studied as a special case.

Table II.7

TOTAL MEAN VALUES OF ELEMENTS IN EACH ZONE AT MARSDEN BAY IN PPM D. WEIGHT

Element	Marsden Zone 1	Marsden Zone 2	Marsden Zone 3
Pb	16.72 ± 4.85	19.48 ± 5.92	20.56 ± 3.69
Cd	7.42 ± 4.12	5.58 ± 2.26	6.32 ± 1.93
Ni	3.65 ± 2.27	4.67 ± 1.77	4.25 ± 2.22
Cu	16.50 ± 3.02	19.31 ± 3.76	18.03 ± 4.95
Zn	143.10 ± 29.30	150.90 ± 31.10	227.30 ± 48.50
Fe	1,799 ± 627	2,473 ± 880	1,705 ± 629
Na	19,560 ± 3,997	18,477 ± 3,439	23,389 ± 6,744
K	9,663 ± 1,896	8,671 ± 2,108	8,750 ± 2,070
Mg	4,287 ± 799	4,947 ± 1,164	6,716 ± 1,991
Ca	16,563 ± 6,754	24,459 ± 7,865	20,692 ± 9,984

Table II.7 summarizes the total data by presenting the mean values for each element from all the limpets collected in each zone over the sampling period. For each element, zonal mean values were calculated and an analysis of variance carried out by SPSS computer programme (SCHEFFE). Significant differences have been calculated at 5% level, and are shown in Table II.8.

As shown in Tables II.7 and II.8

Lead: Zone 3 $\geq$ Zone 2 $\geq$ Zone 1

but the difference is significant only between Zone 3 and Zone 1 (3>1)

	Pb 1	Pb 2	Pb 3	Cd 1	Cd 2	Cd 3	Ni 1	Ni 2	Ni 3	Cu 1	Cu 2	Cu 3
1	•			•			•			•		
2	—	•		—	•		—	•		+	•	
3	+	+	•	—	—	•	—	—	•	—	—	•

	Zn 1	Zn 2	Zn 3	Fe 1	Fe 2	Fe 3	Na 1	Na 2	Na 3	K 1	K 2	K 3
1	•			•			•			•		
2	—	•		+	•		—	•		—	•	
3	+	—	•	—	+	•	+	+	•	—	—	•

	Mg 1	Mg 2	Mg 3	Ca 1	Ca 2	Ca 3
1	•			•		
2	—			+	•	
3	+	+	•	—	—	•

1 = Marsden Bay Zone 1

2 = Marsden Bay Zone 2

3 = Marsden Bay Zone 3

+ = no significant difference

— = significant difference at 5%

Table II.8: Comparison of variance of chemical analysis data for Zones 1, 2 and 3 at Marsden Bay.

Cadmium: No significant difference between the 3 Zones.

Nickel: No significant difference between the 3 Zones.

Copper: Zone 2 $>$ Zone 3 $>$ Zone 1 but the difference is significant only between Zone 2 $>$ Zone 1. $(2 \overset{*}{>} 1)$

Zinc: Zone 3 $>$ Zone 2 $>$ Zone 1

Zone 3 value is significantly different from both Zone 1 and Zone 2 values while Zone 1 value $\approx$ Zone 2 value

Iron: Zone 2 $>$ Zone 1 $>$ Zone 3

Zone 2 $>$ Zone 1 and Zone 1 $\geq$ Zone 3

Zone 2 $>$ Zone 3

Sodium: Zone 3 mean value $>$ Zone 1 $>$ Zone 2

Zone 3 $>$ Zone 2 , Zone 1 $\approx$ Zone 2

Zone 3 $>$ Zone 1

Potassium: No significant difference between the three Zones.

Magnesium: Zone 3 value $>$ Zone 2 $>$ Zone 1 value

Zone 3 $>$ Zone 2 and Zone 1 $\approx$ Zone 2

Zone 3 $>$ Zone 1

Calcium: Zone 2 $\geq$ Zone 3 $\geq$ Zone 1

Zone 2 $>$ Zone 1, only this difference is significant.

The above analysis of variance reveals that for the 9 months of study, there appears to be somewhat higher level of load in the higher levels on the shore. Nowhere does the first Zone appear to contain significantly higher concentrations.

The study of the distribution of the elements in limpets collected from Marsden Bay, in relation to size, Zone, and season, shows that:

1) There is no general distribution pattern for the elements collectively, in relation to the flesh weight (size) of the specimens, although when the distribution of the individual elements is studied a pattern can be seen (see Table II.6).

2) Similarly, there is no general distribution pattern for the higher or lower concentrations of the elements collectively in any one Zone (see Tables II.7,8) although when the distribution of the individual elements is studied, a monthly pattern is observed for some elements in some Zones.

3) Seasonal fluctuations are not consistent for all the elements studied.

Considering these points the following sampling rationale is proposed for future studies;

a) If a comparative study is going to extend over a long period at the same site, samples should be collected in such a way as to ensure that the comparative populations are the same throughout the whole period i.e. that comparisons are made between samples of the same size, taken from the same zone.

b) On the other hand, if the aim of the study is only to measure the "load" of a single, or a number, of elements at a particular site, an alternative system of sampling could be adopted.

In this case one large aggregate of flesh composed of constant proportions of dry flesh weight of all sizeclasses from each zone could be taken for analysis.

c) If an intersite comparative study is going to be made care must be taken to ensure that the comparative classes are the same, i.e. that comparisons are made between samples of the same size-class, taken from the same zone, at the same season from either site.

To maximize the differences at either site, more than one size-class can be used, but if for example, at one site five classes were collected, a comparison must then be made between the same five classes at the other site.

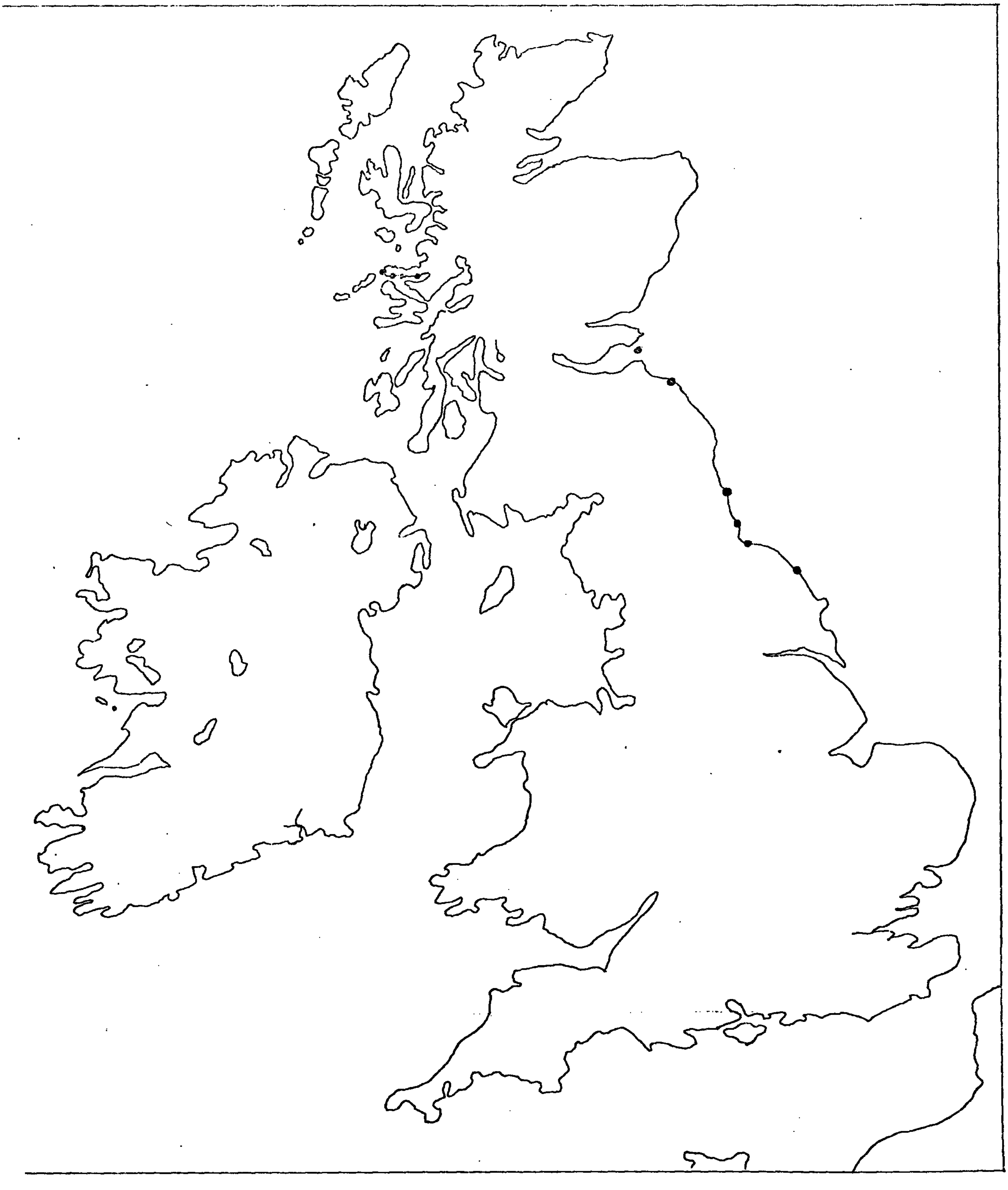


Fig. III.1: Location of sampling sites in Areas A and C.

SECTION III

SUMMARY OF AIMS

Following the more detailed investigations carried out at Marsden Bay, a comparative study of certain aspects of the "growth" and geochemical content of Patella vulgata was undertaken at several sites varying in geographical location, degree of exposure, substeate type, and kind and intensity of pollution. These variations were chosen in an attempt to investigate if, and how, these factors may influence the population characteristics of mollusc under investigation and to clarify whether high levels of metals present in the flesh are due only to man made pollution or whether, in fact, different bedrocks can also influence the biogeochemical composition of P. vulgata.

For the above purposes, samples were collected in the same way as described in Section II. A total of 2,420 limpets were measured and analysed.

III. 1 THE SITES

Throughout this section the sites studied are considered in three main areas based on geographical location. The relevant features of each area are summarized in Tables III. 1, III. 2, III. 3, and an expanded description is presented in the Appendix 6. In Figure III. 1 all the study sites (except Shetland) are illustrated on map.

i. Area A: ARDNAMURCHAN POINT AND LOCH SUNART (Grid Ref. 6258)

The collection of limpets was made in November 1974 and the sampling sites are included in Table III.1 and illustrated on the map (Fig. III.2)

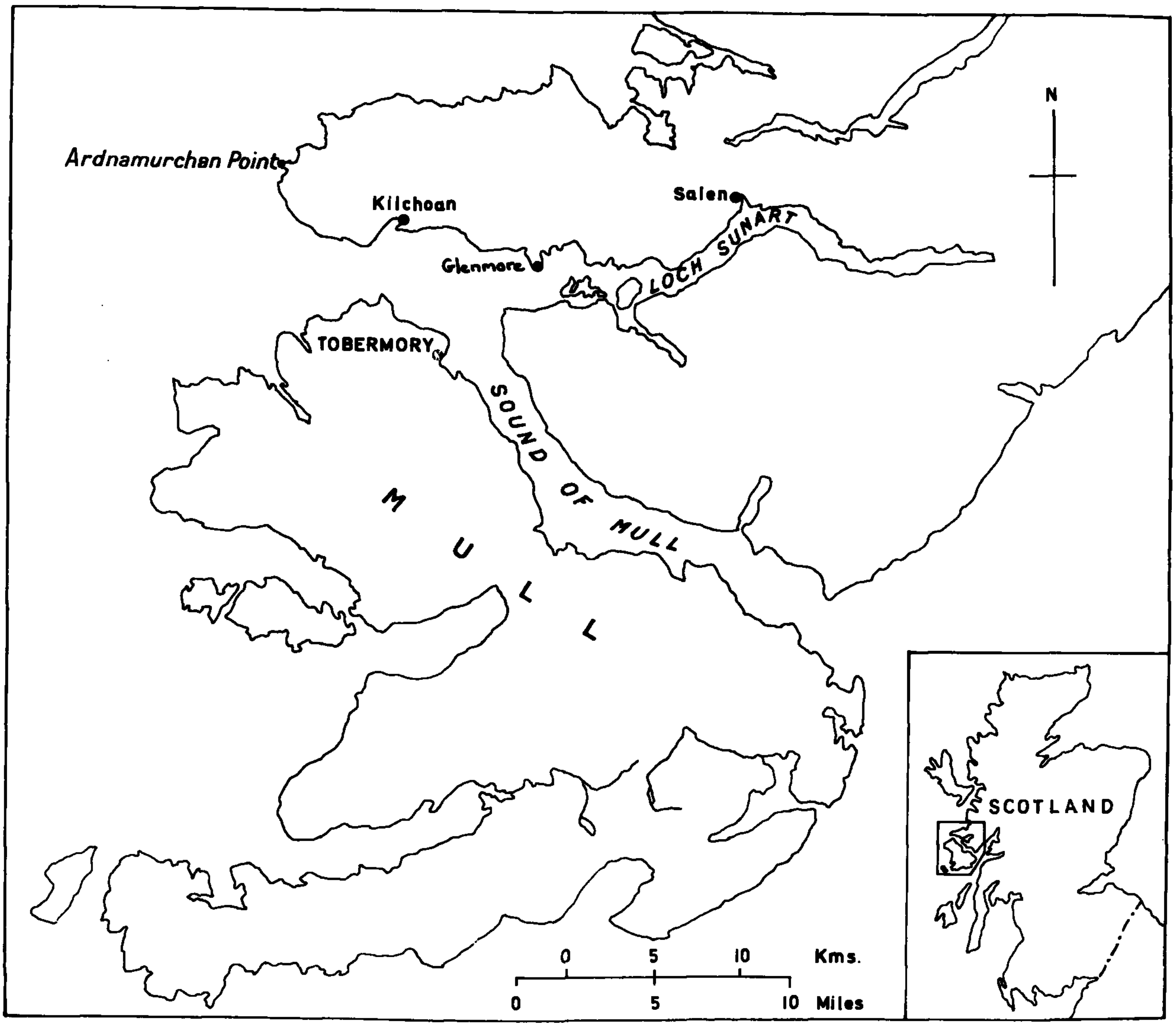


Fig. III.2 Location of the study sites in Area A: Ardamurchan Point - Loch Sunart.

These sites were selected because they represent

(1) a marked gradient of exposure

(2) a lesser gradient of salinity change

in an area where pollution by sewage, is negligible. An added attraction of the sites studied was the fact that at one of them (Salen) there had been limited lead mining in the past. The sites were arranged in Table III.1 in a series based on a subjective assessment of exposure.

Table III.1

AREA A: ARDNAMURCHAN POINT AND LOCH SUNART

Regression slopes	Sites	Zone	Exposure	Salinity	Rock type	Sewage	Pollution
30° 40'	Ardnamurchan	1	Greatest	Greatest	Gabbro	Negligible	None
27° 18'	Ardnamurchan	3			Gabbro		None
39° 30'	Kilchoan	1			Gneiss		None
45° 24'	Kilchoan	3			Gneiss		None
36° 24'	Glenmore Bay	1			Gneiss		None
30° 42'	Glenmore Bay	3			Gneiss		None
29° 30'	Salen	3	Lowest	Lowest	Mica Schist		Some lead mining in the past

ii. Area B: SHETLAND ISLANDS (Grid Ref. 4363)

The collection of specimens was made in May 1975. The sampling sites (Fig. III.3) were selected mainly in relation to other studies going on in the areas, which relate to the threat of future pollution by the oil industry.

The sampling sites, being in an area in which pollution by sewage is negligible and industrialization has never existed, show the following:

(1) a marked gradient of exposure

(2) a variety of rock types including limestone, acid rocks and basic rocks such as serpentine (Flinn 1970), which is known to contain a variety of geochemicals which have adverse effect on the growth of many land plants (Spence

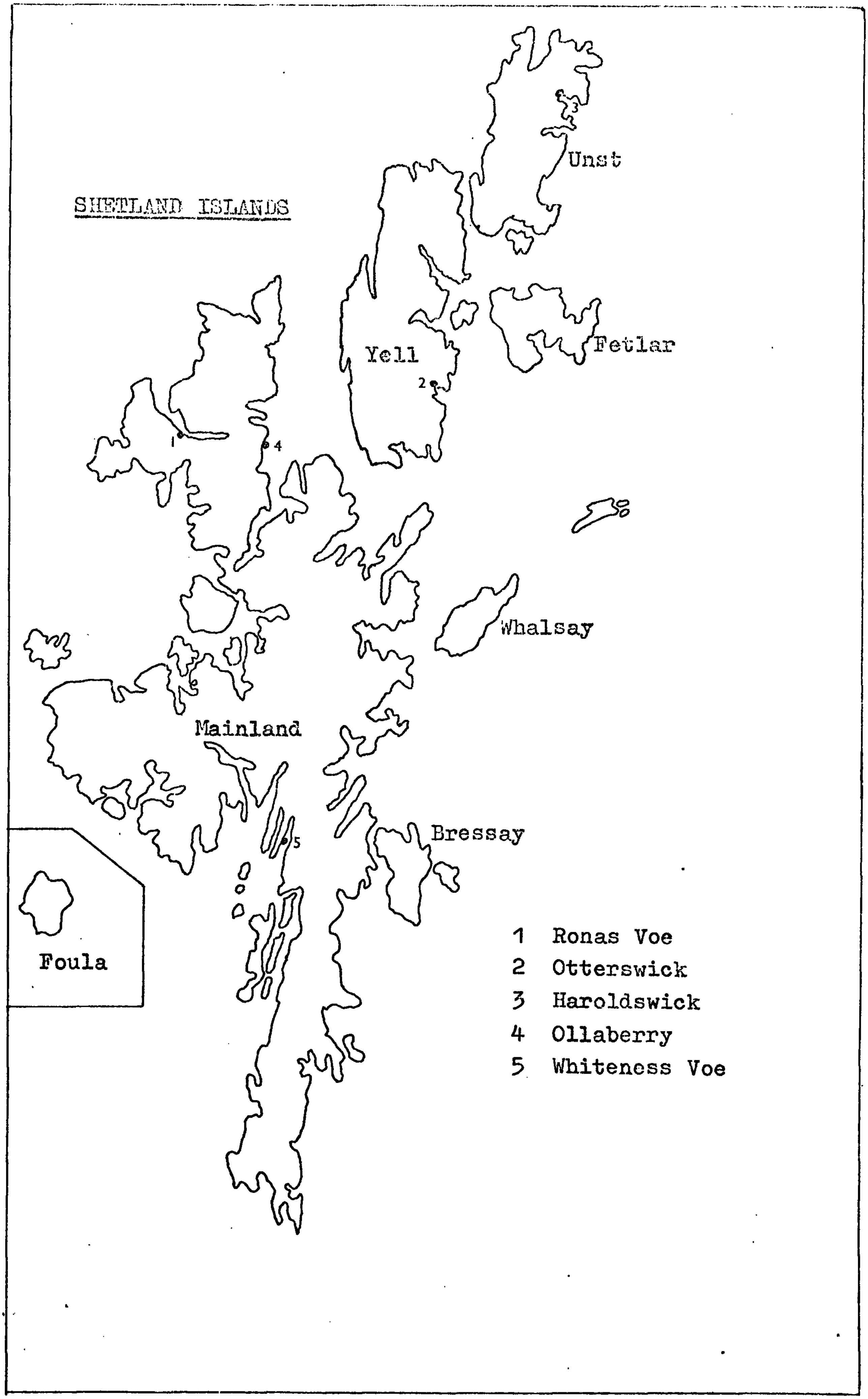


Fig. III.3: Location of sampling sites in Area B: Shetland Islands

1957; 1958; 1959; 1970)

The sites are arranged in Table III.2 in a series based on a subjective assessment of exposure. Unfortunately, it became impossible to collect as complete a range of samples as was intended.

Table III.2

AREA B: SHETLAND ISLANDS

Regression Slopes	Sites	Zone	Exposure	Rock type	Sewage	Pollution
46° 24′	Otterswick Yell	1	Greatest	Gneiss	Nil	Nil
31°		2	Greatest			
38° 40′		3	Greatest			
36° 24′	Whiteness Voe	2	Intermed.	Limestone		
38°		3	"			
40°	Haroldswick	2	"	Serpentine		
40° 50′		3	"			
42° 25′	Ollaberry	2	Least	Schist		
35° 18′		3	"			
42° 36′	Ronas Voe	1	"	Granite		
43° 20′		2	"			
43° 38′		3	"			

iii. Area C: EAST COAST: N.E. ENGLAND AND S.E. SCOTLAND

The bulk of the collections were made in June 1975 with a few collections made in November 1974, January and March 1975.

All the sites were selected with approximately the same degree of exposure and as far as possible on substrata of basic composition. The main differences relate to pollution by sewage, collieries, and other industrial wastes. The sampling sites are arranged in Table III.3 in order of geographical distribution from Isle of May (Grid Ref. NO60 65991) in the north to Robin Hood's Bay (Grid Ref. NZ90 956046) in the south, a distance of about 195 km. (see also Fig. III.4)

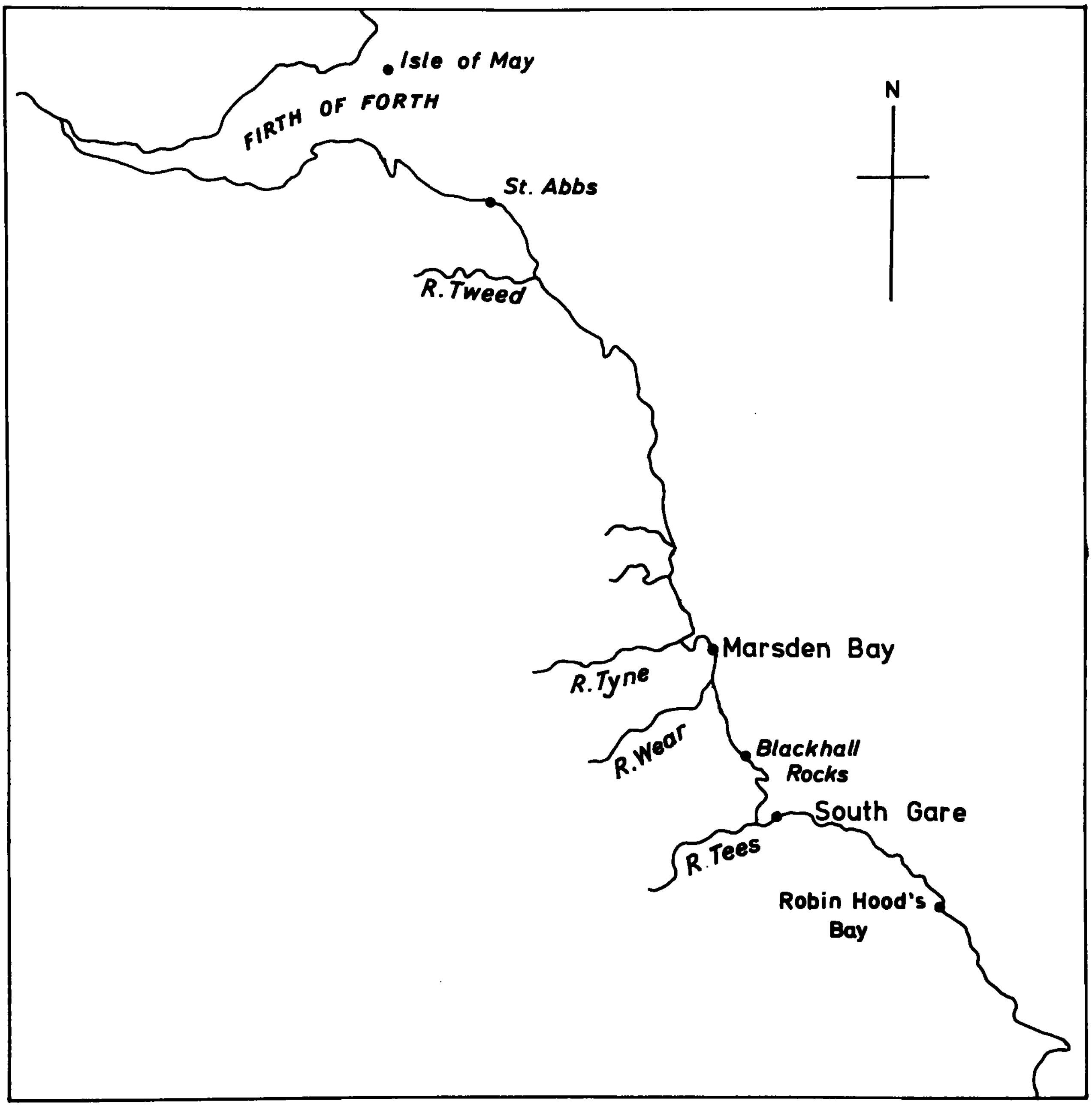


Fig. III.4 Location of the study sites in Area C: N.E. coast of England - S.E. coast of Scotland.

Regression slope	Sites	Zone	Exposure	Rock type	Pollution
50° 24'	Isle of May	1	Exposed	Basalt	Sewage - Estuarine of Firth of Forth
49° 50'	"	3	"	"	
38° 30'	St. Abb's	2	"	Andesite/basalt lava	Unpolluted
50° 45'	"	3	"		"
50° 53'	St. Abb's	1	"	"	"
49° 54'	"	2	"	"	"
35°	"	3	"	"	"
52°	Blackhall Rocks	2	"	Mg. Limestone	Colliery waste and natural turbidity
46° 42'	South Gare	1	"	New red sand-stone	Sewage and massive industrial discharge Estuarine situation
58°		2	"		
56°		3	"	"	
55°		2	"		
51° 15'	Robin Hood's Bay	1	"	Shale (Lias)	Natural turbidity and drift from the North?

Table III.3

AREA C: EAST COAST, N.E. ENGLAND AND S.E. SCOTLAND

III.2 STUDY OF THE SIZE PARAMETERS FLESH WEIGHT, SHELL WEIGHT

In the light of the following:-

(1) the great variation of the "growth" parameter, (flesh weight/ shell weight relationship) which depends both on season and Zone, as shown in the main study area,

(2) the fact that the comparative studies could not all be carried out at the same time and

(3) that at each site, almost always, the limpet sub-populations were sampled only once, it was decided that the data from each area would be studied, discussed and presented separately, Also, that the inter-site comparisons would be based on sub-populations from the same Zone.

However, in order to allow at least some measure of inter-area comparison, the data from the corresponding months and Zones at Marsden Bay are included in each inter-area study.

The observed differences between the regressions were tested by computer analysis,* the results of which are shown in tables for each area. The significant differences were estimated at 1% and 5% levels.

i. Area A

The regressions are presented in Figures III.5 and III.6 and the slopes of the regression lines (in degrees) are included in Table III.1. Full details are given in Appendix 7. No overall trends are shown either in relation to differences in exposure or salinity. The fact that there are frequent significant differences between values for many sites and Zones indicates a high level of intra area variation, and that each subpopulation should be regarded as a separate entity.

If any trend emerges it is as shown in Figures III.5 and III.6, that Marsden Bay regression values are higher than these of corresponding

* Calculations were performed by computer using the programme "REGRESS" supplied by J. Steele of the Computer Unit, Durham University.

subpopulations at this Area A. This trend was confirmed by the "REGRESS" analysis, the results of which are presented in Table III.4

ii. Area B

The results of the size parameters analysis, regressions, and slopes are separately shown in graphs for Zones 1, 2 and 3, (Fig. III.7 III.8, and III.9). The calculation of significant differences between the slopes are collectively presented in Table III.5 including the corresponding values for Marsden Bay. The full data are included in Appendix 8.

The results follow much the same pattern as shown in Area A. No overall trends are shown relating to the exposure gradient, and the variation in regressions in subpopulations from different substrate are difficult to explain. Least interzonal variation is shown by subpopulations on granite and serpentine, while much more variation is shown by those on the gneiss and limestone. Although intra area variation is high, the highest frequency of significant differences is shown when Shetland regressions are compared with the corresponding data from Marsden Bay, the limpets at the latter site having a significantly higher flesh weight (see Table III.5)

iii. Area C

No overall patterns emerge either in relation to latitude or substrate type.

However, comparison of the slopes of the Zonal sub-populations shows that in every case those from sites considered to be affected by large amounts of sewage, namely Marsden Bay, Isle of May, Blackhall Rocks, South Gare (Teesside) are significantly different from those sites considered to be little affected by sewage, namely St. Abb's in the north and Robin Hood's Bay in the south. (See Figs. III.10 - III.14 Table III.6 and Appendix 9).

The similarity of the regressions for St. Abb's and Robin Hood's Bay is of interest as 195 km separate these two sites, and the former is much less affected by suspended material than the latter (Jones 1970, Moore 1973 a). Owing to the fact that this comparison is based on only one sub-population from Robin Hood's Bay this similarity may be entirely fortuitous.

iv. Summary discussion on size parameters data

Table III.7 presents the total data derived from the statistical analysis of regressions.

The pattern of the monthly variation of flesh weight/shell weight correlation was discussed in Section II (see Figs. II.10, II.11, II.12). The variation was shown to differ interzonally; a feature also shown by other workers (Fisher - Piette 1948; Choquet 1968; Lewis and Bowman 1975).

The flesh weight/shell weight correlation indicates a wide local variation, which can be explained, in part at least, by different environmental conditions resulting from tidal movements.

Interzonal variations were also found in intra-site comparisons, as discussed earlier in this Section.

Therefore, within any given area, the P. vulgata population must be divided into several sub-populations, each affected by different conditions and subsequently showing different morphological characteristics e.g. shell-height, length, breadth etc.

For this reason, comparative studies made between populations from different sites are invalid, unless long-term studies have previously been carried out to establish whether or not the populations are similar. Similar conclusions were also reached by Lewis (1970, 72) and also Moore (1974).

Because of the inadequate information from the sites other than

Marsden Bay, comparisons were made only between samples taken from the same zone within the same month.

Even these comparisons have to be viewed with extreme caution, because the climatic differences influencing many of the physiological processes over such a wide geographical range are considerable (see for example Fretter & Graham 1964). Comparisons based on standardised calendar dates may therefore be misleading.

Nonetheless, the results from the inter-site comparisons reported earlier in this Section, are of interest for the following reasons:

(1) The flesh weights of samples from unpolluted sites in all three study areas, although widely separated geographically, are smaller than those of the Marsden Bay samples.

(2) The flesh weights of samples from sites which are heavily affected by sewage discharge are greater than those of samples from sites less affected by this type of pollution Fisher - Piette (1939; 1941; 1943; 1946; 1948) reached similar conclusions after studying P. vulgata populations over a nine year period, as did Hatton (1936).

(3) The east coast sites may be arranged in order of magnitude of flesh weight, corresponding to the gradient of pollution inferred by other workers (Jones 1970; Moore 1974)

Although the above conclusions were based on inadequate data, the fact that there are either reasonable, or interesting indications makes a further, more detailed study well worth-while. Such a study might indicate that a flesh weight/shell weight regression analysis, in combination with other parameters, could be used as an indicator of the environmental conditions affecting P. vulgata populations.

Flesh weight/shell weight relationships for Area A:

Ardnamurchan Point - Loch Sunart.

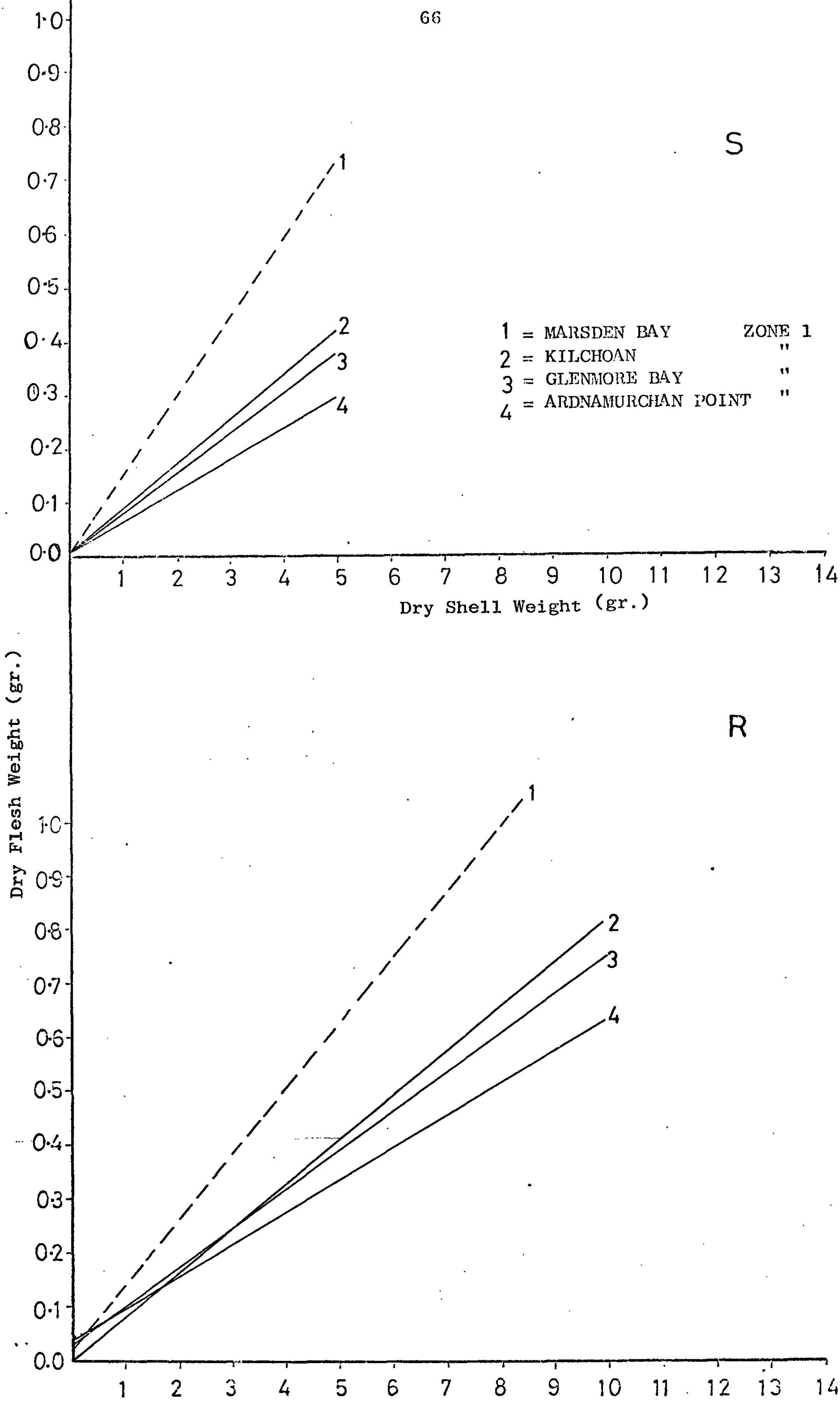


Fig. III.5. Regressions of flesh weight/shell weight relationship for Area A, Zone 1. R = Regression, S = Slope of Regression.

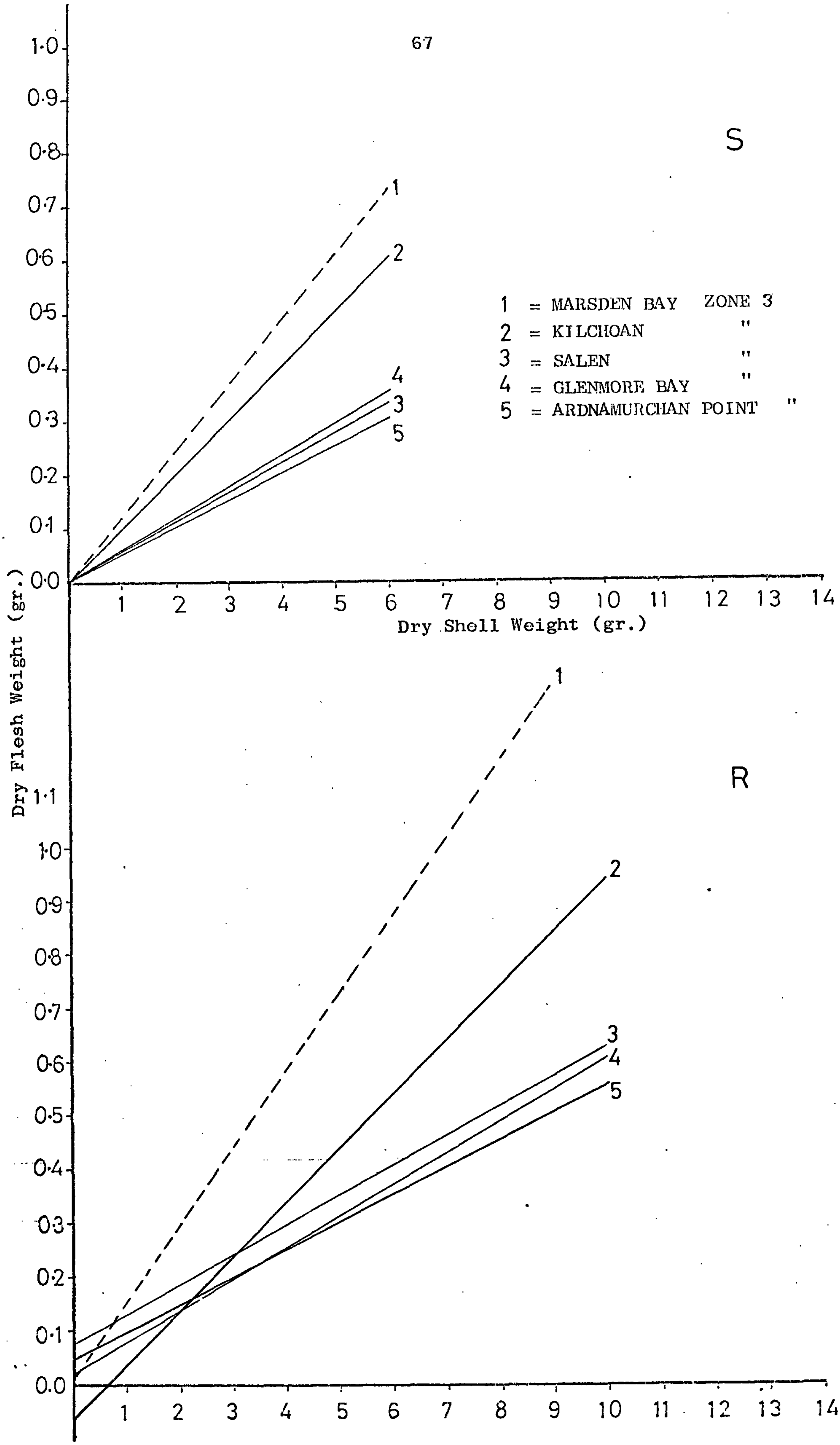


Fig. III.6: Regressions of flesh weight/shell weight relationship for Area A, Zone 3. R = Regression, S = Slope of regression.

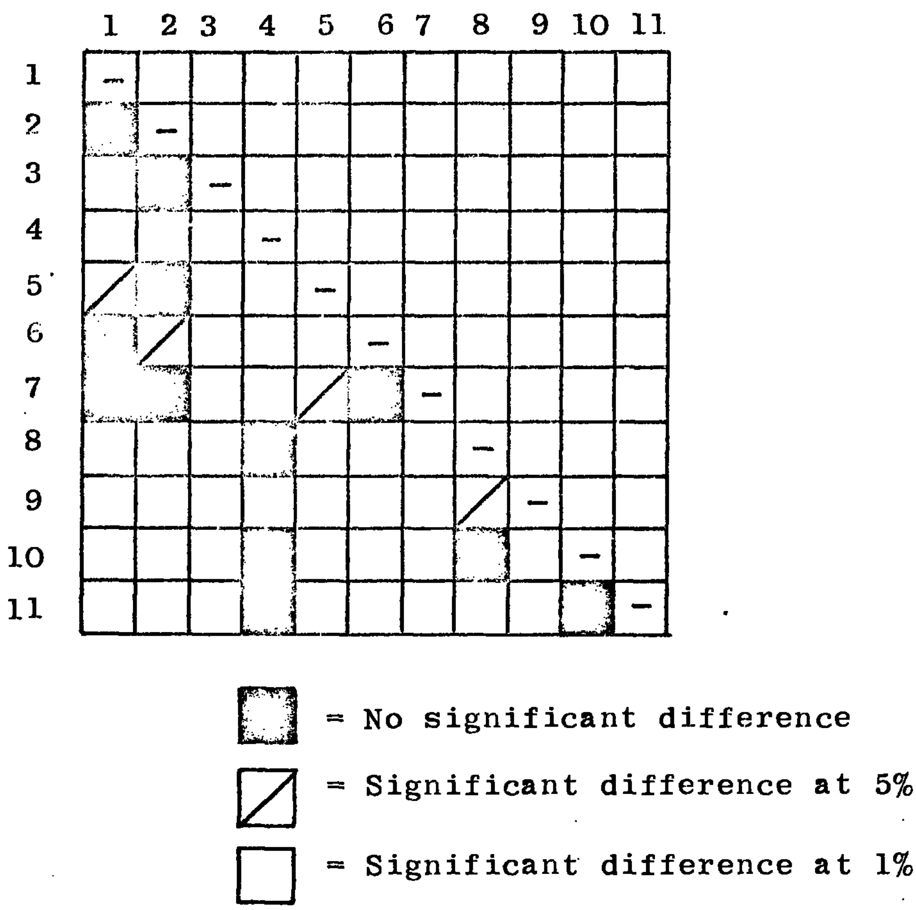


Table III.4: Comparison of flesh weight/shell weight regressions for Area A.

Flesh weight/shell weight relationships for Area B:

Shetland Islands.

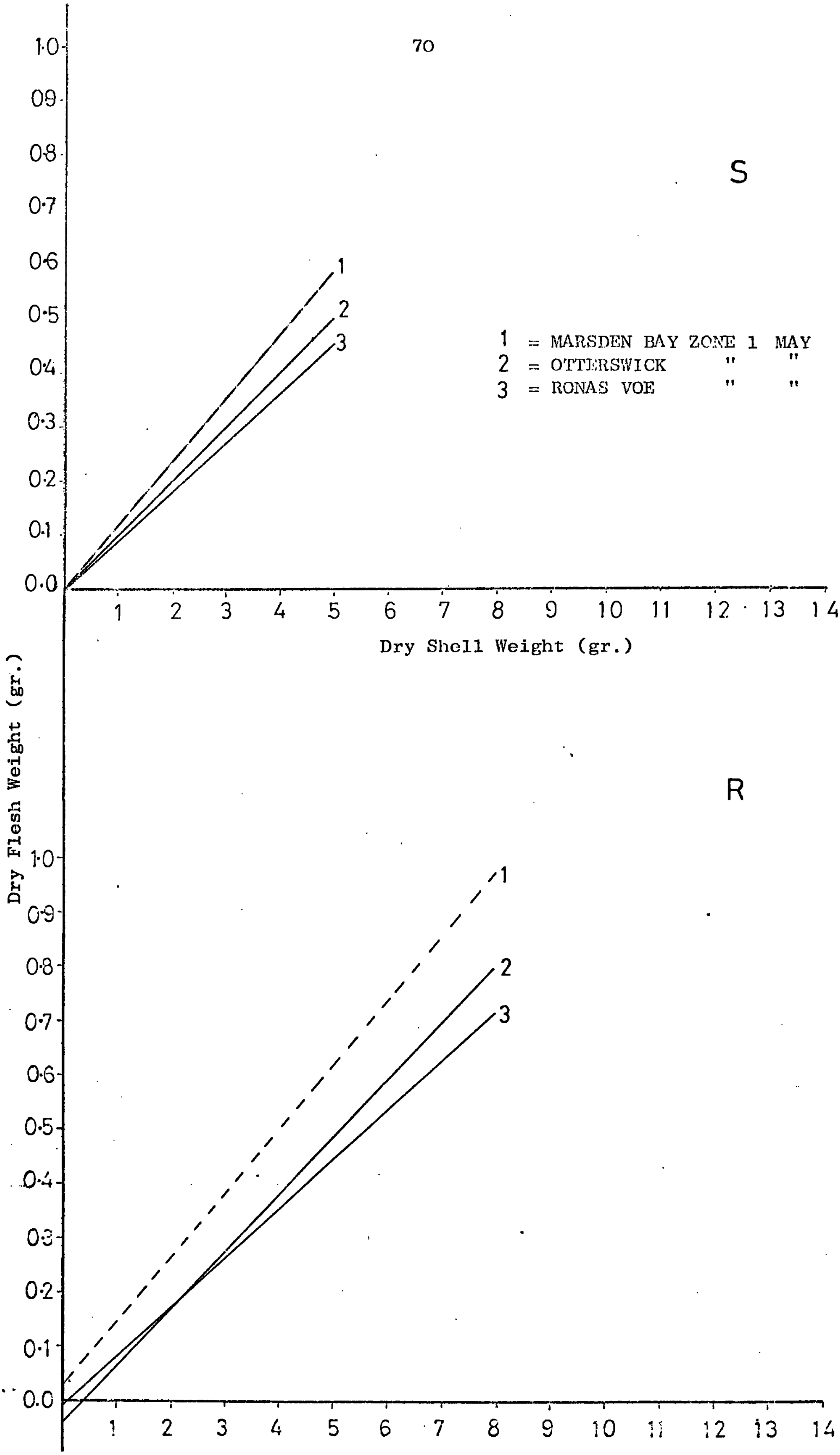


Fig. III.7: Regressions of flesh weight/shell weight relationship for Area B, Zone 1. R = Regression, S = Slope of Regression.

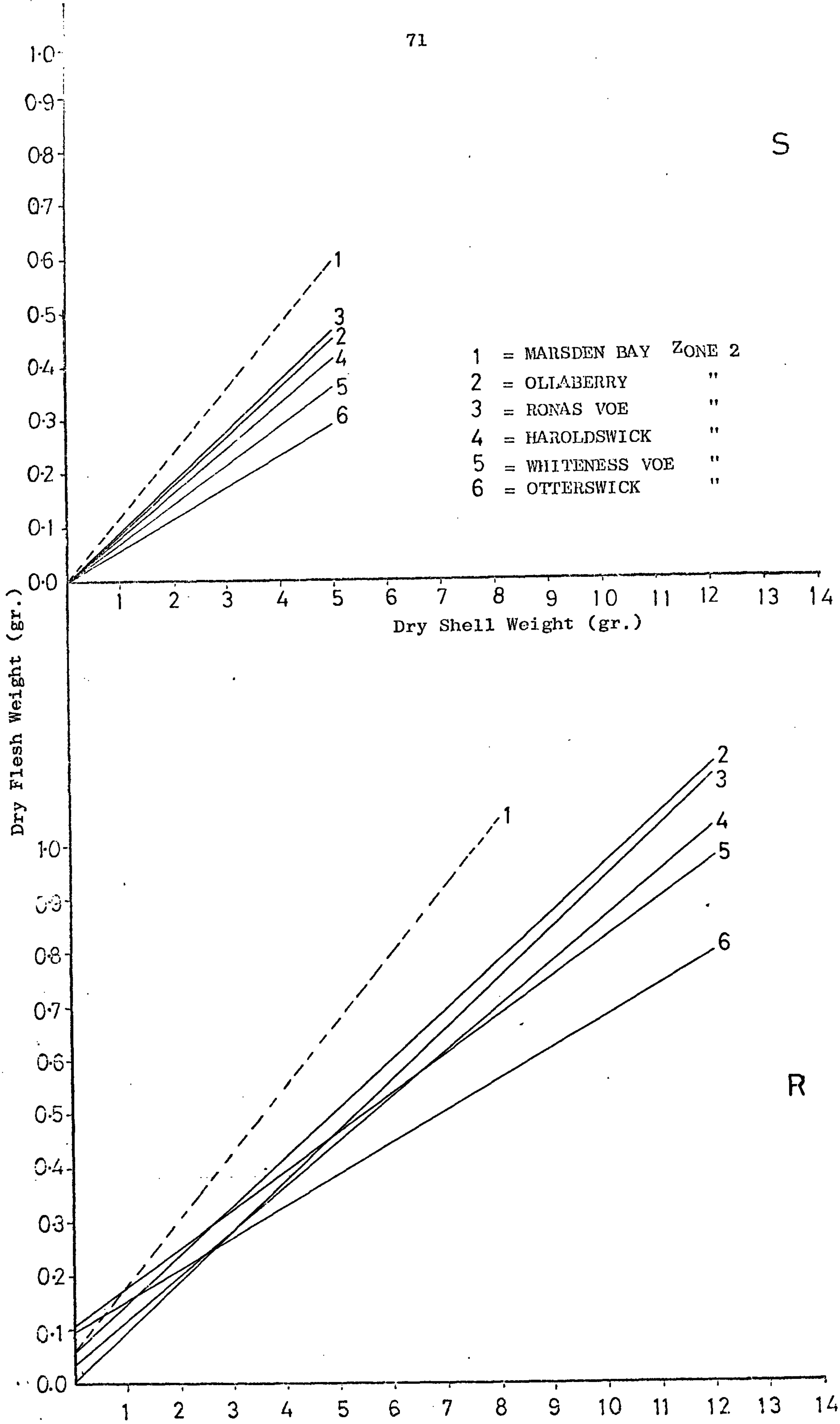


Fig. III.8: Regressions of flesh weight/shell weight relationship for Area B, Zone 2. R = Regression, S = Slope of Regression.

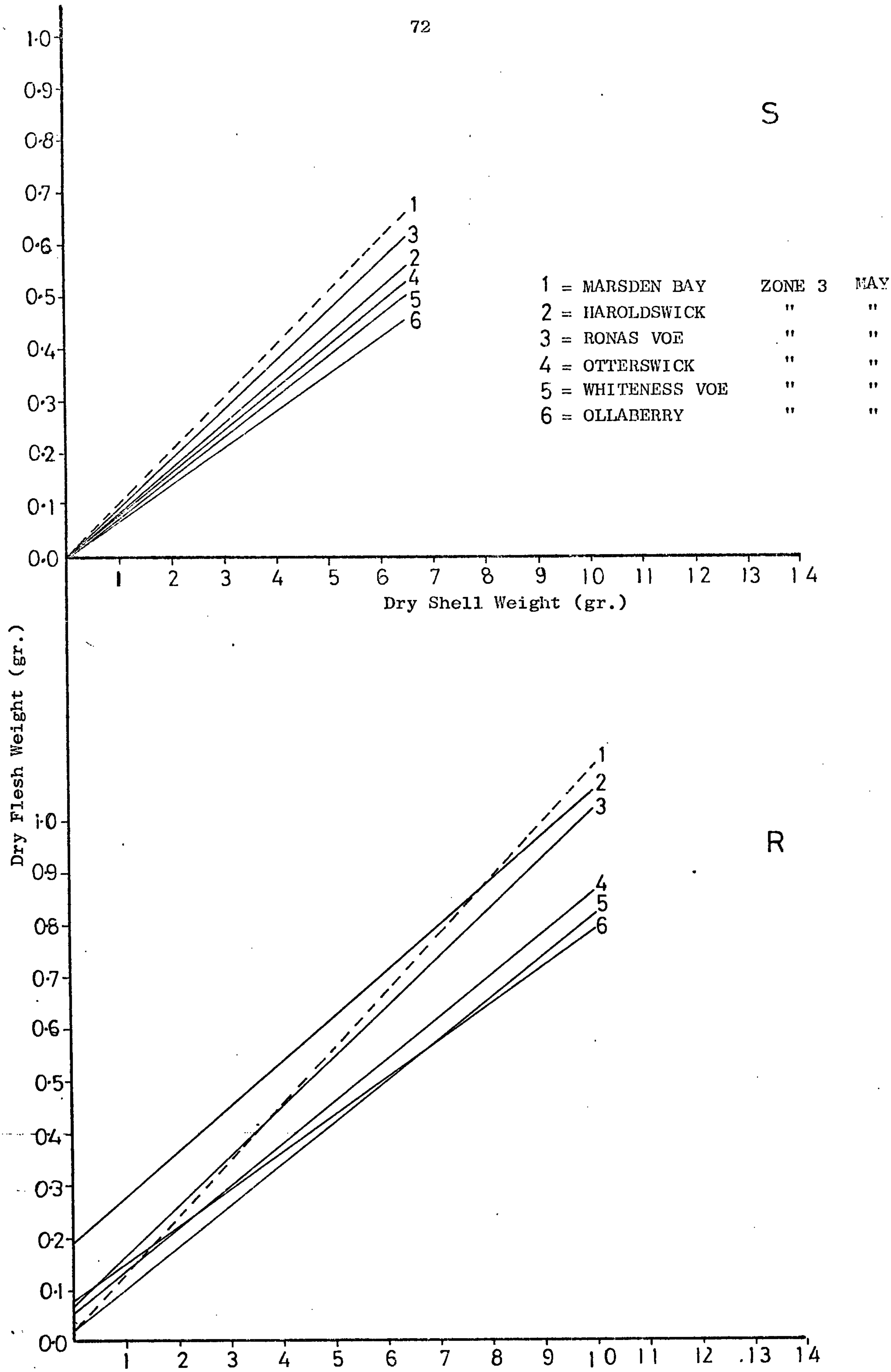


Fig. III.9: Regressions of flesh weight/shell weight relationship for Area B, Zone 3. R = Regression, S = Slope of Regression.

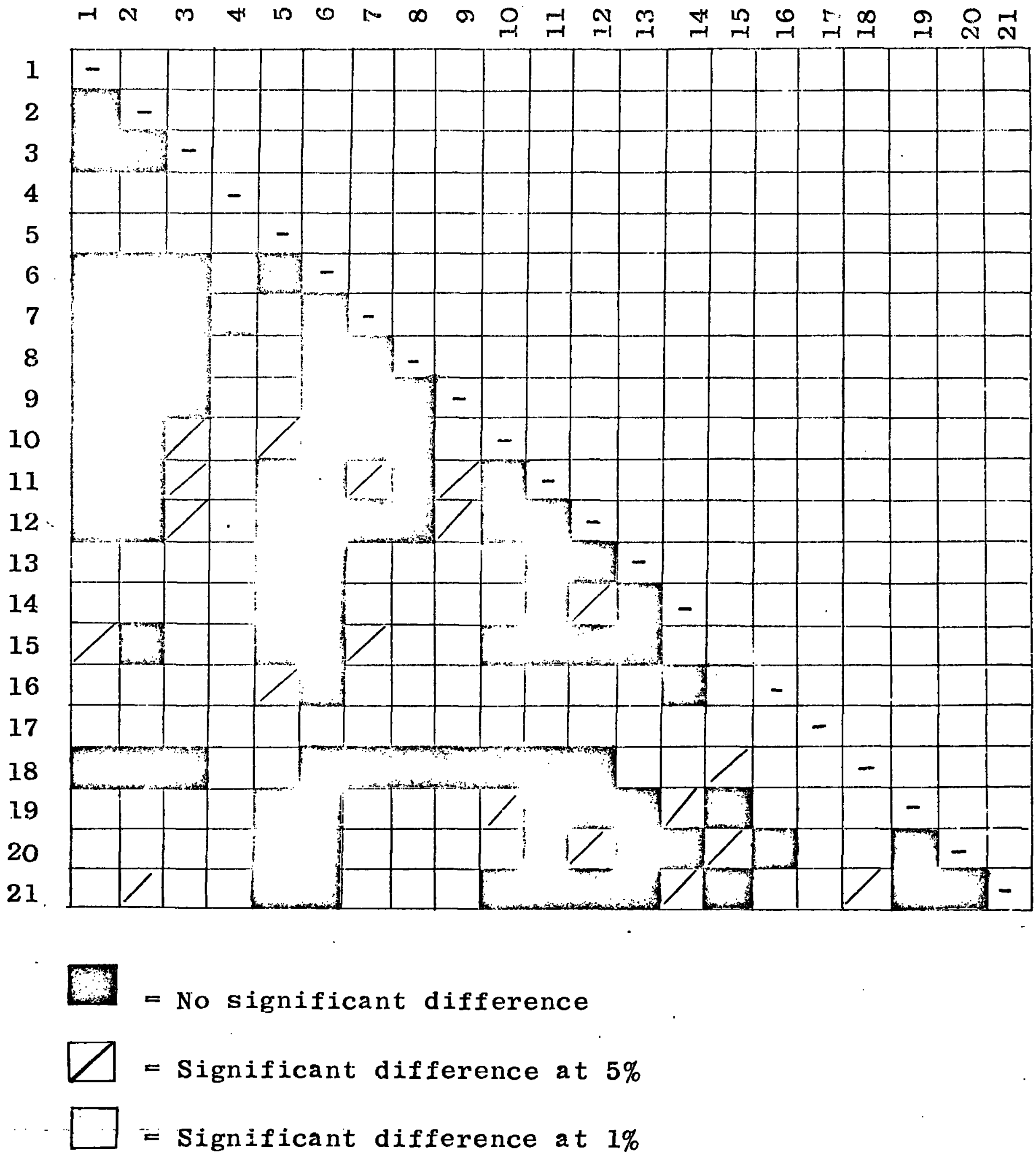


Table III.5: Comparison of flesh weight/shell weight regressions for Area B.

Flesh weight/shell weight relationships for Area C:

N.E. coast of England - S.E. coast of Scotland.

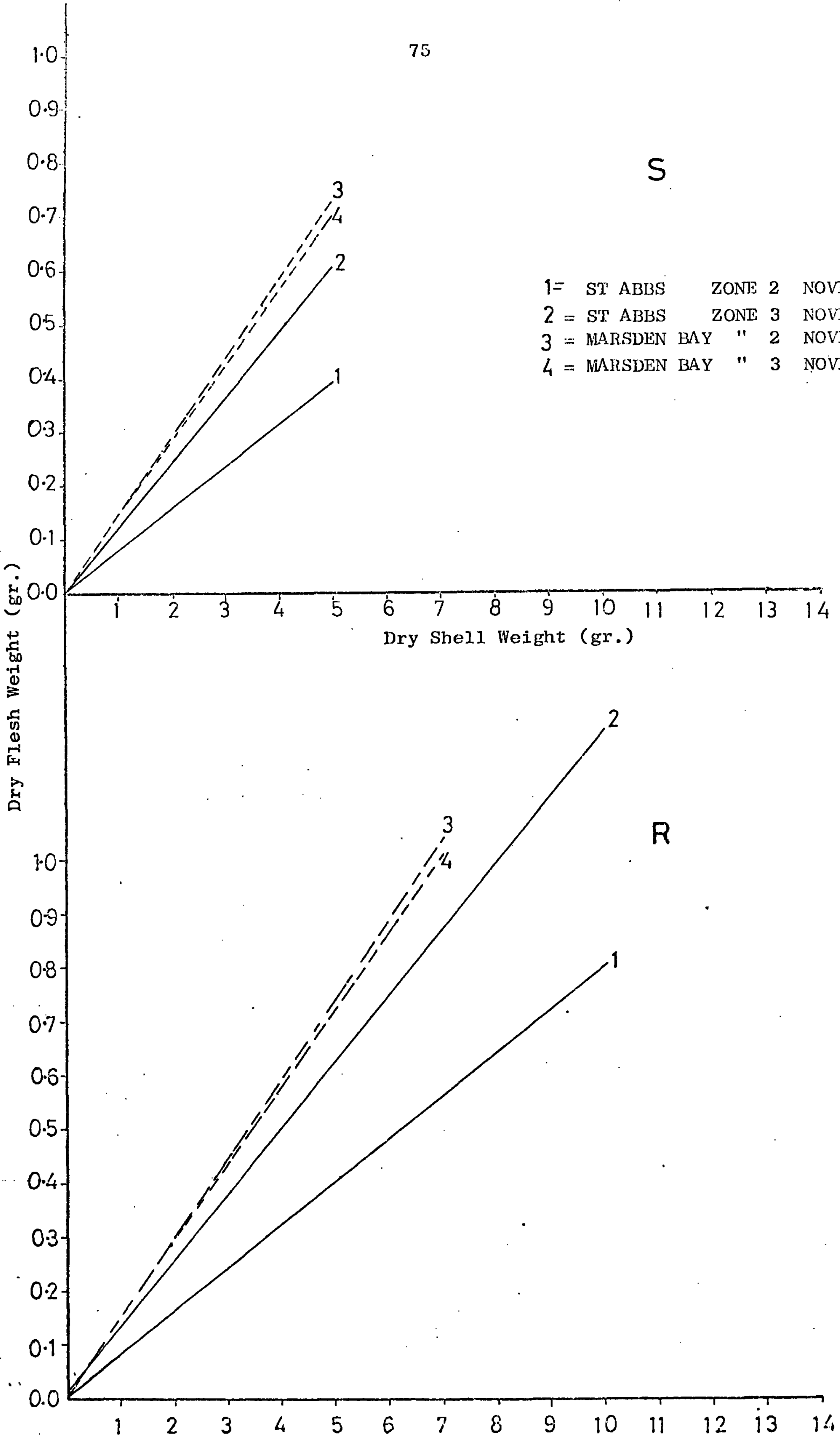


Fig. III.10: Regressions of flesh weight/shell weight relationship for Area C. R = Regression, S = Slope of Regression.

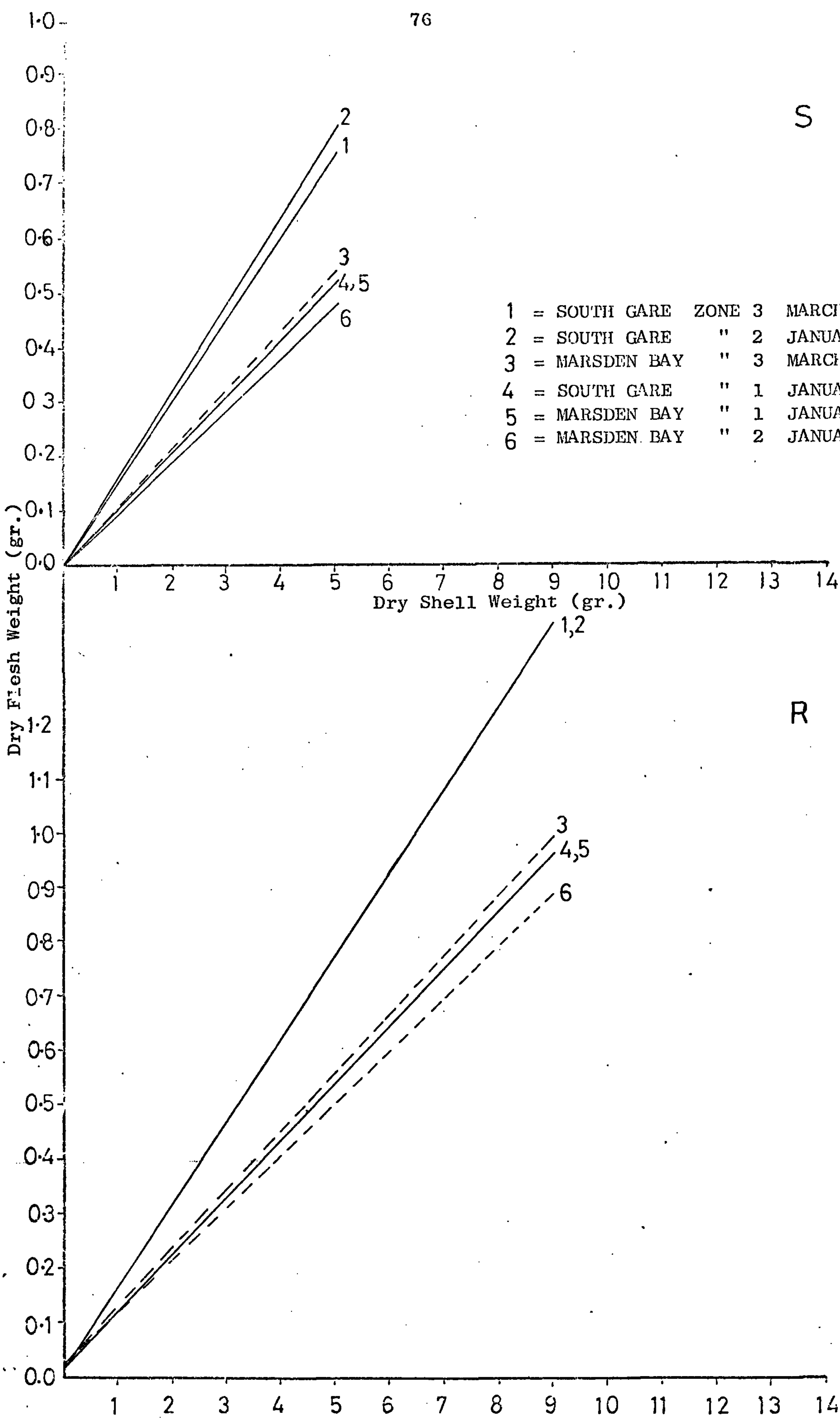


Fig. III.11: Regressions of flesh weight/shell weight relationship for Area C. R = Regression, S = Slope of Regression.

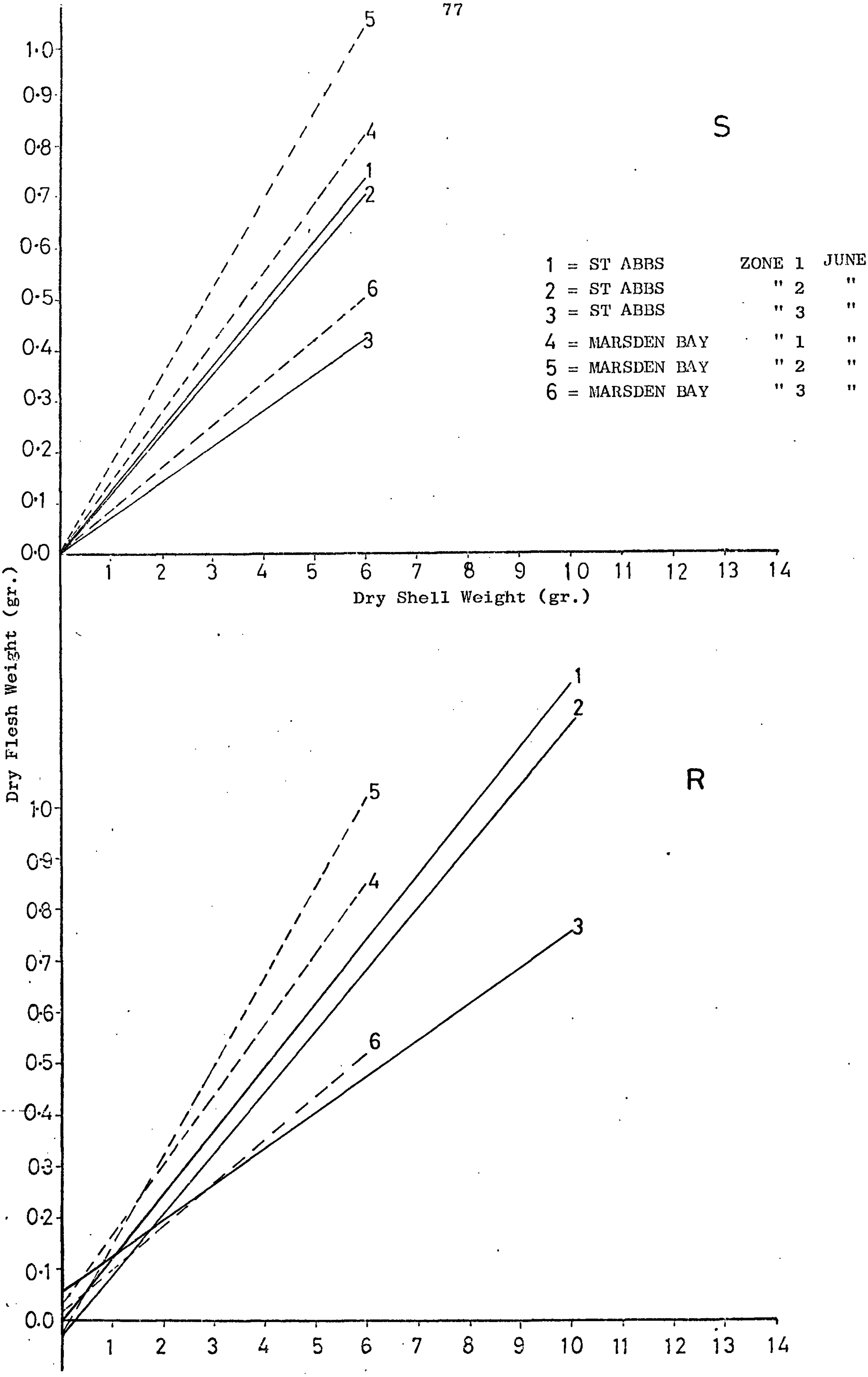


Fig. III.12: Regressions of flesh weight/shell weight relationship for Area C. R = Regression, S = Slope of Regression.

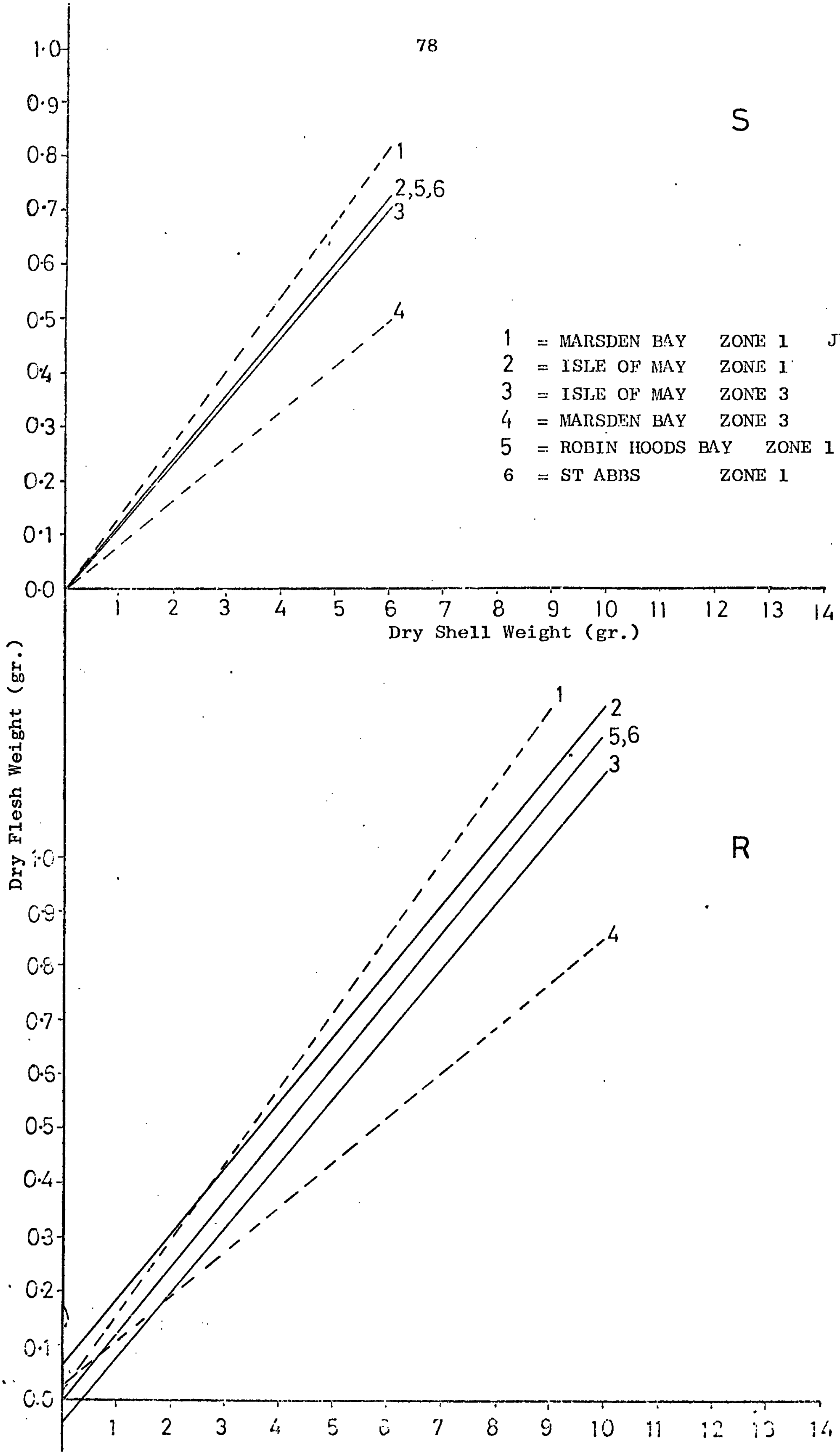


Fig. III.13: Regressions of flesh weight/shell weight relationship for Area C. R = Regression, S = Slope of Regression.

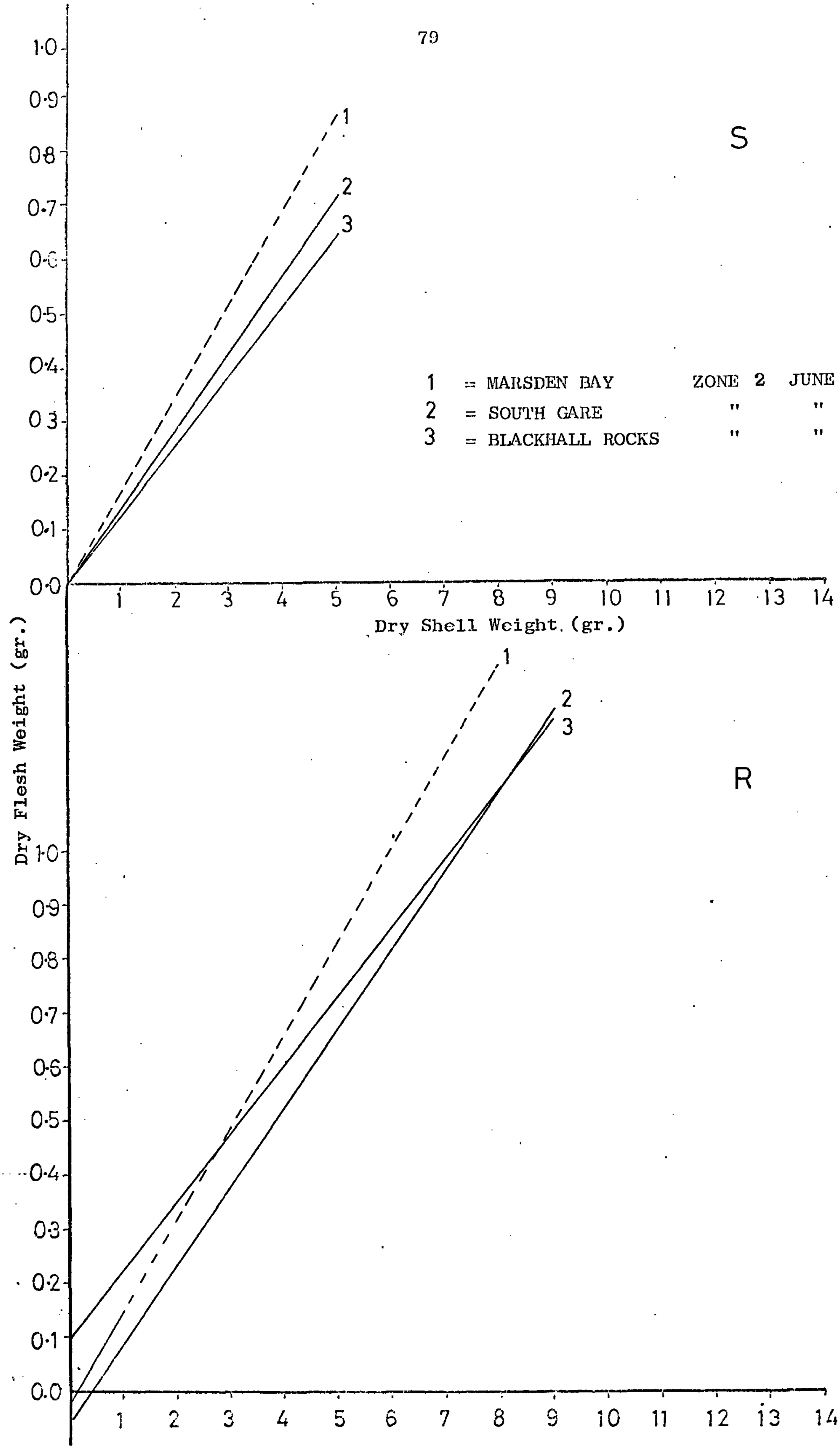
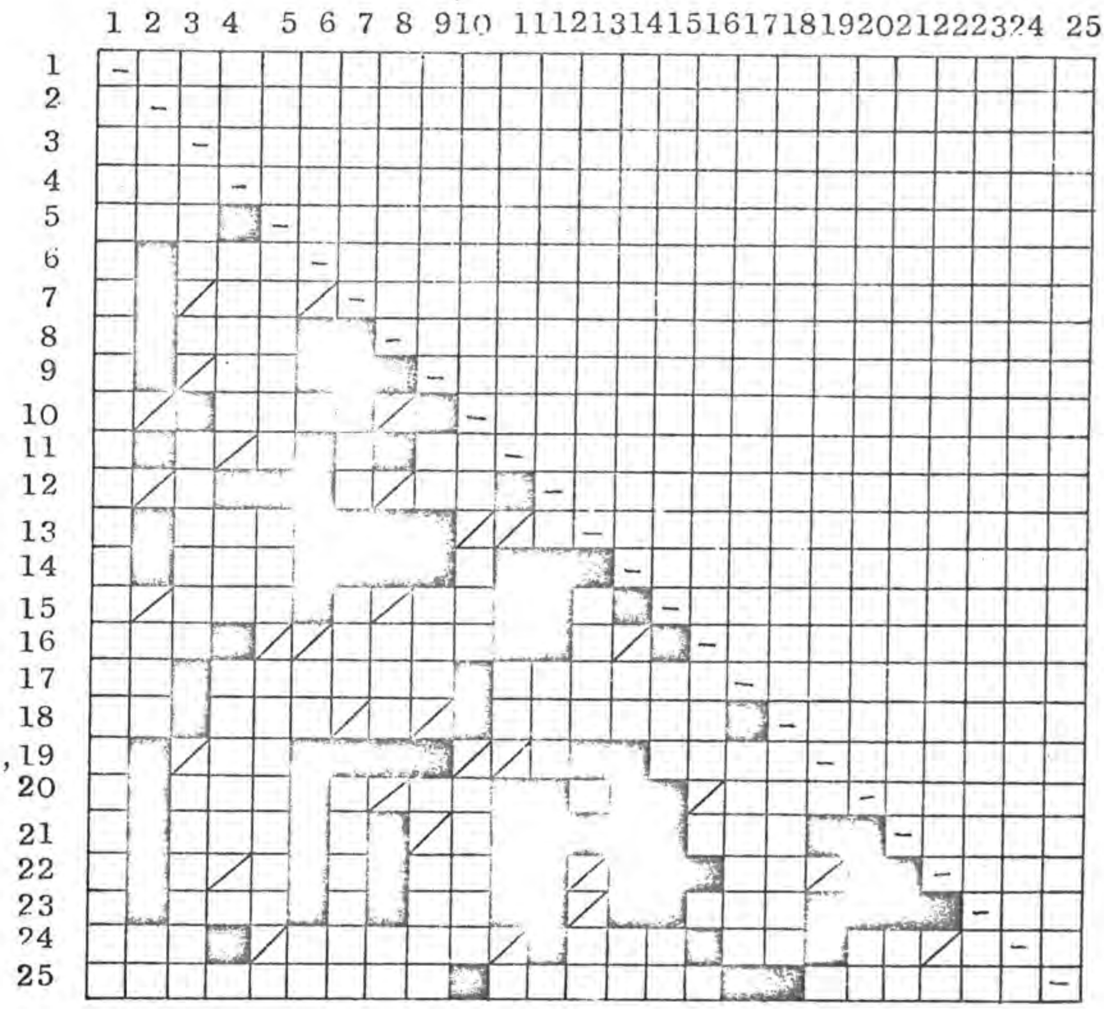


Fig. III.14: Regressions of flesh weight/shell weight relationship for Area C. R = Regression, S = Slope of Regression.

1 =	St Abbs	Zone 2	November
2 =	St Abbs	Zone 3	November
3 =	South Gare	Zone 1	January
4 =	South Gare	Zone 2	January
5 =	South Gare	Zone 3	March
6 =	Isle of May	Zone 1	June
7 =	Isle of May	Zone 3	June
8 =	St Abbs	Zone 1	June
9 =	St Abbs	Zone 2	June
10 =	St Abbs	Zone 3	June
11 =	Blackhall Rocks	Zone 2	June
12 =	South Gare	Zone 2	June
13 =	Robin Hood's Bay	Zone 1	June
14 =	Marsden Bay	Zone 1	November
15 =	Marsden Bay	Zone 2	November
16 =	Marsden Bay	Zone 3	November
17 =	Marsden Bay	Zone 1	January
18 =	Marsden Bay	Zone 2	January
19 =	Marsden Bay	Zone 3	January
20 =	Marsden Bay	Zone 1	March
21 =	Marsden Bay	Zone 2	March
22 =	Marsden Bay	Zone 3	March
23 =	Marsden Bay	Zone 1	June
24 =	Marsden Bay	Zone 2	June
25 =	Marsden Bay	Zone 3	June

Key to Table III.6



▪ = No significant difference

⧄ = Significant difference at 5%

□ = Significant difference at 1%

Table III.6: Comparison of flesh weight/shell weight regressions for Area C.

Overall comparison of regressions of all Areas (A, B and C) sub-populations.

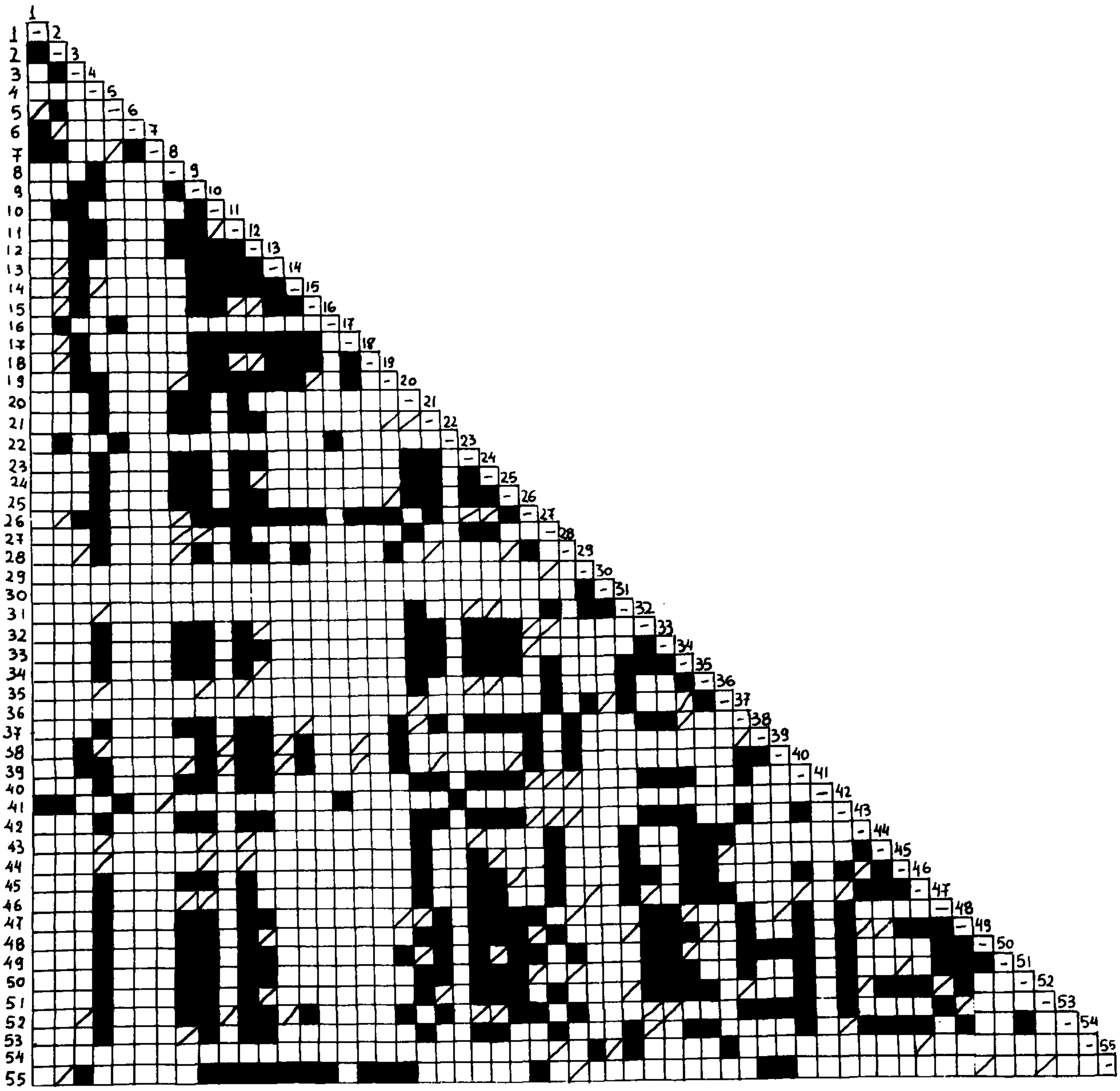


Table III.7: Overall comparison of regressions.

III.3 CHEMICAL ANALYSIS RESULTS

All the chemical analysis results (mean values and standard derivation) for the ten elements under study are presented in Appendix 10 and summarized in histograms in groups, for each area.

Table III.8 shows the distribution of each element content in relation to the size-class of the limpets as revealed in each area.

It is quite clear from the results of this Section that the main features found in the more detailed study area - Marsden Bay - are also shown at the other sites e.g. that cadmium shows a definite pattern of higher concentrations in the larger individuals, (see Table III.8).

The zonal variation also appears to be great in every site and for every element. These findings support those of Section II and reinforce the idea that if valid comparisons are to be made then, size class, zone and sampling period must be standardised.

Owing to the lack of some of the size classes in certain samplings it was finally decided to make intersite comparisons based on the "B" size class of the limpets ("B" = 201-400 mgs) collected from the same Zone at the same season (calendar date)

These comparisons were made using the "SCHEFFE"SPSS computer program (Nie et al. 1970) and the results are presented in Tables III.9 to III.19. A 1% level of significance has been used for the calculations.

The following intersite comparisons were made in this way:

1) Sites of Area A - St. Abbs - Marsden Bay

Zone: 1 sampling date : November

2) Sites of Area A - Marsden Bay

Zone: 3 sampling date: November

3) Sites of Area B - Marsden Bay

Zone: 1 sampling date: May

TABLE III.8

PERCENTAGE OF CASES WHERE ELEMENT CONCENTRATION INCREASES OR DECREASES WITH SIZE AT EACH AREA (A, B, C)

Element	Increase with size	Decrease with size	No pattern
Cd	A 100% B 91% C 84%		
Pb		A 85% B 75% C 69%	
Ni		A 70% B 85% C 84%	
Cu		B 75%	A C
Zn		A 71% B 100% C 100%	
Fe		A 100% B 85% C 84%	
Na		A 70%	B C
K		A 71%	B C
Mg		A 71% B 85% C 76%	
Ca		A 85% C 62%	B (50% increase or decrease)

4) Sites of Area B - Marsden Bay

Zone: 2 sampling date: May

5) Sites of Area B - Marsden Bay

Zone: 3 sampling date: May

6) St. Abb's - Marsden Bay

"C" class comparison Zone: 2 sampling date: November

7) South Gare - Marsden Bay

Zone: 1 sampling date: January

8) South Gare - Marsden Bay

Zone: 2 sampling date: January

9) South Gare - Marsden Bay

Zone: 3 sampling date: March

10) Isle of May - St. Abb's - Robin Hood's Bay - Marsden Bay

Zone: 1 sampling date: June

11) St. Abbs - Blackhall Rocks - Marsden Bay - South Gare

Zone: 2 sampling date: June

12) Isle of May - St. Abb's - Marsden Bay

Zone: 3 sampling date: June

Details are given in Appendix 10

i Area A

a. Intersite comparisons

Intersite comparisons in Area A (see Table III.1) based on the overall results shown in Figures III.15 to III.20 and in Tables III.9a,b, III.10a,b, lead to the following conclusions:

1. The marked gradient of exposure and lesser gradient of salinity which characterizes this area, does not seem to produce any general pattern of distribution of the elements. However examining the elements individually it would appear that the most exposed site (Ardnamurchan Point) shows the lowest level of Pb in both Zones 1 and 3. The same trend is observed for Cu as well and Zn. The latter is in accordance with

Elderfield et al (1971) who stated that there is a broad tendency towards an antipathetic relationship between Zn and salinity.

The opposite trend is observed for Na the levels of which reflect, in Zone 3 samples, the gradient of salinity existing in this area.

2. Cadmium concentrations detected in Zone 3 limpets arranged in an order of magnitude reflect exactly the opposit gradient of salinity and exposure. It is noteworthy that as quoted in Section I salinity may have an affect on cadmium uptake by limpets. In support of this are the laboratory experiments of O'Hara (1973) who tested the influence of salinity and temperature on the cadmium uptake by crabs. He found that the cadmium uptake was higher in low salinities at any temperature.

According to the same author this could be due to the fact that a low salt concentration in the envionment causes an osmotic stress which in turn causes an active uptake of salts necessary to maintain the hyperasmotic conditions of the internal medium. Low Na concentrations are also reflected at this site in the limpet flesh.

3. Lead concentrations were found to be lowest at Ardnamurchan Point and highest at Salen. This pattern of increasing lead content in limpet tissue along the loch is of particular interest, as Salen lies about 7 km from an old lead mine at Strontian (Macgregor 1940). Loch Sunart is long and narrow and is protected from the effects of the open sea. It is probable that there have always been some effects from lead-enriched run-off streams entering the loch close to Salen. Mining activity will simply serve to emphasise a background of lead already present in the study area, and reflected in P. vulgata tissues.

4. The intersite variation of Mg and Ni is low.

b. Interarea comparison (including Marsden Bay and St. Abb's)

In both Zones 1 and 3 the metal concentration is significantly higher at Marsden Bay for the elements Pb, Cu, Fe, Ca, Zn and K. Exceptions are, Zn content Glenmore Zone 1, and K content Kilchoan Zone 1, which are higher than those at Marsden (see Appendix 5 & 10 and Tables III.9,a, III.10a.)

An outstanding feature is the cadmium content of "B" class limpets from both Zones 1 and 3, which is significantly higher than that detected in Marsden samples. Values for St. Abb's Zone 3 lie between those of Area A and Marsden Bay. This is also shown in Figures II.13, III.15 and III.31.

Sodium contents in limpets collected from Area A, are also higher than those of St.Abb's and Marsden Bay. (see Table III. 9a,b, III.10a,b.) Segar et al (1971) working in the Irish Sea have reported values of Na content in P. vulgata tissues which are closer to those of Area A then those of Marsden Bay.

Nickel content is higher at Marsden than that of Ardnamurchan and Glenmore in Zone 1 samples. There is no difference in Zone 3 comparison.

Magnesium content was lower in St. Abb's samples. (This perhaps could be due to the different rock type of these sites among which the andesite and basalt of St. Abb's is more tolerant to weathering in comparison with limestone, mica schist and sometimes Gabbro).

However, tis significant difference of Mg content in P. vulgata tissues is at variance with the opinion expressed by Vinogradov (1953) in which he states that Mg is more or less constant for each species, (see Section II)

(ii) Area B

The results of limpet flesh chemical analysis for this area are presented in Appendix 10 summarized in histrograms in Figs. III.21 to III.30 and the analysis of variance results are shown in Tables III.11a, b - III.13a,b.

a. An intersite study at this Area reveals that

1. The concentration levels of each element vary from site to site and between Zones, showing a high frequency of significant differences in Zn, Fe, Na, Mg, Ca, contents and a lower frequency for Pb, Cd, Ni,

K and Cu.

2. Examining the data in relation to the degree of exposure, the following should be noted.

(a) The highest values of Pb, Cu, Zn, Na, Mg are found in the sheltered sites.

(b) The highest values of Fe in all Zones 1, 2 and 3 are obtained in the most exposed site (Otterswick)

(c) Cadmium concentrations in limpets of Zone 1 are highest in the most exposed site (Otterswick Yell). In contrast the highest values of Zones 2 and 3 are in specimens from the most sheltered site (Ronas Voe).

A similar pattern was found in Area A though under differing conditions of salinity.

3. An analysis of the data in relation to the rock type of each study site demonstrated that Ni concentrations on serpentine are significantly higher than those found in limpets on any other substrat in Shetland.

This difference could be readily explained by the fact that serpentine is known very often to contain Nickel ores, in its structure (Pirsson 1908; Spence 1957)

b. An inter Area comparison shows that

(i) Shetland samples show significantly higher levels of cadmium in comparison with Marsden (see Figs. II.13 and III.21). It is interesting to note that Topping (1972c), after analysing various species of shell-fish from Scottish waters for certain heavy metals, found that the highest Cd values were associated with Orkney and Shetland Islands. He suggested that these results could be related to a high Cd background which might exist in these areas.

(ii) Marsden Bay limpets show significantly higher levels of the elements lead (with the exception of Ollabery Zone 3 samples which are about the same) Copper, Magnesium and Calcium. Zinc, Iron and Sodium may show either a higher or lower level in Marsden samples, depending on the Zone.

(iii) Area C

After a detailed study of chemical analysis data shown by histograms in Figs. III.31 to III.40 and the analysis of variance carried out for the "B" class limpets shown in Tables III.9a,b to III.19a,b the following patterns emerged:

	Lead	Copper	Zinc
Highest	Robin Hood's Bay	Blackhall Rocks	Blackhall Rocks
	Marsden Bay	Robin Hood's Bay	Robin Hood's Bay
	Blackhall Rocks	South Gare	Marsden, South Gare
	South Gare	Marsden Bay	Isle of May
	Isle of May	Isle of May	St. Abb's
Lowest	St. Abb's	St. Abb's	

Fe	Mg	K	Ca
Robin Hood's Bay	Robin Hood's Bay	Isle of May	Robin Hood's Bay
Marsden Bay	Marsden Bay	St. Abb's, Marsden Bay	Robin Hood's Bay
Blackhall Rocks	St. Abb's	South Gare	St. Abb's
Isle of May	Blackhall Rocks	Blackhall Rocks	Blackhall, S. Gare
South Gare	South Gare	Robin Hood's Bay	Isle of May
St. Abb's	Isle of May		

No pattern could be seen for Cd, Na, Ni.

One interesting point is that cadmium very often shows the highest values in samples from St. Abb's and Isle of May. (It must be remembered that Area A and B samples had also highest Cd content)

Nickel concentrations do not differ statistically from site to site.

From the above data the intensity of heavy metal contamination might be subjectively summarised as follows

Highest	Blackhall Rocks
	Robin Hood's Bay
	Marsden Bay, South Gare
Lowest	Isle of May
	St. Abb's

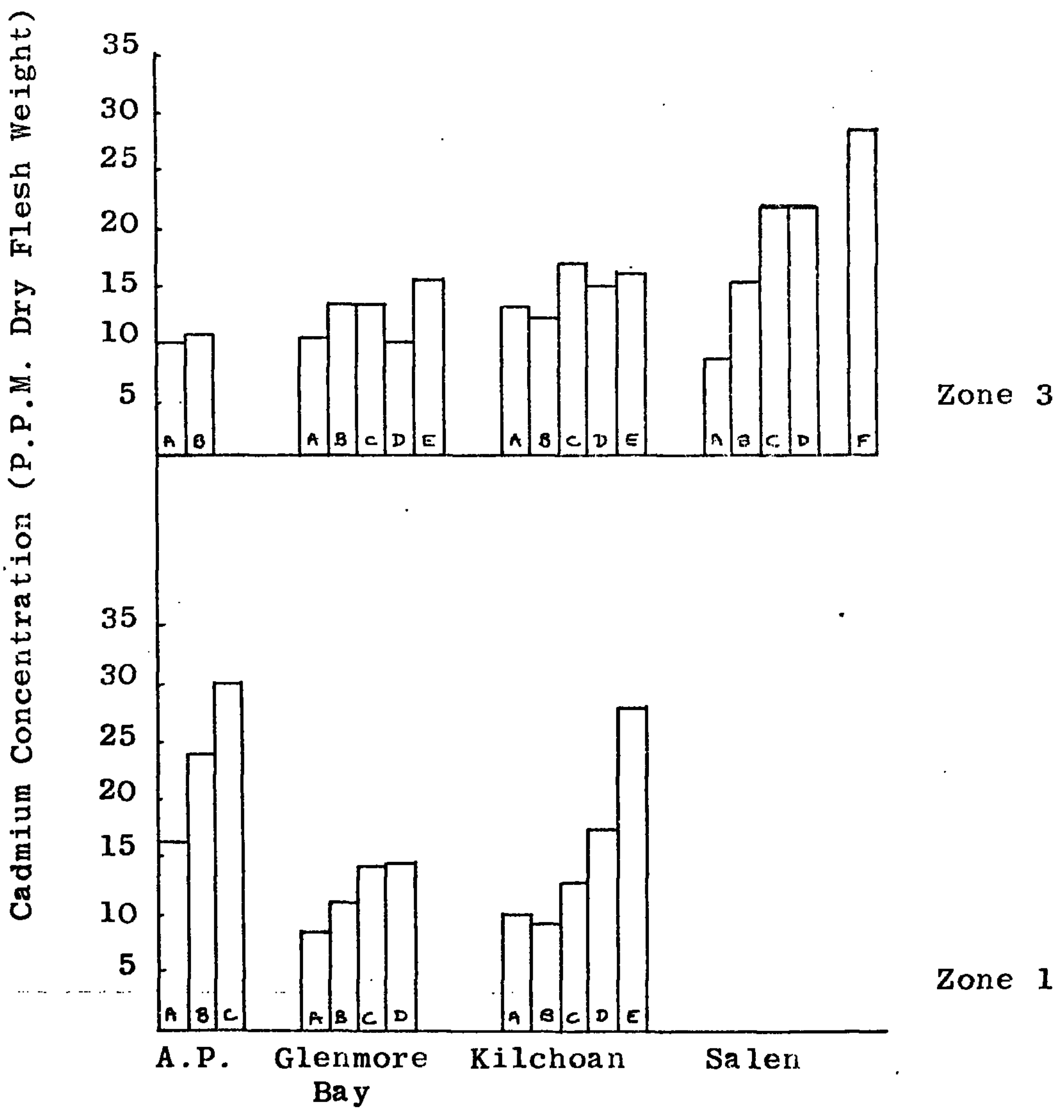
Estimating a "gradient" of pollution (by heavy metals) seems to be a very difficult task. One of the major problems is to establish comparable samples, as already pointed out in this study, and by many previous workers (for example Lewis 1970, 1972; Holden and Topping 1972; Folsom et al 1972; see also Section IV).

In this study some attempt has been made to alleviate this problem by selecting for comparison samples as "similar" as possible. Although a more detailed study concerning the pollution "gradient" is clearly required it is interesting to note that the patterns which have emerged so far for the various elements seem quite logical:

St. Abb's appears to be the least "polluted" area with the Isle of May intermediate between St. Abb's and the "polluted sites". The high concentrations of Mg found at Robin Hood's Bay may be associated with the high Mg content of shales (Bowen 1966). The lead values found at Blackhall Rocks and Marsden Bay were higher than those recorded at the other apparently polluted site, South Gare. The explanation may be that there are more manufacturing processes giving rise to lead wastes on Tyne and Wearside than in Teesmouth (Jones 1970).

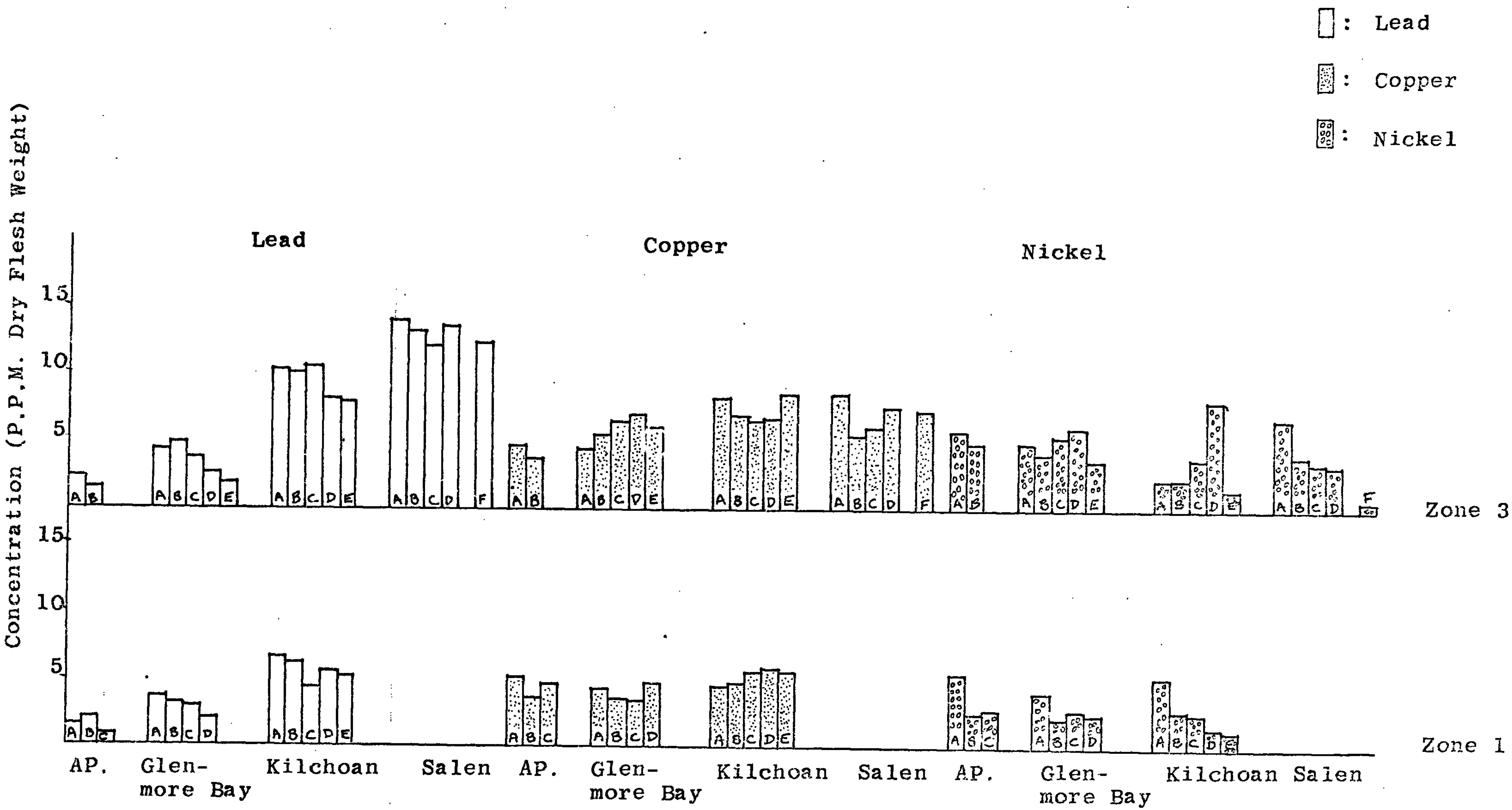
A fuller discussion of the pollution pattern revealed for Area C is given in Section IV.

Figs. III.15 - III.20: Histograms showing the element content (mean values) of all size classes of limpets (A,B,C,....) in Zones 1 and 3, for Area A: Ardnamurchan Point - Loch Sunart.



A.P. = Arnamurchan Point.

Fig. III.15 Cadmium Concentrations at Area A sites



A P. = Ardnamurchan Point Fig. III.16: Lead, copper, nickel concentrations at Area A sites.

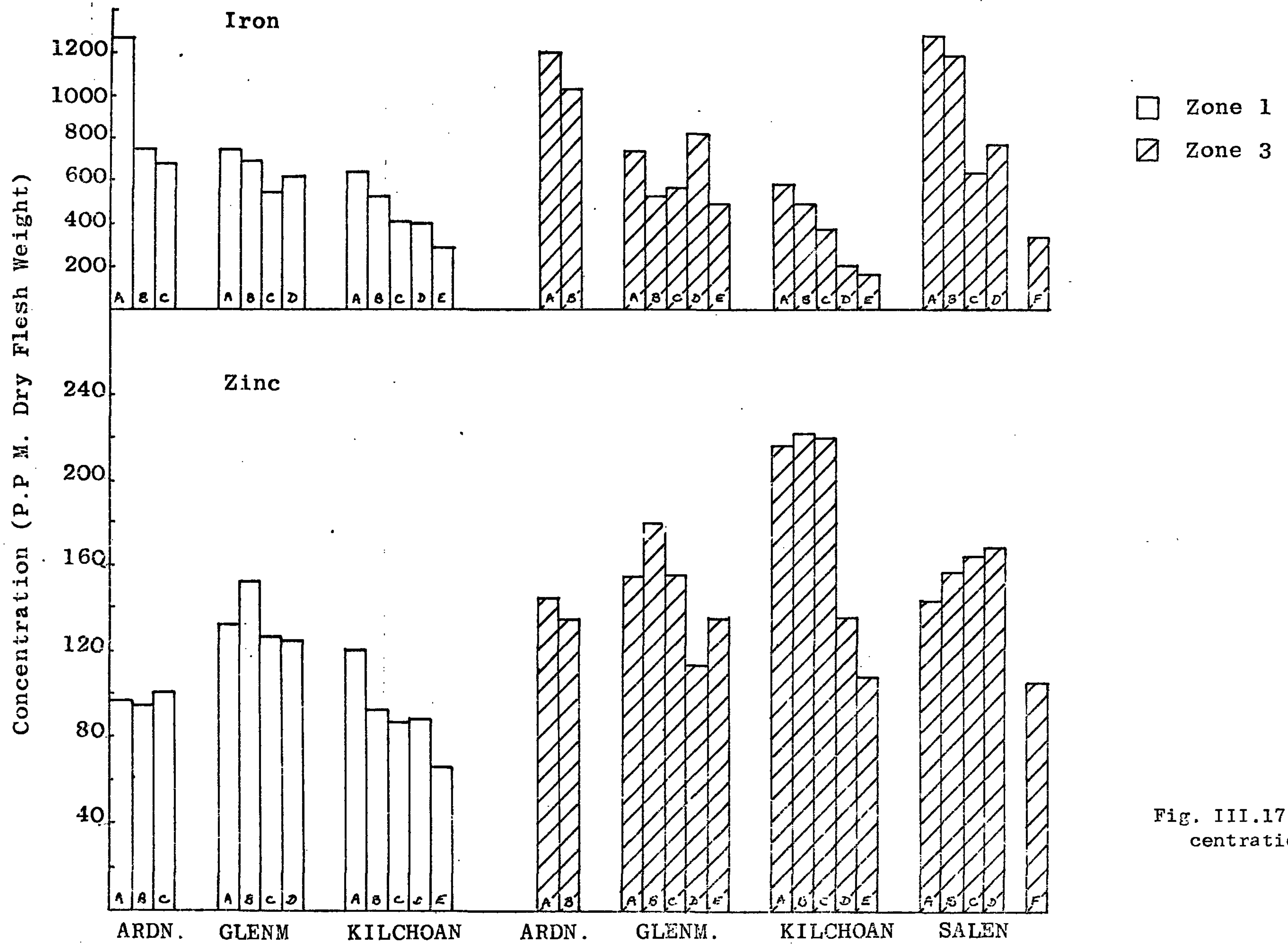


Fig. III.17: Iron, Zinc concentrations at Area A sites

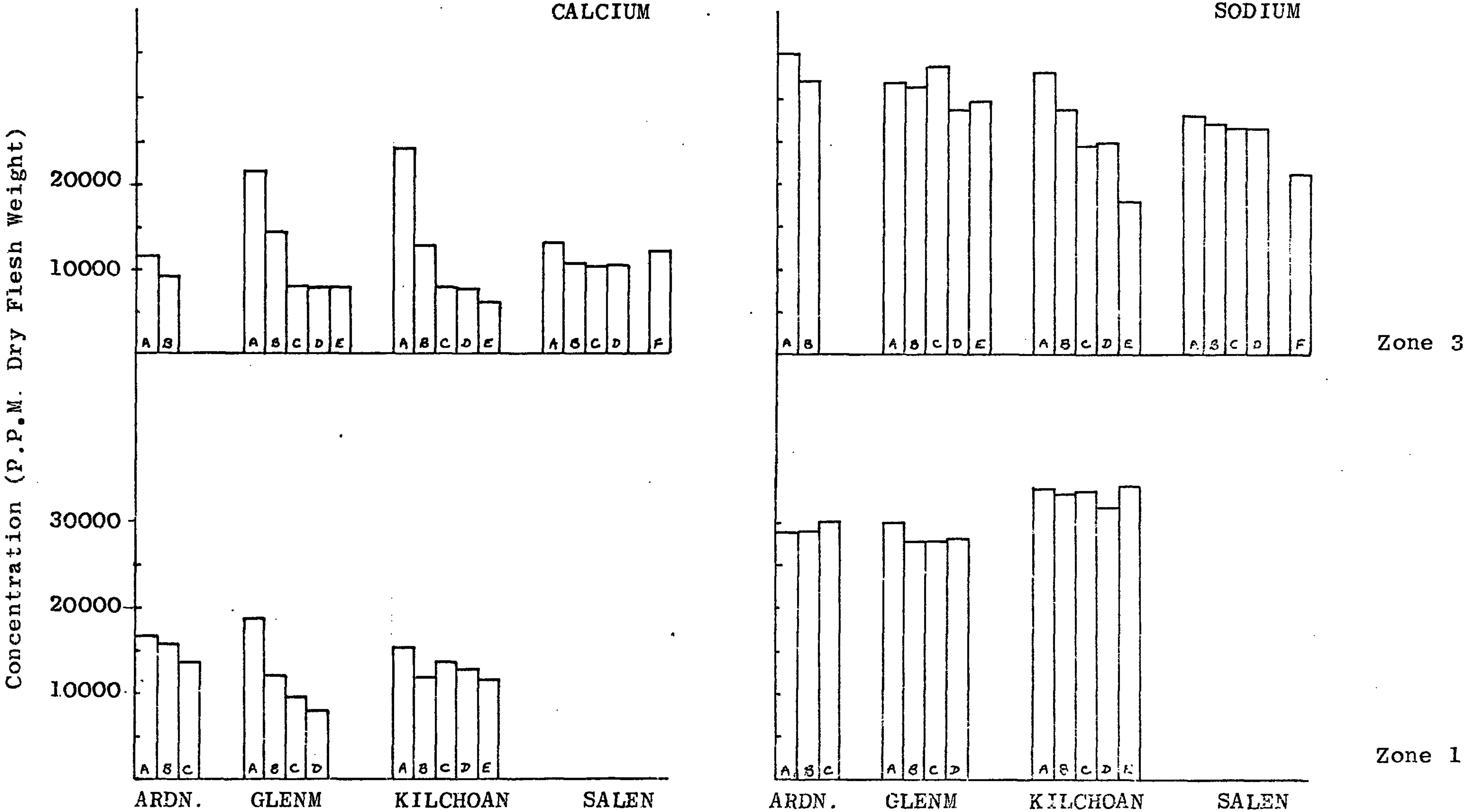
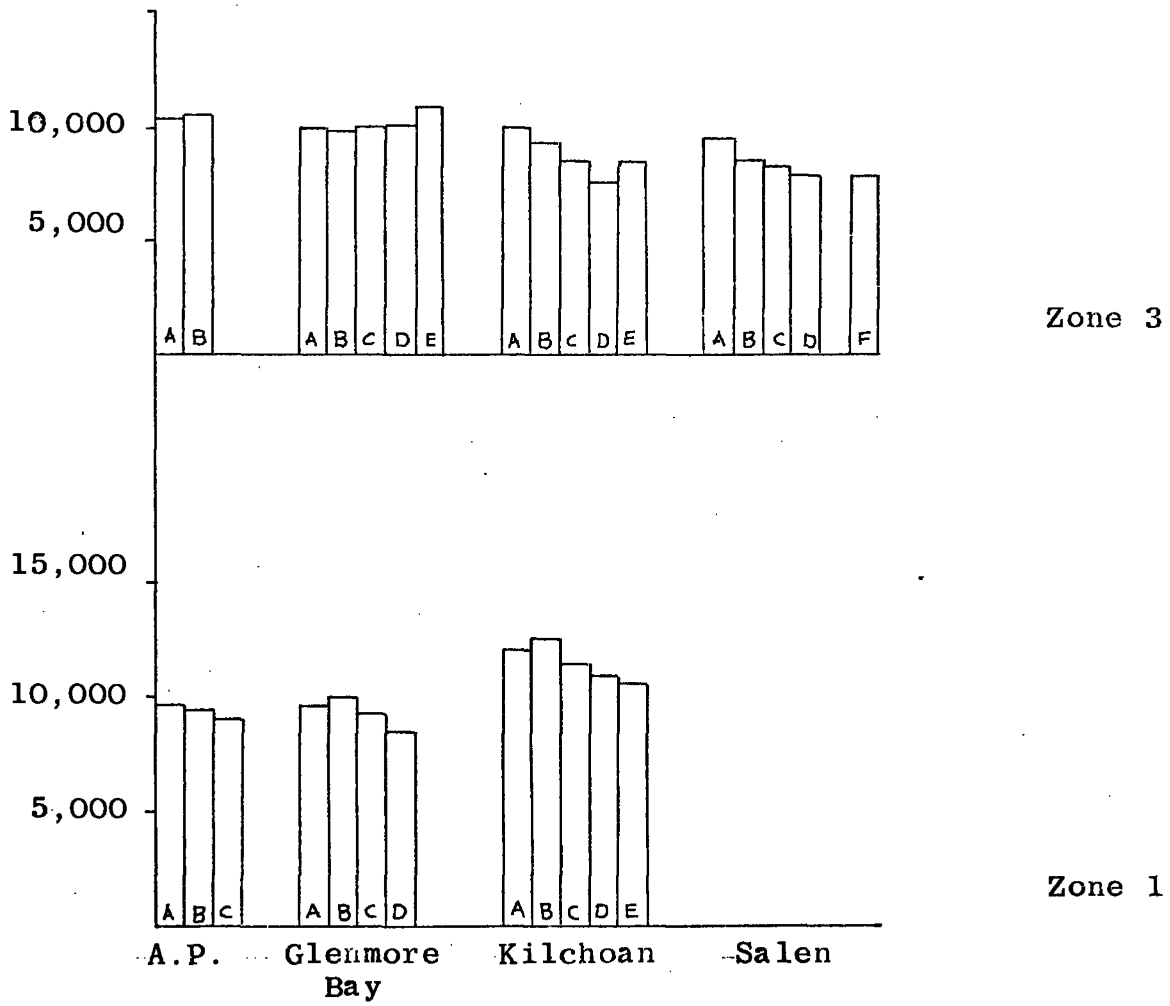


Fig. III.18: Calcium, Sodium concentrations at Area A sites.

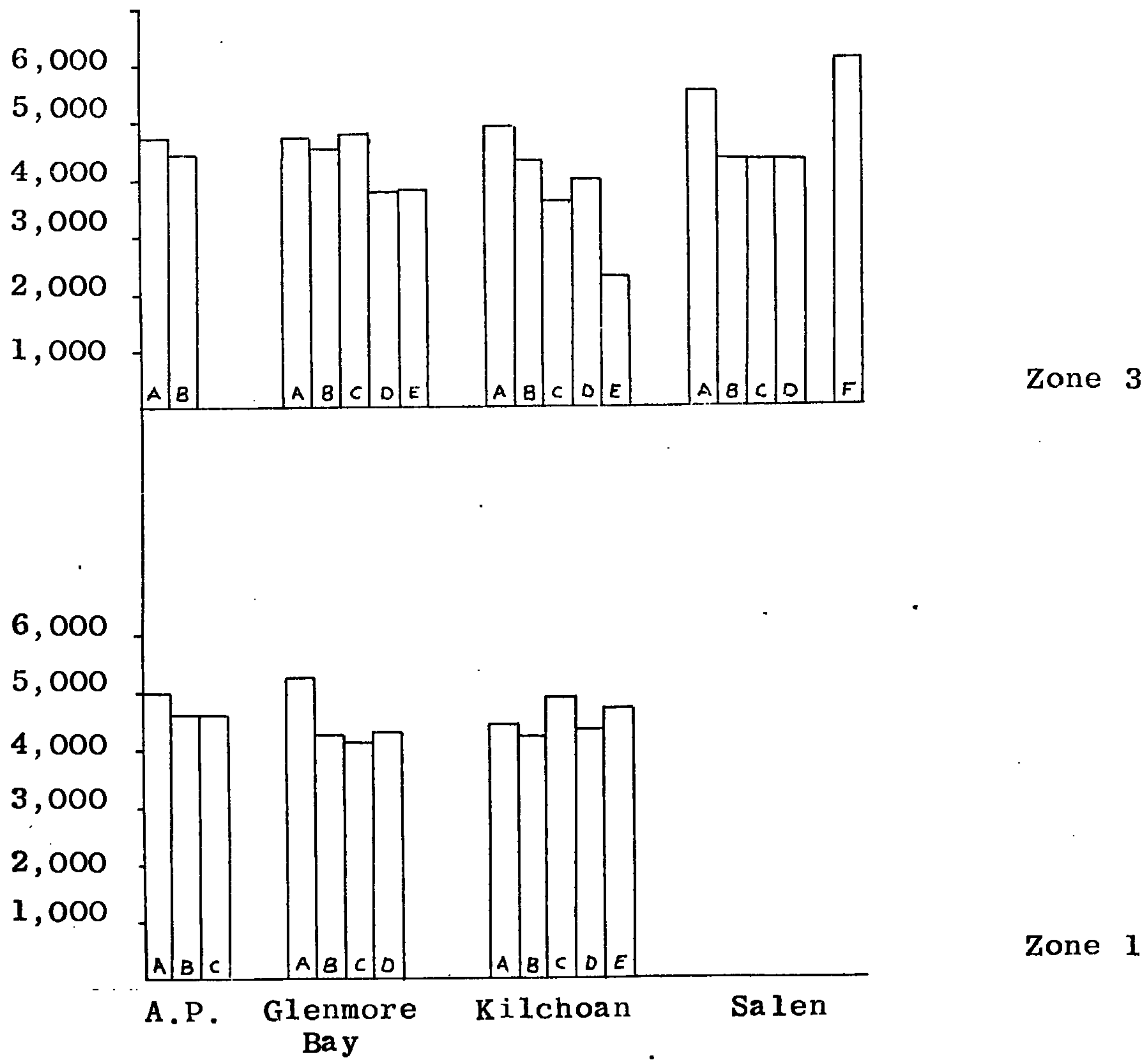
Potassium Concentration (P.P.M. Dry Flesh Weight)



A.P. Arnamurchan Point

Fig. III.19: Potassium concentrations at Area A sites.

Magnesium Concentration (P.P.M. Dry Flesh Weight)



A.P. = Arnamurchan Point

Fig. III.20 Magnesium Concentrations at Area A sites

Figs. III.21 - III.30: Histograms showing the element content (mean values) of all size classes of limpets (A,B,C,...) in Zones 1, 2 and 3, for Area B: Shetland Islands.

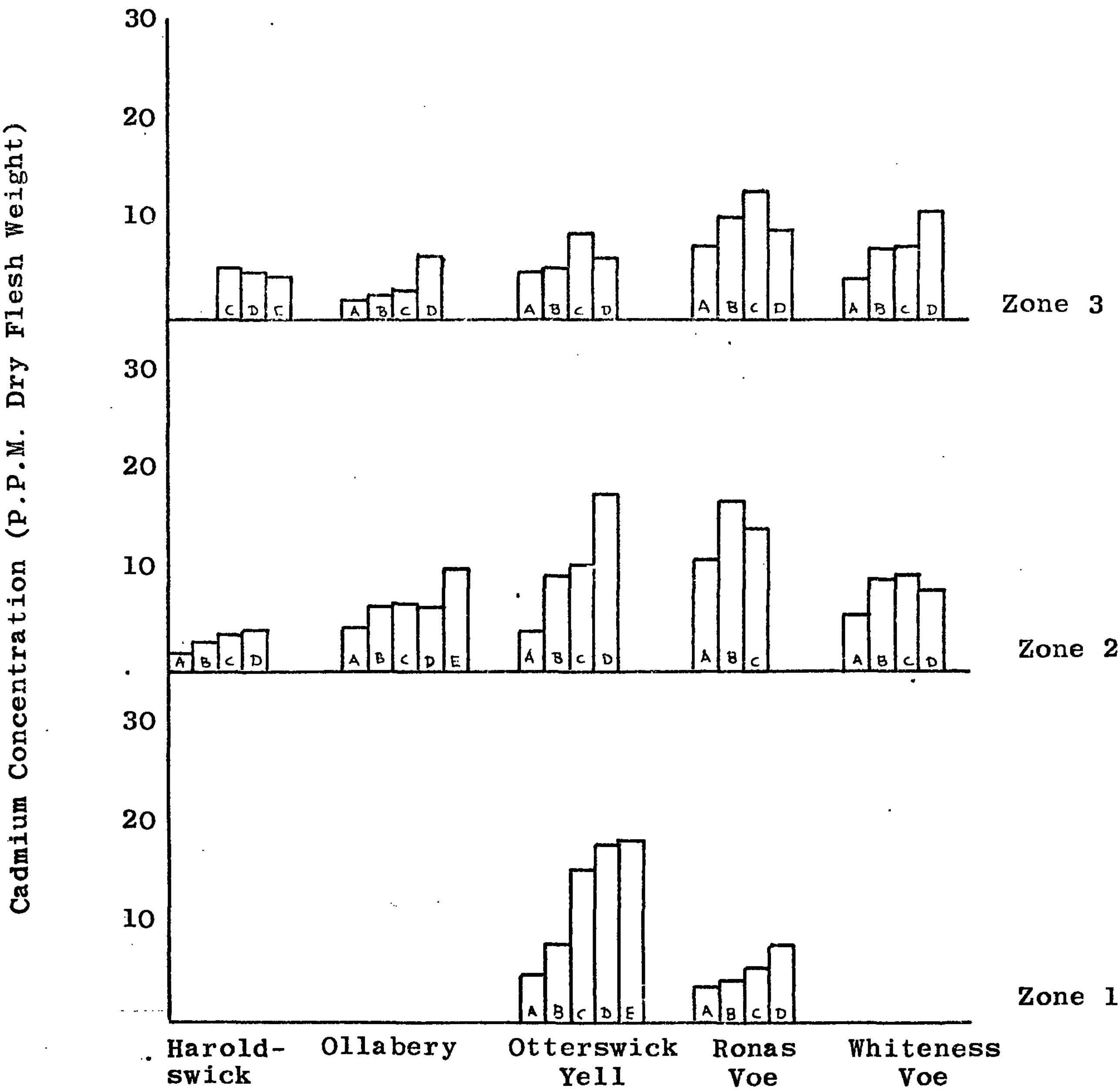


Fig. III.21: Cadmium concentrations in Area B sites.

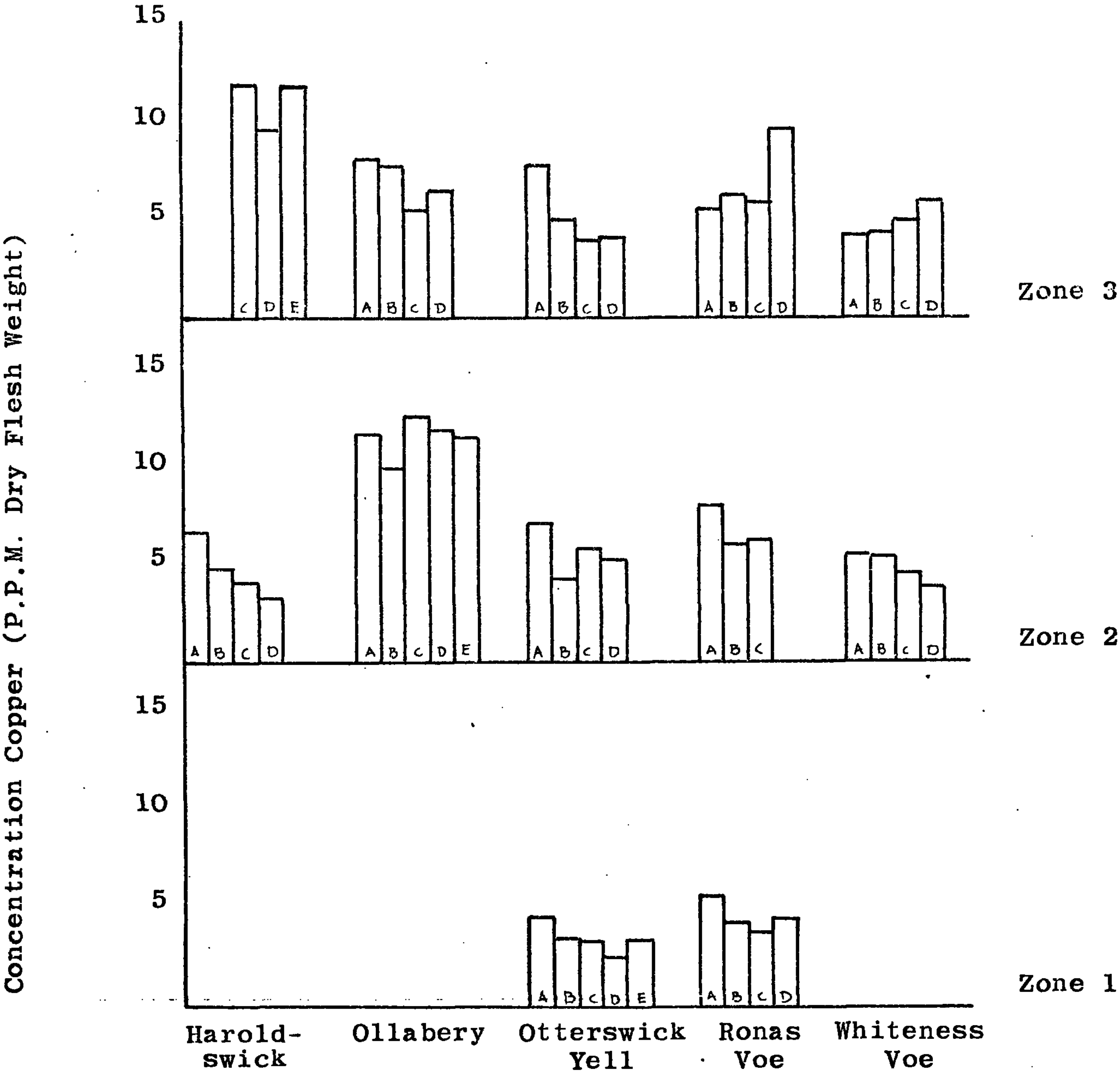


Fig. III.22: Copper concentrations at Area B sites.

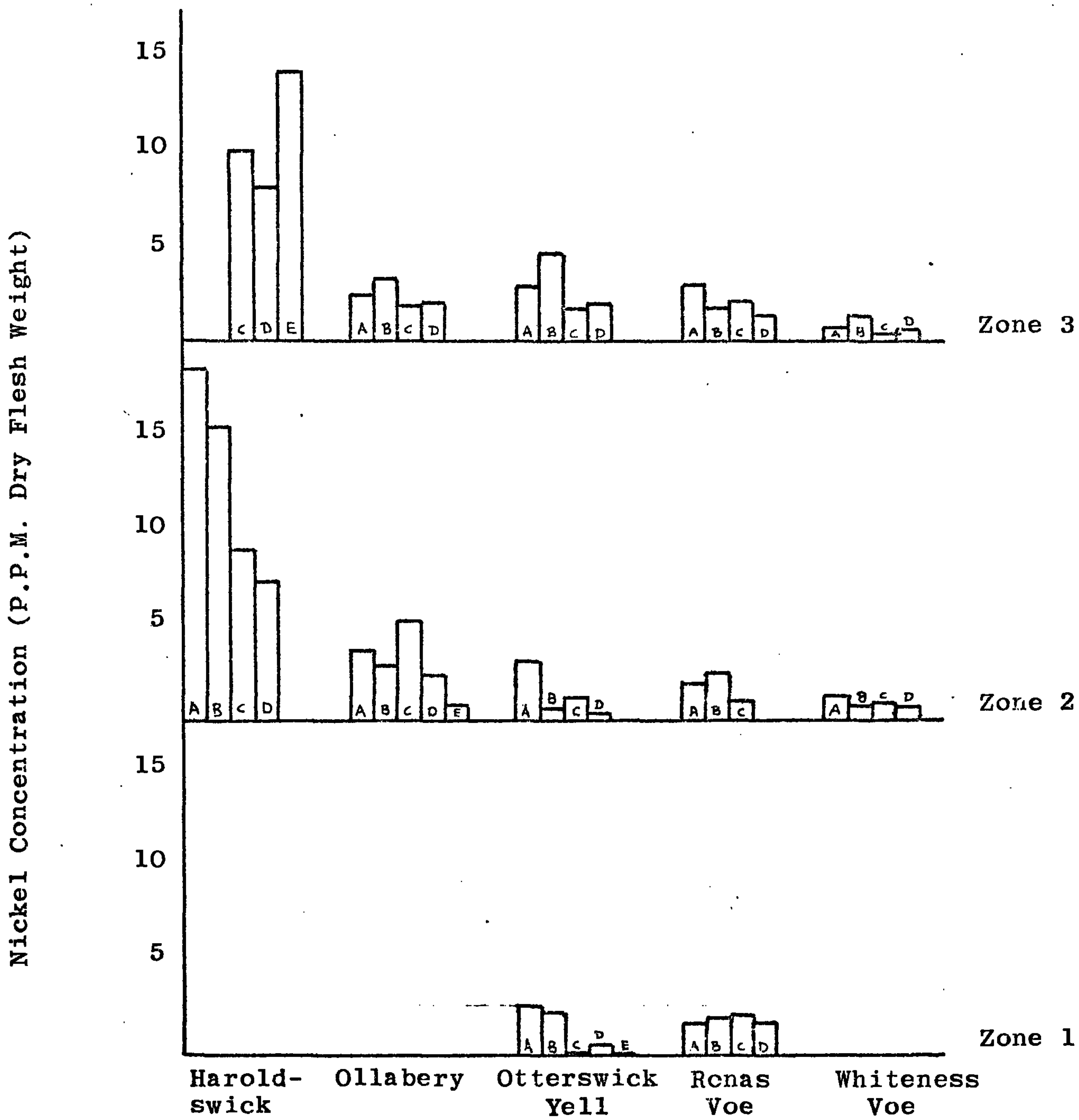


Fig. III.23: Nickel concentrations at Area B sites.

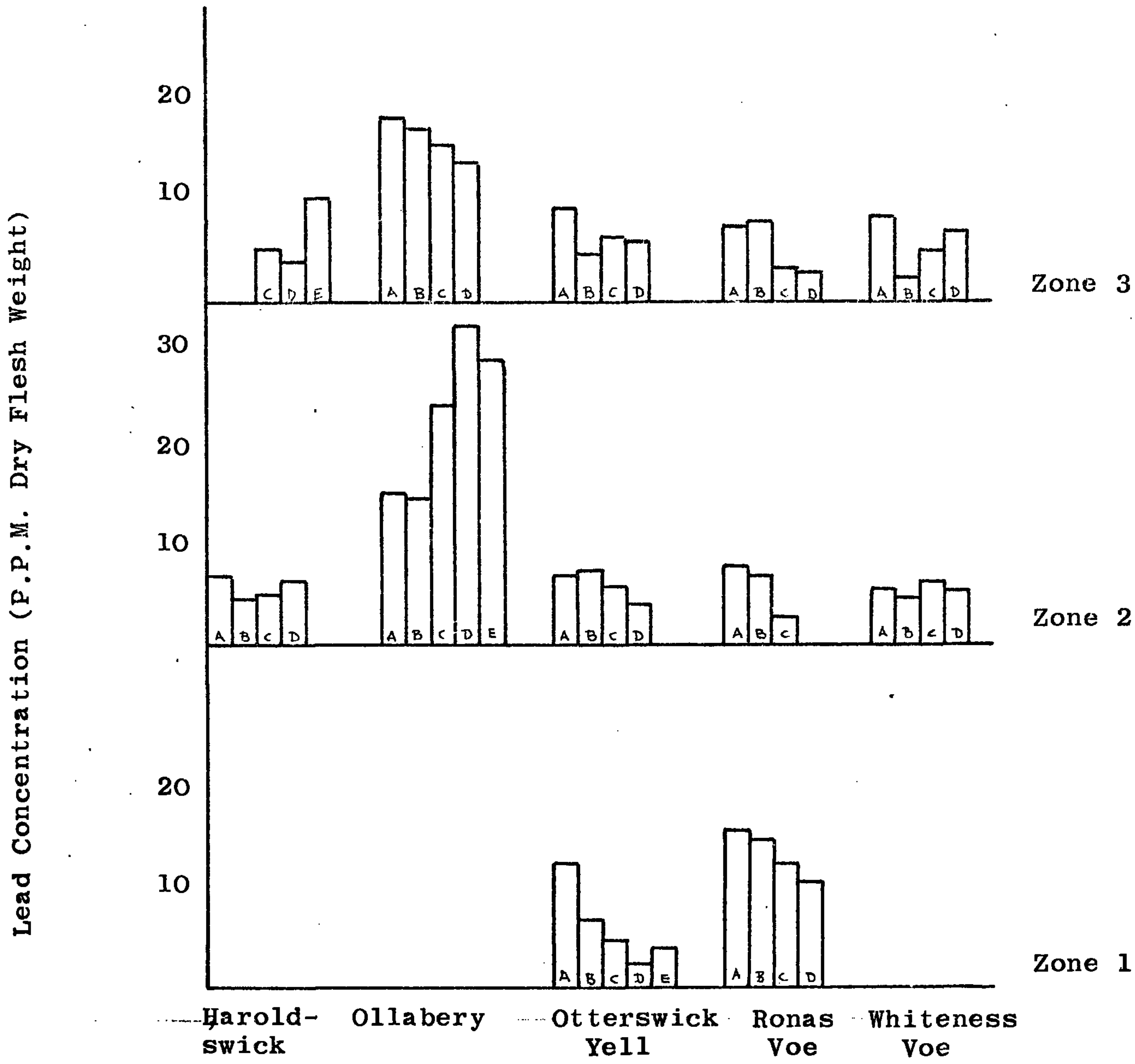


Fig. III.24: Lead concentrations at Area B sites.

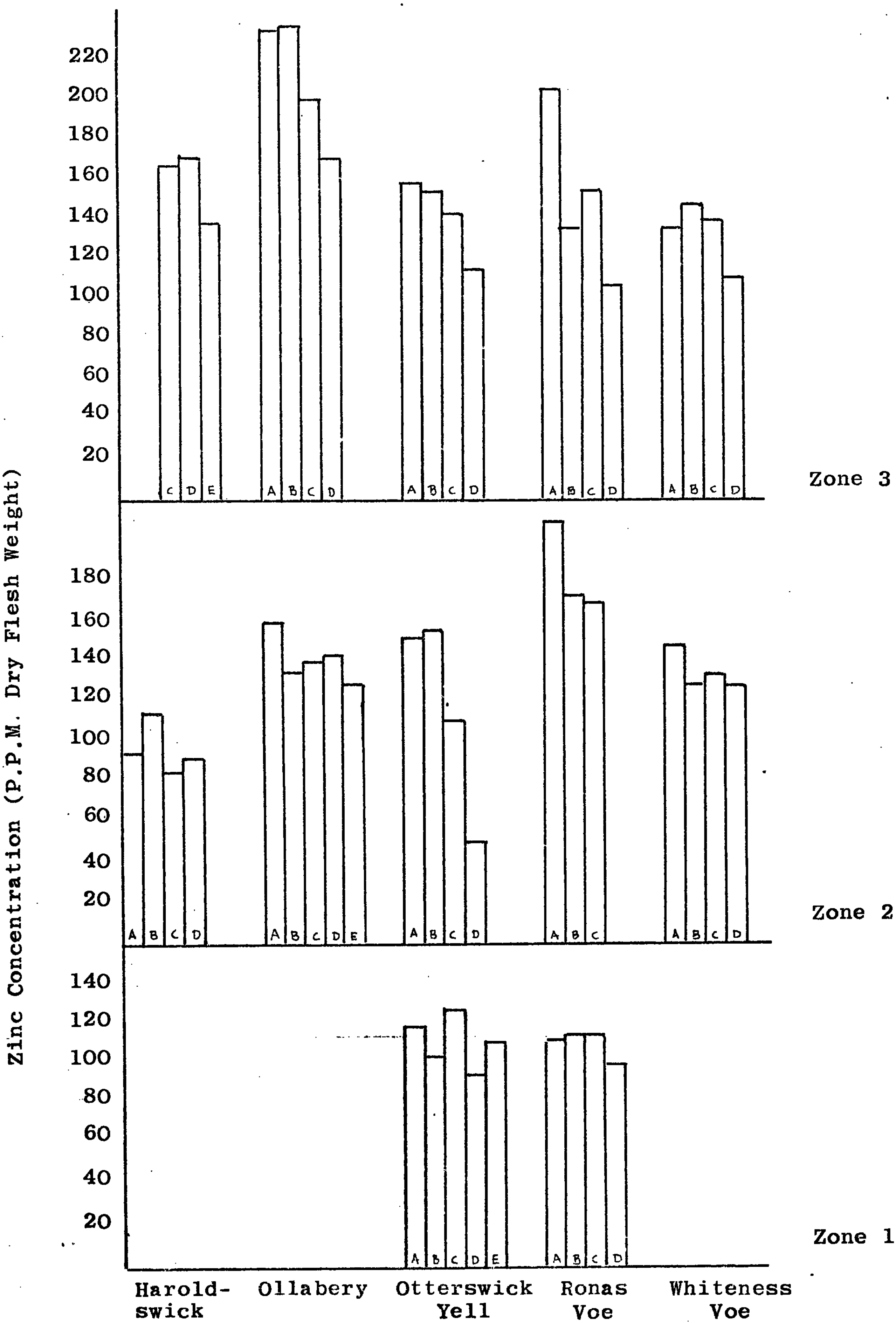


Fig. III.25: Zinc concentrations at Area B sites.

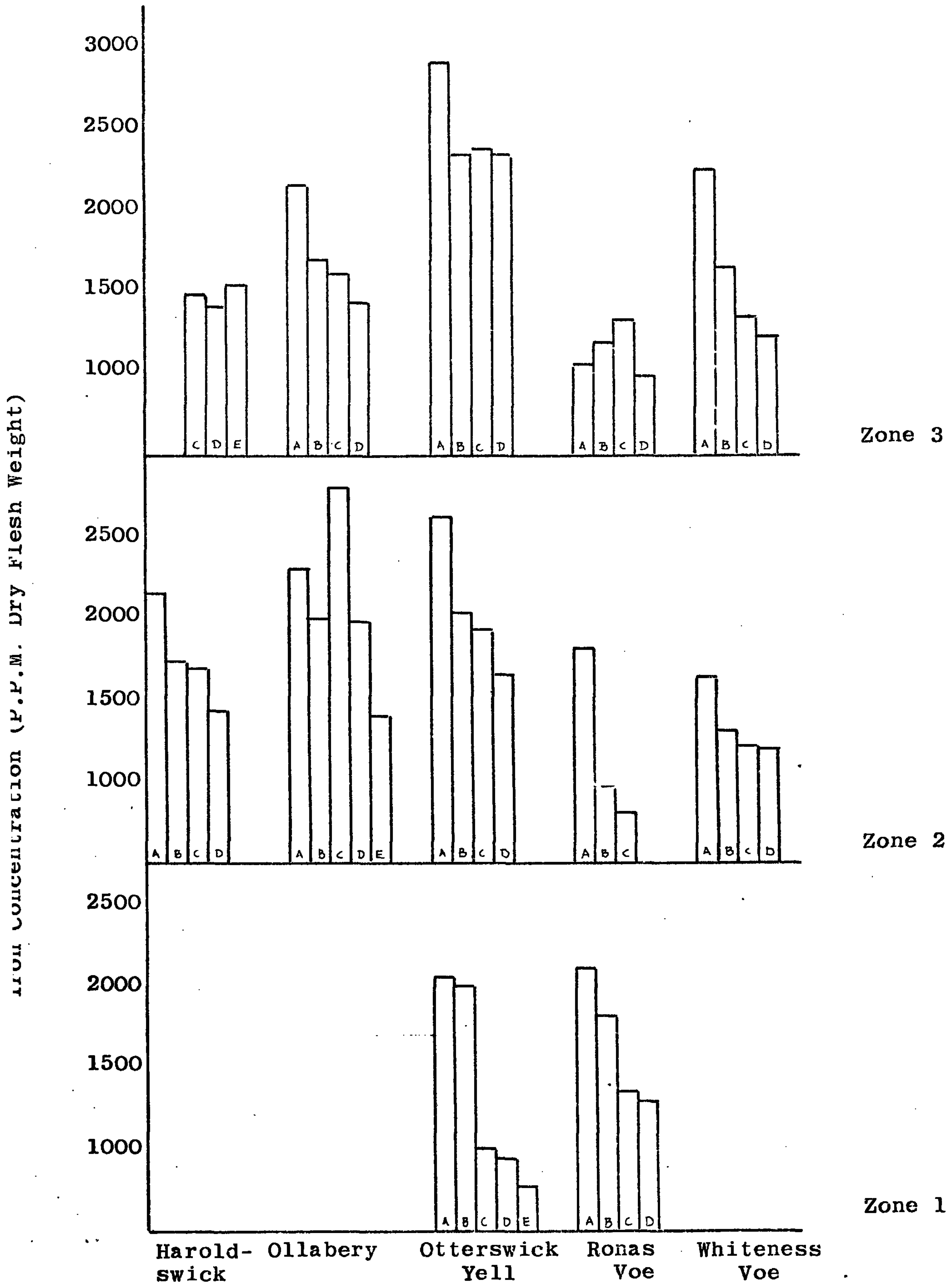


Fig. III.26: Iron concentrations at Area B sites.

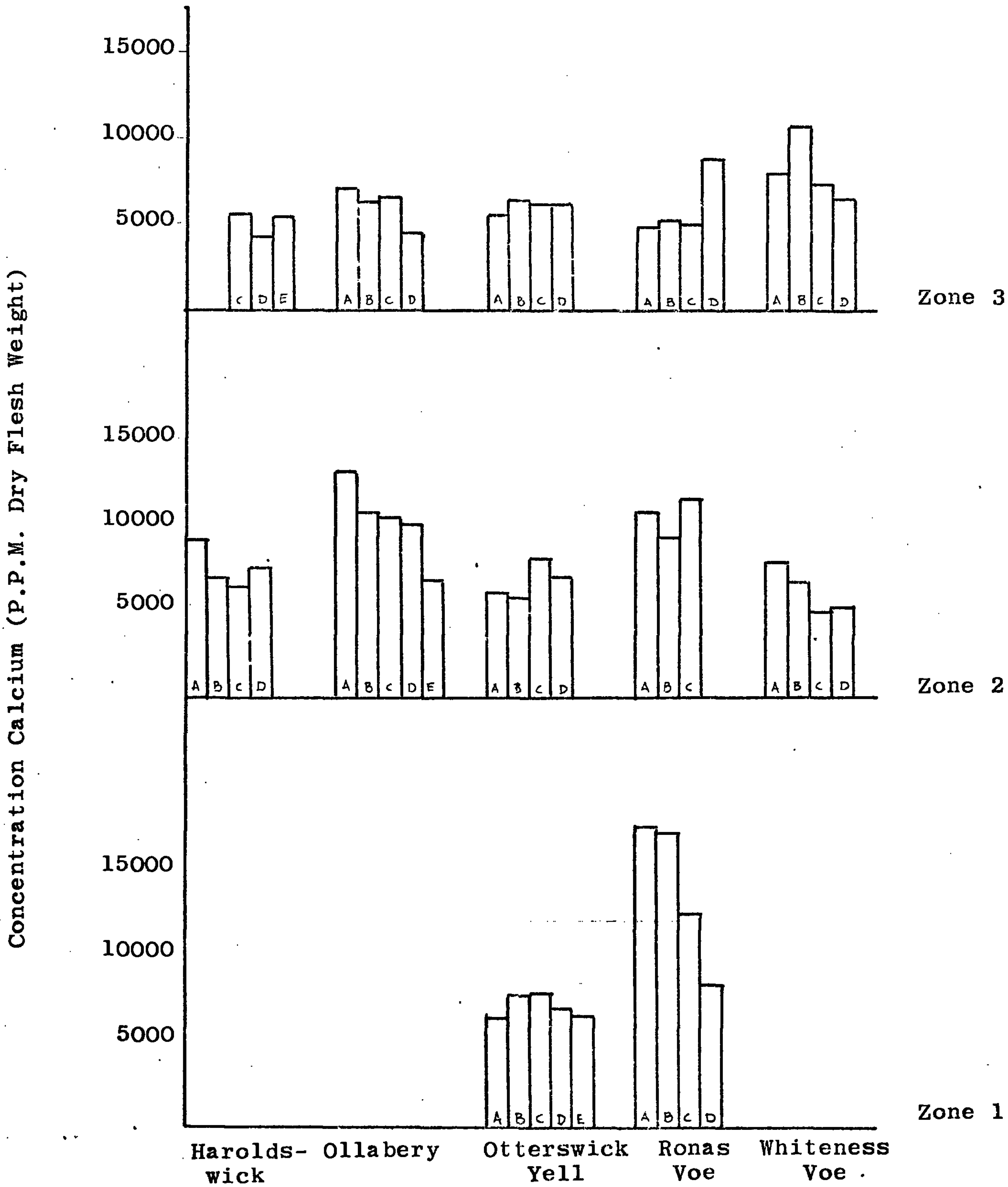


Fig. III.27: Calcium concentrations at Area B sites.

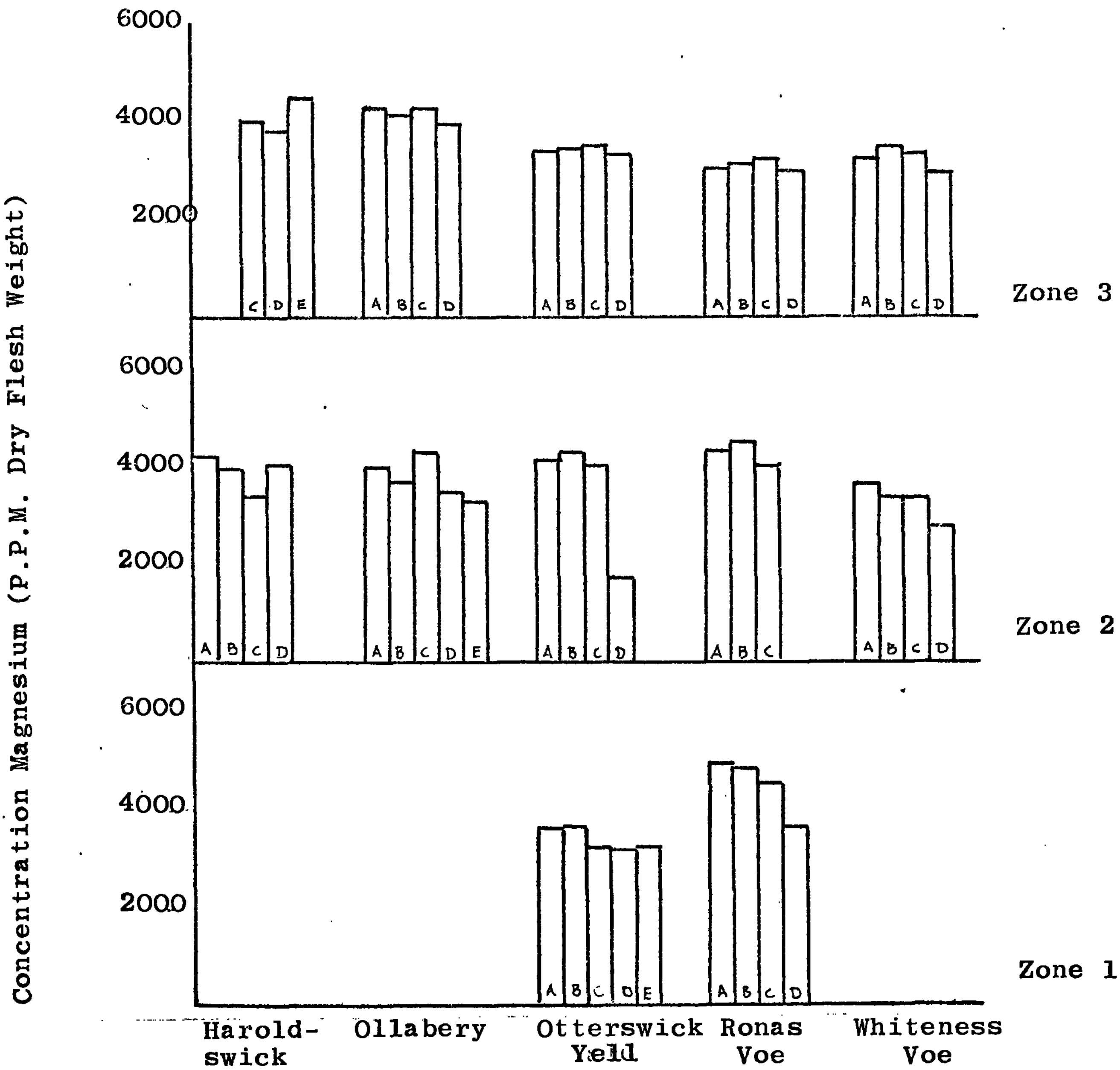


Fig. III.28: Magnesium concentrations at Area B sites.

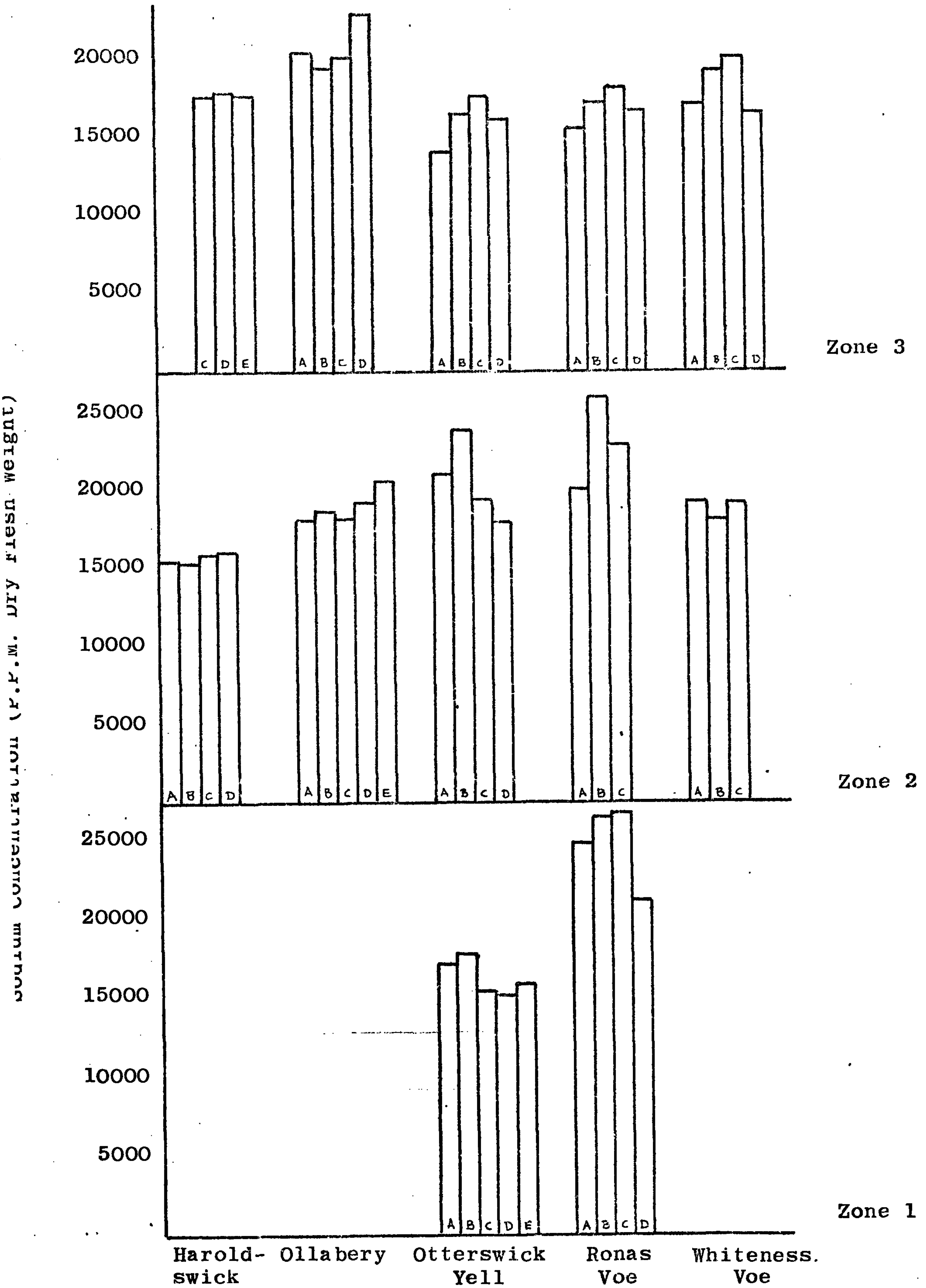


Fig. III.29: Sodium concentrations at Area B sites.

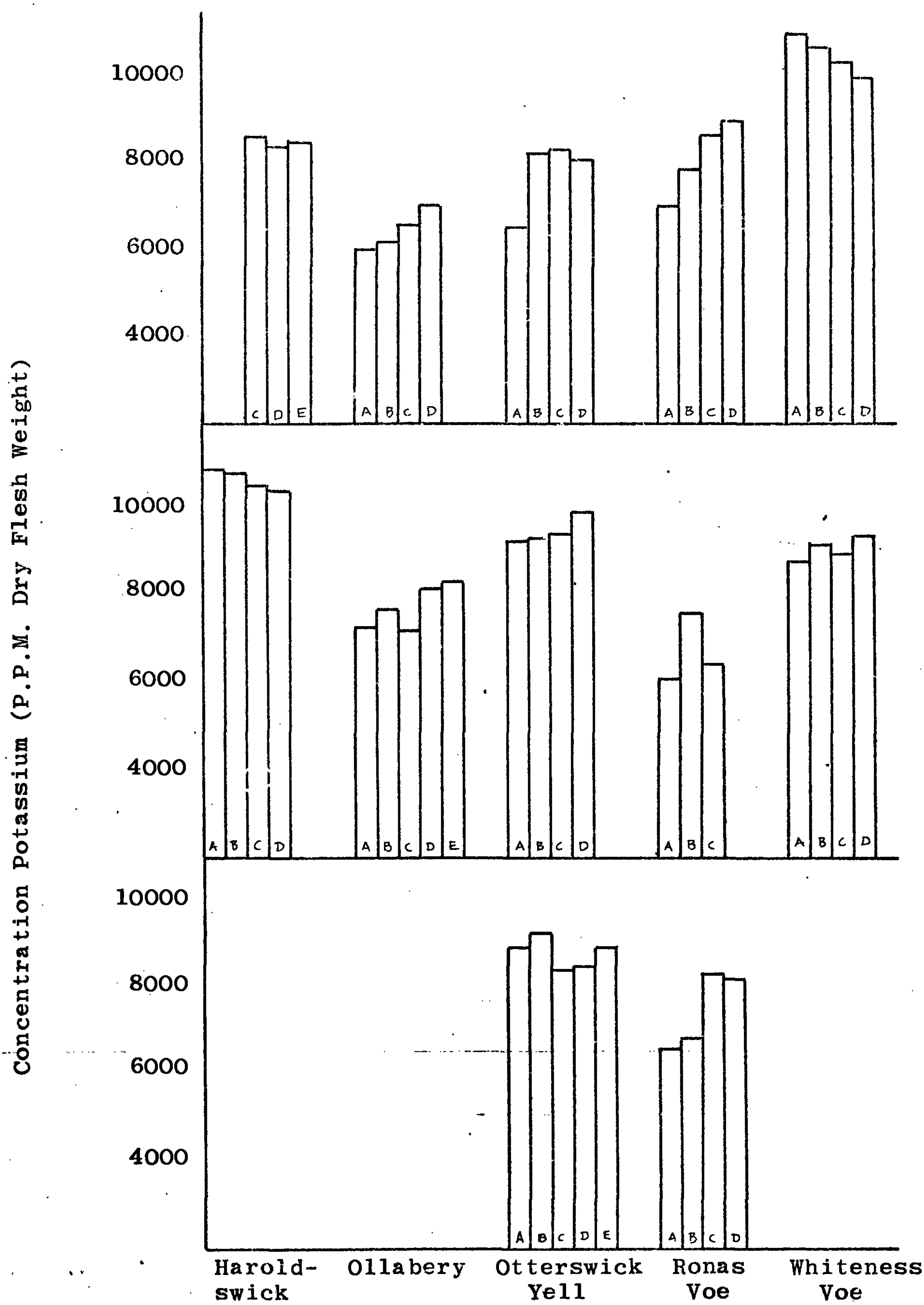


Fig. III.30: Potassium concentrations at Area B sites.

Figs. III.31 - III.40: Histograms showing the element content (mean values) of all size classes of limpets (A,B,C,...) in Zones 1, 2 and 3 for Area C: N.E. coast of England and S.F. coast of Scotland.

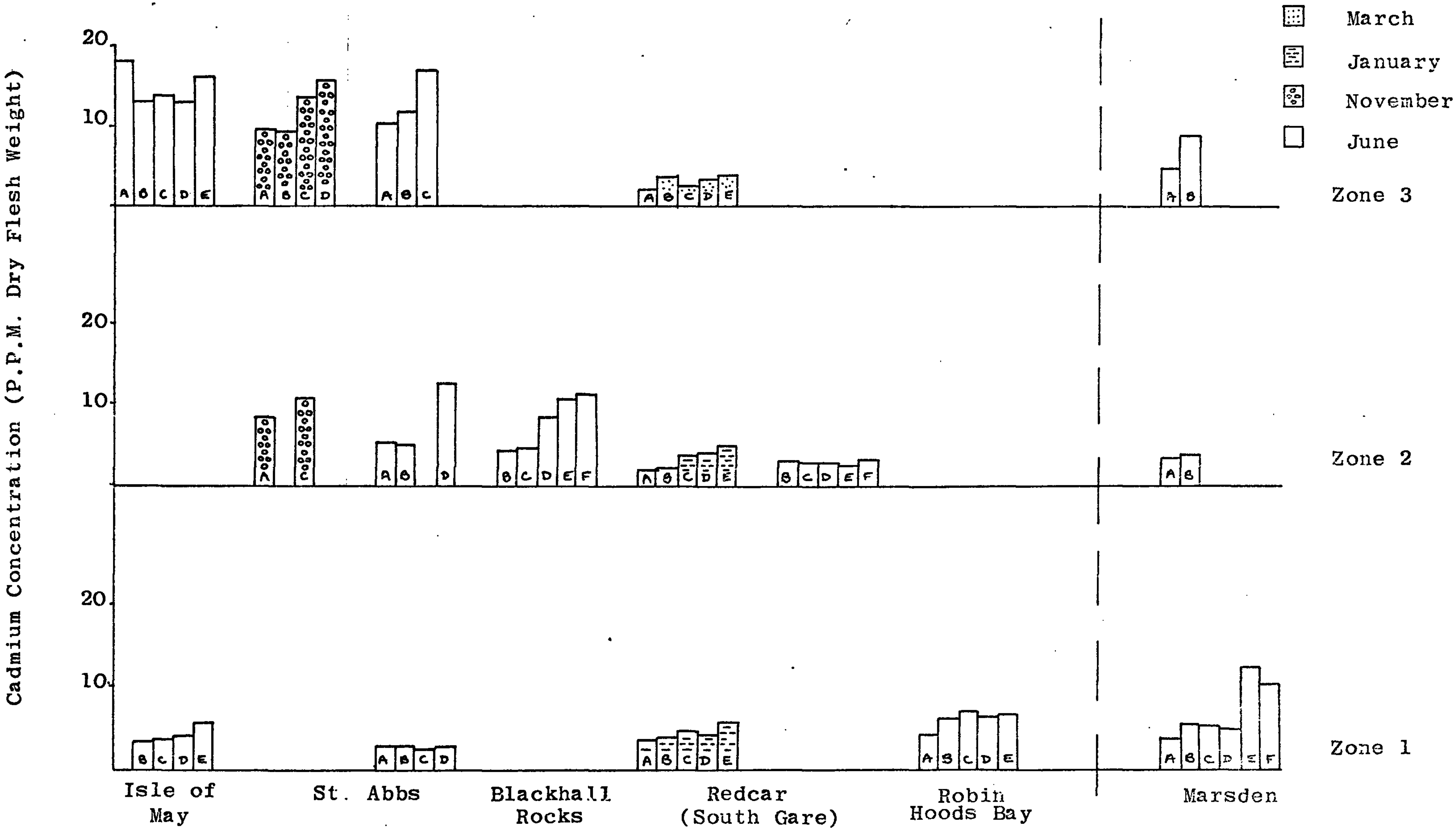
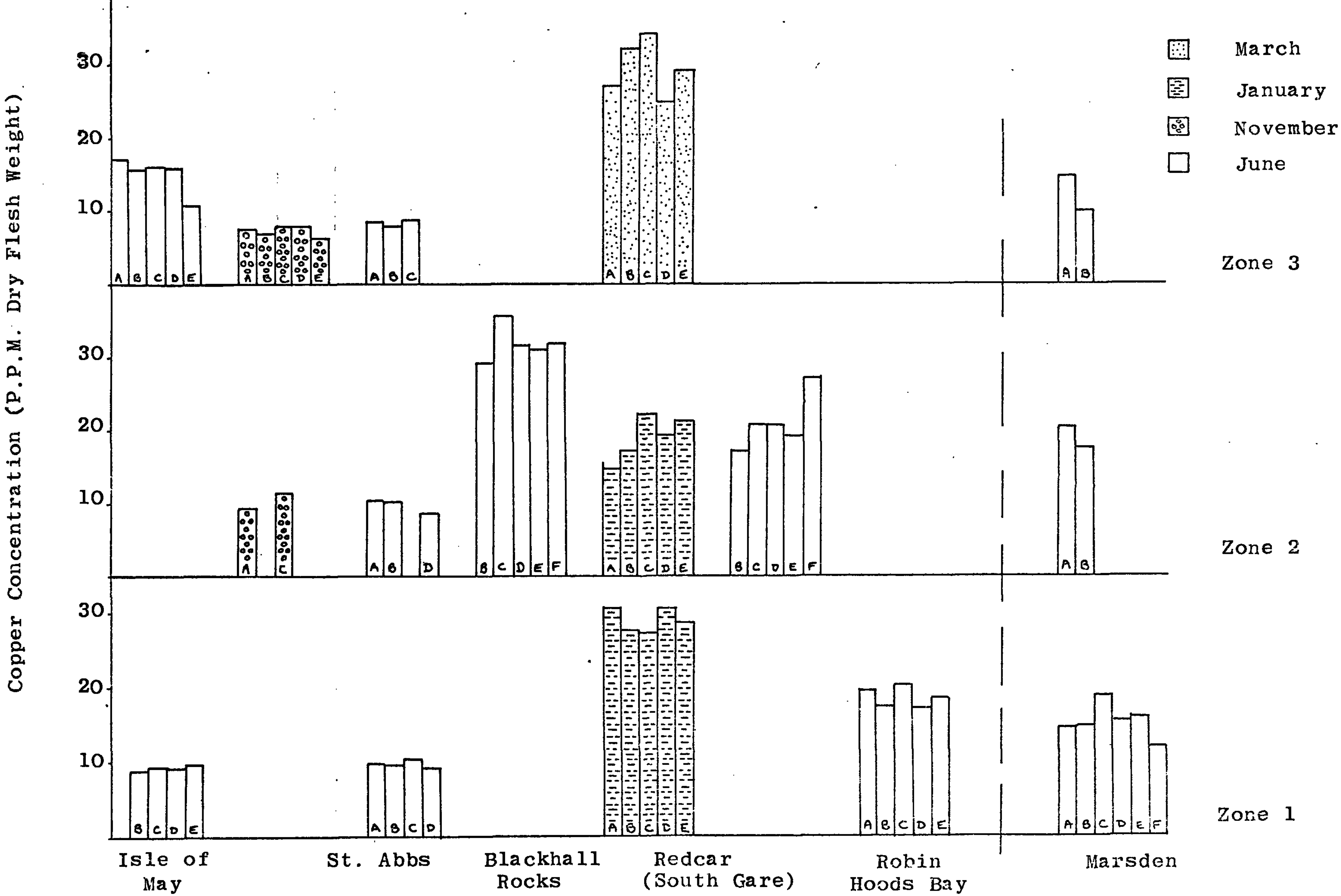


Fig. III.31: Cadmium concentrations at Area C sites.

Fig. III.32: Copper concentrations at Area C sites.



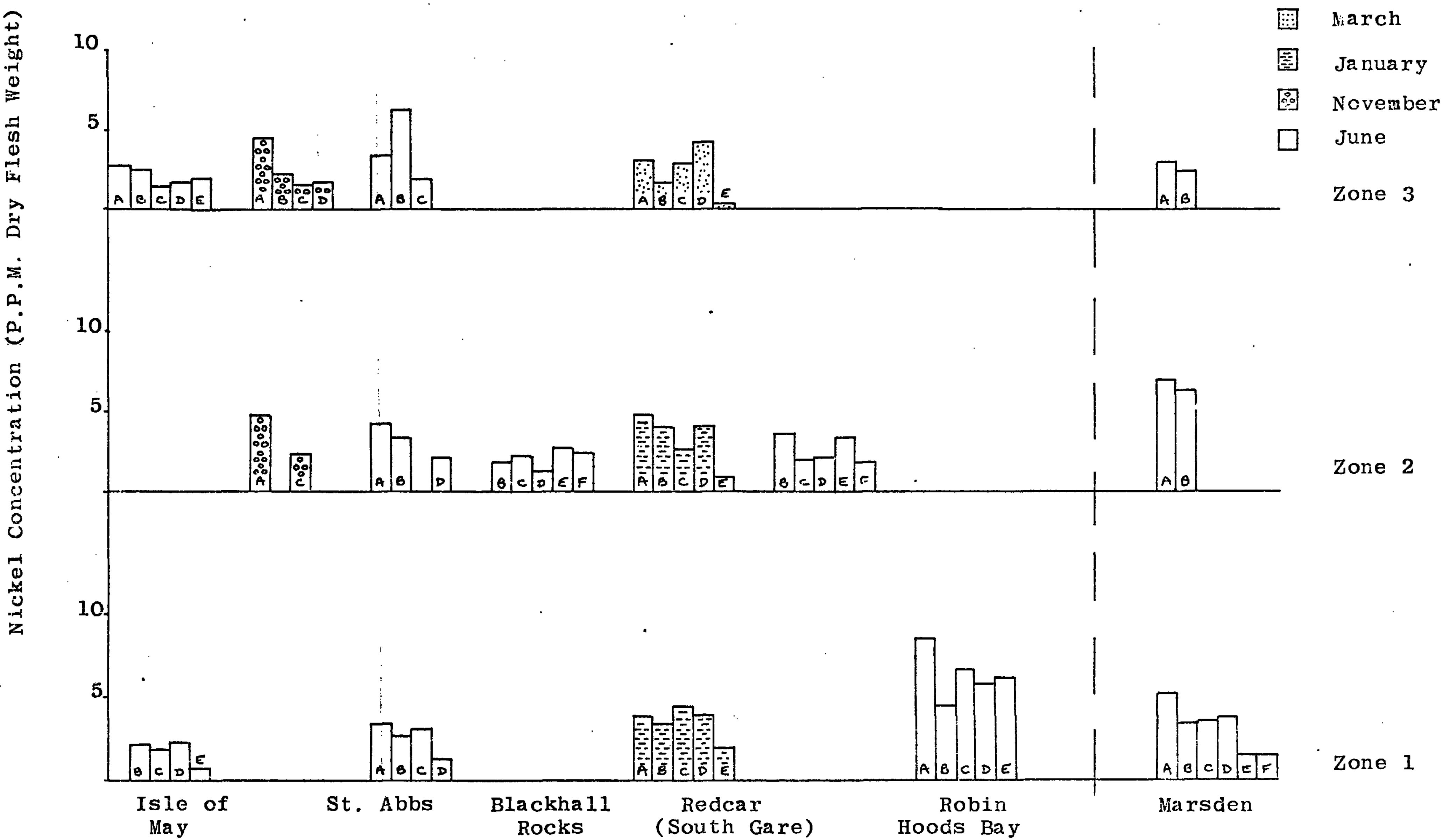
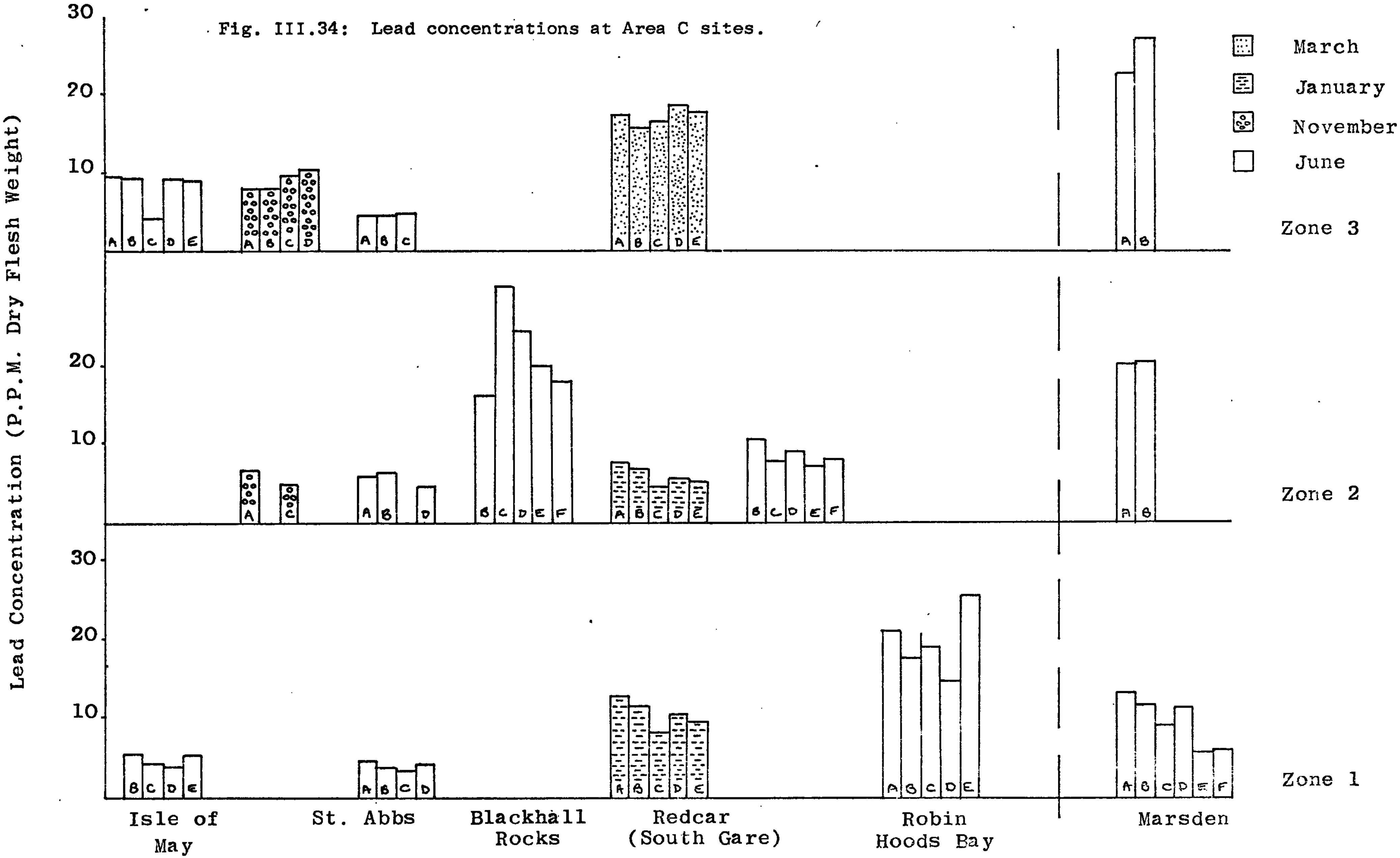


Fig. III.33: Nickel concentrations at Area C sites.

Fig. III.34: Lead concentrations at Area C sites.



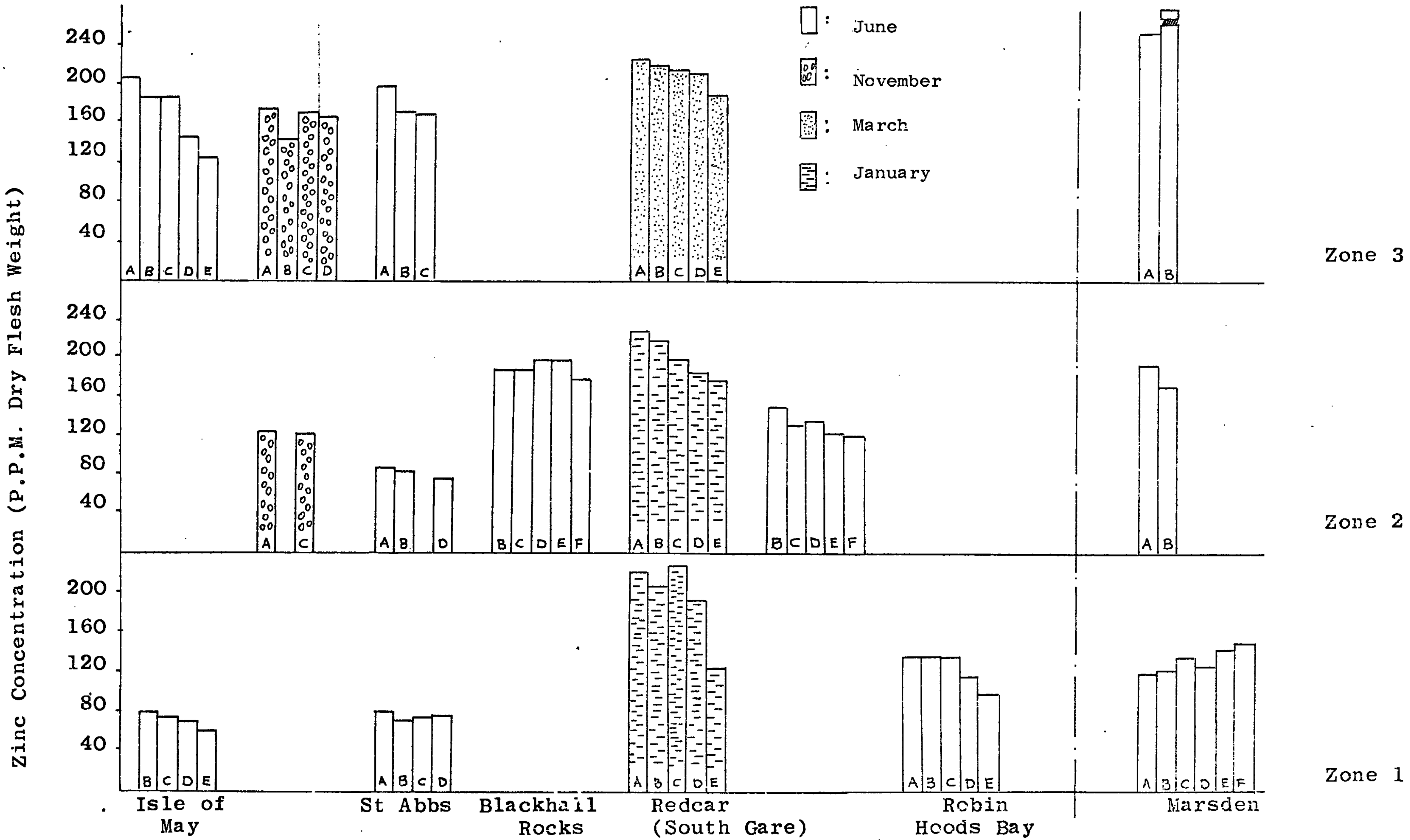


Fig. III.35 Zinc concentration at East Coast Sites

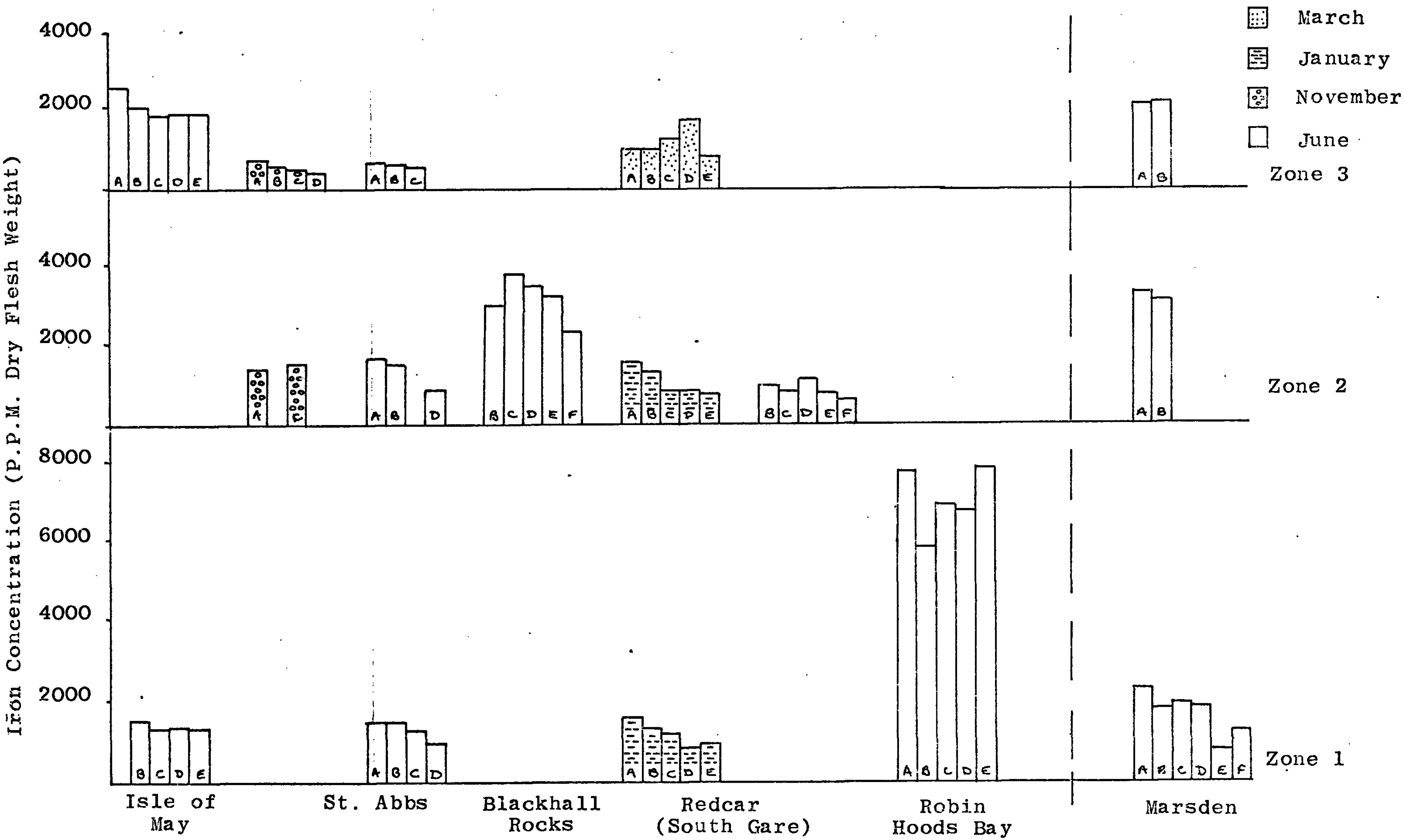


Fig. III.36: Iron concentrations at Area C sites.

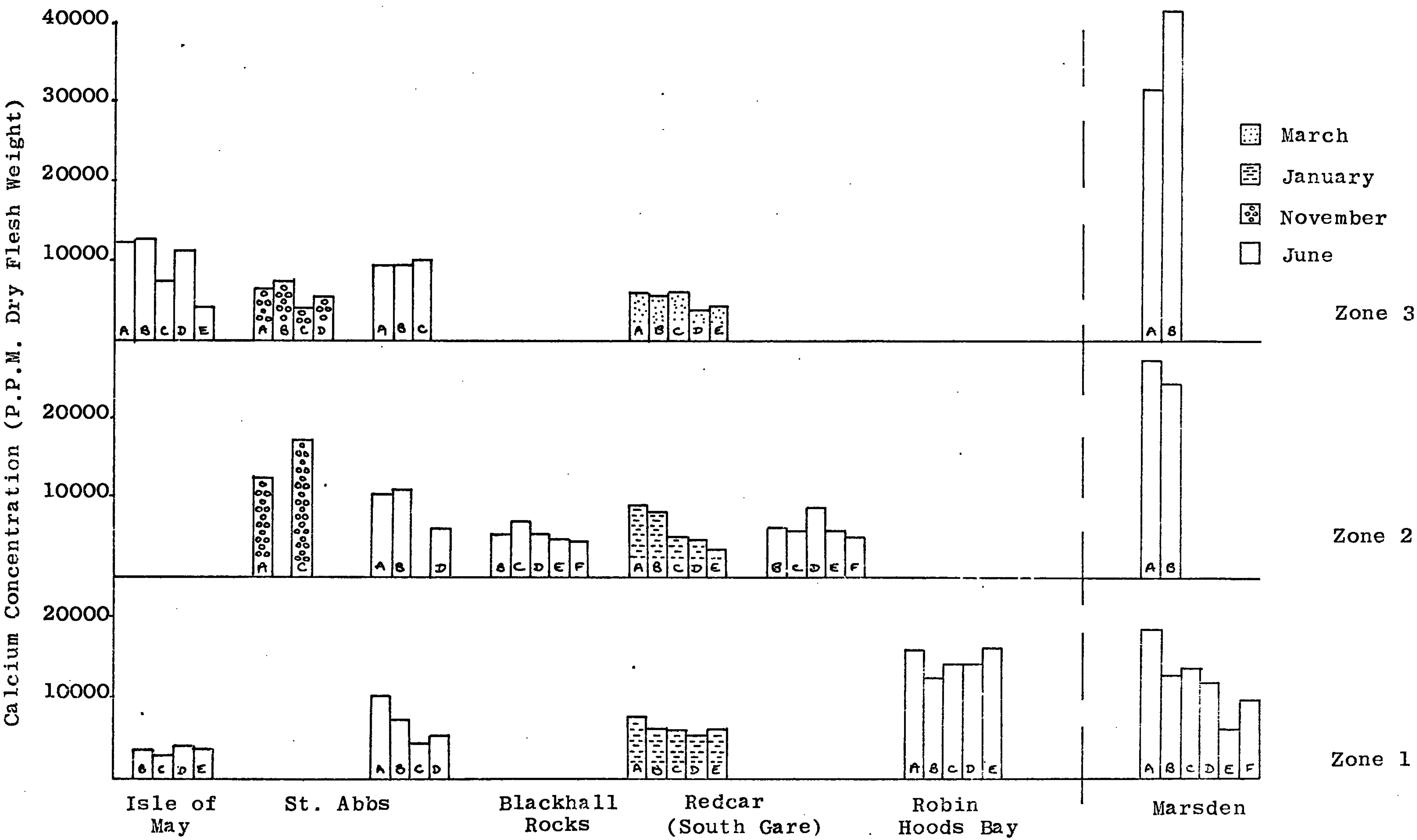


Fig. III.37: Calcium concentrations at Area C sites.

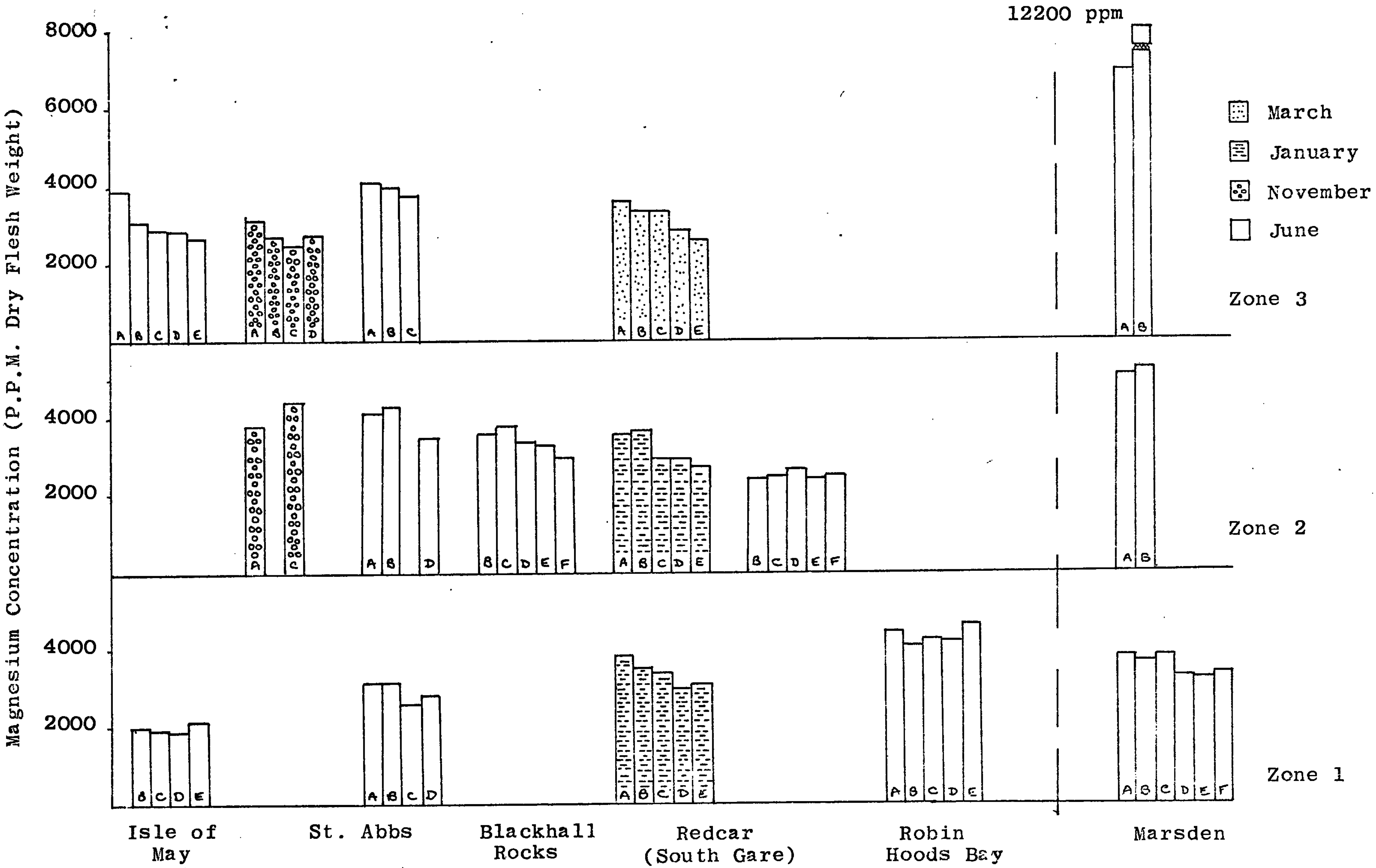


Fig. III.38: Magnesium concentrations at Area C sites.

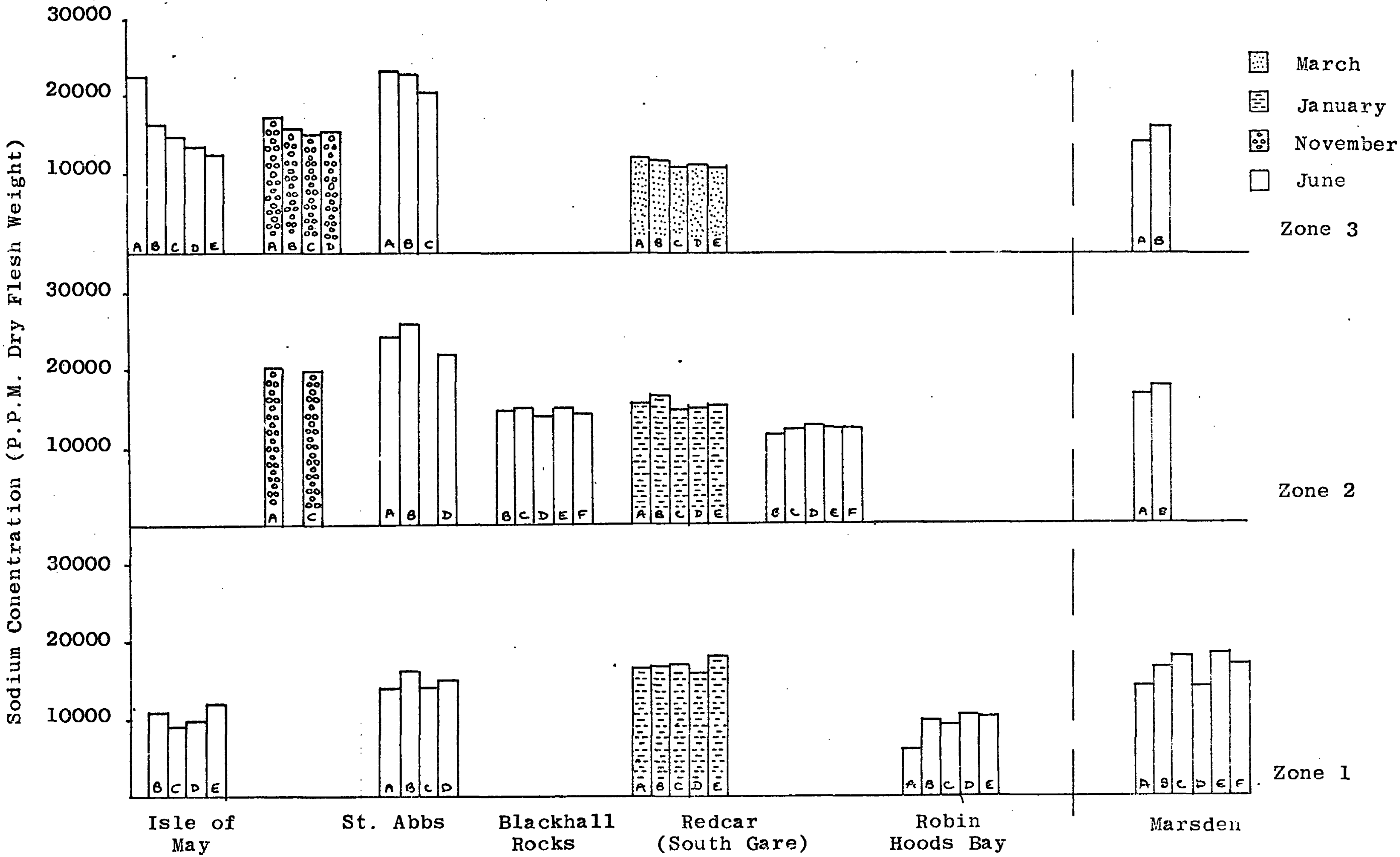


Fig. III.39: Sodium concentrations at Area C sites.

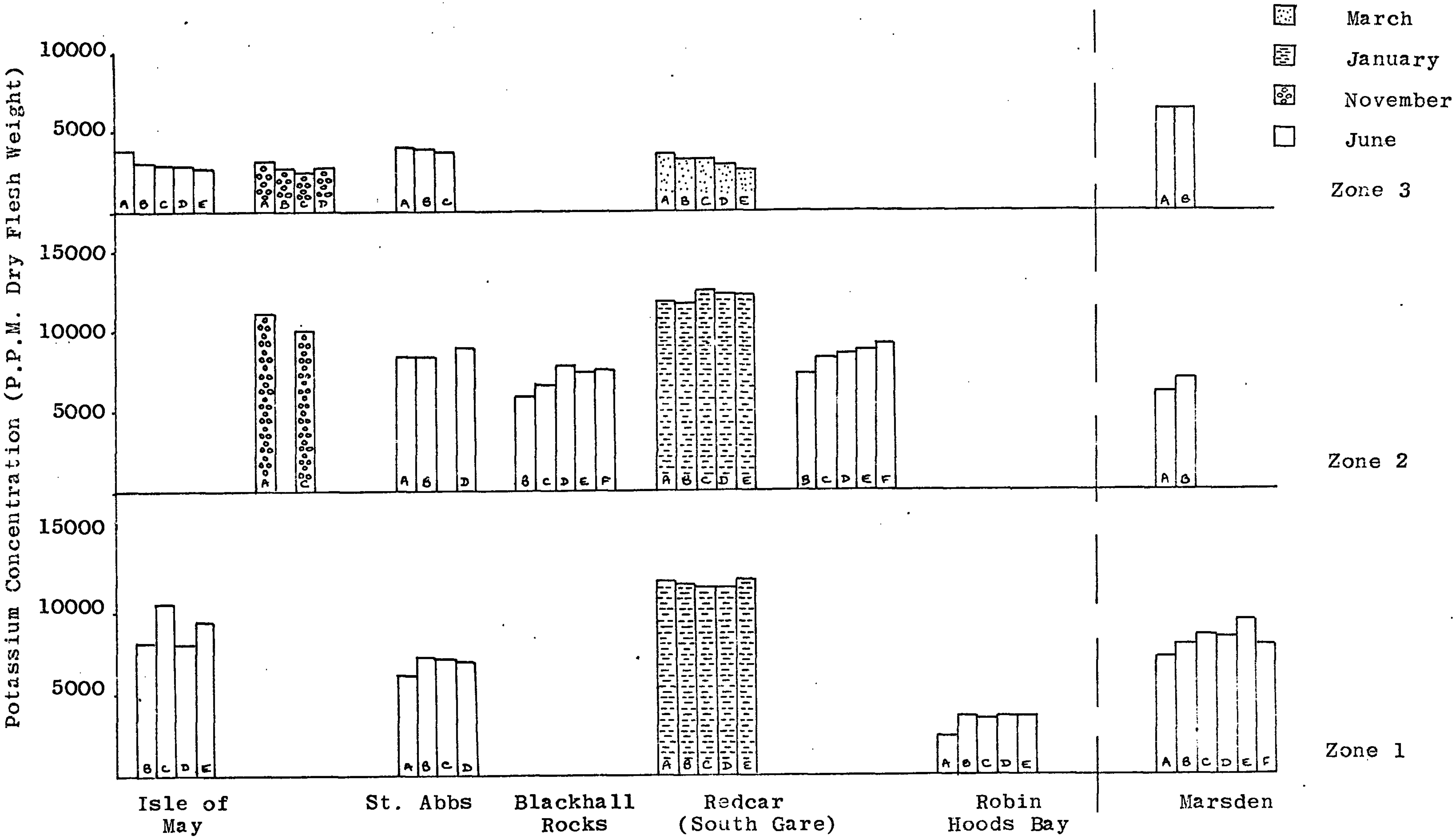


Fig. III.40: Potassium concentrations at Area C sites.

Tables III.9 - III.19: Chemical analysis data for "B" Class limpets in Areas A, B, and C

(a) Mean values and standard deviations of element concentrations

(b) Comparisons of variance of chemical analysis data

Table III.9b

Pb				Cd				Ni				Cu			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
•				•				•				•			
–	•			+	•			–	•			–	•		
+	+	•		+	+	•		–	–	•		+	+	•	
+	+	+	•	+	+	+	•	+	+	–	•	+	+	+	•

Zn				Fe				Na				K			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
•				•				•				•			
+	•			–	•			–	•			+	•		
–	+	•		+	+	•		+	+	•		+	+	•	
+	+	+	•	+	+	+	•	+	+	+	•	+	+	+	•

Mg				Ca			
1	2	3	4	1	2	3	4
•				•			
–	•			+	•		
+	–	•		+	–	•	
+	–	–	•	+	+	+	•

1 = Ardnamurchan Zone 1 November

2 = Glenmore Bay Zone 1 November

3 = Kilchoan Zone 1 November

4 = Marsden Bay Zone 1 November

\+ = Significant difference at 1%

– = No significant difference

Table III.9b: Comparisons of variance of chemical analysis data.

	Pb						Cd						Ni						Cu						Zn					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1	·						·						·						·						·					
2	+	·					+	·					−	·					+	·					+	·				
3	+	+	·				+	−	·				−	−	·				+	+	·				+	+	·			
4	+	+	+	·			+	+	+	·			−	−	−	·			+	−	+	·			+	+	+	·		
5	+	+	+	+	·		−	+	+	+	·		−	−	−	−	·		+	+	−	+	·		−	+	+	−	·	
6	+	+	+	+	+	·	+	+	+	+	−	·	−	−	−	−	−	·	+	+	+	+	+	·	+	+	−	+	+	·

	Fe						Na						K						Mg						Ca					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1	·						·						·						·						·					
2	+	·					−	·					−	·					−	·					+	·				
3	+	−	·				+	+	·				+	−	·				−	−	·				+	+	·			
4	−	+	+	·			+	+	+	·			+	+	+	·			−	−	−	·			−	+	+	·		
5	+	−	−	+	·		+	+	+	+	·		+	+	+	+	·		+	+	+	+	·		+	+	+	+	·	
6	+	+	+	+	+	·	+	+	+	+	−	·	+	+	+	+	−	·	−	−	−	−	+	·	+	−	+	+	+	·

1=Ardnamurchan Zone 3 November

2=Glenmore Bay Zone 3 November

3=Kilchoan Zone 3 November

4=Salen Zone 3 November

5=St Abbs Zone 3 November

6=Marsden Bay Zone 3 November

+ = Significant difference at 1%

− = No significant difference

Table III.10b: Comparisons of variance of chemical analysis data.

	Pb			Cd			Ni			Cu		
	1	2	3	1	2	3	1	2	3	1	2	3
1	·			·			·			·		
2	+	·		+	·		−	·		−	·	
3	+	−	·	+	+	·	−	−	·	+	+	·

	Zn			Fe			Na			K		
	1	2	3	1	2	3	1	2	3	1	2	3
1	·			·			·			·		
2	−	·		+	·		+	·		+	·	
3	+	+	·	+	+	·	+	+	·	+	+	·

	Mg			Ca		
	1	2	3	1	2	3
1	·			·		
2	+	·		+	·	
3	+	−	·	+	+	·

1 = Otterswick Zone 1 May

2 = Ronas Voe Zone 1 May

3 = Marsden Bay Zone 1 May

+ = Significant difference at 1%

− = No significant difference

Table III.11b: Comparisons of variance of chemical analysis data.

Pb	1	2	3	4	5	6
1	•					
2	+	•				
3	−	+	•			
4	−	+	−	•		
5	−	+	−	−	•	
6	+	+	+	+	+	•

Cd	1	2	3	4	5	6
1	•					
2	+	•				
3	+	+	•			
4	+	+	+	•		
5	+	+	−	+	•	
6	+	−	+	+	+	•

Ni	1	2	3	4	5	6
1	•					
2	+	•				
3	+	−	•			
4	+	−	−	•		
5	+	−	−	−	•	
6	+	−	−	−	−	•

Cu	1	2	3	4	5	6
1	•					
2	+	•				
3	−	+	•			
4	−	+	−	•		
5	−	+	−	−	•	
6	+	+	+	+	+	•

Zn	1	2	3	4	5	6
1	•					
2	−	•				
3	+	+	•			
4	+	+	+	•		
5	−	−	+	+	•	
6	+	+	+	+	+	•

Fe	1	2	3	4	5	6
1	•					
2	+	•				
3	+	−	•			
4	+	+	+	•		
5	+	+	+	+	•	
6	+	+	+	+	+	•

Na	1	2	3	4	5	6
1	•					
2	+	•				
3	+	+	•			
4	+	+	+	•		
5	+	+	+	+	•	
6	+	+	+	+	+	•

K	1	2	3	4	5	6
1	•					
2	+	•				
3	+	+	•			
4	+	−	+	•		
5	+	+	−	+	•	
6	+	+	+	+	+	•

Mg	1	2	3	4	5	6
1	•					
2	+	•				
3	+	+	•			
4	+	+	+	•		
5	+	+	+	+	•	
6	+	+	+	+	+	•

Ca	1	2	3	4	5	6
1	•					
2	+	•				
3	−	+	•			
4	+	−	+	•		
5	−	+	+	+	•	
6	+	+	+	+	+	•

1 = Haroldswick Zone 2 May

2 = Ollaberry Zone 2 May

3 = Otterswick Zone 2 May

4 = Ronas Voe Zone 2 May

5 = Whiteness Voe Zone 2 May

6 = Marsden Bay Zone 2 May

+ = Significant difference at 1%

− = No significant difference

Table III.12b: Comparisons of variance of chemical analysis data.

Table III.13b

Pb

	1	2	3	4	5
1	·				
2	+	·			
3	+	−	·		
4	+	−	+	·	
5	−	+	+	+	·

Cd

	1	2	3	4	5
1	·				
2	+	·			
3	+	+	·		
4	+	+	+	·	
5	+	+	+	−	·

Ni

	1	2	3	4	5
1	·				
2	−	·			
3	−	+	·		
4	−	+	−	·	
5	−	+	−	−	·

Cu

	1	2	3	4	5
1	·				
2	+	·			
3	+	−	·		
4	+	−	+	·	
5	+	+	+	+	·

Zn

	1	2	3	4	5
1	·				
2	+	·			
3	+	−	·		
4	+	−	−	·	
5	−	+	+	+	·

Fe

	1	2	3	4	5
1	·				
2	+	·			
3	+	+	·		
4	+	+	+	·	
5	+	+	+	+	·

Na

	1	2	3	4	5
1	·				
2	+	·			
3	+	+	·		
4	+	+	+	·	
5	+	+	+	+	·

K

	1	2	3	4	5
1	·				
2	+	·			
3	+	−	·		
4	+	+	+	·	
5	+	+	−	+	·

Mg

	1	2	3	4	5
1	·				
2	+	·			
3	+	+	·		
4	+	+	+	·	
5	+	+	+	+	·

Ca

	1	2	3	4	5
1	·				
2	−	·			
3	+	+	·		
4	+	+	+	·	
5	+	+	+	+	·

1 = Ollaberry Zone 3 May
2 = Otterswick Zone 3 May
3 = Ronas Voe Zone 3 May
4 = Whiteness Voe Zone 3 May
5 = Marsden Bay Zone 3 May

\+ = Significant difference at 1%
− = No significant difference

* Haroldswick is not included as "B" class data were not available.

Table III.13b: Comparisons of variance of chemical analysis data.

Table III.14b

	Pb		Cd		Ni		Cu		Zn	
	1	2	1	2	1	2	1	2	1	2
1	•		•		•		•		•	
2	+	•	+	•	+	•	+	•	−	•

	Fe		Na		K		Mg		Ca	
	1	2	1	2	1	2	1	2	1	2
1	•		•		•		•		•	
2	+	•	+	•	+	•	+	•	+	•

1= St Abbs Zone 2 November

2= Marsden Bay Zone 2 November

	Pb		Cd		Ni		Cu		Zn	
	1	2	1	2	1	2	1	2	1	2
1	•		•		•		•		•	
2	+	•	−	•	−	•	+	•	+	•

	Fe		Na		K		Mg		Ca	
	1	2	1	2	1	2	1	2	1	2
1	•		•		•		•		•	
2	+	•	−	•	−	•	+	•	+	•

1= St Abbs Zone 3 November

2= Marsden Bay Zone 3 November

+= Significant difference at 5%

−= No significant difference

Table III.14b: Comparisons of variance of chemical analysis data.

Table III.15b

	Pb		Cd		Ni		Cu		Zn	
	1	2	1	2	1	2	1	2	1	2
1	•		•		•		•		•	
2	+	•	+	•	−	•	+	•	+	•

	Fe		Na		K		Mg		Ca	
	1	2	1	2	1	2	1	2	1	2
1	•		•		•		•		•	
2	+	•	+	•	+	•	+	•	+	•

1 = South Gare Zone 1 January
2 = Marsden Bay Zone 1 January

	Pb		Cd		Ni		Cu		Zn	
	1	2	1	2	1	2	1	2	1	2
1	•		•		•		•		•	
2	+	•	+	•	−	•	−	•	+	•

	Fe		Na		K		Mg		Ca	
	1	2	1	2	1	2	1	2	1	2
1	•		•		•		•		•	
2	+	•	+	•	+	•	+	•	+	•

1 = South Gare Zone 2 January
2 = Marsden Bay Zone 2 January
+ = Significant difference at 5%
− = No significant difference

Table III.15b: Comparisons of variance of chemical analysis data.

	Pb		Cd		Ni		Cu		Zn	
	1	2	1	2	1	2	1	2	1	2
1	•		•		•		•		•	
2	–	•	+	•	–	•	+	•	–	•

	Fe		Na		K		Mg		Ca	
	1	2	1	2	1	2	1	2	1	2
1	•		•		•		•		•	
2	+	•	+	•	+	•	+	•	+	•

1 = South Gare Zone 3 March

2 = Marsden Bay Zone 3 March

+ = Significant difference at 1%

– = No significant difference

Table III.16b: Comparisons of variance of chemical analysis data.

Table III.17b

	Pb 1	Pb 2	Pb 3	Pb 4	Cd 1	Cd 2	Cd 3	Cd 4	Ni 1	Ni 2	Ni 3	Ni 4	Cu 1	Cu 2	Cu 3	Cu 4
1	•				•				•				•			
2	+	•			+	•			−	•			+	•		
3	−	+	•		−	+	•		−	+	•		+	+	•	
4	+	+	+	•	+	−	+	•	−	−	−	•	+	+	+	•

	Zn 1	Zn 2	Zn 3	Zn 4	Fe 1	Fe 2	Fe 3	Fe 4	Na 1	Na 2	Na 3	Na 4	K 1	K 2	K 3	K 4
1	•				•				•				•			
2	+	•			+	•			+	•			+	•		
3	−	+	•		+	+	•		+	+	•		+	+	•	
4	+	+	+	•	+	+	+	•	−	+	+	•	+	+	+	•

	Mg 1	Mg 2	Mg 3	Mg 4	Ca 1	Ca 2	Ca 3	Ca 4
1	•				•			
2	+	•			+	•		
3	+	+	•		+	+	•	
4	+	+	+	•	+	+	+	•

1 = St Abbs Zone 1 June
2 = Robin Hood's Bay Zone 1 June
3 = Isle of May Zone 1 June
4 = Marsden Bay Zone 1 June

\+ = Significant difference at 1%
− = No significant difference

Table III.17b: Comparisons of variance of chemical analysis data.

Table III.18b: Comparisons of variance of chemical analysis data.

	Pb				Cd				Ni				Cu			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	•				•				•				•			
2	+	•			−	•			−	•			+	•		
3	−	+	•		+	+	•		−	−	•		+	+	•	
4	+	+	+	•	+	−	−	•	+	+	+	•	+	+	−	•

	Zn				Fe				Na				K			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	•				•				•				•			
2	+	•			+	•			+	•			+	•		
3	+	+	•		+	+	•		+	+	•		+	+	•	
4	+	+	+	•	+	+	+	•	+	+	+	•	+	+	+	•

	Mg				Ca			
	1	2	3	4	1	2	3	4
1	•				•			
2	+	•			+	•		
3	+	+	•		+	−	•	
4	+	+	+	•	+	+	+	•

1= St Abbs Zone 2 June

2= Blackhall Rocks Zone 2 June

3= South Gare Zone 2 June

4= Marsden Bay Zone 2 June

+= Significant difference at 1%

−= No significant difference

	Pb			Cd			Ni			Cu		
	1	2	3	1	2	3	1	2	3	1	2	3
1	•			•			•			•		
2	+	•		−	•		+	•		+	•	
3	+	+	•	+	+	•	+	−	•	+	+	•

	Zn			Fe			Na			K		
	1	2	3	1	2	3	1	2	3	1	2	3
1	•			•			•			•		
2	+	•		+	•		+	•		+	•	
3	+	+	•	+	+	•	+	+	•	+	+	•

	Mg			Ca		
	1	2	3	1	2	3
1	•			•		
2	+	•		+	•	
3	+	+	•	+	+	•

1 = St Abbs Zone 3 June

2 = Isle of May Zone 3 June

3 = Marsden Bay Zone 3 June

+ = Significant difference at 1%

− = No significant difference

Table III.19b: Comparisons of variance of chemical analysis data.

III.4 DEFINITION OF THE "NORMAL" METAL CONCENTRATION

The concentrations of elements in P. vulgata flesh seem to vary widely in response to a number of factors. Some of these have been defined in this study (see Section IV) e.g. size, tidal zone, season, site bedrock and so forth. Establishing a "normal" level for an element in P. vulgata appears therefore to be a very difficult task.

Nonetheless an attempt was made to estimate "norms" for the polluting elements, and in such a way that these "norms" might be as representative as possible.

Three sites were selected, one from each of Areas A, B and C, and thus well spread out geographically. These sites, namely, Ardnamurchan Point (Area A) Otterswick Yell (Area B), and St. Abb's (Area C) suffer a similar degree of exposure and are well removed from sources of industrial effluents. The study sites are consisted of bedrock of differing types, and collections were made during different months, hence results cover as long a period as possible.

Because of the great variation in metal concentrations between the sites, the final mean value for each element "norm" was derived using data from all the size classes and Zones available. The values calculated are presented in Table III.20. It is hoped that these figures can give some representation of a "normal" metal concentration since calculations were based on the widest possible range of data for each site.

Concentrations higher than those presented in Table III.20, might therefore be considered enriched, unless they are explicable in terms of the local geology.

	Pb	Cd	Ni	Cu	Zn	Fe	Month	Type of substrate
ARDNAMURCHAN	1.56	18.22	4.20	4.49	114.6	988	NOV	Gabbrc (Igneous)
OTTERSWICK	6.54	10.06	1.62	4.67	123.7	1920	MAY	Gneiss (Metamorphic)
ST. ABB'S	4.82	5.40	3.24	9.35	109.9	1099	JUN	Andesite/Basalt (Igneous)
MEAN VALUES: "NORMS"	4.30	11.23	3.02	6.17	116.0	1335		

Table III.20

"NORM" VALUES OF CERTAIN ELEMENTS FOR P. VULGATA

SECTION IV

GENERAL DISCUSSION AND CONCLUSIONS

From the intra site and inter site studies discussed in Section II and Section III, the following points can be noted:

(1) The concentration of certain elements found in limpet tissue is dependant on the size of the individual, with higher concentrations of Pb, Cu, Fe, Ni, Mg and Ca tending to be found in smaller individuals. A relationship between size and element content has also been established by other workers (Bellamy et al. 1972; Schulz-Baldes 1973; Leatherland and Burton 1974; Nickless et al. 1972; Peden et al. 1973; Cross et al. 1973; Boyden 1974; Romeril 1974; Young 1975).

Cadmium, however, is a definite exception, in that concentrations are higher in the larger individuals. This pattern was seen in most of the 55 sub-populations studied and has also been reported by other workers also studying P.vulgata (Nickless et al. op.cit. Peden et al. op cit: Boyden op.cit.).

This relationship can be explained because cadmium is a cummulative element (Pringle et al. 1968) and once in, remains fixed within the tissues of the organism throughout its life.

The negative correlation between cadmium content in "polluted" and "unpolluted" sites could then be explained as follows: if the increased flesh weight in the sewage-enriched populations is a real increase in growth rate, then it is possible that those limpets living in enriched waters are not subjected to cadmium uptake for as long as similar sized individuals from unpolluted sites. A further investigation though, is suggested to back up this hypothesis.

The smaller individuals appear to be more susceptible to the uptake of Pb, Cu, Fe, Ni, Mg, and Ca, while the larger individuals indicate that they can exercise some measure of control of uptake, and or storage.

The concentrations of Zn, K, Na, did not reveal any pattern depending on the size.

(2) From the statistical analysis of the Marsden Bay biogeochemical results. the calculated mean values over the nine study months (see Section II) show that individuals from Zones 2 and 3 concentrate the highest amount of Cu, Fe, Ca, Pb, Zn, Na, Mg, while Ni, Cd, and K do not show any pattern between the Zones. It is of interest that no element shows significantly higher concentrations in samples collected from Zone 1.

The zonal variation described above, which is also shown by the flesh weight/shell weight relationship, has been recognized by previous workers as well. (Butterworth et al. 1972; Nickless et al. 1972; Peden et al. 1973). This variation could be due to the different environmental factors at different levels on the shore.

It is not easy to explain the higher concentrations of elements in limpets from higher levels on the shore. However this could be explained as follows: the limpets living on the lower shore will be submerged for much longer periods of time than those on the upper shore. During submergence, the current ventilating the gills will allow continual exchange of elements with the sea water, thus possibly affecting a more adequate control of the ionic balance of the tissues. To this may be added the fact that minerals couldbe preferentially absorbed from the water retained within the body of the organism during periods of "clamp" down.

(3) A monthly variation for all elements was shown in Section II (Fig. II·13 to II·24). This phenomenon was to be expected for the following reasons. a. concentrations of elements in sea water have been shown to vary seasonally (Mullin & Riley 1956; Abdullah et al. 1972; Preston et al. 1972; Preston 1973; Abdullah and Royle 1974). These variations could be due to the movement of currents, fluctuating volumes

of run-off, or to irregular discharges from the land.

b. elements show a tendency to concentrate selectively within certain tissues and several metallic ions are known to be directly involved with fundamental functions of the organism. Mullin & Riley (op.cit.) for instance, have reported highest concentrations of Cd in digestive glands and renal organs of molluscs. This agrees with similar findings by Topping (1972c) who was working with scallops, lobsters and crabs. Vinogradov (1953) has reported that iron is particularly concentrated in the digestive glands and hepatopancreas of P.vulgata Betzer & Pilson (1974) have shown highest concentrations of Cu in the digestive glands of Busycon canaliculatum, while Pringle et al. (1968) found the highest Pb level in gonads and digestive glands and the lowest in the muscle, of various molluscs. Therefore, as the proportions of tissues such as gonad, mantle, etc., change periodically, this could account for variations in the concentrations of certain elements with time.

c. Seasonal climatic differences affect the physiological processes in the organism which, in turn, do exert influence on the accumulation, ingestion, or excretion of the elements (Herbert & Shurben 1963; Pringle et al. 1968; Betzer & Pilson 1974).

It is therefore unlikely that element content should not vary seasonally, when there are so many seasonally fluctuating factors affecting the organism, and the uptake of elements.

Seasonal fluctuations have also been reported in other organisms, Betzer & Pilson (op.cit.) showed a fluctuating Cu content in Busycon, Rocca (1969) also reported a fluctuating Cu content in Octopus vulgaris, and Pilson (1965) in blood of Haliotis spp. Pringle et al. (op.cit.) have also reported seasonal variations for Zn, Cn, Mn, Fe and Cd in Crassostrea gigas. tissues.

During the course of the work 93 Nucella lapillus specimens from Marsden Bay were analysed, to see if an other eulittoral organism known to feed on barnacles and Mytilus (Moore 1936; Berry & Crothers 1974) and occasionally on limpets (Crothers 1971), showed any seasonal variation in element content.

Analyses were carried out for January (34 specimens) and April (59 specimens), details on this investigation are in Appendix - 12.

The results show a very high Cu, variation, a large Fe, Zn, variation, (see table below) whilst the other elements are more or less stable.

	Cu ppm	Fe ppm	Zn ppm
January	367	445	915
April	85	260	660

Therefore it seems reasonable to conclude that seasonal variations is a feature common to a wide range of eulittoral organisms. This reinforces the opinion expressed in Section II about the possibility of misleading comparative studies.

(4) Most elements show a higher accumulation in limpets collected from sheltered sites, but others show higher accumulation in limpets from exposed sites. The influence of exposure on element concentration is, therefore, not easy to explain and it is possible that inter-element relationships which were beyond the scope of this study, are involved. The physiology and bio-chemistry of the organism could be important as synergetic and antagonistic relations between the elements may occur (Pringle et al. 1968; Navrot et al 1975; Ireland 1975)

From the results of the present study it may be inferred that low salinity facilitates high Cd uptake and laboratory test for other marine organism have shown that many factors can influence the uptake of an element, which can subsequently influence the uptake of another.

(5) Pb and Ni show higher concentrations in two sites naturally enriched with these two elements. Salen, which is near to an area with a previous history of lead mining., and Haroldswick, an area of serpentine bedrock. This proves that P. vulgata is "sampling", either through the food chain, and/or directly via osmotic flow, the total geochemistry of the environment in which it lives.

P. vulgata therefore seems to be a sensitive indicator of the concentrations of elements present in its environment, which is an advantage when using this organism in heavy metal pollution studies. But, without a thorough geological knowledge of the site under study, incorrect conclusions could be drawn with regard to the kind of pollution i.e. man-made or natural. Topping (1972 a, c) also discusses this problem in relation to his work in Scottish waters and argues that the high values of Cu and Cd that he found in zooplankton and shellfish could possibly be associated with natural rather than man made induced effects.

Bellamy et al. (1972), Sheppard and Bellamy (1974) emphasise this point in the interpretation of data from the east coast of Britain and the west coast of Italy. The data presented here reinforce their cautionary approach.

(6) The "polluting" elements generally show lower concentrations in "unpolluted" sites and Areas A and B appear to be "unpolluted" in comparison with Marsden Bay.

The "gradient" of pollution reflected in the limpet tissue, for the north-east coast of Britain, shows that St. Abb's is the least polluted site, which is in accordance with earlier literature (Bellamy 1972). Following St. Abb's is the Isle of May, and for these sites the monitoring of P.vulgata concurs with the a priori known intensity of pollution. South Gare and Marsden Bay are higher on the "gradient" scale, while Robin Hood's Bay and Blackhall Rocks appear to be the most polluted sites along the coast. Namely, the highest values of Cu, and Zn were found in limpets from Blackhall Rocks and for Pb and Fe in Robin Hood's Bay.

High values for Cd, Pb and Zn in Blackhall Rocks could be expected as this is the nearest sampled site to Seaham which according to Preston et al. (1972) and Preston (1973) is the most polluted site in respect of these elements. On the other hand, the results from Robin Hood's Bay were somewhat unexpected, especially in terms of Pb, Cu and Zn as the main sources of industrial wastes and sewage are far removed from this site (Jones 1970; Bellamy et al. 1972). But it must be noted that this site is enriched with suspended material derived from boulder clay (Jones op. cit; Moore 1973) and Moore (1974) in his criticism of Jones stated that differences were not apparent between places regarded by Jones to be "un-polluted" and "polluted". Moore (op. cit.) reported that the suspended material created a similar condition in both sites.

The high levels of Fe at Robin Hood's Bay can be readily explained by the presence of the Skinningrove Iron Works, 6 km upcurrent and iron colloids derived from clay particles as reported by Sverdrup et al. (1942).

The high levels of Cu, Pb, Zn, can be possibly explained in terms of natural and/or man made factors, as follows:

1. The bedrock of this site consists of shale, which is known (Bowen 1966) to contain high levels of Pb, Cu, Zn (see Table IV.1).

Table IV.1

CONCENTRATIONS OF SOME ELEMENTS IN VARIOUS TYPES OF BEDROCK

	Cu_{ppm}	Fe_{ppm}	Pb_{ppm}	Zn_{ppm}
igneous rocks	55	56,300	12.5	70
shales	45	47,200	20	95
sandstones	5	9,800	7	16
limestones	4	3,800	9	20

2. Man made pollution effluents and/or natural outflow from the Tees are carried southwards by the residual currents and the tidal movement (Watson & Watson 1968; Moore 1973 a)

This "gradient" is derived from only one sampling (in June) and the comparative results must therefore be considered with caution. However, Starkie (1970) has also found high levels of certain elements at this site and therefore further work on the possible sources of enrichment by heavy metals at this site is required.

(7) P. vulgata can only be considered a valid monitor of heavy metal pollution if the following points are observed.

(a) Analysis must be based on a large number of specimens in an attempt to smooth out individual variations so that results are statistically valid. It is well known that molluscs show a large individual variation in heavy metal concentrations (e.g. Segar et al 1971; Topping 1972c; Leatherland & Burton 1974; Betzer & Pilson 1974)

(b) Variations found in the size class, zone, and season, require that careful sampling techniques be made in order to validate comparative studies. Nickless et al. (1972) examined P. vulgata and Fucus vesiculosus and stated that certain sampling techniques could be misleading especially when based on numerical data. This has also been pointed out by other workers (Butterworth et al. 1972; Lewis 1970, 1972; Betzer & Pilson op. cit Boyden 1974; Moore 1974).

(c) The organism's ability to "sample" the environmental geochemistry, could lead to wrong conclusions if the geochemistry of the area is not well known.

(d) Comparative studies made between areas with different environmental conditions, may also be misleading as salinity, temperature , dissolved oxygen, pH, and exposure may affect the uptake of metal ions.

(e) The whole problem of establishing a good indicator of metal pollution seems to be quite complicated as apart from the inter and intra species variation on selective uptake for certain ions, the metals themselves create a complication. Antagonistic and synergetic interactions have been reported, so that, the presence of one metal ion could prevent the uptake of another metal ion, or alternatively, one metal ion can attract another. This could mislead in the interpretation of the qualitative and quantitative description of pollution in a given area.

On the other hand, the contamination of an organism is not only due to the contamination of the sea water but some elements enter the organism through the food-chain (Hoss 1964; Preston & Jefferies 1969; Bryan 1964; 1966; Bryan & Ward 1965). Therefore the availability of precontaminated food must also influence the metal content of the organism under study.

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APPENDIX 1

SOME INFORMATION ABOUT PATELLA VULGATA BIOLOGY & ECOLOGY

1. CLASSIFICATION

Phylum	:	Molluscs
Subclass	:	Prosobranchia
Order	:	Archaeogastropoda or Diotocardia
Superfamily	:	Patellacea (Docoglossa)
Family	:	Patellidae
Genus	:	Patella
Species	:	P. vulgata L., P. intermedia (Jeffreys) and P. aspera (Lamarck)

2. DESCRIPTION

The shell of P. vulgata is conical, solid, oval or rounded, with ribs radiating from the beak. As the animal gets older the ribs are worn and the shell becomes smooth.

The inside of the shell is variable in colour in the different species, and this difference is one among those used to distinguish the three species, from each other. (Barrett and Yonge, 1958; Fretter and Graham 1962).

When detached from the rock the general appearance from beneath is: in the centre there is the broad muscular "foot" by which adhesion to the rock is effected; in front of it, the distinct head with mouth paired tentacles and eyes at the base. Around the whole there is the fringed mantle and between the mantle and the foot, is a frill of pallial gills. The animal has a reduced number of strong rasping teeth, a very long tongue (radula) and its stomach is a small and featureless sac forming nearly a bend in the gut where the paired digestive diverticula opens. The intestine is long and tightly coiled, storing faeces between tides. The digestive gland produces enzymes for splitting cellulose-like structures. (Morton, 1958; Morton and Yonge 1964; Fretter and Graham op. cit.).

3. REPRODUCTION

There is a single gonad which opens directly to the kidney. The genital products are discharged far back in the mantle cavity. Patella sheds its eggs singly into the plankton; there is no protective covering on these only a thin membrane and an albumen layer which is soon lost. Larval life in the plankton lasts 10 days. (Morton 1958)

Harmaphrodism has been quoted as an occuring phenomenon in Patella's life. (Orton 1928 a, Orton et al 1956; Dodd, 1956 a,b, Blackmore 1969; Das and Seshappa 1948, Lewis and Bowman 1975).

The breeding period is the winter and maximum breeding activity seems to happen from October - December. (Russell 1909, Orton 1929, Fisher-Piette 1948, Orton et al. op cit., Fretter & Graham 1962, Blackmore op. cit) P. vulgata like other molluscs, spawns in the winter as a reaction to changes in temperature; apart from the temperature, other factors play a role in the discharge of the gametes e.g. salinity, food changes, wave action or mechanical shock (Fretter & Graham op. cit, Orton et al. op cit.)

Artificial fertilization has been effected in April by Dodd (1957) and according to Lewis & Bowman (1975) "one must agree therefore with Orton et al. that spawning could extend over six months but whether or not spawning and fertilization do occur naturally in the spring and the contribution, if any, this would make to the total reproduction capacity remain unknown".

4. FOOD

When P. vulgata feeds it moves around its home rasping with the radula anything which it happens to meet. So there is a variation in diet. Graham (1931) stated that P. vulgata eats mainly diatoms and other small algae while David & Fleure (1903) found that it also eats larger Algae such as Corallina and Laminaria. Moore (1938) said that P. vulgata also eats green Algae. Fisher-Piette (1948) gives evidence that it can also eat the larger brown Algae. Jones (1948) agrees with the observations of Fisher-Piette adding that Fucus and Ascophyllum near limpets, seem to have rasped at the base. Barry (quoted by Jonos 1948) found that limpets have enzymes capable to digest lamiarin and fucoidin. Limpets have been shown to be of particular importance to the ecological balance of the rocky shore, especially in the balance between algal and animal abundance. (Southward 1956, 1964; Crapp 1971)

Barry and Munday (1959) showed that the glycogen content of the digestive gland of P. vulgata decreases during the winter a sign of decreased feeding activity.

5. HABITAT AND HABITS

P. vulgata is universally common on all rocky shores (Barrett & Yonge 1958; Fretter & Graham 1964). It is the commonest species of Patella genus and may be found on both rough and smooth rock as well as on pebbles, which are not subjected to too much movement and it is frequent on all angles of slope. It occurs in conditions ranging from considerable exposure to sheltered places and extends from high on the beach to MLWS where the population density falls rapidly.

According to the Lewis (1964) zonation of the coasts P. vulgata occurs in the eulittoral zone from the upper limit of the Balanus zone, to the upper limit of the laminarian zone.

The upper limits of the distribution of P. vulgata though, vary depending on the exposure, illumination, and algal food (Evans 1947; Das & Seshappa 1948; Lewis 1954, 1964)

P. vulgata, invades estuaries where there is sufficient rock or stone, and can endure a low level of salinity (Fisher - Piette 1931, 1948) and as Step (1945) reported the organism has learned to endure fresh water by its exposure to rains. Experiments on the response of this organism to waters of different salinity were carried out by Arnord 1957).

It is well known that P. vulgata after a feeding sortie at night or during the high tide, returns with great precision to its permanent resting site (Morton 1958; Step 1945, Fretter & Graham 1964)

It has long been noticed that the limpet sinks pits, corresponding exactly to the margin of its shell, deep or shallow, depending on the softness or hardness of the rock, and it is almost impossible a similar spot to be found in the area. This led some of the earlier investigators to believe that P. vulgata never wandered from that particular spot although Aristotle 2,000 years ago had recorded the opposite. Russell (1907) recorded that individuals above 20 mm in length did not move from their "home", when the tide was low, but the smaller ones wandered at any time. Orton (1929) stated that in an environment which is not exposed to sunlight limpets of any size may move away from their spots either at low or high tide. Loppens (1922) (quoted by Orton) reported that sometimes the animal does not return to its home but Orton (op. cit.) argued that a change of "home" happens only where the substrate is smooth, wet rock and that it rarely happens on uneven surfaces. This opinion is in accordance with Jones (1948) who observed movement of several yards for marked individuals on wet and smooth rock and stated that for uneven surfaces among thick Balanus movement does not occur. (See also Lewis & Bowman 1975). However, it is generally accepted that medium and large limpets do return to their home (Fretter and Graham 1962).

The movement of limpets depends on: their size, the conditions of the sea (rough, calm) the rock type (the nature of its surface and humidity) and the insolation.

In particular situations the seasonal variation of insolation causes a migration towards the low tide zone in spring and summer and a return upward movement in autumn and winter, though the upward movement is not confined to individuals which originally occupied the high levels (Lewis 1954).

The conical shape of Patella shell serves to resist wave attack, but the animal itself also strongly resists any effort to remove it from its spot. It can for example, resist dislodgment by a force of 15 kilograms. (Pelseneer 1935)

6. DIFFERENCES IN DIFFERENT ZONATION

I. Density and size

Most authors agree that the density of the Patella population is highest on rocks with barnacles and lowest on bare rock or under Fucoids. Fisher-Piette (1948) stated that the density is low on bare exposed rocks, becoming lower under Fucoids but highest near the Fucoids Jones (1946, 1948) also stated that he found the highest density of Patella population on rocks with barnacles and lowest on bare rock. Lewis and Bowman (1975) in their work at Robin Hood's Bay found that the density of the population is higher where Balanus occurs than where there is Mytilus edulis or bare rock.

Canon Norman (quoted by Step 1945) pointed out years ago that "the nearer high-water mark the shell is taken, the higher-spired, more strongly ribbed and smaller it will be" and that "the lower down it lives the flatter, less ribbed and larger it becomes". Orton (1933) also found the largest individuals at the low water mark at Looe Island Nemburry Bay and Menstone.

According to Fisher-Piette (1939, 1948) the size of the individuals is larger under Fucoides and becomes smaller among barnacles. Jones (1948) at Port Mary (Isle of Man) found that there was a difference in the length of P. vulgata shell being larger near Fucus sp. in comparison to that of Balanus zone but he found the biggest specimens on bare rock. Das and Seshappa (1948) in their study on the Northumberland coast, reported that the population density decreases slowly from LWNT to HWST and that the larger limpets are found at higher levels, although they are covered by the tide for a shorter time and their feeding time is less. Blackmore (1969) also detected the largest specimens on the upper shore at Robin Hood's Bay south of Mill Beck (sheltered area). Lewis and Bowman (1975) although emphasizing the high variation in Patella population characters in a limited geographical area, found in most cases an increase in the maximum length at low tide level.

II. Height of the shell

Apart from the differentiation of shell length, shell height also varies along the beach.

Russell (1907) noticed that limpets at high level mark, at the adult stage, have taller shells than those near low water level or in rock pools. Orton(1929; 1933) has correlated these differences with degrees of exposure to drying. He explained this difference by the necessity of the limpet to protect itself from dessication by remaining closely attached to the substratum. While remaining in this position, he assumes that the muscles of the foot are strongly contracted, with the result that the mantle border is drawn in to form a smaller opening. Moore(1934) reinforced this aspect examining the shelfing of the shell when it was moved from the high tide to the low tide mark or the opposite.

III. Behaviour

Davies (1966, 1967) describes how high level P. vulgata are able to acclimate and have a lower respiratory rate during summer compared with low level specimens.

7. SHELL FORMATION

Shell is a complex system of organic matter and lime salt and is crystalline substance separated from the "mother fluid" prepared through the mantle epithalium (Wada 1961).

The shell consists of three layers, an outer periostracum, an inner hypostracum (nacreous layer) and a thick, intermediate ostracum; A modification of the hypostracum fills the top of the shell.

This modification consists of calcite and serves as an added protection against insolation in the tall-shelled animals. (Davies and Fleure 1903; Moore 1934).

A slightly different presentation of these layers is adopted by Wada (1961); in the order from external to internal side of the shell there is the periostracum the prismatic layers and the nacreous layers. The outer and inner nacreous layers are separting by the hypostracum.

According to Bøggild (1930) Lutts et al. (1960), Wada (1961), Wilbur and Yonge (1964) the periostracum is a protein (named conchyolin), the prismatic layers consist of calcite, the nacreous layers consist of conchiolin membrane and aragonite crystals, while the hypostracum is aragonite.

The shell-forming tissue is the mantle and the three layers are secreted by its epithelium through the "mother fluid". The series of shell mineralization may be described as follows:

(1) Formation of organic matrix as the basis of shell material

(2) Fixation of calcium on this organic matrix

(3) Deposition of calcium carbonate crystal.

A number of enzymes participate to the whole procedure of shell formation (Robertson 1941) as for example does carbonic anhydrase (Kawai 1954; Wilbur and Jodrey 1955).

Aragonite is optically biaxial negative in the orthorhombic system. Calcite belongs to the hexagonal system; it is a stable form of $CaCO_3$ and shows optically uniaxial negative.

(Magnesite $MgCO_3$, Siderite $FeCO_3$, Rhodochrosite $MnCO_3$ etc. belong to the calcite group. Bromalite (Ca, Ba) CO_3, Strontianite $SeCO_3$, Cerrusite $PbCO_3$, belong to aragonite group).

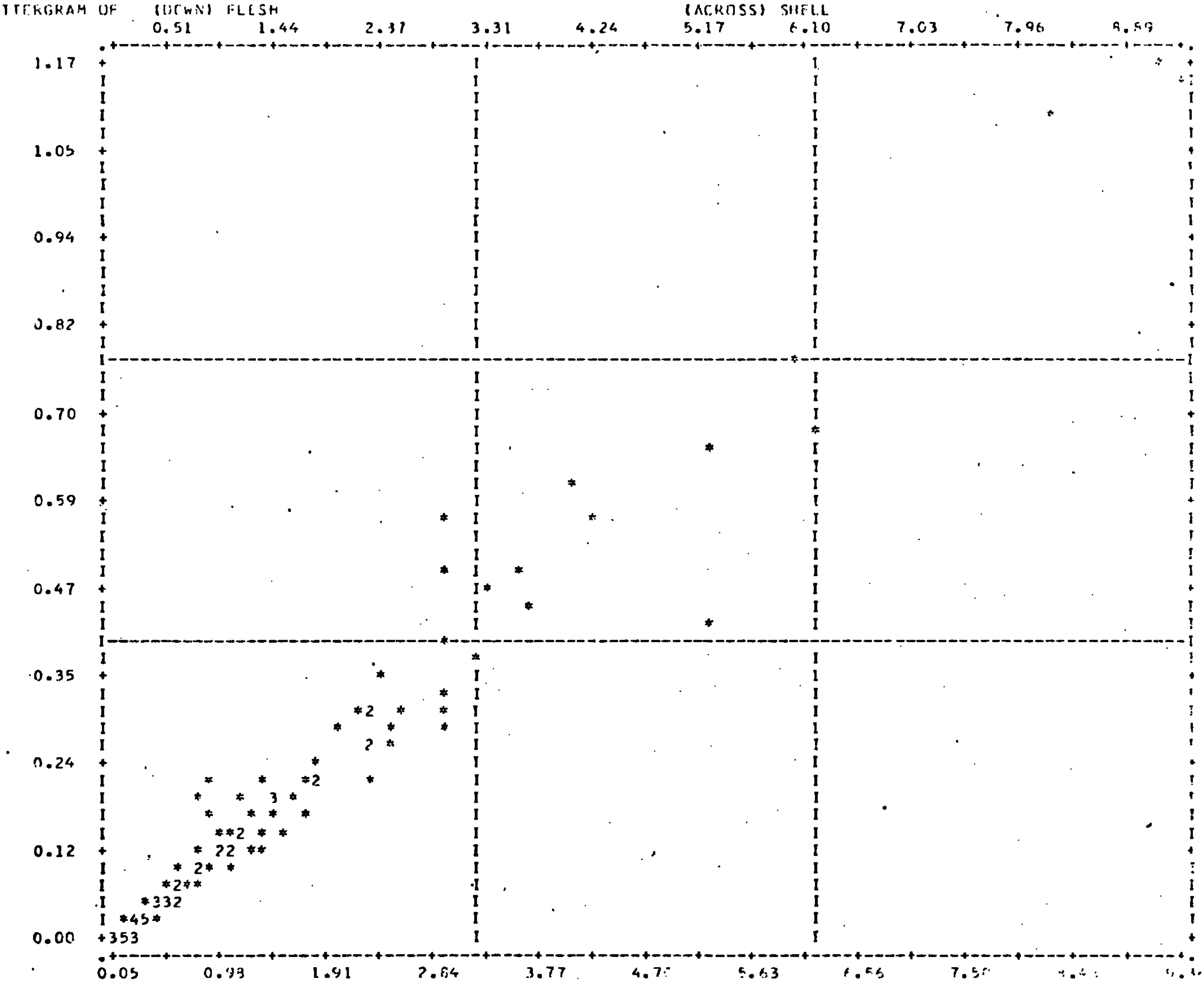
Aragonite in molluscan shells in general, is considerably different from that of inorganic occurence because it includes organic substances which the "mother fluid" prepared through a complex beochemical reaction. Excess of HCO_3 and HCO favours the formation of aragonite. (Wada 1961).

APPENDIX 2

Computer Scattergrams of flesh weight/shell weight relationship for sub-populations collected from Zones 1, 2 and 3 at Marsden Bay, throughout the study period: October 1974 to June 1975.

MARSDEN 1 OCTOBER

FILE NONAME (CREATION DATE = 01/24/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



MARSDEN 1 OCTOBER 01/24/75 PAGE 3

STATISTICS..

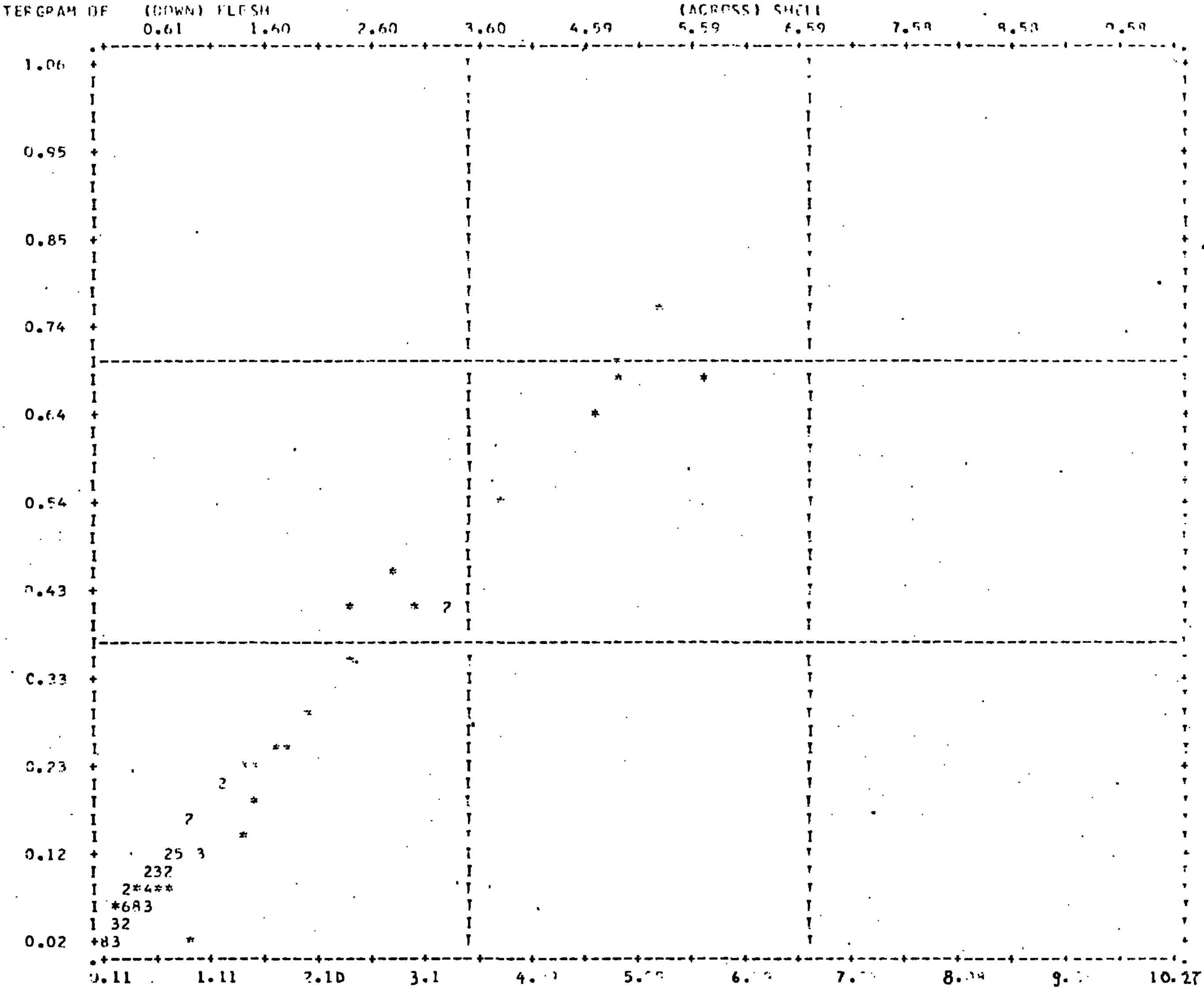
CORRELATION (R)-	0.98108	R SQUARED -	0.96252	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.04592	INTERCEPT (A) -	0.01162	SLOPE (B) -	0.12939

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.00571 ON THE LEFT MARGIN
A VALUE OF 9.42420 ON THE TOP MARGIN

PLOTTED VALUES -	100	EXCLUDED VALUES-	0	MISSING VALUES -	0

MARSDEN 2 OCTOBER

FILE NONAME (CREATION DATE = 09/19/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



MARSDEN 2 OCTOBER 09/19/75 PAGE 3

STATISTICS..

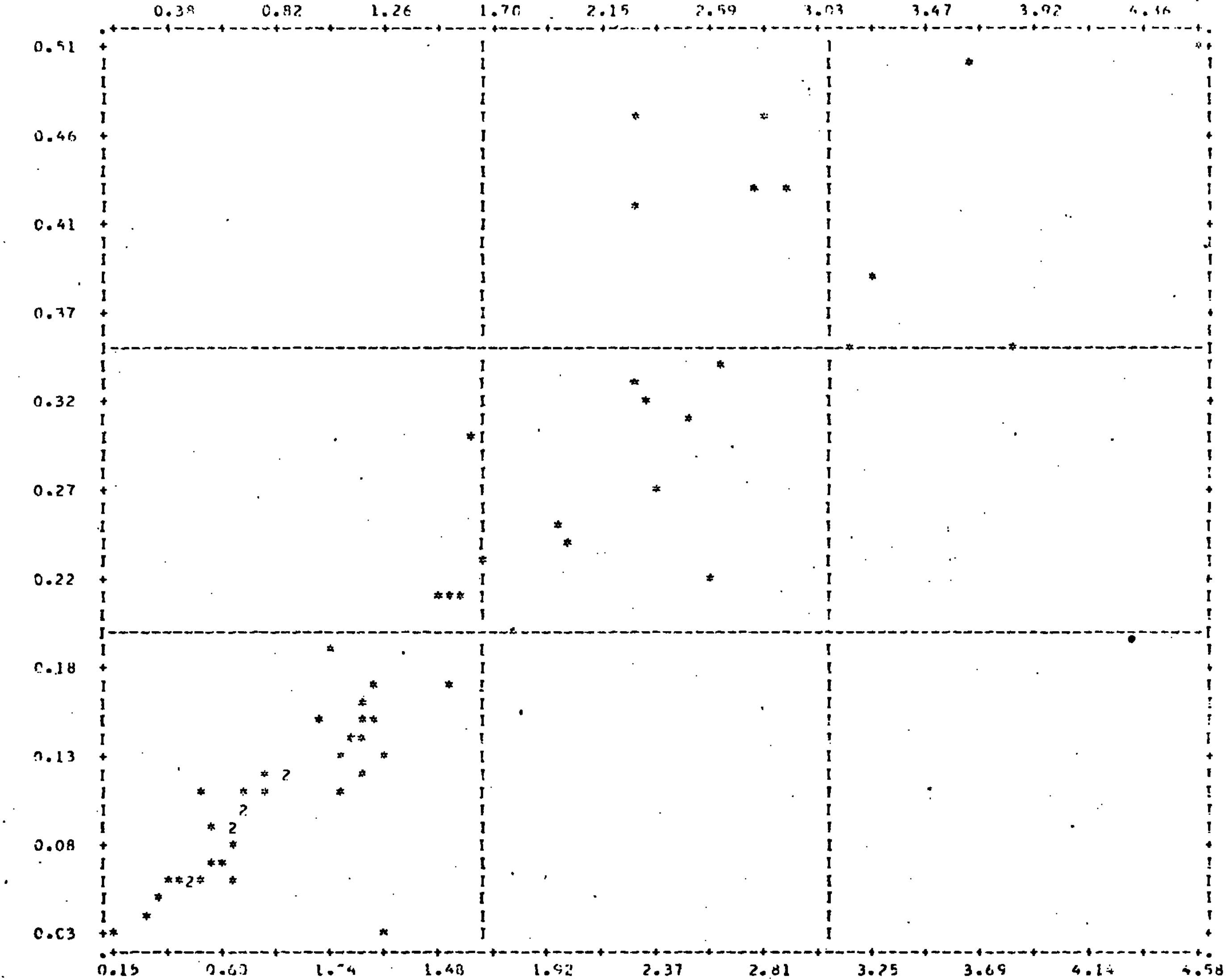
CORRELATION (R)-	0.98132	R SQUARED -	0.96300	SIGNIFICANCE -	0.0000
STD ERR OF EST -	0.03883	INTERCEPT (A) -	0.03142	SLOPE (B) -	0.1220

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.03256 ON THE LEFT MARGIN
A VALUE OF 8.56575 ON THE TOP MARGIN

PLOTTED VALUES -	85	EXCLUDED VALUES-	0	MISSING VALUES -	0

MARSDEN 1 NOVEMBER

FILE NONAME (CREATION DATE = 01/29/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



MARSDEN 1 NOVEMBER

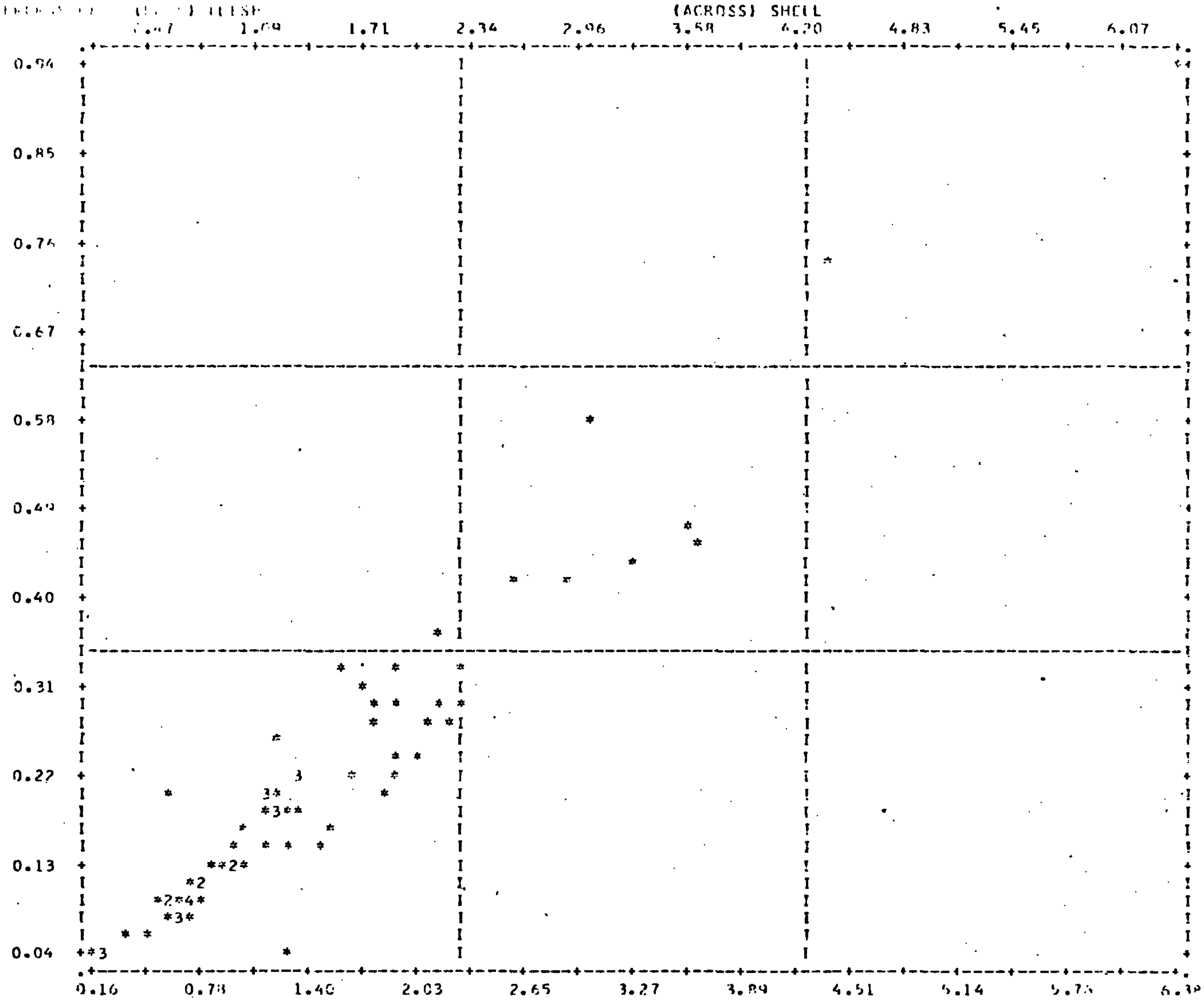
STATISTICS..

CORRELATION (R)-	0.92427	R SQUARED -	0.85427	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.05094	INTERCEPT (A) -	0.01886	SLOPE (B) -	0.12216

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.03239 ON THE LEFT MARGIN
A VALUE OF 4.09853 ON THE TOP MARGIN

PLOTTED VALUES -	61	EXCLUDED VALUES-	0	MISSING VALUES -	0

MARSDEN 2 NOVEMBER



MARSDEN 2 NOVEMBER 02/01/75 PAGE 3

STATISTICS..

CORRELATION (R)-	0.96071	R SQUARED -	0.92296	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.04347	INTERCEPT (A) -	0.01090	SLOPE (B) -	0.14583

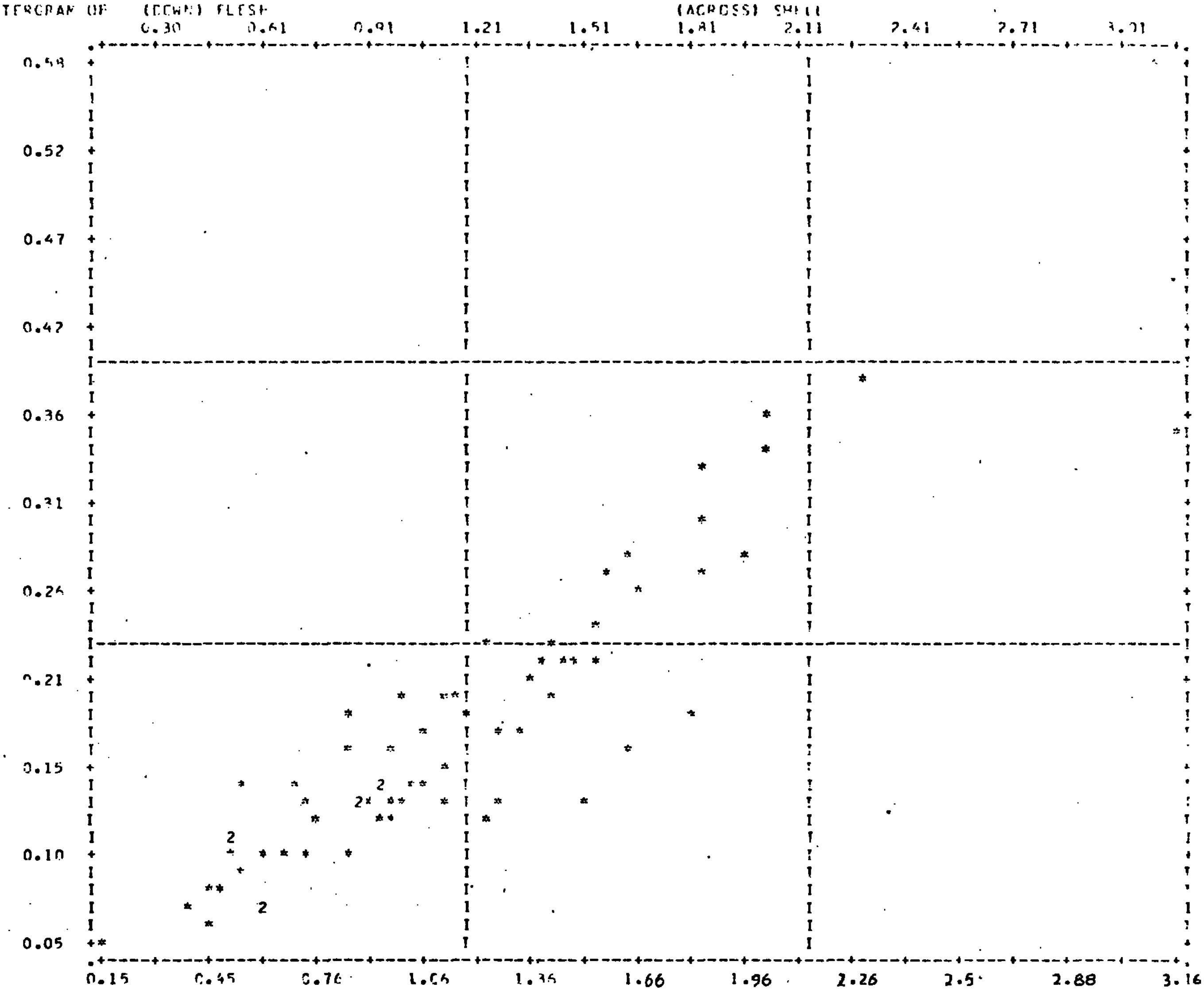
THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.15451 ON THE BOTTOM MARGIN
A VALUE OF 0.95052 ON THE RIGHT MARGIN

PLOTTED VALUES -	75	EXCLUDED VALUES-	0	MISSING VALUES -	0

MARSDEN 3 NOVEMBE   09/15/75   PAGE 2

FILE NONAME (CREATION DATE = 09/15/75)

SCATTERGRAM OF (DOWN) FLESH   (ACROSS) SHELL



MARSDEN 3 NOVEMBER   09/15/75   PAGE 3

STATISTICS..

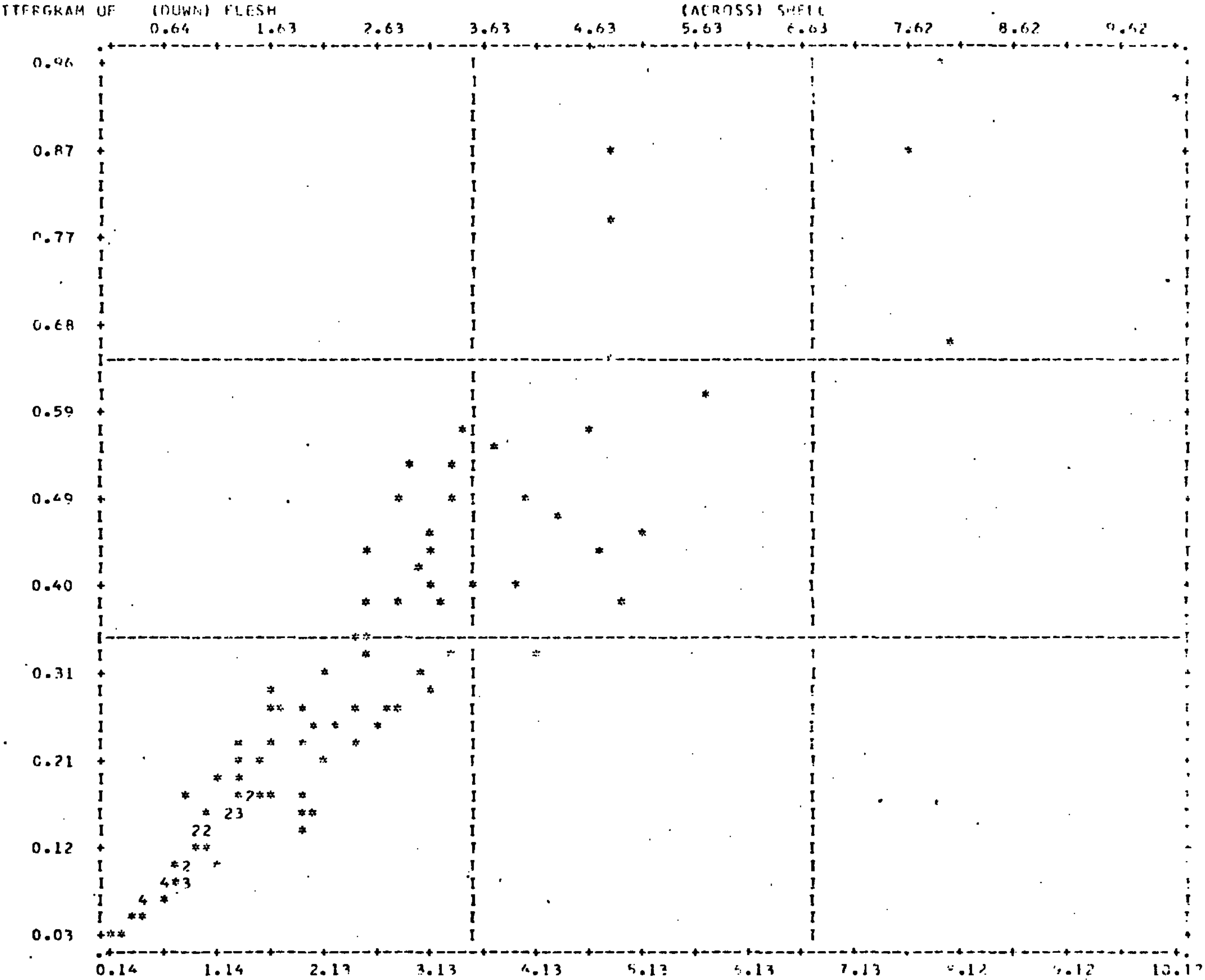
CORRELATION (R)-	0.90836	R SQUARED -	0.82511	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.03886	INTERCEPT (A) -	0.01476	SLOPE (B) -	0.14406

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.14314 ON THE BOTTOM MARGIN
A VALUE OF 0.47445 ON THE RIGHT MARGIN

PLOTTED VALUES - 89   EXCLUDED VALUES- 0

MARSDEN I DECEMBER

FILE NONAME (CREATION DATE = 01/29/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



MARSDEN I DECEMBER 01/29/75 PAGE 5

STATISTICS..

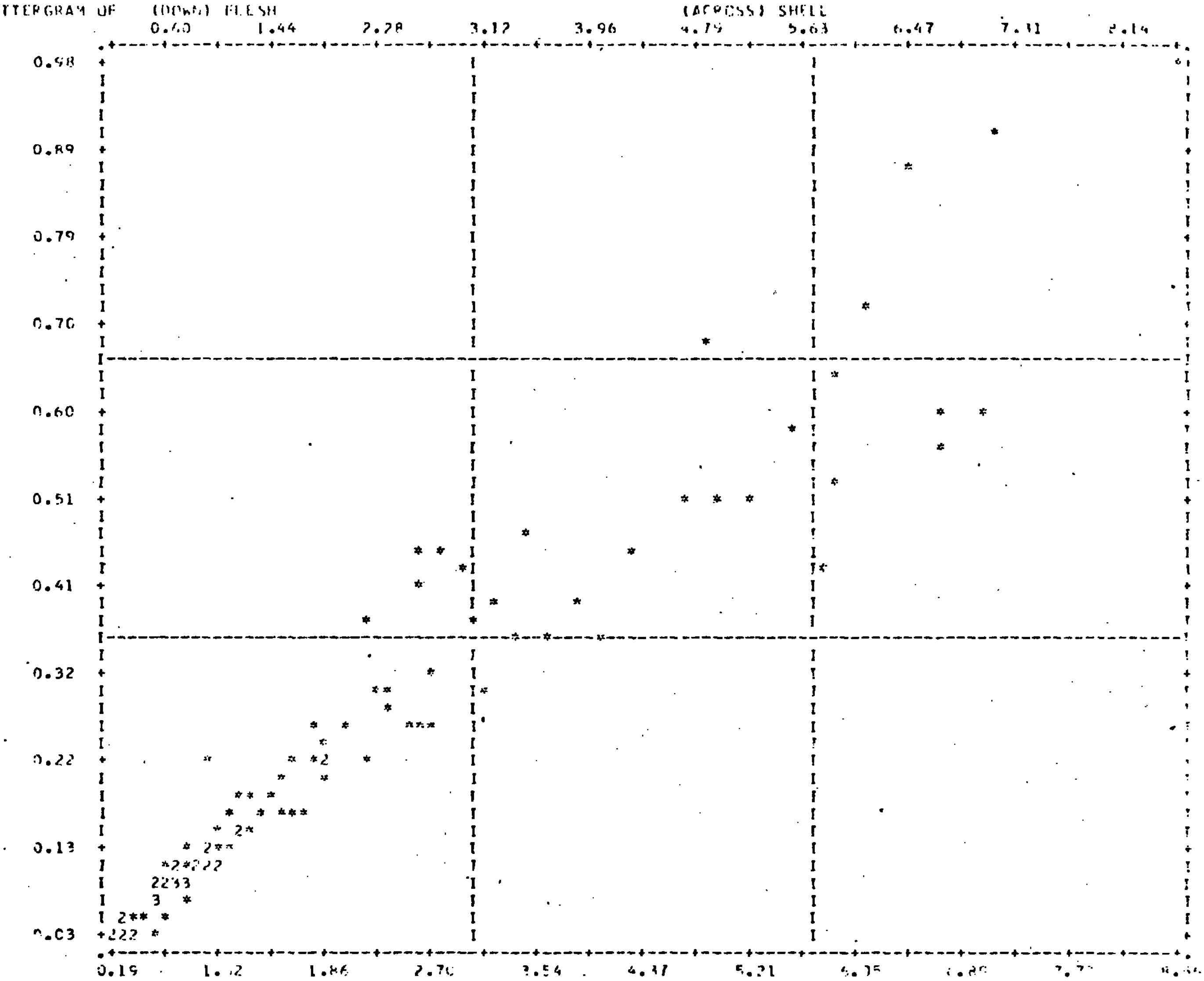
CORRELATION (R)-	0.92235	R SQUARED -	0.85072	SIGNIFICANCE -	0.0000
STD ERR OF EST -	0.08093	INTERCEPT (A) -	0.04768	SLOPE (B) -	0.10537

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.05160 ON THE LEFT MARGIN
A VALUE OF 8.63535 ON THE TOP MARGIN

PLOTTED VALUES - 102 EXCLUDED VALUES- 0 MISSING VALUES - 0

MARSDEN 1 JANUARY

FILE NONAME (CREATION DATE = 01/30/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



MARSDEN 1 JANUARY 01/30/75 PAGE 3

STATISTICS..

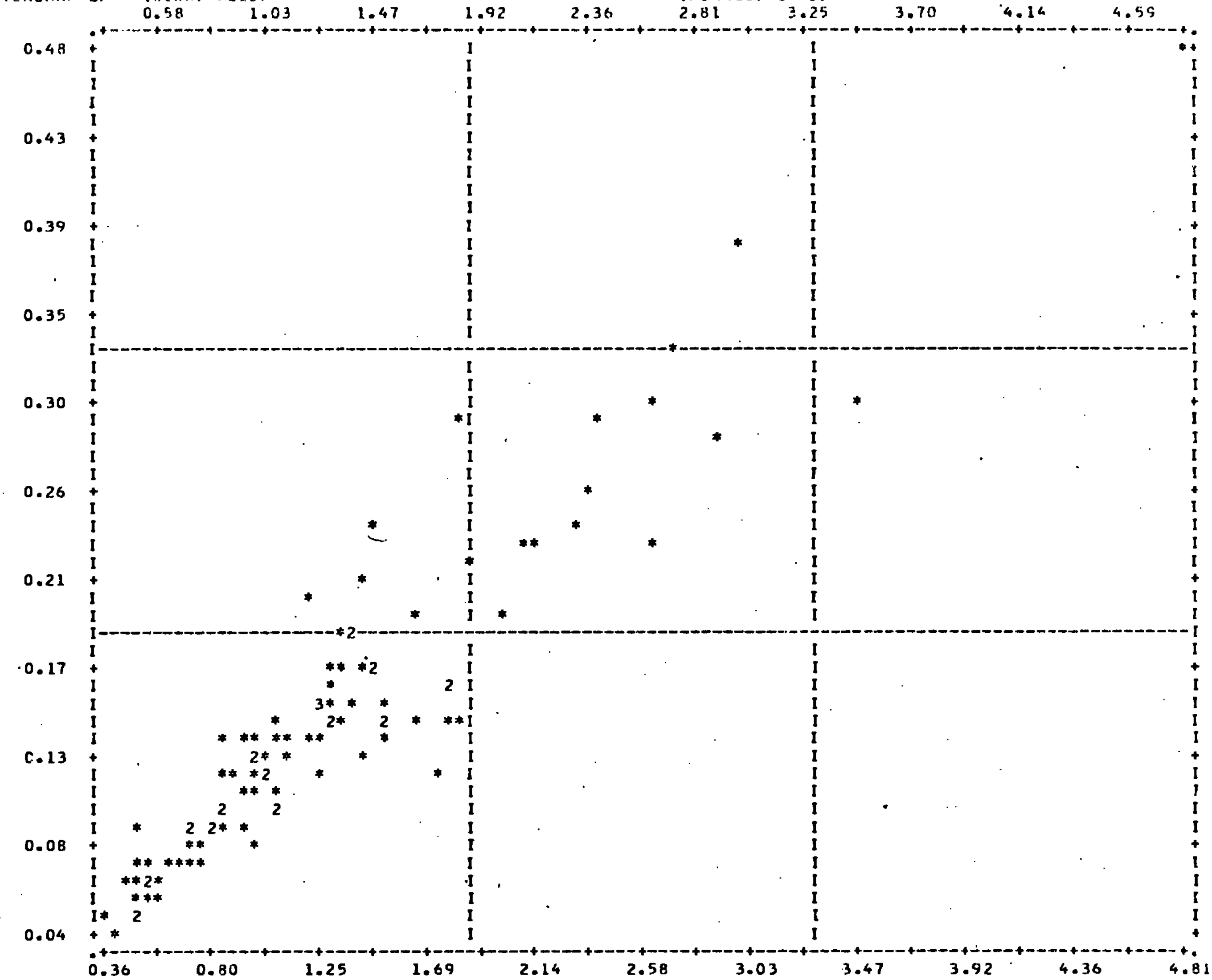
CORRELATION (R)-	0.96129	R SQUARED -	0.92409	SIGNIFICANCE -	0.0000
STD ERR OF EST -	0.05705	INTERCEPT (A) -	0.03691	SLOPE (B) -	0.1026

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.04740 ON THE LEFT MARGIN
A VALUE OF 0.92404 ON THE RIGHT MARGIN

PLOTTED VALUES - 100 EXCLUDED VALUES- 0 MISSING VALUES - 0

MARSDEN 2 JANUARY 02/04/75 PAGE 2

FILE NONAME (CREATION DATE = 02/04/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



MARSDEN 2 JANUARY 02/04/75 PAGE 3

STATISTICS..

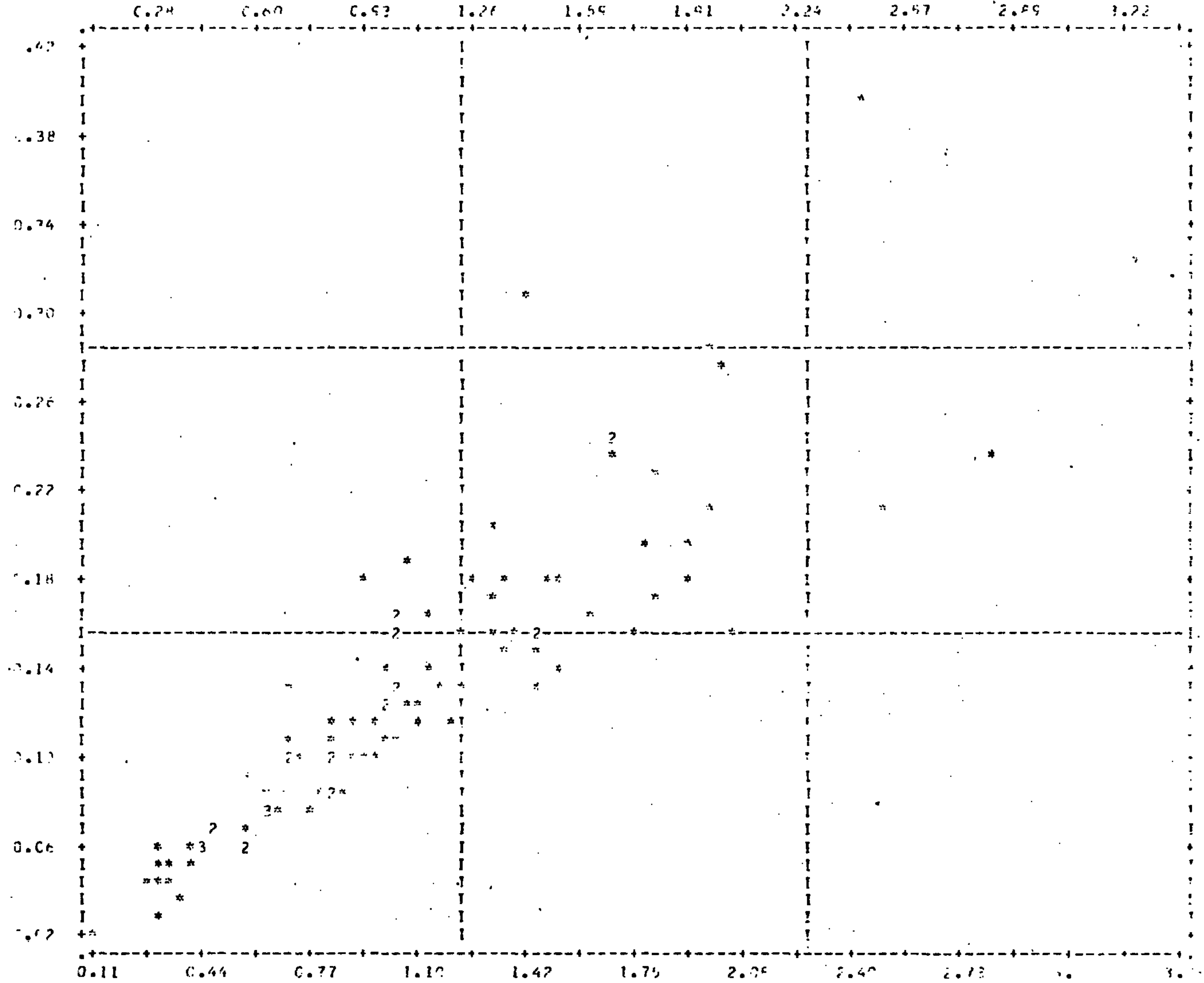
CORRELATION (R)-	0.93620	R SQUARED -	0.87647	SIGNIFICANCE -	0.0000
STD ERR OF EST -	0.02679	INTERCEPT (A) -	0.02289	SLOPE (B) -	0.0986

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.05381 ON THE LEFT MARGIN
A VALUE OF 4.71344 ON THE TOP MARGIN

PLOTTED VALUES -	100	EXCLUDED VALUES-	0	MISSING VALUES -	0

MARSDEN 3 JANUARY

FILE NONAME (CREATION DATE = 04/18/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



MARSDEN 3 JANUARY 04/18/75 PAGE 3

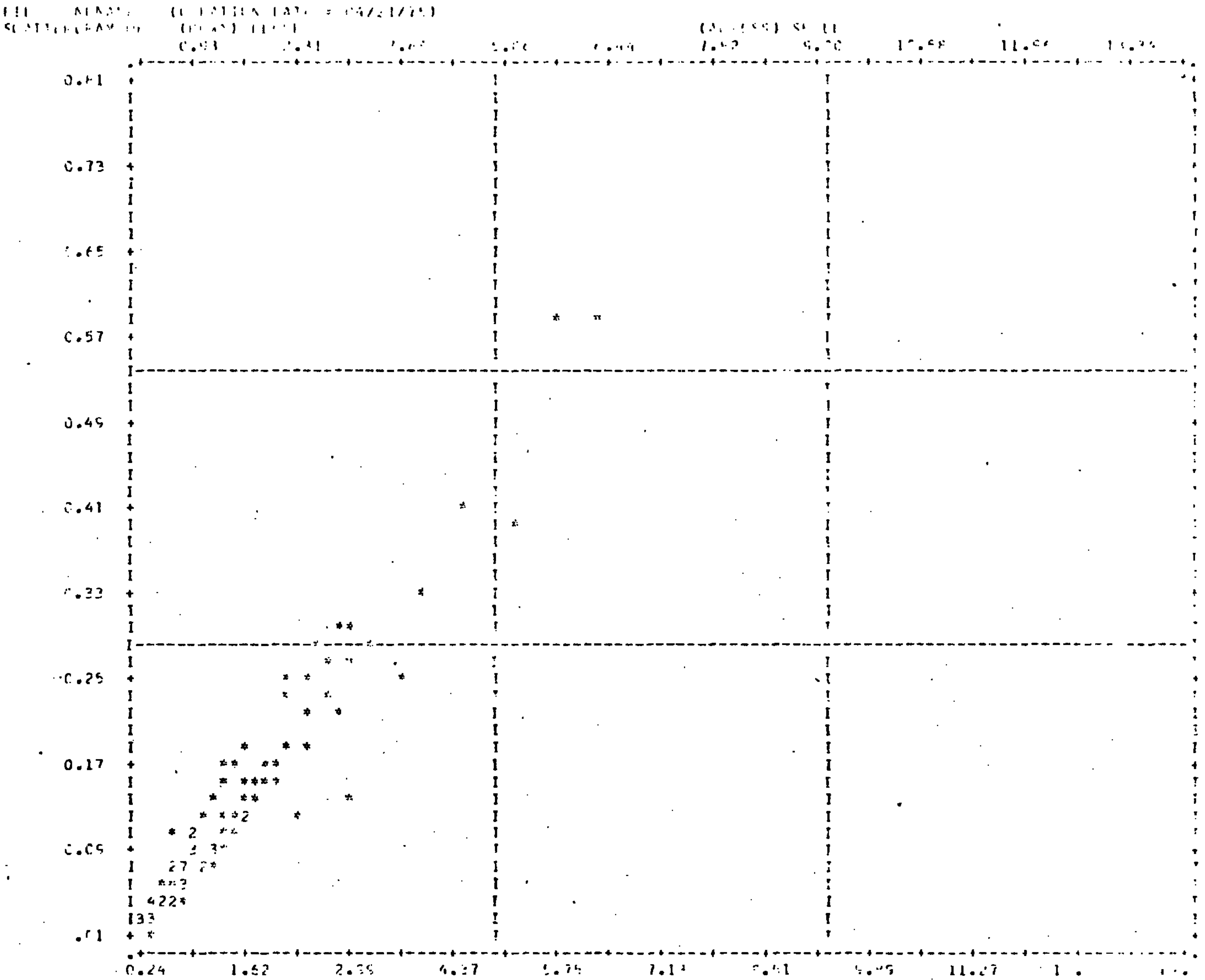
STATISTICS..

CORRELATION (R)-	0.89654	R SQUARED -	0.80379	SIGNIFICANCE -	0.0000
STD ERR OF EST -	0.03316	INTERCEPT (A) -	0.02094	SLOPE (B) -	0.1067

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF .02962 ON THE LEFT MARGIN
A VALUE OF .38592 ON THE RIGHT MARGIN

PLOTTED VALUES 100 EXCLUDED VALUES- 0 MISSING VALUES - 0

MARSDEN I FEBRUARY 04/21/75 PAGE 2



MARSDEN I FEBRUARY 04/21/75 PAGE 2

STATISTICS..

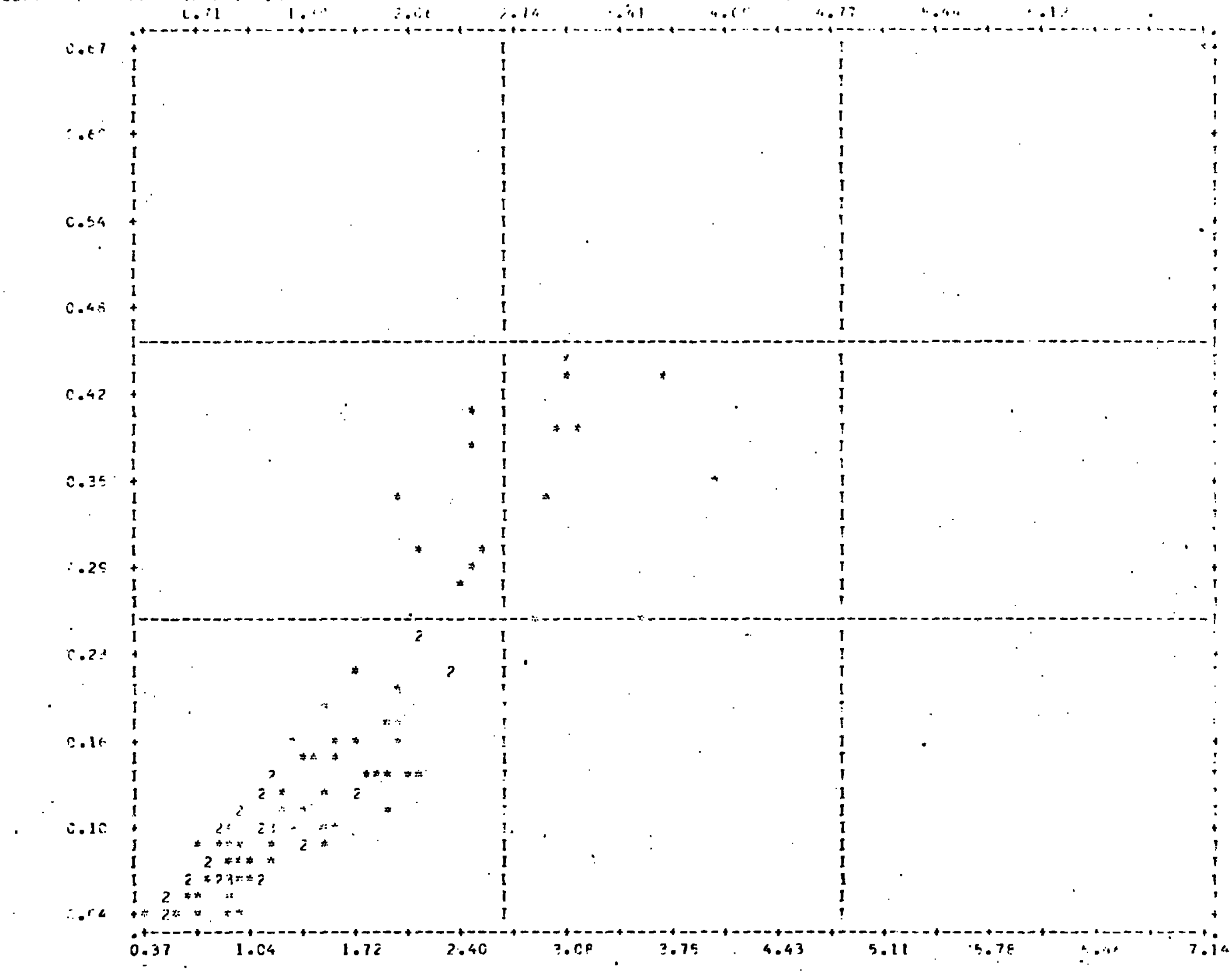
CORRELATION (R)-	0.94525	R SQUARED -	0.89349	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.04361	INTERCEPT (A) -	0.03655	SLOPE (B) -	0.06913

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.04540 ON THE LEFT MARGIN
A VALUE OF 11.42027 ON THE TOP MARGIN

PLOTTED VALUES -	86	EXCLUDED VALUES-	0	MISSING VALUES -	0

MARSDEN 2 FEBRUARY 04/21/75

FILE NCNAME (CREATION DATE = 04/21/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



MARSDEN 2 FEBRUARY 04/21/75 PAGE

STATISTICS..

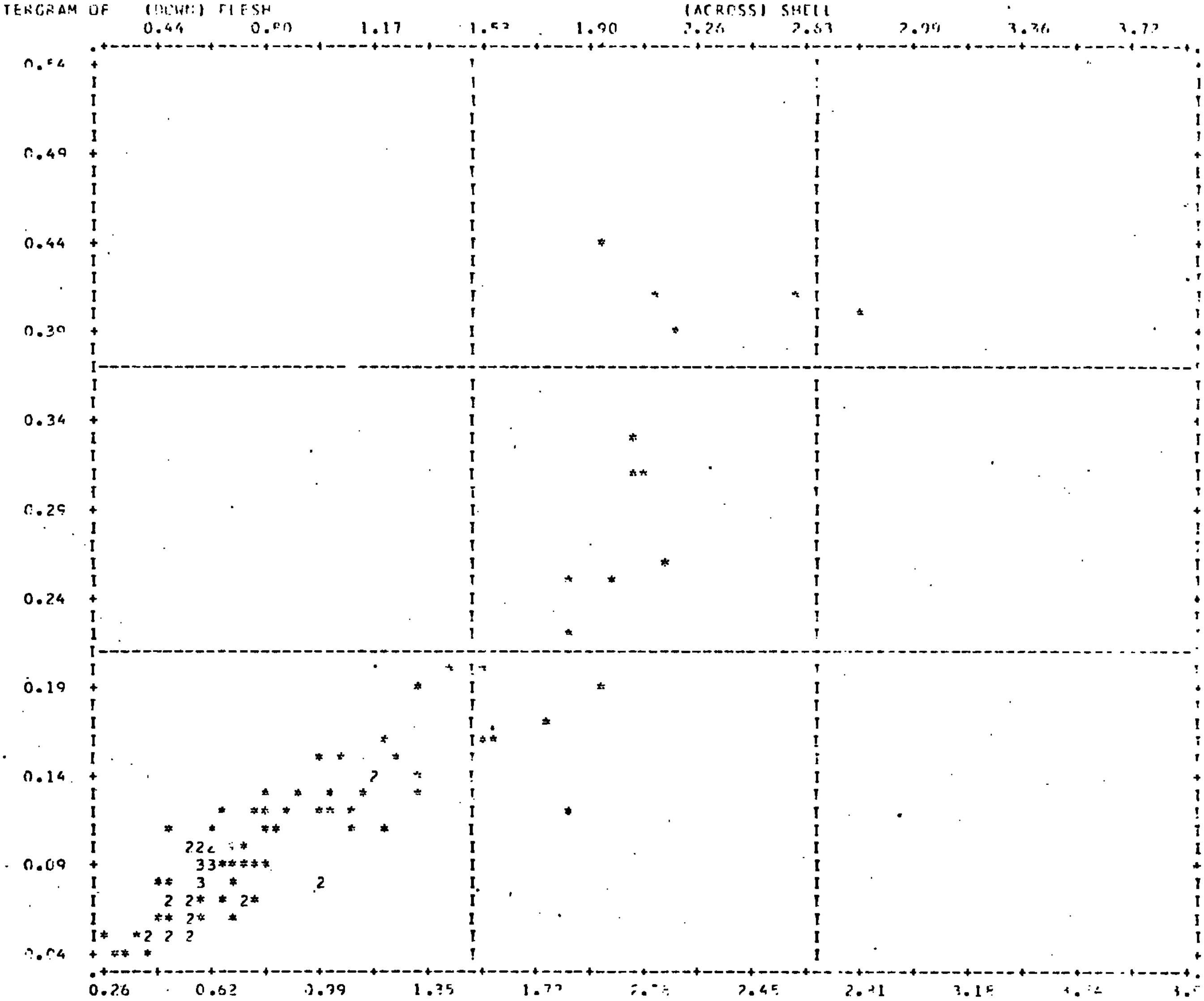
CORRELATION (R)-	0.91451	R SQUARED -	0.83633	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.04685	INTERCEPT (A) -	-0.01212	SLOPE (B) -	0.10956

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.35192 ON THE BOTTOM MARGIN
A VALUE OF 6.31300 ON THE TOP MARGIN

PLOTTED VALUES -	100	EXCLUDED VALUES-	0	MISSING VALUES -	0

MARSDEN 3 FEBRUARY

FILE NONAME (CREATION DATE = 09/15/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



MARSDEN 3 FEBRUARY 09/15/75 PAGE 2

STATISTICS..

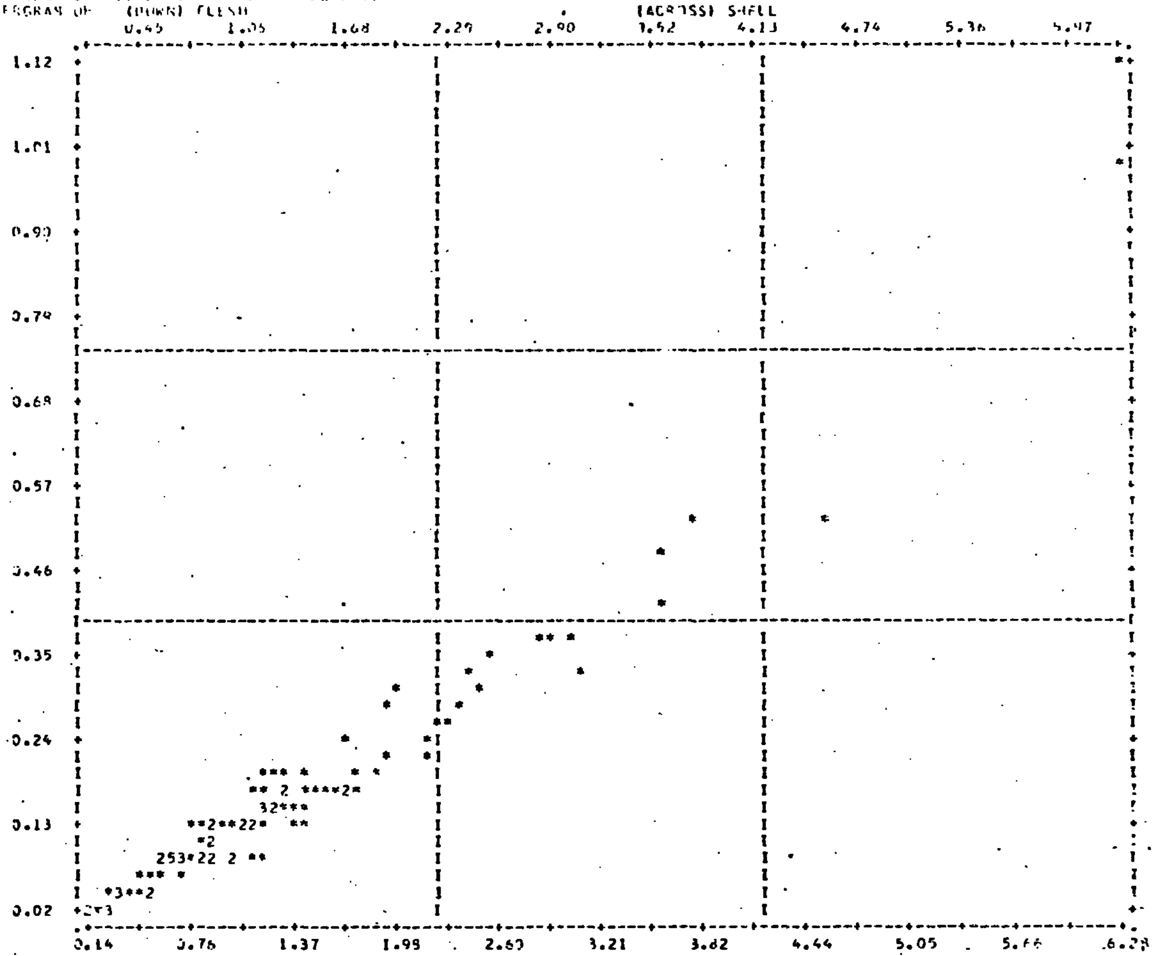
CORRELATION (R)-	0.93051	R SQUARED	-	0.86585	SIGNIFICANCE	-	0.00001
STD ERR OF EST -	0.03777	INTERCEPT (A)	-	-0.00323	SLOPE (B)	-	0.13955

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.22364 ON THE BOTTOM MARGIN
A VALUE OF 0.54680 ON THE RIGHT MARGIN

PLOTTED VALUES - 100 EXCLUDED VALUES- 0 MISSING VALUES -

MARSDEN 1 MARCH 04/25/75

FILE NONAME (CREATION DATE = 04/25/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



MARSDEN 1 MARCH 04/25/75 PAGE 3

STATISTICS..

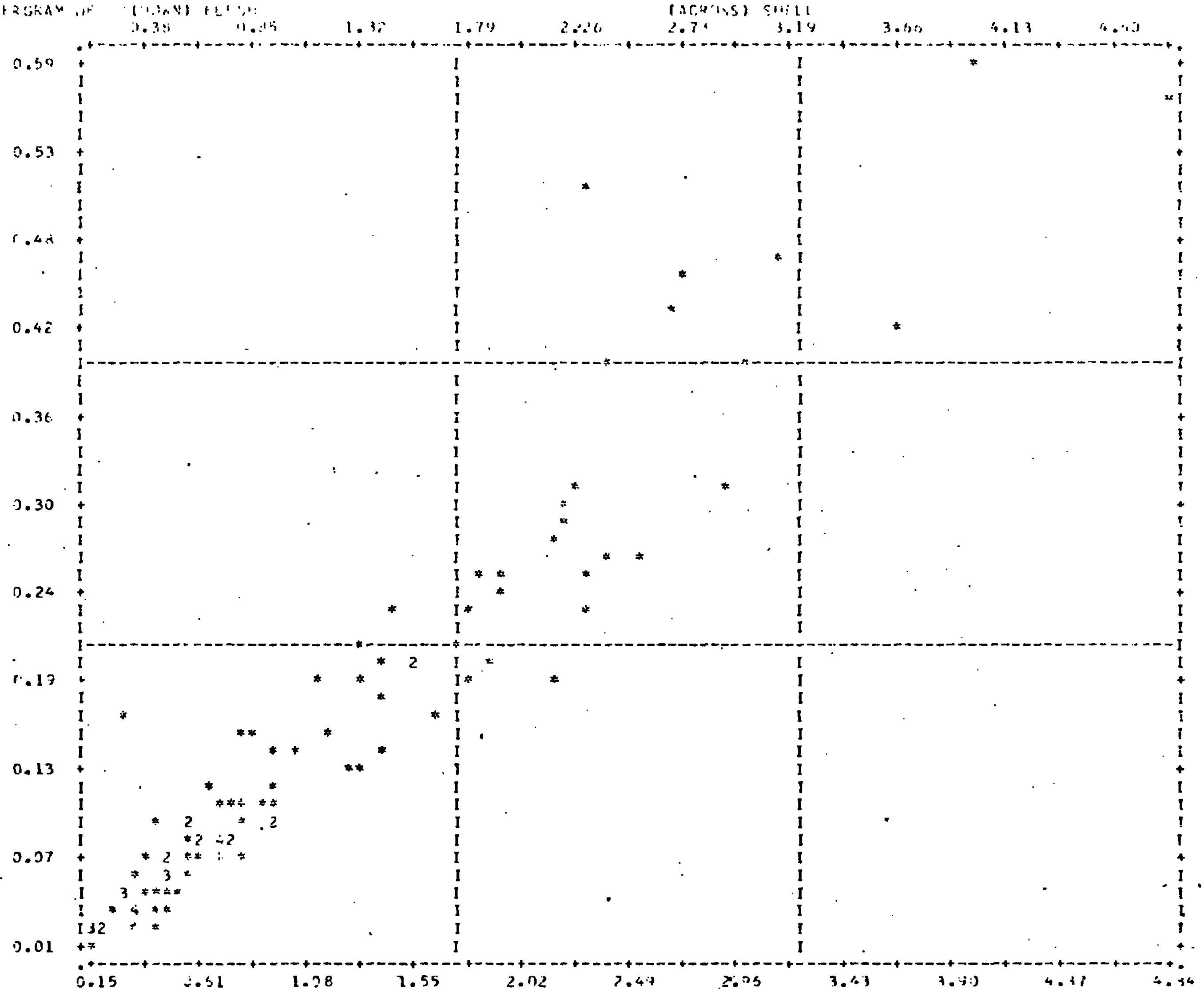
CORRELATION (R)-	0.97272	R SQUARED	-	0.94618	SIGNIFICANCE	-	0.00001
STD ERR OF EST -	0.03875	INTERCEPT (A)	-	-0.01553	SLOPE (B)	-	0.14612

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.11352 ON THE BOTTOM MARGIN
A VALUE OF 0.91074 ON THE RIGHT MARGIN

PLOTTED VALUES -	100	EXCLUDED VALUES-	0	MISSING VALUES -	0

MARSDEN 2 MARCH 04/25/75

FILE NONAME (CREATION DATE = 04/25/75)
SCATTERGRAM OF (DOWN) [illegible] (ACROSS) SHELL



MARSDEN 2 MARCH 04/25/75 PAGE 3

STATISTICS..

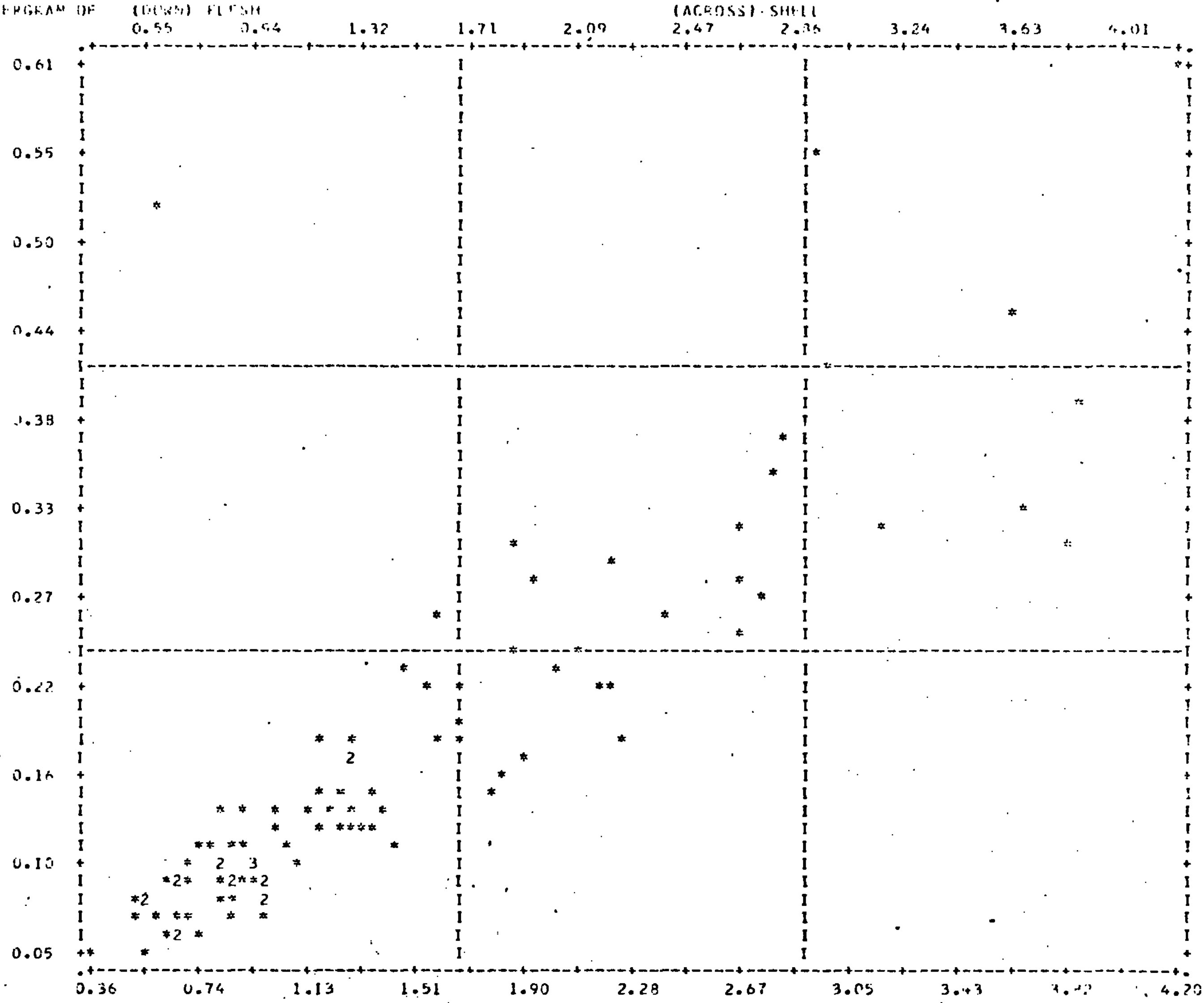
CORRELATION (R) -	0.95034	R SQUARED -	0.90315	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.04050	INTERCEPT (A) -	0.00382	SLOPE (B) -	0.13058

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.01676 ON THE LEFT MARGIN
A VALUE OF 4.59350 ON THE TOP MARGIN

PLOTTED VALUES - 100 EXCLUDED VALUES - 0 MISSING VALUES - 0

MARSDEN 3 MARCH 04/25/75 PAGE 2

FILE NONAME (CREATION DATE = 04/25/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



MARSDEN 3 MARCH 04/25/75 PAGE 3

STATISTICS..

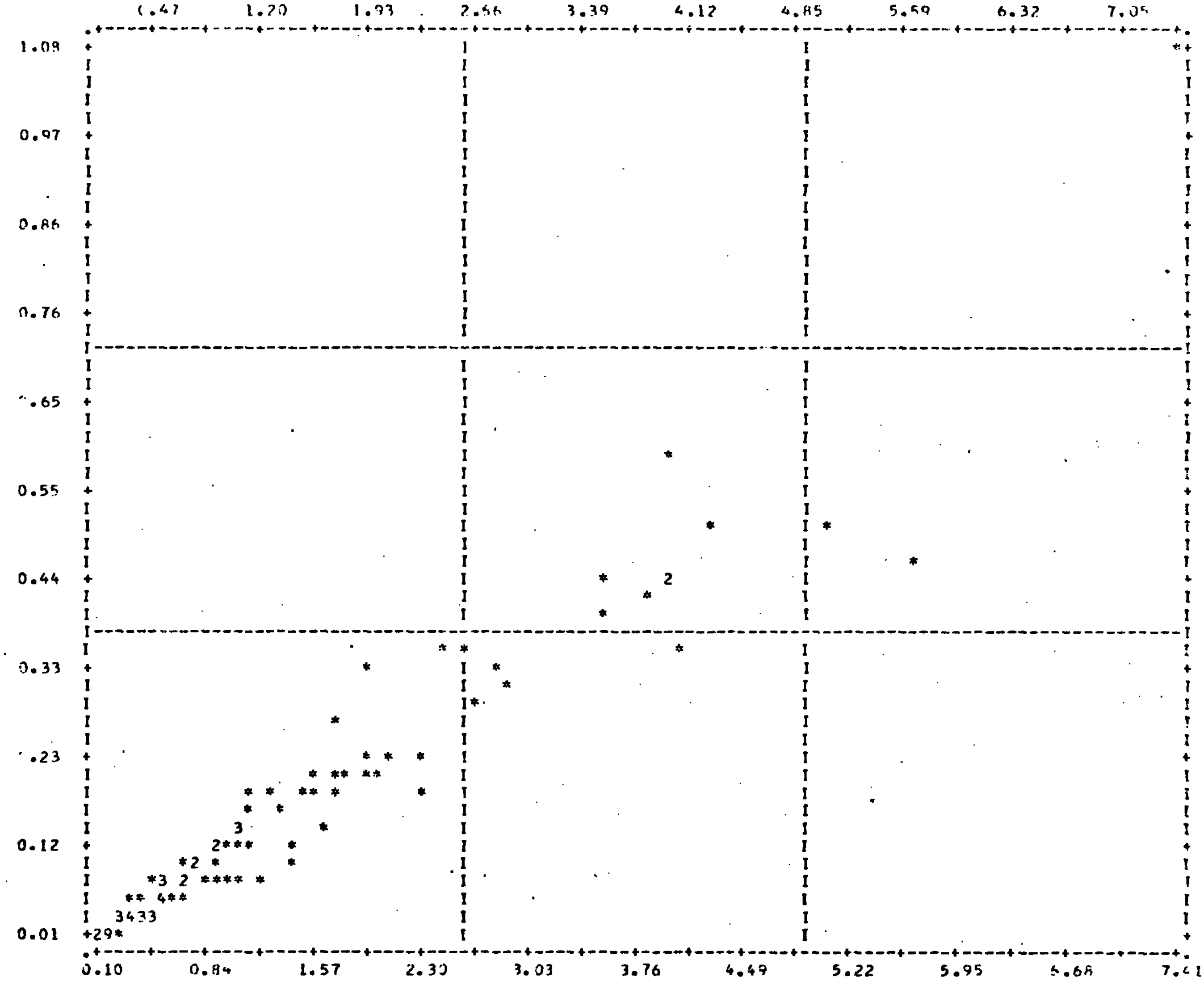
CORRELATION (R)-	0.83533	R SQUARED -	0.69778	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.06294	INTERCEPT (A) -	0.01991	SLOPE (B) -	0.10931

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.05506 ON THE LEFT MARGIN
A VALUE OF 0.48354 ON THE RIGHT MARGIN

PLOTTED VALUES -	98	EXCLUDED VALUES-	0	MISSING VALUES -	0

MARSDEN 1 APRIL 05/01/75 PAGE 2

FILE NONAME (CREATION DATE = 05/01/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



MARSDEN 1 APRIL 05/01/75 PAGE 3

STATISTICS..

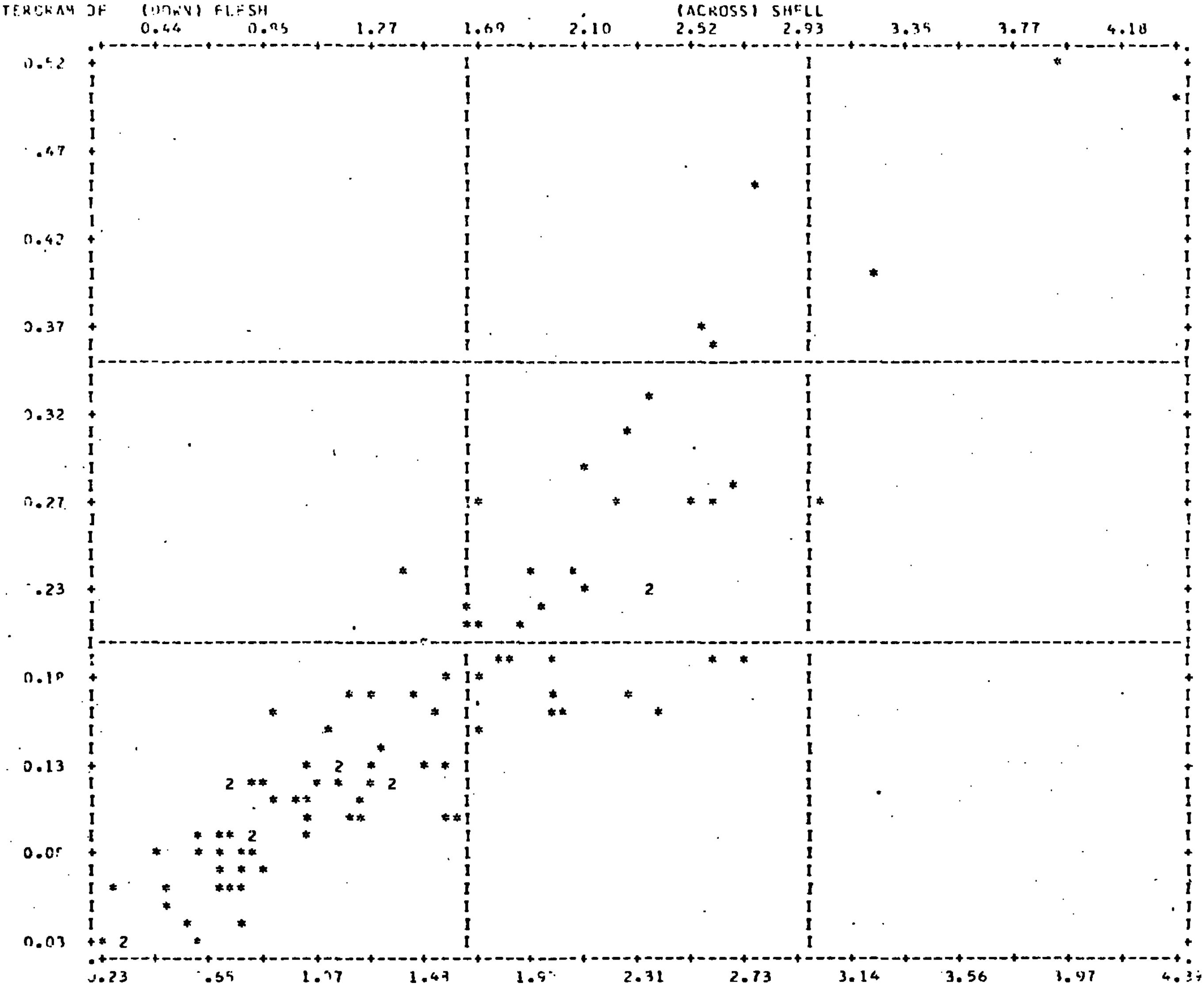
CORRELATION (R)-	0.96588	R SQUARED -	0.93292	SIGNIFICANCE -	0.0000
STD ERR OF EST -	0.04357	INTERCEPT (A) -	0.00470	SLOPE (B) -	0.1173

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.00845 ON THE LEFT MARGIN
A VALUE OF 0.88287 ON THE RIGHT MARGIN

PLOTTED VALUES -	97	EXCLUDED VALUES-	0	MISSING VALUES -	0

MARSDEN 2 APRIL 05/01/75 PAGE 2

FILE NONAME (CREATION DATE = 05/01/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



MARSDEN 2 APRIL 05/01/75 PAGE 3

STATISTICS..

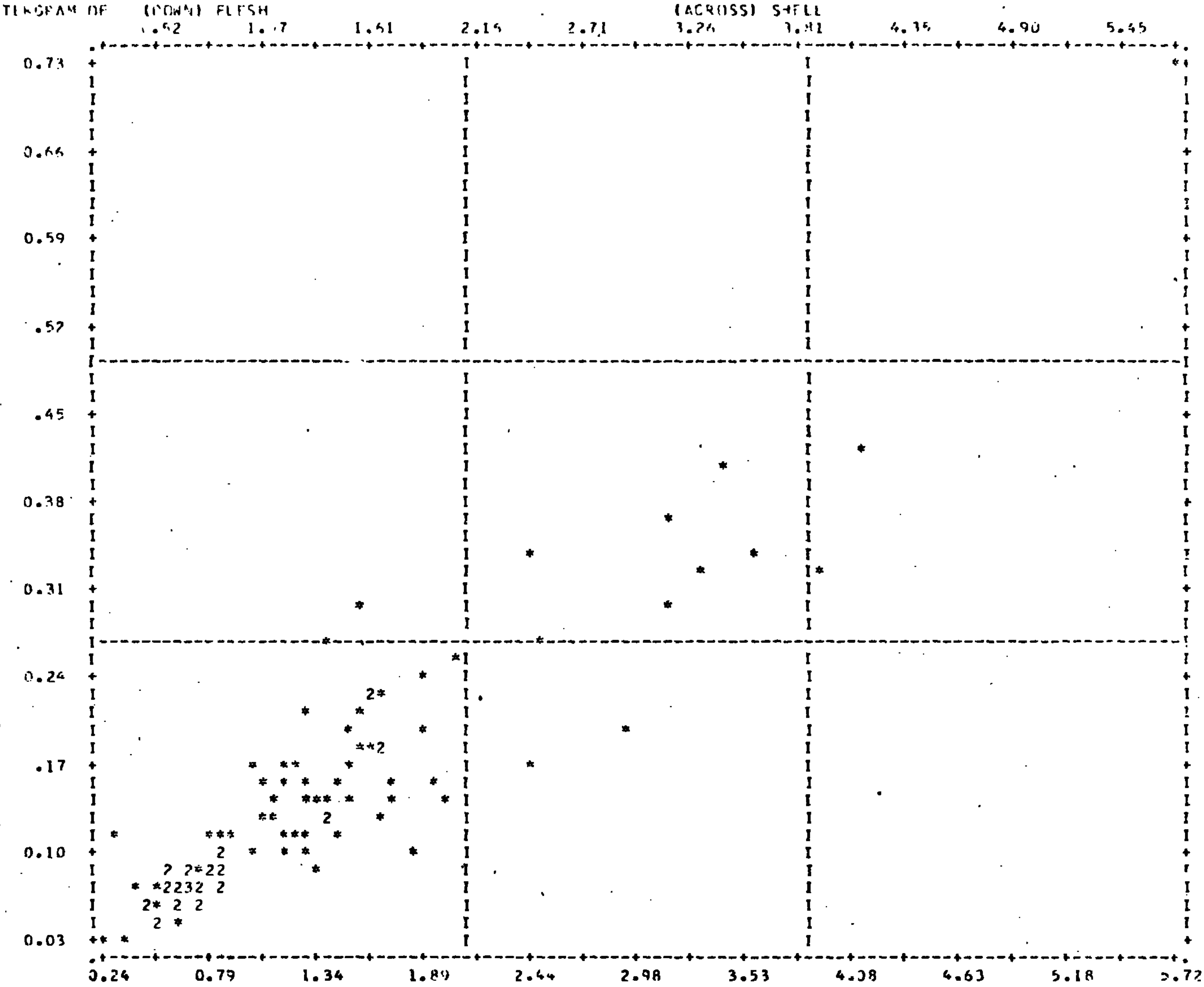
CORRELATION (R)-	0.90457	R SQUARED -	0.81842	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.04283	INTERCEPT (A) -	0.00145	SLOPE (B) -	0.1123

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.02313 ON THE LEFT MARGIN
A VALUE OF 0.49778 ON THE RIGHT MARGIN

PLOTTED VALUES - 97 EXCLUDED VALUES- 0 MISSING VALUES - 0

MARSDEN 3 APRIL 05/01/75

FILE NONAME (CREATION DATE = 05/01/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



MARSDEN 3 APRIL 05/01/75 PAGE 3

STATISTICS..

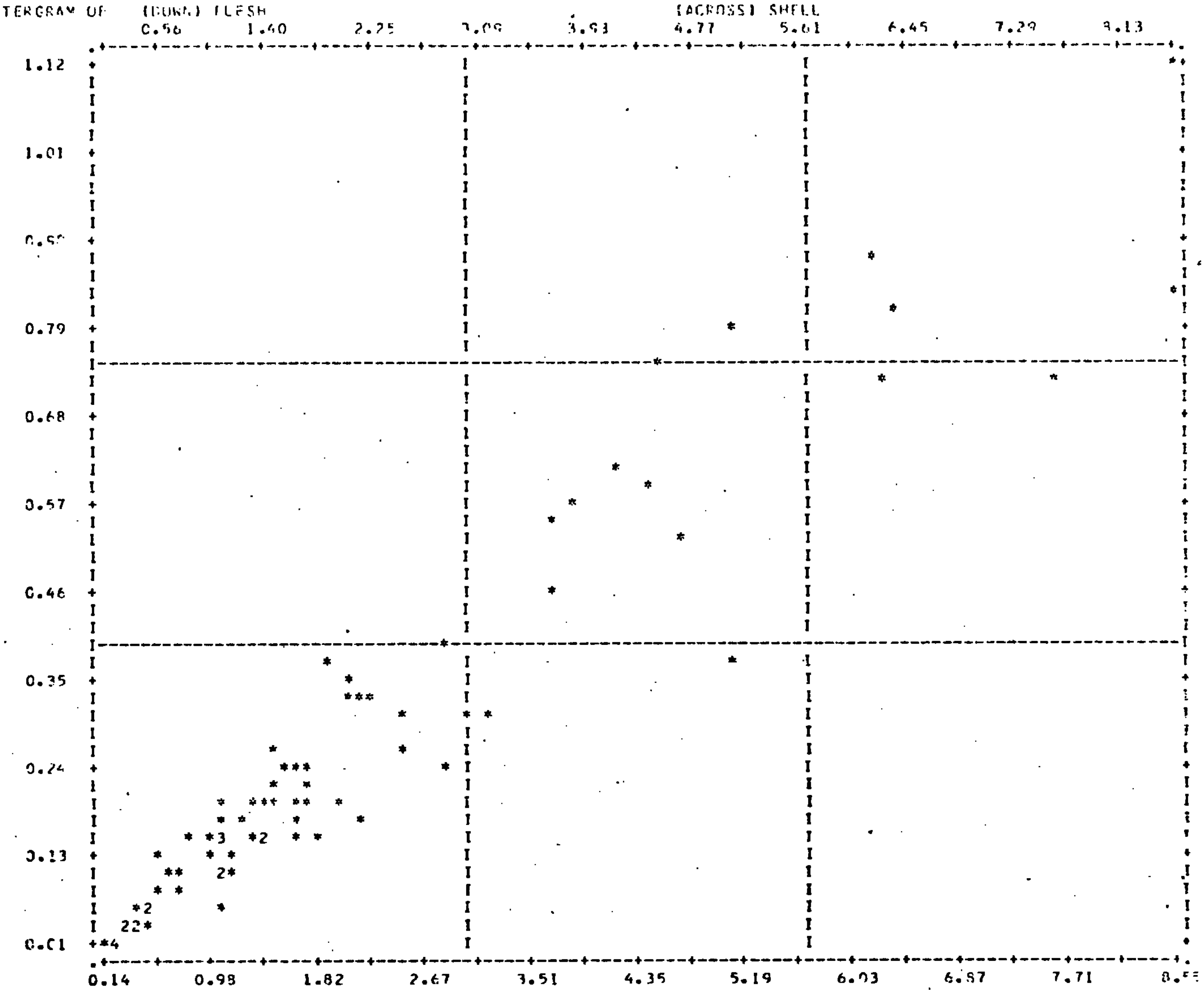
CORRELATION (R)-	0.91918	R SQUARED -	0.84490	SIGNIFICANCE -	0.0000
STD ERR OF EST -	0.04101	INTERCEPT (A) -	0.01710	SLOPE (B) -	0.1026

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.03552 ON THE LEFT MARGIN
A VALUE OF 0.61017 ON THE RIGHT MARGIN

PLOTTED VALUES -	98	EXCLUDED VALUES-	0	MISSING VALUES -	0

MARSDEN I MAY

FILE NONAME (CREATION DATE = 07/11/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



MARSDEN I MAY 07/11/75 PAGE 3

STATISTICS..

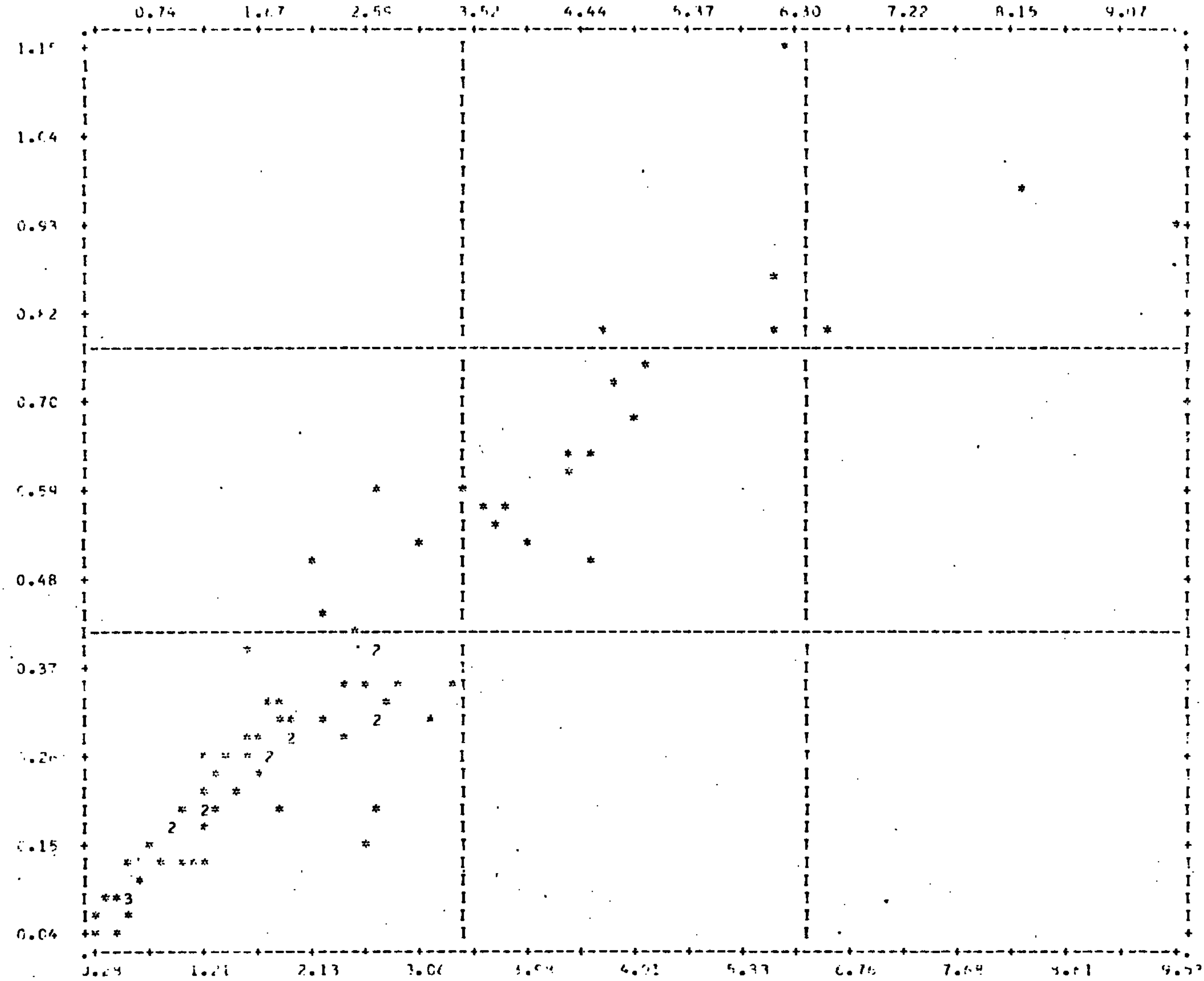
CORRELATION (R)-	0.95415	R SQUARED -	0.91040	SIGNIFICANCE -	0.0000
STD ERR OF EST -	0.07258	INTERCEPT (A) -	0.02343	SLOPE (B) -	0.1117

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.03037 ON THE LEFT MARGIN
A VALUE OF 1.04062 ON THE RIGHT MARGIN

PLOTTED VALUES -	77	EXCLUDED VALUES-	0	MISSING VALUES -	0

MARSDEN 2 MAY 07/16/75

FILE NEWAPE (CREATION DATE = 07/16/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



MARSDEN 2 MAY 07/16/75 PAGE 3

STATISTICS..

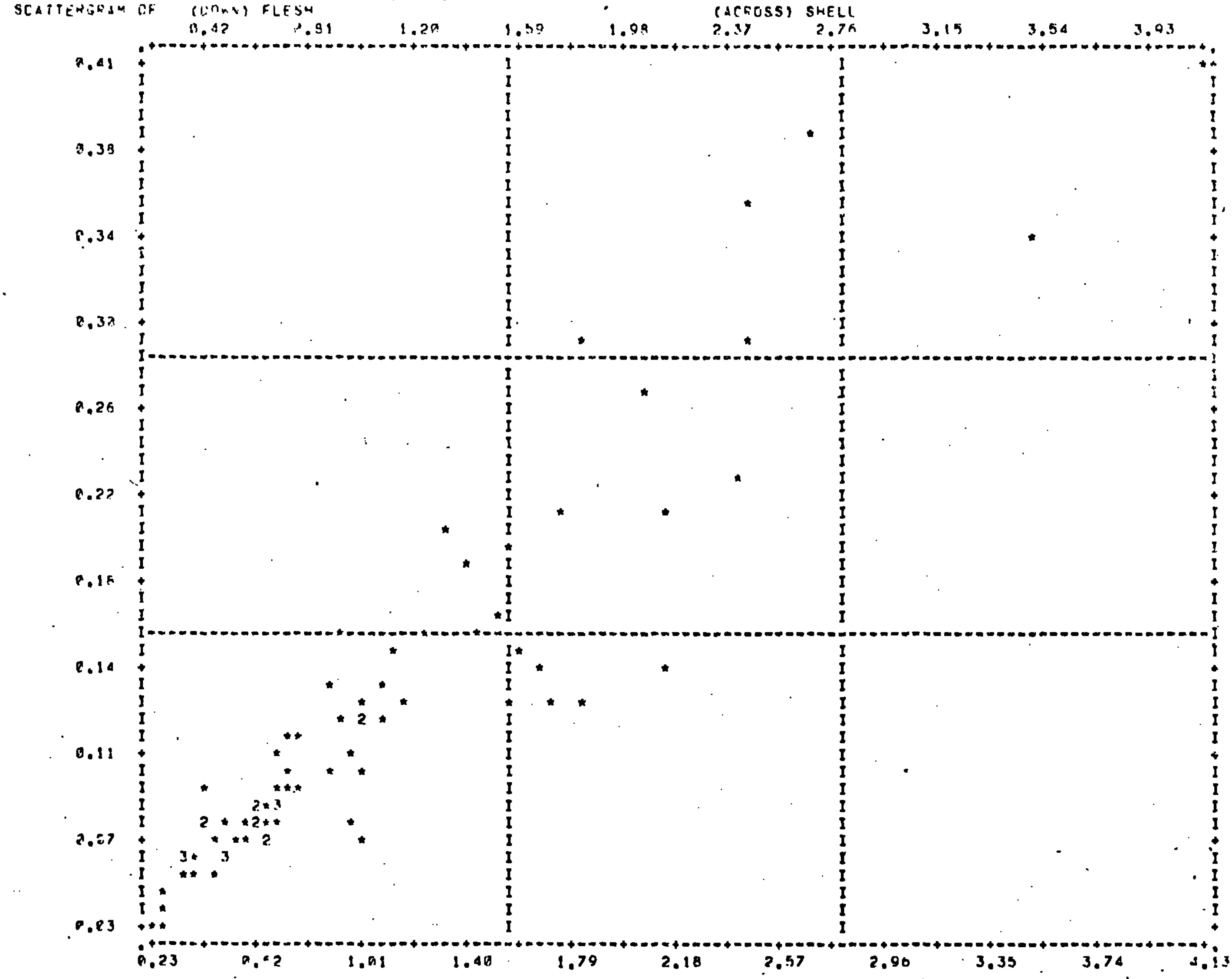
CORRELATION (R)-	0.93148	R SQUARED -	0.86765	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.08966	INTERCEPT (A) -	0.06038	SLOPE (B) -	0.12350

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.08366 ON THE LEFT MARGIN
A VALUE OF 9.00303 ON THE TOP MARGIN

PLOTTED VALUES -	80	EXCLUDED VALUES-	0	MISSING VALUES -	0

MARSDEN 3 MAY 07/16/75 PAGE 2

FILE NONAME (CREATION DATE = 07/16/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



MARSDEN 3 MAY 07/16/75 PAGE 3

STATISTICS..

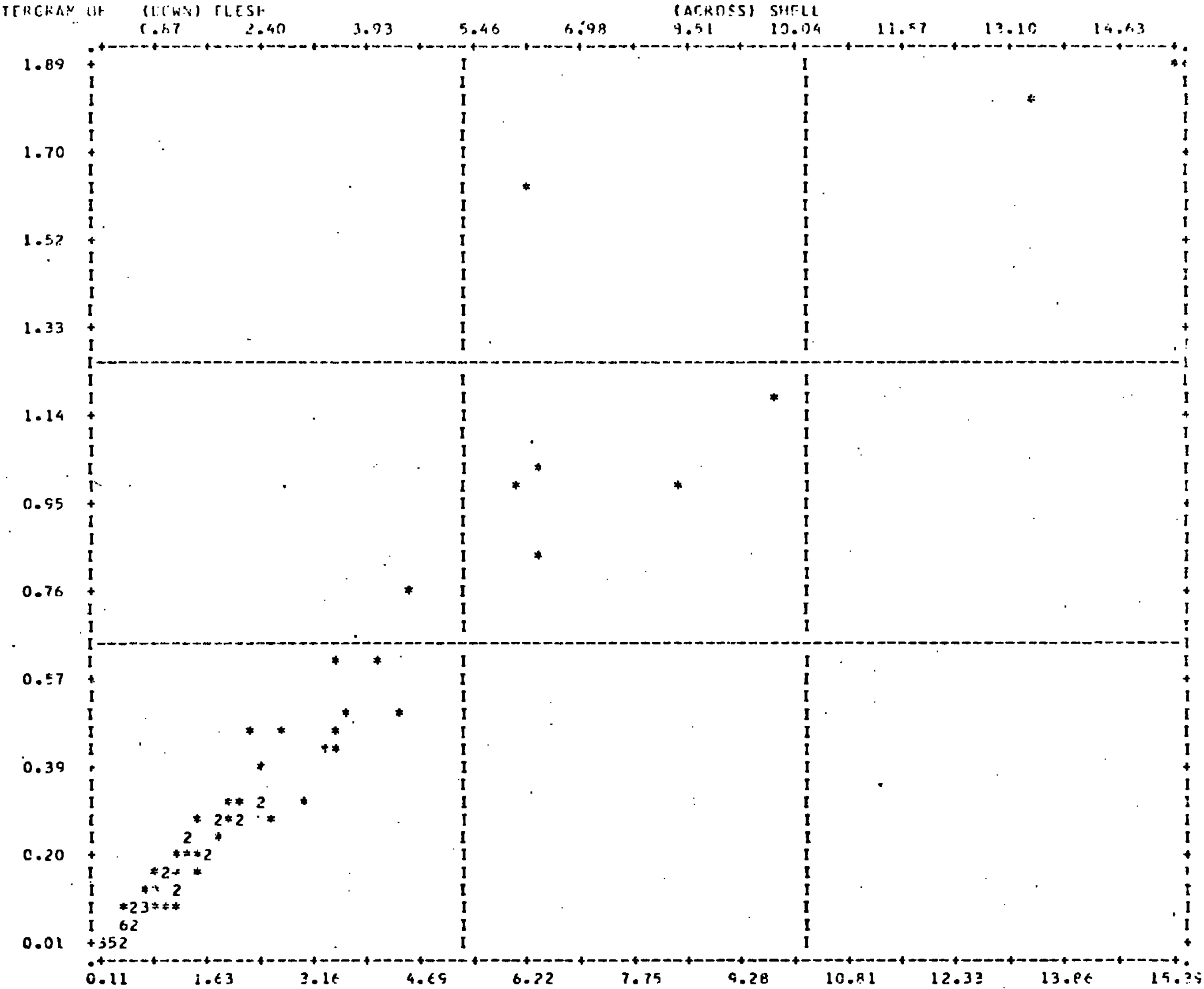
CORRELATION (R)- 0.92854 R SQUARED - 0.86219 SIGNIFICANCE - 0.0000

STD ERR OF EST - 0.03042 INTERCEPT (A) - 0.02058 SLOPE (B) - 0.1012

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.03972 ON THE LEFT MARGIN
A VALUE OF 3.96155 ON THE TOP MARGIN

PLOTTED VALUES - 78 EXCLUDED VALUES- 0 MISSING VALUES - 0

FILE NONAME (CREATION DATE = 07/11/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



STATISTICS..

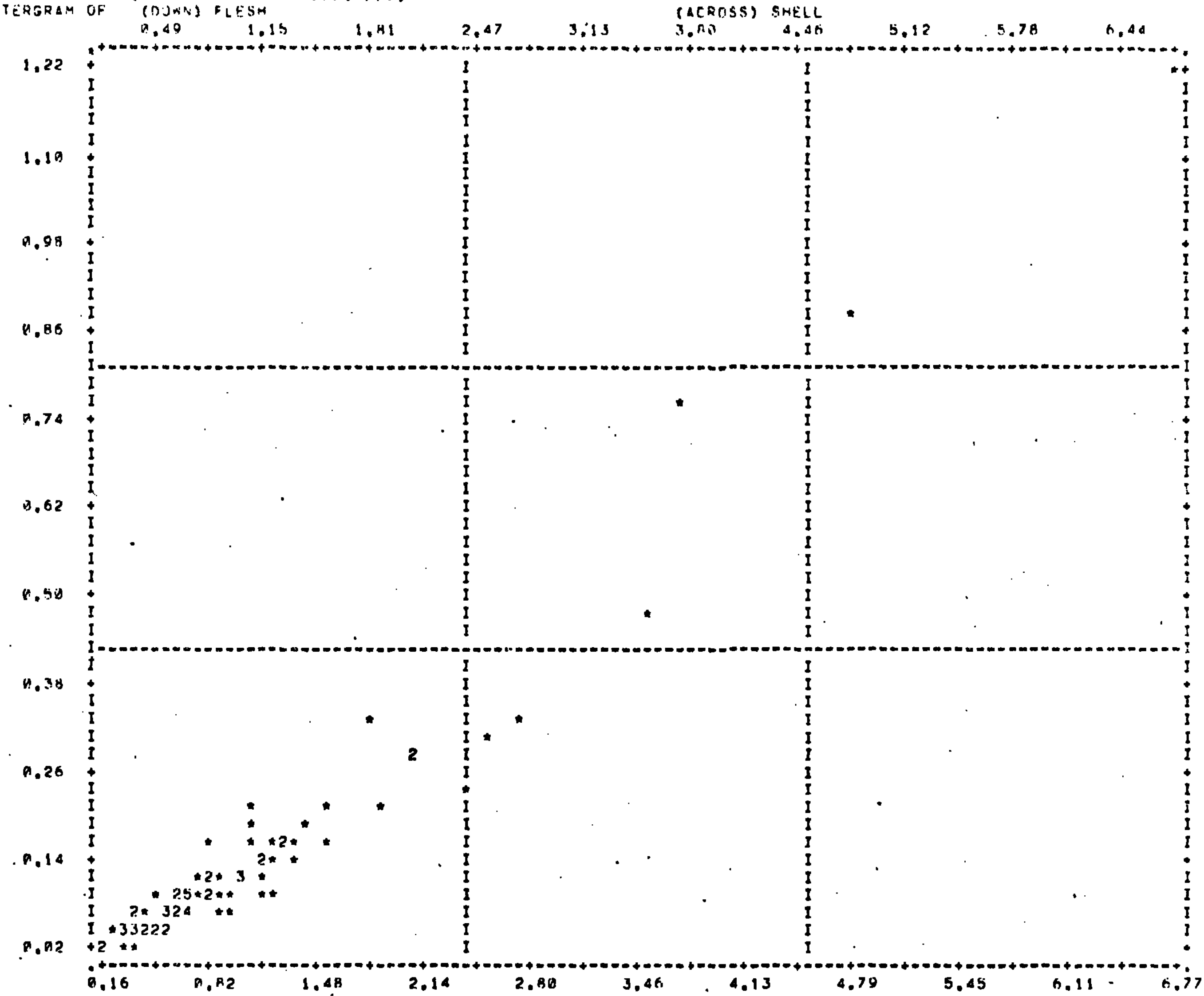
CORRELATION (R)-	0.95961	R SQUARED -	0.92085	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.11270	INTERCEPT (A) -	0.02829	SLOPE (B) -	0.13614

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.02191 ON THE LEFT MARGIN
A VALUE OF 13.97322 ON THE TOP MARGIN

PLOTTED VALUES -	15	EXCLUDED VALUES-	0	MISSING VALUES -	0

MARSDEN 2 JUNE   07/14/75   PAGE 2

FILE NONAME (CREATION DATE = 07/14/75)
SCATTERGRAM OF (DOWN) FLESH   (ACROSS) SHELL



MARSDEN 2 JUNE   07/14/75   PAGE 3

STATISTICS..

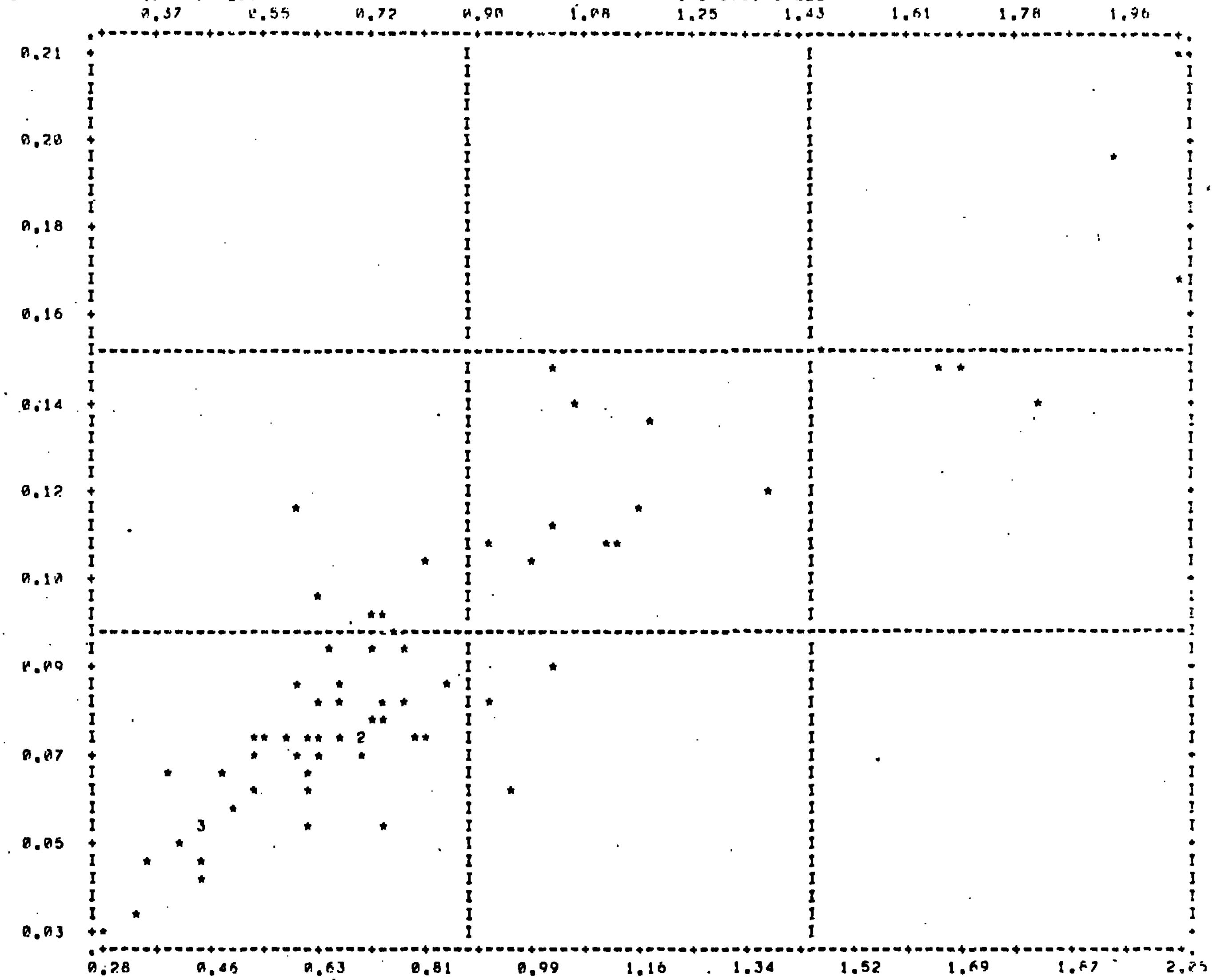
CORRELATION (R)-	0.96979	R SQUARED -	0.94050	SIGNIFICANCE -	0.000
STD ERR OF EST -	0.04524	INTERCEPT (A) -	-0.02640	SLOPE (B) -	0.1730

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.15280 ON THE BOTTOM MARGIN
A VALUE OF 1.15590 ON THE RIGHT MARGIN

PLOTTED VALUES -	8?	EXCLUDED VALUES-	0	MISSING VALUES -	0

MARSDEN 3 JUNE   07/14/75   PAGE 2

FILE NONAME (CREATION DATE = 07/14/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



MARSDEN 3 JUNE   07/14/75   PAGE 3

STATISTICS..

CORRELATION (R)- 0.90885   R SQUARED - 0.82600   SIGNIFICANCE - 0.0[illegible]

STD ERR OF EST - 0.01556   INTERCEPT (A) - 0.02108   SLOPE (B) - 0.0833[illegible]

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.04303 ON THE LEFT MARGIN
A VALUE OF 0.19319 ON THE RIGHT MARGIN

PLOTTED VALUES - 70   EXCLUDED VALUES- 0   MISSING VALUES - 0

APPENDIX 3

PRINCIPAL COMPONENTS ANALYSIS

FILE HEAVY (CREATION DATE = 08/29/75) METAL ANALYSIS

CORRELATION COEFFICIENTS..

	LGEDIAM	SMLDIAM	HEIGHT	FLESHWT	SHELLWT
LGEDIAM	1.00000	0.98050	0.82586	0.83131	0.83579
SMLDIAM	0.98050	1.00000	0.80216	0.82073	0.82677
HEIGHT	0.82586	0.80216	1.00000	0.81656	0.77384
FLESHWT	0.83131	0.82073	0.81656	1.00000	0.72928
SHELLWT	0.83579	0.82677	0.77384	0.72928	1.00000

DETERMINANT = 0.00086000 (0.85995253D-03)

Correlation coefficient for Flesh weight / shell length = 0.83131
which is very high.

APPENDIX 4

INTERFERENCE CORRECTIONS

The formulae used for interference corrections are presented below. Corrections have been made for Pb, Cd, Ni, Cu, values.

1. $$I_{Pb} = \frac{1.5 \times [Ca]}{10^4} + \frac{0.5 \times [Mg]}{10^4} + \frac{0.2 \times [K]}{10^4} + \frac{0.2 \times [Na]}{10^4}$$

2. $$I_{Cd} = \frac{0.24 \times [Ca]}{10^4} + \frac{0.93 \times [Na]}{10^4} + \frac{0.0023 \times [K]}{10^4} + \frac{0.033 \times [Mg]}{10^4}$$

3. $$I_{Ni} = \frac{1.20 \times [Ca]}{10^4} + \frac{0.3 \times [Na]}{10^4} + \frac{0.17 \times [K]}{10^4}$$

4. $$I_{Cu} = \frac{0.15 \times [Ca]}{10^4} + \frac{0.049 \times [Na]}{10^4} + \frac{.038 \times [K]}{10^4} + \frac{0.007 \times [Mg]}{10^4}$$

The above formulae were established as a result of personal communication with T. Brett and I. Vaughman of Durham University.

The interference values I_x where x = Pb, Cd, Ni, Cu were calculated and were then subtracted from the values of Pb, Ni, Cd, Cu, as appropriate.

APPENDIX 5

Chemical analysis data for specimens of all size classes (A, B, C,...), collected from Zones 1, 2 and 3 at Marsden Bay. Tables A1, A2, A3 show the mean values and standard deviations, for each set of analysis.

St. dev. was calculated using the formula:

$$6\,x = \sqrt{\frac{\Sigma x^{2} - \left(\frac{\Sigma x}{n}\right)\Sigma x}{n - 1}}$$

TABLE A1

MARSDEN BAY ZONE 1

	SIZE class	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE
Pb	A	16.90 ± 1.00	22.44 ± 1.00	21.14 ± 0.50	18.43 ± 0.50	16.09 ± 1.00	12.14 ± 0.00	27.20 ± 0.00	20.30 ± 2.37	13.59 ± 2.44
	B	13.44 ± 1.10	19.03 ± 1.10	17.39 ± 3.70	16.04 ± 1.10	18.86 ± 1.70	16.34 ± 1.00	26.87 ± 0.97	19.17 ± 3.36	11.91 ± 1.00
	C	16.25 ± 1.00	19.64 ± 0.50	15.16 ± 2.36	16.20 ± 1.26	21.77 ± 1.20	14.82 ± 1.10	24.68 ± 0.80	21.56 ± 2.96	9.22 ± 2.15
	D	14.95 ± 0.99		11.69 ± 0.63	15.99 ± 0.95	-	-		15.77 ± 2.21	11.60 ± 1.15
	E			14.94 ± 0.95		21.93 ± 0.00	12.67 ± 0		16.73 ± 2.64	6.09 ± 1.50
	F									6.37 ± 0.57
Cd	A	3.69 ± 0.50	3.15 ± 0.34	7.37 ± 0.28	5.04 ± 0.17	5.12 ± 0.30	3.53 ± 0.28	2.66 ± 0.17	7.36 ± 0.59	3.71 ± 0.86
	B	5.09 ± 0.28	3.98 ± 0.20	8.52 ± 0.17	7.40 ± 0.31	5.15 ± 0.28	4.78 ± 0.34	4.37 ± 0.41	5.96 ± 0.07	5.7 ± 0.33
	C	5.02 ± 0.43	6.08 ± 0.47	13.34 ± 0.37	10.03 ± 0.40	4.71 ± 0.43	4.44 ± 0.00	4.55 ± 0.36	7.49 ± 0.31	5.67 ± 0.26
	D	11.92 ± 0.53		17.93 ± 0.30	12.70 ± 0.43	-	-		10.92 ± 0.26	4.90 ± 0.07
	E			20.84 ± 0.57		8.80 ± 0.00	5.84 ± 0.00		10.84 ± 0.20	12.70 ± 0.65
	F									10.53 ± 0.33
Ni	A	5.40 ± 0.83	4.53 ± 0.00	5.64 ± 0.83	6.09 ± 1.30	5.36 ± 1.54	3.66 ± 0.60	5.11 ± 2.68	0.00 ± 0.00	5.22 ± 0.81
	B	5.86 ± 0.81	4.46 ± 1.04	2.43 ± 0.83	4.01 ± 1.00	4.69 ± 1.17	8.42 ± 3.22	6.21 ± 1.48	0.50 ± 0.40	3.58 ± 0.95
	C	5.92 ± 0.54	5.49 ± 2.40	1.92 ± 0.95	4.64 ± 1.78	2.90 ± 0.61	7.23 ± 1.00	4.28 ± 1.78	0.50 ± 0.10	3.67 ± 1.41
	D	3.99 ± 1.41		0.53 ± 1.00	5.73 ± 3.69	-	-		0.60 ± 0.10	3.76 ± 0.95
	E			1.00 ± 0.00		3.39 ± 0.00	0.61 ± 0.00		0.80 ± 0.60	1.53 ± 1.15
	F									1.44 ± 0.95
Cu	A	16.58 ± 0.40	19.13 ± 0.30	15.93 ± 0.10	16.47 ± 0.43	18.42 ± 0.50	13.41 ± 0.10	23.54 ± 0.00	18.93 ± 0.36	14.50 ± 0.14
	B	14.77 ± 0.00	21.61 ± 0.10	15.41 ± 0.43	18.53 ± 0.71	14.59 ± 0.41	16.43 ± 0.30	25.60 ± 0.10	18.66 ± 0.41	14.67 ± 0.17
	C	15.85 ± 0.10	16.64 ± 0.00	15.20 ± 0.46	16.11 ± 0.30	15.71 ± 0.10	12.44 ± 0.40	20.69 ± 0.20	13.79 ± 0.17	18.37 ± 2.47
	D	14.69 ± 0.20		16.05 ± 0.30	17.71 ± 0.10	-	-		15.07 ± 0.57	15.57 ± 1.26
	E			18.05 ± 0.78		14.10 ± 0.10	10.18 ± 0.00		15.11 ± 0.48	15.98 ± 0.42
	F									11.98 ± 0.44
Zn	A	119.6 ± 6.2	123.6 ± 4.4	149.0 ± 2.5	141.2 ± 4.1	118.6 ± 3.7	125.7 ± 7.1	148.0 ± 3.0	170.4 ± 4.1	121.0 ± 3.6
	B	117.7 ± 2.5	132.8 ± 6.3	175.0 ± 6.4	150.6 ± 7.1	144.0 ± 1.7	137.4 ± 1.7	150.2 ± 2.4	152.2 ± 2.4	123.0 ± 1.0
	C	112.8 ± 3.9	118.4 ± 4.8	167.0 ± 11.0	143.2 ± 6.6	103.6 ± 5.1	159.7 ± 2.8	155.8 ± 8.9	167.7 ± 3.2	137.2 ± 6.7
	D	192.2 ± 6.2		172.0 ± 2.6	133.7 ± 4.0	-	-		186.2 ± 4.3	127.3 ± 6.9
	E			141.2 ± 4.5		117.0 ± 0.0	60.0 ± 0.0		237.6 ± 5.5	145.3 ± 2.8
	F									151.0 ± 2.2
Fe	A	2,218 ± 70	1,880 ± 52	1,535 ± 20	1,668 ± 60	2,321 ± 58	1,988 ± 100	3,740 ± 113	2,635 ± 87	2,365 ± 90
	B	1,755 ± 25	1,828 ± 25	1,127 ± 30	1,670 ± 41	1,638 ± 45	1,988 ± 80	3,260 ± 84	2,335 ± 80	1,865 ± 70
	C	1,802 ± 13	2,110 ± 44	927 ± 17	1,358 ± 21	1,008 ± 35	2,088 ± 120	1,866 ± 26	2,510 ± 70	1,975 ± 84
	D	1,665 ± 25		705 ± 10	995 ± 70	-	-		1,690 ± 50	1,877 ± 57
	E			1,195 ± 21		1,125 ± 80	1,785 ± 70		1,735 ± 50	805 ± 81
	F									1,317 ± 70
Na	A	15,400 ± 187	16,340 ± 114	17,840 ± 181	16,020 ± 192	21,600 ± 100	25,800 ± 173	16,460 ± 219	24,625 ± 95	14,295 ± 125
	B	15,825 ± 170	16,660 ± 260	18,920 ± 130	16,540 ± 207	23,333 ± 208	28,233 ± 153	18,900 ± 141	26,125 ± 98	16,520 ± 150
	C	14,180 ± 148	15,740 ± 114	20,300 ± 316	18,360 ± 415	19,733 ± 461	28,933 ± 153	17,920 ± 164	21,675 ± 70	15,045 ± 150
	D	16,225 ± 170		18,833 ± 153	19,850 ± 129	-	-		26,350 ± 60	14,045 ± 195
	E			20,425 ± 250		22,600 ± 100	21,800 ± 100		23,300 ± 100	18,595 ± 150
	F									16,945 ± 125
K	A	12,859 ± 207	11,323 ± 211	10,022 ± 100	11,151 ± 203	7,053 ± 58	7,720 ± 86	9,360 ± 71	7,733 ± 100	7,290 ± 180
	B	12,865 ± 174	11,091 ± 194	11,812 ± 253	11,328 ± 195	8,136 ± 80	7,936 ± 104	10,120 ± 108	8,395 ± 147	8,037 ± 150
	C	12,256 ± 116	10,947 ± 148	11,922 ± 78	11,571 ± 273	8,586 ± 285	7,103 ± 160	10,240 ± 98	7,658 ± 150	8,665 ± 155
	D	11,485 ± 86		12,022 ± 100	11,473 ± 111	-	-		8,845 ± 94	8,402 ± 180
	E			11,734 ± 75		8,472 ± 100	6,322 ± 150		7,766 ± 129	9,565 ± 155
	F									7,902 ± 100
Mg	A	3,876 ± 61	4,322 ± 71	4,646 ± 100	4,484 ± 80	6,633 ± 160	5,133 ± 160	4,770 ± 83	5,284 ± 103	3,837 ± 60
	B	3,572 ± 31	4,125 ± 46	3,846 ± 111	4,247 ± 45	5,216 ± 129	5,416 ± 88	4,750 ± 67	5,172 ± 193	3,662 ± 50
	C	3,294 ± 64	5,129 ± 31	3,496 ± 100	3,797 ± 80	3,866 ± 144	5,483 ± 90	4,780 ± 30	4,684 ± 122	3,850 ± 60
	D	3,412 ± 62		3,046 ± 70	3,339 ± 35	-	-		4,347 ± 168	3,300 ± 40
	E			3,796 ± 50		4,246 ± 100	4,746 ± 80		4,630 ± 104	3,250 ± 75
	F									3,400 ± 90
Ca	A	17,695 ± 526	23,255 ± 764	20,440 ± 100	25,329 ± 528	26,685 ± 676	26,168 ± 208	20,310 ± 192	21,913 ± 503	18,560 ± 385
	B	12,083 ± 130	22,084 ± 288	13,374 ± 358	21,260 ± 266	15,018 ± 176	24,401 ± 577	15,430 ± 320	19,226 ± 500	12,780 ± 212
	C	7,056 ± 50	27,112 ± 420	8,449 ± 150	15,088 ± 352	8,501 ± 288	23,201 ± 257	10,090 ± 151	19,126 ± 414	13,705 ± 330
	D	11,042 ± 242		5,801 ± 80	8,141 ± 236	-	-		10,401 ± 223	11,905 ± 165
	E			9,874 ± 122		14,924 ± 150	30,224 ± 100	15,276 ± 267	22,776 ± 264	6,205 ± 241
	F									9,717 ± 225

TABLE A2
MARSDEN BAY ZONE 2

ppm d.w.	SIZE class	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE
Pb	A	11.57 ± 2.10	20.82 ± 0.00		16.27 ± 1.00	26.50 ± 1.10	20.55 ± 1.70	21.15 ± 0.80	18.23 ± 2.64	20.69 ± 2.08
	B	7.07 ± 1.73	18.37 ± 1.00		24.39 ± 1.10	25.34 ± 1.00	18.33 ± 1.10	24.20 ± 0.70	24.25 ± 1.73	20.81 ± 0.50
	C	8.27 ± 1.73	14.65 ± 0.64			26.59 ± 1.00	15.27 ± 1.00	17.45 ± 1.00	25.70 ± 2.06	
	D	11.01 ± 2.64				31.63 ± 0.00			17.55 ± 1.82	
	E								19.74 ± 1.63	
	F									
Cd	A	5.68 ± 0.52	5.06 ± 0.50		3.95 ± 1.38	4.89 ± 0.38	4.52 ± 0.28	3.21 ± 0.00	5.98 ± 0.53	3.58 ± 0.37
	B	9.56 ± 0.05	5.10 ± 0.50		5.39 ± 0.38	6.32 ± 0.70	4.68 ± 0.38	4.14 ± 0.26	5.79 ± 0.70	3.83 ± 0.31
	C	7.27 ± 0.23	5.12 ± 0.34			5.59 ± 0.38	5.39 ± 0.51	4.10 ± 0.22	6.12 ± 0.43	
	D	5.90 ± 0.38				14.67 ± 0.0			5.12 ± 0.37	
	E								4.19 ± 0.10	
	F									
Ni	A	4.76 ± 0.64	3.99 ± 0.95		5.20 ± 0.83	5.70 ± 1.73	7.77 ± 1.00	5.46 ± 1.19	3.78 ± 0.64	7.12 ± 0.81
	B	1.90 ± 1.15	3.45 ± 0.44		4.27 ± 0.70	3.30 ± 1.16	9.58 ± 0.00	4.44 ± 1.00	2.74 ± 1.00	6.66 ± 1.00
	C	2.61 ± 0.57	4.32 ± 0.60			5.86 ± 0.64	6.12 ± 0.00	5.03 ± 1.70	3.74 ± 0.81	
	D	4.48 ± 2.00				3.25 ± 0.00			2.87 ± 1.23	
	E								3.10 ± 0.57	
	F									
Cu	A	13.00 ± 0.42	18.52 ± 0.10		17.55 ± 0.00	25.25 ± 0.20	19.41 ± 0.10	25.04 ± 0.30	18.77 ± 0.65	20.35 ± 0.45
	B	14.72 ± 0.05	19.46 ± 0.50		16.47 ± 0.20	26.84 ± 0.31	21.23 ± 0.00	20.92 ± 0.00	17.79 ± 1.06	17.53 ± 0.67
	C	16.11 ± 0.69	17.56 ± 0.20			25.37 ± 0.17	18.18 ± 0.31	21.47 ± 0.10	17.13 ± 0.40	
	D	12.48 ± 0.72				24.58 ± 0.20			19.59 ± 0.43	
	E								16.65 ± 0.33	
	F									
Zn	A	92.0 ± 0.0	145.3 ± 3.9		166.2 ± 4.2	187.7 ± 6.6	169.0 ± 1.7	201.3 ± 4.6	156.3 ± 2.5	194.7 ± 5.7
	B	97.0 ± 5.8	127.2 ± 5.0		154.2 ± 5.9	170.7 ± 2.8	172.8 ± 9.5	188.3 ± 3.9	151.5 ± 5.3	173.0 ± 3.6
	C	100.0 ± 1.2	121.8 ± 3.1			159.7 ± 1.4	170.7 ± 4.0	131.3 ± 5.2	139.3 ± 2.2	
	D	113.0 ± 2.0				180.0 ± 0.0			145.5 ± 10.2	
	E								115.5 ± 5.1	
	F									
Fe	A	1,667 ± 21	1,583 ± 19		1,900 ± 41	2,588 ± 100	3,155 ± 58	2,952 ± 58	3,418 ± 153	3,360 ± 126
	B	770 ± 12	1,688 ± 11		1,706 ± 9	1,901 ± 21	3,521 ± 58	2,418 ± 58	3,185 ± 170	3,160 ± 126
	C	1,095 ± 16	1,583 ± 15			2,588 ± 90	3,289 ± 40	2,718 ± 58	3,910 ± 222	
	D	1,137 ± 47				3,485 ± 110			3,110 ± 126	
	E								2,410 ± 150	
	F									
Na	A	19,237 ± 59	16,050 ± 100		14,660 ± 152	21,000 ± 100	24,167 ± 60	13,300 ± 173	19,400 ± 268	16,625 ± 171
	B	20,070 ± 115	15,440 ± 114		13,940 ± 114	21,300 ± 173	25,400 ± 173	13,400 ± 100	19,650 ± 252	17,775 ± 196
	C	15,720 ± 58	13,700 ± 82			20,133 ± 159	24,333 ± 208	16,167 ± 159	19,075 ± 377	
	D	18,070 ± 693				20,000 ± 170			20,000 ± [illegible]	
	E								21,800 ± 4.0	
	F									
K	A	11,140 ± 180	11,560 ± 235		10,558 ± 108	6,420 ± 50	6,453 ± 58	10,096 ± 126	6,063 ± 132	6,283 ± 158
	B	11,215 ± 144	10,910 ± 314		10,570 ± 125	8,237 ± 448	6,787 ± 58	10,980 ± 126	6,551 ± 48	7,108 ± 202
	C	11,190 ± 58	11,335 ± 104			8,120 ± 100	6,937 ± 77	10,046 ± 158	6,063 ± 141	
	D	10,190 ± 361				6,822 ± 50			6,726 ± 138	
	E								7,076 ± 95	
	F									
Mg	A	4,700 ± 10	4,075 ± 104		5,035 ± 50	7,000 ± 50	6,850 ± 50	4,030 ± 77	5,480 ± 29	5,122 ± 104
	B	3,475 ± 29	4,550 ± 41		4,116 ± 53	5,217 ± 126	6,883 ± 77	3,497 ± 50	5,572 ± 96	5,297 ± 71
	C	3,050 ± 58	3,225 ± 29			5,383 ± 29	6,150 ± 100	4,064 ± 30	6,347 ± 82	
	D	3,283 ± 104				5,696 ± 30			5,334 ± 63	
	E								5,084 ± 25	
	F									
Ca	A	26,130 ± 218	21,518 ± 743		33,158 ± 757	37,985 ± 850	36,635 ± 304	21,891 ± 426	26,607 ± 621	27,314 ± 1,054
	B	10,880 ± 58	25,805 ± 236		26,091 ± 345	18,718 ± 226	37,852 ± 190	16,424 ± 132	29,637 ± 840	24,489 ± 520
	C	10,255 ± 323	20,093 ± 317			17,152 ± 306	25,302 ± 355	25,507 ± 318	38,224 ± 385	
	D	15,063 ± 825				16,974 ± 175			24,324 ± 567	
	E								21,912 ± 384	
	F									

TABLE A3
MARSDEN BAY ZONE 3

	SIZE class	OCT	NOV	DEC	JAN	FEB	MARCH	APRIL	MAY	JUNE
Pb	A		19.38 ± 1.33		20.90 ± 1.00	26.04 ± 0.81	19.91 ± 1.00	21.45 ± 1.10	15.25 ± 3.60	22.97 ± 1.91
	B		16.93 ± 1.00		23.49 ± 1.31	25.92 ± 0.00	16.54 ± 0.71	24.24 ± 2.00	17.40 ± 1.60	27.68 ± 0.00
	C		16.12 ± 0.99		20.29 ± 1.07	24.56 ± 1.00	18.53 ± 0.81	16.26 ± 1.00		
	D						18.14 ± 0.00	19.70 ± 0.00		
	E									
	F									
Cd	A		8.37 ± 0.67		9.95 ± 0.43	5.78 ± 0.30	4.77 ± 0.10	5.71 ± 0.10	6.35 ± 1.01	4.79 ± 0.70
	B		8.87 ± 0.51		7.33 ± 0.20	3.89 ± 0.14	4.18 ± 0.10	6.11 ± 0.24	6.14 ± 0.44	8.89 ± 0.00
	C		7.89 ± 0.20		8.72 ± 0.72	5.95 ± 0.50	4.16 ± 0.10	2.93 ± 0.28		
	D						4.87 ± 0.00	7.07 ± 0.26		
	E									
	F									
Ni	A		4.34 ± 0.95		5.34 ± 1.17	4.65 ± 0.00	3.45 ± 0.57	4.42 ± 2.44	3.03 ± 0.00	2.90 ± 0.50
	B		3.09 ± 0.54		5.86 ± 0.61	4.23 ± 0.00	2.21 ± 0.61	3.87 ± 1.81	2.63 ± 0.00	2.40 ± 0.00
	C		2.82 ± 0.61		11.08 ± 0.70	4.16 ± 1.16	3.31 ± 0.57	9.31 ± 1.56		
	D						2.29 ± 0.00	3.77 ± 0.62		
	E									
	F									
Cu	A		4.02 ± 0.20		19.26 ± 0.16	20.47 ± 0.33	19.32 ± 0.00	27.77 ± 0.10	11.77 ± 0.34	14.50 ± 0.79
	B		13.11 ± 0.00		16.34 ± 0.10	19.58 ± 0.20	18.79 ± 0.10	26.40 ± 0.20	13.71 ± 0.47	9.88 ± 0.00
	C		11.71 ± 0.20		18.30 ± 0.20	18.63 ± 0.10	16.95 ± 0.00	24.50 ± 0.00		
	D						18.52 ± 0.10	25.19 ± 0.20		
	E									
	F									
Zn	A		242.3 ± 5.3		217.3 ± 7.6	203.0 ± 8.5	223.3 ± 1.9	224.8 ± 6.6	220.0 ± 7.5	257.2 ± 6.2
	B		235.5 ± 6.6		199.7 ± 1.5	160.0 ± 0.0	227.0 ± 6.0	211.8 ± 6.0	222.3 ± 4.2	321.0 ± 20.0
	C		195.0 ± 0.0		311.0 ± 17.3	179.7 ± 1.5	219.0 ± 1.0	276.0 ± 1.0		
	D						120.0 ± 1.0	308.0 ± 28.3		
	E									
	F									
Fe	A		1,473 ± 33		2,121 ± 116	1,888 ± 100	1,708 ± 35	1,835 ± 44	1,788 ± 111	2,160 ± 50
	B		1,182 ± 16		1,718 ± 100	1,288 ± 40	1,332 ± 42	1,858 ± 59	1,352 ± 87	2,185 ± 60
	C		615 ± 30		2,288 ± 100	921 ± 35	1,198 ± 15	3,413 ± 116		
	D						985 ± 10	2,490 ± 97		
	E									
	F									
Na	A		17,350 ± 158		27,400 ± 100	27,333 ± 153	31,933 ± 59	18,375 ± 96	30,133 ± 116	13,900 ± 182
	B		15,660 ± 114		27,867 ± 117	23,767 ± 252	33,833 ± 252	18,860 ± 207	30,833 ± 153	15,800 ± 310
	C		13,800 ± 200		24,767 ± 306	31,833 ± 153	28,100 ± 100	17,433 ± 116		
	D						26,200 ± 150	16,000 ± 141		
	E									
	F									
K	A		11,585 ± 126		7,287 ± 58	7,687 ± 58	6,763 ± 100	10,410 ± 41	6,833 ± 87	6,333 ± 122
	B		12,160 ± 245		7,520 ± 30	8,670 ± 50	7,480 ± 30	10,210 ± 127	7,816 ± 30	6,333 ± 100
	C		12,547 ± 202		7,037 ± 30	9,920 ± 87	8,046 ± 77	10,893 ± 116		
	D						6,822 ± 30	11,397 ± 491		
	E									
	F									
Mg	A		5,150 ± 100		9,200 ± 361	8,483 ± 104	6,898 ± 50	6,550 ± 129	6,580 ± 189	6,930 ± 129
	B		4,475 ± 185		8,067 ± 77	4,800 ± 50	6,564 ± 104	6,940 ± 65	6,880 ± 158	12,097 ± 210
	C		2,896 ± 100		6,600 ± 87	5,883 ± 58	4,713 ± 29	5,733 ± 104		
	D						3,896 ± 60	4,696 ± 0		
	E									
	F									
Ca	A		14,093 ± 511		33,718 ± 2176	19,985 ± 350	16,491 ± 252	23,793 ± 862	24,559 ± 947	31,676 ± 715
	B		15,268 ± 685		29,218 ± 901	15,952 ± 59	10,907 ± 208	27,690 ± 292	27,609 ± 551	41,526 ± 930
	C		10,074 ± 115		33,818 ± 475	8,718 ± 77	10,057 ± 333	21,980 ± 500		
	D						6,724 ± 50	10,174 ± 231		
	E									
	F									

APPENDIX 6

DESCRIPTION OF THE SITES

A. ARDNAMURCHAN POINT - LOCH SUNART

The Ardnamurchan Point - Loch Sunart area (see map, Fig. III.1) was chosen as a suitable area in which to investigate the effect of fresh water and exposure on limpet form, growth and heavy metal concentration and also to provide a control of "unpolluted" water with which to compare results from east coast sites.

Samples were taken from four sites, which ranged from a sheltered site with reduced salinity about half way up Loch Sunart, to a site exposed to the full force of the Atlantic seas and weather (see Fig. III.2)

All four sites had fairly gentle sloping shorelines, but not the same bedrock.

A.1. Salen (Grid Ref. 6468) is in a small bay, facing south, sheltered by the shores of the long and narrow Loch Sunart, which at this point has a salinity (surface water, gradient) of about 30‰. This level of salinity is reflected in the sublittoral flora (Sheppard pers.comm) but the intertidal flora is typical of a clean, sheltered west coast shoreline. Enteromorpha, Pelvetia canaliculata and Fucus spiralis dominate the high-tide region, giving way successively down the shore to luxuriant growths of Fucus vesiculosus Fucus serratus and Ascophyllum nodosum.

Apart from numerous limpets the shore also supports large number of Nucella lapillus and winkles Littorina spp. and colonies of large Mytilus edulis.

The bedrock is mica schist. Samples were taken from Zone 3, according to the zonation described for the Marsden Bay study.

A.2. Glenmore Bay (Grid Ref.6258). This south-facing bay is situated near the mouth of Loch Sunart, but it is still fairly sheltered from the open sea by the Isle of Mull.

The rock comprising the gently shelving shore is undifferentiated metamorphic (gneiss).

The fauna and the flora are similar to those found at Salen but Fucus serratus is more abundant than Ascophyllum nodosum and there are no Mytilus edulis. Both Laminaria digitata and L.hyperborea grow here in abundance below the low-tide level, indicating a salinity close to that of the open sea.

Samples from Zones 1 and 3 were collected.

A.3. Kilchoan (Grid Ref. 4863). This site is situated in a bay on the southern side of the Ardnamurchan Peninsula, considerably exposed to the Atlantic seas and weather but still somewhat protected by the Isle of Mull to the south-west. The salinity of the water is that of the open sea, and the substrate is undifferentiated metamorphic rock (gneiss).

The flora and fauna is similar to those of Glenmore Bay but Ascophyllum is replaced almost completely by Fucus serratus. Limpets were numerous at all tide levels. Samples were collected from Zones 1 and 3.

A.4. Ardnamurchan Point (Grid Ref. 4167). This site is the most westerly point on the mainland of Britain, and is extremely exposed to the full force of the North Atlantic.

The rocky shore composed of gabbro, is well populated with limpets and vegetated with Pelvetia caualiculata, Fucus spiralis and F.serratus.

Samples were collected from Zones 1 and 3.

B. SHETLAND ISLES (Grid Ref. 4363)

In the Shetland Islands' study an attempt was made to collect limpets from sites with both different bedrock and kind of exposure. Unfortunately, it became impossible to collect as complete a range of samples as was intended.

Table III.2 illustrates the kind of sampling undertaken and a map (see Fig III.3) illustrates the location of the sites. Five sites were selected:

(1) Haroldswick an area where serpentine crops out,

(2) Cllaberry - schist

(3) Otterswick Yell - gneiss

(4) Rona's Voe - granite

(5) Whiteness Voe - limestone

It was decided to collect limpets from sites with different rock-type as well as different degrees of exposure, in order to ascertain if the rock-type of sampling area, and the probable chemical weathering due to wave action, or the load in metals of local small streams could have any influence on the results of the geochemical analysis of limpets.

Specimens were collected in the same way as in the main study area of Marsden Bay, the same criteria were used for the zonation.

The topography of the five sites varied and the intertidal flora was rather poorer in comparison with other sites in Britain, an observation made by Irving (1974).

Ascophyllum nodosum often dominates the mid-tide area in Voes. Fucus ceranoides is common in the mouths of streams and a wide range of green algae is found. In the shallow sublittoral area Fucus serratus gives way to Laminaria saccharina. L. hyperborea is present where a stable rock substrate is available, while L. digitata becomes prominent about low-water mark. In the mid-tide area Fucus spp. gives way progressively up the shore to a Balanus balanoides belt, Patella vulgata is abundant and the lower shore is often dominated by densely packed Mytilus.

C. NORTH-EAST COAST OF BRITAIN

C.1. Isle of May (Grid Ref. NO60 6599). This site is mainly polluted by "nutrients" (estuarine situation heavily affected by the sewage dis-

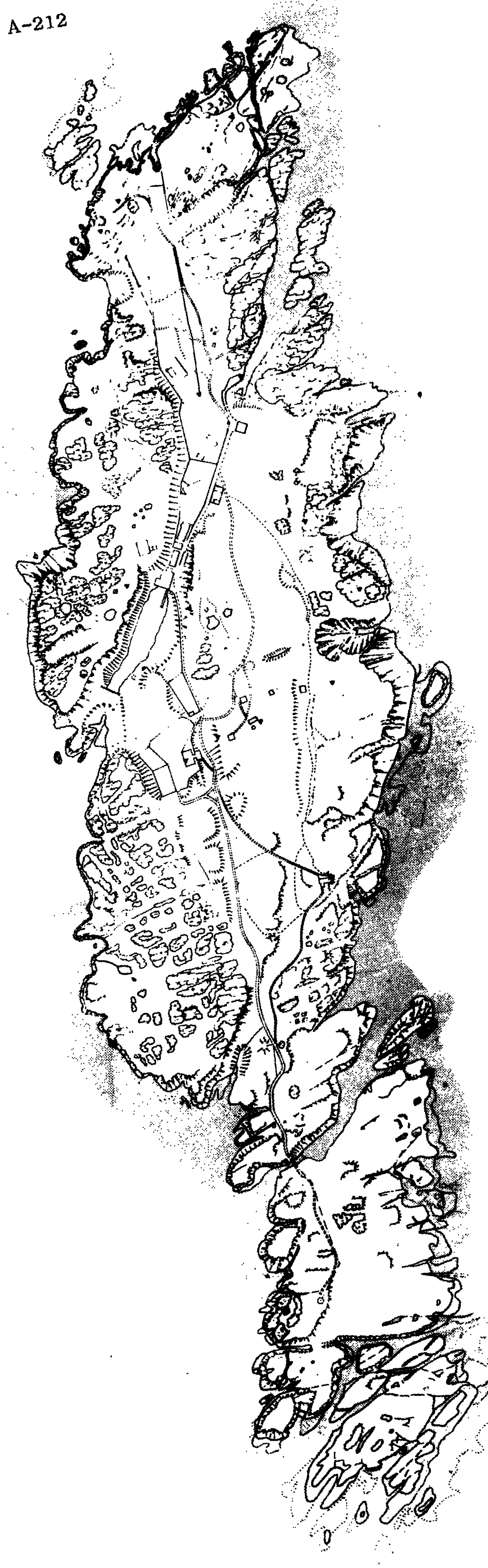


Fig. A.6(i): Isle of May.

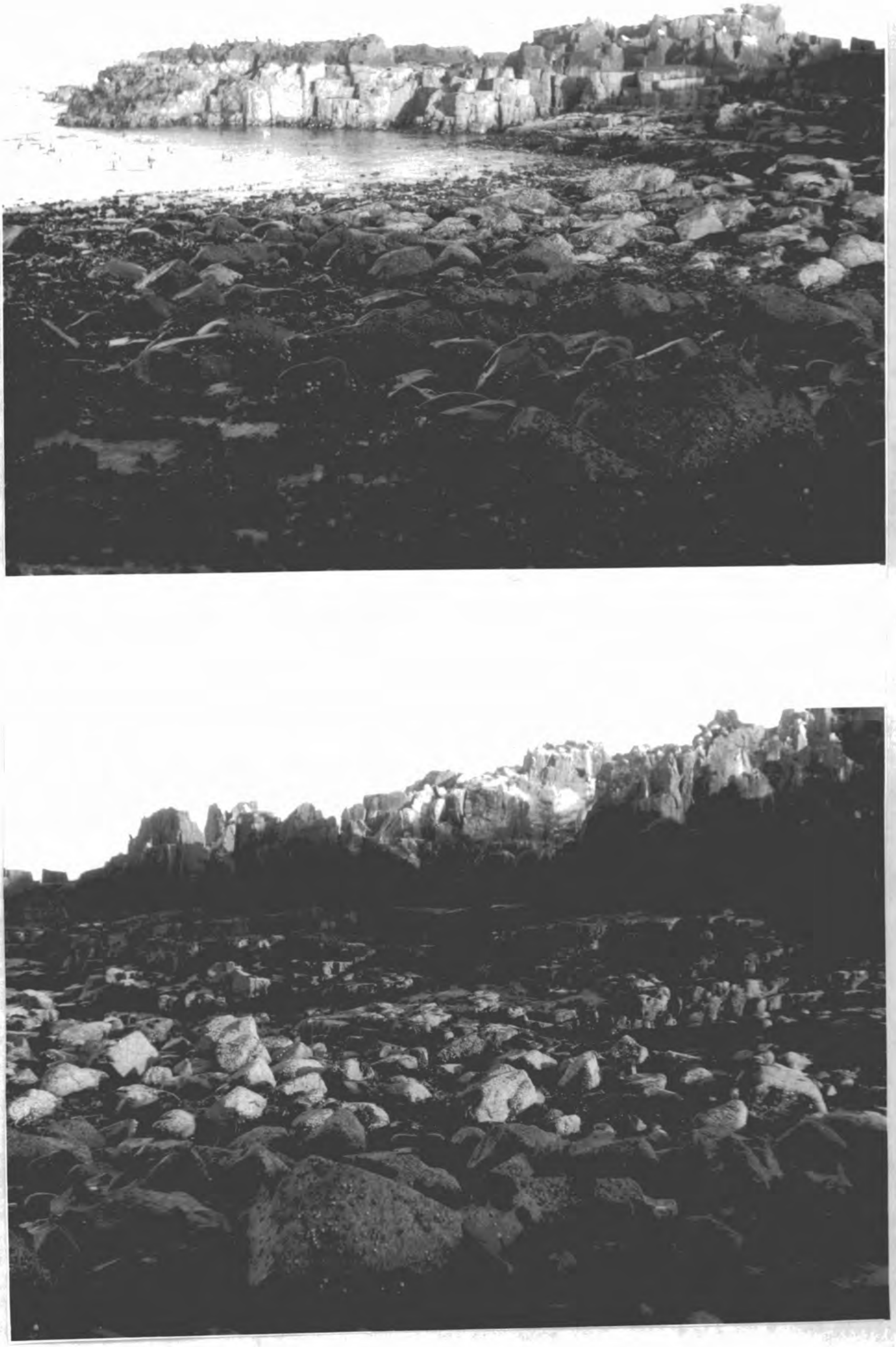


Fig. A-6.ii

charge of Edinburgh) from Firth of Forth (Jones 1970; Starkie 1970;) Samples were taken from the south coast of the Island (see Fig.A-6.i) at an exposed shore, which consisted of basalt.

The main characteristic of the limpet population was the high frequency of large individuals, and the very rich vegetation of the shore.

Limpets were collected from Zones 1 and 3. Figure A-6.ii shows the study area at low-tide.

C.2. St. Abb's Head (Grid Ref.NT69 9069). According to Watson and Watson (1968) and Starkie (1970) there is a movement of the tidal wave southward along the east coast of Britain and currents

So one could expect that pollution from the Firth of Forth would have some effect along the coast of St.Abb's.

On the other hand Bellamy et al.(1968),John (1968),Jones (1970),Bellamy (1972), Bellamy et al. (1972); regard this coast as "unpolluted". In addition, there is no heavy industry here and no local sewage discharge, owing to the sparse population.

Sampling was carried out in a small bay to the north of St.Abb's Head. The coastline here is exposed, though the actual sampling area was relatively sheltered.

Steep stratified cliffs of andesite and basalt lava give way to a gently sloping rocky intertidal zone. The rocky intertidal area is dominated throughout by limpets Patella vulgata and a few Patella aspera. Some dog-wheiks are apparent in the mid- and low-tide zones (Nucella lapillus) and barnacles with Balanus balanoides predominating. Patches of Fucus spp. occur in the lower zone and dense Laminaria digitata may be observed at extreme low-tide. In the sub-littoral zone a rich L. hyperborea forest ("kelp" forest) extends.

C.3. *Blackhall Rocks* Co.Durham (Grid Ref.Ordnance Survey 4738,4739) This site consisted of an exposed coast and headland of Magnesian Limestone, with beaches of sand and shingle.

The proximity of several coal mines discharging waste into the sea must be mentioned (Watson and Watson 1968).

The site must be considered to be heavily "polluted" by suspended material some of which may well be natural, that is from the eroding and weathering dolomite cliffs. Apart from this, there is no major discharge of sewage or other industrial waste in the area.

The fauna was impoverished. There were a few limpets and the only abundant species was *Mytilus edulis*.

The flora consisted of a few patches of *Fucus serratus*.

C.4. *South Gare* (Cleveland) (Grid Ref.NZ52 5527). The collecting site at South Gare was on the seaward side of the breakwater extending out from the mouth of the River Tees. The area comprised a very gently sloping beach of broken rocks and boulders, making up a fairly exposed environment. The flora and fauna were both rather poor, the former consisting mainly of *Fucus serratus* with some *Enteromorpha* and *Rhodymenia palmata*. The dominant animal species was *Mytilus edulis* and the three *Littorina* species were also present. *Nucella lapillus* was notable by its absence while *Patella vulgata* was easily found near the low-tide mark, becoming progressively rarer up the beach. Most of the limpets from Zone 3 were in fact collected from the concrete wall of the breakwater.

Samples from this site were collected in January (2 zones) March (1 zone) and June (1 zone).

From the situation of the collecting site one could expect relatively low and fluctuating levels of salinity and a high level of pollution from both domestic and industrial wastes.

Previous work on the kelp (Jones 1970; Bellamy *et al*. 1967) and on starfish, seaweeds and mussels (Bellamy 1972; Starkie 1970) has shown high concentrations of heavy metal ions. Gray *et al*. (1971) also examining the micro- and meio fauna of sand from Redcar beaches pointed out that in comparison to southern sites Redcar is polluted by heavy metals.

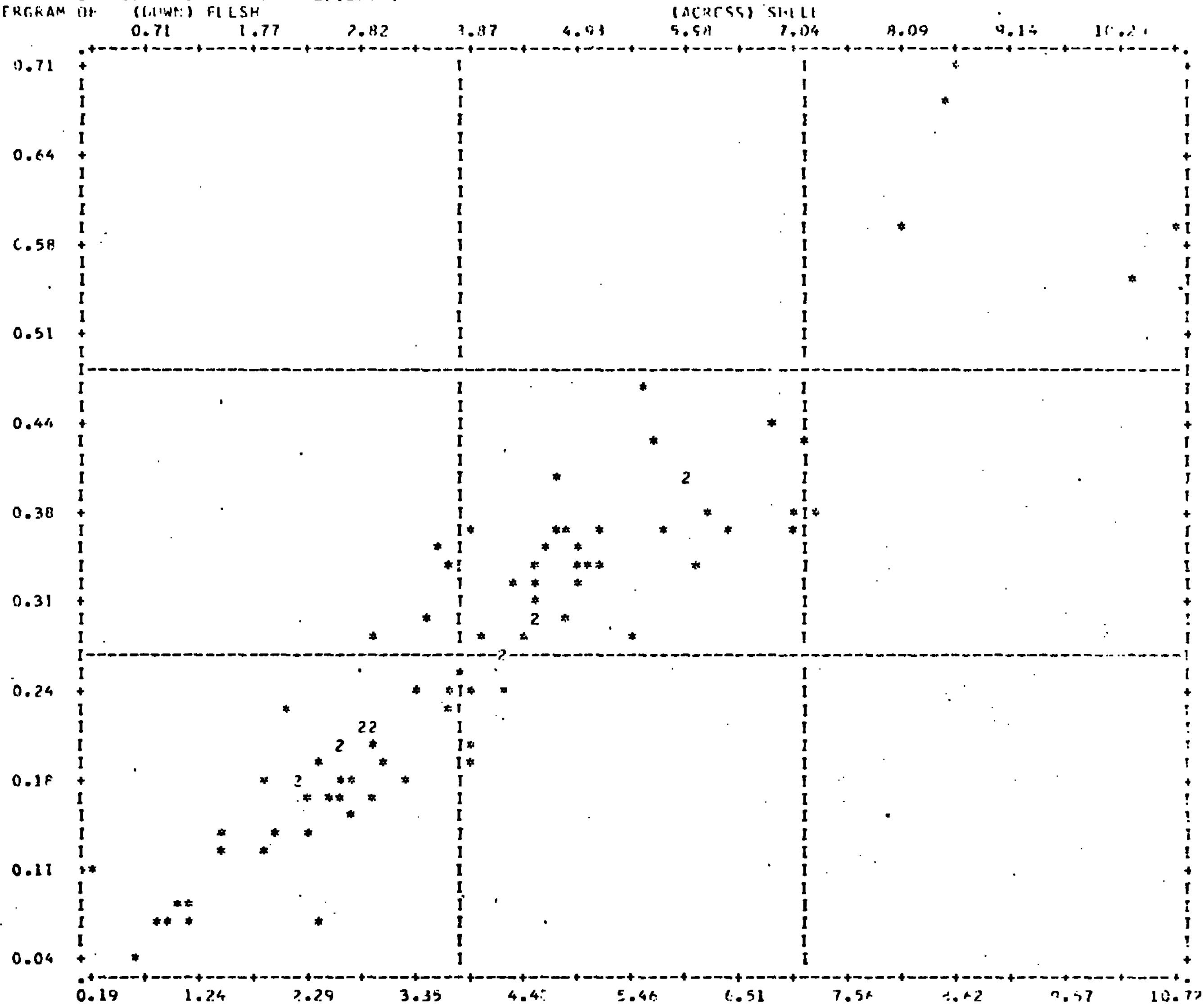
C.5. *Robin Hood's Bay* (Grid Ref. NZ90 956046). The collection of the limpets was made at an intermediately exposed bay on the exposed coastline, which gently slopes towards the sea. Limpets were collected from the low-tide area where they were fairly common. *Littorina littorea* and *Thais lapillus* were present while the number of very small *Mutilys edulis* was marked. Algae were rather sparse along the upper beach but *Fucus serratus* became abundant below M.L.W.N. succeeded by *Laminaria* spp.

APPENDIX 7

Computer scattergrams of flesh weight/shell weight relationship for sub-populations collected from Zones 1 and 3 at Area A: Ardnamurchan Point - Loch Sunart.

ARDNAMURCHAN 1 02/12/75

FILE NONAME (CREATION DATE = 02/12/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



ARDNAMURCHAN 1 02/12/75 PAGE 3

STATISTICS..

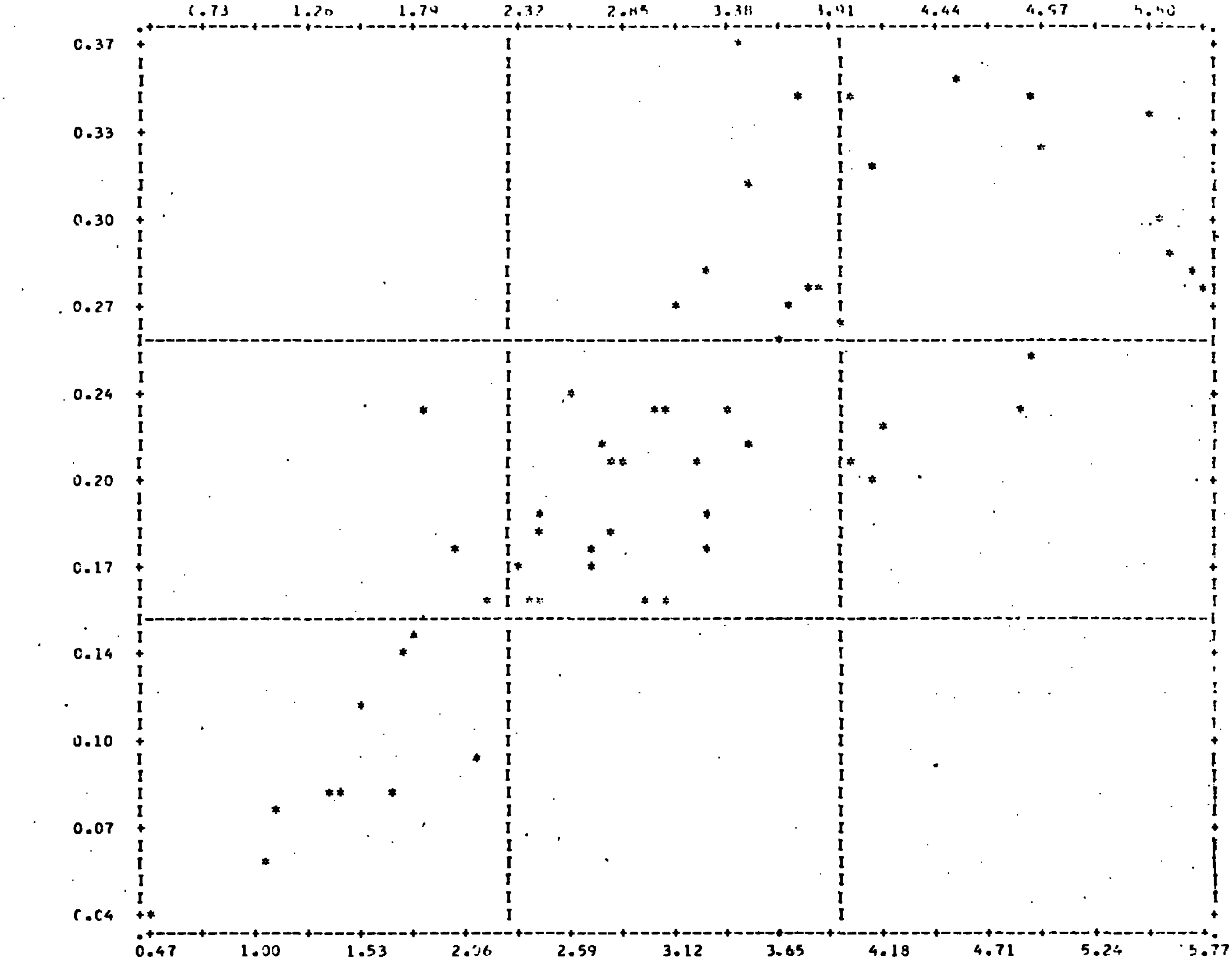
CORRELATION (R)-	0.92529	R SQUARED -	0.85616	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.05111	INTERCEPT (A) -	0.04219	SLOPE (B) -	0.05929

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF -0.04697 ON THE LEFT MARGIN
A VALUE OF 0.68428 ON THE RIGHT MARGIN

PLOTTED VALUES - 87 EXCLUDED VALUES- 0 MISSING VALUES - 0

ARDNAMURCHAN 3 02/12/75 PAGE 2

FILE NONAME (CREATION DATE = 02/12/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



ARDNAMURCHAN 3 02/12/75 PAGE 3

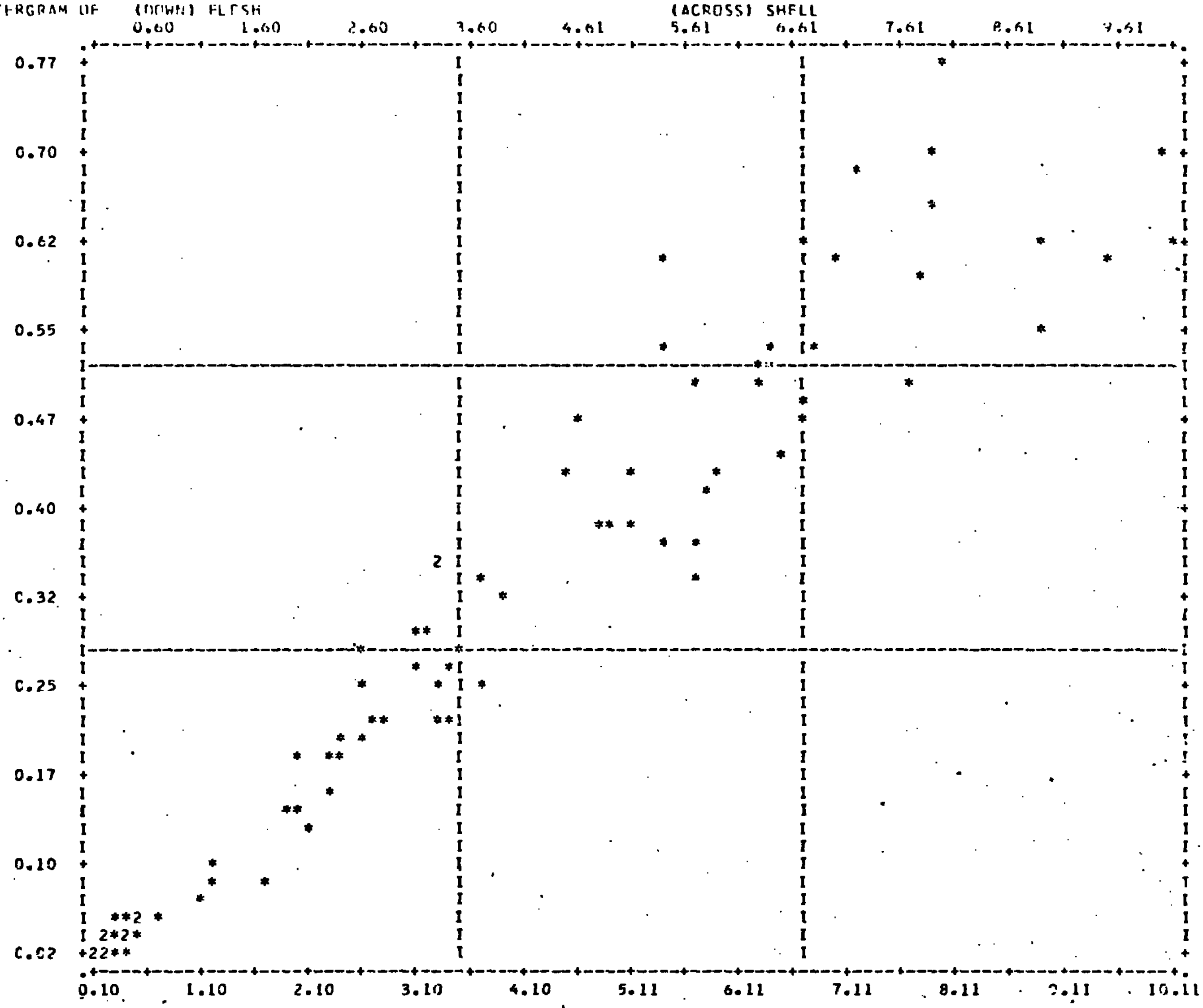
STATISTICS..

CORRELATION (R)-	0.80992	R SQUARED	-	0.65597	SIGNIFICANCE	-	0.00001
STD ERR OF EST -	0.04745	INTERCEPT (A)	-	0.05344	SLOPE (B)	-	0.05155

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.07483 ON THE LEFT MARGIN
A VALUE OF 0.35360 ON THE RIGHT MARGIN

GLENMORE 1 02/12/75 PAGE 2

FILE NONAME (CREATION DATE = 02/12/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



GLENMORE 1 02/12/75 PAGE 3

STATISTICS..

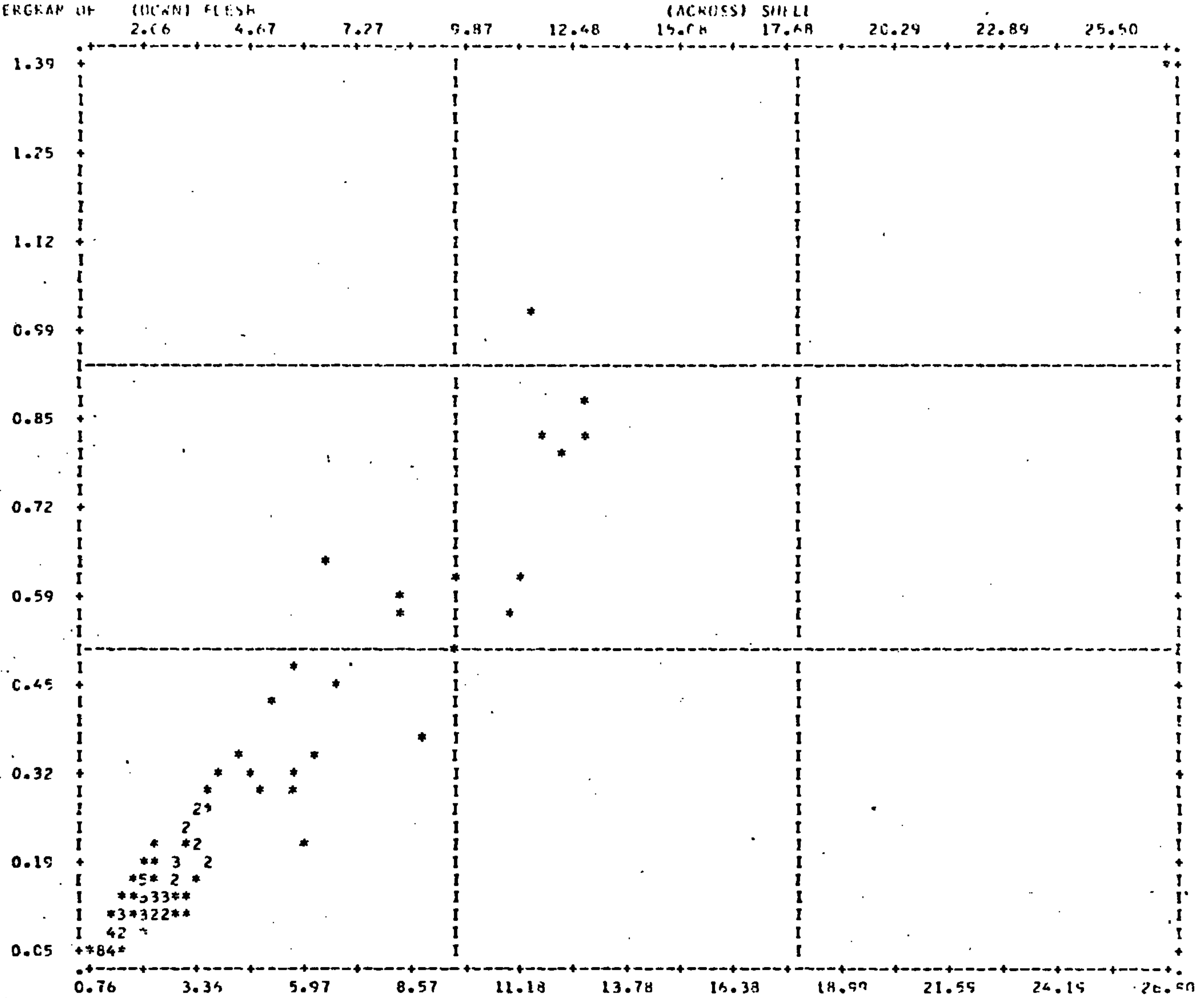
CORRELATION (R)-	0.96113	R SQUARED -	0.92377	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.05930	INTERCEPT (A) -	0.03199	SLOPE (B) -	0.07372

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.03205 ON THE LEFT MARGIN
A VALUE OF 0.78468 ON THE RIGHT MARGIN

PLOTTED VALUES - 82 EXCLUDED VALUES 0 MISSING VALUES

GLENMORE 3 02/12/75 PAGE 2

FILE NONAME (CREATION DATE = 02/12/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



GLENMORE 3 02/12/75 PAGE 3

STATISTICS..

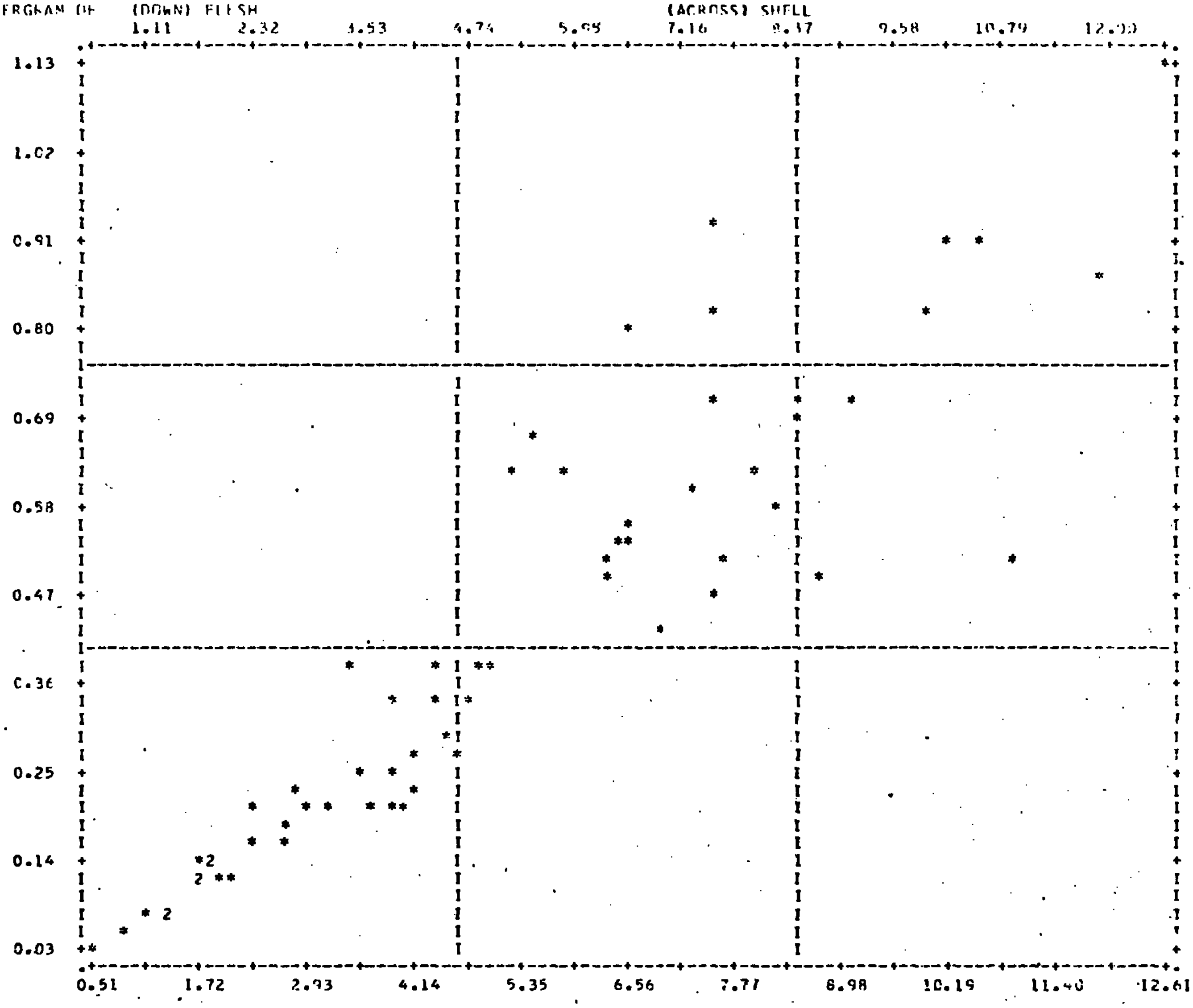
CORRELATION (R)-	0.95736	R SQUARED -	0.91655	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.06811	INTERCEPT (A) -	0.02547	SLOPE (B) -	0.05943

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.05516 ON THE LEFT MARGIN
A VALUE OF 23.37456 ON THE TOP MARGIN

PLOTTED VALUES -	100	EXCLUDED VALUES-	0	MISSING VALUES -	0

KILCHOAN 1 02/11/75 PAGE 2

FILE NENAME (CREATION DATE = 02/11/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



KILCHOAN 1 02/11/75 PAGE 3

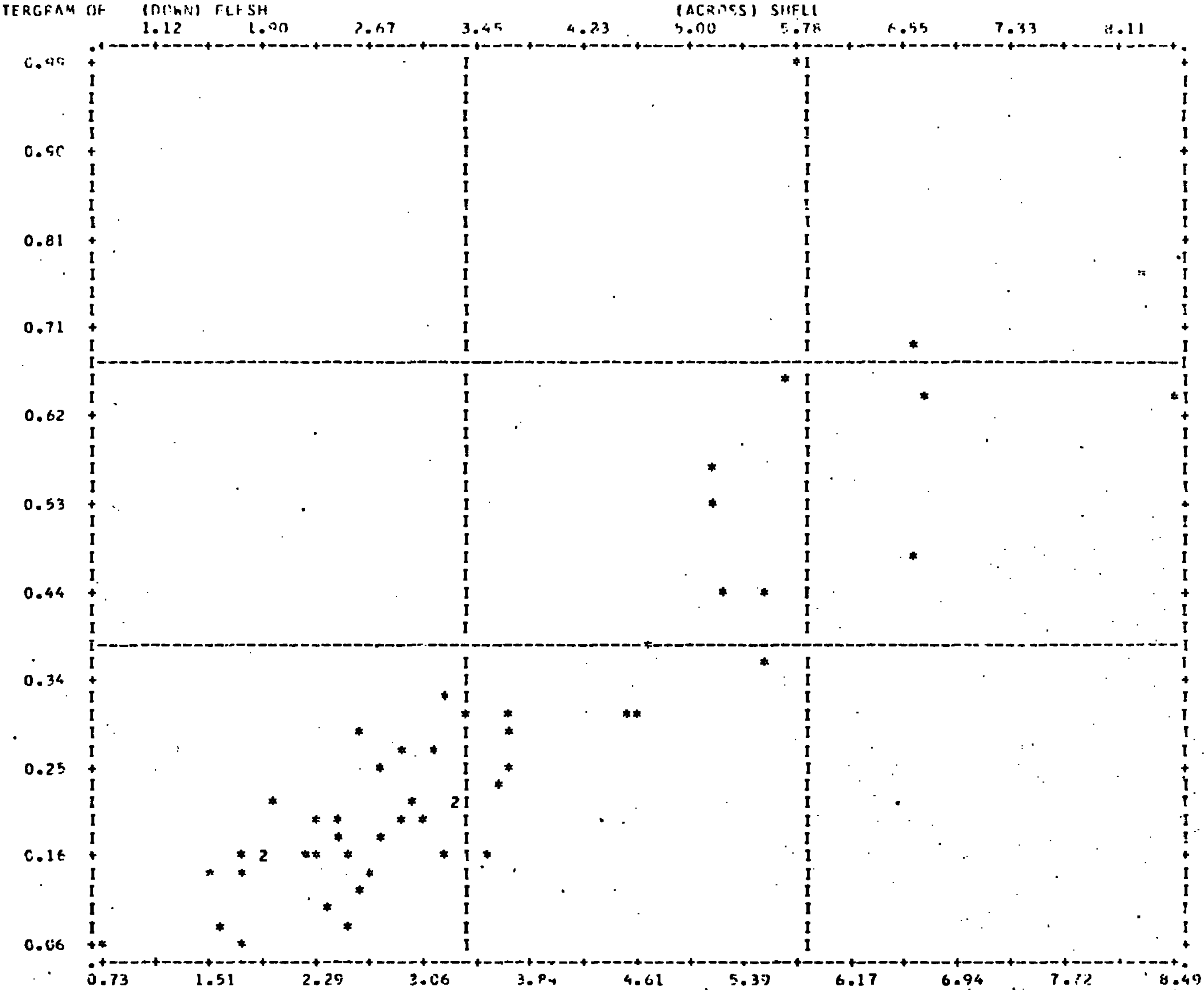
STATISTICS..

CORRELATION (R)-	0.91516	R SQUARED	-	0.83752	SIGNIFICANCE	-	0.00001
STD ERR OF EST -	0.10943	INTERCEPT (A)	-	-0.00350	SLOPE (B)	-	0.08283

THE REGRESSION LINE HITS THE MARGINS OF THE PLOT AT
A VALUE OF 0.02864 ON THE LEFT MARGIN
A VALUE OF [illegible].05084 ON THE RIGHT MARGIN

KILCHOAN 3 02/11/75 PAGE 2

FILE NONAME (CREATION DATE = 02/11/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



KILCHOAN 3 02/11/75 PAGE 3

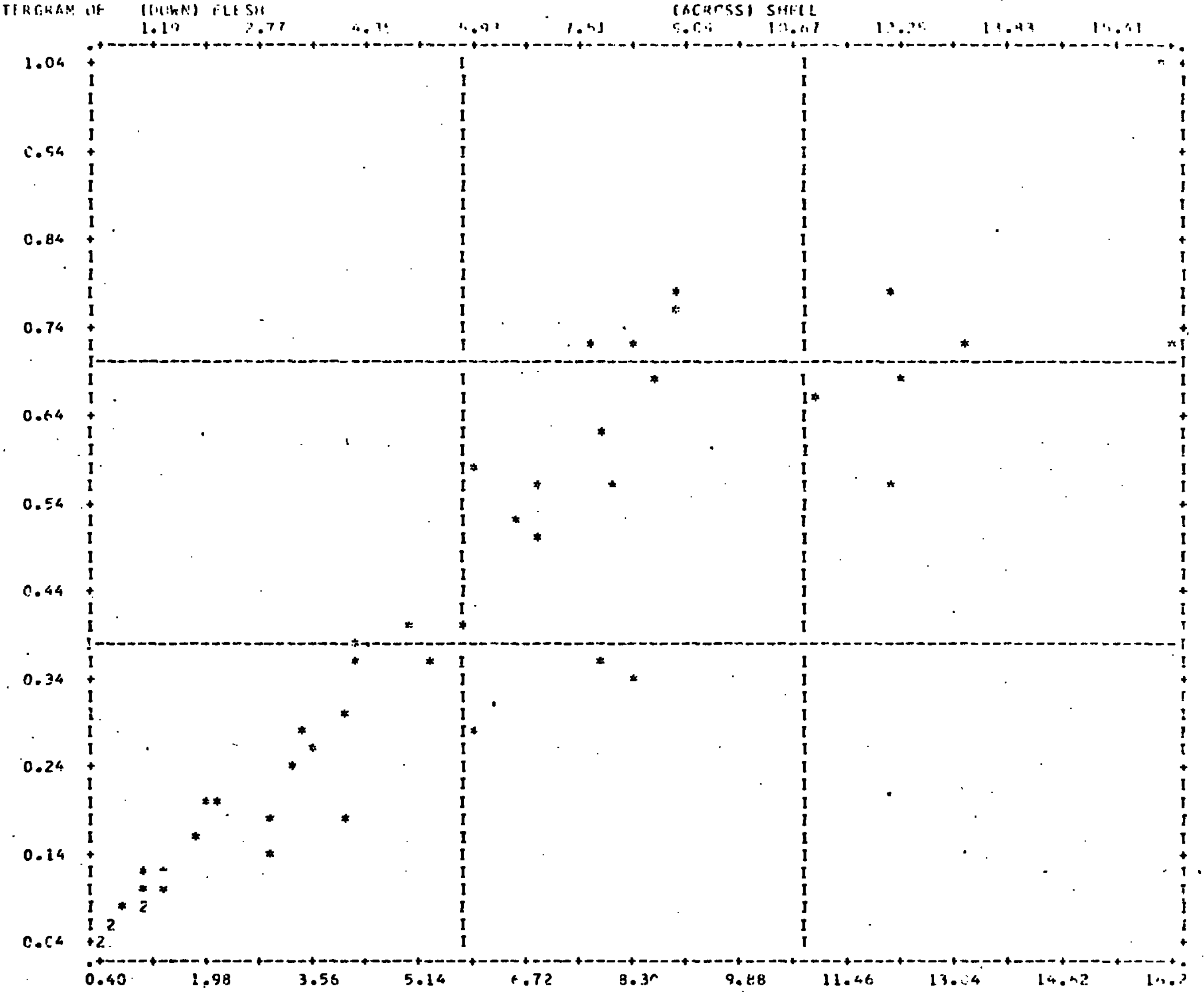
STATISTICS..

CORRELATION (R)-		0.88168	R SQUARED	-	0.77735	SIGNIFICANCE	-	0.00001
STD ERR OF EST -		0.09562	INTERCEPT (A)	-	-0.06142	SLOPE (B)	-	0.10143

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 1.06337 ON THE BOTTOM MARGIN
A VALUE OF 0.80800 ON THE RIGHT MARGIN

SALEN 3 02/12/75 PAGE 2

FILE NCNAME (CREATION DATE = 02/12/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



SALEN 3 02/12/75 PAGE 3

STATISTICS..

CORRELATION (R)-	0.92203	R SQUARED -	0.85013	SIGNIFICANCE -	.00001
STD ERR OF EST -	0.10209	INTERCEPT (A) -	0.07593	SLOPE (B) -	0.05664

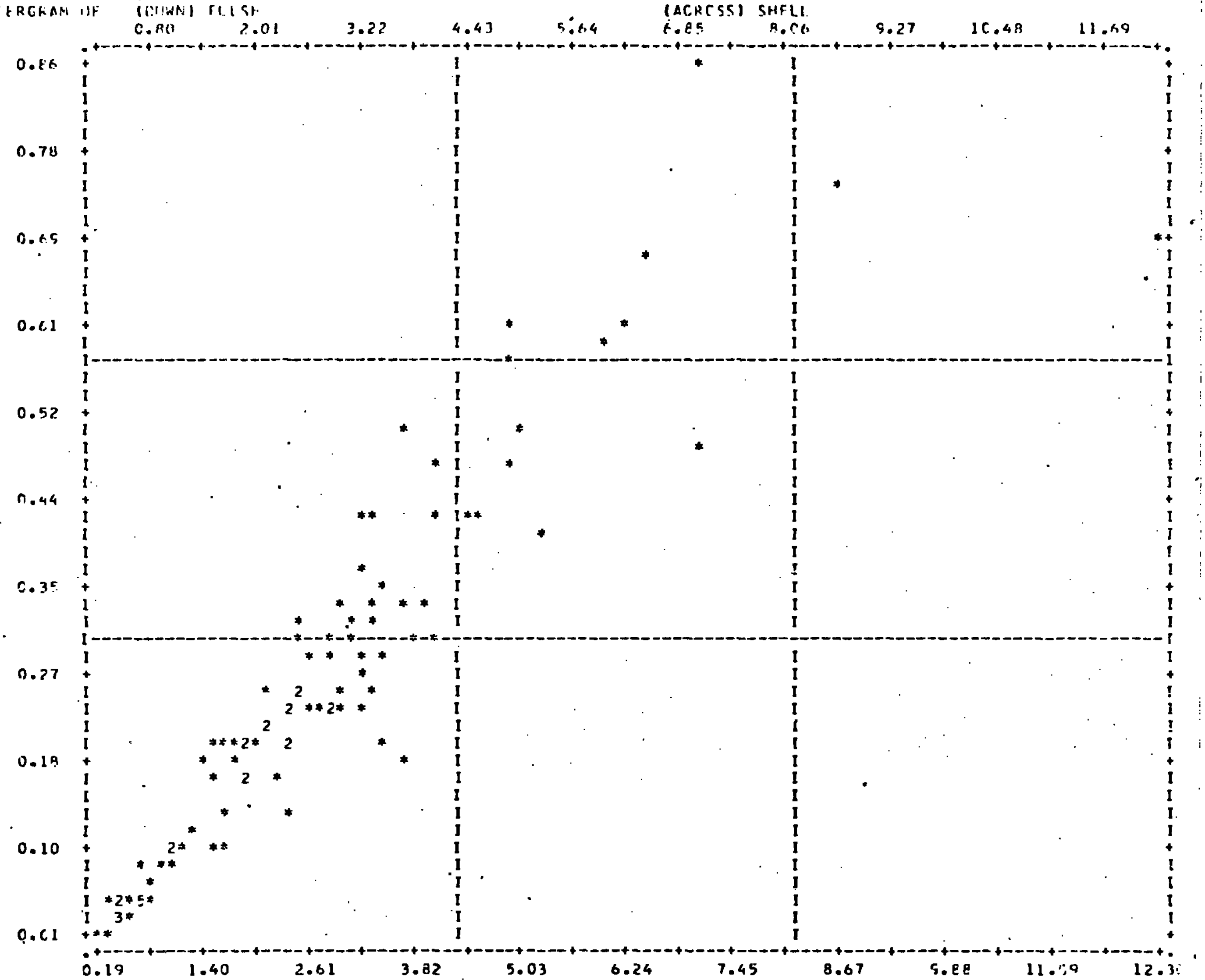
THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.08941 ON THE LEFT MARGIN
A VALUE OF 1.00232 ON THE RIGHT MARGIN

APPENDIX 8

Computer Scattergrams at flesh weight/shell weight relationship for sub-populations collected from Zones 1, 2 and 3 at Area B: Shetland Islands.

HAROLDSWICK 2 07/16/75 PAGE 2

FILE NONAME (CREATION DATE = 07/16/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



HAROLDSWICK 2 07/16/75 PAGE 3

STATISTICS..

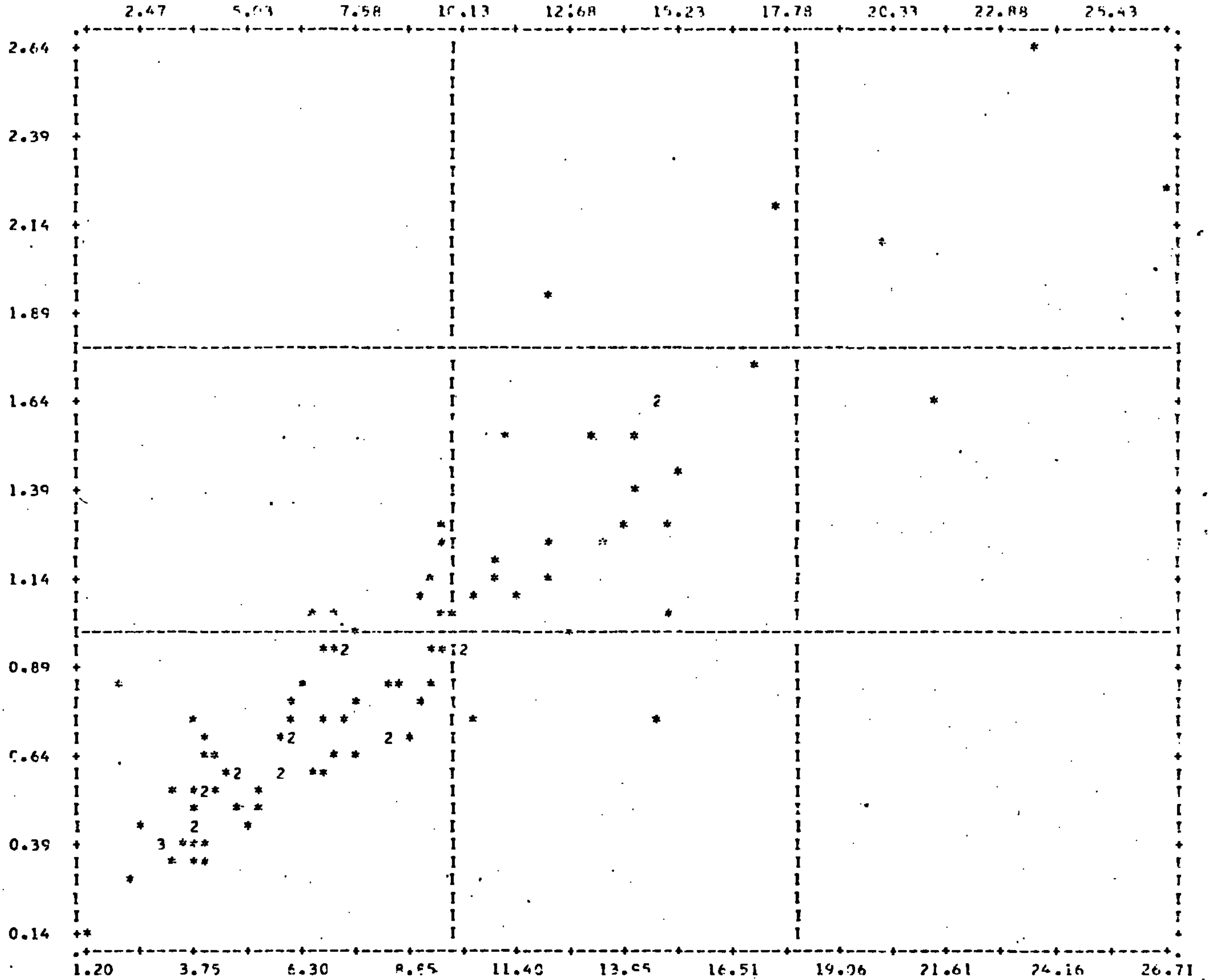
CORRELATION (R)-	0.91782	R SQUARED -	0.84239	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.07176	INTERCEPT (A) -	0.03460	SLOPE (B) -	0.08401

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.04047 ON THE LEFT MARGIN
A VALUE OF 10.08792 ON THE TOP MARGIN

PLOTTED VALUES -	57	EXCLUDED VALUES-	0	MISSING VALUES -	0

HAROLDSWICK 3 08/15/75 PAGE 2

FILE NONAME (CREATION DATE = 08/15/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



HAROLDSWICK 3 08/15/75 PAGE 3

STATISTICS..

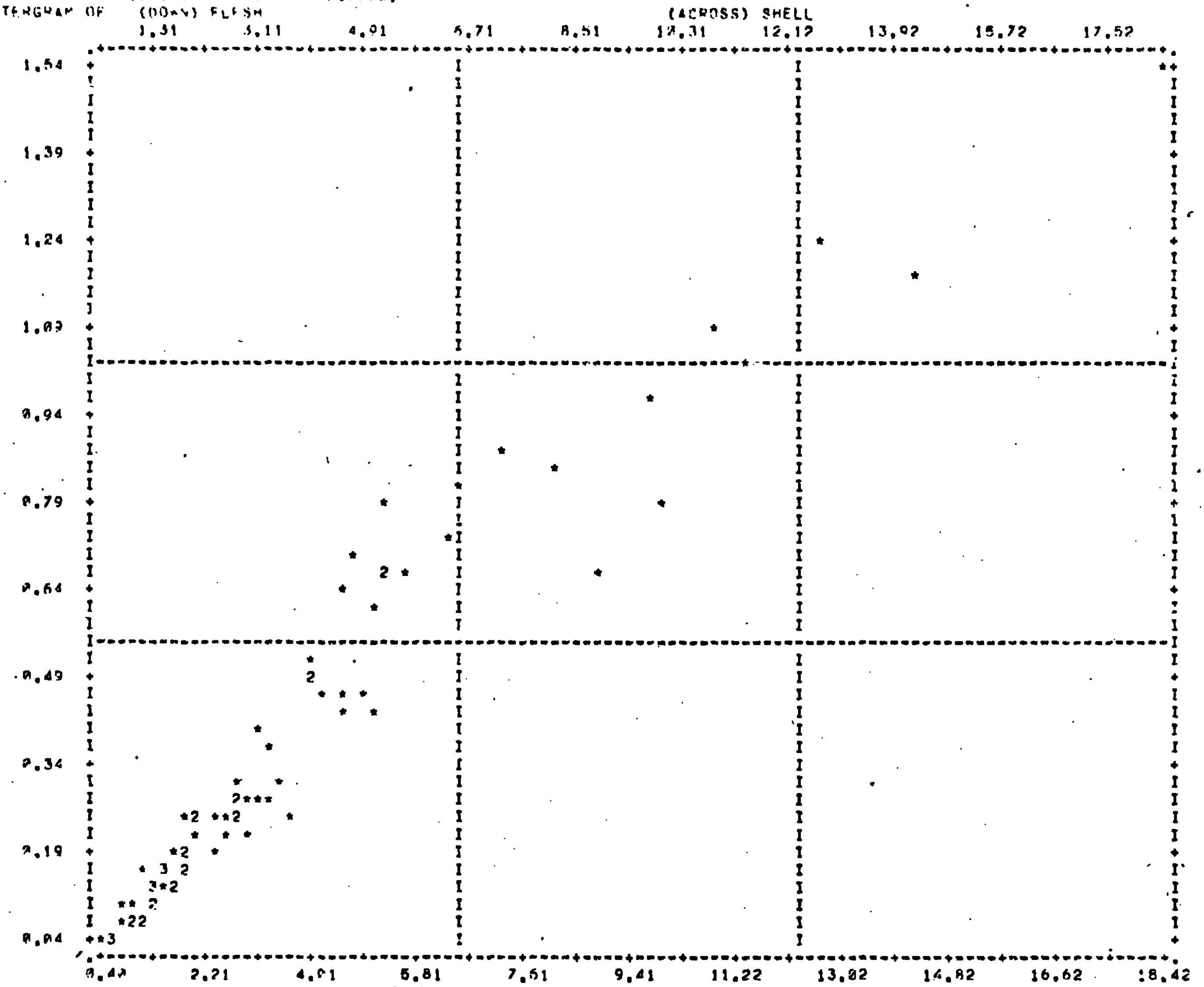
CORRELATION (R)-	0.90585	R SQUARED -	0.82057	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.15972	INTERCEPT (A) -	0.19285	SLOPE (B) -	0.08654

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.27453 ON THE LEFT MARGIN
A VALUE OF 2.52629 ON THE RIGHT MARGIN

PLOTTED VALUES -	58	EXCLUDED VALUES-	0	MISSING VALUES -	0

OLLABERRY 2 08/15/75 PAGE 2

FILE NONAME (CREATION DATE = 08/15/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



OLLABERRY 2 08/15/75 PAGE 3

STATISTICS..

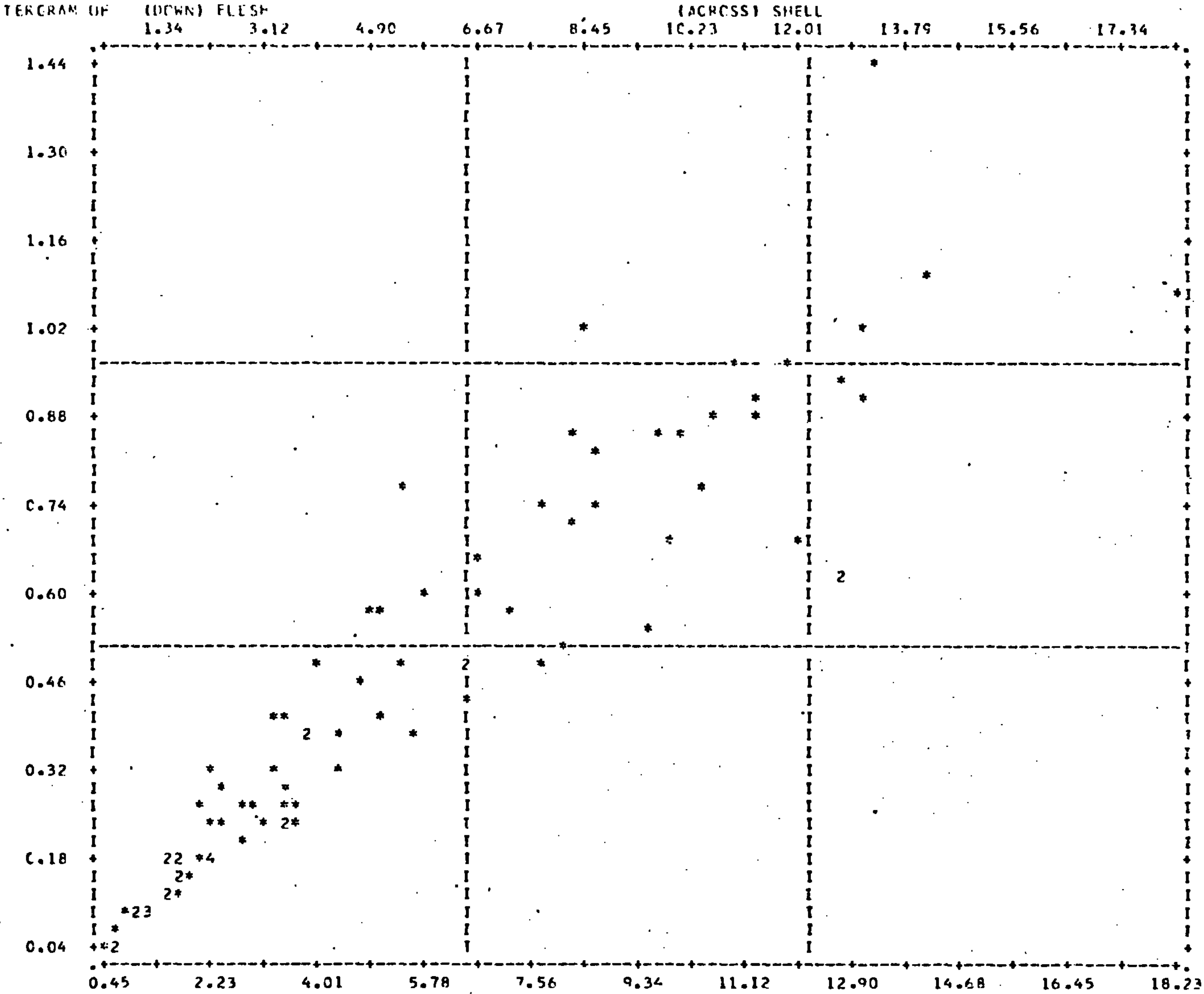
CORRELATION (R)-	0.96183	R SQUARED -	0.92512	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.03009	INTERCEPT (A) -	0.05656	SLOPE (B) -	0.09143

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.07711 ON THE LEFT MARGIN
A VALUE OF 16.58501 ON THE TOP MARGIN

PLOTTED VALUES - 76 EXCLUDED VALUES- 0 MISSING VALUES - 0

OLLABERRY 3 07/16/75 PAGE 2

FILE NONAME (CREATION DATE = 07/16/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



OLLABERRY 3 07/16/75 PAGE 3

STATISTICS..

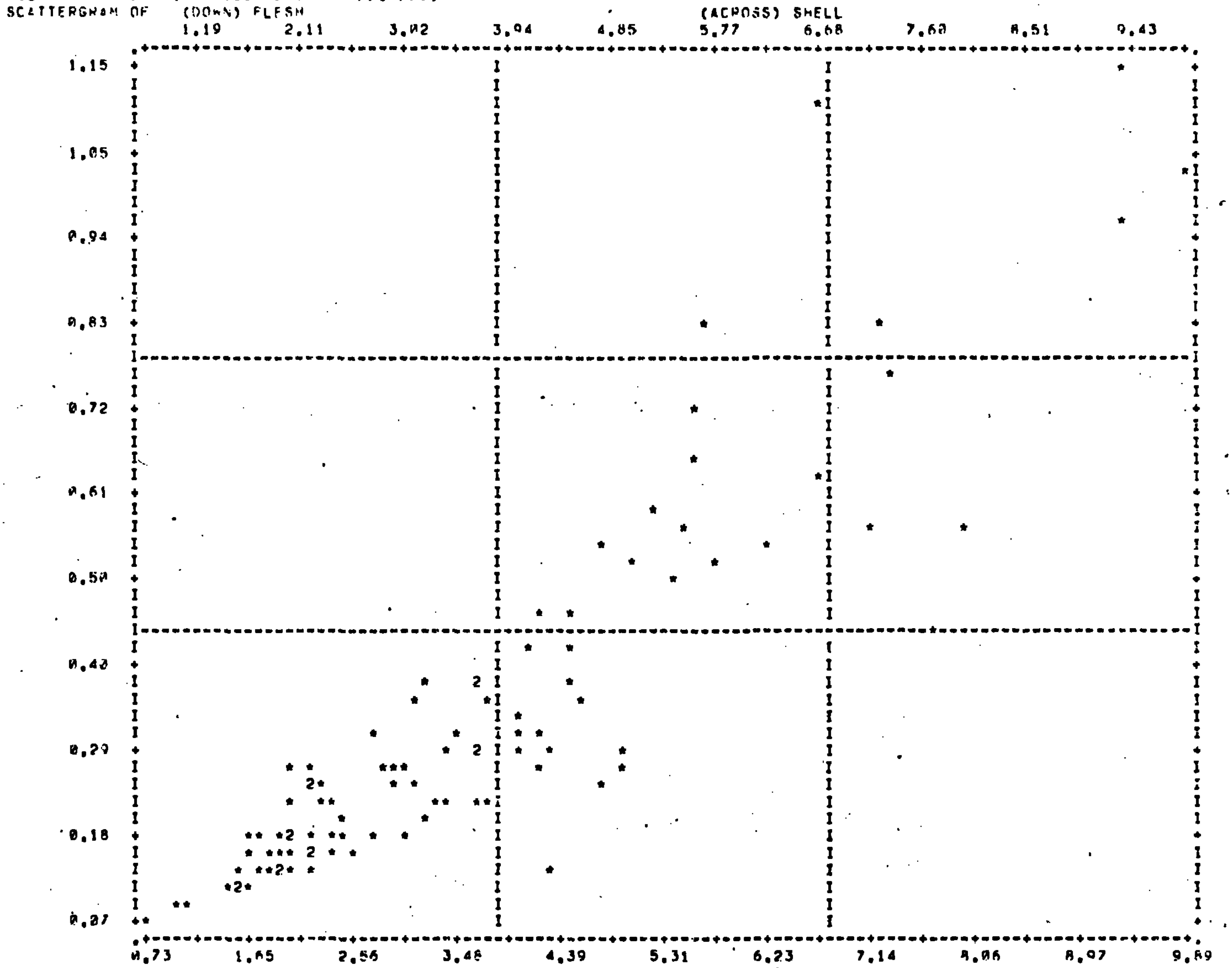
CORRELATION (R)-	0.92667	R SQUARED -	0.85871	SIGNIFICANCE -	0.0000[illegible]
STD ERR OF EST -	0.11873	INTERCEPT (A) -	0.07762	SLOPE (B) -	0.070[illegible]

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.09689 ON THE LEFT MARGIN
A VALUE OF 1.38102 ON THE RIGHT MARGIN

PLOTTED VALUES - 89 EXCLUDED VALUES- 0 MISSING VALUES - 0

OTTERSWICK YELL 1 07/14/75 PAGE 2

FILE NONAME (CREATION DATE = 07/14/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



OTTERSWICK YELL 1 07/14/75 PAGE 3

STATISTICS..

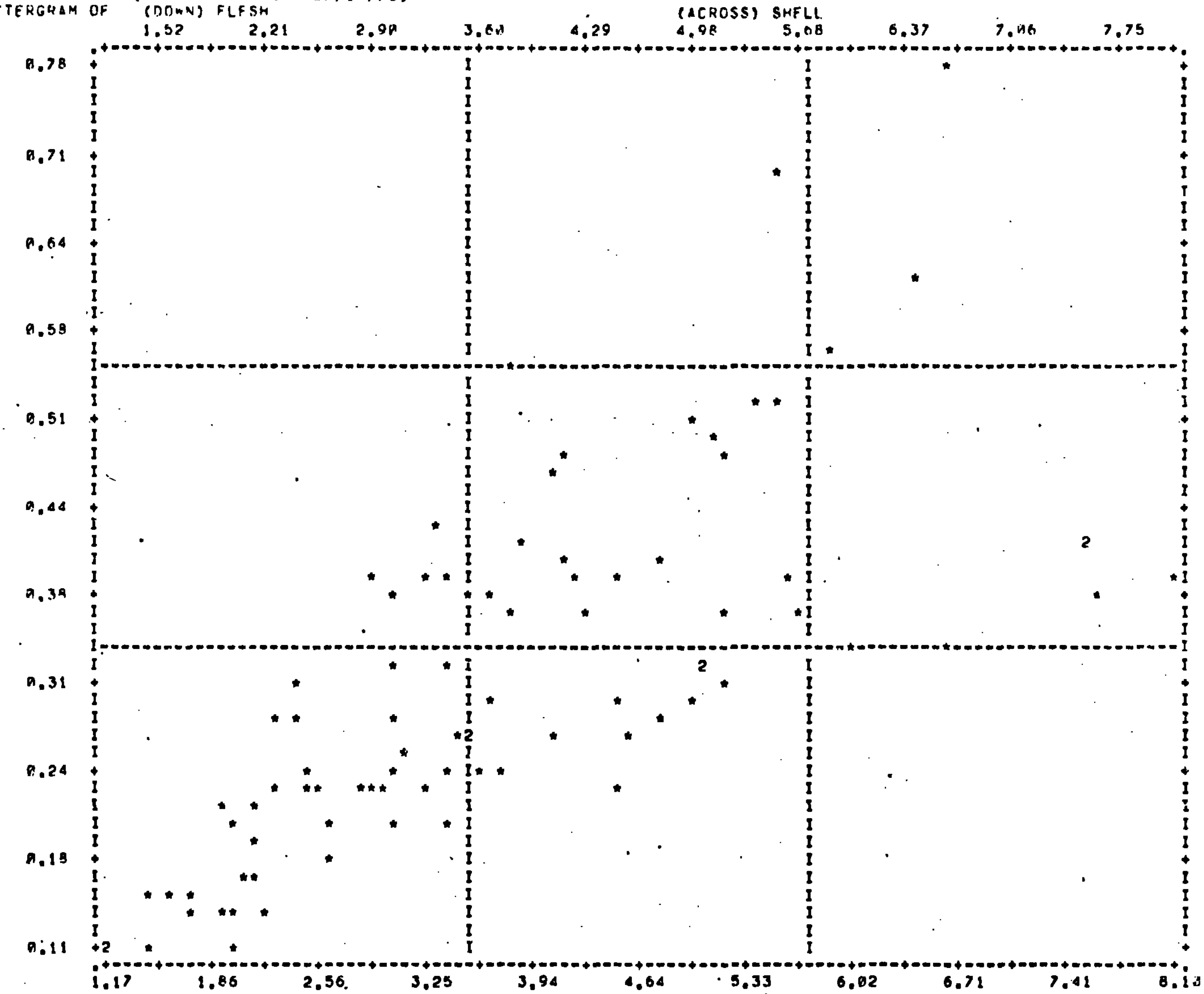
CORRELATION (R)-	0.89669	R SQUARED -	0.80405	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.10182	INTERCEPT (A) -	-0.04141	SLOPE (B) -	0.10503

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.07369 ON THE BOTTOM MARGIN
A VALUE OF 1.02656 ON THE RIGHT MARGIN

PLOTTED VALUES - 97 EXCLUDED VALUES- 0 MISSING VALUES - [illegible]

OTTERSWICK YELL 2 07/14/75 PAGE 2

FILE NONAME (CREATION DATE = 07/14/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



OTTERSWICK YELL 2 07/14/75 PAGE 3

STATISTICS..

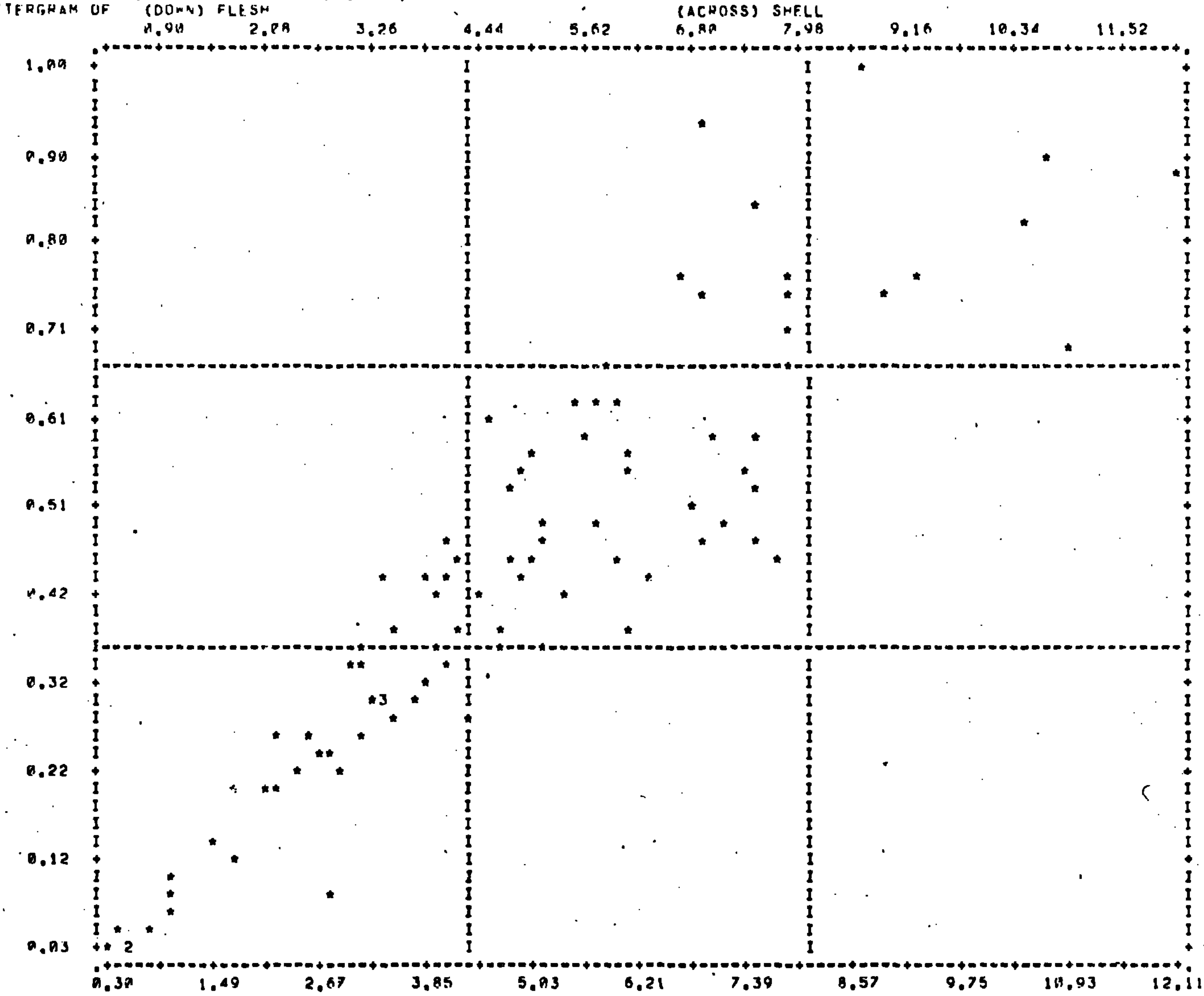
CORRELATION (R)-	0.71695	R SQUARED -	0.51401	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.09356	INTERCEPT (A) -	0.09385	SLOPE (B) -	0.06011

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF [illegible]16226 ON THE LEFT MARGIN
A VALUE OF [illegible]58492 ON THE RIGHT MARGIN

PLOTTED VALUES -	88	EXCLUDED VALUES-	0	MISSING VALUES -	0

OTTERSWICK YELL 3 07/14/75 PAGE 2

FILE NONAME (CREATION DATE = 07/14/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



OTTERSWICK YELL 3 07/14/75 PAGE 3

STATISTICS..

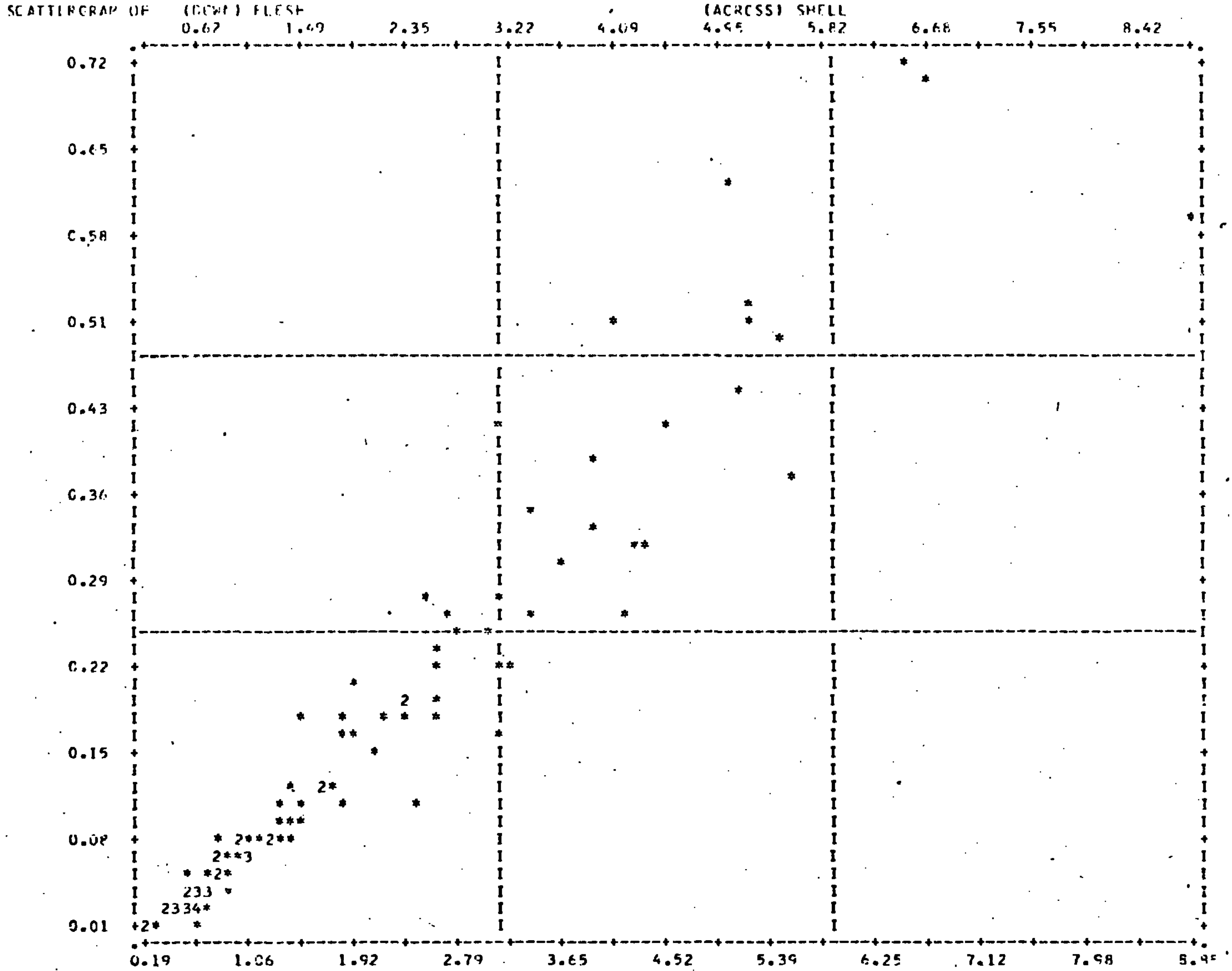
CORRELATION (R)-	0.90213	R SQUARED -	0.61383	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.09792	INTERCEPT (A) -	0.05597	SLOPE (B) -	0.07998

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.07091 ON THE LEFT MARGIN
A VALUE OF 12.02293 ON THE TOP MARGIN

PLOTTED VALUES -	91	EXCLUDED VALUES-	0	MISSING VALUES -	0

RONAS VCE 1 07/16/75 PAGE 2

FILE NONAME (CREATION DATE = 07/16/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



RONAS VCE 1 07/16/75 PAGE 3

STATISTICS..

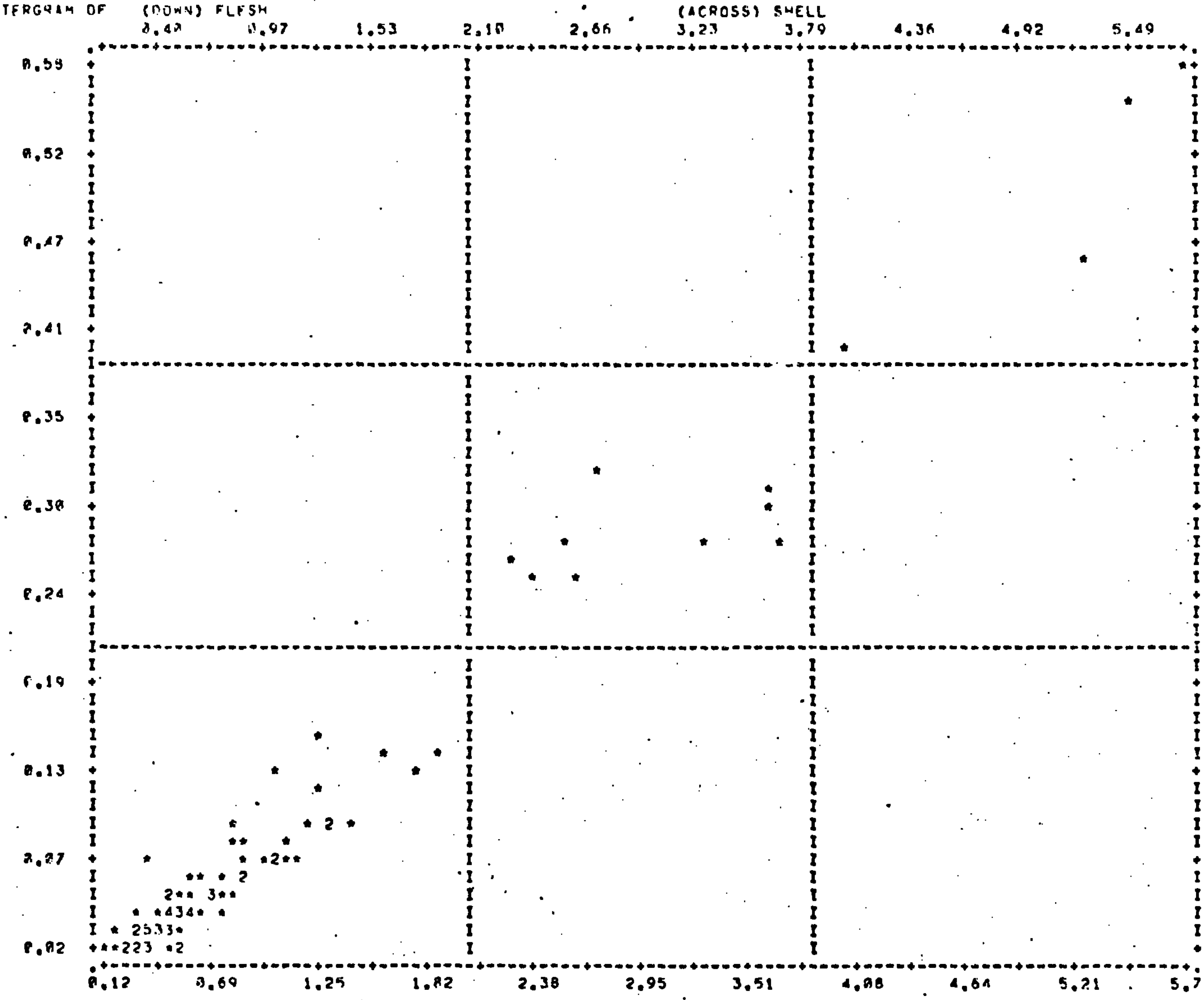
CORRELATION (R)-	0.95496	R SQUARED -	0.91196	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.04894	INTERCEPT (A) -	-0.01132	SLOPE (B) -	0.09209

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF -0.00190 ON THE LEFT MARGIN
A VALUE OF 8.06243 ON THE TOP MARGIN

PLOTTED VALUES -	109	EXCLUDED VALUES-	0	MISSING VALUES -	0

RONAS VOE 2 07/16/75 PAGE 2

FILE NONAME (CREATION DATE = 07/16/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



RONAS VOE 2 07/16/75 PAGE 3

STATISTICS..

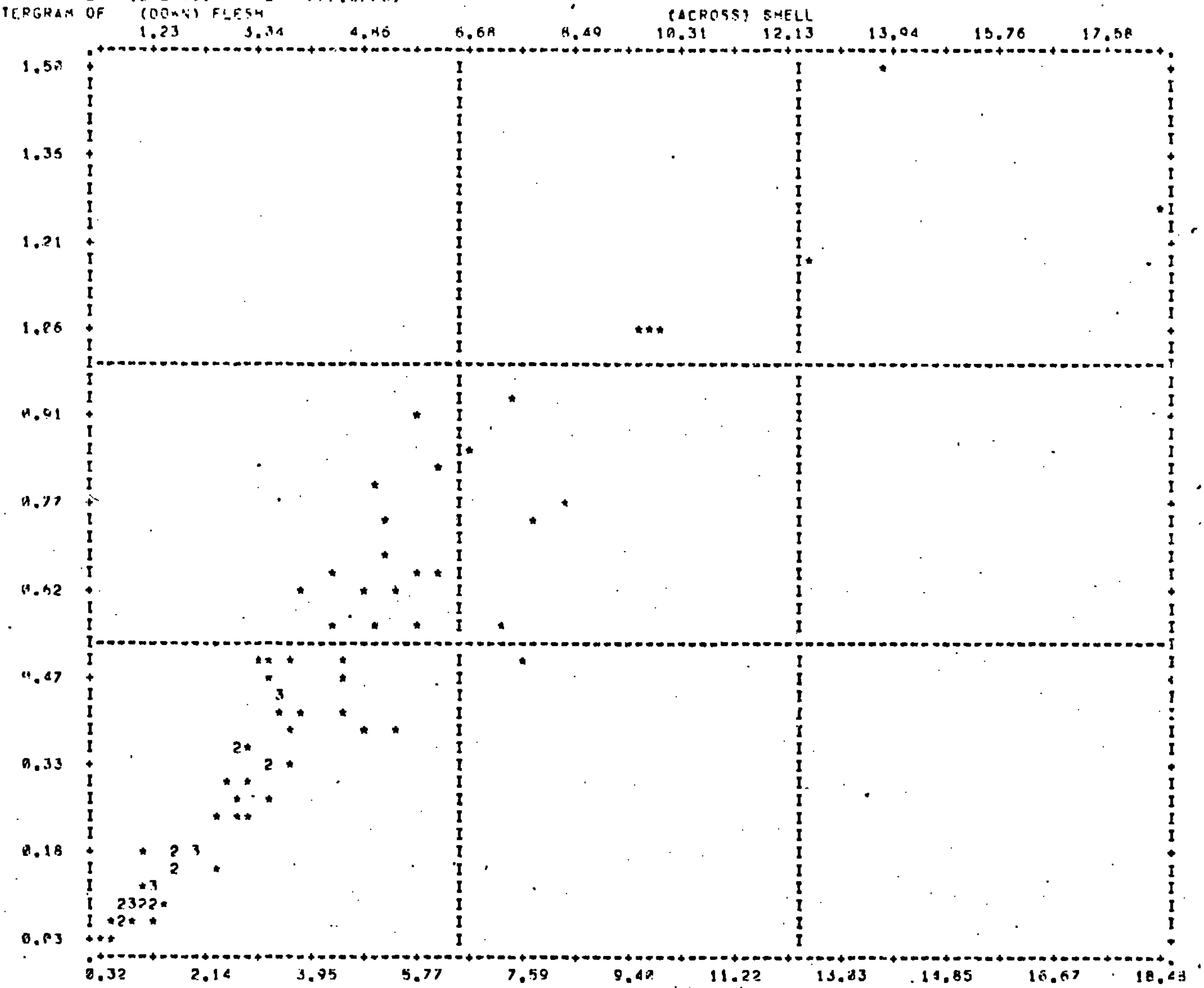
CORRELATION (R)-	0.98222	R SQUARED -	0.96476	SIGNIFICANCE -	0.0002
STD ERR OF EST -	0.02174	INTERCEPT (A) -	-0.00032	SLOPE (B) -	0.0945

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 2.00565 ON THE BOTTOM MARGIN
A VALUE OF 0.55063 ON THE RIGHT MARGIN

PLOTTED VALUES -	90	EXCLUDED VALUES-	0	MISSING VALUES -	0

RONAS VOE 3 07/16/75 PAGE 2

FILE NONAME (CREATION DATE = 07/16/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



RONAS VOE 3 07/16/75 PAGE 3

STATISTICS..

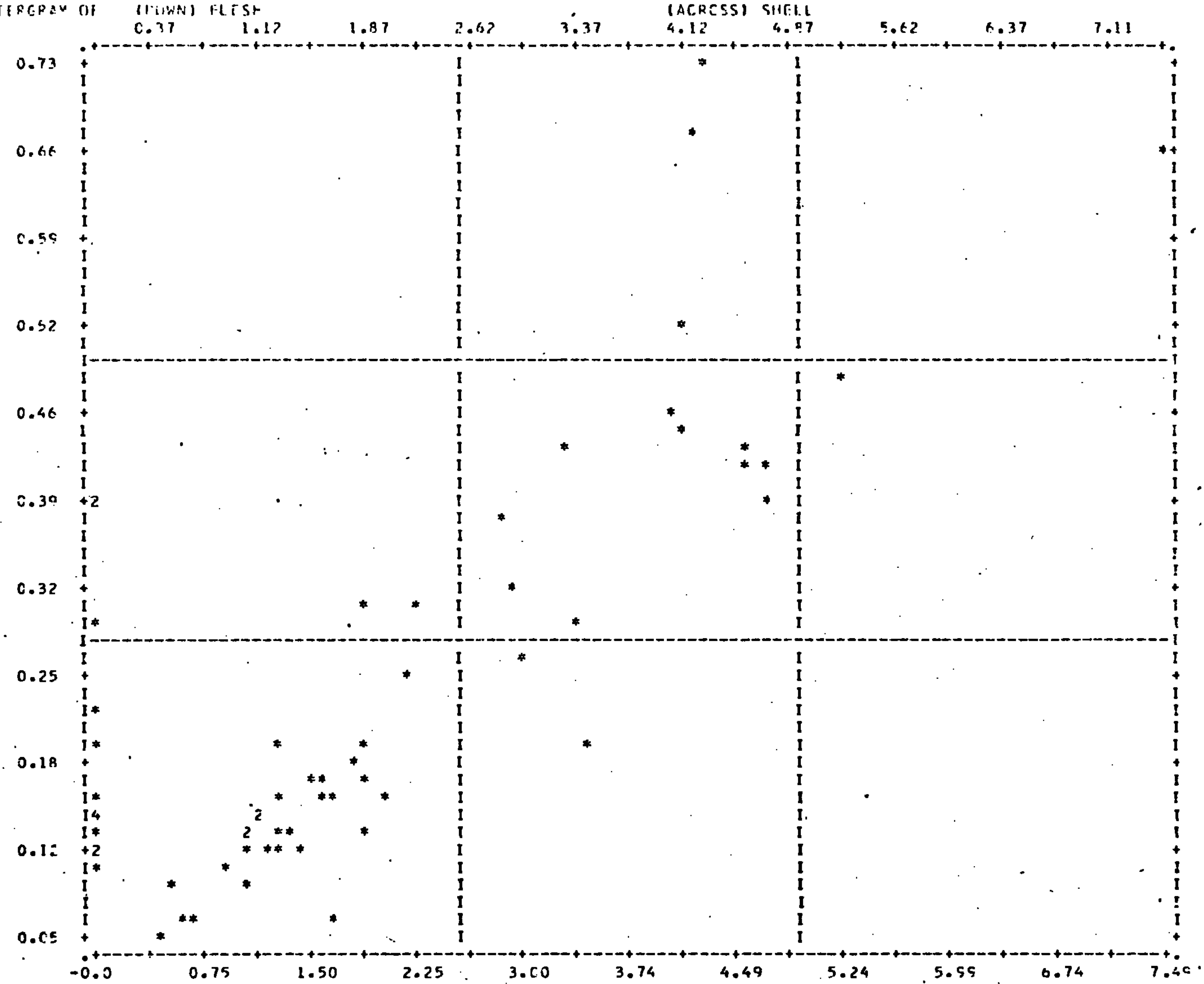
CORRELATION (R)-	0.92742	R SQUARED -	0.86010	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.12371	INTERCEPT (A) -	0.06883	SLOPE (B) -	0.09539

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.08223 ON THE LEFT MARGIN
A VALUE OF 15.34273 ON THE TOP MARGIN

PLOTTED VALUES -	85	EXCLUDED VALUES-	0	MISSING VALUES -	0

WHITENESS VOE 2 07/16/75 PAGE 2

FILE NONAME (CREATION DATE = 07/16/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



WHITENESS VOE 2 07/16/75 PAGE 3

STATISTICS..

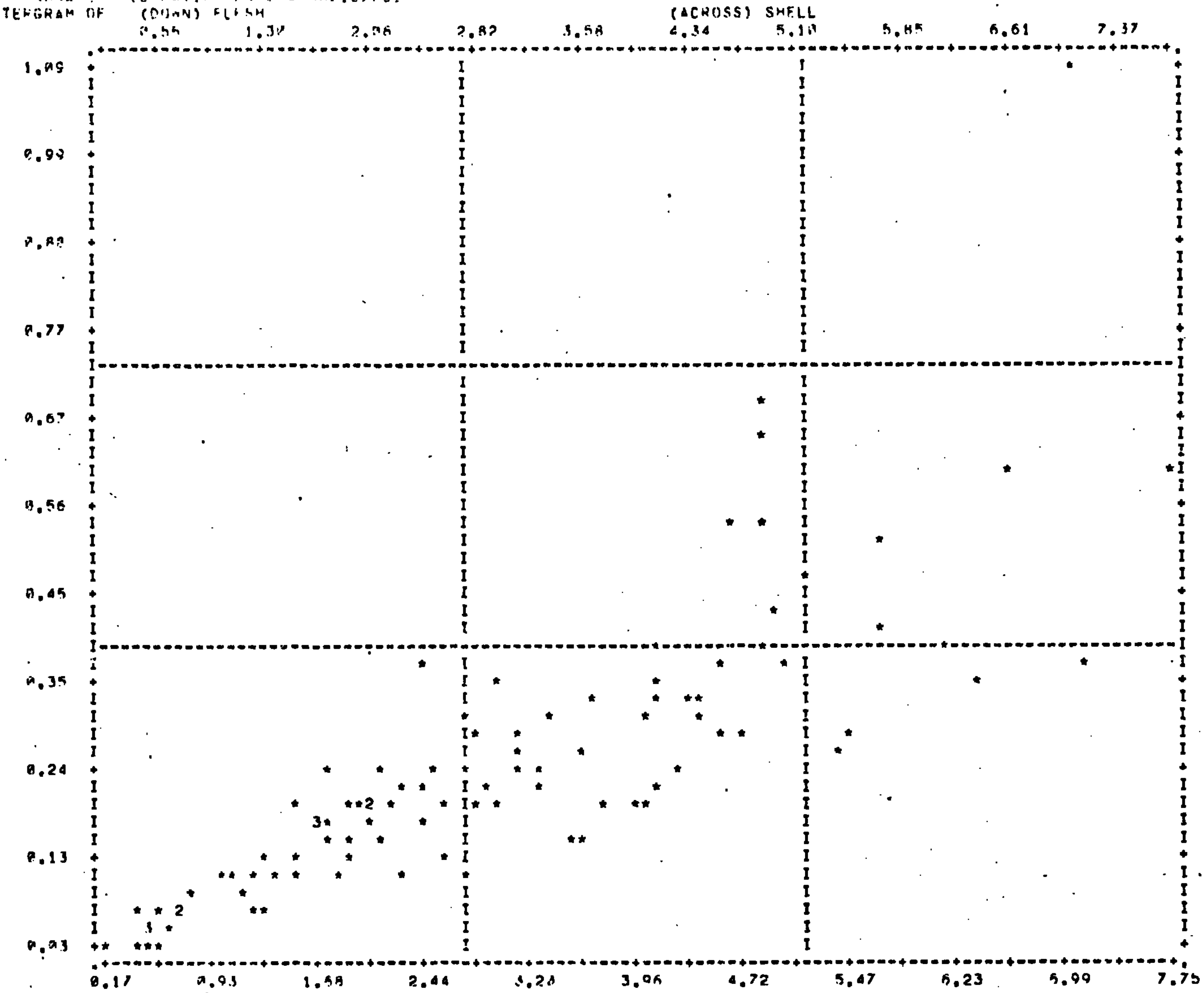
CORRELATION (R)-	0.77785	R SQUARED -	0.60506	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.10135	INTERCEPT (A) -	0.10822	SLOPE (B) -	0.07377

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.10269 ON THE LEFT MARGIN
A VALUE OF 0.66624 ON THE RIGHT MARGIN

PLOTTED VALUES - 62 EXCLUDED VALUES- 0 MISSING VALUES - 0

WHITENESS VOE 3 08/15/75 PAGE 2

FILE NONAME (CREATION DATE = 08/15/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



WHITENESS VOE 3 08/15/75 PAGE 3

STATISTICS..

CORRELATION (R)-	0.82635	R SQUARED -	0.68285	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.09409	INTERCEPT (A) -	0.02234	SLOPE (B) -	0.07801

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.02945 ON THE LEFT MARGIN
A VALUE OF 0.63275 ON THE RIGHT MARGIN

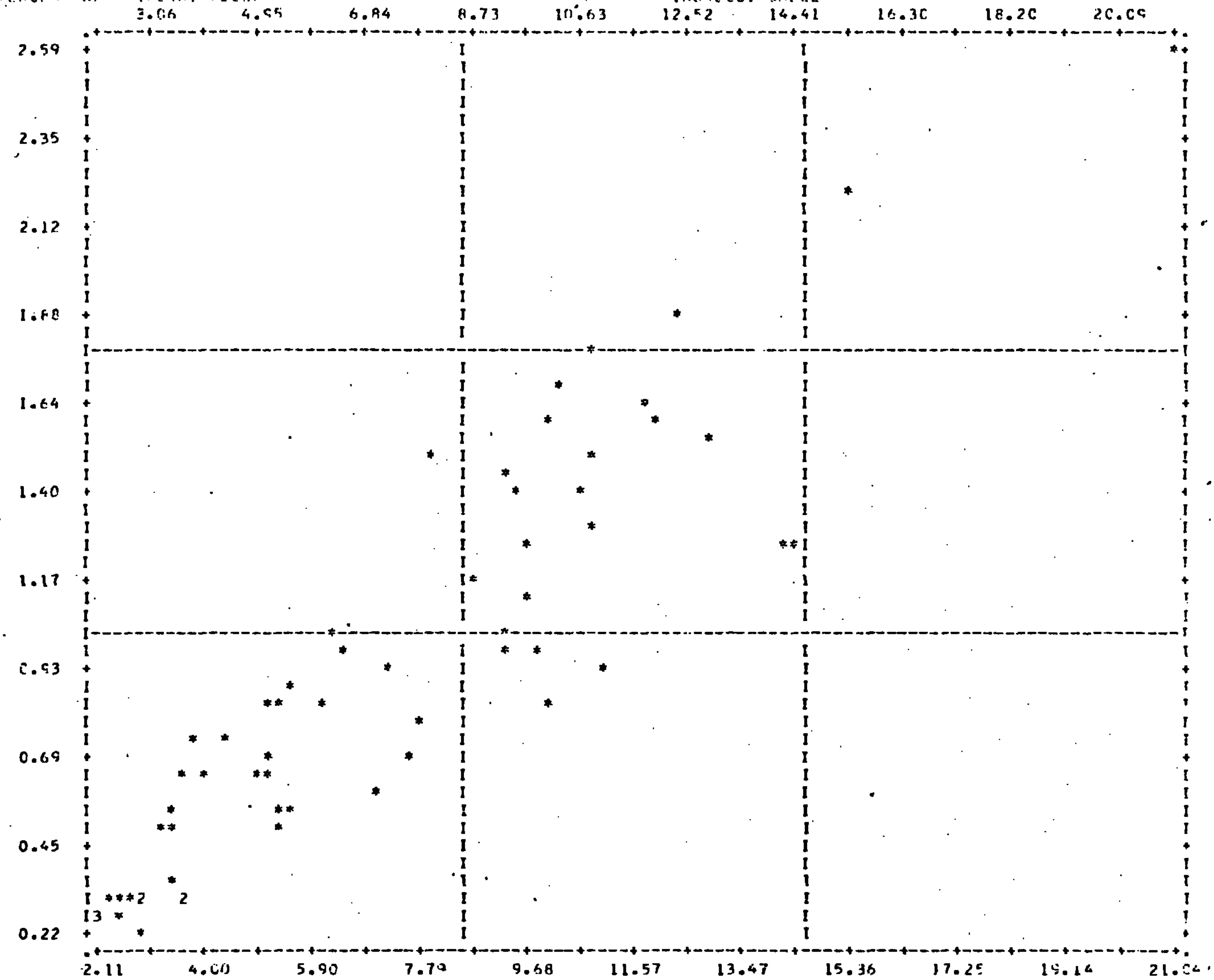
PLOTTED VALUES -	120	EXCLUDED VALUES-	0	MISSING VALUES -	0

APPENDIX 9

Computer Scattergrams of flesh weight/shell weight relationship for sub-populations collected from Zones 1, 2 and 3 at Area C: N.E. coast of England - S.E. coast of Scotland.

ISLE OF MAY 1 07/16/75 PAGE 2

FILE NONAME (CREATION DATE = 07/16/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



ISLE OF MAY 1 07/16/75 PAGE 3

STATISTICS..

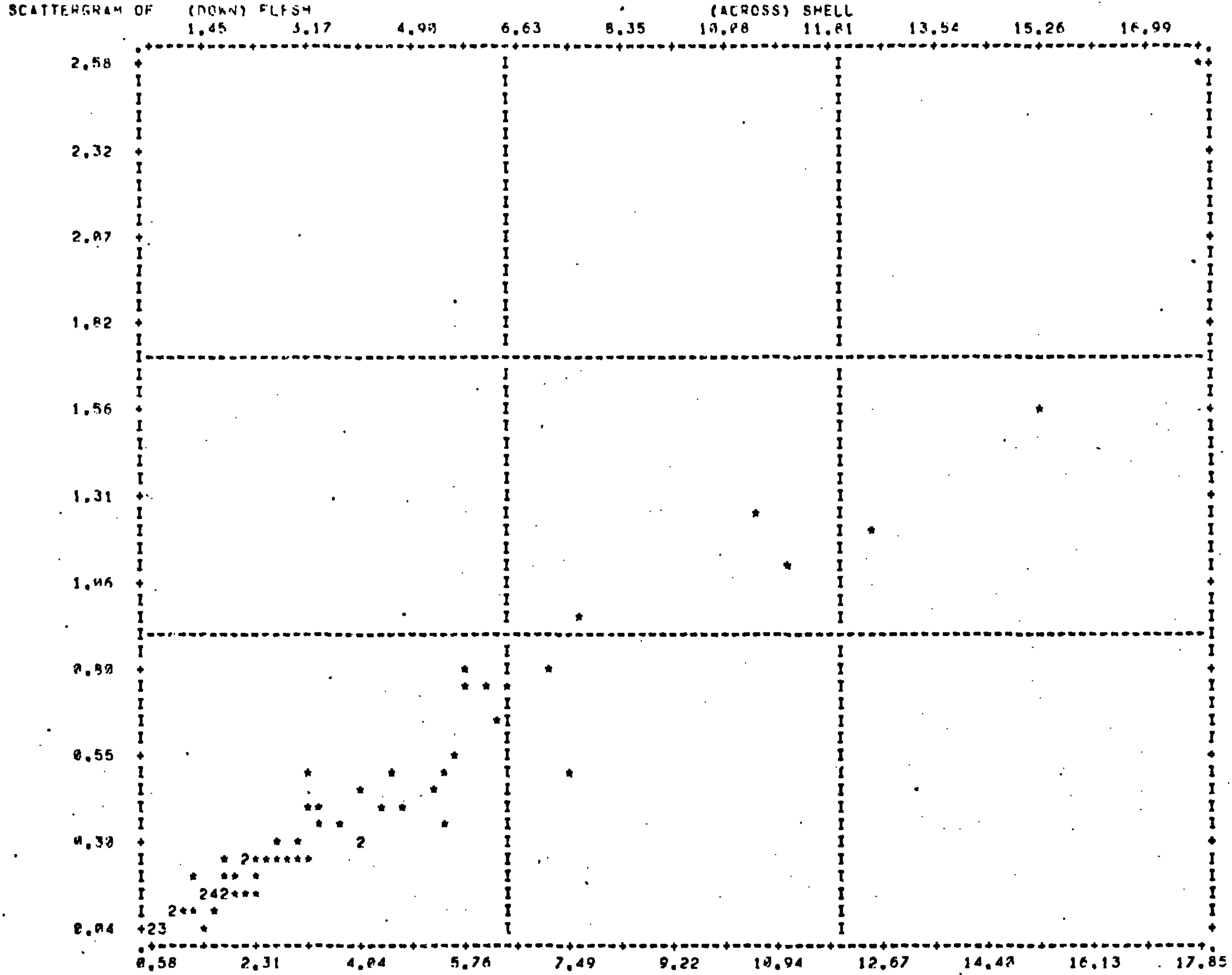
CORRELATION (R)-	0.91172	R SQUARED -	0.83124	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.22218	INTERCEPT (A) -	0.07003	SLOPE (B) -	0.1209

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.30237 ON THE LEFT MARGIN
A VALUE OF 2.63623 ON THE RIGHT MARGIN

PLOTTED VALUES -	61	EXCLUDED VALUES-	0	MISSING VALUES -	0

ISLE OF MAY 3   07/16/75   PAGE   2

FILE   NONAME   (CREATION DATE = 07/16/75)
SCATTERGRAM OF   (DOWN) FLESH   (ACROSS) SHELL



ISLE OF MAY 3   07/16/75   PAGE   3

STATISTICS..

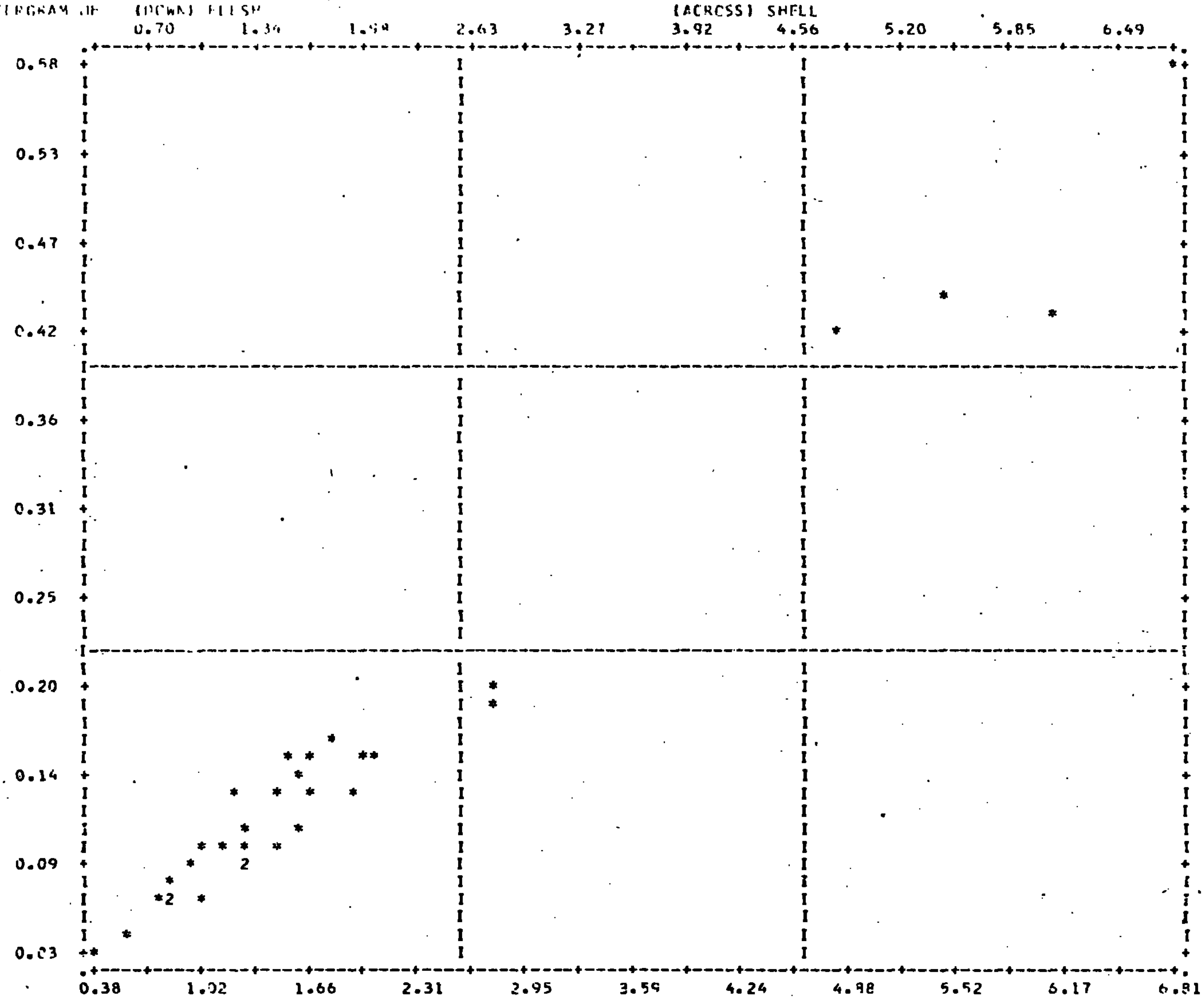
CORRELATION (R)-	0.96674	R SQUARED -	0.93459	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.10824	INTERCEPT (A) -	-0.03568	SLOPE (B) -	0.11845

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.01280 ON THE LEFT MARGIN
A VALUE OF 2.09938 ON THE RIGHT MARGIN

PLOTTED VALUES -	65	EXCLUDED VALUES-	0	MISSING VALUES -	0

STAFBS 1 NOVEMBER 02/06/75 PAGE 2

FILE NONAME (CREATION DATE = 02/06/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



STABBS 2 NOVEMBER 02/06/75 PAGE 3

STATISTICS..

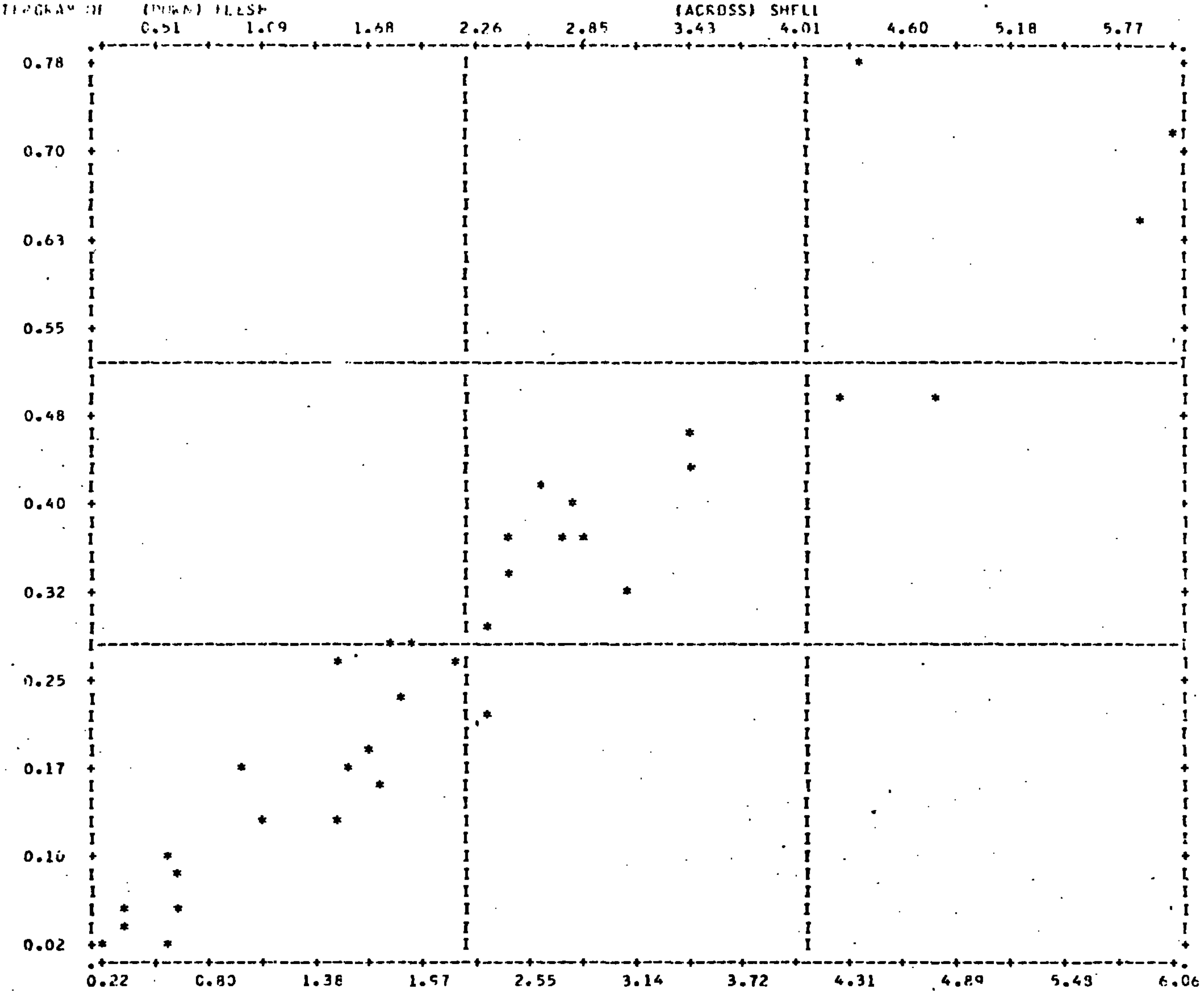
CORRELATION (R)-	0.98673	R SQUARED -	0.97363	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.02125	INTERCEPT (A) -	0.00645	SLOPE (B) -	0.07955

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.04124 ON THE LEFT MARGIN
A VALUE OF 0.55337 ON THE RIGHT MARGIN

PLOTTED VALUES - [illegible] EXCLUDED VALUES- 0 MISSING VALUES -

STABBS 3 November   02/06/75   PAGE 2

FILE NONAME (CREATION DATE = 02/06/75)
SCATTERGRAM OF (DOWN) FLESH   (ACROSS) SHELL



STABBS 3 NOVEMBER   02/06/75   PAGE 3

STATISTICS..

CORRELATION (R)- 0.94944   R SQUARED - 0.90143   SIGNIFICANCE - 0.00001

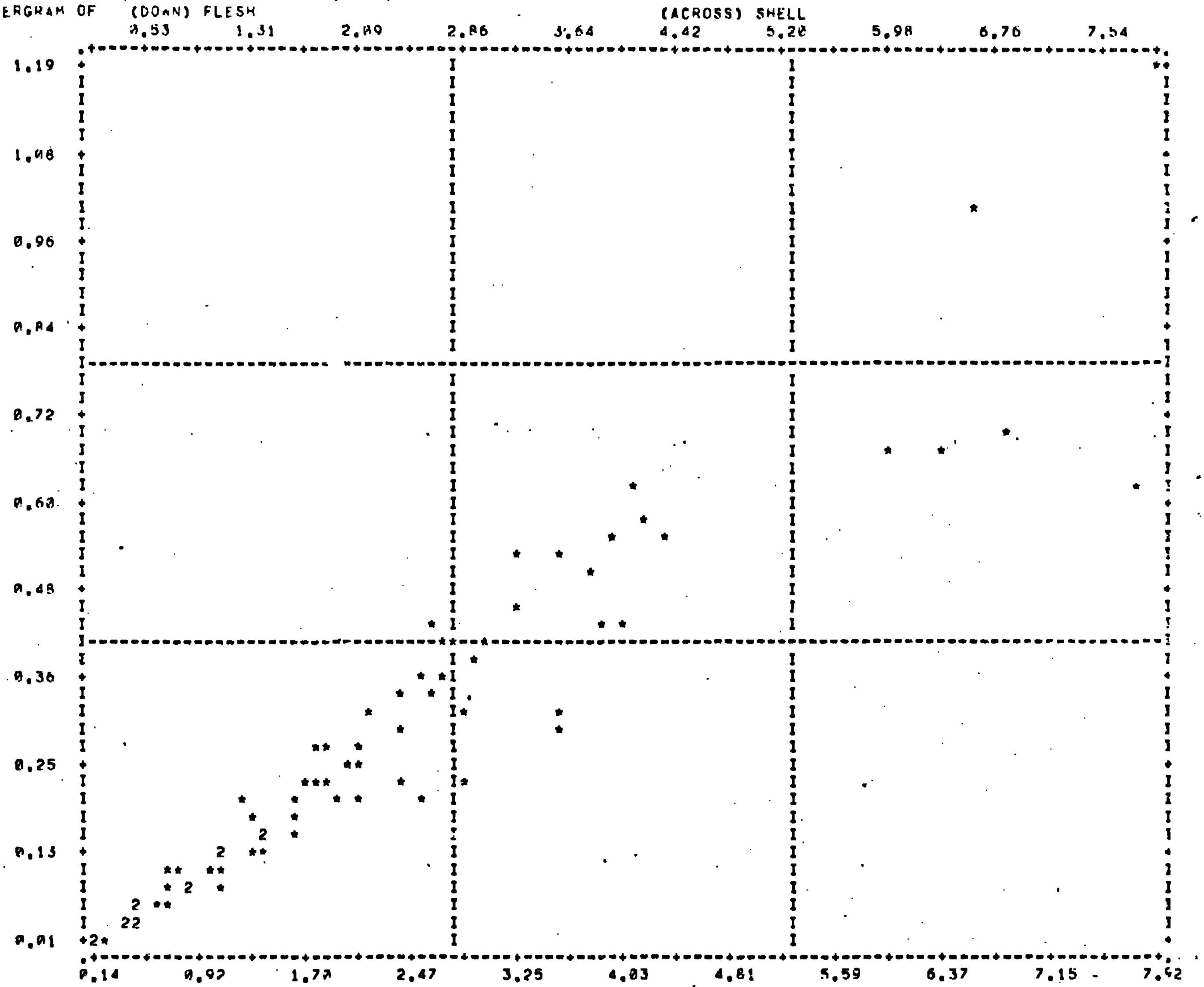
STD ERR OF EST - 0.06186   INTERCEPT (A) - 0.01723   SLOPE (B) - 0.1223[illegible]

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.03650 ON THE LEFT MARGIN
A VALUE OF 0.76[illegible]2 ON THE RIGHT MARGIN

PLOTTED VALUES - 3[illegible]   EXCLUDED VALUES- [illegible]   MISSING VALUES -

STABBS 1 JUNE 07/14/75 PAGE 2

FILE NONAME (CREATION DATE = 07/14/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



STABBS 1 JUNE 07/14/75 PAGE 3

STATISTICS..

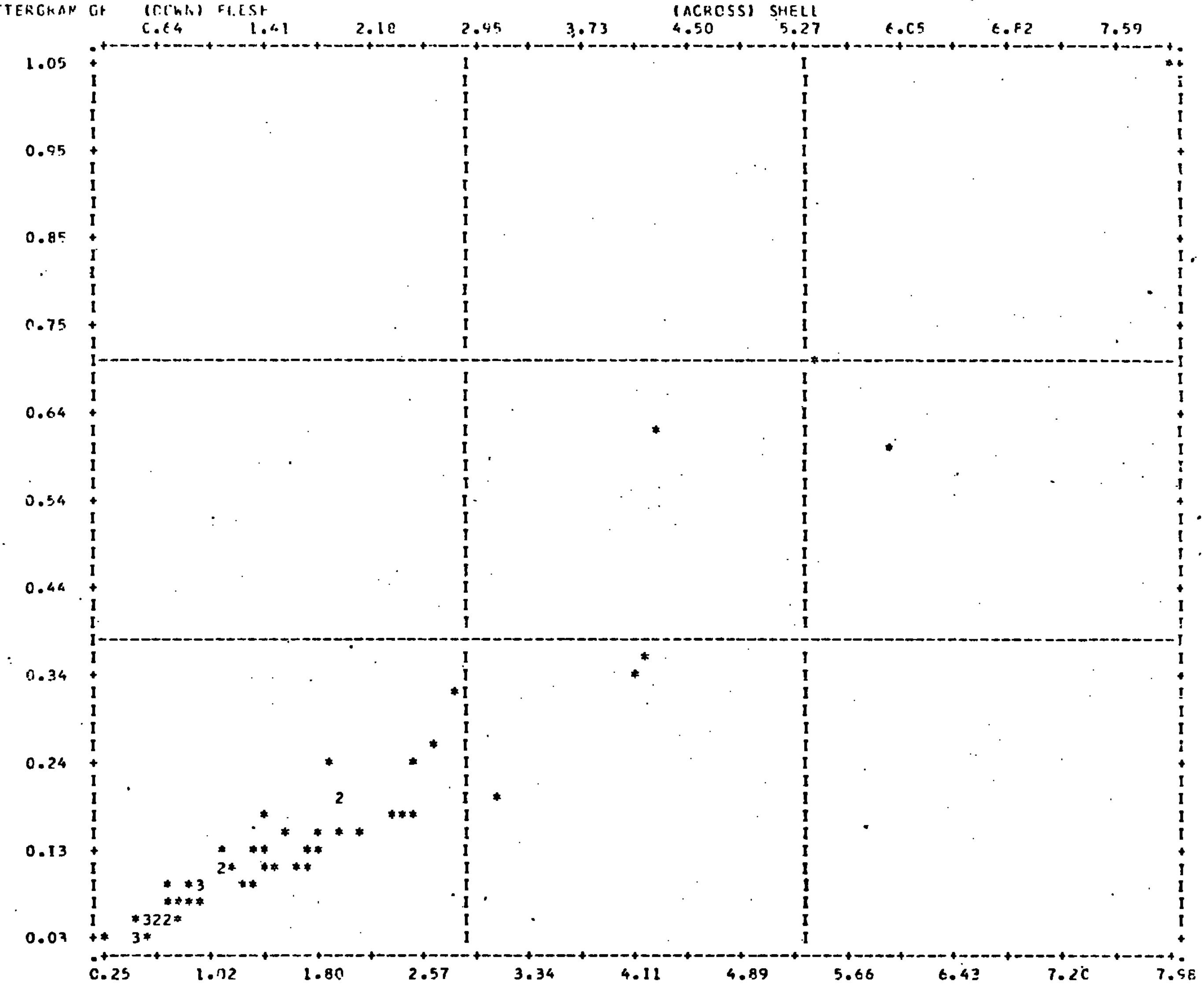
CORRELATION (R)-	0.94521	R SQUARED -	0.89342	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.07639	INTERCEPT (A) -	0.00764	SLOPE (B) -	0.12300

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.01516 ON THE LEFT MARGIN
A VALUE OF 0.99195 ON THE RIGHT MARGIN

PLOTTED VALUES -	73	EXCLUDED VALUES-	0	MISSING VALUES -	0

STABBS 2 JUNE 07/16/75 PAGE 2

FILE NONAME (CREATION DATE = 07/16/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



STABBS 2 JUNE 07/16/75 PAGE 3

STATISTICS..

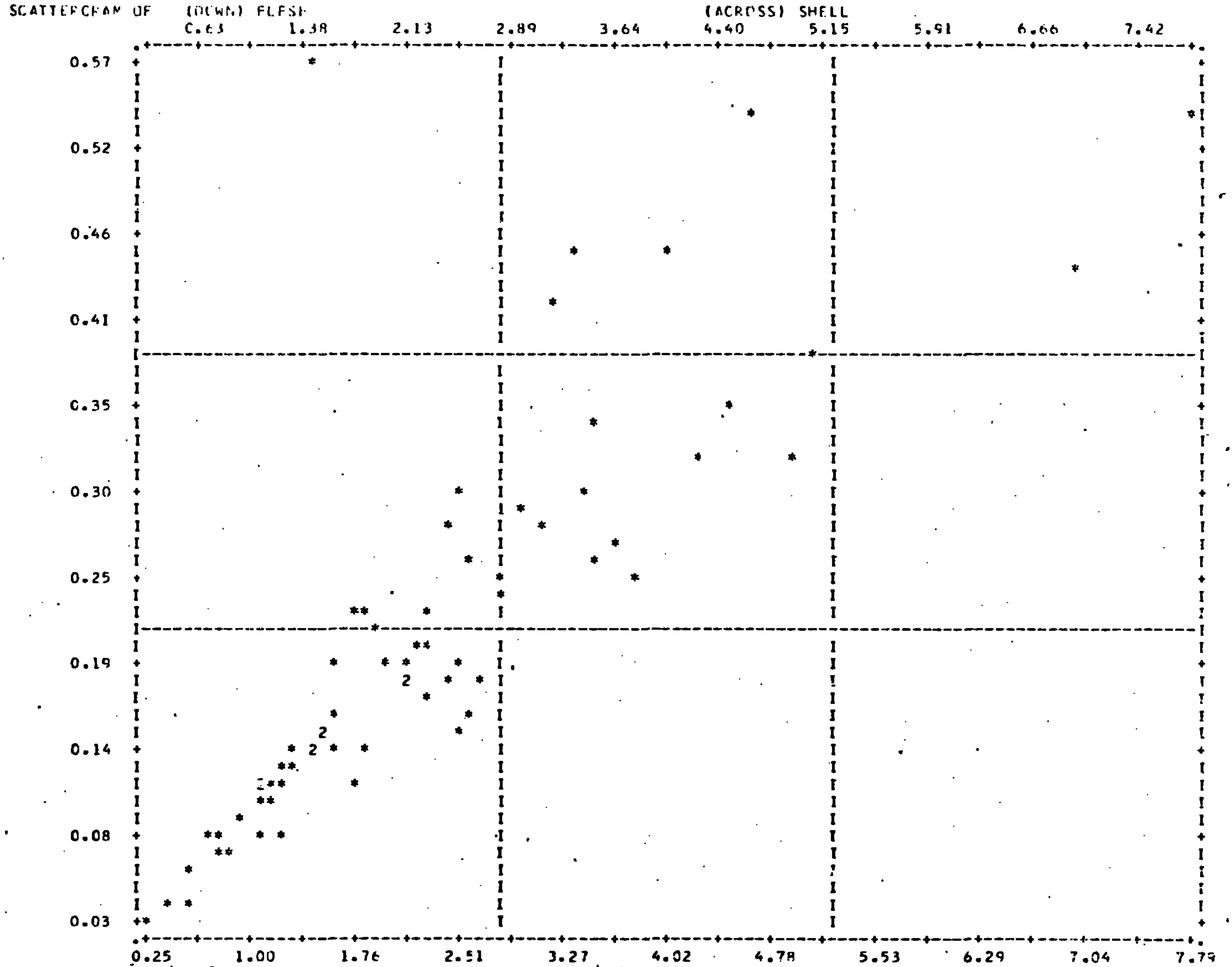
CORRELATION (R)-	0.96176	R SQUARED -	0.92498	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.05026	INTERCEPT (A) -	-0.02886	SLOPE (B) -	0.1187

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.33183 ON THE BOTTOM MARGIN
A VALUE OF 0.92732 ON THE RIGHT MARGIN

PLOTTED VALUES -	58	EXCLUDED VALUES-	0	MISSING VALUES -	0

STABBS 3 JUNE 07/11/75 PAGE 2

FILE NONAME (CREATION DATE = 07/11/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



STABBS 3 JUNE 07/11/75 PAGE 3

STATISTICS..

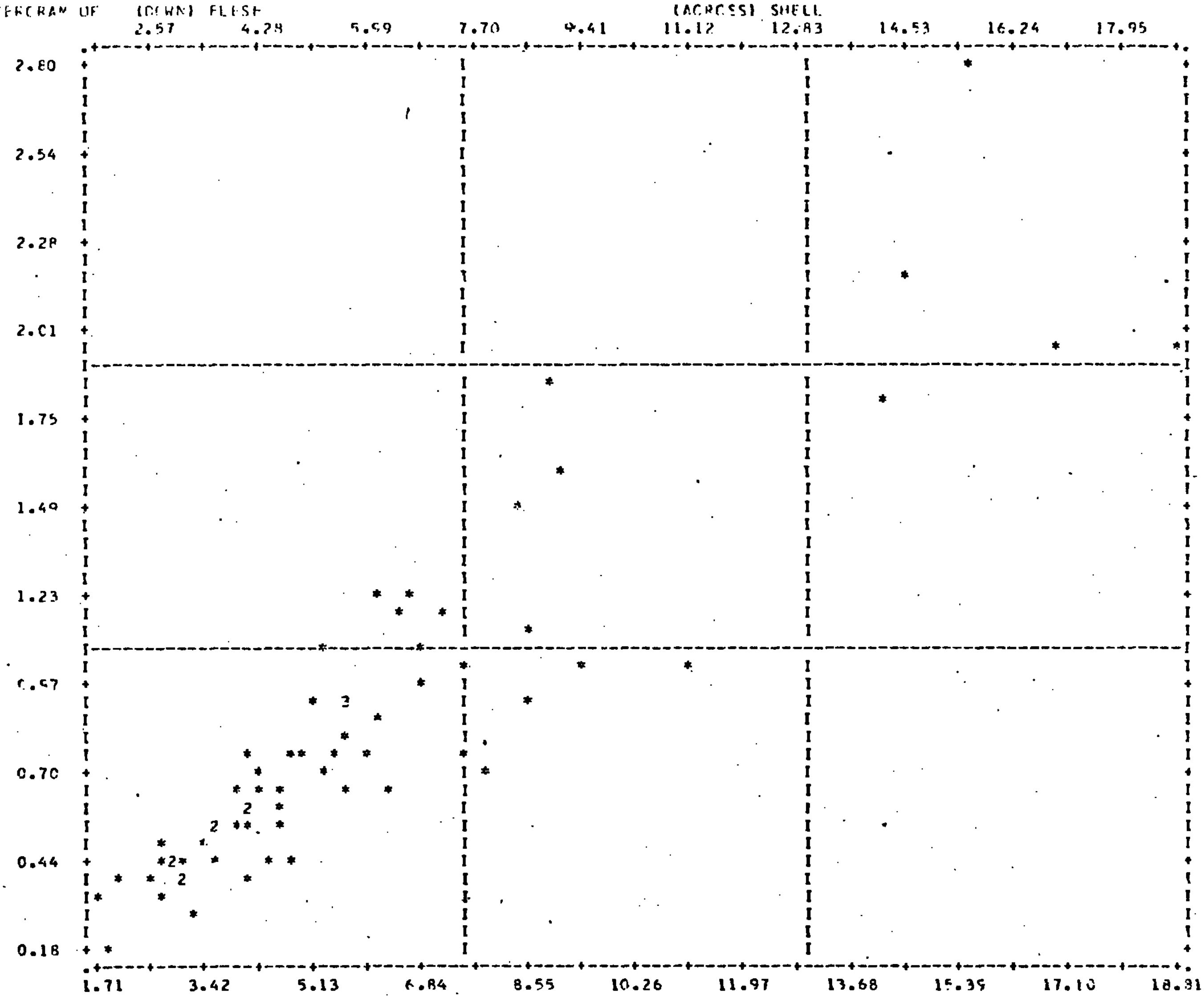
CORRELATION (R)-	0.81476	R SQUARED -	0.66384	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.07277	INTERCEPT (A) -	0.05545	SLOPE (B) -	0.06993

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.06752 ON THE LEFT MARGIN
A VALUE OF 7.51205 ON THE TOP MARGIN

PLOTTED VALUES -	68	EXCLUDED VALUES-	0	MISSING VALUES -	0

BLACKHALL ROCKS 2 07/16/75 PAGE 2

FILE NONAME (CREATION DATE = 07/16/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



BLACKHALL ROCKS 2 07/16/75 PAGE 3

STATISTICS..

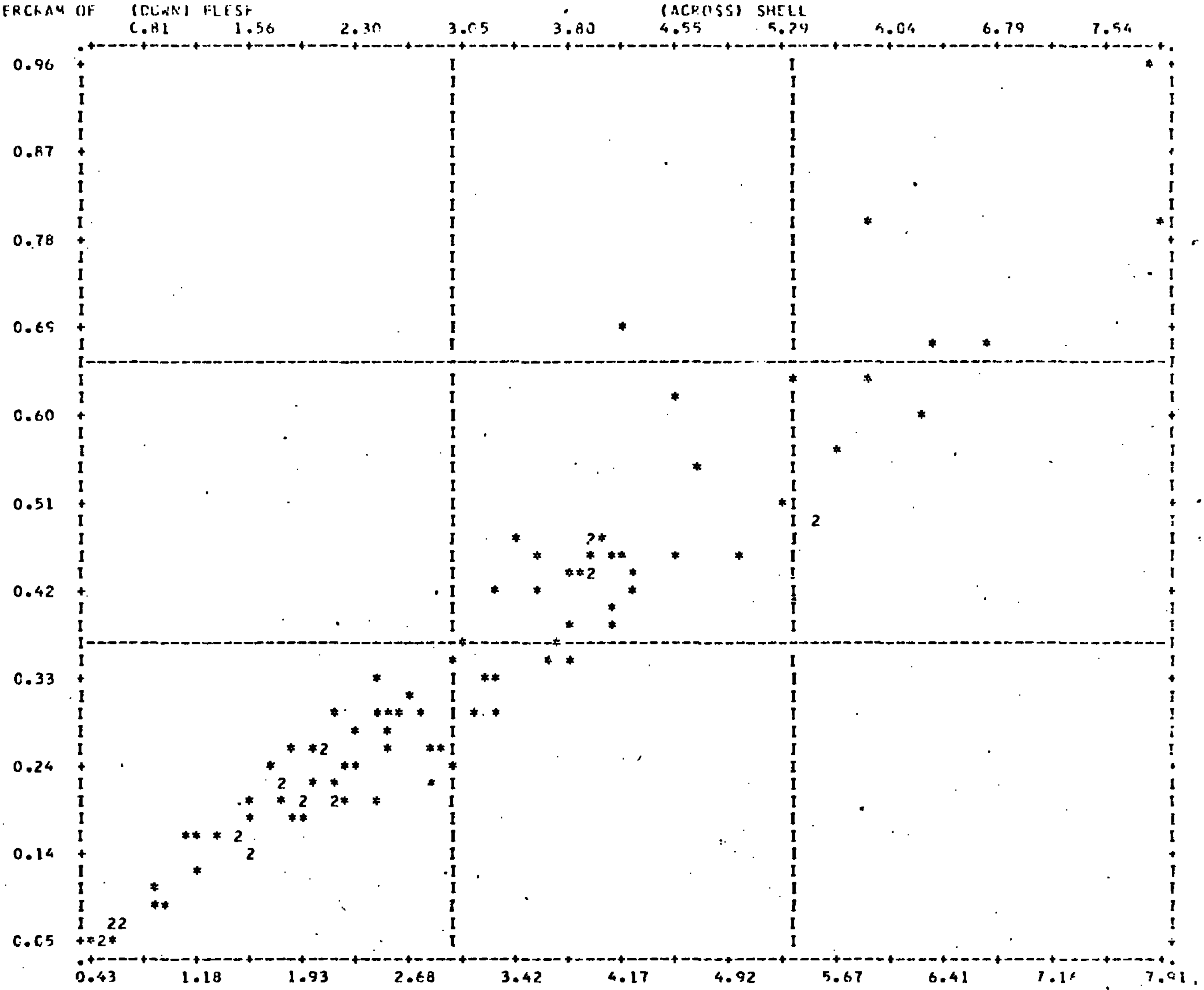
CORRELATION (R)-	0.90527	R SQUARED -	0.81951	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.21493	INTERCEPT (A) -	0.10172	SLOPE (B) -	0.12809

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.29949 ON THE LEFT MARGIN
A VALUE OF 2.53265 ON THE RIGHT MARGIN

PLOTTED VALUES - 66 EXCLUDED VALUES- 0 MISSING VALUES - 0

REDCAR 1 JANUARY (South Gare) 02/12/75 PAGE 2

FILE NONAME (CREATION DATE = 02/12/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



REDCAR 1 JANUARY (South Gare) 02/12/75 PAGE 3

STATISTICS..

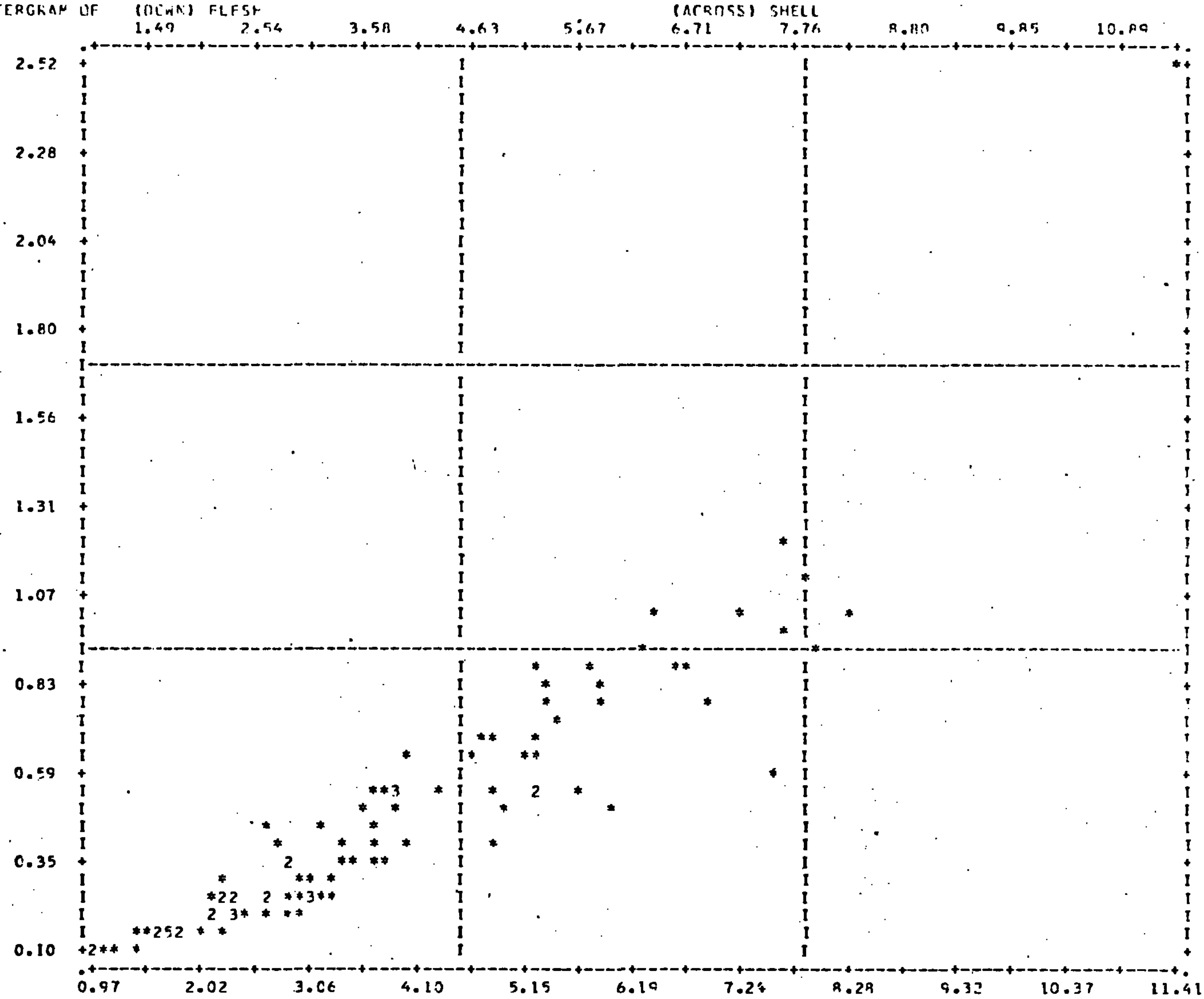
CORRELATION (R)-	0.95912	R SQUARED -	0.91992	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.05206	INTERCEPT (A) -	0.01543	SLOPE (B) -	0.1051

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.05357 ON THE LEFT MARGIN
A VALUE OF 0.86300 ON THE RIGHT MARGIN

PLOTTED VALUES -	100	EXCLUDED VALUES-	0	MISSING VALUES -	0

REDCAR 2 JANUARY (South Gare) 08/15/75 PAGE 2

FILE NONAME (CREATION DATE = 08/15/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



REDCAR 2 JANUARY (SOUTH Gare) 08/15/75 PAGE 3

STATISTICS..

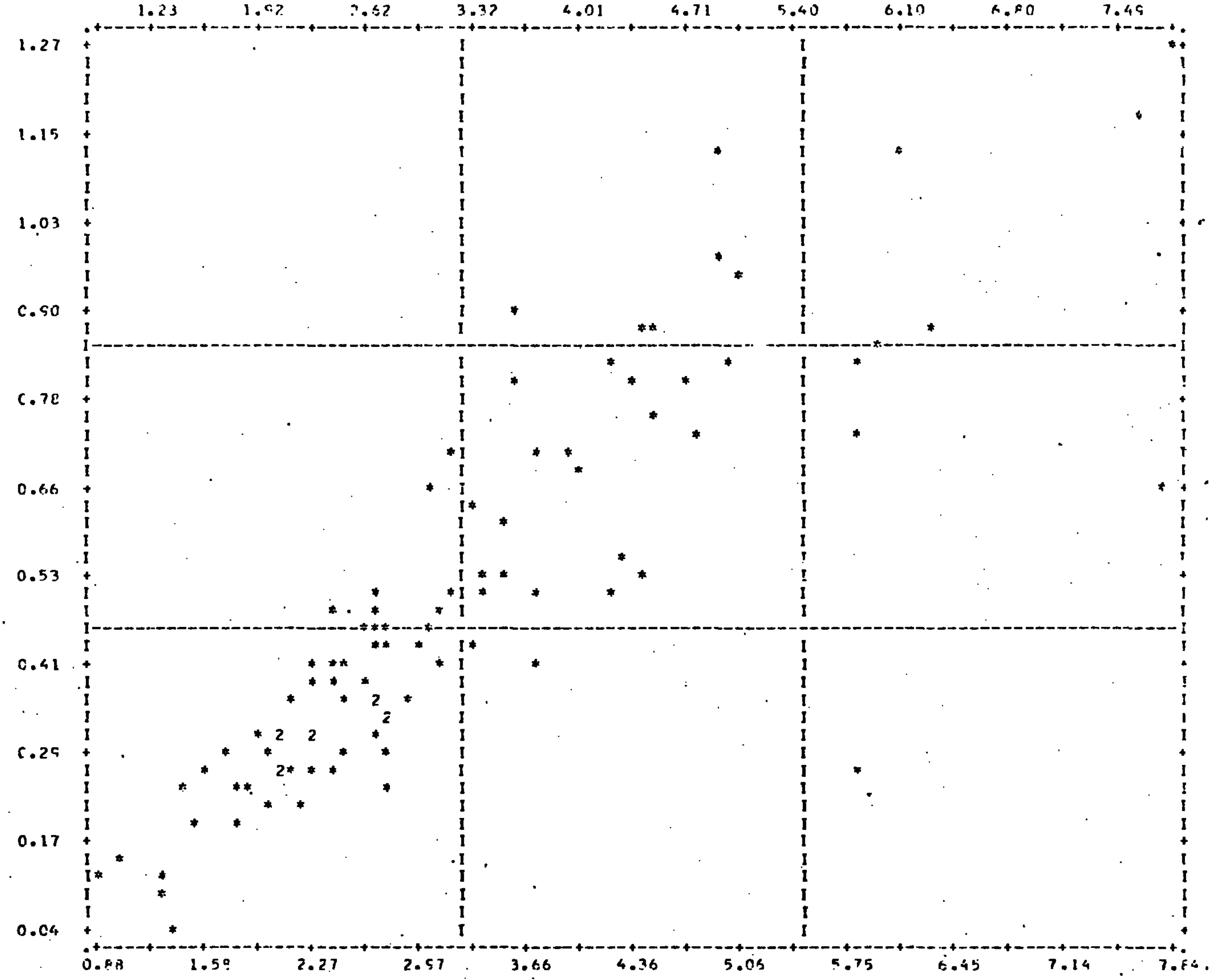
CORRELATION (R)-	0.92554	R SQUARED	-	0.85662	SIGNIFICANCE	-	0.00001
STD ERR OF EST -	0.13132	INTERCEPT (A)	-	-0.12946	SLOPE (B)	-	0.16[illegible]

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 1.15384 ON THE BOTTOM MARGIN
A VALUE OF 1.71794 ON THE RIGHT MARGIN

PLOTTED VALUES -	100	EXCLUDED VALUES-	0	MISSING VALUES -	0

REDCAP 3 MARCH (South Gare) 03/19/75 PAGE 2

FILE NONAME (CREATION DATE = 03/19/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



REDCAP 3 MARCH (South Gare) 03/19/75 PAGE 3

STATISTICS..

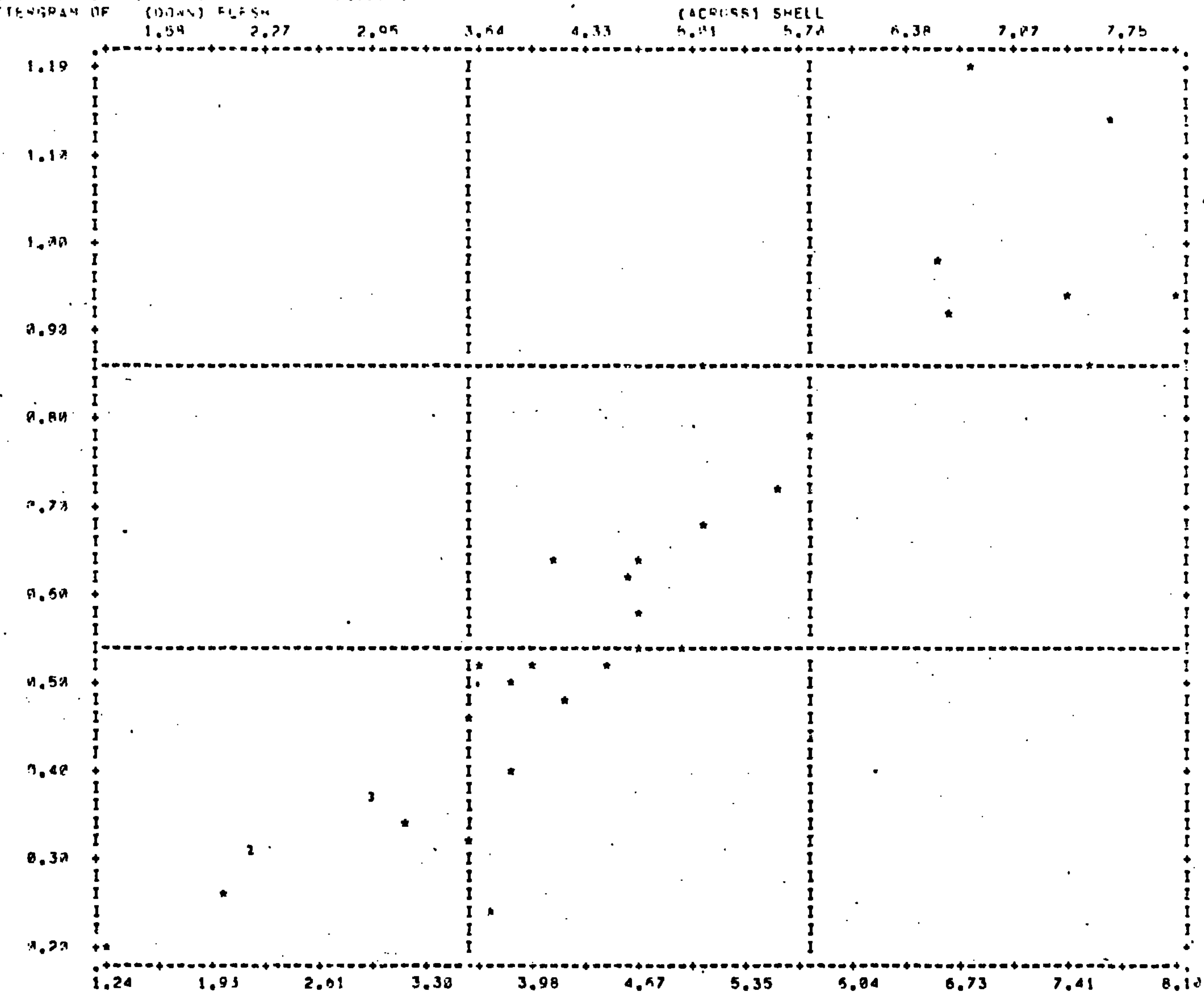
CORRELATION (R)-	0.84801	R SQUARED -	0.71911	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.14104	INTERCEPT (A) -	0.01641	SLOPE (B) -	0.15155

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.13941 ON THE LEFT MARGIN
A VALUE OF 1.21527 ON THE RIGHT MARGIN

PLOTTED VALUES -	93	EXCLUDED VALUES-	0	MISSING VALUES -	0

REDCAR JUNE 2 (South Gare) 07/16/75 PAGE 2

FILE NONAME (CREATION DATE = 07/16/75)
SCATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



REDCAR JUNE 2 (South Gare) 07/16/75 PAGE 3

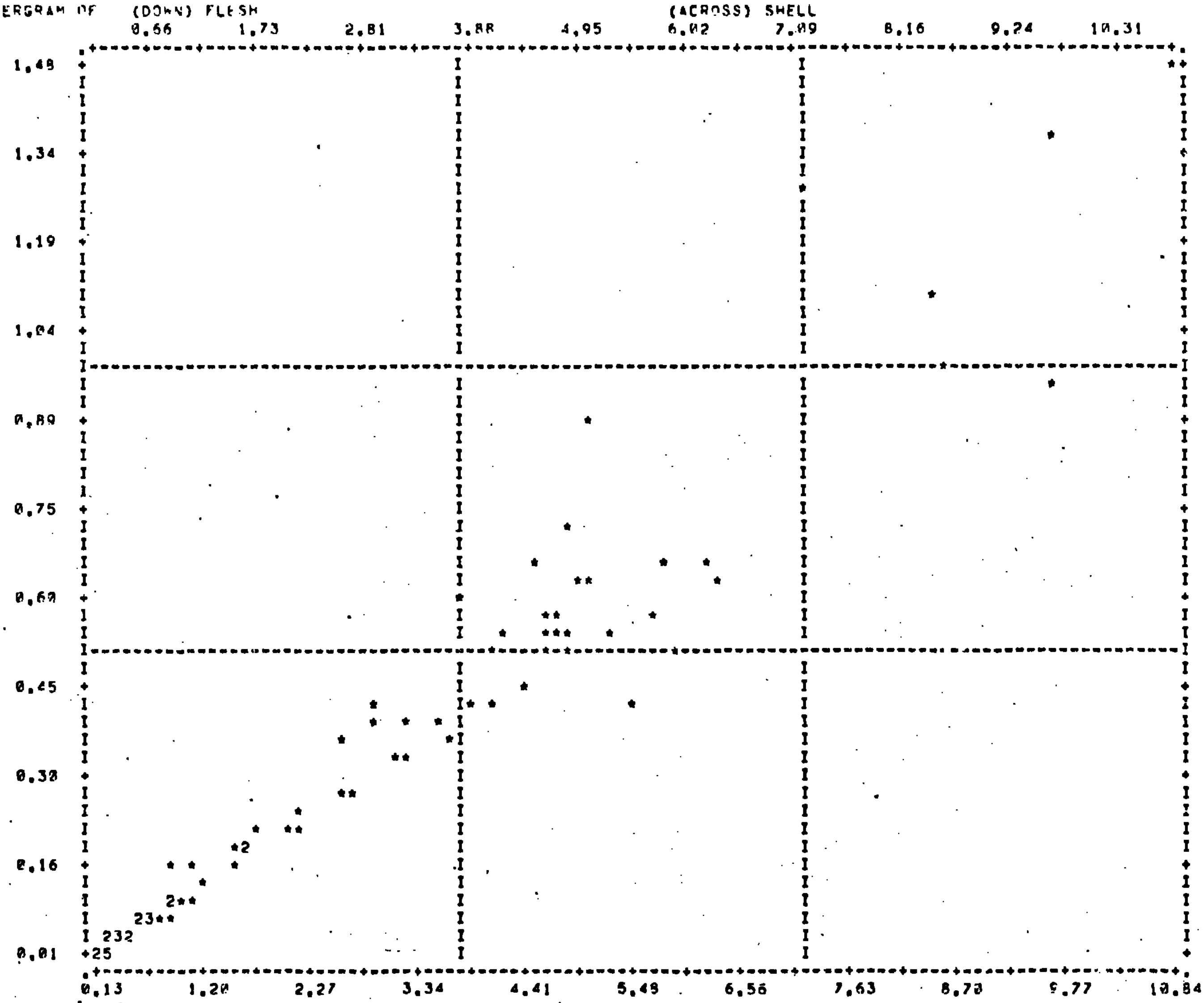
STATISTICS..

CORRELATION (R)-	0.91486	R SQUARED -	0.83697	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.10724	INTERCEPT (A) -	-0.05809	SLOPE (B) -	0.14314

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 1.67922 ON THE BOTTOM MARGIN
A VALUE OF 1.11276 ON THE RIGHT MARGIN

ROBINHOODS 1 08/15/75 PAGE 2

ILE NONAME (CREATION DATE = 08/15/75)
CATTERGRAM OF (DOWN) FLESH (ACROSS) SHELL



ROBINHOODS 1 08/15/75 PAGE 3

STATISTICS..

CORRELATION (R)-	0.96377	R SQUARED -	0.92886	SIGNIFICANCE -	0.00001
STD ERR OF EST -	0.09022	INTERCEPT (A) -	-0.00237	SLOPE (B) -	0.12459

THE REGRESSION LINE CUTS THE MARGINS OF THE PLOT AT
A VALUE OF 0.00012 ON THE LEFT MARGIN
A VALUE OF 1.38194 ON THE RIGHT MARGIN

PLOTTED VALUES -	77	EXCLUDED VALUES-	0	MISSING VALUES -	0

APPENDIX 10

(1) Chemical analysis data for specimens of all size classes (A, B, C,...) collected from Zones 1, 2 and 3 at Areas

A: Ardnamurchan Point - Loch Sunart

B: Shetland Islands and

C: N.E. coast of England - S.E. coast of Scotland

Tables A4, A5, A6, show the mean values and standard deviations, for each set of analysis.

St. dev. was calculated using the formula:

$$6 x = \sqrt{\frac{\sum x^{2} - (\frac{\sum x}{n}) \sum x}{n - 1}}$$

(2) Some details on "B" class comparison for Areas A and B.

TABLE A4

		ZONE 1			ZONE 3			
	SIZE class	ARDNAMURCHAN PT. NOV	GLENMORE BAY NOV	KILCHOAN NOV	ARDNAMURCHAN PT. NOV	GLENMORE BAY NOV	KILCHOAN NOV	SALEN NOV
Pb	A	1.46 ± 0.87	3.62 ± 0.71	6.55 ± 1.00	2.12 ± 0.50	4.19 ± 1.00	10.26 ± 0.50	15.98 ± 0.41
	B	1.53 ± 0.90	3.21 ± 1.00	6.08 ± 0.71	1.56 ± 0.50	4.78 ± 0.70	10.10 ± 0.70	13.19 ± 0.30
	C	0.73 ± 0.90	2.89 ± 0.70	4.30 ± 0.80		3.69 ± 0.70	10.48 ± 0.83	12.04 ± 0.40
	D		2.00 ± 0.50	5.50 ± 0.50		2.67 ± 0.50	8.13 ± 0.57	13.52 ± 0.57
	E			5.12 ± 1.00		1.83 ± 1.73	7.92 ± 0.50	-
	F							12.29 ± 0.50
Cd	A	16.59 ± 0.22	8.68 ± 0.17	10.07 ± 0.22	9.79 ± 0.26	10.21 ± 0.17	12.89 ± 0.40	8.38 ± 0.45
	B	24.11 ± 0.70	10.91 ± 0.24	9.30 ± 0.74	10.50 ± 0.43	13.10 ± 0.10	11.91 ± 0.83	15.19 ± 0.31
	C	30.36 ± 0.44	14.43 ± 0.33	12.82 ± 0.30		13.13 ± 0.37	16.85 ± 0.42	21.52 ± 0.28
	D		14.65 ± 0.56	17.54 ± 0.30		9.91 ± 0.40	14.60 ± 0.28	21.47 ± 0.67
	E			27.89 ± 0.47		15.30 ± 0.10	15.72 ± 0.46	-
	F							28.27 ± 0.00
Ni	A	5.35 ± 1.81	4.01 ± 2.31	5.18 ± 0.60	5.73 ± 2.00	4.88 ± 1.51	2.26 ± 0.60	8.06 ± 1.56
	B	2.48 ± 0.89	2.20 ± 0.54	2.76 ± 0.54	4.77 ± 1.00	4.16 ± 1.00	2.27 ± 0.72	4.11 ± 1.53
	C	2.71 ± 1.14	2.71 ± 1.13	2.56 ± 1.67		5.36 ± 0.57	3.84 ± 0.54	3.58 ± 0.50
	D		2.30 ± 0.50	1.52 ± 1.09		6.04 ± 1.00	6.21 ± 0.00	3.41 ± 0.54
	E			1.39 ± 1.00		3.65 ± 0.62	1.57 ± 0.00	-
	F							0.78 ± 0.00
Cu	A	5.13 ± 0.00	4.20 ± 0.30	4.45 ± 0.31	4.58 ± 0.10	4.35 ± 0.10	8.20 ± 0.30	8.59 ± 0.30
	B	3.55 ± 0.10	3.61 ± 0.10	4.68 ± 0.21	3.63 ± 0.20	5.46 ± 0.20	6.90 ± 0.10	5.45 ± 0.28
	C	4.58 ± 0.20	3.45 ± 0.00	5.55 ± 0.40		6.44 ± 0.30	6.50 ± 0.20	5.95 ± 0.20
	D		4.68 ± 0.00	5.78 ± 0.22		7.01 ± 0.36	6.70 ± 0.10	7.65 ± 0.10
	E			5.51 ± 0.22		6.00 ± 0.22	8.60 ± 0.36	-
	F							7.29 ± 0.20
Zn	A	97.3 ± 2.2	132.0 ± 4.4	120.5 ± 5.2	144.3 ± 3.9	154.6 ± 8.2	216.5 ± 7.7	143.3 ± 9.1
	B	95.5 ± 2.4	152.7 ± 3.9	92.2 ± 6.7	134.7 ± 2.1	179.6 ± 2.0	222.0 ± 11.0	157.3 ± 8.8
	C	101.2 ± 3.6	127.0 ± 4.6	87.2 ± 6.5		155.3 ± 12.0	200.6 ± 11.1	164.0 ± 6.1
	D		125.6 ± 1.6	88.2 ± 9.3		113.3 ± 10.6	135.0 ± 5.0	168.7 ± 11.6
	E			66.0 ± 0.0		135.0 ± 2.6	108.0 ± 1.4	-
	F							105.0 ± 0.0
Fe	A	1,268 ± 21	755 ± 17	640 ± 12	1,200 ± 20	740 ± 16	580 ± 14	1,290 ± 0
	B	758 ± 22	692 ± 45	526 ± 15	1,036 ± 32	525 ± 10	493 ± 16	1,093 ± 15
	C	684 ± 30	545 ± 23	410 ± 12		573 ± 29	377 ± 50	643 ± 26
	D		620 ± 24	403 ± 11		820 ± 17	205 ± 6	768 ± 34
	E			285 ± 10		495 ± 17	165 ± 10	-
	F							360 ± 0
Na	A	28,960 ± 503	29,950 ± 58	33,850 ± 173	35,267 ± 551	31,960 ± 462	23,075 ± 263	28,100 ± 231
	B	29,000 ± 474	27,880 ± 277	33,420 ± 881	32,120 ± 626	31,420 ± 438	23,740 ± 451	27,067 ± 404
	C	30,060 ± 152	27,900 ± 620	33,540 ± 207		33,675 ± 568	24,533 ± 116	26,600 ± 216
	D		28,100 ± 442	31,740 ± 559		29,833 ± 473	24,950 ± 58	26,640 ± 114
	E			34,166 ± 154		29,833 ± 116	17,966 ± 59	-
	F							21,100 ± 295
K	A	9,673 ± 295	9,685 ± 29	12,127 ± 176	10,360 ± 436	9,960 ± 61	9,923 ± 144	9,510 ± 635
	B	9,440 ± 271	10,010 ± 190	12,640 ± 168	10,500 ± 435	9,770 ± 188	9,277 ± 284	8,410 ± 50
	C	9,085 ± 250	9,290 ± 148	11,398 ± 394		9,948 ± 144	8,593 ± 153	8,210 ± 100
	D		8,460 ± 146	10,860 ± 122		10,027 ± 116	7,635 ± 202	7,848 ± 85
	E			10,672 ±		10,887 ± 161	8,522 ± 154	-
	F							7,772 ± 234
Mg	A	5,012 ± 85	5,300 ± 58	4,466 ± 30	4,717 ± 77	4,720 ± 135	4,950 ± 41	5,575 ± 29
	B	4,630 ± 84	4,280 ± 266	4,230 ± 45	4,460 ± 114	4,520 ± 196	4,363 ± 131	4,367 ± 208
	C	4,612 ± 85	4,140 ± 119	4,950 ± 238		4,825 ± 104	3,683 ± 176	4,367 ± 104
	D		4,340 ± 74	4,350 ± 122		3,833 ± 104	4,025 ± 29	4,388 ± 210
	E			4,721 ±		3,846 ± 50	2,371 ±	-
	F							6,121 ± 204
Ca	A	16,855 ± 568	18,830 ± 115	15,413 ± 161	11,547 ± 664	21,570 ± 1153	24,243 ± 229	13,280 ± 231
	B	15,770 ± 569	12,110 ± 1039	11,890 ± 286	9,090 ± 404	14,440 ± 802	12,843 ± 335	10,530 ± 477
	C	13,643 ± 477	9,720 ± 513	13,680 ± 316		7,993 ± 189	7,847 ± 153	10,297 ± 161
	D		8,030 ± 359	12,893 ± 317		7,713 ± 30	7,605 ± 87	10,443 ± 411
	E			11,674 ± 278		7,724 ± 180	6,224 ± 90	-
	F							12,149 ± 450

TABLE A5

ZONE 1

	SIZE class	OTTERSWICK YELL MAY	KONA'S VOE MAY	ISLE OF MAY JUNE	ST.ABBS JUNE	SOUTH GARE JAN	ROBIN HOOD'S BAY JUNE
Pb	A	12.85 ± 2.88	16.15 ± 3.53	-	4.91 ± 0.81	13.08 ± 0.81	21.21 ± 2.15
	B	7.11 ± 1.00	15.17 ± 2.12	5.64 ± 2.89	4.03 ± 0.95	11.71 ± 1.00	17.67 ± 1.63
	C	5.20 ± 1.00	12.82 ± 3.52	4.41 ± 2.21	3.55 ± 1.70	8.34 ± 0.70	19.14 ± 2.06
	D	2.66 ± 1.53	10.98 ± 2.00	3.96 ± 1.73	4.36 ± 2.21	10.80 ± 0.90	14.86 ± 2.88
	E	4.37 ± 1.00		5.57 ± 3.06		9.83 ± 0.50	25.80 ± 1.70
	F						
Cd	A	4.82 ± 0.24	3.52 ± 0.17	-	3.10 ± 0.07	3.92 ± 0.55	4.39 ± 0.37
	B	7.87 ± 0.40	4.34 ± 0.36	3.59 ± 0.26	3.10 ± 0.41	4.09 ± 0.45	6.34 ± 0.38
	C	15.10 ± 0.46	5.56 ± 0.17	3.77 ± 0.24	2.54 ± 0.17	4.78 ± 0.67	7.27 ± 0.37
	D	17.66 ± 0.10	7.77 ± 0.17	4.35 ± 0.22	2.62 ± 0.54	4.24 ± 0.50	6.56 ± 0.26
	E	18.16 ± 0.10		5.90 ± 0.20		5.68 ± 0.33	6.66 ± 0.30
	F						
N	A	2.58 ± 0.00	1.70 ± 0.61	-	3.50 ± 0.95	3.87 ± 0.57	8.61 ± 1.25
	B	2.38 ± 1.00	2.04 ± 1.00	2.11 ± 0.00	2.51 ± 0.81	3.34 ± 0.89	4.41 ± 1.00
	C	0.00 ± 0.00	2.12 ± 0.59	1.86 ± 0.60	3.19 ± 1.25	4.55 ± 0.81	6.70 ± 0.95
	D	0.57 ± 0.00	1.72 ± 0.57	2.33 ± 1.53	1.28 ± 1.28	3.93 ± 0.50	5.66 ± 0.50
	E	0.00 ± 0.00		0.70 ± 0.59		2.02 ± 0.57	7.43 ± 0.50
	F						
Cu	A	4.56 ± 0.28	5.55 ± 0.36	-	9.75 ± 0.47	30.73 ± 1.70	19.46 ± 0.52
	B	3.50 ± 0.22	4.28 ± 0.49	8.68 ± 0.01	9.66 ± 0.37	27.75 ± 1.00	17.27 ± 0.36
	C	3.40 ± 0.49	3.85 ± 0.30	9.39 ± 0.09	10.49 ± 0.34	27.25 ± 0.50	20.20 ± 1.89
	D	2.57 ± 0.14	4.56 ± 0.35	9.05 ± 0.36	9.10 ± 0.80	30.78 ± 0.71	17.24 ± 0.43
	E	3.47 ± 0.50		9.63 ± 0.26		28.75 ± 1.00	18.48 ± 0.85
	F						
Zn	A	119.[illegible] ± 17.0	112.6 ± 17.0	-	82.2 ± 0.5	221.6 ± 4.4	137.0 ± 10.7
	B	104.6 ± 7.6	115.0 ± 10.4	78.3 ± 5.1	71.7 ± 2.1	204.7 ± 5.6	137.0 ± 0.8
	C	127.5 ± 43.1	115.3 ± 3.2	75.6 ± 3.8	227.2 ± 2.5	227.2 ± 2.5	137.0 ± 2.9
	D	95.0 ± 9.9	101.0 ± 0	71.6 ± 1.6	76.9 ± 3.7	193.5 ± 10.6	117.2 ± 2.6
	E	111.0 ± 4.2		61.3 ± 2.4		123.6 ± 1.9	100.5 ± 1.7
	F						
Fe	A	2,061 ± 29	2,109 ± 142	-	1,503 ± 48	1,643 ± 37	7,740 ± 208
	B	2,006 ± 72	1,819 ± 21	1,533 ± 16	1,493 ± 17	1,356 ± 9	5,865 ± 83
	C	1,016 ± 69	1,356 ± 0	1,356 ± 10	1,273 ± 10	1,200 ± 44	6,915 ± 96
	D	941 ± 29	1,291 ± 5	1,376 ± 10	968 ± 29	863 ± 38	6,790 ± 183
	E	771 ± 17		1,342 ± 47		915 ± 0	7,915 ± 171
	F						
Na	A	17,300 ± 60	24,967 ± 252	-	13,950 ± 58	16,750 ± 129	6,175 ± 123
	B	17,967 ± 59	26,633 ± 231	11,000 ± 200	16,350 ± 100	16,940 ± 134	9,92[illegible] ± 125
	C	15,600 ± 361	26,933 ± 153	9,233 ± 208	14,025 ± 126	17,125 ± 126	9,4[illegible]5 ± 439
	D	15,300 ± 100	21,300 ± 250	10,000 ± 200	15,175 ± 145	15,875 ± 126	10,620 ± [illegible]29
	E	16,000 ± 70		12,133 ± 58		18,266 ± 59	10,245 ± 150
	F						
K	A	8,947 ± 27	6,620 ± 132	-	6,221 ± 165	11,985 ± 50	2,340 ± 111
	B	9,287 ± 161	6,870 ± 50	8,280 ± 58	7,296 ± 48	11,848 ± 111	3,628 ± 95
	C	8,420 ± 0	8,337 ± 153	10,563 ± 100	7,221 ± 85	11,660 ± 71	3,478 ± 63
	D	8,513 ± 52	8,237 ± 30	8,030 ± 104	7,083 ± 51	11,647 ± 48	3,590 ± 41
	E	8,970 ± 0		9,436 ± 101		12,172 ± 424	3,603 ± 25
	F						
Mg	A	3,633 ± 29	4,933 ± 116	-	3,160 ± 48	3,813 ± 111	4,450 ± 58
	B	3,666 ± 77	4,833 ± 29	1,997 ± 0	3,135 ± 25	3,525 ± 29	4,113 ± 48
	C	3,233 ± 29	4,516 ± 126	1,897 ± 0	2,585 ± 48	3,413 ± 48	4,238 ± 85
	D	3,183 ± 29	3,650 ± 50	1,830 ± 29	2,814 ± 29	3,000 ± 41	4,225 ± 29
	E	3,200 ± 50		2,113 ± 29		3,121 ± 35	4,663 ± 25
	F						
Ca	A	6,280 ± 50	17,547 ± 351	-	10,201 ± 532	7,680 ± 158	16,005 ± 524
	B	7,713 ± 275	17,180 ± 229	3,541 ± 77	7,251 ± 104	6,255 ± 65	12,343 ± 165
	C	7,730 ± 312	10,497 ± 333	2,857 ± 104	4,326 ± 41	6,118 ± 111	14,243 ± 232
	D	6,913 ± 77	8,297 ± 176	3,891 ± 189	5,376 ± 132	5,355 ± 171	14,293 ± 206
	E	6,480 ± 70		3,666 ± 138		6,049 ± 35	16,268 ± 405
	F						

TABLE A6
ZONE 2

	SIZE class	HAROLDSWICK MAY	OLLABERRY MAY	OTTERSWICK YELL MAY	RONA'S VOE MAY	WHITENESS VOE MAY	ST. ABBS NOV	ST. ABBS JUNE	BLACKHALL ROCKS JUNE	SOUTH GARE JAN	SOUTH GARE JUNE
Pb	A	7.22 ± 1.54	15.65 ± 2.10	7.27 ± 0.00	8.14 ± 0.57	5.72 ± 1.18	6.80 ± 0.20	6.06 ± 0.57	-	7.78 ± 1.00	-
	B	4.89 ± 2.09	15.33 ± 3.14	7.58 ± 0.61	7.20 ± 1.73	4.94 ± 0.63	-	6.45 ± 0.00	16.24 ± 3.00	7.02 ± 0.71	10.61 ± 1.70
	C	5.34 ± 0.00	24.68 ± 1.57	6.00 ± 1.15	2.97 ± 1.73	6.50 ± 2.00	5.00 ± 0.40	-	30.57 ± 2.87	4.52 ± 0.83	5.08 ± 0.57
	D	6.48 ± 1.53	32.76 ± 1.00	4.29 ± 0.00		5.58 ± 0.00		4.78 ± 0.57	24.83 ± 4.03	5.89 ± 0.50	9.14 ± 1.00
	E		29.23 ± 0.50						20.18 ± 2.64	5.43 ± 0.63	7.26 ± 0.64
	F								18.25 ± 1.73		8.32 ± 1.55
Cd	A	1.86 ± 0.14	4.32 ± 0.20	4.05 ± 0.31	11.08 ± 0.34	5.60 ± 0.26	8.75 ± 0.28	5.39 ± 0.14	-	1.83 ± 0.22	-
	B	3.01 ± 0.43	6.45 ± 0.45	9.46 ± 0.44	17.06 ± 0.44	9.20 ± 0.34	-	5.36 ± 0.31	4.46 ± 0.36	2.25 ± 0.33	3.29 ± 0.55
	C	3.66 ± 0.00	6.52 ± 0.10	10.55 ± 0.41	14.24 ± 0.38	9.53 ± 0.40	10.91 ± 0.28	-	4.76 ± 0.36	3.84 ± 0.42	2.92 ± 0.00
	D	4.03 ± 0.40	6.45 ± 0.36	17.73 ± 0.41		8.30 ± 0.20		12.69 ± 0.33	8.66 ± 0.43	4.11 ± 0.33	2.94 ± 0.17
	E		10.21 ± 0.10						10.87 ± 0.45	5.03 ± 0.10	2.69 ± 0.30
	F								11.43 ± 0.14		3.39 ± 0.64
Ni	A	18.58 ± 1.55	3.75 ± 2.00	3.14 ± 0.61	2.00 ± 0.00	1.31 ± 0.00	4.90 ± 1.30	4.37 ± 0.57	-	4.89 ± 2.50	-
	B	15.51 ± 1.75	3.01 ± 1.00	0.76 ± 0.45	2.62 ± 1.00	0.82 ± 0.15	-	3.51 ± 0.71	2.00 ± 0.59	4.12 ± 1.38	3.78 ± 0.61
	C	9.07 ± 0.57	5.28 ± 1.53	1.28 ± .55	1.13 ± 0.59	0.98 ± .52	2.39 ± 0.50	-	2.35 ± 0.95	2.71 ± 1.58	2.13 ± 0.59
	D	7.43 ± 1.00	2.40 ± 1.16	0.44 ± 0.00		0.76 ± 0.00		2.20 ± 0.95	1.30 ± 1.00	4.16 ± 2.30	2.25 ± 0.59
	E		0.92 ± 0.57						2.86 ± 0.81	0.90 ± 0.57	3.48 ± 0.54
	F								2.41 ± 1.00		1.64 ± 0.00
Cu	A	6.68 ± 1.65	11.66 ± 0.69	7.07 ± 0.38	7.98 ± 0.42	5.50 ± 0.33	9.44 ± 0.41	10.41 ± 1.07	-	14.70 ± 0.00	-
	B	4.85 ± 0.56	9.86 ± 0.64	4.23 ± 0.44	6.02 ± 0.64	5.45 ± 0.36	-	10.24 ± 0.31	29.06 ± 3.82	17.22 ± 1.00	17.00 ± 0.42
	C	4.06 ± 0.14	12.25 ± 0.61	5.87 ± 0.78	6.26 ± 0.57	4.60 ± 0.32	11.57 ± 0.34	-	35.62 ± 3.30	22.10 ± 0.30	20.50 ± 0.10
	D	3.29 ± 0.21	11.80 ± 0.56	5.26 ± 0.00		3.89 ± 0.30		8.76 ± 0.78	31.65 ± 2.50	19.12 ± 0.20	20.61 ± 0.73
	E		11.44 ± 0.28						30.90 ± 3.69	21.13 ± 0.62	19.01 ± 0.00
	F								31.91 ± 1.28		27.02 ± 1.00
Zn	A	95.0 ± 2.0	160.0 ± 3.5	151.7 ± 3.5	209.5 ± 5.0	148.4 ± 4.2	124.6 ± 10.0	88.5 ± 1.7	-	229.8 ± 8.7	-
	B	115.0 ± 23.4	134.7 ± 4.0	155.4 ± 9.2	173.0 ± 2.8	128.0 ± 8.9	-	85.2 ± 1.9	191.7 ± 11.8	219.0 ± 1.9	152.4 ± 4.7
	C	85.0 ± 2.8	140.7 ± 1.3	111.0 ± 1.4	169.5 ± 6.4	133.4 ± 3.8	123.0 ± 8.1	-	192.8 ± 2.2	202.2 ± 4.0	133.9 ± 1.0
	D	92.0 ± 10.2	143.4 ± 5.7	51.0 ± 0.0		128.0 ± 0.0		77.0 ± 5.3	199.3 ± 5.4	188.7 ± 6.3	136.6 ± 1.6
	E		128.7 ± 4.6						198.5 ± 5.8	178.0 ± 3.6	125.6 ± 3.5
	F								180.5 ± 7.2		122.3 ± 2.1
Fe	A	2,153 ± 29	2,305 ± 72	2,619 ± 76	1,811 ± 15.8	1,633 ± 72	1,382 ± 28	1,632 ± 103	-	1,542 ± 149	-
	B	1,739 ± 31	1,995 ± 17	2,029 ± 60	961 ± 17.0	1,313 ± 72	-	1,500 ± 125	2,990 ± 0	1,326 ± 30	995 ± 18
	C	1,691 ± 46	2,792 ± 41	1,931 ± 64	811 ± 17.3	1,219 ± 72	1,515 ± 56	-	3,815 ± 126	840 ± 30	805 ± 20
	D	1,439 ± 12	1,978 ± 12	1,652 ± 10		1,200 ± 50		843 ± 123	3,465 ± 96	828 ± 31	1,125 ± 26
	E		1,405 ± 10						3,215 ± 96	765 ± 72	788 ± 15
	F								2,340 ± 100		622 ± 32
Na	A	15,500 ± 173	18,100 ± 173	21,000 ± 100	20,100 ± 173	19,267 ± 231	20,260 ± 167	24,250 ± 238	-	15,700 ± 82	-
	B	15,433 ± 153	18,667 ± 153	23,767 ± 260	25,967 ± 260	18,133 ± 116	-	25,975 ± 236	14,970 ± 200	16,460 ± 152	11,475 ± 50
	C	15,833 ± 153	18,200 ± 0	19,300 ± 819	22,867 ± 160	19,200 ± 173	20,000 ± 220	-	15,145 ± 50	14,780 ± 130	12,400 ± 70
	D	16,033 ± 153	19,233 ± 153	18,000 ± 300		15,000 ± 0		21,955 ± 96	14,120 ± 100	15,240 ± 706	12,900 ± 100
	E		20,567 ± 59						15,020 ± 129	15,300 ± 100	10,767 ± 59
	F								14,045 ± 150		12,633 ± 58
K	A	10,970 ± 132	7,339 ± 126	9,320 ± 87	6,130 ± 151	8,827 ± 281	11,190 ± 275	8,471 ± 149	-	11,885 ± 65	-
	B	10,887 ± 59	7,789 ± 126	9,370 ± 87	7,653 ± 275	9,203 ± 153	-	8,546 ± 48	6,090 ± 50	11,850 ± 156	7,496 ± 63
	C	10,597 ± 76	7,289 ± 58	9,470 ± 70	6,470 ± 160	9,003 ± 506	10,010 ± 50	-	6,753 ± 170	12,600 ± 198	8,466 ± 30
	D	10,453 ± 116	8,222 ± 250	9,970 ± 90		9,420 ± 0		9,083 ± 71	7,815 ± 87	12,360 ± 345	8,616 ± 77
	E		8,397 ± 35						7,565 ± 194	12,272 ± 71	8,950 ± 126
	F								7,640 ± 147		9,400 ± 126
Mg	A	4,200 ± 50	3,979 ± 29	4,100 ± 50	4,300 ± 50	3,633 ± 58	3,810 ± 65	4,122 ± 87	-	3,600 ± 41	-
	B	3,967 ± 58	3,663 ± 58	4,283 ± 29	4,483 ± 29	3,367 ± 29		4,272 ± 65	3,600 ± 50	3,650 ± 79	2,447 ± 41
	C	3,400 ± 0	4,275 ± 104	4,020 ± 26	4,000 ± 70	3,317 ± 29	4,400 ± 50	-	3,813 ± 48	2,950 ± 50	2,480 ± 29
	D	3,567 ± 58	3,479 ± 29	1,700 ± 50		2,750 ± 40		3,497 ± 70	3,375 ± 65	2,960 ± 139	2,680 ± 58
	E		3,296 ± 40						3,338 ± 25	2,746 ± 70	2,430 ± 29
	F								2,963 ± 48		2,530 ± 53
Ca	A	9,147 ± 161	13,157 ± 480	6,113 ± 111	10,830 ± 150	7,980 ± 180	12,540 ± 451	10,514 ± 565	-	9.918 ± 202	-
	B	6,980 ± 400	10,774 ± 255	5,847 ± 77	9,380 ± 110	6,730 ± 182	-	10,964 ± 397	5,447 ± 116	8,210 ± 277	6,264 ± 293
	C	6,437 ± 227	11,524 ± 278	8,163 ± 30	11,630 ± 100	5,147 ± 158	17,403 ± 162	-	7,018 ± 202	5,230 ± 146	5,826 ± 200
	D	7,580 ± 330	10,107 ± 126	7,080 ± 70		5,280 ± 170		6,164 ± 118	5,393 ± 103	4,760 ± 291	8,743 ± 176
	E		6,824 ± 171						4,685 ± 66	3,587 ± 88	5,876 ± 229
	F								4,480 ± 71		5,159 ± 58

TABLE A7

ZONE 3

	SIZE CLASS	HAROLDSWICK MAY	ULLAFRRY MAY	OTTERSWICK YELL MAY	RONA'S VOE MAY	WHITENESS VOE MAY	ISLE OF MAY JUNE	ST.ABBS NOV	ST.ABBS JUNE	SOUTH GARE MARCH
Pb	A	- -	13.85 ± 0.73	9.58 ± 0.00	7.65 ± 1.00	8.73 ± 3.23	9.68 ± 1.54	8.12 ± 0.57	4.68 ± 1.00	17.47 ± 0.00
	B	- -	17.67 ± 1.35	[illegible] ± 1.54	8.21 ± 0.65	2.61 ± 1.00	9.42 ± 1.50	8.18 ± 0.70	4.67 ± 1.00	15.84 ± 0.84
	C	5.42 ± 1.00	15.93 ± 0.71	6.69 ± 1.53	3.52 ± 1.73	5.29 ± 1.73	4.21 ± 1.82	9.76 ± 0.70	4.75 ± 0.00	16.65 ± 0.71
	D	4.29 ± 1.17	14.19 ± 2.91	6.41 ± 0.00	3.01 ± 0.00	7.34 ± 1.00	9.36 ± 2.10	10.51 ± 0.50		18.97 ± 0.90
	E	10.42 ± 0.00					9.10 ± 3.51			17.78 ± 1.00
	F									
Cd	A	-	2.01 ± 0.17	4.94 ± 0.00	7.41 ± 0.17	4.11 ± 0.17	18.38 ± 0.64	9.49 ± 0.05	10.30 ± 0.31	1.94 ± 0.10
	B	-	2.54 ± 0.26	5.39 ± 0.28	10.34 ± 0.59	7.23 ± 0.10	13.17 ± 0.37	9.46 ± 0.37	11.73 ± 1.27	3.54 ± 0.17
	C	5.20 ± 0.17	3.03 ± 0.17	8.61 ± 0.42	15.21 ± 1.68	7.33 ± 0.31	13.98 ± 0.30	13.60 ± 0.31	17.14 ± 0.00	2.51 ± 0.41
	D	4.80 ± 0.17	6.48 ± 0.30	6.40 ± 0.26	9.00 ± 0.26	10.7[illegible] ± 0.24	12.60 ± 0.69	15.91 ± 0.63		3.27 ± 0.34
	E	4.47 ± 0.20					16.38 ± 0.31			3.76 ± 0.36
	F									
N	A	-	2.43 ± 1.00	2.80 ± 0.00	2.93 ± 1.00	0.67 ± 0.58	2.71 ± 0.00	4.48 ± 0.00	3.55 ± 0.57	3.24 ± 0.57
	B	-	3.22 ± 0.61	4.60 ± 1.00	1.71 ± 0.70	1.29 ± 0.59	2.48 ± 0.52	2.22 ± 0.83	6.37 ± 0.75	1.99 ± 0.66
	C	9.98 ± 1.54	1.83 ± 0.59	1.57 ± 1.00	2.02 ± 0.59	0.32 ± 1.00	1.47 ± 0.00	1.63 ± 0.50	1.95 ± 0.54	2.93 ± 0.83
	D	8.13 ± 2.09	1.99 ± 0.59	1.95 ± 0.59	1.29 ± 0.00	0.55 ± 1.00	1.73 ± 1.53	1.69 ± 1.63		4.29 ± 2.62
	E	14.16 ± 0.57					1.94 ± 0.00			0.06 ± 1.00
	F									
Cu	A	-	8.07 ± 0.38	7.70 ± 0.00	5.67 ± 2.10	4.30 ± 0.17	17.12 ± 0.35	7.55 ± 0.10	8.49 ± 0.00	26.78 ± 1.00
	B	-	7.73 ± 0.18	5.07 ± 0.17	6.31 ± 0.16	4.38 ± 0.71	15.60 ± 0.27	6.94 ± 0.17	7.89 ± 0.20	31.79 ± 1.10
	C	11.87 ± 0.17	5.58 ± 0.16	4.09 ± 0.08	5.98 ± 0.40	5.06 ± 1.10	16.10 ± 0.21	7.81 ± 0.20	8.69 ± 0.00	33.78 ± 1.00
	D	9.56 ± 0.65	6.46 ± 0.17	4.14 ± 0.22	9.68 ± 2.62	6.09 ± 0.21	15.97 ± 0.19	7.78 ± 0.34		24.83 ± 1.10
	E	11.76 ± 0.85					20.72 ± 0.98	6.27 ± 0.40		28.62 ± 0.42
	F									
Zn	A	-	234.0 ± 6.9	158.0 ± 0.0	204.3 ± 6.5	135.0 ± 11.4	207.0 ± 6.6	177.0 ± 2.3	198.2 ± 2.8	225.7 ± 9.1
	B	-	236.3 ± 23.1	154.0 ± 14.8	136.0 ± 6.0	147.5 ± 9.2	186.7 ± 2.1	145.8 ± 6.1	172.6 ± 4.2	220.3 ± 6.3
	C	167.0 ± 4.4	199.0 ± 11.3	143.0 ± 2.7	153.3 ± 9.1	138.6 ± 3.1	186.5 ± 3.5	173.0 ± 4.7	171.6 ± 0.7	215.6 ± 4.5
	D	170.5 ± 5.0	171.3 ± 1.6	115.0 ± 5.3	107.5 ± 7.1	111.3 ± 9.2	147.0 ± 5.2	168.7 ± 2.6		212.2 ± 4.9
	E	138.5 ± 7.8					125.7 ± 6.4			190.0 ± 7.8
	F									
Fe	A	-	2,153 ± 77	2,900 ± 20	1,056 ± 10	2,236 ± 100	2,603 ± 58	710 ± 12	648 ± 15	1,022 ± 77
	B	-	1,686 ± 36	2,336 ± 87	1,189 ± 23	1,641 ± 96	2,103 ± 29	534 ± 36	605 ± 20	1,072 ± 23
	C	1,489 ± 29	1,616 ± 46	2,369 ± 29	1,323 ± 50	1,343 ± 16	1,856 ± 50	493 ± 10	535 ± 30	1,250 ± 35
	D	1,416 ± 36	1,429 ± 42	2,336 ± 50	976 ± 10	1,226 ± 26	1,929 ± 55	393 ± 17		1,724 ± 23
	E	1,546 ± 12					1,917 ± 29			810 ± 10
	F									
Na	A	-	20,433 ± 231	14,000 ± [illegible]	15,500 ± 100	17,100 ± 300	22,700 ± 173	17,600 ± 115	23,225 ± 96	12,000 ± 100
	B	-	19,400 ± 400	16,367 ± 116	17,233 ± 231	19,133 ± 159	16,567 ± 59	15,960 ± 152	22,700 ± 100	11,760 ± 84
	C	17,600 ± 361	20,067 ± 116	17,533 ± 208	18,100 ± 173	20,000 ± 200	14,700 ± 200	15,225 ± 222	20,500 ± 90	10,940 ± 152
	D	17,800 ± 0	22,767 ± 153	16,167 ± 153	16,700 ± 300	16,500 ± 100	13,633 ± 58	15,525 ± 479		11,140 ± 55
	E	17,700 ± 0					12,635 ± 322			10,900 ± [illegible]
	F									
K	A	-	6,037 ± 116	6,570 ± [illegible]	7,070 ± 87	10,990 ± 161	6,930 ± 30	12,127 ± 176	7,133 ± 58	10,922 ± [illegible]
	B	-	6,237 ± 126	8,270 ± 265	7,887 ± 58	10,696 ± 58	9,146 ± 176	12,685 ± 272	6,983 ± 87	10,920 ± 142
	C	8,653 ± 176	6,603 ± 29	8,353 ± 189	8,687 ± 276	10,363 ± 312	10,213 ± 0	11,398 ± 111	6,833 ± 80	11,130 ± 84
	D	8,403 ± 161	7,087 ± 126	8,103 ± 58	8,987 ± 77	9,963 ± 520	9,230 ± 77	11,210 ± 397		10,440 ± 191
	E	8,530 ± 128					10,613 ± 132			11,293 ± 231
	F									
Mg	A	-	4,283 ± 116	3,400 ± 0	3,050 ± 500	3,247 ± 20	3,880 ± 104	3,150 ± 50	4,085 ± 48	3,596 ± 60
	B	-	4,150 ± 0	3,467 ± 77	3,150 ± 107	3,497 ± 50	3,097 ± 50	2,713 ± 85	3,997 ± 50	3,340 ± 22
	C	4,050 ± 132	4,283 ± 29	3,533 ± 29	3,250 ± 100	3,347 ± 20	2,922 ± 25	2,475 ± 104	3,747 ± 50	3,360 ± 96
	D	3,800 ± 100	3,950 ± 50	3,300 ± 100	2,983 ± 290	2,964 ± 29	2,847 ± 20	2,767 ± 126		2,890 ± 22
	E	4,483 ± 153					2,697 ± 10			2,633 ± 29
	F									
Ca	A	-	7,097 ± 333	5,580 ± [illegible]	4,947 ± 300	8,024 ± 100	12,441 ± 419	6,530 ± 229	9,414 ± 125	5,974 ± 100
	B	-	6,297 ± 77	6,430 ± 278	5,280 ± 105	10,791 ± [illegible]	12,757 ± 535	7,405 ± 512	9,443 ± 161	5,610 ± 84
	C	5,663 ± 153	6,530 ± 87	6,330 ± 250	5,180 ± 132	7,474 ± 50	7,657 ± 226	3,893 ± 85	10,126 ± 110	6,290 ± 178
	D	4,363 ± 202	4,503 ± 75	6,297 ± 176	8,830 ± 100	6,574 ± 200	11,307 ± 402	5,463 ± 126		3,700 ± 91
	E	5,513 ± 153					4,174 ± 387			4,313 ± 202
	F									

DETAILS ON STATISTICAL ANALYSIS FOR SECTION III CHEMICAL ANALYSIS DATA.

ZONE 1

Pb : MA $\overset{*}{>}$ KI $\overset{*}{>}$ GL > ARD

Cd : ARD $\overset{*}{>}$ GL $\overset{*}{>}$ KI $\overset{*}{>}$ MA

Ni : MA > KI > ARD > GL but only MA $\overset{*}{>}$ ARD > MA $\overset{*}{>}$ GL

Cu : MA $\overset{*}{>}$ KI $\overset{*}{>}$ GL > ARD

Zn : GL $\overset{*}{>}$ MA $\overset{*}{>}$ ARD > KI

Fe : MA $\overset{*}{>}$ ARD > GL $\overset{*}{>}$ KI

Na : KI $\overset{*}{>}$ ARD > GL $\overset{*}{>}$ MA

K : KI $\overset{*}{>}$ MA $\overset{*}{>}$ GL $\overset{*}{>}$ ARD

Mg : ARD > GL > KI > MA only ARD $\overset{*}{>}$ KI and ARD $\overset{*}{>}$ MA

Ca : MA $\overset{*}{>}$ ARD $\overset{*}{>}$ GL > KI

Where :

(1): ARD = Ardnamurchan

(2): GL = Glenmore bay

(3): KI = Kilchoan

(4): MA = Marsden Bay

* : signif. diff.

ZONE 3

Pb : MA $\overset{*}{\geq}$ SA $\overset{*}{\geq}$ KI $\overset{*}{\geq}$ STAB $\overset{*}{\geq}$ GL $\overset{*}{\geq}$ ARD

Cd : SA $\overset{*}{\geq}$ GL > KI $\overset{*}{\geq}$ ARD > STAB > MA

Ni : Any combinations do not show sign. diff.

Cu : MA $\overset{*}{\geq}$ STAB > KI $\overset{*}{\geq}$ GL > SAL $\overset{*}{\geq}$ ARD

Zn : MA > KI $\overset{*}{\geq}$ GL $\overset{*}{\geq}$ SAL > STAB > ARD

Fe : MA $\overset{*}{\geq}$ SAL > ARD $\overset{*}{\geq}$ STAB > GL > KI

Na : ARD > GL $\overset{*}{\geq}$ KI $\overset{*}{\geq}$ SA $\overset{*}{\geq}$ STAB > MA

K : STAB > MA $\overset{*}{\geq}$ ARD > GL > KI $\overset{*}{\geq}$ SAL

Mg : GL > MA > ARD > SAL > KI $\overset{*}{\geq}$ STAB

Ca : MA > GL $\overset{*}{\geq}$ KI $\overset{*}{\geq}$ SAL > ARD $\overset{*}{\geq}$ STAB

(1): SA = SALEN

B Area Shetland Marsden

Pb

- Zone 1: MA > RON $\overset{*}{\geq}$ OTT
- " 2: MA $\overset{*}{\geq}$ OLL $\overset{*}{\geq}$ OTT > RON > WHI V. > HAR
- " 3: OLL > MA $\overset{*}{\geq}$ RON > OTT > WHI

Cd

- " 1: OTT $\overset{*}{\geq}$ MA $\overset{*}{\geq}$ RON
- " 2: RON $\overset{*}{\geq}$ OTT > WHI V. $\overset{*}{\geq}$ OLL > MA $\overset{*}{\geq}$ HAR
- " 3: RON $\overset{*}{\geq}$ WHI V. > MA > OTT $\overset{*}{\geq}$ OLL

Ni

- " 1: OTT > RON > MA
- " 2: HAR $\overset{*}{\geq}$ OLL > MA > RON > WHI V > OTT
- " 3: OTT > OLL > MA > RON > WHI V
  (OTT $\overset{*}{\geq}$ RON, OTT $\overset{*}{\geq}$ WHI V, OTT $\overset{*}{\geq}$ MA)

Cu

- " 1: MA $\overset{*}{\geq}$ RON > OTT
- " 2: MA $\overset{*}{\geq}$ OLL $\overset{*}{\geq}$ RON > WHI V > HAR > OTT
- " 3: MA > OLL > RON > OTT > WHI V.

Zn

- " 1: MA $\overset{*}{\geq}$ RON > OTT
- " 2: RON $\overset{*}{\geq}$ OTT $\overset{*}{\geq}$ MA $\overset{*}{\geq}$ OLL > WHI V > HAR
- " 3: OLL > MA > OTT > WHI V > RON

Fe

- 1: MA $\overset{*}{\geq}$ OTT $\overset{*}{\geq}$ RON
- 2: MA $\overset{*}{\geq}$ OTT > OLL > HAR $\overset{*}{\geq}$ WHI V. $\overset{*}{\geq}$ RON
- 3: OTT $\overset{*}{\geq}$ OLL > WHI V. $\overset{*}{\geq}$ MA $\overset{*}{\geq}$ RON

B Area (cont.)

Na	Zone 1	RON $\overset{*}{>}$ MA $\overset{*}{>}$ OTT
	" 2	RON $\overset{*}{>}$ OTT $\overset{*}{>}$ MA $\overset{*}{>}$ OLL $\overset{*}{>}$ WHI V. $\overset{*}{>}$ HAR
	" 3	MA $\overset{*}{>}$ OLL > WHI V $\overset{*}{>}$ RON $\overset{*}{>}$ OTT
K	" 1	OTT $\overset{*}{>}$ MA $\overset{*}{>}$ RON
	" 2	HAR $\overset{*}{>}$ OTT > WHI V $\overset{*}{>}$ OLL > RON $\overset{*}{>}$ MA
	" 3	WHI V $\overset{*}{>}$ OTT > RON > MA $\overset{*}{>}$ OLL
Mg	" 1	MA > RON $\overset{*}{>}$ OTT
	" 2	MA $\overset{*}{>}$ RON $\overset{*}{>}$ OTT $\overset{*}{>}$ HAR $\overset{*}{>}$ OLL $\overset{*}{>}$ WHI V.
	" 3	MA $\overset{*}{>}$ OLL $\overset{*}{>}$ WHI V > OTT $\overset{*}{>}$ RON
Ca	" 1	MA > RON $\overset{*}{>}$ OTT
	" 2	MA $\overset{*}{>}$ OLL > RON $\overset{*}{>}$ HAR > WHI V. > OTT
	" 3	MA $\overset{*}{>}$ WHI V > OTT $\overset{*}{>}$ OLL $\overset{*}{>}$ RON

Where;

(1) HAR = Haroldswick

(2) OLL = Ollaberry

(3) OTT = Otterswick

(4) RON = Ronas voe

(5) WHI V = Whitness voe

APPENDIX 11

File of all size parameters data for <u>P. vulgata:</u> Shell length, shell breadth, shell height (in mm), dry flesh weight and dry shell weight (in mgr.)

```
$SIG BTM7 T=20 P=40
**LAST SIGNON WAS: 14:06.32  04-15-75
 USER "ETM7" SIGNED ON AT  03:12.48 ON 04-16-75
$CREATE FILE1 SIZE=20P
 FILE "FILE1" HAS BEEN CREATED.
$NUMBER
$UNNUMBER
$LIST FILE1
```

			shell length (mm)	shell breadth (mm)	shell Height (mm)	Flesh weight (mgs)	SHELL WEIGHT (mgs)
1	63						
2	RUN NAME		KILCHCAN 1	NOV.			
3	KI1NOV	1	45	39	16	632	7993
4	KI1NOV	2	42	37	14	686	5523
5	KI1NOV	3	37	33	12	396	4853
6	KI1NOV	4	24	19	7	74	893
7	KI1NOV	5	33	28	12	266	3499
8	KI1NOV	6	34	27	11	226	2901
9	KI1NOV	7	29	26	8	150	1674
10	KI1NOV	8	26	22	8	86	1078
11	KI1NOV	9	44	39	13	736	7538
12	KI1NOV	10	28	24	9	131	1752
13	KI1NOV	11	30	24	9	140	2100
14	KI1NOV	12	33	26	13	246	2806
15	KI1NOV	13	45	40	16	518	10913
16	KI1NOV	14	50	45	17	946	7539
17	KI1NOV	15	31	26	19	175	2289
18	KI1NOV	16	46	40	17	717	8467
19	KI1NOV	17	39	32	12	343	4743
20	KI1NOV	18	47	43	20	1132	12608
21	KI1NOV	19	46	39	17	509	8783
22	KI1NOV	20	42	36	15	563	6583
23	KI1NOV	21	43	36	16	544	6503
24	KI1NOV	22	50	43	20	879	11857
25	KI1NOV	23	50	44	20	933	10550
26	KI1NOV	24	40	30	11	357	3879
27	KI1NOV	25	40	35	11	297	4093
28	KI1NOV	26	47	41	16	597	8214
29	KI1NOV	27	43	37	14	553	6487
30	KI1NOV	28	45	40	17	817	6524
31	KI1NOV	29	35	31	12	404	3396
32	KI1NOV	30	31	26	9	136	1997
33	KI1NOV	31	37	30	11	212	3190
34	KI1NOV	32	36	30	12	235	4147
35	KI1NOV	33	30	24	8	137	1719
36	KI1NOV	34	21	17	6	35	509
37	KI1NOV	35	43	38	14	515	6365
38	KI1NOV	36	38	31	11	300	4486
39	KI1NOV	37	42	35	14	646	5873
40	KI1NOV	38	43	38	15	518	6359
41	KI1NOV	39	35	32	11	216	3863
42	KI1NOV	40	47	40	17	638	5276
43	KI1NOV	41	31	25	8	162	1806
44	KI1NOV	42	32	24	11	215	2350
45	KI1NOV	43	48	40	15	520	7638
46	KI1NOV	44	52	46	19	928	10191
47	KI1NOV	45	37	28	12	259	3877
48	KI1NOV	46	36	30	11	214	3677
49	KI1NOV	47	37	30	11	227	3959
50	KI1NOV	48	43	36	15	627	7332
51	KI1NOV	49	27	22	7	91	1387
52	KI1NOV	50	30	23	8	159	1874

53	KI1NOV	51	38	32	14	399	4426
54	KI1NOV	52	46	39	18	729	9117
55	KI1NOV	53	48	43	18	839	9937
56	KI1NOV	54	48	42	16	840	7498
57	KI1NOV	55	47	40	14	449	6884
58	KI1NOV	56	35	30	10	202	2738
59	KI1NOV	57	46	41	18	706	8475
60	KI1NOV	58	43	39	15	485	7488
61	KI1NOV	59	38	31	12	296	4668
62	KI1NOV	60	27	22	8	83	1380
63	KI1NOV	61	40	33	12	349	4441
64	KI1NOV	62	33	26	9	180	2707
65	KI1NOV	63	38	33	13	403	4997
66	82						
67	RUN NAME		GLENMORE 1 NOV				
68	GL1NOV	1	41	32	14	392	4781
69	GL1NOV	2	18	16	5	48	364
70	GL1NOV	3	19	14	6	62	322
71	GL1NOV	4	42	36	14	353	5681
72	GL1NOV	5	36	28	14	334	3948
73	GL1NOV	6	18	15	4	34	246
74	GL1NOV	7	20	15	5	38	388
75	GL1NOV	8	40	35	14	379	5737
76	GL1NOV	9	36	30	12	366	3267
77	GL1NOV	10	46	40	17	628	6881
78	GL1NOV	11	35	29	12	260	3689
79	GL1NOV	12	39	31	14	435	4508
80	GL1NOV	13	33	28	10	211	2405
81	GL1NOV	14	40	33	15	484	4574
82	GL1NOV	15	35	28	11	262	2635
83	GL1NOV	16	37	31	11	309	3107
84	GL1NOV	17	37	29	11	281	2630
85	GL1NOV	18	42	36	16	455	6518
86	GL1NOV	19	22	18	6	57	486
87	GL1NOV	20	44	40	17	638	6750
88	GL1NOV	21	35	29	12	277	3145
89	GL1NOV	22	44	38	15	543	6830
90	GL1NOV	23	43	36	18	595	7794
91	GL1NOV	24	36	30	11	274	3376
92	GL1NOV	25	32	27	10	196	2256
93	GL1NOV	26	17	13	4	40	207
94	GL1NOV	27	40	32	17	615	5450
95	GL1NOV	28	37	30	13	290	3504
96	GL1NOV	29	45	38	17	701	7887
97	GL1NOV	30	21	17	5	47	339
98	GL1NOV	31	42	37	20	694	7182
99	GL1NOV	32	19	15	5	42	354
100	GL1NOV	33	32	25	10	199	1959
101	GL1NOV	34	45	39	16	655	7917
102	GL1NOV	35	42	33	13	392	5064
103	GL1NOV	36	44	37	17	516	6298
104	GL1NOV	37	13	11	3	27	101
105	GL1NOV	38	22	16	7	52	543
106	GL1NOV	39	44	39	16	498	6671
107	GL1NOV	40	35	29	14	345	3680
108	GL1NOV	41	37	31	11	255	3265
109	GL1NOV	42	31	26	9	133	2141
110	GL1NOV	43	37	30	13	228	3407
111	GL1NOV	44	52	47	17	615	9500
112	GL1NOV	45	42	40	16	518	7721

113	GL1NOV	46	31	25	10	156	2017
114	GL1NOV	47	22	18	6	65	674
115	GL1NOV	48	46	41	17	554	8868
116	GL1NOV	49	36	30	12	232	3280
117	GL1NOV	50	17	12	4	41	213
118	GL1NOV	51	18	15	4	34	237
119	GL1NOV	52	18	14	5	34	275
120	GL1NOV	53	22	17	6	60	526
121	GL1NOV	54	46	39	18	632	10110
122	GL1NOV	55	35	28	10	211	2576
123	GL1NOV	56	37	30	13	363	3263
124	GL1NOV	57	45	40	13	535	6418
125	GL1NOV	58	39	32	16	523	6371
126	GL1NOV	59	44	39	14	424	5796
127	GL1NOV	60	33	28	12	221	2706
128	GL1NOV	61	32	27	10	166	2313
129	GL1NOV	62	43	37	14	548	5396
130	GL1NOV	63	37	31	13	398	4885
131	GL1NOV	64	28	23	8	93	1152
132	GL1NOV	65	43	38	15	532	6273
133	GL1NOV	66	35	29	10	224	2841
134	GL1NOV	67	45	37	14	618	7028
135	GL1NOV	68	40	34	14	376	5441
136	GL1NOV	69	40	36	14	430	5116
137	GL1NOV	70	49	42	19	700	9963
138	GL1NOV	71	43	36	15	436	5931
139	GL1NOV	72	26	22	7	77	1128
140	GL1NOV	73	13	10	3	25	105
141	GL1NOV	74	43	35	14	513	5747
142	GL1NOV	75	30	25	8	111	1210
143	GL1NOV	76	38	31	12	305	3180
144	GL1NOV	77	44	38	15	486	6684
145	GL1NOV	78	32	25	10	155	1903
146	GL1NOV	79	30	25	9	98	1665
147	GL1NOV	80	33	27	11	200	2392
148	GL1NOV	81	45	40	17	775	8020
149	GL1NOV	82	19	15	6	64	436
150	87						
151	RUN NAME		ARDNAMURCHAN 1 NOV				
152	AR1NOV	1	33	26	9	176	2147
153	AR1NOV	2	37	31	9	222	2964
154	AR1NOV	3	34	30	11	72	2376
155	AR1NOV	4	26	21	7	76	1164
156	AR1NOV	5	30	23	8	125	1449
157	AR1NOV	6	44	37	13	449	6800
158	AR1NOV	7	23	18	5	42	623
159	AR1NOV	8	42	36	13	478	5592
160	AR1NOV	9	40	34	13	366	4715
161	AR1NOV	10	24	20	6	71	862
162	AR1NOV	11	33	27	11	221	2932
163	AR1NOV	12	31	25	8	144	2030
164	AR1NOV	13	40	34	11	351	3592
165	AR1NOV	14	38	29	10	253	3350
166	AR1NOV	15	33	27	10	185	2181
167	AR1NOV	16	32	25	8	145	1483
168	AR1NOV	17	46	40	16	710	8648
169	AR1NOV	18	38	32	11	304	3408
170	AR1NOV	19	39	31	13	365	4799
171	AR1NOV	20	39	33	11	368	3827
172	AR1NOV	21	49	40	17	688	8460

173	AR1NOV	22	31	25	10	178	1845
174	AR1NOV	23	31	26	8	135	1845
175	AR1NOV	24	37	31	11	255	3863
176	AR1NOV	25	41	36	11	348	5108
177	AR1NOV	26	45	39	12	440	7126
178	AR1NOV	27	34	28	10	164	2300
179	AR1NOV	28	36	30	8	187	2618
180	AR1NOV	29	37	29	10	189	3851
181	AR1NOV	30	39	34	12	370	5135
182	AR1NOV	31	36	32	11	279	4199
183	AR1NOV	32	33	27	9	231	2051
184	AR1NOV	33	40	29	10	289	2934
185	AR1NOV	34	42	36	13	363	6987
186	AR1NOV	35	32	26	10	190	2376
187	AR1NOV	36	47	41	17	554	10354
188	AR1NOV	37	41	36	12	407	6000
189	AR1NOV	38	34	28	9	219	2853
190	AR1NOV	39	31	27	9	152	2667
191	AR1NOV	40	34	29	10	221	2830
192	AR1NOV	41	39	35	11	353	4932
193	AR1NOV	42	41	34	13	329	4479
194	AR1NOV	43	38	36	14	370	6453
195	AR1NOV	44	33	29	9	170	2897
196	AR1NOV	45	40	33	12	344	5086
197	AR1NOV	46	36	28	14	289	3966
198	AR1NOV	47	33	27	10	206	2650
199	AR1NOV	48	46	42	16	597	10725
200	AR1NOV	49	34	29	10	233	3630
201	AR1NOV	50	41	35	14	414	5941
202	AR1NOV	51	41	35	13	348	4890
203	AR1NOV	52	34	30	10	199	3061
204	AR1NOV	53	39	33	12	311	4478
205	AR1NOV	54	39	32	12	343	4550
206	AR1NOV	55	32	27	10	175	2589
207	AR1NOV	56	33	28	10	168	2474
208	AR1NOV	57	41	34	12	406	4671
209	AR1NOV	58	15	12	3	121	186
210	AR1NOV	59	41	34	13	334	4917
211	AR1NOV	60	33	29	10	183	2710
212	AR1NOV	61	41	34	12	366	5734
213	AR1NOV	62	32	26	9	145	2242
214	AR1NOV	63	36	31	10	248	3707
215	AR1NOV	64	38	34	11	359	4606
216	AR1NOV	65	27	23	8	95	1167
217	AR1NOV	66	38	33	13	293	5501
218	AR1NOV	67	40	36	13	348	3672
219	AR1NOV	68	42	37	12	381	7206
220	AR1NOV	69	34	27	10	213	2901
221	AR1NOV	70	26	21	7	83	1067
222	AR1NOV	71	25	21	6	74	916
223	AR1NOV	72	47	42	15	593	8080
224	AR1NOV	73	36	29	10	206	2653
225	AR1NOV	74	43	37	12	378	7070
226	AR1NOV	75	37	31	11	263	3766
227	AR1NOV	76	36	31	11	212	3915
228	AR1NOV	77	37	33	12	305	4549
229	AR1NOV	78	35	29	11	185	3263
230	AR1NOV	79	41	35	14	382	6145
231	AR1NOV	80	38	32	12	272	4210
232	AR1NOV	81	38	32	12	307	4805

233	AR1NOV	82	39	33	11	323	4311
234	AR1NOV	83	39	36	15	436	5698
235	AR1NOV	84	39	33	12	291	4447
236	AR1NOV	85	38	33	10	251	4170
237	AR1NOV	86	43	39	13	349	6063
238	AR1NOV	87	38	30	13	306	4502
239	48						
240	RUN NAME		SALEN 3 NOV				
241	SA3NOV	1	41	32	25	692	12315
242	SA3NOV	2	36	27	15	312	4105
243	SA3NOV	3	21	16	8	66	561
244	SA3NOV	4	30	23	12	205	2097
245	SA3NOV	5	37	29	20	538	6615
246	SA3NOV	6	28	22	15	194	2298
247	SA3NOV	7	26	22	11	168	1841
248	SA3NOV	8	34	28	12	248	3171
249	SA3NOV	9	39	31	21	355	8233
250	SA3NOV	10	18	13	7	41	396
251	SA3NOV	11	48	40	25	1037	16099
252	SA3NOV	12	37	30	22	379	7753
253	SA3NOV	13	23	20	10	93	1079
254	SA3NOV	14	40	32	24	790	9001
255	SA3NOV	15	31	25	14	277	3557
256	SA3NOV	16	43	35	27	734	13201
257	SA3NOV	17	27	22	13	211	1945
258	SA3NOV	18	22	17	10	113	989
259	SA3NOV	19	34	28	19	285	5866
260	SA3NOV	20	23	20	10	121	1987
261	SA3NOV	21	22	18	9	101	1288
262	SA3NOV	22	41	32	21	681	8603
263	SA3NOV	23	47	40	24	738	16198
264	SA3NOV	24	39	32	20	506	6929
265	SA3NOV	25	21	15	8	81	669
266	SA3NOV	26	33	27	20	364	5307
267	SA3NOV	27	18	14	7	55	409
268	SA3NOV	28	37	33	23	635	7897
269	SA3NOV	29	42	34	22	578	7965
270	SA3NOV	30	45	36	25	794	12141
271	SA3NOV	31	42	32	21	731	7644
272	SA3NOV	32	30	25	15	194	2875
273	SA3NOV	33	38	33	23	722	8220
274	SA3NOV	34	36	27	17	410	4957
275	SA3NOV	35	33	27	16	382	4110
276	SA3NOV	36	38	30	19	415	5725
277	SA3NOV	37	20	15	8	62	612
278	SA3NOV	38	42	35	23	762	8988
279	SA3NOV	39	42	32	24	663	11048
280	SA3NOV	40	30	23	18	199	3971
281	SA3NOV	41	34	28	15	294	3360
282	SA3NOV	42	39	32	19	591	5909
283	SA3NOV	43	41	34	25	568	12122
284	SA3NOV	44	22	15	9	85	1039
285	SA3NOV	45	36	30	17	375	4242
286	SA3NOV	46	37	29	22	560	6833
287	SA3NOV	47	30	24	15	151	2968
288	SA3NOV	48	24	18	11	133	1381
289	52						
290	RUN NAME		KILCHCAN 3 NOV				
291	KI3NOV	1	28	23	15	324	3401
292	KI3NOV	2	30	21	15	214	3319

293	KI3NOV 3	26	20	10	96	1577
294	KI3NOV 4	33	25	17	446	5209
295	KI3NOV 5	30	25	15	215	3273
296	KI3NOV 6	43	34	21	649	8494
297	KI3NOV 7	36	29	20	705	6659
298	KI3NOV 8	30	24	13	170	2553
299	KI3NOV 9	35	27	18	576	5193
300	KI3NOV 10	37	32	21	199	2881
301	KI3NOV 11	28	20	9	149	1746
302	KI3NOV 12	29	20	13	191	2757
303	KI3NOV 13	31	24	20	318	4647
304	KI3NOV 14	27	21	14	79	1746
305	KI3NOV 15	28	21	12	262	2719
306	KI3NOV 16	21	17	9	65	735
307	KI3NOV 17	28	20	12	221	1955
308	KI3NOV 18	29	23	12	204	2412
309	KI3NOV 19	30	23	11	131	2561
310	KI3NOV 20	27	21	11	164	1778
311	KI3NOV 21	29	22	15	295	2609
312	KI3NOV 22	30	21	14	167	3191
313	KI3NOV 23	23	18	10	145	1515
314	KI3NOV 24	25	20	13	108	2376
315	KI3NOV 25	25	20	12	166	1929
316	KI3NOV 26	30	22	15	166	3548
317	KI3NOV 27	27	22	14	227	2982
318	KI3NOV 28	29	23	13	329	3243
319	KI3NOV 29	28	20	16	286	3153
320	KI3NOV 30	33	24	20	372	5555
321	KI3NOV 31	38	30	22	782	8224
322	KI3NOV 32	25	18	15	95	2509
323	KI3NOV 33	34	27	21	487	6636
324	KI3NOV 34	28	21	14	296	3663
325	KI3NOV 35	35	28	15	250	3629
326	KI3NOV 36	27	22	15	145	2664
327	KI3NOV 37	29	23	15	324	3707
328	KI3NOV 38	35	29	20	669	5709
329	KI3NOV 39	30	24	16	266	3711
330	KI3NOV 40	28	22	12	284	2872
331	KI3NOV 41	26	20	13	163	2239
332	KI3NOV 42	28	20	15	196	3068
333	KI3NOV 43	37	31	18	657	6745
334	KI3NOV 44	27	21	13	209	2258
335	KI3NOV 45	36	30	18	993	5743
336	KI3NOV 46	22	20	12	160	1877
337	KI3NOV 47	36	30	16	438	5541
338	KI3NOV 48	32	25	17	398	4681
339	KI3NOV 49	30	23	18	316	4542
340	KI3NOV 50	32	26	19	534	5174
341	KI3NOV 51	26	20	14	161	2304
342	KI3NOV 52	29	23	11	178	2469
343	100					
344	RUN NAME	GLENMORE 3 NOV				
345	GL3NOV 1	39	33	23	630	11298
346	GL3NOV 2	23	18	13	163	2237
347	GL3NOV 3	26	20	12	187	2424
348	GL3NOV 4	24	20	11	75	1529
349	GL3NOV 5	27	19	13	176	2183
350	GL3NOV 6	19	15	9	69	999
351	GL3NOV 7	35	29	18	309	5776
352	GL3NOV 8	29	19	13	172	2109

353	GL3NOV	9	21	17	11	62	1079
354	GL3NOV	10	23	22	11	162	1817
355	GL3NOV	11	23	18	12	128	1459
356	GL3NOV	12	28	23	14	154	2980
357	GL3NOV	13	28	21	17	154	2685
358	GL3NOV	14	24	19	14	125	1968
359	GL3NOV	15	28	22	15	165	2844
360	GL3NOV	16	27	20	15	136	2508
361	GL3NOV	17	22	17	10	87	1310
362	GL3NOV	18	26	20	12	207	2028
363	GL3NOV	19	23	18	11	120	1494
364	GL3NOV	20	30	23	15	128	2689
365	GL3NOV	21	26	19	10	93	1552
366	GL3NOV	22	22	17	10	100	1160
367	GL3NOV	23	21	17	11	100	1309
368	GL3NOV	24	20	15	9	71	1266
369	GL3NOV	25	22	16	9	68	1045
370	GL3NOV	26	20	15	9	63	989
371	GL3NOV	27	29	23	12	181	1939
372	GL3NOV	28	47	37	21	834	11571
373	GL3NOV	29	43	35	21	844	12626
374	GL3NOV	30	38	30	21	394	8918
375	GL3NOV	31	33	24	14	300	3579
376	GL3NOV	32	28	21	11	133	2229
377	GL3NOV	33	38	32	18	612	8360
378	GL3NOV	34	28	20	13	213	2787
379	GL3NOV	35	31	25	19	324	5625
380	GL3NOV	36	34	27	18	431	5068
381	GL3NOV	37	30	24	14	124	2994
382	GL3NOV	38	34	30	15	319	5041
383	GL3NOV	39	25	20	10	141	1665
384	GL3NOV	40	21	16	9	72	1364
385	GL3NOV	41	46	38	25	881	12793
386	GL3NOV	42	27	21	10	151	2221
387	GL3NOV	43	26	22	11	122	2052
388	GL3NOV	44	41	31	21	621	9571
389	GL3NOV	45	28	22	13	148	2190
390	GL3NOV	46	28	22	14	141	2729
391	GL3NOV	47	28	22	14	152	2556
392	GL3NOV	48	29	22	15	281	3398
393	GL3NOV	49	44	33	21	573	8250
394	GL3NOV	50	31	22	18	196	3515
395	GL3NOV	51	30	23	14	208	2959
396	GL3NOV	52	29	20	12	135	2006
397	GL3NOV	53	40	31	20	643	6514
398	GL3NOV	54	28	22	16	170	3274
399	GL3NOV	55	30	23	14	270	3639
400	GL3NOV	56	32	26	15	248	3190
401	GL3NOV	57	34	26	18	227	6056
402	GL3NOV	58	28	22	13	148	2231
403	GL3NOV	59	22	18	9	71	1154
404	GL3NOV	60	24	18	11	64	1181
405	GL3NOV	61	29	22	14	132	2669
406	GL3NOV	62	20	16	8	54	760
407	GL3NOV	63	38	30	21	454	6839
408	GL3NOV	64	35	31	18	354	6323
409	GL3NOV	65	20	16	10	56	937
410	GL3NOV	66	25	21	14	158	2336
411	GL3NOV	67	31	24	14	234	3068
412	GL3NOV	68	23	18	11	108	1249

413	GL3NOV	69	31	24	13	186	2892
414	GL3NOV	70	31	25	20	341	4661
415	GL3NOV	71	34	26	17	370	4416
416	GL3NOV	72	27	22	12	95	1932
417	GL3NOV	72	44	34	25	1017	11361
418	GL3NOV	74	33	25	17	337	3799
419	GL3NOV	75	25	20	10	113	1539
420	GL3NOV	76	23	18	10	105	1472
421	GL3NOV	77	23	19	8	058	970
422	GL3NOV	78	46	37	23	820	12156
423	GL3NOV	79	25	20	12	157	1803
424	GL3NOV	80	44	34	19	571	10958
425	GL3NOV	81	29	25	14	247	3163
426	GL3NOV	82	37	28	19	481	5746
427	GL3NOV	83	27	18	11	147	2058
428	GL3NOV	84	21	16	9	73	893
429	GL3NOV	85	40	33	21	513	9664
430	GL3NOV	86	54	46	29	1388	26798
431	GL3NOV	87	28	22	12	172	1993
432	GL3NOV	88	25	18	13	132	1907
433	GL3NOV	89	30	23	15	233	3293
434	GL3NOV	90	19	14	10	53	931
435	GL3NOV	91	22	18	13	118	2187
436	GL3NOV	92	29	23	12	190	2863
437	GL3NOV	93	21	17	11	81	1357
438	GL3NOV	94	28	23	12	121	2365
439	GL3NOV	95	27	22	13	178	2136
440	GL3NOV	96	27	22	14	116	2856
441	GL3NOV	97	28	26	12	238	2386
442	GL3NOV	98	27	20	14	229	3247
443	GL3NOV	99	28	21	17	291	3433
444	GL3NOV	100	30	26	15	195	3524
445	59						
446	RUN NAME		ARDNAMURCHAN 3 NOV				
447	AR3NOV	1	31	24	16	269	3137
448	AR3NOV	2	31	26	12	162	2969
449	AR3NOV	3	31	22	14	216	3466
450	AR3NOV	4	27	23	12	177	1988
451	AR3NOV	5	18	14	6	39	468
452	AR3NOV	6	36	30	14	350	4898
453	AR3NOV	7	30	21	14	222	2740
454	AR3NOV	8	34	24	19	347	4005
455	AR3NOV	9	27	23	15	232	3029
456	AR3NOV	10	27	22	12	232	1851
457	AR3NOV	11	33	25	13	234	3079
458	AR3NOV	12	36	28	14	292	5603
459	AR3NOV	13	24	17	10	80	1122
460	AR3NOV	14	30	24	13	162	2422
461	AR3NOV	15	30	26	16	237	2615
462	AR3NOV	16	33	26	14	177	3285
463	AR3NOV	17	34	25	13	287	3288
464	AR3NOV	18	33	27	13	322	4135
465	AR3NOV	19	29	24	15	181	2706
466	AR3NOV	20	26	22	11	101	2126
467	AR3NOV	21	26	21	10	86	1689
468	AR3NOV	22	37	30	14	275	5770
469	AR3NOV	23	29	25	12	184	2824
470	AR3NOV	24	34	28	18	343	5491
471	AR3NOV	25	32	28	14	352	3734
472	AR3NOV	26	35	27	14	366	3437

473	AR3NOV	27	34	28	15	287	5706
474	AR3NOV	28	23	18	8	64	1030
475	AR3NOV	29	28	22	12	150	1802
476	AR3NOV	30	28	20	10	119	1542
477	AR3NOV	31	34	30	11	212	3242
478	AR3NOV	32	34	30	13	204	4122
479	AR3NOV	33	37	31	15	304	5575
480	AR3NOV	34	30	23	11	162	2174
481	AR3NOV	35	32	26	14	320	3507
482	AR3NOV	36	31	23	11	172	2314
483	AR3NOV	37	28	24	10	143	1744
484	AR3NOV	38	33	28	15	254	4942
485	AR3NOV	39	35	29	12	271	3685
486	AR3NOV	40	31	24	11	229	3359
487	AR3NOV	41	36	28	14	355	4564
488	AR3NOV	42	32	27	12	195	3295
489	AR3NOV	43	24	19	10	90	1356
490	AR3NOV	44	39	30	14	328	4989
491	AR3NOV	45	28	24	12	190	2446
492	AR3NOV	46	30	25	15	210	2871
493	AR3NOV	47	32	27	14	261	3649
494	AR3NOV	48	27	19	9	90	1429
495	AR3NOV	49	33	26	15	275	3794
496	AR3NOV	50	34	27	17	214	4022
497	AR3NOV	51	31	25	15	276	3852
498	AR3NOV	52	33	26	15	232	4895
499	AR3NOV	53	31	26	12	214	2800
500	AR3NOV	54	33	29	13	227	4179
501	AR3NOV	55	31	25	12	171	2686
502	AR3NOV	56	35	29	13	262	3990
503	AR3NOV	57	30	24	12	189	2412
504	AR3NOV	58	30	24	13	160	2402
505	AR3NOV	59	29	24	15	157	3080
~~506~~	~~93~~						
507	100						
508	RUN NAME		REDCAR 1 JAN				
509	RE1JAN	1	31	26	10	214	2429
510	RE1JAN	2	38	30	13	461	3921
511	RE1JAN	3	41	33	14	497	5530
512	RE1JAN	4	30	27	10	232	2792
513	RE1JAN	5	27	24	9	193	1519
514	RE1JAN	6	38	31	12	427	3572
515	RE1JAN	7	19	15	5	70	542
516	RE1JAN	8	33	27	12	286	2289
517	RE1JAN	9	26	21	10	169	1350
518	RE1JAN	10	28	21	13	182	1820
519	RE1JAN	11	35	26	13	366	3046
520	RE1JAN	12	40	34	14	517	5263
521	RE1JAN	13	32	24	11	199	1935
522	RE1JAN	14	35	28	13	419	3252
523	RE1JAN	15	31	25	12	216	2134
524	RE1JAN	16	32	26	11	245	2259
525	RE1JAN	17	24	19	8	95	917
526	RE1JAN	18	37	30	13	333	3229
527	RE1JAN	19	29	22	11	220	1776
528	RE1JAN	20	39	33	15	642	5332
529	RE1JAN	21	38	33	15	497	5510
530	RE1JAN	22	19	15	5	54	434
531	RE1JAN	23	25	21	9	178	1141
532	RE1JAN	24	45	37	16	642	5856

533	REIJAN	25	35	29	14	448	3862
534	REIJAN	26	26	21	8	128	1175
535	REIJAN	27	37	29	14	461	3557
536	REIJAN	28	28	23	12	207	1810
537	REIJAN	29	30	23	11	232	2135
538	REIJAN	30	26	22	7	170	1146
539	REIJAN	31	39	33	14	441	3939
540	REIJAN	32	35	28	12	301	2594
541	REIJAN	33	30	25	9	203	1555
542	REIJAN	34	43	37	15	615	6292
543	REIJAN	35	31	25	12	279	2506
544	REIJAN	36	41	33	15	632	4563
545	REIJAN	37	30	24	12	290	2123
546	REIJAN	38	40	33	14	486	3404
547	REIJAN	39	27	24	9	176	1465
548	REIJAN	40	40	33	14	476	4055
549	REIJAN	41	39	33	11	468	4075
550	REIJAN	42	46	38	22	960	7816
551	REIJAN	43	32	26	13	261	2813
552	REIJAN	44	22	18	7	120	902
553	REIJAN	45	30	24	11	200	1914
554	REIJAN	46	28	25	12	188	1933
555	REIJAN	47	38	31	14	434	4260
556	REIJAN	48	20	16	6	69	598
557	REIJAN	49	28	24	9	240	1688
558	REIJAN	50	39	31	16	556	4677
559	REIJAN	51	20	16	6	80	572
560	REIJAN	52	31	26	11	254	2077
561	REIJAN	53	33	29	11	304	2517
562	REIJAN	54	34	29	12	327	3287
563	REIJAN	55	33	25	13	331	2421
564	REIJAN	56	21	17	6	79	672
565	REIJAN	57	38	32	13	383	4077
566	REIJAN	58	31	26	10	263	2080
567	REIJAN	59	38	29	14	476	3966
568	REIJAN	60	37	31	13	466	4572
569	REIJAN	61	36	30	11	356	3829
570	REIJAN	62	31	26	9	216	2124
571	REIJAN	63	37	29	14	448	3950
572	REIJAN	64	30	24	11	213	2249
573	REIJAN	65	39	32	14	481	3922
574	REIJAN	66	34	28	13	299	2746
575	REIJAN	67	27	23	10	149	1568
576	REIJAN	68	38	31	15	693	4177
577	REIJAN	69	27	24	12	254	2003
578	REIJAN	70	35	31	15	388	3774
579	REIJAN	71	35	29	11	294	3100
580	REIJAN	72	38	32	13	463	4194
581	REIJAN	73	21	17	6	79	657
582	REIJAN	74	38	31	13	436	3785
583	REIJAN	75	41	37	16	684	6362
584	REIJAN	76	39	30	13	412	4084
585	REIJAN	77	21	16	6	90	588
586	REIJAN	78	36	30	12	351	3681
587	REIJAN	79	38	31	13	379	3720
588	REIJAN	80	43	35	15	798	5854
589	REIJAN	81	34	28	12	248	2296
590	REIJAN	82	45	37	15	684	6694
591	REIJAN	83	32	25	11	264	1851
592	REIJAN	84	34	29	14	305	3289

593	RE1JAN	85	40	34	15	469	5006
594	RE1JAN	86	46	38	19	801	7909
595	RE1JAN	87	31	25	14	257	2865
596	RE1JAN	88	35	28	10	309	2694
597	RE1JAN	89	35	28	11	351	2977
598	RE1JAN	90	31	27	13	267	2504
599	RE1JAN	91	39	31	13	442	4255
600	RE1JAN	92	40	34	15	574	5640
601	RE1JAN	93	30	24	10	218	1769
602	RE1JAN	94	21	15	6	60	504
603	RE1JAN	95	29	24	8	150	1562
604	RE1JAN	96	24	19	8	103	920
605	RE1JAN	97	29	23	9	178	1469
606	RE1JAN	98	31	25	11	221	1982
607	RE1JAN	99	34	27	11	250	2996
608	RE1JAN	100	32	25	11	291	2482
609	RUN NAME		REDCAR 3 MAR				
610	RE3MAR	1	22	16	10	131	881
611	RE3MAR	2	29	23	15	377	2868
612	RE3MAR	3	37	28	18	847	5841
613	RE3MAR	4	36	28	16	546	4414
614	RE3MAR	5	31	24	17	707	3713
615	RE3MAR	6	33	29	16	722	3940
616	RE3MAR	7	38	30	17	1127	6132
617	RE3MAR	8	35	28	17	851	4250
618	RE3MAR	9	40	31	20	1140	4893
619	RE3MAR	10	32	25	13	525	3167
620	RE3MAR	11	36	30	18	270	5825
621	RE3MAR	12	28	21	11	218	2218
622	RE3MAR	13	34	28	15	880	4489
623	RE3MAR	14	25	20	9	133	1315
624	RE3MAR	15	28	22	14	272	2083
625	RE3MAR	16	30	24	14	506	2384
626	RE3MAR	17	33	26	15	729	3155
627	RE3MAR	18	27	21	12	269	2307
628	RE3MAR	19	28	22	12	415	2473
629	RE3MAR	20	31	22	15	670	3032
630	RE3MAR	21	38	32	20	877	5990
631	RE3MAR	22	28	22	12	326	2297
632	RE3MAR	23	30	23	15	469	2598
633	RE3MAR	24	25	20	11	252	1820
634	RE3MAR	25	38	31	20	660	7761
635	RE3MAR	26	29	21	13	332	2049
636	RE3MAR	27	31	23	14	431	2435
637	RE3MAR	28	32	25	15	631	3502
638	RE3MAR	29	32	25	14	437	3322
639	RE3MAR	30	28	22	13	286	2091
640	RE3MAR	31	31	23	15	442	2715
641	RE3MAR	32	30	24	15	487	3094
642	RE3MAR	33	30	23	13	333	2682
643	RE3MAR	34	36	30	16	754	5824
644	RE3MAR	35	25	20	12	222	1962
645	RE3MAR	36	28	21	14	306	2499
646	RE3MAR	37	44	35	20	1192	7646
647	RE3MAR	38	29	24	15	251	2754
648	RE3MAR	39	30	23	17	521	2710
649	RE3MAR	40	33	24	16	430	3707
650	RE3MAR	41	25	19	10	247	1440
651	RE3MAR	42	30	24	10	377	2716
652	RE3MAR	43	31	23	13	386	2696

653	RE3MAR	44	37	29	14	583	4261
654	RE3MAR	45	38	27	17	757	4483
655	RE3MAR	46	31	24	12	480	3058
656	RE3MAR	47	28	22	15	433	2284
657	RE3MAR	48	37	30	16	1000	4930
658	RE3MAR	49	42	34	21	1272	7839
659	RE3MAR	50	28	23	16	442	2959
660	RE3MAR	51	31	23	13	395	2617
661	RE3MAR	52	29	23	14	480	2794
662	RE3MAR	53	29	22	15	383	2450
663	RE3MAR	54	37	27	17	835	4996
664	RE3MAR	55	29	21	17	500	2700
665	RE3MAR	56	28	19	10	273	1574
666	RE3MAR	57	37	31	15	817	4331
667	RE3MAR	58	22	15	9	160	1001
668	RE3MAR	59	34	26	14	551	3514
669	RE3MAR	60	30	24	13	430	3128
670	RE3MAR	61	36	28	14	915	3620
671	RE3MAR	62	37	27	16	884	4440
672	RE3MAR	63	30	25	14	345	2777
673	RE3MAR	64	26	20	12	290	1984
674	RE3MAR	65	33	25	16	529	3410
675	RE3MAR	66	37	28	18	750	4776
676	RE3MAR	67	40	30	15	957	5063
677	RE3MAR	68	41	31	17	900	6300
678	RE3MAR	69	31	25	12	470	2681
679	RE3MAR	70	34	27	17	820	3588
680	RE3MAR	71	33	25	13	550	3417
681	RE3MAR	72	24	19	11	210	1510
682	RE3MAR	73	33	27	14	518	3719
683	RE3MAR	74	32	27	15	698	3993
684	RE3MAR	75	34	26	15	530	4238
685	RE3MAR	76	27	19	12	328	1949
686	RE3MAR	77	31	26	16	648	3325
687	RE3MAR	78	29	22	14	335	2076
688	RE3MAR	79	30	22	13	290	2770
689	RE3MAR	80	29	23	14	445	2740
690	RE3MAR	81	27	22	15	402	2418
691	RE3MAR	82	29	24	12	390	2241
692	RE3MAR	83	25	19	11	198	1800
693	RE3MAR	84	26	19	13	255	1861
694	RE3MAR	85	23	19	9	43	1368
695	RE3MAR	86	27	21	14	285	2123
696	RE3MAR	87	36	27	17	813	4705
697	RE3MAR	88	26	18	14	312	1714
698	RE3MAR	89	23	18	9	115	1277
699	RE3MAR	90	28	23	13	350	2754
700	RE3MAR	91	25	20	12	364	2163
701	RE3MAR	92	27	24	12	285	2425
702	RE3MAR	93	27	21	13	322	2264
703	100						
704	RUN NAME		REDCAR 2 JAN (south gare)				
705	RE2JAN	1	33	24	13	478	3122
706	RE2JAN	2	22	19	9	173	1597
707	RE2JAN	3	37	30	16	568	5301
708	RE2JAN	4	30	24	11	241	2279
709	RE2JAN	5	38	33	16	542	5643
710	RE2JAN	6	38	30	16	697	4752
711	RE2JAN	7	32	27	14	308	2918
712	RE2JAN	8	31	24	12	274	2819

713	RE2JAN	9	37	28	18	716	5289
714	RE2JAN	10	32	26	15	584	2774
715	RE2JAN	11	27	22	11	444	2640
716	RE2JAN	12	35	28	14	653	4032
717	RE2JAN	13	34	27	14	525	3626
718	RE2JAN	14	40	32	17	1031	7218
719	RE2JAN	15	25	19	10	195	1670
720	RE2JAN	16	24	17	9	142	1099
721	RE2JAN	17	23	17	9	129	1351
722	RE2JAN	18	30	25	13	263	3011
723	RE2JAN	19	24	19	8	123	972
724	RE2JAN	20	19	15	8	104	977
725	RE2JAN	21	28	22	11	258	2248
726	RE2JAN	22	33	26	14	315	3229
727	RE2JAN	23	27	20	10	166	1569
728	RE2JAN	24	40	27	15	716	4798
~~729~~	~~RE2JAN~~	~~25~~	~~48~~	~~37~~	~~22~~	~~2523~~	~~11413~~ X
730	RE2JAN	25	48	37	22	2523	11413
731	RE2JAN	26	30	23	10	241	2484
732	RE2JAN	27	26	18	8	146	1212
733	RE2JAN	28	35	27	14	501	3864
734	RE2JAN	29	32	25	15	572	3899
735	RE2JAN	30	36	28	14	586	4338
736	RE2JAN	31	30	24	13	374	2833
737	RE2JAN	32	26	20	10	186	1745
738	RE2JAN	33	27	20	10	196	1735
739	RE2JAN	34	34	26	11	364	3692
740	RE2JAN	35	27	20	10	195	1838
741	RE2JAN	36	36	28	14	654	5156
742	RE2JAN	37	41	30	18	905	6596
743	RE2JAN	38	45	34	18	1023	7670
744	RE2JAN	39	35	25	13	418	3707
745	RE2JAN	40	28	22	12	195	2178
746	RE2JAN	41	35	28	16	845	5349
747	RE2JAN	42	31	24	14	425	4043
748	RE2JAN	43	29	25	12	294	3058
749	RE2JAN	44	41	35	19	1246	7660
750	RE2JAN	45	31	25	12	261	3194
751	RE2JAN	46	40	32	18	942	6308
752	RE2JAN	47	25	19	10	182	1658
753	RE2JAN	48	38	30	17	521	4967
754	RE2JAN	49	42	35	21	1130	7861
755	RE2JAN	50	40	30	19	791	5847
756	RE2JAN	51	44	32	20	947	7951
757	RE2JAN	52	38	30	16	673	4596
758	RE2JAN	53	36	36	14	551	3732
759	RE2JAN	54	34	27	15	415	4830
760	RE2JAN	55	30	25	12	369	2818
761	RE2JAN	56	42	35	19	617	7522
762	RE2JAN	57	37	29	16	893	5808
763	RE2JAN	58	40	33	18	800	6939
764	RE2JAN	59	40	32	17	774	5411
765	RE2JAN	60	36	30	17	647	5264
766	RE2JAN	61	39	30	16	798	5385
767	RE2JAN	62	33	24	13	399	3227
768	RE2JAN	63	35	26	15	347	3747
769	RE2JAN	64	29	24	12	417	2720
770	RE2JAN	65	30	23	11	234	2871
771	RE2JAN	66	27	21	11	251	2153
772	RE2JAN	67	27	22	12	256	2226

773	RE2JAN	68	26	20	10	173	1450
774	RE2JAN	69	29	22	11	301	2191
775	RE2JAN	70	28	23	11	237	2329
776	RE2JAN	71	25	19	10	178	1769
777	RE2JAN	72	26	20	10	186	1674
778	RE2JAN	73	33	25	12	248	3005
779	RE2JAN	74	25	21	11	210	2091
780	RE2JAN	75	31	23	11	238	2638
781	RE2JAN	76	30	23	12	274	2327
782	RE2JAN	77	29	23	11	214	2099
783	RE2JAN	78	30	24	12	258	2594
784	RE2JAN	79	27	20	11	188	1991
785	RE2JAN	80	23	20	8	155	1383
786	RE2JAN	81	29	23	12	238	2286
787	RE2JAN	82	30	24	12	257	2314
788	RE2JAN	83	32	24	12	258	2630
789	RE2JAN	84	30	25	13	278	3255
790	RE2JAN	85	34	27	13	344	3094
791	RE2JAN	86	32	26	13	283	3092
792	RE2JAN	87	33	27	16	543	3879
793	RE2JAN	88	36	30	16	571	4805
794	RE2JAN	89	32	25	13	284	2920
795	RE2JAN	90	40	30	16	893	5305
796	RE2JAN	91	32	26	13	352	3327
797	RE2JAN	92	32	26	14	457	3725
798	RE2JAN	93	32	26	15	385	3509
799	RE2JAN	94	36	29	14	553	3933
800	RE2JAN	95	36	28	17	511	5941
801	RE2JAN	96	45	37	18	1068	8277
802	RE2JAN	97	41	32	16	1057	6355
803	RE2JAN	98	37	30	17	579	5212
804	RE2JAN	99	39	32	18	894	6726
805	RE2JAN	100	40	32	17	847	5931
806		100					
807	RUN NAME		MARSDEN 2 JAN				
808	MA2JAN	1	28	25	11	151	1764
809	MA2JAN	2	25	21	10	122	1233
810	MA2JAN	3	30	26	13	235	2144
811	MA2JAN	4	23	21	9	125	1021
812	MA2JAN	5	17	14	6	39	397
813	MA2JAN	6	22	17	9	101	867
814	MA2JAN	7	23	20	8	130	964
815	MA2JAN	8	28	22	11	198	2007
816	MA2JAN	9	24	20	10	154	1250
817	MA2JAN	10	26	21	10	154	1273
818	MA2JAN	11	25	22	10	171	1315
819	MA2JAN	12	25	22	10	160	1363
820	MA2JAN	13	23	18	8	123	897
821	MA2JAN	14	22	18	8	82	716
822	MA2JAN	15	25	21	8	114	1001
823	MA2JAN	16	20	15	7	78	526
824	MA2JAN	17	18	16	8	78	664
825	MA2JAN	18	25	20	9	147	1279
826	MA2JAN	19	21	18	9	86	992
827	MA2JAN	20	22	18	7	124	840
828	MA2JAN	21	21	17	8	97	724
829	MA2JAN	22	19	15	6	63	506
830	MA2JAN	23	19	16	7	94	506
831	MA2JAN	24	19	15	7	75	481
832	MA2JAN	25	24	19	9	154	1230

833	MA2JAN	26	23	19	9	121	995
834	MA2JAN	27	27	22	10	132	1433
835	MA2JAN	28	20	16	6	69	569
836	MA2JAN	29	27	23	11	176	1340
837	MA2JAN	30	21	16	8	64	552
838	MA2JAN	31	26	22	9	139	1262
839	MA2JAN	32	20	16	8	77	643
840	MA2JAN	33	26	23	11	151	1844
841	MA2JAN	34	25	20	9	107	1059
842	MA2JAN	35	25	23	10	147	1632
843	MA2JAN	36	22	19	8	99	921
844	MA2JAN	37	26	23	10	191	1394
845	MA2JAN	38	25	22	10	149	1523
846	MA2JAN	39	22	18	7	99	810
847	MA2JAN	40	26	24	10	243	1451
848	MA2JAN	41	25	22	10	148	1505
849	MA2JAN	42	23	18	8	99	810
850	MA2JAN	43	27	22	10	176	1421
851	MA2JAN	44	24	19	8	110	938
852	MA2JAN	45	20	15	7	67	530
853	MA2JAN	46	24	20	9	129	1027
854	MA2JAN	47	25	20	8	135	1134
855	MA2JAN	48	25	20	9	118	1068
856	MA2JAN	49	27	22	10	177	1450
857	MA2JAN	50	26	22	10	142	1194
858	MA2JAN	51	23	18	10	121	1031
859	MA2JAN	52	36	31	16	479	4810
860	MA2JAN	53	30	26	14	335	2734
861	MA2JAN	54	31	26	13	306	2607
862	MA2JAN	55	23	19	8	109	1055
863	MA2JAN	56	23	18	8	102	847
864	MA2JAN	57	32	26	13	383	3002
865	MA2JAN	58	28	23	10	190	1403
866	MA2JAN	59	19	16	7	73	515
867	MA2JAN	60	25	21	9	148	1297
868	MA2JAN	61	28	23	12	227	1851
869	MA2JAN	62	30	25	12	259	2341
870	MA2JAN	63	23	20	9	132	983
871	MA2JAN	64	26	21	9	157	1236
872	MA2JAN	65	24	20	10	141	1128
873	MA2JAN	66	26	22	12	175	1452
874	MA2JAN	67	24	20	10	211	1212
875	MA2JAN	68	19	15	6	56	512
876	MA2JAN	69	27	21	9	122	1726
877	MA2JAN	70	25	20	11	150	1322
878	MA2JAN	71	18	15	5	49	358
879	MA2JAN	72	26	21	12	154	1521
880	MA2JAN	73	28	21	10	193	1317
881	MA2JAN	74	24	20	9	149	1059
882	MA2JAN	75	28	24	13	239	2098
883	MA2JAN	76	22	17	7	94	694
884	MA2JAN	77	21	18	7	75	765
885	MA2JAN	78	24	20	8	136	956
886	MA2JAN	79	28	24	12	163	1786
887	MA2JAN	80	26	22	9	168	1313
888	MA2JAN	81	23	18	8	93	845
889	MA2JAN	82	18	14	6	67	455
890	MA2JAN	83	30	24	12	298	1819
891	MA2JAN	84	29	24	12	250	2300
892	MA2JAN	85	30	26	14	298	2416

893	MA2JAN	86	26	21	10	217	1444
894	MA2JAN	87	19	15	6	70	471
895	MA2JAN	88	22	18	9	138	967
896	MA2JAN	89	22	19	10	141	841
897	MA2JAN	90	20	16	7	91	694
898	MA2JAN	91	30	26	11	238	2635
899	MA2JAN	92	34	28	14	308	3464
900	MA2JAN	93	27	23	10	136	1532
901	MA2JAN	94	31	27	13	288	2916
902	MA2JAN	95	21	15	6	56	493
903	MA2JAN	96	28	23	11	170	1762
904	MA2JAN	97	20	16	7	65	597
905	MA2JAN	98	22	16	8	87	775
906	MA2JAN	99	25	20	9	140	1067
907	MA2JAN	100	27	22	11	202	1666
908	100						
909	RUN NAME		MARSDEN 1JAN				
910	MAIJAN	1	20	16	8	88	701
911	MAIJAN	2	24	20	7	142	1035
912	MAIJAN	3	17	14	5	56	340
913	MAIJAN	4	28	24	11	181	1613
914	MAIJAN	5	36	30	12	409	3842
915	MAIJAN	6	31	26	10	301	2356
916	MAIJAN	7	23	18	6	100	678
917	MAIJAN	8	38	35	13	525	4966
918	MAIJAN	9	25	21	8	133	1118
919	MAIJAN	10	32	26	12	276	2547
920	MAIJAN	11	39	34	16	600	5580
921	MAIJAN	12	32	27	12	330	2697
922	MAIJAN	13	46	42	15	617	7071
923	MAIJAN	14	33	26	12	410	3238
924	MAIJAN	15	15	12	4	30	186
925	MAIJAN	16	21	18	7	113	911
926	MAIJAN	17	31	26	12	302	2286
927	MAIJAN	18	15	13	5	38	233
928	MAIJAN	19	26	22	10	167	1323
929	MAIJAN	20	33	28	10	236	2183
930	MAIJAN	21	39	35	14	570	6687
931	MAIJAN	22	25	22	8	152	1174
932	MAIJAN	23	26	21	8	154	1178
933	MAIJAN	24	32	26	12	272	2577
934	MAIJAN	25	33	27	11	452	2631
935	MAIJAN	26	24	22	9	222	964
936	MAIJAN	27	28	24	11	289	2332
937	MAIJAN	28	22	20	7	99	776
938	MAIJAN	29	40	34	13	543	5870
939	MAIJAN	30	44	38	13	654	5917
940	MAIJAN	31	42	33	12	686	4886
941	MAIJAN	32	31	25	8	234	1591
942	MAIJAN	33	23	19	9	119	990
943	MAIJAN	34	32	24	10	238	1739
944	MAIJAN	35	22	17	7	98	617
945	MAIJAN	36	31	27	11	269	2023
946	MAIJAN	37	31	26	9	218	1852
947	MAIJAN	38	45	37	18	984	8563
948	MAIJAN	39	21	16	6	94	547
949	MAIJAN	40	15	12	4	36	186
950	MAIJAN	41	22	18	6	62	586
951	MAIJAN	42	40	35	17	731	6111
952	MAIJAN	43	33	25	13	469	3493

953	MAIJAN	44	36	32	13	510	4748
954	MAIJAN	45	36	29	11	439	2968
955	MAIJAN	46	25	19	8	144	953
956	MAIJAN	47	31	27	11	381	2178
957	MAIJAN	48	25	22	9	180	1087
958	MAIJAN	49	22	20	6	124	833
959	MAIJAN	50	25	20	7	115	893
960	MAIJAN	51	28	24	10	223	1836
961	MAIJAN	52	22	18	5	89	642
962	MAIJAN	53	40	30	12	367	3399
963	MAIJAN	54	31	26	9	264	1763
964	MAIJAN	55	21	16	6	62	474
965	MAIJAN	56	24	19	6	129	783
966	MAIJAN	57	18	15	5	44	329
967	MAIJAN	58	21	17	6	48	523
968	MAIJAN	59	22	18	6	78	548
969	MAIJAN	60	27	23	7	147	1064
970	MAIJAN	61	27	23	9	160	1263
971	MAIJAN	62	42	36	12	508	5178
972	MAIJAN	63	28	24	9	167	1723
973	MAIJAN	64	23	18	7	90	752
974	MAIJAN	65	17	14	5	57	310
975	MAIJAN	66	21	17	5	81	532
976	MAIJAN	67	31	25	9	223	1889
977	MAIJAN	68	36	32	11	371	3595
978	MAIJAN	69	41	36	13	435	5837
979	MAIJAN	70	27	22	8	190	1203
980	MAIJAN	71	42	36	15	877	6483
981	MAIJAN	72	35	26	10	458	2783
982	MAIJAN	73	25	20	7	131	976
983	MAIJAN	74	23	19	7	108	686
984	MAIJAN	75	23	19	6	121	706
985	MAIJAN	76	34	28	12	266	2688
986	MAIJAN	77	23	19	6	93	665
987	MAIJAN	78	30	26	9	252	1887
988	MAIJAN	79	36	28	10	422	2611
989	MAIJAN	80	17	14	5	42	246
990	MAIJAN	81	17	14	5	50	294
991	MAIJAN	82	21	18	6	108	783
992	MAIJAN	83	26	23	8	197	1266
993	MAIJAN	84	18	15	4	46	322
994	MAIJAN	85	23	20	8	122	925
995	MAIJAN	86	39	33	12	450	4252
996	MAIJAN	87	24	19	7	109	629
997	MAIJAN	88	21	17	5	74	497
998	MAIJAN	89	30	24	4	188	1435
999	MAIJAN	90	23	20	7	87	805
1000	MAIJAN	91	31	24	9	176	1512
1001	MAIJAN	92	28	22	9	215	1531
1002	MAIJAN	93	23	20	7	124	995
1003	MAIJAN	94	35	29	11	375	3037
1004	MAIJAN	95	45	37	15	919	7168
1005	MAIJAN	96	21	16	7	105	509
1006	MAIJAN	97	37	33	14	373	4023
1007	MAIJAN	98	33	25	11	306	3123
1008	MAIJAN	99	25	19	6	102	757
1009	MAIJAN	100	45	39	14	614	6742
1010	100						
1011	RUN NAME		MARSDEN 1	DEC			
1012	MAIDEC	1	27	24	8	193	1431

1013	MAIDEC	2	31	27	12	332	2517
1014	MAIDEC	3	22	18	10	152	973
1015	MAIDEC	4	33	27	11	360	2403
1016	MAIDEC	5	25	23	9	231	1346
1017	MAIDEC	6	23	18	8	95	713
1018	MAIDEC	7	37	32	12	566	3772
1019	MAIDEC	8	18	15	7	68	444
1020	MAIDEC	9	29	21	10	191	1504
1021	MAIDEC	10	29	24	9	277	1638
1022	MAIDEC	11	24	19	8	190	871
1023	MAIDEC	12	23	20	8	136	951
1024	MAIDEC	13	35	32	12	309	3020
1025	MAIDEC	14	22	19	9	154	1031
1026	MAIDEC	15	25	20	9	139	1017
1027	MAIDEC	16	33	29	10	225	2146
1028	MAIDEC	17	31	26	13	314	2120
1029	MAIDEC	18	40	32	16	810	4793
1030	MAIDEC	19	25	19	7	149	980
1031	MAIDEC	20	22	19	8	162	1022
1032	MAIDEC	21	27	22	10	202	1127
1033	MAIDEC	22	27	21	10	174	1214
1034	MAIDEC	23	36	31	12	586	3386
1035	MAIDEC	24	30	20	12	302	1612
1036	MAIDEC	25	37	32	14	500	4042
1037	MAIDEC	26	36	31	10	422	3007
1038	MAIDEC	27	35	29	12	463	3099
1039	MAIDEC	28	30	26	10	253	2039
1040	MAIDEC	29	33	28	10	453	2496
1041	MAIDEC	30	37	30	11	531	2954
1042	MAIDEC	31	27	22	10	161	1331
1043	MAIDEC	32	29	23	10	180	1465
1044	MAIDEC	33	32	27	12	347	2542
1045	MAIDEC	34	33	29	14	306	3151
1046	MAIDEC	35	39	33	11	874	4810
1047	MAIDEC	36	23	19	7	84	629
1048	MAIDEC	37	40	35	14	611	5691
1049	MAIDEC	38	35	27	12	404	3095
1050	MAIDEC	39	32	26	13	286	2737
1051	MAIDEC	40	21	18	7	100	619
1052	MAIDEC	41	30	24	11	237	1658
1053	MAIDEC	42	27	22	10	189	1663
1054	MAIDEC	43	20	15	5	78	414
1055	MAIDEC	44	15	10	3	26	137
1056	MAIDEC	45	26	22	9	206	1289
1057	MAIDEC	46	31	25	11	261	2258
1058	MAIDEC	47	26	19	12	161	1256
1059	MAIDEC	48	36	27	14	533	3359
1060	MAIDEC	49	25	21	10	247	1290
1061	MAIDEC	50	32	27	13	447	3099
1062	MAIDEC	51	38	30	13	491	4356
1063	MAIDEC	52	31	25	14	501	2881
1064	MAIDEC	53	37	28	13	507	3336
1065	MAIDEC	54	32	26	14	387	2488
1066	MAIDEC	55	28	20	10	192	1291
1067	MAIDEC	56	21	19	6	94	679
1068	MAIDEC	57	31	24	13	269	2392
1069	MAIDEC	58	36	30	10	398	3247
1070	MAIDEC	59	34	28	13	274	2846
1071	MAIDEC	60	28	24	9	227	1567
1072	MAIDEC	61	30	25	11	277	1892

1073	MAIDEC	62	37	31	12	343	4172
1074	MAIDEC	63	45	40	14	960	7971
1075	MAIDEC	64	30	24	10	279	1746
1076	MAIDEC	65	30	27	10	173	1962
1077	MAIDEC	66	33	29	11	260	2646
1078	MAIDEC	67	37	31	13	418	3978
1079	MAIDEC	68	48	43	19	931	10121
1080	MAIDEC	69	21	17	6	82	631
1081	MAIDEC	70	34	17	11	386	2828
1082	MAIDEC	71	36	32	12	335	3352
1083	MAIDEC	72	20	18	7	110	785
1084	MAIDEC	73	36	30	11	411	3512
1085	MAIDEC	74	47	40	13	873	7636
1086	MAIDEC	75	41	36	11	465	5094
1087	MAIDEC	76	38	34	12	392	4934
1088	MAIDEC	77	27	24	7	162	1347
1089	MAIDEC	78	39	33	11	444	4696
1090	MAIDEC	79	28	25	8	157	1362
1091	MAIDEC	80	29	25	11	250	1927
1092	MAIDEC	81	39	30	14	646	4818
1093	MAIDEC	82	41	34	10	583	4654
1094	MAIDEC	83	30	26	10	142	1911
1095	MAIDEC	84	30	25	9	194	1924
1096	MAIDEC	85	41	38	19	678	8020
1097	MAIDEC	86	32	27	10	241	2419
1098	MAIDEC	87	30	25	10	163	2043
1099	MAIDEC	88	25	21	6	87	828
1100	MAIDEC	89	17	13	4	29	248
1101	MAIDEC	90	23	20	6	98	800
1102	MAIDEC	91	27	22	8	119	1185
1103	MAIDEC	92	26	21	9	134	1068
1104	MAIDEC	93	24	18	8	114	838
1105	MAIDEC	94	16	14	6	47	326
1106	MAIDEC	95	21	16	6	69	438
1107	MAIDEC	96	20	17	6	65	439
1108	MAIDEC	97	24	19	7	117	834
1109	MAIDEC	98	24	20	7	85	867
1110	MAIDEC	99	22	17	6	91	597
1111	MAIDEC	100	19	16	6	52	419
1112	68						
1113	RUN NAME		MARSDEN 3 NOV				
1114	MA3NOV	1	27	22	13	336	1832
1115	MA3NOV	2	22	18	11	129	1244
1116	MA3NOV	3	19	14	8	113	516
1117	MA3NOV	4	19	15	7	86	470
1118	MA3NOV	5	21	17	9	170	845
1119	MA3NOV	6	22	18	11	205	1104
1120	MA3NOV	7	22	18	10	130	937
1121	MA3NOV	8	20	17	14	230	1410
1122	MA3NOV	9	23	19	10	182	1047
1123	MA3NOV	10	29	22	13	396	2276
1124	MA3NOV	11	24	18	10	136	993
1125	MA3NOV	12	28	21	13	284	1629
1126	MA3NOV	13	26	21	11	263	1647
1127	MA3NOV	14	24	20	11	174	1261
1128	MA3NOV	15	32	26	15	358	3161
1129	MA3NOV	16	22	17	9	133	959
1130	MA3NOV	17	28	23	12	309	1847
1131	MA3NOV	18	28	21	13	353	2026
1132	MA3NOV	19	19	13	7	98	558

1133	MA3NOV	20	18	14	7	100	501
1134	MA3NOV	21	20	15	10	106	657
1135	MA3NOV	22	19	16	8	74	616
1136	MA3NOV	23	20	15	8	119	509
1137	MA3NOV	24	28	23	11	280	1954
1138	MA3NOV	25	21	18	8	203	983
1139	MA3NOV	26	25	20	10	223	1541
1140	MA3NOV	27	26	19	12	165	1623
1141	MA3NOV	28	28	22	13	276	1838
1142	MA3NOV	29	23	18	9	131	1130
1143	MA3NOV	30	22	19	9	149	1036
1144	MA3NOV	31	24	19	11	205	1154
1145	MA3NOV	32	30	25	16	577	3106
1146	MA3NOV	33	25	20	11	201	1411
1147	MA3NOV	34	25	20	10	230	1248
1148	MA3NOV	35	22	17	9	140	713
1149	MA3NOV	36	20	18	10	140	863
1150	MA3NOV	37	17	14	7	81	442
1151	MA3NOV	38	26	20	10	279	1570
1152	MA3NOV	39	29	24	12	369	2029
1153	MA3NOV	40	22	15	9	125	974
1154	MA3NOV	41	22	18	9	143	1067
1155	MA3NOV	42	21	17	10	131	906
1156	MA3NOV	43	19	15	7	73	591
1157	MA3NOV	44	24	19	10	216	1377
1158	MA3NOV	45	25	19	10	186	1170
1159	MA3NOV	46	25	20	10	137	1510
1160	MA3NOV	47	24	18	10	179	1322
1161	MA3NOV	48	26	20	12	246	1536
1162	MA3NOV	49	23	18	10	169	976
1163	MA3NOV	50	18	15	9	108	611
1164	MA3NOV	51	20	17	7	147	544
1165	MA3NOV	52	25	20	11	221	1447
1166	MA3NOV	53	19	17	9	141	878
1167	MA3NOV	54	22	16	9	127	752
1168	MA3NOV	55	20	17	9	151	694
1169	MA3NOV	56	26	22	12	194	1821
1170	MA3NOV	57	16	13	7	77	380
1171	MA3NOV	58	23	18	10	147	925
1172	MA3NOV	59	25	20	10	138	1262
1173	MA3NOV	60	20	16	9	108	728
1174	MA3NOV	61	25	21	11	219	1490
1175	MA3NOV	62	20	17	9	190	836
1176	MA3NOV	63	24	20	9	154	1110
1177	MA3NOV	64	13	10	5	46	154
1178	MA3NOV	65	26	21	10	212	1351
1179	MA3NOV	66	16	13	8	67	464
1180	MA3NOV	67	22	17	10	146	923
1181	MA3NOV	68	21	17	9	102	855
1182	75						
1183	RUN NAME		MARSDEN 2 NOV				
1184	MA2NOV	1	38	33	13	754	4364
1185	MA2NOV	2	22	19	8	123	765
1186	MA2NOV	3	22	19	6	117	728
1187	MA2NOV	4	26	19	8	259	1209
1188	MA2NOV	5	17	14	5	57	1291
1189	MA2NOV	6	21	17	7	103	714
1190	MA2NOV	7	15	12	4	53	159
1191	MA2NOV	8	20	16	6	106	599
1192	MA2NOV	9	29	24	12	300	2249

1193	MA2NOV	10	27	23	10	311	1786
1194	MA2NOV	11	35	31	14	477	3567
1195	MA2NOV	12	28	23	12	243	1889
1196	MA2NOV	13	20	17	6	86	663
1197	MA2NOV	14	22	19	9	174	1060
1198	MA2NOV	15	26	21	10	209	1181
1199	MA2NOV	16	28	23	11	328	1716
1200	MA2NOV	17	34	29	12	429	2910
1201	MA2NOV	18	26	20	9	196	1234
1202	MA2NOV	19	28	23	10	182	1538
1203	MA2NOV	20	16	12	5	54	231
1204	MA2NOV	21	30	25	11	341	2278
1205	MA2NOV	22	17	13	5	62	324
1206	MA2NOV	23	25	22	9	233	1364
1207	MA2NOV	24	25	19	7	157	965
1208	MA2NOV	25	22	18	7	104	664
1209	MA2NOV	26	34	28	14	460	3663
1210	MA2NOV	27	26	20	10	196	1190
1211	MA2NOV	28	20	15	6	111	621
1212	MA2NOV	29	28	24	10	215	1810
1213	MA2NOV	30	21	16	6	209	624
1214	MA2NOV	31	27	22	9	330	1575
1215	MA2NOV	32	20	17	6	104	702
1216	MA2NOV	33	30	26	13	434	2610
1217	MA2NOV	34	26	21	10	229	1346
1218	MA2NOV	35	25	20	8	152	1263
1219	MA2NOV	36	27	23	10	203	1347
1220	MA2NOV	37	21	16	7	111	547
1221	MA2NOV	38	24	20	10	216	1130
1222	MA2NOV	39	25	20	9	193	1154
1223	MA2NOV	40	23	19	5	126	781
1224	MA2NOV	41	23	20	10	196	1293
1225	MA2NOV	42	15	11	4	44	219
1226	MA2NOV	43	22	17	7	138	874
1227	MA2NOV	44	29	23	11	373	2151
1228	MA2NOV	45	25	21	7	213	1180
1229	MA2NOV	46	23	18	7	113	764
1230	MA2NOV	47	30	25	11	336	1884
1231	MA2NOV	48	20	16	7	88	606
1232	MA2NOV	49	29	24	12	281	2088
1233	MA2NOV	50	30	26	16	587	3027
1234	MA2NOV	51	23	17	10	138	998
1235	MA2NOV	52	24	18	9	164	1184
1236	MA2NOV	53	18	14	6	71	487
1237	MA2NOV	54	40	32	18	937	6381
1238	MA2NOV	55	27	21	9	187	1204
1239	MA2NOV	56	20	16	7	86	639
1240	MA2NOV	57	24	19	9	150	985
1241	MA2NOV	58	29	26	11	289	2238
1242	MA2NOV	59	22	18	6	97	626
1243	MA2NOV	60	31	26	11	300	2134
1244	MA2NOV	61	32	26	14	451	3250
1245	MA2NOV	62	20	17	8	92	734
1246	MA2NOV	63	27	22	10	236	1341
1247	MA2NOV	64	30	24	11	277	1791
1248	MA2NOV	65	27	22	9	160	1490
1249	MA2NOV	66	15	12	5	49	251
1250	MA2NOV	67	22	17	7	106	727
1251	MA2NOV	68	24	20	7	142	884
1252	MA2NOV	69	30	25	11	241	2017

1253	MA2NOV	70	28	24	11	239	1654
1254	MA2NOV	71	22	19	7	108	743
1255	MA2NOV	72	26	21	7	145	1056
1256	MA2NOV	73	27	23	11	223	1879
1257	MA2NOV	74	25	22	9	209	1236
1258	MA2NOV	75	28	24	10	310	1871
1259	61						
1260	RUN NAME		MARSDEN 1	NOV			
1261	MAINOV	1	29	25	11	305	1610
1262	MAINOV	2	22	18	7	104	676
1263	MAINOV	3	20	16	7	91	640
1264	MAINOV	4	25	20	10	127	1154
1265	MAINOV	5	29	23	10	237	1680
1266	MAINOV	6	30	26	10	323	2332
1267	MAINOV	7	34	29	14	440	2882
1268	MAINOV	8	18	15	6	69	470
1269	MAINOV	9	32	26	11	472	2263
1270	MAINOV	10	22	18	7	116	694
1271	MAINOV	11	22	18	7	70	652
1272	MAINOV	12	22	18	7	99	636
1273	MAINOV	13	34	28	11	477	2802
1274	MAINOV	14	26	21	8	146	1191
1275	MAINOV	15	38	33	13	510	4579
1276	MAINOV	16	19	15	5	58	337
1277	MAINOV	17	20	16	6	99	535
1278	MAINOV	18	20	16	7	66	496
1279	MAINOV	19	24	20	8	136	1082
1280	MAINOV	20	33	28	13	341	2611
1281	MAINOV	21	24	19	9	154	1001
1282	MAINOV	22	21	16	7	112	528
1283	MAINOV	23	32	28	12	355	3160
1284	MAINOV	24	20	15	7	71	477
1285	MAINOV	25	27	22	9	164	1180
1286	MAINOV	26	20	15	7	108	672
1287	MAINOV	27	25	21	9	148	1219
1288	MAINOV	28	31	26	11	251	2031
1289	MAINOV	29	35	30	13	505	3630
1290	MAINOV	30	35	27	13	386	3268
1291	MAINOV	31	25	22	10	137	1240
1292	MAINOV	32	21	19	7	112	762
1293	MAINOV	33	19	14	5	68	368
1294	MAINOV	34	27	22	8	139	1140
1295	MAINOV	35	30	27	12	226	2587
1296	MAINOV	36	23	19	8	127	867
1297	MAINOV	37	35	30	12	356	3842
1298	MAINOV	38	29	24	10	219	1508
1299	MAINOV	39	35	30	12	437	2786
1300	MAINOV	40	20	16	5	76	551
1301	MAINOV	41	15	11	4	33	155
1302	MAINOV	42	17	13	5	51	291
1303	MAINOV	43	22	19	8	120	858
1304	MAINOV	44	25	20	8	114	1067
1305	MAINOV	45	30	27	11	276	2381
1306	MAINOV	46	25	22	8	186	1059
1307	MAINOV	47	33	27	12	336	2287
1308	MAINOV	48	16	13	5	40	1262
1309	MAINOV	49	29	23	10	201	1779
1310	MAINOV	50	27	23	11	222	1491
1311	MAINOV	51	19	15	5	68	428
1312	MAINOV	52	28	23	10	170	1513

1313	MAINOV	53	29	24	10	217	1554
1314	MAINOV	54	25	21	7	126	787
1315	MAINOV	55	22	17	6	87	629
1316	MAINOV	56	20	16	6	77	596
1317	MAINOV	57	29	25	12	253	1953
1318	MAINOV	58	33	30	13	427	2287
1319	MAINOV	59	29	26	13	316	2506
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1321	MAINOV	61	25	21	9	167	1237
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1323	RUN NAME		MARSDEN 1 OCT				
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1325	MAIOCT	2	31	25	9	188	1751
1326	MAIOCT	3	30	25	10	229	1855
1327	MAIOCT	4	20	15	6	46	429
1328	MAIOCT	5	38	33	12	443	5286
1329	MAIOCT	6	26	20	7	183	928
1330	MAIOCT	7	40	35	12	570	4197
1331	MAIOCT	8	43	42	18	1170	9159
1332	MAIOCT	9	36	31	11	568	2965
1333	MAIOCT	10	30	25	8	203	1485
1334	MAIOCT	11	35	29	9	303	2917
1335	MAIOCT	12	34	29	11	336	2938
1336	MAIOCT	13	35	30	11	498	2967
1337	MAIOCT	14	26	23	7	130	983
1338	MAIOCT	15	28	23	9	160	1511
1339	MAIOCT	16	33	27	10	283	2322
1340	MAIOCT	17	32	26	9	311	2222
1341	MAIOCT	18	27	23	8	143	1100
1342	MAIOCT	19	30	24	8	186	1471
1343	MAIOCT	20	18	14	4	34	264
1344	MAIOCT	21	21	17	6	74	460
1345	MAIOCT	22	33	28	11	416	2890
1346	MAIOCT	23	23	20	7	77	688
1347	MAIOCT	24	47	41	17	1169	9358
1348	MAIOCT	25	17	13	5	29	257
1349	MAIOCT	26	40	36	14	680	5230
1350	MAIOCT	27	32	28	12	294	2423
1351	MAIOCT	28	15	12	4	26	188
1352	MAIOCT	29	18	15	5	37	324
1353	MAIOCT	30	17	13	4	23	200
1354	MAIOCT	31	33	26	9	317	2559
1355	MAIOCT	32	24	19	7	224	859
1356	MAIOCT	33	25	20	6	208	805
1357	MAIOCT	34	25	21	7	96	783
1358	MAIOCT	35	24	20	9	106	1090
1359	MAIOCT	36	21	17	6	55	455
1360	MAIOCT	37	21	18	6	58	562
1361	MAIOCT	38	26	23	8	158	1396
1362	MAIOCT	39	38	33	11	458	3694
1363	MAIOCT	40	32	27	10	304	2012
1364	MAIOCT	41	32	26	9	204	1592
1365	MAIOCT	42	24	19	7	136	781
1366	MAIOCT	43	25	22	8	134	989
1367	MAIOCT	44	21	16	6	56	466
1368	MAIOCT	45	23	20	7	84	597
1369	MAIOCT	46	27	25	8	137	1388
1370	MAIOCT	47	27	23	9	164	1120
1371	MAIOCT	48	33	30	10	262	2422
1372	MAIOCT	49	24	21	7	121	913

1373	MAIOCT	50	21	16	6	65	486
1374	MAIOCT	51	25	21	8	168	969
1375	MAIOCT	52	29	24	9	234	1367
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1378	MAIOCT	55	18	15	5	43	299
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1382	MAIOCT	59	11	8	2	5	46
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1385	MAIOCT	62	11	9	3	22	92
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1393	MAIOCT	70	26	23	7	163	1122
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1396	MAIOCT	73	27	22	8	153	1056
1397	MAIOCT	74	28	23	8	209	1401
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1399	MAIOCT	76	22	18	5	82	576
1400	MAIOCT	77	22	19	9	116	645
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1402	MAIOCT	79	30	27	10	327	2297
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1404	MAIOCT	81	17	13	4	25	216
1405	MAIOCT	82	26	23	7	132	1056
1406	MAIOCT	83	36	31	13	488	3282
1407	MAIOCT	84	29	24	8	206	1434
1408	MAIOCT	85	27	22	7	172	1290
1409	MAIOCT	86	39	33	11	613	4061
1410	MAIOCT	87	31	26	10	312	2242
1411	MAIOCT	88	32	26	9	359	2388
1412	MAIOCT	89	46	40	13	1105	8210
1413	MAIOCT	90	31	28	10	281	2316
1414	MAIOCT	91	14	11	4	21	166
1415	MAIOCT	92	35	33	11	508	3602
1416	MAIOCT	93	31	27	9	221	1861
1417	MAIOCT	94	39	32	15	688	6172
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1419	MAIOCT	96	43	34	13	793	5986
1420	MAIOCT	97	34	19	11	232	2312
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1423	MAIOCT	100	36	30	11	330	2936

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USER "BTM7" SIGNED ON AT  18:02:05 ON WED AUG 20/75
CREATE FILE2
FILE "FILE2" HAS BEEN CREATED.
NUMBER
UNNUMBER
LIST FILE2
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     2       RUN NAME          MARSDEN 3 JANUARY
     3       MA3JAN   1        18        14         7        66       582
     4       MA3JAN   2        21        17         8       100       692
     5       MA3JAN   3        22        17        10       129       988
     6       MA3JAN   4        31        24        16       238      2814
     7       MA3JAN   5        25        20        10       160      1404
     8       MA3JAN   6        16        12         7        55       354
     9       MA3JAN   7        17        15         7        68       473
    10       MA3JAN   8        15        13         6        28       296
    11       MA3JAN   9        23        18        10       138      1045
    12       MA3JAN  10        26        20        11       186      1352
    13       MA3JAN  11        26        22        10       240      1676
    14       MA3JAN  12        26        21        13       315      1413
    15       MA3JAN  13        27        23        13       280      2014
    16       MA3JAN  14        24        17        10       122      1105
    17       MA3JAN  15        24        18        10       165      1129
    18       MA3JAN  16        24        19         9       125      1071
    19       MA3JAN  17        26        22        12       249      1673
    20       MA3JAN  18        19        16         8        84       827
    21       MA3JAN  19        26        23        11       215      1975
    22       MA3JAN  20        22        17         9       144       983
    23       MA3JAN  21        26        20        12       159      1756
    24       MA3JAN  22        20        16        10        91       819
    25       MA3JAN  23        22        16         8        80       649
    26       MA3JAN  24        25        20        13       248      1694
    27       MA3JAN  25        22        17         9       128       990
    28       MA3JAN  26        17        13         7        59       319
    29       MA3JAN  27        27        22        11       172      1628
    30       MA3JAN  28        31        23        15       424      3385
    31       MA3JAN  29        28        20        11       205      1782
    32       MA3JAN  30        17        13         6        50       303
    33       MA3JAN  31        23        20        13       160      1320
    34       MA3JAN  32        22        17         8       116       995
    35       MA3JAN  33        25        20        11       186      1265
    36       MA3JAN  34        20        15        10       109       700
    37       MA3JAN  35        20        16        10       120       820
    38       MA3JAN  36        25        20        11       155      1341
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    40       MA3JAN  38        23        18        13       137      1439
    41       MA3JAN  39        29        22        12       221      2511
    42       MA3JAN  40        22        18        15       142      1523
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    44       MA3JAN  42        24        18        10       139      1167
    45       MA3JAN  43        24        19        10       191      1056
    46       MA3JAN  44        17        13         7        63       433
    47       MA3JAN  45        25        19        12       140      1217
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    49       MA3JAN  47        19        15        11       103       935
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79	MA3JAN	77	22	18	8	105	888
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86	MA3JAN	84	22	16	11	189	922
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89	MA3JAN	87	21	16	8	106	765
90	MA3JAN	88	22	18	8	109	1015
91	MA3JAN	89	31	26	15	327	3255
92	MA3JAN	90	27	20	12	179	1801
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94	MA3JAN	92	19	15	8	82	625
95	MA3JAN	93	19	17	10	136	714
96	MA3JAN	94	22	17	10	100	947
97	MA3JAN	95	19	14	8	72	574
98	MA3JAN	96	22	17	9	112	835
99	MA3JAN	97	17	13	5	37	369
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102	MA3JAN	100	16	13	6	50	327
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107	MA1FEB	3	25	21	7	89	836
108	MA1FEB	4	40	33	11	291	3295
109	MA1FEB	5	23	18	7	77	590
110	MA1FEB	6	25	20	6	60	843
111	MA1FEB	7	20	17	5	38	358

112	MA1FEB	8	20	15	5	37	356
113	MA1FEB	9	35	28	11	132	2292
114	MA1FEB	10	42	36	15	308	5150
115	MA1FEB	11	36	33	10	345	4008
116	MA1FEB	12	34	29	9	185	1962
117	MA1FEB	13	28	23	9	141	1186
118	MA1FEB	14	37	34	11	263	3641
119	MA1FEB	15	53	47	20	812	14027
120	MA1FEB	16	27	23	7	127	1126
121	MA1FEB	17	26	21	7	106	962
122	MA1FEB	18	32	27	8	162	1604
123	MA1FEB	19	32	28	10	155	1724
124	MA1FEB	20	18	15	5	36	303
125	MA1FEB	21	35	29	11	204	2484
126	MA1FEB	22	45	39	16	598	5728
127	MA1FEB	23	29	23	7	107	1213
128	MA1FEB	24	37	31	11	232	2824
129	MA1FEB	25	28	23	9	180	1395
130	MA1FEB	26	37	31	11	242	2788
131	MA1FEB	27	31	26	8	135	1328
132	MA1FEB	28	30	25	10	166	1752
133	MA1FEB	29	36	30	10	310	2993
134	MA1FEB	30	27	22	6	110	969
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136	MA1FEB	32	34	28	8	263	2169
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138	MA1FEB	34	19	15	5	53	407
139	MA1FEB	35	17	13	5	40	240
140	MA1FEB	36	26	21	7	83	800
141	MA1FEB	37	25	20	7	85	814
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143	MA1FEB	39	20	17	4	48	309
144	MA1FEB	40	37	31	12	276	3049
145	MA1FEB	41	34	30	10	261	2393
146	MA1FEB	42	31	26	7	139	1474
147	MA1FEB	43	36	29	9	270	2759
148	MA1FEB	44	33	28	10	237	2116
149	MA1FEB	45	29	22	7	118	1364
150	MA1FEB	46	32	27	7	135	1623
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152	MA1FEB	48	30	25	8	156	1670
153	MA1FEB	49	23	18	6	63	722
154	MA1FEB	50	26	21	7	72	841
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162	MA1FEB	58	16	14	4	30	237
163	MA1FEB	59	27	22	8	97	988
164	MA1FEB	60	31	26	8	97	1325
165	MA1FEB	61	27	22	7	122	993
166	MA1FEB	62	33	27	9	162	2045
167	MA1FEB	63	30	23	8	157	1372
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170	MA1FEB	66	23	19	6	50	574
171	MA1FEB	67	22	18	6	47	513

172	MA1FEB	68	25	20	6	69	699
173	MA1FEB	69	26	21	7	108	884
174	MA1FEB	70	24	18	6	60	629
175	MA1FEB	71	21	16	6	61	488
176	MA1FEB	72	28	23	7	87	1000
177	MA1FEB	73	29	20	8	180	1418
178	MA1FEB	74	26	27	7	85	729
179	MA1FEB	75	30	19	9	204	1625
180	MA1FEB	76	25	19	6	117	706
181	MA1FEB	77	24	19	7	79	822
182	MA1FEB	78	23	19	6	85	707
183	MA1FEB	79	25	20	8	73	774
184	MA1FEB	80	34	29	10	232	2393
185	MA1FEB	81	33	29	8	177	1935
186	MA1FEB	82	30	23	8	115	1467
187	MA1FEB	83	26	21	7	105	1223
188	MA1FEB	84	38	33	11	156	2954
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190	MA1FEB	86	25	19	7	90	755
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197	MA2FEB	5	27	23	10	158	1613
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199	MA2FEB	7	28	24	10	100	1366
200	MA2FEB	8	23	18	8	106	816
201	MA2FEB	9	28	23	10	149	1825
202	MA2FEB	10	25	20	8	69	1037
203	MA2FEB	11	28	22	11	144	1771
204	MA2FEB	12	24	21	9	94	1184
205	MA2FEB	13	26	22	8	108	1305
206	MA2FEB	14	27	22	10	119	1906
207	MA2FEB	15	28	24	11	147	1899
208	MA2FEB	16	29	24	12	211	1985
209	MA2FEB	17	28	23	11	164	1440
210	MA2FEB	18	25	20	9	131	1114
211	MA2FEB	19	29	25	12	151	2079
212	MA2FEB	20	36	21	13	354	4000
213	MA2FEB	21	23	18	9	75	789
214	MA2FEB	22	19	15	7	39	511
215	MA2FEB	23	22	18	8	46	706
216	MA2FEB	24	25	22	11	134	1739
217	MA2FEB	25	32	27	14	314	2112
218	MA2FEB	26	30	26	13	302	2469
219	MA2FEB	27	24	20	9	167	1301
220	MA2FEB	28	23	18	9	83	1172
221	MA2FEB	29	25	21	8	107	1121
222	MA2FEB	30	23	20	8	87	791
223	MA2FEB	31	32	27	13	262	2880
224	MA2FEB	32	28	23	13	184	1947
225	MA2FEB	33	18	15	6	42	368
226	MA2FEB	34	28	25	13	150	2148
227	MA2FEB	35	26	21	9	136	1146
228	MA2FEB	36	25	20	9	116	1254
229	MA2FEB	37	31	25	14	310	2557
230	MA2FEB	38	32	28	14	342	2944
231	MA2FEB	39	23	19	8	68	910

232	MA2FEB	40	22	19	8	80	758
233	MA2FEB	41	21	16	6	57	609
234	MA2FEB	42	24	19	9	84	960
235	MA2FEB	43	23	18	9	91	886
236	MA2FEB	44	27	23	12	171	1690
237	MA2FEB	45	23	20	9	110	1105
238	MA2FEB	46	28	23	11	219	1723
239	MA2FEB	47	25	20	9	72	1090
240	MA2FEB	48	23	19	8	41	963
241	MA2FEB	49	23	18	8	42	895
242	MA2FEB	50	20	16	7	55	489
243	MA2FEB	51	21	18	7	76	635
244	MA2FEB	52	22	18	9	102	893
245	MA2FEB	53	31	26	12	399	2976
246	MA2FEB	54	30	26	15	410	2479
247	MA2FEB	55	23	18	8	57	885
248	MA2FEB	56	20	17	7	44	508
249	MA2FEB	57	23	20	7	52	713
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251	MA2FEB	59	30	25	11	290	2371
252	MA2FEB	60	32	30	14	260	3580
253	MA2FEB	61	37	29	11	450	3100
254	MA2FEB	62	26	22	11	123	1404
255	MA2FEB	63	23	20	8	67	1084
256	MA2FEB	64	23	19	9	76	985
257	MA2FEB	65	32	27	12	396	3119
258	MA2FEB	66	24	21	9	104	1168
259	MA2FEB	67	26	22	10	132	1702
260	MA2FEB	68	23	18	9	99	966
261	MA2FEB	69	23	18	8	75	901
262	MA2FEB	70	26	22	10	176	1597
263	MA2FEB	71	23	18	8	70	822
264	MA2FEB	72	26	22	10	112	1571
265	MA2FEB	73	32	26	12	382	2445
266	MA2FEB	74	22	18	7	67	825
267	MA2FEB	75	34	26	13	429	3065
268	MA2FEB	76	24	18	10	125	982
269	MA2FEB	77	28	24	12	345	2019
270	MA2FEB	78	31	24	12	243	2147
271	MA2FEB	79	24	21	10	82	1077
272	MA2FEB	80	22	18	9	105	858
273	MA2FEB	81	24	20	9	110	1204
274	MA2FEB	82	25	19	9	104	1161
275	MA2FEB	83	22	19	7	96	828
276	MA2FEB	84	27	21	10	197	1521
277	MA2FEB	85	28	24	10	184	1967
278	MA2FEB	86	36	30	13	440	3666
279	MA2FEB	87	40	32	20	667	7136
280	MA2FEB	88	24	18	9	148	1174
281	MA2FEB	89	26	23	10	110	1516
282	MA2FEB	90	30	25	12	215	2339
283	MA2FEB	91	23	20	11	127	1214
284	MA2FEB	92	27	24	12	166	2025
285	MA2FEB	93	29	25	11	245	2145
286	MA2FEB	94	26	22	11	95	1527
287	MA2FEB	95	22	18	9	119	992
288	MA2FEB	96	18	16	7	45	572
289	MA2FEB	97	24	21	9	148	1191
290	MA2FEB	98	21	17	9	70	927
291	MA2FEB	99	26	22	9	164	1387

292	MA2FEB 100	22	17	7	67	618
293	100					
294	RUN NAME	MARSDEN 3 FEBRUARY				
295	MA3FEB 1	19	15	9	81	583
296	MA3FEB 2	23	17	10	125	1007
297	MA3FEB 3	21	16	8	125	751
298	MA3FEB 4	18	15	9	63	706
299	MA3FEB 5	20	16	8	70	661
300	MA3FEB 6	21	16	8	75	539
301	MA3FEB 7	20	15	7	56	409
302	MA3FEB 8	21	17	9	104	733
303	MA3FEB 9	21	17	10	118	814
304	MA3FEB 10	20	16	8	104	538
305	MA3FEB 11	21	16	8	92	594
306	MA3FEB 12	17	13	8	50	460
307	MA3FEB 13	23	17	10	154	1003
308	MA3FEB 14	19	15	7	62	537
309	MA3FEB 15	23	19	9	133	1041
310	MA3FEB 16	23	20	9	164	1207
311	MA3FEB 17	22	17	9	82	993
312	MA3FEB 18	21	17	9	111	835
313	MA3FEB 19	26	21	12	176	1745
314	MA3FEB 20	26	21	12	224	1835
315	MA3FEB 21	25	20	11	140	1306
316	MA3FEB 22	28	22	12	417	2105
317	MA3FEB 23	19	14	8	69	585
318	MA3FEB 24	23	15	12	153	1051
319	MA3FEB 25	23	18	10	139	1165
320	MA3FEB 26	24	19	9	117	1208
321	MA3FEB 27	26	21	11	121	1825
322	MA3FEB 28	25	19	12	152	1245
323	MA3FEB 29	24	19	11	167	1585
324	MA3FEB 30	31	25	17	467	3905
325	MA3FEB 31	19	16	9	99	611
326	MA3FEB 32	21	17	9	78	774
327	MA3FEB 33	15	11	5	42	304
328	MA3FEB 34	30	24	15	404	2805
329	MA3FEB 35	23	19	8	124	873
330	MA3FEB 36	19	15	8	85	487
331	MA3FEB 37	22	19	8	125	970
332	MA3FEB 38	19	15	8	58	550
333	MA3FEB 39	16	12	6	50	257
334	MA3FEB 40	21	16	9	112	612
335	MA3FEB 41	16	13	7	54	355
336	MA3FEB 42	22	16	9	124	788
337	MA3FEB 43	21	16	10	122	675
338	MA3FEB 44	19	15	8	99	563
339	MA3FEB 45	25	18	12	165	1542
340	MA3FEB 46	20	17	8	97	721
341	MA3FEB 47	20	15	8	59	440
342	MA3FEB 48	19	14	7	99	569
343	MA3FEB 49	18	14	7	57	472
344	MA3FEB 50	19	14	7	99	600
345	MA3FEB 51	23	19	11	125	1105
346	MA3FEB 52	26	20	10	208	1418
347	MA3FEB 53	18	15	9	118	471
348	MA3FEB 54	19	16	7	088	570
349	MA3FEB 55	28	22	12	254	1818
350	MA3FEB 56	23	17	11	136	913
351	MA3FEB 57	20	14	8	67	599

352	MA3FEB	58	19	15	8	102	619
353	MA3FEB	59	33	26	16	539	3576
354	MA3FEB	60	28	24	13	397	2197
355	MA3FEB	61	28	20	14	445	1926
356	MA3FEB	62	25	21	12	134	1330
357	MA3FEB	63	20	16	10	94	812
358	MA3FEB	64	19	15	7	76	472
359	MA3FEB	65	15	11	7	38	346
360	MA3FEB	66	28	23	11	195	1950
361	MA3FEB	67	18	14	7	81	431
362	MA3FEB	68	17	13	7	48	400
363	MA3FEB	69	24	20	11	147	1175
364	MA3FEB	70	22	16	8	91	756
365	MA3FEB	71	21	17	8	131	814
366	MA3FEB	72	23	18	10	134	1134
367	MA3FEB	73	22	17	7	79	699
368	MA3FEB	74	30	23	11	330	2060
369	MA3FEB	75	22	17	10	80	970
370	MA3FEB	76	20	15	7	93	669
371	MA3FEB	77	28	23	13	318	2036
372	MA3FEB	78	18	14	7	70	480
373	MA3FEB	79	18	15	8	51	538
374	MA3FEB	80	18	15	7	54	407
375	MA3FEB	81	20	16	9	77	716
376	MA3FEB	82	21	15	10	89	609
377	MA3FEB	83	25	20	12	207	1522
378	MA3FEB	84	23	19	10	193	1308
379	MA3FEB	85	20	15	7	94	623
380	MA3FEB	86	20	16	10	91	708
381	MA3FEB	87	18	13	9	71	567
382	MA3FEB	88	20	16	9	86	597
383	MA3FEB	89	18	14	6	60	476
384	MA3FEB	90	21	17	8	108	682
385	MA3FEB	91	20	15	9	95	599
386	MA3FEB	92	29	24	13	260	2169
387	MA3FEB	93	22	18	9	110	1085
388	MA3FEB	94	20	16	9	91	614
389	MA3FEB	95	28	24	13	315	2086
390	MA3FEB	96	30	25	15	412	2604
391	MA3FEB	97	20	16	7	95	587
392	MA3FEB	98	28	22	11	250	1964
393	MA3FEB	99	21	17	8	71	726
394	MA3FEB	100	19	15	7	67	532
395	100						
396	RUN NAME		MARSDEN 1 MARCH				
397	MA1MAR	1	25	20	5	94	680
398	MA1MAR	2	29	23	8	195	1519
399	MA1MAR	3	34	28	10	353	2504
400	MA1MAR	4	34	29	10	295	2345
401	MA1MAR	5	32	25	10	259	2144
402	MA1MAR	6	31	24	9	197	1651
403	MA1MAR	7	35	26	10	273	2269
404	MA1MAR	8	44	36	14	1120	6277
405	MA1MAR	9	27	22	8	150	1113
406	MA1MAR	10	22	21	7	118	876
407	MA1MAR	11	36	29	12	318	2457
408	MA1MAR	12	28	23	7	179	1137
409	MA1MAR	13	29	25	8	189	1564
410	MA1MAR	14	24	21	8	124	893
411	MA1MAR	15	27	23	8	158	1274

412	MAIMAR	16	27	22	8	146	1072
413	MAIMAR	17	22	18	7	94	691
414	MAIMAR	18	31	25	10	144	1350
415	MAIMAR	19	41	35	12	545	4574
416	MAIMAR	20	30	25	11	220	1851
417	MAIMAR	21	28	21	8	164	1178
418	MAIMAR	22	21	17	4	75	446
419	MAIMAR	23	37	30	11	384	3009
420	MAIMAR	24	23	19	7	100	633
421	MAIMAR	25	30	25	9	180	1588
422	MAIMAR	26	19	15	5	47	316
423	MAIMAR	27	27	20	8	101	1183
424	MAIMAR	28	23	19	6	89	632
425	MAIMAR	29	28	25	7	163	1377
426	MAIMAR	30	24	17	7	89	590
427	MAIMAR	31	26	22	7	141	914
428	MAIMAR	32	32	27	11	224	1900
429	MAIMAR	33	43	35	13	995	6262
430	MAIMAR	34	28	23	7	155	1175
431	MAIMAR	35	32	25	8	246	1657
432	MAIMAR	36	37	31	11	379	2879
433	MAIMAR	37	34	27	11	230	2158
434	MAIMAR	38	35	30	11	388	2844
435	MAIMAR	39	27	24	8	198	1187
436	MAIMAR	40	27	22	7	154	1010
437	MAIMAR	41	37	32	12	421	3565
438	MAIMAR	42	19	16	5	55	374
439	MAIMAR	43	17	13	5	36	218
440	MAIMAR	44	33	27	10	316	1987
441	MAIMAR	45	34	30	10	284	2204
442	MAIMAR	46	29	24	8	208	1266
443	MAIMAR	47	26	20	6	141	866
444	MAIMAR	48	27	22	9	98	1004
445	MAIMAR	49	38	31	10	342	3065
446	MAIMAR	50	24	18	7	104	836
447	MAIMAR	51	25	19	6	91	770
448	MAIMAR	52	29	23	8	203	1172
449	MAIMAR	53	25	21	9	107	1126
450	MAIMAR	54	24	19	7	140	738
451	MAIMAR	55	25	20	7	125	798
452	MAIMAR	56	18	15	5	53	311
453	MAIMAR	57	30	24	7	202	1334
454	MAIMAR	58	22	17	6	61	487
455	MAIMAR	59	25	22	7	133	853
456	MAIMAR	60	28	24	8	178	1309
457	MAIMAR	61	33	27	9	293	1935
458	MAIMAR	62	28	23	8	170	1210
459	MAIMAR	63	38	32	11	501	3588
460	MAIMAR	64	29	23	10	170	1318
461	MAIMAR	65	27	22	8	146	1181
462	MAIMAR	66	24	19	6	95	648
463	MAIMAR	67	20	16	5	47	472
464	MAIMAR	68	18	14	5	42	280
465	MAIMAR	69	27	22	7	151	1052
466	MAIMAR	70	29	26	8	181	1646
467	MAIMAR	71	25	20	7	109	905
468	MAIMAR	72	23	18	6	83	600
469	MAIMAR	73	25	19	6	138	821
470	MAIMAR	74	29	26	8	214	1423
471	MAIMAR	75	25	17	7	98	719

472	MA1MAR	76	27	22	9	158	1252
473	MA1MAR	77	15	10	3	23	142
474	MA1MAR	78	24	20	6	92	797
475	MA1MAR	79	24	20	5	105	591
476	MA1MAR	80	19	16	4	40	283
477	MA1MAR	81	30	27	9	196	1756
478	MA1MAR	82	28	24	9	133	1433
479	MA1MAR	83	26	22	8	135	1108
480	MA1MAR	84	19	14	5	52	325
481	MA1MAR	85	26	22	7	96	885
482	MA1MAR	86	14	12	3	32	150
483	MA1MAR	87	38	30	13	533	3757
484	MA1MAR	88	23	18	6	93	660
485	MA1MAR	89	30	24	8	167	1440
486	MA1MAR	90	22	18	6	80	510
487	MA1MAR	91	34	28	11	345	2386
488	MA1MAR	92	30	23	9	186	1417
489	MA1MAR	93	22	18	6	47	481
490	MA1MAR	94	26	20	7	106	979
491	MA1MAR	95	22	20	6	90	619
492	MA1MAR	96	17	14	5	52	288
493	MA1MAR	97	17	14	5	37	268
494	MA1MAR	98	30	26	10	206	1748
495	MA1MAR	99	24	20	6	80	695
496	MA1MAR	100	28	23	8	198	1311
497	100						
498	RUN NAME		MARSDEN 2 MARCH				
499	MA2MAR	1	19	14	7	45	468
500	MA2MAR	2	19	16	6	75	484
501	MA2MAR	3	17	14	6	39	410
502	MA2MAR	4	18	15	7	49	412
503	MA2MAR	5	15	11	4	32	199
504	MA2MAR	6	16	12	6	24	189
505	MA2MAR	7	22	18	7	102	574
506	MA2MAR	8	21	18	9	113	775
507	MA2MAR	9	22	18	9	86	714
508	MA2MAR	10	30	24	11	233	1766
509	MA2MAR	11	24	18	8	115	954
510	MA2MAR	12	35	30	18	578	4836
511	MA2MAR	13	19	17	7	67	488
512	MA2MAR	14	17	15	6	61	346
513	MA2MAR	15	16	13	5	38	336
514	MA2MAR	16	30	25	11	403	2417
515	MA2MAR	17	34	27	14	468	3141
516	MA2MAR	18	14	10	5	11	166
517	MA2MAR	19	37	31	14	592	3981
518	MA2MAR	20	18	15	7	53	539
519	MA2MAR	21	22	17	8	155	780
520	MA2MAR	22	22	18	8	106	799
521	MA2MAR	23	17	13	5	44	257
522	MA2MAR	24	22	18	7	73	611
523	MA2MAR	25	32	25	13	512	2308
524	MA2MAR	26	31	25	10	277	2401
525	MA2MAR	27	24	18	10	150	1032
526	MA2MAR	28	17	14	6	45	326
527	MA2MAR	29	22	18	7	83	779
528	MA2MAR	30	19	16	8	88	623
529	MA2MAR	31	27	24	11	190	1770
530	MA2MAR	32	32	26	13	440	2683
531	MA2MAR	33	24	20	9	94	939

532	MA2MAR	34	22	16	8	90	755
533	MA2MAR	35	20	16	8	71	575
534	MA2MAR	36	30	26	11	189	2182
535	MA2MAR	37	28	25	11	265	1811
536	MA2MAR	38	28	25	10	244	1938
537	MA2MAR	39	15	11	4	25	167
538	MA2MAR	40	21	17	8	85	604
539	MA2MAR	41	27	23	11	235	1462
540	MA2MAR	42	24	20	9	146	964
541	MA2MAR	43	23	18	8	107	725
542	MA2MAR	44	27	22	11	207	1567
543	MA2MAR	45	27	21	9	216	1298
544	MA2MAR	46	27	24	10	171	1653
545	MA2MAR	47	33	27	13	399	3024
546	MA2MAR	48	13	10	4	25	146
547	MA2MAR	49	19	15	6	74	480
548	MA2MAR	50	24	18	7	90	718
549	MA2MAR	51	20	17	9	83	698
550	MA2MAR	52	22	17	7	74	701
551	MA2MAR	53	24	18	10	110	888
552	MA2MAR	54	15	13	6	51	270
553	MA2MAR	55	15	12	6	53	310
554	MA2MAR	56	16	12	6	96	575
555	MA2MAR	57	20	18	7	64	584
556	MA2MAR	58	18	14	7	59	462
557	MA2MAR	59	33	28	14	461	2747
558	MA2MAR	60	31	27	12	288	2148
559	MA2MAR	61	29	25	11	307	2205
560	MA2MAR	62	24	20	9	136	1268
561	MA2MAR	63	28	23	11	259	1950
562	MA2MAR	64	31	25	14	235	2300
563	MA2MAR	65	23	19	9	94	804
564	MA2MAR	66	16	12	5	49	280
565	MA2MAR	67	17	13	6	74	397
566	MA2MAR	68	17	13	6	55	384
567	MA2MAR	69	19	14	7	94	444
568	MA2MAR	70	24	18	7	79	801
569	MA2MAR	71	19	16	6	46	485
570	MA2MAR	72	24	19	8	160	847
571	MA2MAR	73	28	25	12	298	2202
572	MA2MAR	74	25	21	9	187	1339
573	MA2MAR	75	29	25	11	215	1725
574	MA2MAR	76	17	13	6	58	456
575	MA2MAR	77	14	12	4	25	165
576	MA2MAR	78	23	19	10	116	929
577	MA2MAR	79	27	22	21	139	1413
578	MA2MAR	80	18	14	6	40	351
579	MA2MAR	81	28	26	11	261	2317
580	MA2MAR	82	18	13	6	31	322
581	MA2MAR	83	33	29	14	421	3666
582	MA2MAR	84	27	22	8	197	1432
583	MA2MAR	85	33	28	11	323	2279
584	MA2MAR	86	20	18	6	84	569
585	MA2MAR	87	25	20	9	167	270
586	MA2MAR	88	32	27	12	277	2530
587	MA2MAR	89	30	25	11	207	1876
588	MA2MAR	90	26	22	9	138	1314
589	MA2MAR	91	26	21	8	193	1133
590	MA2MAR	92	23	18	8	94	933
591	MA2MAR	93	20	15	8	83	730

592	MA2MAR	94	28	14	6	35	340
593	MA2MAR	95	19	16	7	29	441
594	MA2MAR	96	21	17	7	125	672
595	MA2MAR	97	26	20	10	153	1170
596	MA2MAR	98	26	23	10	203	1560
597	MA2MAR	99	31	28	12	315	2914
598	MA2MAR	100	26	21	10	184	1418
599	98						
600	RUN NAME		MARSDEN 3 MARCH				
601	MA3MAR	1	26	20	11	135	1362
602	MA3MAR	2	20	16	12	122	912
603	MA3MAR	3	17	12	8	48	571
604	MA3MAR	4	22	17	8	79	706
605	MA3MAR	5	19	15	11	123	780
606	MA3MAR	6	21	15	9	96	680
607	MA3MAR	7	25	20	13	163	1828
608	MA3MAR	8	22	17	11	103	903
609	MA3MAR	9	24	19	8	129	1326
610	MA3MAR	10	23	17	10	146	882
611	MA3MAR	11	34	30	16	454	3629
612	MA3MAR	12	19	15	9	96	712
613	MA3MAR	13	29	22	10	186	2255
614	MA3MAR	14	24	19	10	142	1139
615	MA3MAR	15	21	16	9	68	674
616	MA3MAR	16	24	20	11	143	1413
617	MA3MAR	17	24	18	9	176	1280
618	MA3MAR	18	30	23	13	381	2804
619	MA3MAR	19	19	16	9	522	581
620	MA3MAR	20	28	23	11	314	1848
621	MA3MAR	21	27	24	13	218	2170
622	MA3MAR	22	31	24	13	223	2188
623	MA3MAR	23	28	23	14	281	2733
624	MA3MAR	24	27	21	12	227	1536
625	MA3MAR	25	24	16	10	130	1281
626	MA3MAR	26	29	24	14	260	2667
627	MA3MAR	27	22	16	10	100	802
628	MA3MAR	28	19	14	8	81	515
629	MA3MAR	29	34	27	16	608	4203
630	MA3MAR	30	18	14	8	86	555
631	MA3MAR	31	24	18	10	184	1158
632	MA3MAR	32	20	15	8	62	669
633	MA3MAR	33	23	18	12	114	947
634	MA3MAR	34	20	16	9	87	816
635	MA3MAR	35	19	16	8	101	650
636	MA3MAR	36	35	26	17	331	3682
637	MA3MAR	37	27	23	13	249	2073
638	MA3MAR	38	27	21	12	266	1600
639	MA3MAR	39	23	18	9	113	926
640	MA3MAR	40	27	21	13	179	1883
641	MA3MAR	41	21	16	8	86	859
642	MA3MAR	42	20	17	10	69	756
643	MA3MAR	43	16	13	9	52	360
644	MA3MAR	44	21	17	9	88	976
645	MA3MAR	45	34	28	18	403	3873
646	MA3MAR	46	32	27	13	428	2956
647	MA3MAR	47	27	22	14	294	1920
648	MA3MAR	48	20	15	7	73	592
649	MA3MAR	49	24	19	11	181	1297
650	MA3MAR	50	30	22	14	288	2662
651	MA3MAR	51	29	24	14	325	2647

652	MA3MAR	52	25	19	9	135	1244
653	MA3MAR	53	26	20	13	236	1482
654	MA3MAR	54	27	22	12	217	1673
655	MA3MAR	55	24	18	9	147	1211
656	MA3MAR	56	21	18	10	100	986
657	MA3MAR	57	27	22	13	239	1867
658	MA3MAR	58	26	23	14	228	2025
659	MA3MAR	59	30	24	15	327	3175
660	MA3MAR	60	24	18	10	127	1002
661	MA3MAR	61	22	17	10	95	956
662	MA3MAR	62	32	27	14	562	2938
663	MA3MAR	63	28	23	14	298	2190
664	MA3MAR	64	22	17	12	105	1080
665	MA3MAR	65	21	16	8	81	960
666	MA3MAR	66	26	21	12	152	1765
667	MA3MAR	67	25	20	10	191	1276
668	MA3MAR	68	22	18	11	141	1019
669	MA3MAR	69	20	15	8	104	804
670	MA3MAR	70	24	19	12	157	1253
671	MA3MAR	71	21	16	9	97	841
672	MA3MAR	72	21	18	11	108	951
673	MA3MAR	73	20	16	9	115	713
674	MA3MAR	74	23	18	9	96	858
675	MA3MAR	75	19	15	8	86	559
676	MA3MAR	76	20	16	11	115	825
677	MA3MAR	77	19	14	8	87	530
678	MA3MAR	78	24	19	10	138	1267
679	MA3MAR	79	19	14	10	95	643
680	MA3MAR	80	21	15	9	125	745
681	MA3MAR	81	32	25	19	309	3827
682	MA3MAR	82	24	18	10	120	865
683	MA3MAR	83	21	17	12	118	1060
684	MA3MAR	84	31	25	14	351	2780
685	MA3MAR	85	27	22	11	201	1675
686	MA3MAR	86	26	21	12	183	1684
687	MA3MAR	87	25	20	10	117	1451
688	MA3MAR	88	22	18	11	155	1165
689	MA3MAR	89	31	24	13	269	2403
690	MA3MAR	90	21	17	9	140	806
691	MA3MAR	91	21	15	8	69	615
692	MA3MAR	92	25	20	11	150	1347
693	MA3MAR	93	21	17	9	95	932
694	MA3MAR	94	24	17	11	128	1165
695	MA3MAR	95	25	20	12	190	1580
696	MA3MAR	96	22	17	10	80	852
697	MA3MAR	97	22	17	10	82	961
698	MA3MAR	98	20	16	8	81	676
699	97						
700	RUN NAME		MARSDEN 1 APRIL				
701	MA1APR	1	40	36	14	475	5666
702	MA1APR	2	25	20	8	125	874
703	MA1APR	3	24	20	8	98	983
704	MA1APR	4	31	24	11	242	1927
705	MA1APR	5	19	16	7	67	652
706	MA1APR	6	33	27	10	200	2332
707	MA1APR	7	15	11	4	22	176
708	MA1APR	8	14	12	5	34	159
709	MA1APR	9	21	16	7	65	527
710	MA1APR	10	22	18	6	69	572
711	MA1APR	11	19	16	7	85	524

712	MA1APR	12	27	22	8	131	1419
713	MA1APR	13	25	21	7	87	876
714	MA1APR	14	26	20	7	124	938
715	MA1APR	15	18	14	5	45	289
716	MA1APR	16	22	18	7	65	683
717	MA1APR	17	30	25	10	276	1702
718	MA1APR	18	32	28	12	305	2688
719	MA1APR	19	30	25	9	191	1697
720	MA1APR	20	27	22	8	191	1254
721	MA1APR	21	13	10	4	13	105
722	MA1APR	22	17	14	5	35	309
723	MA1APR	23	20	17	5	45	481
724	MA1APR	24	26	21	7	82	1082
725	MA1APR	25	23	19	6	91	713
726	MA1APR	26	15	11	3	25	143
727	MA1APR	27	19	15	6	46	419
728	MA1APR	28	17	14	4	28	238
729	MA1APR	29	24	20	8	131	992
730	MA1APR	30	24	18	8	96	841
731	MA1APR	31	24	18	6	77	695
732	MA1APR	32	30	27	10	205	1730
733	MA1APR	33	27	20	8	190	1114
734	MA1APR	34	19	15	5	51	482
735	MA1APR	35	20	17	7	90	564
736	MA1APR	36	22	17	6	92	529
737	MA1APR	37	28	23	7	90	1225
738	MA1APR	38	35	28	10	331	2857
739	MA1APR	39	17	13	4	42	264
740	MA1APR	40	25	20	8	129	1144
741	MA1APR	41	20	16	7	38	473
742	MA1APR	42	40	32	14	505	4286
743	MA1APR	43	28	21	9	199	1581
744	MA1APR	44	32	27	12	356	2439
745	MA1APR	45	17	13	4	38	257
746	MA1APR	46	28	22	8	171	1379
747	MA1APR	47	24	19	8	110	752
748	MA1APR	48	30	25	10	208	1537
749	MA1APR	49	17	14	5	35	245
750	MA1APR	50	18	14	5	35	374
751	MA1APR	51	32	27	11	351	2798
752	MA1APR	52	28	24	7	197	1482
753	MA1APR	53	36	32	12	402	3507
754	MA1APR	54	15	12	4	31	205
755	MA1APR	55	21	18	6	106	695
756	MA1APR	56	26	21	8	140	1083
757	MA1APR	57	15	12	4	15	151
758	MA1APR	58	13	11	4	27	158
759	MA1APR	59	13	10	3	18	128
760	MA1APR	60	14	11	4	32	170
761	MA1APR	61	32	30	10	370	2571
762	MA1APR	62	36	32	12	590	3974
763	MA1APR	63	18	16	5	43	356
764	MA1APR	64	30	25	11	223	1958
765	MA1APR	65	19	15	5	52	350
766	MA1APR	66	29	24	9	212	1808
767	MA1APR	67	20	15	5	82	460
768	MA1APR	68	34	30	14	369	4016
769	MA1APR	69	19	16	5	57.	553
770	MA1APR	70	26	23	8	173	1155
771	MA1APR	71	28	23	10	154	1635

772	MA1APR	72	38	31	12	445	4005
773	MA1APR	73	21	16	5	67	509
774	MA1APR	74	19	15	5	63	363
775	MA1APR	75	31	27	10	232	2282
776	MA1APR	76	25	21	7	146	1089
777	MA1APR	77	47	39	17	1078	7412
778	MA1APR	78	35	30	12	458	3528
779	MA1APR	79	35	30	12	460	4004
780	MA1APR	80	32	26	9	228	2094
781	MA1APR	81	15	12	5	20	206
782	MA1APR	82	30	25	10	345	1947
783	MA1APR	83	37	33	16	506	5084
784	MA1APR	84	35	33	12	435	3836
785	MA1APR	85	25	20	6	108	792
786	MA1APR	86	25	18	6	103	920
787	MA1APR	87	19	15	5	58	338
788	MA1APR	88	18	13	7	41	420
789	MA1APR	89	28	20	8	116	1395
790	MA1APR	90	26	20	9	157	1069
791	MA1APR	91	29	24	11	218	2001
792	MA1APR	92	26	21	8	142	1047
793	MA1APR	93	16	11	5	18	197
794	MA1APR	94	15	12	4	22	180
795	MA1APR	95	15	11	4	18	157
796	MA1APR	96	15	12	4	24	151
797	MA1APR	97	15	13	5	32	208
798	97						
799	RUN NAME		MARSDEN 2 APRIL				
800	MA2APR	1	23	19	8	99	796
801	MA2APR	2	31	28	13	280	3002
802	MA2APR	3	33	28	13	455	2759
803	MA2APR	4	29	24	11	182	1697
804	MA2APR	5	25	20	9	103	1215
805	MA2APR	6	35	30	16	518	3928
806	MA2APR	7	30	27	11	195	2586
807	MA2APR	8	25	20	9	108	1179
808	MA2APR	9	23	19	8	98	808
809	MA2APR	10	23	18	9	116	920
810	MA2APR	11	24	18	9	127	732
811	MA2APR	12	21	17	8	97	711
812	MA2APR	13	25	20	9	134	1143
813	MA2APR	14	21	18	8	119	728
814	MA2APR	15	18	13	6	66	284
815	MA2APR	16	32	27	14	409	3212
816	MA2APR	17	32	26	13	377	2557
817	MA2APR	18	31	16	14	196	2742
818	MA2APR	19	27	23	9	160	1987
819	MA2APR	20	28	22	12	160	2033
820	MA2APR	21	25	20	10	128	1337
821	MA2APR	22	23	18	10	95	1016
822	MA2APR	23	23	18	10	114	999
823	MA2APR	24	17	14	5	31	319
824	MA2APR	25	21	15	8	99	608
825	MA2APR	26	30	26	12	235	2367
826	MA2APR	27	28	23	10	209	1687
827	MA2APR	28	30	25	14	302	2111
828	MA2APR	29	24	23	17	106	1578
829	MA2APR	30	26	21	10	123	1377
830	MA2APR	31	26	23	11	101	1618
831	MA2APR	32	29	24	12	177	1966

832	MA2APR	33	27	24	11	195	1759
833	MA2APR	34	29	25	12	234	2120
834	MA2APP	35	26	21	10	136	1287
835	MA2APR	36	31	25	12	234	2350
836	MA2APR	37	29	28	13	287	2706
837	MA2APR	38	29	25	12	167	2406
838	MA2APR	39	22	18	8	91	747
839	MA2APR	40	24	20	10	108	1036
840	MA2APR	41	26	20	12	119	1167
841	MA2APR	42	29	23	12	243	1905
842	MA2APR	43	23	18	8	85	759
843	MA2APR	44	24	21	8	116	1042
844	MA2APR	45	25	21	10	124	1268
845	MA2APR	46	26	22	10	134	1570
846	MA2APR	47	29	23	11	166	1538
847	MA2APR	48	21	17	8	72	764
848	MA2APR	49	24	19	9	86	816
849	MA2APR	50	20	16	7	40	613
850	MA2APR	51	18	13	5	39	334
851	MA2APR	52	23	18	8	86	697
852	MA2APR	53	19	16	6	81	456
853	MA2APR	54	31	18	12	333	2368
854	MA2APP	55	20	15	8	64	479
855	MA2APR	56	21	18	7	62	702
856	MA2APR	57	33	28	11	363	2583
857	MA2APR	58	28	25	12	177	2274
858	MA2APR	59	23	19	10	126	844
859	MA2APR	60	30	26	12	219	1937
860	MA2APR	61	25	21	9	156	1103
861	MA2APR	62	27	20	8	158	914
862	MA2APR	63	23	18	9	132	1008
863	MA2APR	64	27	22	9	177	1183
864	MA2APR	65	33	29	16	500	4388
865	MA2APR	66	32	28	14	282	2600
866	MA2APR	67	30	24	12	284	2236
867	MA2APR	68	20	16	8	67	726
868	MA2APR	69	27	23	9	129	1494
869	MA2APR	70	30	25	12	187	1991
870	MA2APR	71	29	24	11	215	1856
871	MA2APR	72	27	22	9	186	1560
872	MA2APR	73	29	26	13	281	2528
873	MA2APR	74	31	26	11	315	2284
874	MA2APR	75	27	23	12	218	1653
875	MA2APR	76	26	21	10	171	1437
876	MA2APP	77	25	21	12	243	1398
877	MA2APR	78	27	20	10	204	1477
878	MA2APR	79	30	23	12	280	1689
879	MA2APR	80	23	20	8	122	829
880	MA2APR	81	26	22	12	155	1699
881	MA2APR	82	26	20	11	170	1287
882	MA2APR	83	30	26	11	241	2069
883	MA2APR	84	22	19	8	50	790
884	MA2APR	85	26	22	10	147	1295
885	MA2APR	86	21	16	7	83	612
886	MA2APR	87	15	13	5	35	235
887	MA2APR	88	21	16	8	75	706
888	MA2APR	89	24	20	10	134	1134
889	MA2APR	90	24	21	9	121	1065
890	MA2APR	91	23	17	9	72	874
891	MA2APR	92	19	16	6	54	486

892	MA2APR	93	21	16	8	48	556
893	MA2APR	94	22	17	9	69	763
894	MA2APR	95	24	20	9	111	1222
895	MA2APR	96	30	24	10	214	1648
896	MA2APR	97	26	22	10	187	1813
897		98					
898	RUN NAME		MARSDEN 3 APRIL				
899	MA3APR	1	24	20	12	180	1217
900	MA3APR	2	22	18	9	117	865
901	MA3APR	3	25	22	11	230	1674
902	MA3APR	4	24	20	10	131	1123
903	MA3APR	5	27	21	11	149	1508
904	MA3APR	6	26	21	12	165	1731
905	MA3APR	7	20	15	8	73	477
906	MA3APR	8	20	18	9	78	857
907	MA3APR	9	20	17	8	93	680
908	MA3APR	10	27	20	13	254	1870
909	MA3APR	11	23	18	10	106	838
910	MA3APR	12	18	14	9	98	573
911	MA3APR	13	20	14	9	78	629
912	MA3APR	14	22	18	12	130	1053
913	MA3APR	15	30	22	12	231	1596
914	MA3APR	16	17	14	8	57	532
915	MA3APR	17	25	20	10	165	1198
916	MA3APR	18	19	16	9	87	705
917	MA3APR	19	20	17	8	82	854
918	MA3APR	20	25	18	11	138	1390
919	MA3APR	21	25	19	9	154	1277
920	MA3APR	22	24	20	11	172	1175
921	MA3APR	23	17	14	7	51	534
922	MA3APR	24	25	20	11	181	1495
923	MA3APR	25	20	17	7	83	633
924	MA3APR	26	22	17	10	95	799
925	MA3APR	27	21	17	12	127	1168
926	MA3APR	28	20	15	10	85	658
927	MA3APR	29	18	15	9	84	532
928	MA3APR	30	22	18	10	119	306
929	MA3APR	31	20	17	8	74	724
930	MA3APR	32	20	17	9	82	572
931	MA3APR	33	24	19	11	124	907
932	MA3APR	34	30	24	11	260	2058
933	MA3APR	35	25	20	11	129	1453
934	MA3APR	36	20	15	8	60	733
935	MA3APR	37	21	16	8	72	717
936	MA3APR	38	19	15	9	70	514
937	MA3APR	39	24	18	10	122	1211
938	MA3APR	40	24	18	11	100	1344
939	MA3APR	41	22	17	10	174	1015
940	MA3APR	42	22	17	9	103	1029
941	MA3APR	43	21	16	8	80	757
942	MA3APR	44	19	15	8	77	562
943	MA3APR	45	21	17	8	95	760
944	MA3APR	46	21	15	9	94	835
945	MA3APR	47	15	13	6	31	330
946	MA3APR	48	25	19	11	155	1339
947	MA3APR	49	32	26	17	326	3930
948	MA3APR	50	30	26	14	379	3149
949	MA3APR	51	23	18	11	103	1291
950	MA3APR	52	28	23	12	213	1576
951	MA3APR	53	24	19	12	146	1393

952	MA3APR	54	26	21	12	304	1539
953	MA3APR	55	34	29	13	336	3292
954	MA3APR	56	22	16	9	98	864
955	MA3APR	57	24	19	11	108	1185
956	MA3APR	58	19	15	10	76	659
957	MA3APR	59	20	17	12	104	830
958	MA3APR	60	18	15	7	49	643
959	MA3APR	61	16	12	7	35	244
960	MA3APR	62	26	21	13	196	1545
961	MA3APR	63	26	22	12	102	1856
962	MA3APR	64	27	21	13	189	1682
963	MA3APR	65	23	18	11	171	1054
964	MA3APR	66	26	23	11	151	1706
965	MA3APR	67	20	15	9	100	774
966	MA3APR	68	30	16	14	344	2442
967	MA3APR	69	25	20	11	145	1145
968	MA3APR	70	30	25	14	209	2936
969	MA3APR	71	27	21	12	209	1518
970	MA3APR	72	25	20	10	130	1396
971	MA3APR	73	20	16	9	120	785
972	MA3APR	74	20	14	7	70	455
973	MA3APR	75	28	23	11	155	1991
974	MA3APR	76	31	27	15	351	3566
975	MA3APR	77	19	15	8	72	652
976	MA3APR	78	29	24	12	173	2409
977	MA3APR	79	25	19	12	230	1596
978	MA3APR	80	17	12	8	74	425
979	MA3APR	81	19	16	9	90	688
980	MA3APR	82	25	19	10	171	1264
981	MA3APR	83	34	28	15	431	4129
982	MA3APR	84	24	20	10	213	1284
983	MA3APR	85	19	15	9	70	624
984	MA3APR	86	20	15	10	92	565
985	MA3APR	87	37	30	18	731	5725
986	MA3APR	88	27	21	10	159	1966
987	MA3APR	89	22	20	9	123	1276
988	MA3APR	90	25	20	13	161	1443
989	MA3APR	91	26	21	12	203	1902
990	MA3APR	92	28	23	13	275	2465
991	MA3APR	93	33	27	14	410	3447
992	MA3APR	94	31	25	17	304	3155
993	MA3APR	95	23	21	14	133	1685
994	MA3APR	96	26	20	12	187	1659
995	MA3APR	97	28	21	10	273	1388
996	MA3APR	98	26	21	10	196	1602
997	77						
998	RUN NAME		MARSDEN 1 MAY				
999	MA1MAY	1	25	22	8	80	1046
1000	MA1MAY	2	19	16	4	53	339
1001	MA1MAY	3	47	42	19	851	8552
1002	MA1MAY	4	46	41	16	1121	8513
1003	MA1MAY	5	40	37	13	387	5090
1004	MA1MAY	6	28	25	9	256	1560
1005	MA1MAY	7	16	13	4	31	192
1006	MA1MAY	8	38	29	10	187	2160
1007	MA1MAY	9	37	31	11	307	3156
1008	MA1MAY	10	46	41	13	727	6297
1009	MA1MAY	11	28	24	6	200	1060
1010	MA1MAY	12	38	34	12	632	4176
1011	MA1MAY	13	40	34	13	801	5069

1012	MAIMAY	14	39	30	11	758	4549
1013	MAIMAY	15	40	35	12	537	4685
1014	MAIMAY	16	32	26	10	334	2037
1015	MAIMAY	17	30	24	8	209	1391
1016	MAIMAY	18	39	34	12	593	4459
1017	MAIMAY	19	31	27	9	174	1631
1018	MAIMAY	20	32	26	9	327	2150
1019	MAIMAY	21	32	25	9	221	1760
1020	MAIMAY	22	38	30	10	406	2817
1021	MAIMAY	23	28	25	8	130	1174
1022	MAIMAY	24	32	26	8	152	1820
1023	MAIMAY	25	28	21	8	156	1299
1024	MAIMAY	26	30	26	9	152	1661
1025	MAIMAY	27	30	27	8	192	1651
1026	MAIMAY	28	31	25	9	192	1354
1027	MAIMAY	29	32	26	9	371	1945
1028	MAIMAY	30	22	17	5	57	463
1029	MAIMAY	31	24	21	6	109	635
1030	MAIMAY	32	21	18	6	65	496
1031	MAIMAY	33	22	17	6	86	586
1032	MAIMAY	34	20	17	4	50	382
1033	MAIMAY	35	16	11	4	30	143
1034	MAIMAY	36	45	39	15	815	6368
1035	MAIMAY	37	27	22	7	146	993
1036	MAIMAY	38	26	21	6	148	824
1037	MAIMAY	39	24	20	6	106	751
1038	MAIMAY	40	28	22	8	167	1072
1039	MAIMAY	41	45	38	13	884	6190
1040	MAIMAY	42	38	33	12	560	3647
1041	MAIMAY	43	25	20	7	116	1057
1042	MAIMAY	44	35	31	11	317	2997
1043	MAIMAY	45	36	22	7	159	1073
1044	MAIMAY	46	29	23	8	150	1414
1045	MAIMAY	47	41	30	12	312	2497
1046	MAIMAY	48	41	34	11	586	3848
1047	MAIMAY	49	24	22	8	182	1211
1048	MAIMAY	50	45	40	17	726	7654
1049	MAIMAY	51	24	20	7	88	761
1050	MAIMAY	52	36	32	11	250	2812
1051	MAIMAY	53	32	25	7	239	1724
1052	MAIMAY	54	23	20	7	154	966
1053	MAIMAY	55	23	21	7	109	1048
1054	MAIMAY	56	35	29	9	269	2533
1055	MAIMAY	57	22	18	6	076	515
1056	MAIMAY	58	18	14	5	033	263
1057	MAIMAY	59	33	28	10	198	1996
1058	MAIMAY	60	38	32	9	465	3634
1059	MAIMAY	61	30	24	8	277	1484
1060	MAIMAY	62	25	32	7	151	1088
1061	MAIMAY	63	32	28	7	245	1650
1062	MAIMAY	64	33	27	11	335	2230
1063	MAIMAY	65	25	23	7	125	1184
1064	MAIMAY	66	21	17	6	56	401
1065	MAIMAY	67	30	24	7	166	1366
1066	MAIMAY	68	23	18	6	141	587
1067	MAIMAY	69	20	17	5	65	397
1068	MAIMAY	70	16	13	4	20	210
1069	MAIMAY	71	20	15	5	46	324
1070	MAIMAY	72	29	33	8	178	1092
1071	MAIMAY	73	32	28	8	367	2051

1072	MA1MAY	74	30	23	7	204	1495
1073	MA1MAY	75	29	26	7	236	1447
1074	MA1MAY	76	30	26	9	200	1768
1075	MA1MAY	77	17	15	4	15	200
1076	80						
1077	RUN NAME		MARSDEN 2 MAY				
1078	MA2MAY	1	47	39	12	977	8245
1079	MA2MAY	2	29	25	10	402	1617
1080	MA2MAY	3	22	18	7	118	617
1081	MA2MAY	4	16	13	6	75	326
1082	MA2MAY	5	20	15	6	88	391
1083	MA2MAY	6	41	34	15	1150	6222
1084	MA2MAY	7	20	17	7	101	586
1085	MA2MAY	8	38	32	14	648	4496
1086	MA2MAY	9	25	22	9	142	1064
1087	MA2MAY	10	24	21	9	273	1363
1088	MA2MAY	11	21	17	7	138	593
1089	MA2MAY	12	34	28	13	314	2677
1090	MA2MAY	13	30	25	11	300	1948
1091	MA2MAY	14	28	23	10	204	1329
1092	MA2MAY	15	19	16	6	57	454
1093	MA2MAY	16	31	25	10	207	1824
1094	MA2MAY	17	44	38	16	811	6615
1095	MA2MAY	18	42	32	16	876	6095
1096	MA2MAY	19	41	34	14	813	4610
1097	MA2MAY	20	20	15	7	082	442
1098	MA2MAY	21	29	23	11	264	1563
1099	MA2MAY	22	31	25	10	254	1669
1100	MA2MAY	23	27	20	10	204	1192
1101	MA2MAY	24	28	23	9	225	1521
1102	MA2MAY	25	41	38	15	693	4890
1103	MA2MAY	26	35	28	14	366	3364
1104	MA2MAY	27	38	33	16	753	5013
1105	MA2MAY	28	48	41	16	928	9534
1106	MA2MAY	29	36	29	15	539	3971
1107	MA2MAY	30	26	21	8	150	702
1108	MA2MAY	31	30	25	9	342	1890
1109	MA2MAY	32	42	38	16	814	6093
1110	MA2MAY	33	39	33	15	743	4697
1111	MA2MAY	34	17	12	5	36	281
1112	MA2MAY	35	35	28	13	364	2865
1113	MA2MAY	36	37	30	14	557	3709
1114	MA2MAY	37	34	29	12	414	2701
1115	MA2MAY	38	29	27	10	335	1730
1116	MA2MAY	39	39	32	14	584	3589
1117	MA2MAY	40	32	26	12	297	2451
1118	MA2MAY	41	37	30	14	635	4308
1119	MA2MAY	42	37	30	12	571	3820
1120	MA2MAY	43	34	29	14	606	2643
1121	MA2MAY	44	27	23	9	199	1008
1122	MA2MAY	45	38	30	14	652	4392
1123	MA2MAY	46	34	28	13	609	3383
1124	MA2MAY	47	33	25	12	356	2373
1125	MA2MAY	48	26	22	9	241	1306
1126	MA2MAY	49	22	16	6	92	590
1127	MA2MAY	50	32	23	11	305	1859
1128	MA2MAY	51	27	23	11	275	1735
1129	MA2MAY	52	24	19	9	171	901
1130	MA2MAY	53	28	23	9	235	1221
1131	MA2MAY	54	35	26	13	396	2695

1132	MA2MAY	55	33	29	14	542	3046
1133	MA2MAY	56	29	23	13	314	1964
1134	MA2MAY	57	29	23	12	301	1935
1135	MA2MAY	58	26	22	10	202	1172
1136	MA2MAY	59	33	27	12	316	2700
1137	MA2MAY	60	36	30	12	319	3184
1138	MA2MAY	61	27	22	9	186	1236
1139	MA2MAY	62	30	25	10	275	1782
1140	MA2MAY	63	26	20	8	142	1171
1141	MA2MAY	64	31	26	11	506	2172
1142	MA2MAY	65	40	35	14	505	4520
1143	MA2MAY	66	30	26	12	321	2267
1144	MA2MAY	67	25	23	11	271	1244
1145	MA2MAY	68	34	28	11	345	2740
1146	MA2MAY	69	31	27	13	349	2603
1147	MA2MAY	70	24	21	8	142	865
1148	MA2MAY	71	33	26	13	431	2535
1149	MA2MAY	72	29	24	11	157	2556
1150	MA2MAY	73	31	26	12	438	2225
1151	MA2MAY	74	27	23	11	295	1668
1152	MA2MAY	75	24	25	9	299	1559
1153	MA2MAY	76	30	25	11	210	2710
1154	MA2MAY	77	23	18	7	62	571
1155	MA2MAY	78	23	20	10	135	1102
1156	MA2MAY	79	24	20	9	170	919
1157	MA2MAY	80	21	17	7	89	535
1158	78						
1159	RUN NAME		MARSDEN 3 MAY				
1160	MA3MAY	1	31	26	12	355	2436
1161	MA3MAY	2	28	23	12	218	1764
1162	MA3MAY	3	27	21	11	192	1400
1163	MA3MAY	4	26	20	11	160	1245
1164	MA3MAY	5	33	28	18	414	4127
1165	MA3MAY	6	23	19	11	132	1024
1166	MA3MAY	7	26	22	11	201	1545
1167	MA3MAY	8	33	28	17	.342	3484
1168	MA3MAY	9	31	26	15	386	2666
1169	MA3MAY	10	22	18	12	130	1162
1170	MA3MAY	11	26	20	10	208	1314
1171	MA3MAY	12	15	13	07	64	365
1172	MA3MAY	13	16	14	7	62	330
1173	MA3MAY	14	30	25	13	293	2443
1174	MA3MAY	15	28	21	14	295	1842
1175	MA3MAY	16	23	17	8	103	752
1176	MA3MAY	17	19	15	9	87	678
1177	MA3MAY	18	29	25	12	215	2127
1178	MA3MAY	19	28	23	12	131	1811
1179	MA3MAY	20	27	21	12	173	1523
1180	MA3MAY	21	23	16	10	122	911
1181	MA3MAY	22	21	16	10	117	787
1182	MA3MAY	23	29	25	13	232	2411
1183	MA3MAY	24	24	19	12	137	1086
1184	MA3MAY	25	26	21	11	129	1565
1185	MA3MAY	27	20	18	10	139	908
1186	MA3MAY	28	21	14	9	86	683
1187	MA3MAY	29	23	18	11	162	925
1188	MA3MAY	30	22	17	7	85	663
1189	MA3MAY	31	22	17	11	120	740
1190	MA3MAY	32	14	12	7	42	279
1191	MA3MAY	33	20	16	8	95	706

1192	MA3MAY	34	22	17	9	92	731
1193	MA3MAY	35	21	19	10	157	1122
1194	MA3MAY	36	21	16	10	110	710
1195	MA3MAY	37	19	16	9	81	613
1196	MA3MAY	38	18	13	8	75	437
1197	MA3MAY	39	20	15	10	77	663
1198	MA3MAY	40	18	15	9	73	592
1199	MA3MAY	41	21	16	9	74	646
1200	MA3MAY	42	19	15	8	83	620
1201	MA3MAY	43	18	14	7	65	511
1202	MA3MAY	44	19	15	8	71	552
1203	MA3MAY	45	21	15	9	86	617
1204	MA3MAY	46	18	15	9	80	513
1205	MA3MAY	47	20	16	7	68	651
1206	MA3MAY	48	18	15	7	65	510
1207	MA3MAY	49	16	13	6	63	330
1208	MA3MAY	50	15	12	5	32	228
1209	MA3MAY	51	15	12	6	28	264
1210	MA3MAY	52	17	14	7	61	358
1211	MA3MAY	53	18	14	7	58	356
1212	MA3MAY	54	17	14	7	79	435
1213	MA3MAY	55	16	13	6	48	266
1214	MA3MAY	56	21	16	8	77	956
1215	MA3MAY	57	31	26	13	275	2077
1216	MA3MAY	58	24	19	9	124	1004
1217	MA3MAY	59	24	19	9	105	1003
1218	MA3MAY	60	26	20	12	148	1684
1219	MA3MAY	61	18	15	8	65	489
1220	MA3MAY	62	36	21	10	161	1447
1221	MA3MAY	63	25	20	10	131	1708
1222	MA3MAY	64	20	16	7	77	680
1223	MA3MAY	65	26	21	12	148	2157
1224	MA3MAY	66	22	18	10	110	967
1225	MA3MAY	67	25	20	11	159	1596
1226	MA3MAY	68	21	16	8	80	603
1227	MA3MAY	69	20	16	9	73	1016
1228	MA3MAY	70	18	15	7	54	474
1229	MA3MAY	71	24	19	10	128	1094
1230	MA3MAY	72	24	18	10	121	1007
1231	MA3MAY	73	21	17	9	89	706
1232	MA3MAY	74	22	17	9	94	755
1233	MA3MAY	75	19	14	9	91	438
1234	MA3MAY	76	20	16	8	82	577
1235	MA3MAY	77	19	14	8	67	459
1236	MA3MAY	78	17	13	8	54	399
1237	75						
1238	RUN NAME		MARSDEN 1 JUNE				
1239	MA1JUN	1	44	39	14	1003	6066
1240	MA1JUN	2	41	35	11	774	4506
1241	MA1JUN	3	17	14	4	33	170
1242	MA1JUN	4	37	30	14	487	3537
1243	MA1JUN	5	40	37	15	870	6368
1244	MA1JUN	6	39	33	11	537	3651
1245	MA1JUN	7	34	28	12	496	2665
1246	MA1JUN	8	25	23	7	194	934
1247	MA1JUN	9	32	30	8	314	2106
1248	MA1JUN	10	51	48	22	1893	15391
1249	MA1JUN	11	38	32	11	450	3379
1250	MA1JUN	12	47	43	20	1186	9754
1251	MA1JUN	13	32	28	10	302	2117

1252	MA1JUN	14	44	38	11	501	4415
1253	MA1JUN	15	25	20	8	138	822
1254	MA1JUN	16	16	14	4	25	192
1255	MA1JUN	17	44	40	19	1030	6331
1256	MA1JUN	18	39	32	9	641	3397
1257	MA1JUN	19	29	23	8	146	1111
1258	MA1JUN	20	46	41	17	1015	8368
1259	MA1JUN	21	54	48	18	1830	13363
1260	MA1JUN	22	45	40	18	1651	6159
1261	MA1JUN	23	39	32	12	436	3396
1262	MA1JUN	24	33	28	11	331	2347
1263	MA1JUN	25	18	15	6	37	291
1264	MA1JUN	26	31	26	9	262	1834
1265	MA1JUN	27	32	26	11	276	1902
1266	MA1JUN	28	39	26	8	256	1360
1267	MA1JUN	29	29	24	10	230	1569
1268	MA1JUN	30	34	30	10	411	2373
1269	MA1JUN	31	33	29	10	285	2549
1270	MA1JUN	32	30	25	10	293	1713
1271	MA1JUN	33	28	24	9	181	1423
1272	MA1JUN	34	33	28	10	464	2227
1273	MA1JUN	35	32	28	9	280	1786
1274	MA1JUN	36	29	23	8	273	1350
1275	MA1JUN	37	40	32	12	647	4113
1276	MA1JUN	38	12	11	3	16	114
1277	MA1JUN	39	22	20	5	88	564
1278	MA1JUN	40	37	31	10	337	2358
1279	MA1JUN	41	33	28	13	345	3034
1280	MA1JUN	42	29	24	8	194	1161
1281	MA1JUN	43	29	26	7	216	1186
1282	MA1JUN	44	34	28	10	345	1930
1283	MA1JUN	45	30	25	8	188	1094
1284	MA1JUN	46	31	26	9	280	1473
1285	MA1JUN	47	22	17	6	58	459
1286	MA1JUN	48	26	21	6	92	698
1287	MA1JUN	49	31	28	9	282	2046
1288	MA1JUN	50	25	20	7	109	659
1289	MA1JUN	51	21	18	6	57	470
1290	MA1JUN	52	20	15	5	37	341
1291	MA1JUN	53	25	21	6	101	586
1292	MA1JUN	54	25	21	7	125	721
1293	MA1JUN	55	21	18	5	83	525
1294	MA1JUN	56	21	18	6	73	408
1295	MA1JUN	57	20	15	5	40	280
1296	MA1JUN	58	29	23	9	200	1408
1297	MA1JUN	59	24	20	6	90	697
1298	MA1JUN	60	29	25	8	176	1096
1299	MA1JUN	61	30	25	9	213	1560
1300	MA1JUN	62	29	23	8	203	1298
1301	MA1JUN	63	19	16	6	30	330
1302	MA1JUN	64	28	24	7	156	1111
1303	MA1JUN	65	25	21	8	106	1046
1304	MA1JUN	66	20	17	5	95	442
1305	MA1JUN	67	20	17	5	45	381
1306	MA1JUN	68	25	23	8	111	1148
1307	MA1JUN	69	25	20	7	104	806
1308	MA1JUN	70	23	19	6	80	585
1309	MA1JUN	71	22	18	6	72.	434
1310	MA1JUN	72	23	18	6	58	483
1311	MA1JUN	73	22	18	6	64	400

1312	MA1JUN	74	14	13	4	10	106
1313	MA1JUN	75	17	14	4	26	183
1314		80					
1315	RUN NAME		MARSDEN 2 JUNE				
1316	MA2JUN	1	35	29	13	502	3537
1317	MA2JUN	2	31	27	12	288	2061
1318	MA2JUN	3	31	24	12	242	2398
1319	MA2JUN	4	21	18	8	74	703
1320	MA2JUN	5	40	34	11	788	3698
1321	MA2JUN	6	19	16	6	74	363
1322	MA2JUN	7	31	25	11	189	1549
1323	MA2JUN	8	39	34	15	904	4801
1324	MA2JUN	9	44	37	16	1222	6766
1325	MA2JUN	10	33	25	14	323	2531
1326	MA2JUN	11	29	24	11	234	1863
1327	MA2JUN	12	30	25	11	304	2048
1328	MA2JUN	13	33	26	12	337	2753
1329	MA2JUN	14	36	21	10	190	1376
1330	MA2JUN	15	23	17	8	118	610
1331	MA2JUN	16	26	22	8	216	1069
1332	MA2JUN	17	23	19	9	133	762
1333	MA2JUN	18	25	19	9	135	993
1334	MA2JUN	19	25	20	8	98	714
1335	MA2JUN	20	24	20	10	152	1222
1336	MA2JUN	21	20	18	8	98	624
1337	MA2JUN	22	28	23	10	237	1541
1338	MA2JUN	23	20	17	8	87	661
1339	MA2JUN	24	22	18	7	77	668
1340	MA2JUN	25	28	23	11	201	1441
1341	MA2JUN	26	27	23	11	185	1315
1342	MA2JUN	27	28	24	9	163	1326
1343	MA2JUN	28	18	16	6	79	379
1344	MA2JUN	29	23	18	9	112	751
1345	MA2JUN	30	27	22	10	200	1100
1346	MA2JUN	31	29	26	13	341	1806
1347	MA2JUN	32	23	20	9	138	958
1348	MA2JUN	33	26	22	10	125	1010
1349	MA2JUN	34	23	20	8	117	913
1350	MA2JUN	35	20	17	8	70	568
1351	MA2JUN	36	22	18	9	105	795
1352	MA2JUN	37	24	21	8	87	902
1353	MA2JUN	38	24	19	8	106	702
1354	MA2JUN	39	24	19	8	134	815
1355	MA2JUN	40	22	17	7	63	571
1356	MA2JUN	41	26	21	10	138	1144
1357	MA2JUN	42	25	20	10	129	1040
1358	MA2JUN	43	21	18	8	107	672
1359	MA2JUN	44	25	20	10	113	1236
1360	MA2JUN	45	22	18	6	108	494
1361	MA2JUN	46	24	20	8	107	796
1362	MA2JUN	47	27	25	8	158	1150
1363	MA2JUN	48	20	17	7	81	552
1364	MA2JUN	49	20	17	8	74	586
1365	MA2JUN	50	22	19	7	104	706
1366	MA2JUN	51	25	19	9	184	846
1367	MA2JUN	52	24	20	9	169	1066
1368	MA2JUN	53	24	20	11	180	1236
1369	MA2JUN	54	23	19	9	91	906
1370	MA2JUN	55	21	17	8	93	629
1371	MA2JUN	56	14	10	6	37	164

1372	MA2JUN	57	20	16	7	55	498
1373	MA2JUN	58	23	19	9	105	940
1374	MA2JUN	59	24	20	10	145	1155
1375	MA2JUN	60	22	18	9	72	709
1376	MA2JUN	61	23	20	8	120	822
1377	MA2JUN	62	15	12	6	54	208
1378	MA2JUN	63	19	14	6	54	452
1379	MA2JUN	64	26	23	9	184	1258
1380	MA2JUN	65	18	14	6	61	336
1381	MA2JUN	66	21	17	7	83	532
1382	MA2JUN	67	22	16	9	113	724
1383	MA2JUN	68	25	20	10	117	1163
1384	MA2JUN	69	19	16	7	68	471
1385	MA2JUN	70	22	18	8	78	603
1386	MA2JUN	71	17	13	5	52	271
1387	MA2JUN	72	20	15	6	85	418
1388	MA2JUN	73	17	14	5	47	274
1389	MA2JUN	74	17	13	6	50	286
1390	MA2JUN	75	19	16	7	69	418
1391	MA2JUN	76	20	15	6	52	390
1392	MA2JUN	77	16	12	6	49	286
1393	MA2JUN	78	15	11	4	24	169
1394	MA2JUN	79	17	13	5	33	337
1395	MA2JUN	80	18	14	6	54	383
1396	70						
1397	RUN NAME		MARSDEN 3 JUNE				
1398	MA3JUN	1	26	21	12	153	1469
1399	MA3JUN	2	24	18	9	114	1109
1400	MA3JUN	3	24	19	10	140	1189
1401	MA3JUN	4	26	21	13	215	2043
1402	MA3JUN	5	22	18	9	100	728
1403	MA3JUN	6	19	15	7	68	605
1404	MA3JUN	7	22	17	9	90	780
1405	MA3JUN	8	24	20	9	141	1051
1406	MA3JUN	9	21	18	7	55	746
1407	MA3JUN	10	22	18	9	74	816
1408	MA3JUN	11	18	14	7	64	395
1409	MA3JUN	12	21	16	8	72	710
1410	MA3JUN	13	18	14	7	48	355
1411	MA3JUN	14	18	14	7	43	442
1412	MA3JUN	15	18	15	8	65	470
1413	MA3JUN	16	22	16	9	103	634
1414	MA3JUN	17	20	15	9	72	545
1415	MA3JUN	18	19	15	7	53	437
1416	MA3JUN	19	19	15	6	61	528
1417	MA3JUN	20	19	14	6	45	442
1418	MA3JUN	21	22	18	7	90	659
1419	MA3JUN	22	22	17	9	119	607
1420	MA3JUN	23	21	17	9	111	807
1421	MA3JUN	24	20	16	9	81	677
1422	MA3JUN	25	25	20	10	125	1372
1423	MA3JUN	26	22	18	8	73	790
1424	MA3JUN	27	16	13	6	30	281
1425	MA3JUN	28	22	18	8	96	760
1426	MA3JUN	29	20	16	8	84	665
1427	MA3JUN	30	20	17	9	73	709
1428	MA3JUN	31	20	16	9	80	633
1429	MA3JUN	32	22	18	8	79	736
1430	MA3JUN	33	20	16	8	65	620
1431	MA3JUN	34	18	14	7	51	397

1432	MA3JUN	35	18	13	6	35	329
1433	MA3JUN	36	23	18	10	109	990
1434	MA3JUN	37	23	18	8	79	921
1435	MA3JUN	38	20	16	9	90	718
1436	MA3JUN	39	19	16	9	72	621
1437	MA3JUN	40	19	14	7	55	442
1438	MA3JUN	41	26	22	11	152	1692
1439	MA3JUN	42	22	19	10	96	976
1440	MA3JUN	43	24	19	10	88	1021
1441	MA3JUN	44	28	22	13	193	1946
1442	MA3JUN	45	21	17	8	84	604
1443	MA3JUN	46	21	16	8	76	732
1444	MA3JUN	47	20	17	8	72	587
1445	MA3JUN	48	20	17	9	99	740
1446	MA3JUN	49	17	14	7	53	443
1447	MA3JUN	50	25	21	12	152	1664
1448	MA3JUN	51	25	21	10	118	1017
1449	MA3JUN	52	25	20	10	152	1028
1450	MA3JUN	53	24	18	10	113	921
1451	MA3JUN	54	21	16	8	76	730
1452	MA3JUN	55	20	18	9	70	698
1453	MA3JUN	56	20	16	7	67	536
1454	MA3JUN	57	20	16	9	71	528
1455	MA3JUN	58	20	16	8	73	669
1456	MA3JUN	59	20	16	9	81	767
1457	MA3JUN	60	28	22	12	144	1823
1458	MA3JUN	61	23	18	11	113	1128
1459	MA3JUN	62	31	24	12	170	2047
1460	MA3JUN	63	24	19	11	119	1167
1461	MA3JUN	64	19	16	8	59	493
1462	MA3JUN	65	19	15	7	63	608
1463	MA3JUN	66	21	18	8	71	630
1464	MA3JUN	67	21	18	9	84	841
1465	MA3JUN	68	20	15	8	54	615
1466	MA3JUN	69	20	15	8	67	633
1467	MA3JUN	70	23	18	9	62	944
1468	77						
1469	RUN NAME		ROBINHOODS,1				
1470	RB1JUN	1	57	45	19	1483	10843
1471	RB1JUN	2	42	35	12	562	4710
1472	RB1JUN	3	52	46	14	978	9699
1473	RB1JUN	4	41	33	11	547	4198
1474	RB1JUN	5	36	30	10	349	3117
1475	RB1JUN	6	26	21	6	75	681
1476	RB1JUN	7	35	30	8	297	2540
1477	RB1JUN	8	54	47	17	1384	9634
1478	RB1JUN	9	42	36	11	524	4808
1479	RB1JUN	10	43	36	12	670	4569
1480	RB1JUN	11	28	22	7	120	990
1481	RB1JUN	12	22	18	6	56	473
1482	RB1JUN	13	40	35	13	563	4843
1483	RB1JUN	14	16	13	4	12	166
1484	RB1JUN	15	43	38	12	646	4902
1485	RB1JUN	16	31	26	10	213	1673
1486	RB1JUN	17	41	34	11	551	4576
1487	RB1JUN	18	26	22	7	115	874
1488	RB1JUN	19	25	20	7	98	777
1489	RB1JUN	20	36	29	10	367	2605
1490	RB1JUN	21	42	35	11	618	3810
1491	RB1JUN	22	19	15	5	42	325

1492	RB1JUN	23	39	33	10	444	2925
1493	RB1JUN	24	17	15	4	41	201
1494	RB1JUN	25	37	32	9	289	2726
1495	RB1JUN	26	14	12	4	10	127
1496	RB1JUN	27	28	24	8	115	1053
1497	RB1JUN	28	43	38	13	550	5238
1498	RB1JUN	29	50	41	15	1111	8478
1499	RB1JUN	30	42	36	13	531	4115
1500	RB1JUN	31	18	13	4	29	227
1501	RB1JUN	32	45	39	13	529	5874
1502	RB1JUN	33	28	22	7	162	867
1503	RB1JUN	34	42	37	12	634	5065
1504	RB1JUN	35	43	36	12	730	4888
1505	RB1JUN	36	28	24	8	131	1211
1506	RB1JUN	37	27	22	7	120	910
1507	RB1JUN	38	51	43	15	1011	8581
1508	RB1JUN	39	28	22	8	163	1083
1509	RB1JUN	40	42	35	12	574	4605
1510	RB1JUN	41	18	14	5	37	246
1511	RB1JUN	42	24	19	6	86	534
1512	RB1JUN	43	24	18	7	71	685
1513	RB1JUN	44	46	40	14	641	6334
1514	RB1JUN	45	17	13	5	38	208
1515	RB1JUN	46	24	20	7	97	709
1516	RB1JUN	47	39	32	11	410	3249
1517	RB1JUN	48	35	29	9	267	2161
1518	RB1JUN	49	39	30	11	391	3646
1519	RB1JUN	50	45	38	12	599	5680
1520	RB1JUN	51	25	20	7	98	896
1521	RB1JUN	52	19	16	5	42	335
1522	RB1JUN	53	45	39	14	675	5837
1523	RB1JUN	54	30	25	9	209	1566
1524	RB1JUN	55	42	36	12	448	4145
1525	RB1JUN	56	41	35	11	437	3905
1526	RB1JUN	57	23	17	6	82	517
1527	RB1JUN	58	20	16	5	49	331
1528	RB1JUN	59	19	15	5	44	250
1529	RB1JUN	60	33	28	10	235	2091
1530	RB1JUN	61	31	26	8	194	1597
1531	RB1JUN	62	18	14	4	34	215
1532	RB1JUN	63	35	29	9	398	2860
1533	RB1JUN	64	43	39	12	433	5471
1534	RB1JUN	65	43	38	13	895	5019
1535	RB1JUN	66	40	36	12	527	4650
1536	RB1JUN	67	37	30	9	363	3182
1537	RB1JUN	68	37	31	12	421	3565
1538	RB1JUN	69	41	36	12	474	4386
1539	RB1JUN	70	34	27	8	230	1752
1540	RB1JUN	71	34	30	9	223	2151
1541	RB1JUN	72	22	18	6	55	502
1542	RB1JUN	73	18	14	4	23	254
1543	RB1JUN	74	43	37	12	582	4736
1544	RB1JUN	75	50	43	15	1300	7149
1545	RB1JUN	76	44	39	15	684	6259
1546	RB1JUN	77	30	25	9	185	1502
1547	66						
1548	RUN NAME		BLACKFALLROCKS,2				
1549	BL2JUN	1	50	46	25	1986	18808
1550	BL2JUN	2	47	38	21	1869	8948
1551	BL2JUN	3	37	30	16	630	4122

1552	BL2JUN	4	49	41	21	1058	11110
1553	BL2JUN	5	29	24	9	349	1715
1554	BL2JUN	6	30	25	12	421	3166
1555	BL2JUN	7	43	36	16	1230	6650
1556	BL2JUN	8	36	30	14	442	4068
1557	BL2JUN	9	46	39	20	1634	9150
1558	BL2JUN	10	39	31	15	798	4953
1559	BL2JUN	11	43	35	18	974	6830
1560	BL2JUN	12	53	45	25	2800	15691
1561	BL2JUN	13	48	41	26	1845	14243
1562	BL2JUN	14	47	37	16	954	8542
1563	BL2JUN	15	37	29	16	608	4586
1564	BL2JUN	16	54	45	25	1991	16994
1565	BL2JUN	17	32	27	13	452	2748
1566	BL2JUN	18	36	30	15	694	4700
1567	BL2JUN	19	48	41	25	2203	14516
1568	BL2JUN	20	42	34	15	918	5162
1569	BL2JUN	21	27	23	11	181	1955
1570	BL2JUN	22	32	28	12	415	2633
1571	BL2JUN	23	34	27	14	449	2880
1572	BL2JUN	24	44	37	18	743	7872
1573	BL2JUN	25	30	24	12	426	2139
1574	BL2JUN	26	36	29	14	548	4609
1575	BL2JUN	27	35	28	14	613	4064
1576	BL2JUN	28	39	33	16	944	5578
1577	BL2JUN	29	43	35	21	1187	7138
1578	BL2JUN	30	42	35	18	803	7465
1579	BL2JUN	31	39	30	14	473	4864
1580	BL2JUN	32	42	35	16	1182	6560
1581	BL2JUN	33	38	32	15	1113	5368
1582	BL2JUN	34	38	31	15	917	5587
1583	BL2JUN	35	46	37	19	1070	9412
1584	BL2JUN	36	43	38	16	1024	7507
1585	BL2JUN	37	37	34	15	796	4852
1586	BL2JUN	38	42	33	16	1110	6817
1587	BL2JUN	39	39	30	15	.737	4270
1588	BL2JUN	40	35	29	13	543	3433
1589	BL2JUN	41	39	32	16	914	6174
1590	BL2JUN	42	33	26	13	425	3077
1591	BL2JUN	43	35	26	13	475	3058
1592	BL2JUN	44	34	28	13	454	2845
1593	BL2JUN	45	35	30	13	557	3646
1594	BL2JUN	46	39	31	16	764	5999
1595	BL2JUN	47	36	29	13	573	3613
1596	BL2JUN	48	35	26	13	504	2816
1597	BL2JUN	49	37	30	14	482	4420
1598	BL2JUN	50	34	28	12	318	3316
1599	BL2JUN	51	39	33	14	752	5322
1600	BL2JUN	52	35	28	12	486	3670
1601	BL2JUN	53	39	32	18	860	5690
1602	BL2JUN	54	41	34	20	1162	8577
1603	BL2JUN	55	37	29	13	600	3967
1604	BL2JUN	56	35	36	12	359	2747
1605	BL2JUN	57	38	32	15	677	4362
1606	BL2JUN	58	46	38	19	1525	8439
1607	BL2JUN	59	35	30	14	761	4144
1608	BL2JUN	60	36	29	17	671	5592
1609	BL2JUN	61	39	30	14	591.	4144
1610	BL2JUN	62	42	35	16	1240	6186
1611	BL2JUN	63	40	33	15	917	5599

1612	BL2JUN	64	35	30	14	660	4012
1613	BL2JUN	65	34	29	13	658	6376
1614	BL2JUN	66	39	31	16	792	5460
1615	29						
1616	RUN NAME		REDCAR,2,JUNE				
1617	REDJUN	1	35	29	14	404	3836
1618	REDJUN	2	41	34	18	733	5569
1619	REDJUN	3	38	32	17	548	4691
1620	REDJUN	4	30	24	11	267	1981
1621	REDJUN	5	40	33	16	623	4633
1622	REDJUN	6	40	31	15	557	4970
1623	REDJUN	7	43	35	18	862	7555
1624	REDJUN	8	36	30	15	475	3589
1625	REDJUN	9	42	34	18	942	7404
1626	REDJUN	10	40	33	16	792	5756
1627	REDJUN	11	42	35	18	1195	6780
1628	REDJUN	12	41	34	16	640	4649
1629	REDJUN	13	43	36	18	977	6618
1630	REDJUN	14	38	34	16	858	5082
1631	REDJUN	15	38	31	15	595	4638
1632	REDJUN	16	41	33	14	696	5061
1633	REDJUN	17	43	35	17	926	6627
1634	REDJUN	18	36	31	15	525	3655
1635	REDJUN	19	37	30	16	537	3997
1636	REDJUN	20	35	27	14	340	3598
1637	REDJUN	21	36	32	14	489	4161
1638	REDJUN	22	33	29	13	359	3190
1639	REDJUN	23	45	39	18	944	8097
1640	REDJUN	24	39	31	15	243	3709
1641	REDJUN	25	34	30	15	524	4493
1642	REDJUN	26	36	30	15	507	3870
1643	REDJUN	27	44	36	20	1140	7698
1644	REDJUN	28	37	31	16	642	4154
1645	REDJUN	29	26	19	8	202	1241
1646	61						
1647	RUN NAME		ISLE OF MAY,1				
1648	IS1MAY	1	40	32	18	860	5410
1649	IS1MAY	2	48	42	21	1268	9756
1650	IS1MAY	3	46	40	17	1058	9377
1651	IS1MAY	4	52	44	19	1624	12019
1652	IS1MAY	5	44	39	17	700	7609
1653	IS1MAY	6	49	40	21	937	10940
1654	IS1MAY	7	52	42	25	1311	10872
1655	IS1MAY	8	37	31	12	376	3376
1656	IS1MAY	9	48	43	19	1461	9344
1657	IS1MAY	10	32	26	10	310	2161
1658	IS1MAY	11	53	45	24	1277	14228
1659	IS1MAY	12	62	54	25	2591	21036
1660	IS1MAY	13	47	42	19	979	9288
1661	IS1MAY	14	51	44	19	1829	10796
1662	IS1MAY	15	50	42	20	1434	10602
1663	IS1MAY	16	57	49	19	1288	14432
1664	IS1MAY	17	42	36	17	874	6122
1665	IS1MAY	18	48	39	21	1624	9990
1666	IS1MAY	19	54	47	23	1654	11840
1667	IS1MAY	20	48	43	23	1534	3053
1668	IS1MAY	21	41	33	16	927	5464
1669	IS1MAY	22	31	25	11	317	2380
1670	IS1MAY	23	37	32	13	541	3402
1671	IS1MAY	24	47	39	18	823	7798

1672	IS1MAY	25	47	38	18	1211	8654
1673	IS1MAY	26	38	33	13	780	4342
1674	IS1MAY	27	51	42	18	1010	9933
1675	IS1MAY	28	50	44	21	1583	12825
1676	IS1MAY	29	35	28	12	501	3234
1677	IS1MAY	30	40	36	15	591	5516
1678	IS1MAY	31	34	30	10	311	2608
1679	IS1MAY	32	41	35	16	994	6555
1680	IS1MAY	33	48	44	19	841	10006
1681	IS1MAY	34	29	25	10	305	2134
1682	IS1MAY	35	38	31	14	671	3983
1683	IS1MAY	36	50	40	22	1503	10735
1684	IS1MAY	37	50	41	21	1145	9728
1685	IS1MAY	38	50	43	24	2221	15402
1686	IS1MAY	39	38	34	15	760	3892
1687	IS1MAY	40	35	26	12	327	2904
1688	IS1MAY	41	34	30	13	553	3354
1689	IS1MAY	42	50	42	20	1713	10253
1690	IS1MAY	43	32	28	11	273	2456
1691	IS1MAY	44	34	28	11	216	2781
1692	IS1MAY	45	49	41	24	1886	12298
1693	IS1MAY	46	40	32	13	713	5134
1694	IS1MAY	47	36	28	11	337	2855
1695	IS1MAY	48	34	31	13	652	3683
1696	IS1MAY	49	34	28	11	319	2431
1697	IS1MAY	50	33	27	10	269	2111
1698	IS1MAY	51	41	34	16	681	4924
1699	IS1MAY	52	49	42	23	1440	9417
1700	IS1MAY	53	40	36	15	535	5331
1701	IS1MAY	54	42	37	14	561	5313
1702	IS1MAY	55	41	36	18	876	5126
1703	IS1MAY	56	35	29	13	345	3659
1704	IS1MAY	57	37	31	11	336	3674
1705	IS1MAY	58	46	37	19	956	7261
1706	IS1MAY	59	44	38	17	1037	6232
1707	IS1MAY	60	42	34	17	633	7030
1708	IS1MAY	61	41	35	15	682	5062
1709	65						
1710	RUN NAME		ISLE OF MAY,3				
1711	IS3MAY	1	27	22	10	077	1440
1712	IS3MAY	2	49	40	23	1239	12425
1713	IS3MAY	3	47	41	22	1274	10545
1714	IS3MAY	4	42	34	18	835	5690
1715	IS3MAY	5	40	34	14	433	4677
1716	IS3MAY	6	47	40	21	1143	11172
1717	IS3MAY	7	55	47	26	2576	17853
1718	IS3MAY	8	36	30	13	417	3318
1719	IS3MAY	9	39	34	14	482	5206
1720	IS3MAY	10	29	23	12	228	1991
1721	IS3MAY	11	34	29	15	439	3120
1722	IS3MAY	12	31	24	11	260	2276
1723	IS3MAY	13	35	29	12	284	3004
1724	IS3MAY	14	29	23	11	180	1771
1725	IS3MAY	15	29	24	13	165	2229
1726	IS3MAY	16	32	23	12	230	2264
1727	IS3MAY	17	28	22	11	158	1936
1728	IS3MAY	18	26	22	10	161	1481
1729	IS3MAY	19	38	34	20	572	5668
1730	IS3MAY	20	38	31	14	373	3679
1731	IS3MAY	21	45	37	19	515	7528

1732	IS3MAY	22	37	29	14	453	4054
1733	IS3MAY	23	31	25	10	183	2170
1734	IS3MAY	24	37	34	17	508	4501
1735	IS3MAY	25	32	27	15	313	3986
1736	IS3MAY	26	41	35	17	536	5388
1737	IS3MAY	27	41	37	17	764	5734
1738	IS3MAY	28	41	33	18	768	6121
1739	IS3MAY	29	23	19	8	90	816
1740	IS3MAY	30	43	38	16	758	6527
1741	IS3MAY	31	37	31	15	405	4342
1742	IS3MAY	32	29	23	10	176	1605
1743	IS3MAY	33	47	43	25	1577	15206
1744	IS3MAY	34	43	38	18	959	7717
1745	IS3MAY	35	43	37	19	806	7153
1746	IS3MAY	36	38	31	15	340	4082
1747	IS3MAY	37	35	29	13	356	3422
1748	IS3MAY	38	38	32	18	394	5409
1749	IS3MAY	39	33	26	14	299	2694
1750	IS3MAY	40	29	24	10	157	1586
1751	IS3MAY	41	25	19	11	115	1068
1752	IS3MAY	42	29	22	10	223	1806
1753	IS3MAY	43	23	18	8	101	891
1754	IS3MAY	44	27	22	10	212	1215
1755	IS3MAY	45	22	17	8	88	640
1756	IS3MAY	46	24	18	10	130	932
1757	IS3MAY	47	29	25	10	143	1558
1758	IS3MAY	48	37	31	14	503	3219
1759	IS3MAY	49	45	35	17	671	6273
1760	IS3MAY	50	33	28	10	275	2175
1761	IS3MAY	51	32	27	11	270	2115
1762	IS3MAY	52	30	25	12	292	2518
1763	IS3MAY	53	36	31	12	344	3063
1764	IS3MAY	54	30	25	12	261	2571
1765	IS3MAY	55	33	27	11	277	2904
1766	IS3MAY	56	28	23	10	148	1610
1767	IS3MAY	57	34	27	22	251	3221
1768	IS3MAY	58	25	21	9	123	1215
1769	IS3MAY	59	30	26	10	286	1815
1770	IS3MAY	60	24	20	7	88	785
1771	IS3MAY	61	21	15	8	42	582
1772	IS3MAY	62	25	20	8	70	840
1773	IS3MAY	63	29	24	11	156	1795
1774	IS3MAY	64	28	23	19	161	1507
1775	IS3MAY	65	29	23	10	151	1665
1776	73						
1777	RUN NAME		ABBS,1,JUNE				
1778	AB1JUN	1	47	40	18	1195	7925
1779	AB1JUN	2	45	39	18	1021	6601
1780	AB1JUN	3	30	27	10	202	2076
1781	AB1JUN	4	35	30	12	429	3029
1782	AB1JUN	5	32	27	10	215	2558
1783	AB1JUN	6	40	36	11	560	3928
1784	AB1JUN	7	28	25	8	151	1411
1785	AB1JUN	8	42	37	16	695	6406
1786	AB1JUN	9	25	21	7	105	740
1787	AB1JUN	10	38	31	11	313	3545
1788	AB1JUN	11	25	20	6	97	801
1789	AB1JUN	12	43	39	13	720	6823
1790	AB1JUN	13	27	23	8	133	1067
1791	AB1JUN	14	21	17	6	58	429

1792	AB1JUN	15	46	40	16	635	7742
1793	AB1JUN	16	34	28	10	290	1812
1794	AB1JUN	17	28	24	9	203	1651
1795	AB1JUN	18	33	28	10	341	2362
1796	AB1JUN	19	40	35	14	679	5950
1797	AB1JUN	20	37	31	12	340	3536
1798	AB1JUN	21	33	28	10	300	2403
1799	AB1JUN	22	40	34	15	458	4030
1800	AB1JUN	23	39	33	12	551	3577
1801	AB1JUN	24	27	23	8	143	1043
1802	AB1JUN	25	16	13	4	21	169
1803	AB1JUN	26	38	32	13	509	3817
1804	AB1JUN	27	34	27	10	233	1864
1805	AB1JUN	28	36	30	11	409	2931
1806	AB1JUN	29	32	28	9	326	2142
1807	AB1JUN	30	29	24	9	140	1349
1808	AB1JUN	31	29	22	9	200	1221
1809	AB1JUN	32	34	29	12	440	2622
1810	AB1JUN	33	36	22	8	100	1102
1811	AB1JUN	34	28	25	9	158	1647
1812	AB1JUN	35	33	28	9	206	1944
1813	AB1JUN	36	22	19	5	55	447
1814	AB1JUN	37	28	24	8	157	1354
1815	AB1JUN	38	20	17	6	48	351
1816	AB1JUN	39	20	16	5	44	361
1817	AB1JUN	40	16	13	4	10	217
1818	AB1JUN	41	40	35	12	597	4216
1819	AB1JUN	42	36	30	11	475	3290
1820	AB1JUN	43	26	21	7	101	855
1821	AB1JUN	44	36	30	12	548	3286
1822	AB1JUN	45	27	25	8	182	1340
1823	AB1JUN	46	33	28	12	222	2866
1824	AB1JUN	47	22	17	7	89	669
1825	AB1JUN	48	33	27	10	285	2068
1826	AB1JUN	49	20	16	6	63	437
1827	AB1JUN	50	32	28	8	187	1648
1828	AB1JUN	51	33	29	11	379	2683
1829	AB1JUN	52	35	30	10	428	2716
1830	AB1JUN	53	31	26	10	238	1783
1831	AB1JUN	54	14	12	3	8	139
1832	AB1JUN	55	34	29	10	233	2381
1833	AB1JUN	56	35	29	11	378	2568
1834	AB1JUN	57	40	36	12	567	4305
1835	AB1JUN	58	34	29	11	426	2798
1836	AB1JUN	59	38	30	12	438	3895
1837	AB1JUN	60	34	29	11	344	2642
1838	AB1JUN	61	39	33	14	633	4105
1839	AB1JUN	62	22	17	6	49	477
1840	AB1JUN	63	23	20	7	77	664
1841	AB1JUN	64	29	25	8	132	1340
1842	AB1JUN	65	30	26	10	266	2107
1843	AB1JUN	66	32	27	10	274	1876
1844	AB1JUN	67	32	27	10	246	1997
1845	AB1JUN	68	26	22	8	107	995
1846	AB1JUN	69	24	20	6	104	649
1847	AB1JUN	70	25	21	8	105	1037
1848	AB1JUN	71	34	28	12	320	2855
1849	AB1JUN	72	30	25	10	242	1681
1850	AB1JUN	73	23	19	7	76	619
1851	58						

1852	RUN NAME		ABBS,2,JUNE				
1853	AB2JUN	1	42	34	17	621	5941
1854	AB2JUN	2	22	18	06	54	542
1855	AB2JUN	3	33	28	10	271	2644
1856	AB2JUN	4	18	14	5	31	250
1857	AB2JUN	5	24	20	7	88	698
1858	AB2JUN	6	40	32	14	710	5449
1859	AB2JUN	7	34	27	11	327	2775
1860	AB2JUN	8	26	20	9	121	1083
1861	AB2JUN	9	33	28	11	247	1882
1862	AB2JUN	10	29	23	9	140	1372
1863	AB2JUN	11	22	18	6	050	506
1864	AB2JUN	12	22	17	7	54	673
1865	AB2JUN	13	29	24	10	142	1336
1866	AB2JUN	14	29	25	10	166	1973
1867	AB2JUN	15	32	27	10	192	2475
1868	AB2JUN	16	24	20	8	102	741
1869	AB2JUN	17	29	23	10	123	1724
1870	AB2JUN	18	28	22	8	118	1207
1871	AB2JUN	19	22	17	7	68	531
1872	AB2JUN	20	30	24	8	131	1407
1873	AB2JUN	21	24	20	7	82	837
1874	AB2JUN	22	34	28	11	240	2501
1875	AB2JUN	23	30	28	10	168	2078
1876	AB2JUN	24	43	35	12	632	4301
1877	AB2JUN	25	34	28	11	194	2338
1878	AB2JUN	26	21	18	5	43	530
1879	AB2JUN	27	33	28	11	204	3081
1880	AB2JUN	28	27	23	8	139	1062
1881	AB2JUN	29	30	24	10	138	1830
1882	AB2JUN	30	24	20	08	83	955
1883	AB2JUN	31	26	22	8	93	926
1884	AB2JUN	32	49	39	16	1054	7977
1885	AB2JUN	33	38	32	12	344	4118
1886	AB2JUN	34	23	18	7	62	570
1887	AB2JUN	35	29	24	9	98	1244
1888	AB2JUN	36	33	27	11	214	1966
1889	AB2JUN	37	22	18	7	67	598
1890	AB2JUN	38	37	32	14	368	4170
1891	AB2JUN	39	31	27	11	178	2388
1892	AB2JUN	40	33	26	10	202	1982
1893	AB2JUN	41	31	25	8	144	1750
1894	AB2JUN	42	30	25	10	154	1540
1895	AB2JUN	43	22	19	7	78	775
1896	AB2JUN	44	29	23	9	107	1363
1897	AB2JUN	45	27	22	8	120	1110
1898	AB2JUN	46	25	21	9	99	933
1899	AB2JUN	47	19	15	6	42	447
1900	AB2JUN	48	24	19	7	57	778
1901	AB2JUN	49	31	25	9	164	1776
1902	AB2JUN	50	20	16	6	48	494
1903	AB2JUN	51	21	17	7	55	693
1904	AB2JUN	52	26	22	8	191	1406
1905	AB2JUN	53	26	22	8	98	952
1906	AB2JUN	54	22	17	6	55	500
1907	AB2JUN	55	23	19	6	61	733
1908	AB2JUN	56	28	23	10	121	1485
1909	AB2JUN	57	24	20	8	102	867
1910	AB2JUN	58	28	24	9	128	1603
1911	68						

1912	RUN NAME	ABRS,3,JUNE					
1913	AB3JUN 1	29	23	10	227	1788
1914	AB3JUN 2	17	14	6	46	412
1915	AB3JUN 3	25	20	9	120	1072
1916	AB3JUN 4	25	21	11	139	1618
1917	AB3JUN 5	15	12	5	31	248
1918	AB3JUN 6	31	25	10	183	2100
1919	AB3JUN 7	25	20	9	90	1206
1920	AB3JUN 8	29	23	11	203	2021
1921	AB3JUN 9	34	26	11	259	3530
1922	AB3JUN 10	31	25	11	185	2142
1923	AB3JUN 11	22	16	8	82	763
1924	AB3JUN 12	23	20	10	110	1162
1925	AB3JUN 13	21	16	7	52	556
1926	AB3JUN 14	27	21	11	158	2534
1927	AB3JUN 15	20	17	7	71	529
1928	AB3JUN 16	29	23	11	146	1851
1929	AB3JUN 17	26	21	10	140	1326
1930	AB3JUN 18	22	17	8	93	703
1931	AB3JUN 19	34	27	12	311	3406
1932	AB3JUN 20	39	32	15	391	5091
1933	AB3JUN 21	29	23	11	289	2413
1934	AB3JUN 22	36	29	16	326	4242
1935	AB3JUN 23	37	29	15	461	4048
1936	AB3JUN 24	22	18	8	80	837
1937	AB3JUN 25	42	37	19	538	7795
1938	AB3JUN 26	45	37	17	445	6994
1939	AB3JUN 27	39	31	17	323	4938
1940	AB3JUN 28	38	29	16	543	4641
1941	AB3JUN 29	37	30	13	350	3506
1942	AB3JUN 30	34	25	14	288	3123
1943	AB3JUN 31	32	25	12	208	2199
1944	AB3JUN 32	32	26	11	185	2655
1945	AB3JUN 33	33	26	11	260	2693
1946	AB3JUN 34	30	23	12	188	2421
1947	AB3JUN 35	27	22	10	146	1421
1948	AB3JUN 36	27	21	9	157	1563
1949	AB3JUN 37	23	18	9	104	951
1950	AB3JUN 38	37	29	13	274	3630
1951	AB3JUN 39	40	33	14	362	4440
1952	AB3JUN 40	33	26	12	236	2815
1953	AB3JUN 41	29	23	9	155	1519
1954	AB3JUN 42	23	17	9	91	1041
1955	AB3JUN 43	29	22	11	228	2321
1956	AB3JUN 44	28	22	10	164	1586
1957	AB3JUN 45	32	24	12	308	2489
1958	AB3JUN 46	36	28	14	462	3380
1959	AB3JUN 47	27	21	10	129	1306
1960	AB3JUN 48	26	22	10	142	1456
1961	AB3JUN 49	33	26	14	249	2782
1962	AB3JUN 50	35	28	14	423	3162
1963	AB3JUN 51	27	22	10	130	1206
1964	AB3JUN 52	35	28	15	250	3780
1965	AB3JUN 53	27	21	8	115	1096
1966	AB3JUN 54	30	23	12	226	1816
1967	AB3JUN 55	23	17	7	93	786
1968	AB3JUN 56	26	20	11	570	1459
1969	AB3JUN 57	25	20	11	125	1251
1970	AB3JUN 58	32	24	12	214	2272
1971	AB3JUN 59	31	24	11	201	2144

1972	AB3JUN 60	29	24	9	124	1762
1973	AB3JUN 61	23	18	10	118	1190
1974	AB3JUN 62	28	21	11	223	1943
1975	AB3JUN 63	32	26	14	292	2933
1976	AB3JUN 64	29	22	12	175	2266
1977	AB3JUN 65	33	25	11	200	2475
1978	AB3JUN 66	24	19	10	124	1070
1979	AB3JUN 67	32	26	11	164	2590
1980	AB3JUN 68	27	22	11	194	1624
1981	32					
1982	RUN NAME	ABBS,1,NOVEMBER				
1983	AB1NOV 1	39	32	16	427	4806
1984	AB1NOV 2	27	21	10	120	1606
1985	AB1NOV 3	38	32	14	449	5431
1986	AB1NOV 4	40	34	15	434	6125
1987	AB1NOV 5	33	26	13	200	2731
1988	AB1NOV 6	30	25	10	154	2052
1989	AB1NOV 7	23	18	7	66	828
1990	AB1NOV 8	30	24	9	149	1570
1991	AB1NOV 9	28	23	8	157	1549
1992	AB1NOV 10	29	24	9	138	1902
1993	AB1NOV 11	29	23	10	141	1678
1994	AB1NOV 12	25	20	8	89	1256
1995	AB1NOV 13	24	21	8	102	1023
1996	AB1NOV 14	27	21	9	102	1469
1997	AB1NOV 15	30	16	6	47	598
1998	AB1NOV 16	20	15	6	32	376
1999	AB1NOV 17	32	26	13	193	2746
2000	AB1NOV 18	30	23	10	157	1984
2001	AB1NOV 19	23	18	7	78	818
2002	AB1NOV 20	30	22	10	154	1637
2003	AB1NOV 21	42	35	17	584	6811
2004	AB1NOV 22	27	21	9	137	1462
2005	AB1NOV 23	22	18	7	76	746
2006	AB1NOV 24	22	18	7	67	799
2007	AB1NOV 25	27	22	9	136	1234
2008	AB1NOV 26	27	20	10	120	1292
2009	AB1NOV 27	27	21	7	92	976
2010	AB1NOV 28	24	18	8	76	989
2011	AB1NOV 29	26	20	9	91	1257
2012	AB1NOV 30	25	22	9	99	1251
2013	AB1NOV 31	25	21	8	99	1147
2014	AB1NOV 32	29	25	10	169	1808
2015	34					
2016	RUN NAME	ABBS,3,NOVEMBER				
2017	AB3NOV 1	14	11	5	22	216
2018	AB3NOV 2	40	33	16	727	6060
2019	AB3NOV 3	28	23	11	234	1843
2020	AB3NOV 4	35	28	14	442	3416
2021	AB3NOV 5	20	16	8	59	600
2022	AB3NOV 6	17	14	6	59	358
2023	AB3NOV 7	20	15	8	37	569
2024	AB3NOV 8	36	30	18	499	4226
2025	AB3NOV 9	28	23	12	283	1893
2026	AB3NOV 10	39	30	16	497	4757
2027	AB3NOV 11	32	25	12	337	3056
2028	AB3NOV 12	36	29	15	461	3419
2029	AB3NOV 13	24	18	8	188	976
2030	AB3NOV 14	31	22	15	426	2600
2031	AB3NOV 15	32	27	12	374	2844

2032	AB3NOV	16	33	27	11	296	2323
2033	AB3NOV	17	27	20	13	286	1774
2034	AB3NOV	18	26	21	13	224	2296
2035	AB3NOV	19	40	31	18	647	5875
2036	AB3NOV	20	32	25	13	407	2801
2037	AB3NOV	21	28	22	11	173	1746
2038	AB3NOV	22	32	26	12	372	2421
2039	AB3NOV	23	36	30	14	778	4379
2040	AB3NOV	24	33	27	10	342	2454
2041	AB3NOV	25	31	25	13	380	2757
2042	AB3NOV	26	25	20	11	174	1557
2043	AB3NOV	27	20	16	8	84	648
2044	AB3NOV	28	30	23	12	279	2134
2045	AB3NOV	29	23	18	11	129	1088
2046	AB3NOV	30	16	13	6	40	332
2047	AB3NOV	31	26	21	13	274	1487
2048	AB3NOV	32	25	17	11	130	1477
2049	AB3NOV	33	19	15	7	101	586
2050	AB3NOV	34	26	20	13	200	1689
2051	97						
2052	RUN NAME		HAROLDSWICK 2				
2053	HA2MAW	1	37	33	12	346	3331
2054	HA2MAW	2	41	34	15	425	4125
2055	HA2MAW	3	31	25	9	201	2393
2056	HA2MAW	4	21	18	6	48	475
2057	HA2MAW	5	33	28	12	247	2954
2058	HA2MAW	6	33	26	21	270	3210
2059	HA2MAW	7	33	29	11	250	2879
2060	HA2MAW	8	30	24	9	180	1862
2061	HA2MAW	9	33	27	11	196	3699
2062	HA2MAW	10	32	28	12	236	2717
2063	HA2MAW	11	34	28	11	346	3025
2064	HA2MAW	12	34	28	11	320	2541
2065	HA2MAW	13	24	20	6	63	741
2066	HA2MAW	14	38	34	11	316	2870
2067	HA2MAW	15	35	29	11	.263	2488
2068	HA2MAW	16	25	20	9	112	1188
2069	HA2MAW	17	22	19	7	63	691
2070	HA2MAW	18	22	19	6	60	671
2071	HA2MAW	19	33	28	12	301	2901
2072	HA2MAW	20	35	28	11	289	3420
2073	HA2MAW	21	38	33	11	375	3173
2074	HA2MAW	22	35	29	10	243	2618
2075	HA2MAW	23	30	25	9	181	2260
2076	HA2MAW	24	32	24	9	214	1857
2077	HA2MAW	25	44	37	18	498	7148
2078	HA2MAW	26	36	32	13	438	3335
2079	HA2MAW	27	36	32	11	307	3798
2080	HA2MAW	28	37	32	12	481	4020
2081	HA2MAW	29	37	32	12	247	3206
2082	HA2MAW	30	50	42	18	711	12297
2083	HA2MAW	31	33	28	12	317	2532
2084	HA2MAW	32	24	19	8	102	1047
2085	HA2MAW	33	31	26	11	140	2365
2086	HA2MAW	34	31	26	12	212	3504
2087	HA2MAW	35	22	18	8	98	725
2088	HA2MAW	36	44	38	16	865	7100
2089	HA2MAW	37	43	37	15	626.	6266
2090	HA2MAW	38	26	24	10	196	1793
2091	HA2MAW	39	20	16	6	50	484

2092	HA2MAW	40	34	28	10	247	2416
2093	HA2MAW	41	46	41	20	755	8639
2094	HA2MAW	42	43	35	18	680	6449
2095	HA2MAW	43	41	35	13	416	5235
2096	HA2MAW	44	31	26	8	210	1969
2097	HA2MAW	45	29	24	7	127	1271
2098	HA2MAW	46	35	29	12	304	3079
2099	HA2MAW	47	37	31	14	592	4916
2100	HA2MAW	48	45	38	16	626	4918
2101	HA2MAW	49	34	30	14	312	4038
2102	HA2MAW	50	41	34	14	508	4985
2103	HA2MAW	51	19	15	6	46	539
2104	HA2MAW	52	41	27	9	207	1559
2105	HA2MAW	53	33	29	9	227	2098
2106	HA2MAW	54	18	16	5	31	447
2107	HA2MAW	55	27	23	7	91	1055
2108	HA2MAW	56	38	34	13	352	3988
2109	HA2MAW	57	37	31	13	424	4464
2110	HA2MAW	58	28	22	11	215	1876
2111	HA2MAW	59	33	26	11	205	2343
2112	HA2MAW	60	19	15	5	39	376
2113	HA2MAW	61	35	29	12	429	3223
2114	HA2MAW	62	31	25	10	251	2355
2115	HA2MAW	63	30	26	9	173	1933
2116	HA2MAW	64	45	38	13	603	6040
2117	HA2MAW	65	32	26	12	220	2093
2118	HA2MAW	66	36	31	12	292	3273
2119	HA2MAW	67	22	18	6	61	658
2120	HA2MAW	68	29	25	8	134	1647
2121	HA2MAW	69	31	26	9	254	2069
2122	HA2MAW	70	26	22	10	100	1530
2123	HA2MAW	71	38	32	12	327	3388
2124	HA2MAW	72	39	31	12	425	4584
2125	HA2MAW	73	35	30	13	325	3087
2126	HA2MAW	74	31	25	9	212	1787
2127	HA2MAW	75	30	25	10	211	1621
2128	HA2MAW	76	36	32	15	519	3668
2129	HA2MAW	77	39	34	14	488	4939
2130	HA2MAW	78	33	31	11	268	2916
2131	HA2MAW	79	25	21	7	110	1087
2132	HA2MAW	80	17	14	6	53	356
2133	HA2MAW	81	29	24	9	167	1579
2134	HA2MAW	82	23	19	7	91	868
2135	HA2MAW	83	33	28	12	236	2854
2136	HA2MAW	84	23	18	5	53	629
2137	HA2MAW	85	23	18	6	61	618
2138	HA2MAW	86	31	26	12	268	2474
2139	HA2MAW	87	33	28	10	297	2579
2140	HA2MAW	88	22	17	6	49	523
2141	HA2MAW	89	27	22	10	187	1382
2142	HA2MAW	90	18	13	6	41	485
2143	HA2MAW	91	34	30	13	344	3754
2144	HA2MAW	92	36	31	12	267	2337
2145	HA2MAW	93	29	24	8	113	1691
2146	HA2MAW	94	36	30	13	359	3422
2147	HA2MAW	95	24	20	7	66	774
2148	HA2MAW	96	15	11	4	13	191
2149	HA2MAW	97	17	14	5	26	297
2150	98						
2151	RUN NAME		HAROLDSWICK 3				

2152	HA3MAW	1	34	29	14	564	3358
2153	HA3MAW	2	38	34	15	788	5927
2154	HA3MAW	3	37	31	13	537	4100
2155	HA3MAW	4	44	37	19	956	7292
2156	HA3MAW	5	33	26	16	474	3712
2157	HA3MAW	6	46	41	20	804	9011
2158	HA3MAW	7	41	33	17	611	5727
2159	HA3MAW	8	38	31	14	598	4822
2160	HA3MAW	9	41	33	20	964	7021
2161	HA3MAW	10	44	37	22	812	7632
2162	HA3MAW	11	40	35	20	748	6829
2163	HA3MAW	12	44	37	16	1325	9627
2164	HA3MAW	13	43	37	24	1132	9109
2165	HA3MAW	14	36	31	20	524	5267
2166	HA3MAW	15	49	43	24	1127	11444
2167	HA3MAW	16	45	40	20	1165	12227
2168	HA3MAW	17	42	36	16	720	6127
2169	HA3MAW	18	47	41	24	1309	13887
2170	HA3MAW	19	35	29	17	484	4926
2171	HA3MAW	20	30	25	12	319	2134
2172	HA3MAW	21	32	26	13	462	2503
2173	HA3MAW	22	34	29	14	652	4054
2174	HA3MAW	23	44	36	22	975	10128
2175	HA3MAW	24	38	32	18	706	5677
2176	HA3MAW	25	36	28	14	560	4011
2177	HA3MAW	26	52	46	31	1638	21456
2178	HA3MAW	27	50	42	29	2204	17581
2179	HA3MAW	28	50	46	24	1561	11078
2180	HA3MAW	29	41	32	17	843	6366
2181	HA3MAW	30	48	40	23	1160	10976
2182	HA3MAW	31	47	39	21	1243	9738
2183	HA3MAW	32	33	27	15	407	4031
2184	HA3MAW	33	39	32	20	752	7361
2185	HA3MAW	34	40	34	19	1045	6514
2186	HA3MAW	35	44	36	22	735	8455
2187	HA3MAW	36	36	30	14	.337	4059
2188	HA3MAW	37	48	40	23	1644	14788
2189	HA3MAW	38	32	28	15	413	3092
2190	HA3MAW	39	51	42	25	1550	13299
2191	HA3MAW	40	37	29	14	424	3770
2192	HA3MAW	41	34	26	13	436	2980
2193	HA3MAW	42	38	32	17	708	6083
2194	HA3MAW	43	54	49	25	1758	17102
2195	HA3MAW	44	41	34	20	1062	6982
2196	HA3MAW	45	45	38	25	1030	12639
2197	HA3MAW	46	36	30	14	487	4891
2198	HA3MAW	47	42	36	19	655	7641
2199	HA3MAW	48	35	28	14	425	3595
2200	HA3MAW	49	43	35	20	867	8366
2201	HA3MAW	50	45	37	23	963	10085
2202	HA3MAW	51	42	35	18	621	6682
2203	HA3MAW	52	34	28	15	583	3716
2204	HA3MAW	53	52	45	26	737	14706
2205	HA3MAW	54	36	31	14	575	4261
2206	HA3MAW	55	41	30	16	747	6907
2207	HA3MAW	56	45	38	23	1097	10400
2208	HA3MAW	57	42	35	20	638	7027
2209	HA3MAW	58	47	44	25	1335	14960
2210	HA3MAW	59	37	30	16	646	4327
2211	HA3MAW	60	44	38	23	740	10412

2212	HA3MAW	61	43	38	21	1164	9297
2213	HA3MAW	62	40	33	21	974	7400
2214	HA3MAW	63	44	36	20	879	9335
2215	HA3MAW	64	51	40	21	1981	12167
2216	HA3MAW	65	49	44	33	2637	23571
2217	HA3MAW	66	42	36	18	954	6688
2218	HA3MAW	67	38	32	16	605	4817
2219	HA3MAW	68	45	36	23	1052	9605
2220	HA3MAW	69	39	32	17	610	5784
2221	HA3MAW	70	48	45	27	1461	15175
2222	HA3MAW	71	34	29	12	527	3689
2223	HA3MAW	72	24	19	10	137	1199
2224	HA3MAW	73	32	26	16	359	3126
2225	HA3MAW	74	43	36	19	731	8261
2226	HA3MAW	75	35	29	16	742	3832
2227	HA3MAW	76	37	33	14	609	4434
2228	HA3MAW	77	42	37	20	860	8523
2229	HA3MAW	78	49	42	22	1255	13438
2230	HA3MAW	79	47	39	22	1201	10865
2231	HA3MAW	80	48	42	27	1435	14311
2232	HA3MAW	81	51	42	26	1637	14727
2233	HA3MAW	82	46	38	24	1080	14951
2234	HA3MAW	83	34	29	15	695	3893
2235	HA3MAW	84	49	42	25	1560	14287
2236	HA3MAW	85	43	36	18	612	6698
2237	HA3MAW	86	33	26	12	415	2997
2238	HA3MAW	87	38	31	13	342	3731
2239	HA3MAW	88	35	29	13	468	3858
2240	HA3MAW	89	43	35	16	865	1909
2241	HA3MAW	90	40	34	20	720	8731
2242	HA3MAW	91	44	37	21	1067	9800
2243	HA3MAW	92	45	40	20	975	9240
2244	HA3MAW	93	38	31	14	562	5250
2245	HA3MAW	94	47	42	21	1285	12159
2246	HA3MAW	95	45	38	23	970	9723
2247	HA3MAW	96	45	36	22	1025	7688
2248	HA3MAW	97	52	46	34	2098	20054
2249	HA3MAW	98	57	49	35	2265	26710
2250	76						
2251	RUN NAME		OLLABERRY 2				
2252	CL2MAY	1	25	22	9	128	1265
2253	OL2MAY	2	38	32	15	474	4465
2254	CL2MAY	3	36	32	13	447	5149
2255	OL2MAY	4	44	38	18	686	8890
2256	CL2MAY	5	34	29	14	382	3231
2257	CL2MAY	6	39	32	15	678	5217
2258	OL2MAY	7	37	29	16	697	5282
2259	CL2MAY	8	38	32	15	724	4684
2260	OL2MAY	9	32	27	13	294	2777
2261	CL2MAY	10	32	29	14	420	3043
2262	OL2MAY	11	33	29	13	307	3128
2263	OL2MAY	12	37	30	19	850	6442
2264	OL2MAY	13	34	28	11	225	3012
2265	OL2MAY	14	29	25	10	229	2021
2266	OL2MAY	15	30	25	11	280	2027
2267	OL2MAY	16	29	22	10	206	1838
2268	OL2MAY	17	46	38	22	1190	14258
2269	CL2MAY	18	29	23	9	150	1746
2270	OL2MAY	19	32	27	12	236	2555
2271	OL2MAY	20	29	22	11	174	1858

2272	OL2MAY	21	37	32	15	461	4571
2273	OL2MAY	22	35	30	16	486	4176
2274	OL2MAY	23	33	28	12	324	3491
2275	OL2MAY	24	25	22	11	207	1929
2276	OL2MAY	25	25	21	10	189	1519
2277	OL2MAY	26	37	31	12	502	3943
2278	OL2MAY	27	32	27	12	282	2826
2279	OL2MAY	28	37	31	13	465	4999
2280	OL2MAY	29	40	32	16	649	4579
2281	OL2MAY	30	49	42	21	1270	12716
2282	OL2MAY	31	34	31	16	537	4003
2283	OL2MAY	32	31	26	11	282	2346
2284	OL2MAY	33	31	25	11	276	2114
2285	OL2MAY	34	30	22	12	266	1934
2286	OL2MAY	35	45	37	23	1098	10976
2287	OL2MAY	36	38	31	15	685	5611
2288	OL2MAY	37	49	44	26	1543	18422
2289	OL2MAY	38	38	32	15	520	3933
2290	OL2MAY	39	40	34	19	862	8089
2291	OL2MAY	40	26	22	9	154	1395
2292	OL2MAY	41	45	38	22	1053	11439
2293	OL2MAY	42	32	26	12	285	2696
2294	OL2MAY	43	31	26	13	281	2674
2295	OL2MAY	44	38	32	17	819	5245
2296	OL2MAY	45	32	26	11	298	2908
2297	OL2MAY	46	44	36	17	899	7190
2298	OL2MAY	47	38	32	15	627	5083
2299	OL2MAY	48	39	34	17	749	6318
2300	OL2MAY	49	43	36	20	982	9857
2301	OL2MAY	50	34	29	14	296	3282
2302	OL2MAY	51	27	22	11	156	1711
2303	OL2MAY	52	32	28	13	284	3569
2304	OL2MAY	53	43	37	19	820	9950
2305	OL2MAY	54	28	24	9	175	1447
2306	OL2MAY	55	19	15	7	74	529
2307	OL2MAY	56	26	22	9	140	1348
2308	OL2MAY	57	29	23	12	223	2354
2309	OL2MAY	58	32	27	13	324	2759
2310	OL2MAY	59	33	28	11	257	2599
2311	OL2MAY	60	28	23	10	176	1806
2312	OL2MAY	61	26	23	10	169	1482
2313	OL2MAY	62	23	18	8	89	949
2314	OL2MAY	63	25	20	8	90	1029
2315	OL2MAY	64	29	24	8	128	1286
2316	OL2MAY	65	29	23	9	204	1655
2317	OL2MAY	66	25	20	9	143	1373
2318	OL2MAY	67	26	20	7	95	1066
2319	OL2MAY	68	25	20	6	121	849
2320	OL2MAY	69	26	22	9	169	1219
2321	OL2MAY	70	28	22	10	162	1425
2322	OL2MAY	71	20	17	6	87	684
2323	OL2MAY	72	20	17	8	126	974
2324	OL2MAY	73	24	20	8	97	1207
2325	OL2MAY	74	17	14	7	45	405
2326	OL2MAY	75	21	16	6	74	559
2327	OL2MAY	76	19	16	6	59	507
2328	89						
2329	RUN NAME		OLLABERRY 3				
2330	OL3MAY	1	33	27	16	391	4364
2331	OL3MAY	2	30	24	11	195.	2262

2332	CL3MAY	3	31	25	11	307	2388
2333	OL3MAY	4	25	19	11	113	1219
2334	OL3MAY	5	38	31	12	581	4951
2335	OL3MAY	6	43	36	21	734	8292
2336	OL3MAY	7	50	43	28	1100	18232
2337	OL3MAY	8	25	21	9	129	1670
2338	OL3MAY	9	33	26	13	336	3229
2339	CL3MAY	10	45	38	26	635	12734
2340	OL3MAY	11	43	37	21	990	10933
2341	OL3MAY	12	42	36	20	744	8650
2342	OL3MAY	13	28	23	9	154	1839
2343	CL3MAY	14	38	33	19	670	6602
2344	OL3MAY	15	47	40	25	1120	14081
2345	OL3MAY	16	27	22	11	184	1779
2346	CL3MAY	17	36	30	15	476	4668
2347	OL3MAY	18	30	23	11	184	2311
2348	CL3MAY	19	33	28	15	322	4277
2349	OL3MAY	20	31	26	12	262	2392
2350	CL3MAY	21	35	29	14	399	3835
2351	CL3MAY	22	28	23	14	197	2074
2352	OL3MAY	23	32	28	13	241	3473
2353	CL3MAY	24	24	22	12	206	1762
2354	OL3MAY	25	37	31	12	377	3780
2355	OL3MAY	26	37	31	14	418	5106
2356	OL3MAY	27	36	29	14	279	3716
2357	OL3MAY	28	32	26	12	272	2829
2358	CL3MAY	29	21	16	8	84	662
2359	OL3MAY	30	31	24	11	225	2792
2360	CL3MAY	31	38	33	20	506	6448
2361	CL3MAY	32	40	33	14	384	5658
2362	OL3MAY	33	29	22	12	186	2183
2363	CL3MAY	34	31	25	12	256	3090
2364	OL3MAY	35	20	18	8	63	702
2365	OL3MAY	36	23	19	8	113	1021
2366	CL3MAY	37	44	39	32	939	12759
2367	OL3MAY	38	23	19	10	117	1234
2368	CL3MAY	39	42	36	27	880	10501
2369	OL3MAY	40	23	12	8	110	1014
2370	CL3MAY	41	20	16	8	61	675
2371	CL3MAY	42	18	14	6	40	450
2372	OL3MAY	43	29	24	14	265	2097
2373	OL3MAY	44	44	38	19	544	9596
2374	OL3MAY	45	33	28	13	240	3446
2375	OL3MAY	46	41	37	24	701	12038
2376	CL3MAY	47	39	34	15	618	5749
2377	OL3MAY	48	41	34	18	591	7199
2378	OL3MAY	49	35	27	12	422	3524
2379	CL3MAY	50	38	32	15	490	5516
2380	CL3MAY	51	40	32	16	762	7657
2381	OL3MAY	52	42	35	21	829	8615
2382	OL3MAY	53	35	28	13	318	3522
2383	CL3MAY	54	29	24	12	248	3702
2384	OL3MAY	55	33	28	13	419	3374
2385	OL3MAY	56	27	23	10	154	1626
2386	OL3MAY	57	30	21	11	337	2178
2387	CL3MAY	58	32	27	14	275	3498
2388	OL3MAY	59	37	31	16	776	5425
2389	OL3MAY	60	23	17	8	98	786
2390	CL3MAY	61	29	22	10	186	1506
2391	OL3MAY	62	27	22	10	141	1586

2392	CL3MAY	63	26	20	11	184	1445
2393	OL3MAY	64	29	23	11	195	2143
2394	CL3MAY	65	48	41	21	920	13132
2395	OL3MAY	66	26	23	11	158	1764
2396	CL3MAY	67	25	20	9	145	1453
2397	OL3MAY	68	25	20	8	110	1090
2398	OL3MAY	69	45	38	22	934	11383
2399	CL3MAY	70	37	33	18	442	6474
2400	OL3MAY	71	47	40	25	1033	13016
2401	CL3MAY	72	32	26	13	270	2892
2402	OL3MAY	73	40	33	22	519	8085
2403	OL3MAY	74	45	38	24	894	11346
2404	OL3MAY	75	51	42	25	1440	13327
2405	CL3MAY	76	43	35	24	860	9755
2406	OL3MAY	77	43	36	20	862	8214
2407	CL3MAY	78	48	41	24	986	11898
2408	CL3MAY	79	41	35	19	1022	8522
2409	OL3MAY	80	40	32	15	510	6557
2410	OL3MAY	81	41	35	22	878	10027
2411	OL3MAY	82	43	38	19	509	7744
2412	OL3MAY	83	45	36	21	781	10391
2413	CL3MAY	84	35	30	16	586	5133
2414	OL3MAY	85	35	28	15	509	4021
2415	CL3MAY	86	41	34	18	689	9856
2416	CL3MAY	87	30	26	11	258	2190
2417	OL3MAY	88	41	33	17	611	6655
2418	OL3MAY	89	43	36	24	648	12637
2419	97						
2420	RUN NAME		CTTERSWICKYELL 1				
2421	OT1MAY	1	53	46	19	1122	6673
2422	OT1MAY	2	41	35	15	539	5748
2423	OT1MAY	3	51	49	18	980	9358
2424	OT1MAY	4	47	46	19	1025	9886
2425	CT1MAY	5	41	36	15	542	5030
2426	OT1MAY	6	25	24	10	154	1858
2427	OT1MAY	7	45	37	17	768	7281
2428	OT1MAY	8	40	35	15	568	6244
2429	OT1MAY	9	45	39	19	588	7928
2430	OT1MAY	10	40	35	15	552	4797
2431	OT1MAY	11	37	29	12	326	4005
2432	CT1MAY	12	27	25	10	159	1986
2433	OT1MAY	13	34	27	12	219	3208
2434	CT1MAY	14	32	28	11	197	2482
2435	CT1MAY	15	32	26	11	233	2391
2436	OT1MAY	16	28	24	9	152	1580
2437	OT1MAY	17	37	33	13	420	4444
2438	OT1MAY	18	44	39	18	657	5626
2439	CT1MAY	19	33	28	10	233	2332
2440	OT1MAY	20	32	28	12	193	2721
2441	OT1MAY	21	36	30	13	288	4170
2442	OT1MAY	22	33	30	12	240	3432
2443	CT1MAY	23	31	27	9	199	2050
2444	OT1MAY	24	22	18	12	72	734
2445	OT1MAY	25	27	25	10	138	2177
2446	CT1MAY	26	36	29	14	307	3652
2447	OT1MAY	27	35	30	15	427	4110
2448	CT1MAY	28	31	26	10	231	2009
2449	CT1MAY	29	36	31	14	347	3991
2450	OT1MAY	30	34	29	12	240	3795
2451	CT1MAY	31	35	28	13	261	2942

2452	OT1MAY	32	34	29	12	301	3353
2453	OT1MAY	33	34	29	12	250	3085
2454	OT1MAY	34	33	28	10	278	2030
2455	OT1MAY	35	38	31	14	272	4911
2456	OT1MAY	36	45	40	16	651	6704
2457	OT1MAY	37	37	31	11	377	3229
2458	OT1MAY	38	44	37	15	525	5379
2459	OT1MAY	39	42	36	18	836	5704
2460	OT1MAY	40	37	33	13	316	3508
2461	OT1MAY	41	36	32	11	376	4490
2462	OT1MAY	42	41	30	11	483	4243
2463	OT1MAY	43	34	29	11	187	3047
2464	OT1MAY	44	38	34	15	290	4935
2465	OT1MAY	45	30	25	8	169	1892
2466	OT1MAY	46	31	25	11	170	2544
2467	OT1MAY	47	32	31	13	248	4750
2468	OT1MAY	48	27	25	10	151	1986
2469	OT1MAY	49	30	25	10	154	1886
2470	OT1MAY	50	30	26	9	198	2200
2471	OT1MAY	51	40	33	12	394	3689
2472	OT1MAY	52	35	29	10	313	2763
2473	OT1MAY	53	29	25	10	194	2352
2474	OT1MAY	54	36	32	14	305	4286
2475	OT1MAY	55	32	26	10	174	2365
2476	OT1MAY	56	35	30	14	301	4070
2477	OT1MAY	57	38	31	14	466	4454
2478	OT1MAY	58	25	22	10	118	1620
2479	OT1MAY	59	28	20	10	132	1552
2480	OT1MAY	60	24	19	9	100	1002
2481	OT1MAY	61	27	24	9	200	1716
2482	OT1MAY	62	17	22	10	128	1535
2483	OT1MAY	63	30	25	10	153	1752
2484	OT1MAY	64	26	22	10	123	1508
2485	OT1MAY	65	30	25	13	220	2497
2486	OT1MAY	66	33	29	10	277	2159
2487	OT1MAY	67	30	24	10	145	1959
2488	OT1MAY	68	34	28	10	272	2925
2489	OT1MAY	69	39	29	11	225	3299
2490	OT1MAY	70	35	28	10	266	2216
2491	OT1MAY	71	29	24	9	167	1686
2492	OT1MAY	72	36	32	10	289	3642
2493	OT1MAY	73	30	25	9	175	1863
2494	OT1MAY	74	29	25	10	163	2201
2495	OT1MAY	75	35	30	14	140	4311
2496	OT1MAY	76	30	27	9	193	1932
2497	OT1MAY	77	39	32	12	370	3106
2498	OT1MAY	78	43	37	15	590	5528
2499	OT1MAY	79	50	42	19	850	7257
2500	OT1MAY	80	35	30	12	288	2819
2501	OT1MAY	81	47	41	18	1154	9357
2502	OT1MAY	82	25	21	7	106	1080
2503	OT1MAY	83	29	24	11	185	2032
2504	OT1MAY	84	34	30	10	252	2159
2505	OT1MAY	85	31	25	11	180	2191
2506	OT1MAY	86	34	32	13	384	3670
2507	OT1MAY	87	32	26	12	250	2321
2508	OT1MAY	88	30	25	8	188	1678
2509	OT1MAY	89	30	30	11	280	3040
2510	OT1MAY	90	39	35	12	357	3742
2511	OT1MAY	91	40	25	17	598	5212

2512	OT1MAY	92	34	27	12	230	3637
2513	OT1MAY	93	35	30	14	311	4253
2514	OT1MAY	94	46	37	16	734	5541
2515	OT1MAY	95	37	32	14	363	4538
2516	OT1MAY	96	45	39	18	571	7135
2517	OT1MAY	97	43	36	19	456	7681
2518	88						
2519	RUN NAME		CTTERSWICKYELL 2				
2520	OT2MAY	1	41	36	17	564	5851
2521	OT2MAY	2	34	29	12	380	3049
2522	OT2MAY	3	37	31	12	335	3029
2523	OT2MAY	4	32	29	14	283	3441
2524	OT2MAY	5	36	31	14	427	3890
2525	OT2MAY	6	41	34	19	776	6662
2526	OT2MAY	7	35	28	14	409	4141
2527	OT2MAY	8	40	34	15	502	5109
2528	OT2MAY	9	42	35	19	484	5201
2529	OT2MAY	10	38	31	18	377	7620
2530	OT2MAY	11	40	35	16	530	5390
2531	OT2MAY	12	37	33	15	402	4205
2532	OT2MAY	13	33	28	14	299	3679
2533	OT2MAY	14	38	31	16	348	5999
2534	OT2MAY	15	41	34	19	707	5512
2535	OT2MAY	16	33	27	12	232	2913
2536	OT2MAY	17	37	28	17	306	5013
2537	OT2MAY	18	33	30	15	331	5070
2538	OT2MAY	19	39	33	19	426	7560
2539	OT2MAY	20	36	31	14	270	4558
2540	OT2MAY	21	33	25	14	271	3501
2541	OT2MAY	22	32	26	13	215	3415
2542	OT2MAY	23	34	30	12	441	3291
2543	OT2MAY	24	34	26	14	382	3632
2544	OT2MAY	25	38	34	19	415	4786
2545	OT2MAY	26	33	27	16	231	4476
2546	OT2MAY	27	33	29	13	246	3053
2547	OT2MAY	28	31	25	11	185	2644
2548	OT2MAY	29	37	31	14	384	3547
2549	OT2MAY	30	40	34	17	392	8101
2550	OT2MAY	31	32	29	14	398	3412
2551	OT2MAY	32	37	31	15	334	5082
2552	OT2MAY	33	31	28	12	285	3059
2553	OT2MAY	34	40	35	16	394	5595
2554	OT2MAY	35	33	30	13	237	2862
2555	OT2MAY	36	36	32	18	516	4987
2556	OT2MAY	37	27	25	11	148	1920
2557	OT2MAY	38	32	29	11	242	2544
2558	OT2MAY	39	38	33	19	617	6497
2559	OT2MAY	40	37	30	16	398	4531
2560	OT2MAY	41	40	36	18	529	5532
2561	OT2MAY	42	31	25	12	219	2154
2562	OT2MAY	43	30	26	11	293	2271
2563	OT2MAY	44	34	29	13	248	3586
2564	OT2MAY	45	33	29	11	250	3385
2565	OT2MAY	46	27	22	12	138	2005
2566	OT2MAY	47	34	28	15	276	3591
2567	OT2MAY	48	32	27	11	253	2457
2568	OT2MAY	49	30	26	10	207	1986
2569	OT2MAY	50	30	26	11	230	2294
2570	OT2MAY	51	27	23	10	110	1480
2571	OT2MAY	52	30	25	12	238	2491

2572	OT2MAY	53	26	24	9	152	1560
2573	OT2MAY	54	30	27	12	321	2438
2574	OT2MAY	55	28	23	12	149	2230
2575	OT2MAY	56	26	22	9	115	1171
2576	OT2MAY	57	24	19	10	115	1172
2577	OT2MAY	58	27	20	9	154	1470
2578	OT2MAY	59	36	32	15	372	4305
2579	OT2MAY	60	39	34	12	558	3813
2580	OT2MAY	61	40	35	19	423	7535
2581	OT2MAY	62	42	36	19	474	4095
2582	OT2MAY	63	30	25	13	205	3021
2583	OT2MAY	64	37	32	15	315	5221
2584	OT2MAY	65	34	28	15	281	4101
2585	OT2MAY	66	35	31	14	297	4517
2586	OT2MAY	67	36	31	16	285	4786
2587	OT2MAY	68	38	33	14	376	5157
2588	OT2MAY	69	35	32	15	374	5668
2589	OT2MAY	70	38	34	17	485	4159
2590	OT2MAY	71	34	28	14	234	3274
2591	OT2MAY	72	33	30	12	402	2885
2592	OT2MAY	73	28	24	10	158	1744
2593	OT2MAY	74	32	26	12	242	2959
2594	OT2MAY	75	34	29	14	374	3795
2595	OT2MAY	76	33	28	15	393	3216
2596	OT2MAY	77	29	25	10	229	1913
2597	OT2MAY	78	28	23	10	149	1696
2598	OT2MAY	79	27	23	13	171	2100
2599	OT2MAY	80	33	29	13	329	3409
2600	OT2MAY	81	40	33	17	345	6658
2601	OT2MAY	82	32	28	12	213	2654
2602	OT2MAY	83	29	23	10	173	2117
2603	OT2MAY	84	32	25	13	290	2437
2604	OT2MAY	85	31	25	14	253	3727
2605	OT2MAY	86	33	28	13	262	3093
2606	OT2MAY	87	28	22	9	118	1968
2607	OT2MAY	88	28	23	11	203	2149
2608	91						
2609	RUN NAME		OTTERSWICKYELL 3				
2610	OT3MAY	1	31	26	13	260	2736
2611	OT3MAY	2	30	25	13	104	2838
2612	OT3MAY	3	37	29	15	444	4901
2613	OT3MAY	4	32	27	14	231	2940
2614	OT3MAY	5	36	30	17	471	4996
2615	OT3MAY	6	39	33	18	559	6098
2616	OT3MAY	7	41	35	20	561	7417
2617	OT3MAY	8	29	26	12	205	2236
2618	OT3MAY	9	39	33	17	647	5785
2619	OT3MAY	10	40	34	20	946	6895
2620	OT3MAY	11	22	19	7	103	1030
2621	OT3MAY	12	43	39	23	998	8719
2622	OT3MAY	13	41	36	20	594	7086
2623	OT3MAY	14	42	37	24	694	10959
2624	OT3MAY	15	39	34	16	448	6356
2625	OT3MAY	16	43	39	20	488	7461
2626	OT3MAY	17	37	31	16	476	5134
2627	OT3MAY	18	39	33	15	462	4249
2628	OT3MAY	19	34	28	15	356	4079
2629	OT3MAY	20	37	31	18	482	4101
2630	OT3MAY	21	33	27	14	309	3414
2631	OT3MAY	22	32	29	15	373	3194

2632	OT3MAY	23	34	29	16	297	4321
2633	OT3MAY	24	35	31	15	418	4020
2634	OT3MAY	25	35	29	16	371	5093
2635	OT3MAY	26	41	38	28	677	7864
2636	OT3MAY	27	38	32	14	640	5488
2637	OT3MAY	28	26	21	11	154	1480
2638	OT3MAY	29	34	28	14	323	3811
2639	OT3MAY	30	35	27	14	383	4143
2640	OT3MAY	31	31	26	15	388	3495
2641	OT3MAY	32	33	28	13	344	3093
2642	OT3MAY	33	38	31	16	501	5714
2643	OT3MAY	34	18	13	6	48	421
2644	OT3MAY	35	42	37	19	483	6965
2645	OT3MAY	36	42	36	18	517	6804
2646	OT3MAY	37	36	31	16	541	4826
2647	OT3MAY	38	31	26	15	280	3530
2648	OT3MAY	39	38	31	15	563	4964
2649	OT3MAY	40	34	28	13	350	2963
2650	OT3MAY	41	40	37	18	501	7130
2651	OT3MAY	42	43	36	23	837	10403
2652	OT3MAY	43	33	27	14	312	3398
2653	OT3MAY	44	31	26	14	304	3432
2654	OT3MAY	45	41	34	22	747	8886
2655	OT3MAY	46	34	29	12	265	2588
2656	OT3MAY	47	36	30	14	417	4495
2657	OT3MAY	48	36	30	13	301	3260
2658	OT3MAY	49	38	30	15	371	4691
2659	OT3MAY	50	23	19	6	49	868
2660	OT3MAY	51	36	29	17	446	4059
2661	OT3MAY	52	42	36	20	686	5899
2662	OT3MAY	53	42	37	19	708	7886
2663	OT3MAY	54	40	35	22	766	7842
2664	OT3MAY	55	42	36	18	782	6740
2665	OT3MAY	56	38	31	16	388	6136
2666	OT3MAY	57	32	27	13	242	2688
2667	OT3MAY	58	37	31	18	457	4790
2668	OT3MAY	59	46	38	20	749	7877
2669	OT3MAY	60	34	29	16	436	3972
2670	OT3MAY	61	45	40	20	769	9257
2671	OT3MAY	62	39	35	16	495	5151
2672	OT3MAY	63	32	26	15	315	3775
2673	OT3MAY	64	40	33	18	642	6004
2674	OT3MAY	65	38	33	18	578	6091
2675	OT3MAY	66	42	35	17	604	7525
2676	OT3MAY	67	32	26	13	272	3168
2677	OT3MAY	68	45	38	22	915	10742
2678	OT3MAY	69	32	27	15	454	3379
2679	OT3MAY	70	18	13	6	44	484
2680	OT3MAY	71	24	20	8	116	1052
2681	OT3MAY	72	48	41	27	896	12114
2682	OT3MAY	73	43	38	22	462	7786
2683	OT3MAY	74	20	16	6	42	546
2684	OT3MAY	75	15	12	6	27	305
2685	OT3MAY	76	40	34	17	538	7451
2686	OT3MAY	77	42	37	21	846	7506
2687	OT3MAY	78	40	32	18	756	6969
2688	OT3MAY	79	39	33	16	592	5594
2689	OT3MAY	80	35	29	17	576	5027
2690	OT3MAY	81	29	23	11	214	1769
2691	OT3MAY	82	28	24	11	214	2046

2692	OT3MAY	83	33	29	15	367	3990
2693	OT3MAY	84	36	30	17	620	4537
2694	OT3MAY	85	37	30	16	426	5401
2695	OT3MAY	86	37	32	16	470	5974
2696	OT3MAY	87	28	24	13	233	2393
2697	OT3MAY	88	29	24	13	278	2171
2698	OT3MAY	89	29	24	9	132	1751
2699	OT3MAY	90	37	31	16	390	4728
2700	OT3MAY	91	25	21	7	82	992
2701	100						
2702	RUN NAME		RCNASVCE,1				
2703	RO1MAV	1	25	20	9	98	1424
2704	RO1MAV	2	26	20	8	87	1136
2705	RO1MAV	3	35	27	15	311	3631
2706	RO1MAV	4	23	18	8	76	825
2707	RO1MAV	5	10	12	4	21	189
2708	RO1MAV	6	33	26	15	279	3422
2709	RO1MAV	7	32	25	10	165	2070
2710	RO1MAV	8	37	31	14	324	4231
2711	RO1MAV	9	25	21	10	105	1454
2712	RO1MAV	10	20	16	6	27	496
2713	RO1MAV	11	18	14	7	24	591
2714	RO1MAV	12	27	22	11	185	1511
2715	RO1MAV	13	19	12	7	36	431
2716	RO1MAV	14	16	12	4	11	227
2717	RO1MAV	15	19	14	7	36	563
2718	RO1MAV	16	21	17	7	55	733
2719	RO1MAV	17	22	17	7	55	567
2720	RO1MAV	18	20	16	7	62	802
2721	RO1MAV	19	20	16	7	43	574
2722	RO1MAV	20	32	26	13	216	1890
2723	RO1MAV	21	22	17	6	40	630
2724	RO1MAV	22	20	17	7	44	561
2725	RO1MAV	23	24	18	9	72	1020
2726	RO1MAV	24	20	16	6	36	465
2727	RO1MAV	25	23	19	7	55	875
2728	RO1MAV	26	27	23	9	137	1051
2729	RO1MAV	27	27	22	9	135	1712
2730	RO1MAV	28	20	14	7	35	594
2731	RO1MAV	29	32	26	12	283	2565
2732	RO1MAV	30	19	15	6	42	588
2733	RO1MAV	31	20	16	7	51	647
2734	RO1MAV	32	30	24	10	174	1927
2735	RO1MAV	33	29	25	11	121	2434
2736	RO1MAV	34	22	17	7	77	802
2737	RO1MAV	35	26	22	10	136	1634
2738	RO1MAV	36	25	21	9	87	1201
2739	RO1MAV	37	20	16	8	36	623
2740	RO1MAV	38	26	24	9	138	1422
2741	RO1MAV	39	31	23	12	182	2207
2742	RO1MAV	40	19	15	6	37	438
2743	RO1MAV	41	34	28	15	398	3877
2744	RO1MAV	42	22	19	8	46	839
2745	RO1MAV	43	27	20	8	83	1257
2746	RO1MAV	44	34	29	17	425	4496
2747	RO1MAV	45	25	19	9	90	1057
2748	RO1MAV	46	21	17	8	70	883
2749	RO1MAV	47	24	18	8	88	945
2750	RO1MAV	48	25	20	8	84	1010
2751	RO1MAV	49	28	22	9	110	1828

2752	R01MAV	50	33	27	11	190	2625
2753	R01MAV	51	31	26	11	250	2615
2754	R01MAV	52	37	30	15	430	3154
2755	R01MAV	53	23	18	8	93	838
2756	R01MAV	54	17	13	5	24	289
2757	R01MAV	55	22	16	7	43	706
2758	R01MAV	56	34	28	12	226	3244
2759	R01MAV	57	21	16	7	48	733
2760	R01MAV	58	28	21	10	117	1467
2761	R01MAV	59	18	14	6	37	528
2762	R01MAV	60	33	28	14	179	3120
2763	R01MAV	61	42	35	17	717	6516
2764	R01MAV	62	26	21	9	88	1355
2765	R01MAV	63	38	31	18	524	5185
2766	R01MAV	64	39	32	14	511	4067
2767	R01MAV	65	22	17	7	39	656
2768	R01MAV	66	32	27	15	286	3153
2769	R01MAV	67	37	30	14	268	4190
2770	R01MAV	68	40	32	17	458	5118
2771	R01MAV	69	24	20	8	71	1012
2772	R01MAV	70	18	15	5	30	356
2773	R01MAV	71	20	15	7	45	700
2774	R01MAV	72	43	36	16	704	6643
2775	R01MAV	73	30	27	11	199	2386
2776	R01MAV	74	29	23	10	192	1800
2777	R01MAV	75	25	18	8	80	1002
2778	R01MAV	76	19	15	6	35	596
2779	R01MAV	77	20	15	7	37	703
2780	R01MAV	78	29	26	9	173	1838
2781	R01MAV	79	29	25	11	202	2348
2782	R01MAV	80	24	18	8	81	1040
2783	R01MAV	81	24	20	8	86	1379
2784	R01MAV	82	35	28	14	264	3036
2785	R01MAV	83	35	29	13	207	2589
2786	R01MAV	84	37	31	16	392	5582
2787	R01MAV	85	29	23	9	103	1319
2788	R01MAV	86	21	16	8	56	758
2789	R01MAV	87	36	30	14	349	3955
2790	R01MAV	88	34	28	15	356	3425
2791	R01MAV	89	31	25	12	194	2325
2792	R01MAV	90	26	20	10	110	1312
2793	R01MAV	91	41	33	18	621	5076
2794	R01MAV	92	34	27	14	258	2770
2795	R01MAV	93	39	31	17	331	4386
2796	R01MAV	94	35	29	11	271	2706
2797	R01MAV	95	33	27	13	225	3117
2798	R01MAV	96	46	37	17	593	8850
2799	R01MAV	97	33	28	10	223	2623
2800	R01MAV	98	18	15	5	33	387
2801	R01MAV	99	37	33	16	506	5237
2802	R01MAV	100	40	34	16	501	5507
2803	90						
2804	RUN NAME		RCNASVCE 2				
2805	R02MAV	1	15	12	8	35	370
2806	R02MAV	2	19	15	7	42	512
2807	R02MAV	3	21	17	10	92	825
2808	R02MAV	4	18	13	6	38	376
2809	R02MAV	5	19	15	9	62	587
2810	R02MAV	6	19	15	7	42	568
2811	R02MAV	7	22	17	9	64	828

2812	RO2MAV	8	22	18	8	92	840
2813	RO2MAV	9	17	15	6	36	366
2814	RO2MAV	10	17	13	7	40	361
2815	RO2MAV	11	35	28	16	281	3702
2816	RO2MAV	12	16	13	7	28	362
2817	RO2MAV	13	27	22	10	152	1576
2818	RO2MAV	14	16	14	5	27	348
2819	RO2MAV	15	17	12	7	40	350
2820	RO2MAV	16	19	13	8	49	503
2821	RO2MAV	17	20	14	11	74	850
2822	RO2MAV	18	19	15	8	46	553
2823	RO2MAV	19	26	21	12	148	1891
2824	RO2MAV	20	25	19	10	154	1253
2825	RO2MAV	21	19	15	9	54	711
2826	RO2MAV	22	25	18	12	108	1327
2827	RO2MAV	23	25	20	9	92	1085
2828	RO2MAV	24	18	14	9	42	620
2829	RO2MAV	25	15	11	5	20	222
2830	RO2MAV	26	31	24	16	323	2693
2831	RO2MAV	27	18	14	7	35	421
2832	RO2MAV	28	20	15	9	48	715
2833	RO2MAV	29	20	15	8	65	645
2834	RO2MAV	30	15	10	5	24	185
2835	RO2MAV	31	18	14	7	53	443
2836	RO2MAV	32	17	13	7	45	442
2837	RO2MAV	33	20	15	8	67	585
2838	RO2MAV	34	16	11	7	24	306
2839	RO2MAV	35	37	31	19	558	5474
2840	RO2MAV	36	32	26	15	311	3642
2841	RO2MAV	37	36	30	19	579	5771
2842	RO2MAV	38	31	25	13	263	2630
2843	RO2MAV	39	29	23	15	260	2363
2844	RO2MAV	40	23	18	10	82	1065
2845	RO2MAV	41	30	23	15	275	2260
2846	RO2MAV	42	19	15	9	61	658
2847	RO2MAV	43	17	11	7	31	418
2848	RO2MAV	44	22	18	10	75	982
2849	RO2MAV	45	32	25	15	278	3273
2850	RO2MAV	46	13	9	4	19	120
2851	RO2MAV	47	16	13	7	30	284
2852	RO2MAV	48	18	14	6	47	434
2853	RO2MAV	49	30	22	17	280	2564
2854	RO2MAV	50	22	17	11	135	1030
2855	RO2MAV	51	25	19	9	84	1113
2856	RO2MAV	52	21	17	8	57	742
2857	RO2MAV	53	34	27	14	299	3639
2858	RO2MAV	54	25	21	11	100	1436
2859	RO2MAV	55	24	20	11	104	1304
2860	RO2MAV	56	21	15	10	57	774
2861	RO2MAV	57	26	21	11	135	1753
2862	RO2MAV	58	14	12	7	34	289
2863	RO2MAV	59	24	19	11	107	1194
2864	RO2MAV	60	19	16	7	48	573
2865	RO2MAV	61	19	14	7	38	502
2866	RO2MAV	62	18	15	8	48	487
2867	RO2MAV	63	18	15	6	47	387
2868	RO2MAV	64	17	13	7	40	442
2869	RO2MAV	65	25	20	10	122	1258
2870	RO2MAV	66	23	17	10	84	1031
2871	RO2MAV	67	34	28	16	402	4016

2872	RO2MAV	68	24	19	9	80	1031
2873	RO2MAV	69	20	15	8	69	736
2874	RO2MAV	70	22	17	8	77	847
2875	RO2MAV	71	19	14	7	38	445
2876	RO2MAV	72	17	13	8	38	465
2877	RO2MAV	73	16	13	7	33	348
2878	RO2MAV	74	19	14	8	50	558
2879	RO2MAV	75	21	16	9	100	790
2880	RO2MAV	76	18	13	7	50	446
2881	RO2MAV	77	18	13	7	63	444
2882	RO2MAV	78	15	11	6	25	240
2883	RO2MAV	79	37	30	16	463	5260
2884	RO2MAV	80	14	10	6	38	175
2885	RO2MAV	81	17	13	7	29	452
2886	RO2MAV	82	17	13	7	77	373
2887	RO2MAV	83	21	15	9	62	684
2888	RO2MAV	84	16	10	6	22	508
2889	RO2MAV	85	10	11	6	34	265
2890	RO2MAV	86	17	13	8	50	492
2891	RO2MAV	87	18	15	7	30	506
2892	RO2MAV	88	10	12	7	28	361
2893	RO2MAV	89	18	14	8	51	268
2894	RO2MAV	90	18	14	8	53	490
2895	85						
2896	RUN NAME		RONASVCE 3				
2897	RO3MAV	1	47	40	23	1203	12458
2898	RO3MAV	2	39	33	17	953	7413
2899	RO3MAV	3	37	30	16	824	5050
2900	RO3MAV	4	34	27	15	450	3414
2901	RO3MAV	5	29	23	13	374	2678
2902	RO3MAV	6	37	30	16	681	5165
2903	RO3MAV	7	32	25	14	331	3227
2904	RO3MAV	8	22	19	10	116	1373
2905	RO3MAV	9	39	33	16	850	6198
2906	RO3MAV	10	36	30	15	568	4372
2907	RO3MAV	11	35	28	16	442	4412
2908	RO3MAV	12	33	27	13	347	3577
2909	RO3MAV	13	30	26	13	179	2393
2910	RO3MAV	14	40	32	17	1016	6429
2911	RO3MAV	15	39	31	16	757	5184
2912	RO3MAV	16	42	34	21	1082	9856
2913	RO3MAV	17	37	28	14	625	3797
2914	RO3MAV	18	35	24	18	398	4835
2915	RO3MAV	19	36	30	15	670	4346
2916	RO3MAV	20	51	42	31	1292	18484
2917	RO3MAV	21	36	28	17	640	5484
2918	RO3MAV	22	44	36	21	1091	9651
2919	RO3MAV	23	25	19	10	124	1183
2920	RO3MAV	24	28	24	16	270	2640
2921	RO3MAV	25	41	33	20	773	8310
2922	RO3MAV	26	32	28	14	511	3245
2923	RO3MAV	27	25	21	11	163	1515
2924	RO3MAV	28	36	31	15	407	5338
2925	RO3MAV	29	35	28	16	643	4932
2926	RO3MAV	30	28	21	15	265	2679
2927	RO3MAV	31	32	25	14	521	3551
2928	RO3MAV	32	36	29	17	590	5775
2929	RO3MAV	33	38	31	21	578	7137
2930	RO3MAV	34	38	30	22	506	7675
2931	RO3MAV	35	46	37	26	1503	13775

2932	RO3MAV	36	29	24	14	393	3610
2933	RO3MAV	37	23	19	10	110	1106
2934	RO3MAV	38	25	19	11	201	1565
2935	RO3MAV	39	30	24	15	311	2840
2936	RO3MAV	40	24	21	9	185	1[illegible]48
2937	RO3MAV	41	31	25	15	485	3256
2938	RO3MAV	42	31	26	16	573	5079
2939	RO3MAV	43	37	30	16	516	4473
2940	RO3MAV	44	22	18	8	107	891
2941	RO3MAV	45	37	31	21	750	7800
2942	RO3MAV	46	24	19	9	91	1203
2943	RO3MAV	47	20	14	9	93	767
2944	RO3MAV	48	41	33	18	875	6648
2945	RO3MAV	49	38	20	12	197	1895
2946	RO3MAV	50	39	31	16	940	5703
2947	RO3MAV	51	32	25	19	500	4563
2948	RO3MAV	52	37	30	15	432	3747
2949	RO3MAV	53	28	23	12	261	2349
2950	RO3MAV	54	33	26	13	453	3462
2951	RO3MAV	55	30	25	13	343	3220
2952	RO3MAV	56	31	26	12	376	2995
2953	RO3MAV	57	38	30	15	671	6090
2954	RO3MAV	58	31	25	13	516	3026
2955	RO3MAV	59	33	26	15	288	3258
2956	RO3MAV	60	30	24	14	418	3492
2957	RO3MAV	61	38	30	19	679	58[illegible]4
2958	RO3MAV	62	21	16	8	96	711
2959	RO3MAV	63	23	17	10	130	1069
2960	RO3MAV	64	19	14	9	91	775
2961	RO3MAV	65	19	15	8	82	669
2962	RO3MAV	66	22	17	9	140	1158
2963	RO3MAV	67	20	16	10	95	948
2964	RO3MAV	68	19	15	8	91	721
2965	RO3MAV	69	17	13	6	33	426
2966	RO3MAV	70	31	24	12	264	2808
2967	RO3MAV	71	21	17	8	93	814
2968	RO3MAV	72	23	19	11	100	1182
2969	RO3MAV	73	23	18	10	125	1184
2970	RO3MAV	74	23	19	10	100	1033
2971	RO3MAV	75	43	35	21	1082	9879
2972	RO3MAV	76	25	19	12	188	1526
2973	RO3MAV	77	22	17	11	110	1140
2974	RO3MAV	78	26	20	11	186	1882
2975	RO3MAV	79	18	14	9	67	583
2976	RO3MAV	80	24	19	11	168	1647
2977	RO3MAV	81	32	23	13	381	2707
2978	RO3MAV	82	34	27	15	472	3338
2979	RO3MAV	83	30	23	11	199	1891
2980	RO3MAV	84	16	12	7	48	320
2981	RO3MAV	85	31	25	13	320	2536
2982	62						
2983	RUN NAME		WHITENESSVOE 2				
2984	WH2MAV	1	18	15	7	68	689
2985	WH2MAV	2	23	18	8	147	1112
2986	WH2MAV	3	26	21	13	180	1881
2987	WH2MAV	4	33	29	16	441	4554
2988	WH2MAV	5	34	26	14	728	4305
2989	WH2MAV	6	35	30	16	674	4197
2990	WH2MAV	7	31	26	12	324	2915
2991	WH2MAV	8	4[illegible]	32	18	669	7489

2992	WH2MAV	9	25	20	9	172	1495
2993	WH2MAV	10	26	22	10	191	1896
2994	WH2MAV	11	32	27	16	419	4734
2995	WH2MAV	12	27	23	11	254	2162
2996	WH2MAV	13	35	28	15	422	4549
2997	WH2MAV	14	32	26	16	446	4137
2998	WH2MAV	15	32	25	16	465	4065
2999	WH2MAV	16	29	26	14	279	3024
3000	WH2MAV	17	24	19	10	138	1329
3001	WH2MAV	18	35	29	16	401	4705
3002	WH2MAV	19	35	30	18	534	4090
3003	WH2MAV	20	31	27	14	304	3354
3004	WH2MAV	21	24	18	9	166	1249
3005	WH2MAV	22	26	21	12	160	1684
3006	WH2MAV	23	27	22	11	136	1892
3007	WH2MAV	24	22	18	7	107	892
3008	WH2MAV	25	22	17	8	136	1080
3009	WH2MAV	26	24	19	9	138	1285
3010	WH2MAV	27	27	22	12	166	2025
3011	WH2MAV	28	25	20	11	172	1538
3012	WH2MAV	29	26	21	9	64	1649
3013	WH2MAV	30	22	17	9	131	1053
3014	WH2MAV	31	17	14	6	48	418
3015	WH2MAV	32	32	25	16	202	3438
3016	WH2MAV	33	19	15	7	71	573
3017	WH2MAV	34	35	28	18	491	5228
3018	WH2MAV	35	24	18	10	200	1310
3019	WH2MAV	36	22	18	9	126	1032
3020	WH2MAV	37	24	19	9	121	1202
3021	WH2MAV	38	28	23	9	310	2269
3022	WH2MAV	39	28	22	11	313	1877
3023	WH2MAV	40	25	20	12	163	1607
3024	WH2MAV	41	22	17	9	95	1062
3025	WH2MAV	42	25	20	8	126	1446
3026	WH2MAV	43	31	24	12	378	2351
3027	WH2MAV	44	28	22	11	205	1895
3028	WH2MAV	45	19	14	7	92	490
3029	WH2MAV	46	30	28	12	432	3309
3030	WH2MAV	47	23	18	11	152	1154
3031	WH2MAV	48	24	20	8	127	1238
3032	WH2MAV	49	22	18	10	127	
3033	WH2MAV	50	29	23	9	209	
3034	WH2MAV	51	32	24	15	395	
3035	WH2MAV	52	30	24	12	302	
3036	WH2MAV	53	32	26	15	393	
3037	WH2MAV	54	22	19	9	151	
3038	WH2MAV	55	28	23	10	144	
3039	WH2MAV	56	25	21	9	150	
3040	WH2MAV	57	29	23	11	231	
3041	WH2MAV	58	23	18	8	114	
3042	WH2MAV	59	24	20	10	157	
3043	WH2MAV	60	24	19	8	145	
3044	WH2MAV	61	25	20	8	143	
3045	WH2MAV	62	23	18	8	126	
3046	100						
3047	RUN NAME		WHITENESSVOE 3				
3048	WH3MAV	1	21	17	6	86	701
3049	WH3MAV	2	18	13	5	72	416
3050	WH3MAV	3	19	15	7	51	489
3051	WH3MAV	4	29	20	10	258	1786

3052	WH3MAV	5	23	21	8	199	1498
3053	WH3MAV	6	29	23	11	198	1996
3054	WH3MAV	7	25	22	9	146	1533
3055	WH3MAV	8	25	22	11	155	1995
3056	WH3MAV	9	28	24	9	199	1771
3057	WH3MAV	10	26	21	12	180	1702
3058	WH3MAV	11	18	15	6	42	452
3059	WH3MAV	12	21	17	8	100	760
3060	WH3MAV	13	19	15	7	87	583
3061	WH3MAV	14	15	10	4	27	167
3062	WH3MAV	15	21	17	7	62	606
3063	WH3MAV	16	26	21	8	128	1418
3064	WH3MAV	17	28	20	11	217	2052
3065	WH3MAV	18	24	19	10	82	1241
3066	WH3MAV	19	18	14	6	51	475
3067	WH3MAV	20	24	19	9	89	1331
3068	WH3MAV	21	30	24	11	260	2733
3069	WH3MAV	22	28	23	12	195	2424
3070	WH3MAV	23	31	26	13	280	3152
3071.	WH3MAV	24	29	24	11	206	2202
3072	WH3MAV	25	32	28	15	209	3721
3073	WH3MAV	26	30	25	13	231	2435
3074	WH3MAV	27	27	22	10	157	1776
3075	WH3MAV	28	31	26	12	254	3246
3076	WH3MAV	29	32	27	12	201	2998
3077	WH3MAV	30	33	28	14	236	3275
3078	WH3MAV	31	29	23	12	261	2157
3079	WH3MAV	32	33	28	16	390	4861
3080	WH3MAV	33	38	31	26	273	5412
3081	WH3MAV	34	36	30	16	449	4944
3082	WH3MAV	35	36	29	17	418	5680
3083	WH3MAV	36	27	22	11	213	1912
3084	WH3MAV	37	36	30	19	702	4881
3085	WH3MAV	38	42	37	20	1094	7064
3086	WH3MAV	39	31	27	13	173	3469
3087	WH3MAV	40	27	22	10	.179	1700
3088	WH3MAV	41	34	31	12	328	3682
3089	WH3MAV	42	32	26	14	211	3961
3090	WH3MAV	43	38	31	15	302	4529
3091	WH3MAV	44	34	27	15	332	4318
3092	WH3MAV	45	34	28	16	353	4145
3093	WH3MAV	46	35	30	16	371	5015
3094	WH3MAV	47	34	29	15	400	4099
3095	WH3MAV	48	22	15	9	117	1202
3096	WH3MAV	49	30	24	14	364	2984
3097	WH3MAV	50	30	26	14	378	2447
3098	WH3MAV	51	40	32	18	610	6577
3099	WH3MAV	52	28	21	12	131	2290
3100	WH3MAV	53	30	25	14	284	2804
3101	WH3MAV	54	35	31	18	495	5196
3102	WH3MAV	55	34	28	14	340	4137
3103	WH3MAV	56	32	26	12	165	3561
3104	WH3MAV	57	23	19	9	124	1068
3105	WH3MAV	58	35	26	14	316	4062
3106	WH3MAV	59	19	16	7	73	679
3107	WH3MAV	60	28	23	12	168	2149
3108	WH3MAV	61	27	21	13	213	2594
3109	WH3MAV	62	33	27	12	121	2727
3110	WH3MAV	63	37	30	19	662	4859
3111	WH3MAV	64	28	23	11	199	2044

3112	WH3MAV	65	31	26	13	249	3127
3113	WH3MAV	66	35	30	16	289	4688
3114	WH3MAV	67	38	32	16	376	7158
3115	WH3MAV	68	34	28	17	380	4530
3116	WH3MAV	69	32	25	13	270	3606
3117	WH3MAV	70	37	33	16	521	5728
3118	WH3MAV	71	41	35	17	615	7749
3119	WH3MAV	72	23	19	9	105	1149
3120	WH3MAV	73	35	29	17	542	4634
3121	WH3MAV	74	28	22	15	147	2599
3122	WH3MAV	75	31	26	11	227	2302
3123	WH3MAV	76	34	27	12	292	3105
3124	WH3MAV	77	17	15	4	46	373
3125	WH3MAV	78	36	30	13	210	4044
3126	WH3MAV	79	31	28	14	260	4274
3127	WH3MAV	80	23	19	10	147	1341
3128	WH3MAV	81	25	21	10	118	1532
3129	WH3MAV	82	38	32	15	352	6378
3130	WH3MAV	83	31	26	16	324	4426
3131	WH3MAV	84	24	20	8	132	1015
3132	WH3MAV	85	36	30	18	543	4872
3133	WH3MAV	86	26	22	10	170	1931
3134	WH3MAV	87	27	22	12	182	1687
3135	WH3MAV	88	18	13	7	59	461
3136	WH3MAV	89	31	26	11	252	2491
3137	WH3MAV	90	35	29	12	307	2740
3138	WH3MAV	91	33	26	13	309	3379
3139	WH3MAV	92	25	20	12	117	1849
3140	WH3MAV	93	35	31	17	395	6124
3141	WH3MAV	94	31	27	12	228	2906
3142	WH3MAV	95	19	14	6	41	578
3143	WH3MAV	96	33	23	12	205	2895
3144	WH3MAV	97	36	30	24	337	4448
3145	WH3MAV	98	25	21	13	186	2079
3146	WH3MAV	99	33	26	15	226	4107
3147	WH3MAV	100	38	30	19	287	5492

END OF FILE

$RUN ZOB 7=-A
EXECUTION BEGINS

RUN NAME KILCHCAN 1

N= 63
C (VAR OF X)= 4.4956 A (VAR OF Y)= 548.7927 B (COEFF)= 10.1113

VARIANCE= 1.4617 RATIO (VAR/C)= 0.3251

RUN NAME GLENMORE 1

N= 82
C (VAR OF X)= 3.6904 A (VAR OF Y)= 627.2749 B (COEFF)= 12.530

VARIANCE= 0.5977 RATIO (VAR/C)= 0.1620

APPENDIX 12

CHEMICAL ANALYSIS OF NUCELLA LAPILLUS

93 Nucella lapillus specimens were collected from Zone 2 at Marsden Bay. One collection was done in January 1975 (34 specimens) and another in April 1975, (59 specimens). The size of the shell of all specimens varied in length from 1.8 cm to 2.9 cm and from 1.2 cm to 1.8 cm in breadth. The flesh was removed from the shell and was left for 24 hours in the over (103^{o}). The flesh was ground and 5 replicas for each month were analysed as described in Section II.

Interference corrections were also made (see Appendix 4) and mean values and standard deviation were calculated. The geochemical analysis gave the following results:

	Pb	Cu	Ni	Cd	Na
January	4.5 + .64	367 + 7.0	2.5 + 1.0	21.0 + .20	10,000 + 180
April	6.0 + .71	85 + 1.0	2.0 + 7.2	24.6 + .30	11,600 + 190

	Ca	Mg	K	Fe	Zn
January	4,900 + 130	7,300 + 100	6,900 + 100	445 + 150	915 + 15
April	5,750 + 120	6,050 + 200	4990 + 110	260 + 100	660 + 10