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**A PRELIMINARY LIST OF MACROFAUNA FROM A MANGROVE
FOREST AND ADJACENT BIOTOPES AT SURIN ISLAND,
WESTERN PENINSULAR THAILAND**

by

Dawn W. Frith



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By DAWN W. FRITH¹

Phuket Marine Biological Center

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ABSTRACT

The distribution of the macrofauna of a mangrove forest and adjacent sand and mud flats was investigated at Koh Surin Nua, an island of the Surin Island Group in the Andaman Sea off the west coast of Peninsular Thailand and just south of the Burmese border. Fifty one species of macrofauna were found, thirty eight of which occurred within the mangrove biotope. The mangrove macrofauna was dominated by polychaetes, crustaceans and molluscs. Coelenterates, sipunculid worms, an insect and fishes were, however, also recorded. Only four of the mangrove dwelling species were found in either the sand or mud flat biotopes, the remaining species occurring exclusively within the mangrove forest. The findings, thus, emphasise the characteristic nature of the mangrove macrofauna at this locality. In composition the mangrove macrofauna was similar to that described for other localities in the Indo-West Pacific region.

Comparisons are made between the macrofauna found at Koh Surin Nua with those found in similar biotopes on Phuket Island, near to, and almost in contact with, the coast of west Peninsular Thailand where previous studies have been made. At least six forms found at Koh Surin Nua during the present investigation are new records for the fauna of Thailand.

I. INTRODUCTION

A preliminary investigation was made of the macrofauna of a mangrove forest and adjacent sand and mud flats at Koh² Surin, a group of islands in the Andaman Sea off the west coast of Peninsular Thailand (9°25' N., 98°50' E.), near to the southern Burmese border. The study area was situated in a sheltered bay on the south of Koh Surin Nua (see Fig. 1). The inner part of the bay

was fringed with mangrove trees *Bruguiera gymnorhiza* Lmk., *Rhizophora apiculata* Blume, *R. mucronata* Lmk. and *Sonneratia alba* Smith. In the inner part of the bay, directly adjacent to the mangrove forest, was a sand flat, and in the outer part of the bay a mud flat, the area between the sand and mud flats consisting of a mixture of the two substrates (see Fig. 2).

The area of mangrove investigated during the present study consisted of mangrove trees *B. gym-*

¹ Present address : c/o Department of Zoology, Monash University, Clayton, Victoria, Australia 3168.

² Koh = Island or islands in Thai language.

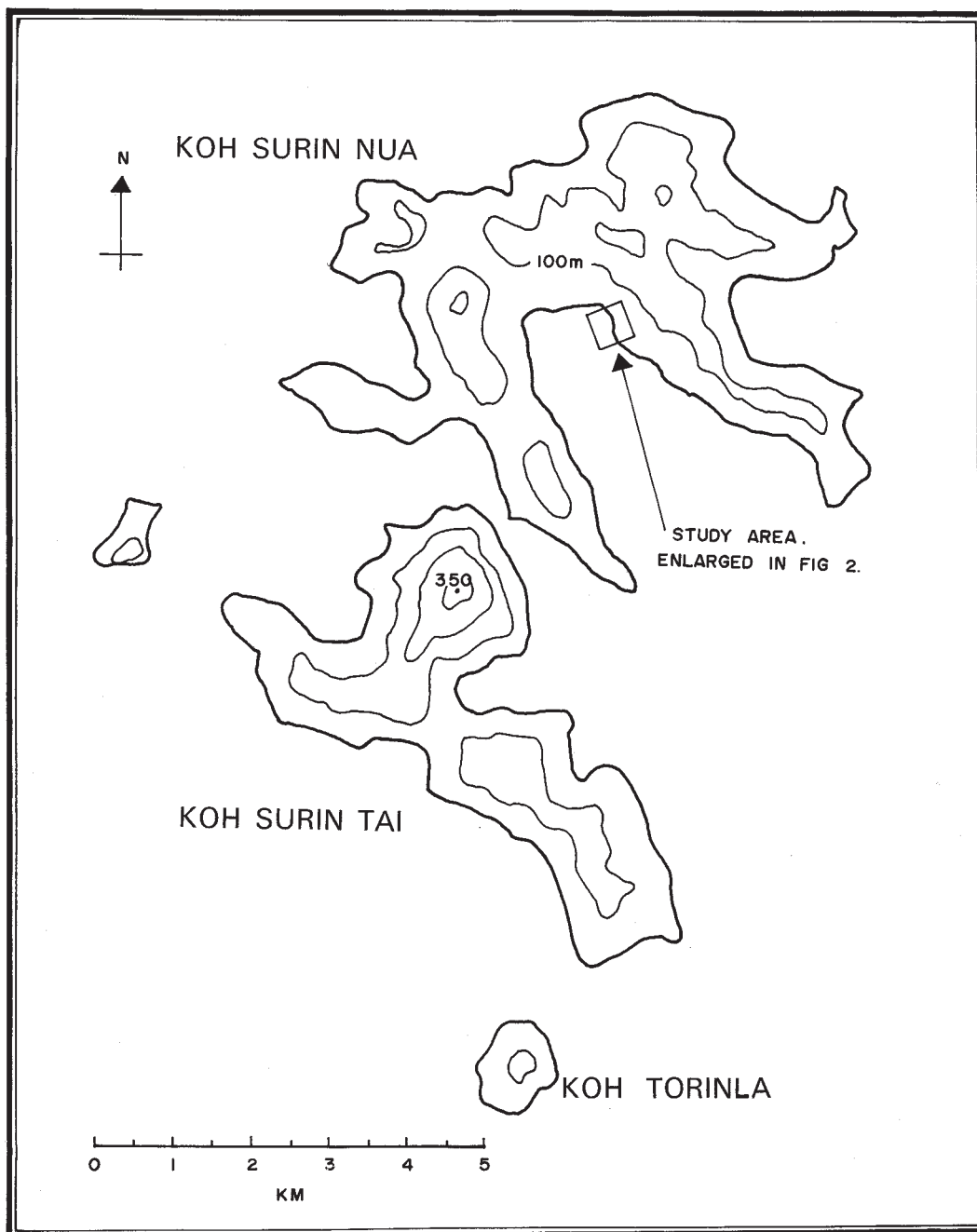


Fig. 1—Map of the Surin Island Group indicating the position of the study area, in the southward facing bay of Koh Surin Nua. (See Fig. 2 for enlarged map of the study area.)

norhiza, *R. apiculata* and *R. mucronata*, the former species forming the more landward part of the forest, and the latter two species the more seaward part. Collections of macrofauna were made at low tide during approximately thirty hours of field work in April 1976. Animals were collected from the surface of the substrate (epifauna) and from within the substrate (infauna) in the mangrove, sand and mud flat biotopes. In addition, animals were collected from roots, trunks, branches and leaves of mangrove trees, and beneath and among dead mangrove wood and rotting vegetation.

The horizontal and vertical distribution of each animal species in the mangrove biotope, and the horizontal distribution of each animal species in

the sand and mud flat biotopes were examined to give an indication of the zonation of macrofauna in this intertidal area. In addition, the density of both epifaunal and infaunal animals was determined for each biotope (see Materials and Methods). A brief comparison is made between the macrofaunas of the mangrove, sand and mud flat biotopes at Koh Surin to the macrofaunas of similar biotopes on Phuket Island (7°51' N., 98°25' E.), an island directly adjacent and almost in contact with Peninsular Thailand (see Frith *et al.*, 1976).

The taxa collected, apart from the polychaetes and fishes, were identified using reference material in the collections at the Phuket Marine Biological Center, Thailand, the identification of this material having been previously confirmed by recognised

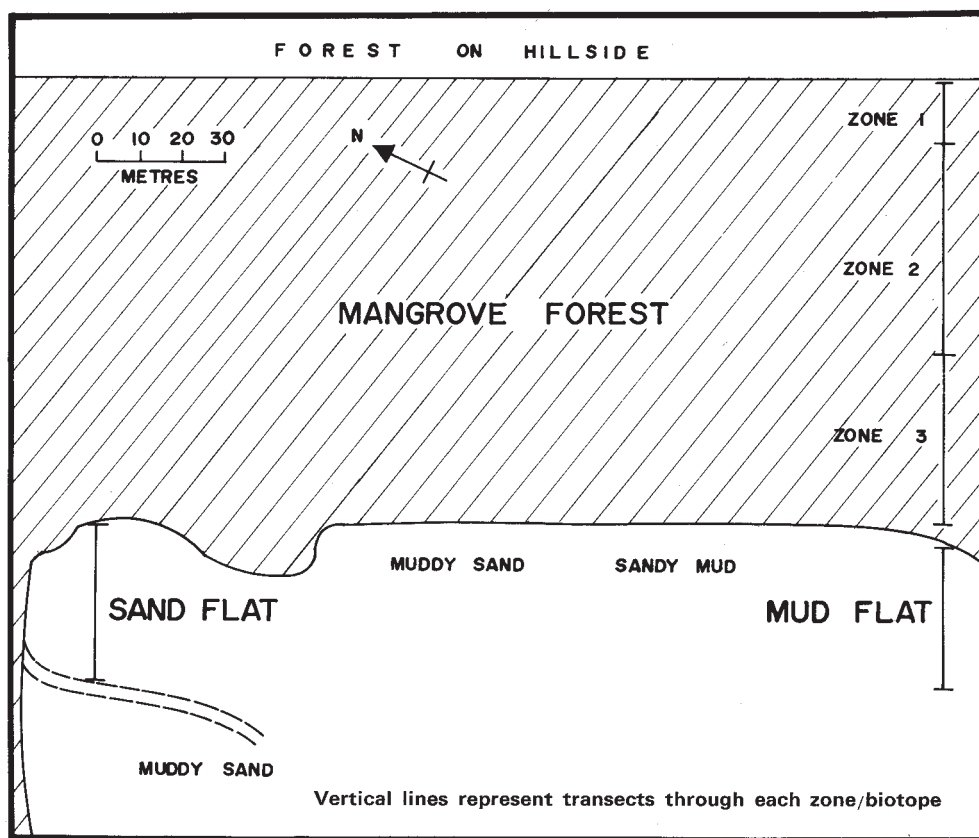


Fig. 2—Schematic map, drawn to scale, of the Koh Surin Nua study area. (See Fig. 1 for the relative position of this area in the Surin Island Group.)

authorities (see Frith *et al.*, 1976). The polychaetes were, however, kindly identified by Dr. Louis Amoureux, Université Catholique, France; and the fishes were identified using the characters presented by Eggert (1935) and Koumans (1942). All specimens collected during the present study are registered in the reference collection at the Phuket Marine Biological Center.

II. DESCRIPTION OF STUDY AREA

The study area consisted of mangrove, sand and mud flat biotopes, details of which follow:

MANGROVE BIOTOPE

The mangrove forest, in the area where intensive collections were made, was approximately one hundred and five metres wide from landward to seaward (west to east) edge (see Fig. 2), and was clearly divisible into three zones as follows:

Zone 1

Fifteen metres of forest from the landwardmost edge of mangrove growth seaward (see Fig. 2); a relatively open area with a few *Bruguiera gymnorrhiza* mangrove trees. This zone was bordered by a steep forested hill (see Fig. 2).

Zone 2

Fifty metres wide; seaward of zone 1 (see Fig. 1); a dense forest of *B. gymnorrhiza* mixed with a few *Rhizophora mucronata* mangrove trees.

Zone 3

Forty metres wide; seaward of zone 2 (see Fig. 2); a dense forest of *R. mucronata* mixed with a few *R. apiculata* mangrove trees.

SAND FLAT BIOTOPE

The particular area of sand flat investigated was situated in the inner bay (see Fig. 2); and was approximately forty metres wide extending from the seaward edge of the mangrove forest westwards towards the centre of the bay. A small freshwater stream ran from a nearby hill, through a thin line

of mangrove forest, into the bay at the edge of the sand flat (Fig. 2).

MUD FLAT BIOTOPE

The particular area of mud flat investigated was situated in the more seaward outer part of the bay, south of the sand flat (see Fig. 2), and was approximately forty metres wide extending from the edge of the mangrove forest westwards towards the central part of the bay.

III. MATERIALS AND METHODS

a) COLLECTION OF MACROFAUNA

1. Epifaunal and infaunal animals

Transects were made through the mangrove forest and across the sand and mud flats from landward to seaward (see Fig. 2) in order to examine the distribution and density of the epifaunal and infaunal animals found in these three biotopes. Samples were taken at five metre intervals along the mangrove and mud flat transects, and at one metre intervals along the sand flat transect. The larger number of sampling points in the latter biotope was for the purpose of another, more intensive, investigation (see Frith & Frith, 1977). The number of sampling points for each biotope are given in Appendix 1. A half metre square quadrat frame was placed at each sampling point. Animals dwelling on the surface of the substrate (epifauna) were collected from within the quadrat frame. Animals dwelling within the substrate (infauna) were collected by digging up the substrate from within the quadrat frame down to a depth of twenty five centimetres, and then removing all animals visible to the naked eye. Below this depth, apart from a few large decapod crustaceans, the substrate was apparently devoid of macrofaunal life.

It should be noted here that for more convenient comparisons with most previous published works, including the Phuket study (see Frith *et al.*, 1976), the density figures for macrofauna, resulting from the half metre square, have been multiplied by four to give density values for a metre square in all subsequent reference to population densities herein.

2. Tree dwelling animals

Animals were collected from roots, trunks, branches and leaves of *Rhizophora apiculata* and *R. mucronata* mangrove trees, their position on the trees and locality within the mangrove forest being noted to obtain data on their horizontal and vertical distribution.

In addition, mangrove dwelling animals were collected at random from other areas of mangrove forest within the same bay at Koh Surin Nua not only from the substrate and trees but also from beneath and among dead wood and rotting vegetation. All animals were preserved in 70% alcohol on the island and then returned to the laboratory to be sorted and identified.

b) ANALYSIS OF SUBSTRATE

Substrate surface samples were collected from the majority of quadrats along each transect line (see Table 1). On return to the laboratory the samples were treated as follows:

One hundred grams of each sample were dried for twenty four hours at 105°C. Fifty grams of this sample were then sieved for twenty minutes through graded sieves in an automatic sieving machine. Sieve hole diameters were 2.0, 1.0, 0.5,

0.25, 0.125 and 0.063 millimetres respectively. Each resultant grain size sample was weighed to within 0.1 grams of accuracy. The mean values of each grain size for the three mangrove zones, sand and mud flats were calculated and expressed as percentages of the total weights, and these data are given in Table 1.

Fifteen grams of each of the original dried samples were ashed for two hours at 550°C. and then reweighed to determine the organic content. The mean values of organic content for each of the three mangrove zones, sand and mud flats were determined and expressed as percentages of the dry weights, and these data are also given in Table 1.

IV. RESULTS

A list of all macrofaunal species found during the present study is given in Appendix 1, and an indication of their presence or absence in each of the three mangrove zones, the sand and mud flat is presented. In addition the density values, when available, of epifaunal and infaunal species are given in Appendix 1 for each biotope, and species collected at random for which no quantitative data are available are also listed. Species found within the mangrove, sand and mud flat

Table 1. Nature of the substrates at the Koh Surin Nua study area, western Peninsular Thailand.

Number of samples (N)	MANGROVE			SAND FLAT	MUD FLAT
	Zone 1 N = 3	Zone 2 N = 10	Zone 3 N = 7	N = 17	N = 7
PARTICLE SIZE (expressed as a % of total weight)					
Gravel (> 2.0 mm.)	33.1	29.5	24.0	32.6	15.6
Very coarse sand (1.0–2.0 mm.)	31.3	26.0	22.5	25.7	16.7
Coarse sand (0.5–1.0 mm.)	16.1	25.2	11.3	14.8	8.8
Medium sand (0.25–0.5 mm.)	10.5	13.0	10.6	9.0	9.4
Fine sand (0.125–0.25 mm.)	5.4	8.4	8.6	5.2	7.2
Very fine sand (0.063–0.125 mm.)	2.1	4.4	8.3	2.7	3.3
Mud (< 0.063 mm.)	1.5	3.5	14.6	10.0	39.0
ORGANIC CONTENT (expressed as a % of dry weight)					
	0.7	1.9	1.9	2.1	1.4

biotopes at Koh Surin Nua which were not recorded in similar biotopes on Phuket Island (Lundøer 1974, Frith *et al.*, 1976, Tantanasiriwong —*in prep.*) are indicated in Appendix 1. Families of polychaete worms, brachyuran crustaceans, and molluscs are arranged according to the taxonomic lists given in Day (1967), Serene (1966) and Kira (1965) respectively. Species within each family are listed alphabetically, firstly by genus and subsequently by species. Authors' names are given in Appendix 1 for each species and are not, therefore, repeated in the text.

Fifty one species were found within the study area at Koh Surin Nua, namely; 1 coelenterate species, 1 sipunculid species, 8 polychaete species, 19 crustacean species, 1 insect species, 18 mollusc species and 3 fish species (see Appendix 1). The distribution and, when data are available, the density of taxa, and the nature of the substrates are discussed below for each of the three mangrove zones, the sand flat and the mud flat.

MANGROVE BIOTOPE

Of the 38 species found within this biotope, 34 were found exclusively within this forest; the macrofauna of this biotope being, therefore, quite peculiar to it (see Appendix 1 and Discussion). Details for each zone follow:

Zone 1

The substrate of this zone was extremely sandy, consisting predominantly of gravel and coarse sand (80.5%) mixed with finer sand and mud (see Table 1). The organic content of the substrate was notably lower in this zone than elsewhere (see Table 1).

In total 5 epifaunal species were found in this zone, namely 1 hermit crab *Diogenes* sp., 1 grapsid crab *Chiromanthes indiarum*, 2 freshwater gastropod molluscs *Clithon peguensis* and *Stenomelania dautsenbergiana*, and 1 mud-skipper fish *Periophthalmus vulgaris*. The most abundant species in this area were *C.indiarum*, notably more so here than in zone 2 (see Appendix 1), and

C. peguensis. It is noteworthy that *Diogenes* sp., *C. peguensis* and *S. dautsenbergiana* were not found elsewhere within the study area.

Zone 2

The substrate of this area was similar in composition to that of zone 1, apart from a slightly higher content of finer grain particles (see Table 1). The organic content of the substrate in this area was low but somewhat higher than that of the previous zone (see Table 1).

In total 8 species were found; the epifauna consisted of 1 grapsid crab *Chiromanthes indiarum* and 1 mud-skipper fish *Periophthalmus vulgaris*; the infauna of 1 fiddler crab *Uca lactea annulipes* and 1 grapsid crab *Helice leachi*; and the tree fauna of gastropod molluscs *Nerita planospira* and *Littorina scabra* (see Appendix 1). Two species of boring molluscs, *Teredo* spp., were found within *Rhizophora* wood in this zone. The most abundant species was *H.leachi*, notably more so here than in zone 3, and to a lesser extent *U.lactea annulipes* (see Appendix 1). Although no quantitative data are available for the tree dwelling animals found in this zone, no species was apparently abundant. Moreover the tree dwelling animals were only found on the lower parts of the prop roots of *Rhizophora mucronata*, no more than twenty centimetres above the ground. It is noteworthy that all the species found within this zone were also found in either zone 1 or 3 of the mangrove forest, but their densities differed considerably from zone to zone (Appendix 1).

Zone 3

The substrate of this area was also relatively sandy, but with a much higher proportion of finer sand and mud than was found in the previous mangrove zones (Table 1). The organic content of the substrate was low and the same as that of zone 2 (see Table 1).

Thirty four species were found in this zone (Appendix 1). The epifauna consisted of 1 hermit crab *Clibanarius padavensis*, 1 gastropod mollusc

Cerithium patulum and 1 mud-skipper fish *Periophthalmus vulgaris*. The infauna consisted of an unidentified species of sipunculid worm, polychaetes *Marphysa mossambica* and *Paraheteromastus tenuis*, a callianassid mud-lobster *Thalassina anomala*, fiddler crabs *Uca dussumieri* and *U. lactea annulipes*, a grapsid crab *Helice leachi*, and a lamellibranch mollusc *Gafrarium tumidum*. The tree fauna consisted of grapsid crabs *Metopograpsus oceanicus* and *Parasesarma plicatum*, gastropod molluscs *Nerita grayana*, *N. chamaeleon*, *N. planospira*, *Monodonta labio*, *Littorina scabra*, *Cerithium patulum* and *Cronia margariticola*, and lamellibranch molluscs *Brachidontes rostratus*, *Isognomon ehippium* and *Saccostrea cucullata*. In addition an unidentified species of spirorbinid worm was found attached to the shells of *B. rostratus*. It is noteworthy that all the above mentioned tree dwelling animals were found attached to prop roots and trunks of mangrove trees *Rhizophora apiculata* and *R. mucronata*, and apart from *L. scabra*, did not occur at a height greater than one metre from the ground. *Littorina scabra*, however, was also found attached to branches and leaves, often more than two metres above the ground, and during high tides ascended even higher up the trees.

Within this zone there was an abundance of dead mangrove wood and rotting vegetation associated with which 13 macrofaunal species were found. These consisted of unidentified species of sea anemone, amphipod, isopod, prawn, lepidopteran insect larva, and eleotrid fish, a xanthid crab *Epixanthus dentatus*, grapsid crabs *P. plicatum* and *Sesarmoides kraussi*, and a gastropod mollusc *Melampus flavus* (?). In addition two species of boring molluscs, *Teredo* spp., were found within *Rhizophora* wood in this zone.

The most abundant species in this zone were the fiddler crabs *U. d. dussumieri* and *U. lactea annulipes*, the latter species being notably more abundant here than elsewhere within the study area (see Appendix 1). Although no quantitative data are available for the tree dwelling animals,

N. planospira, *L. scabra*, *C. patulum*, *B. rostratus*, *I. ehippium* and *S. cucullata* were apparently abundant, notably on the *Rhizophora* mangrove trees directly adjacent to the sand and mud flats. Of the 34 species found in this zone, 25 species (73.5%) were not found elsewhere within the study area, and were thus apparently restricted to this more diverse and more seaward mangrove zone (see Appendix 1 and Discussion).

SAND FLAT BIOTOPE

The substrate consisted predominantly of gravel and coarse sand (73.1%), mixed with a relatively small amount of finer sand and mud; the organic content of the substrate was lower, but slightly higher than elsewhere in the study area (see Table 1).

In total 11 species were found in this sand flat biotope consisting of one unidentified species of sipunculid worm, polychaetes *Pseudeurythoe acarunculata* (?), *Marphysa mossambica*, *Petaloproctus terricola* and *Loimia medusa*, an isopod *Ligia* sp., ocypodid crabs *Macrophthalmus parvimanus*, *Uca lactea annulipes*, *U. tetragonon* and *U. vocans vocans*, and a gastropod mollusc *Nassarius globosus* (see Appendix 1). The most abundant species were *U. tetragonon* and to a lesser extent *U. lactea annulipes*. It is noteworthy that of the 11 species found in this biotope, 5 species were not found elsewhere within the study area (see Appendix 1).

MUD FLAT BIOTOPE

The substrate, although extremely muddy, contained a relatively high proportion of gravel and coarse sand; the organic content of the substrate was extremely low (see Table 1).

In total 11 species were found in this mud flat biotope consisting of an unidentified species of sipunculid worm, polychaetes *Marphysa macintoshi*, *M. mossambica*, *Dasybranchus caducus* and *Loimia medusa*, a xanthid crab *Baptozius venosus*, ocypodid crabs *Macrophthalmus parvimanus* and *Uca vocans vocans*, a gastropod mollusc *Nassarius olivaceus*, a lamellibranch mollusc *Gafrarium*

tumidum and a mud-skipper fish *Periophthalmus koelreuteri*. The most abundant species was the fiddler crab *U.v.vocans*, notably more so here than in the sand flat biotope where it was also found (see Appendix 1). It is noteworthy that of the 11 species found in this biotope, 5 were not recorded elsewhere within the study area (see Appendix 1).

V. DISCUSSION AND CONCLUSIONS

During the present preliminary investigation 51 species of macrofauna were found within the study area at Koh Surin Nua, of which 38, 11 and 11 species occurred in the mangrove, sand and mud flat biotopes respectively. It is extremely noteworthy that 34 of the species found within the mangrove biotope did not occur in either of the other biotopes, the results thus emphasising the characteristic nature of such a mangrove macrofauna as was also found to be the case in a mangrove forest on Phuket Island (Frith *et al.*, 1976) and in other areas of the Indo-West Pacific region (Day 1974, Sasekumar 1974).

The species diversity of macrofauna within the mangrove forest at Koh Surin Nua was very low and species present were not particularly abundant compared to a mangrove forest on Phuket Island (see Frith *et al.*, 1976). Although the island location of this mangrove must to some extent certainly contribute to the paucity of species found there, other factors such as the age and extent of the forest and the particle size and organic content of the substrate may also account for this low diversity and/or density. The mangrove forest studied covered a relatively small area (as did other stands of mangrove forest about the island) compared to mangrove forests on the adjacent mainland of Thailand, and the diameter of the average tree trunk was small suggesting a young or growth-restricted forest. It is possible that some of the more characteristic mangrove dwelling animals have not, as yet, colonised this mangrove forest, but it seems more likely that the somewhat limited ecological niches of small islands such as Koh Surin Nua, in particular

the limitations upon species diversity within the mangrove due to the restricted nature of the forest area there, has thus resulted in species paucity.

The substrate of the Koh Surin Nua mangrove forest was extremely sandy which is atypical of mature mangrove forests, where the substrate is normally muddy (see Macnae 1968) and in this respect it is noteworthy that during the present investigation a notable absence and/or sparsity of mud-dwelling mangrove forest animals such as sipunculids, polychaetes, mud-lobsters, crabs and lamellibranch molluscs, which are common in mangrove forests on Phuket Island where the substrate is muddy (Frith *et al.*, 1976), was recorded. Conversely, however, species such as the fiddler crab *Uca lactea annulipes* (see Frith & Frith, 1977), the gastropod mollusc *Nerita chamaeleon* and the lamellibranch mollusc *Gafrarium tumidum*, which are normally more characteristic of sand or sandy mud substrates on Phuket Island (see Frith *et al.*, 1976), were found within the mangrove forest at Koh Surin Nua, their presence there being apparently directly correlated to the type of substrate (i.e. the presence of sand). The organic content of the mangrove substrate at Koh Surin Nua was very low and it was, therefore, interesting to note an absence and/or sparsity of some of the more typical deposit feeding mangrove animals such as ocypodid crabs and gastropod molluscs that feed directly upon the organic material of the substrate. On Phuket Island (the Ao Nam Bor mangrove forest), where the organic content of the mangrove substrate was much higher than that of Koh Surin Nua, these animals were both abundant and diverse in species (see Frith *et al.*, 1976). Whilst the low organic content of the mangrove substrate in the Koh Surin Nua study area is, to some extent, attributable to a high proportion of larger particles in the substrate (see Newell 1970), it is probable that much of the organic material is exported from the forest by ebbing tides, especially during the southwest monsoon period (May to November), but this point requires further investigation.

The majority of mangrove macrofauna at Koh Surin Nua occurred in the more seaward area of zone 3. It is possible, although no pertinent data are available, that their presence there rather than in the more landward mangrove zones 1 and 2 was directly related to tidal coverage. This would be especially applicable to such animals as the tree dwelling lamellibranchs that feed by filtering micro-organisms from the water and thus rely on high tides for their food. It is noteworthy that on Phuket Island tree dwelling lamellibranchs were also found in the more seaward mangrove areas (Frith *et al.*, 1976). It was of extreme interest to find an absence of barnacles on the mangrove trees within the Koh Surin Nua study area, whereas in a Phuket mangrove they were found to be abundant (see Frith *et al.*, 1976). It is not possible, however, within the scope of this preliminary study to suggest reasons for this total absence. It is noteworthy that the crabs *Chiromantes indiarum* and *Helice leachi* (Grapsidae) were notably more abundant in the landward rather than the seaward mangrove forest areas (Appendix 1). Members of this crab family are well adapted to aerial breathing and thus are able to withstand longer exposure periods; an adaptation which allows them to colonise the more landward intertidal areas (see Macnae 1968). The crab *C. indiarum* was similarly zoned within a Phuket mangrove forest (Frith *et al.*, 1976).

At Koh Surin Nua the mangrove macrofauna was dominated by the crustacean families Xanthidae, Ocypodidae and Grapsidae; gastropod mollusc families Neritidae, Littorinidae, Muricidae and Ellobiidae; and fish family Gobiidae, as has been found in mangroves elsewhere in the Indo-West Pacific region (see Berry 1963, 1972, Macnae & Kalk 1962, Macnae 1963, 1966, 1967, 1968, Day 1974, Sasekumar 1974, Frith *et al.*, 1976). As pointed out previously (Frith *et al.*, 1976) very few polychaete worms have been recorded from mangroves elsewhere in the Indo-West Pacific region, except from Southeast Asian localities. At Koh Surin Nua, however, the families Eunicidae and Capitellidae were represented within the mangrove forest, as they were in mangroves on

Phuket Island (Frith *et al.*, 1976) and in Malaysia (Berry 1963, 1972, Sasekumar 1974). Notably few lamellibranchs have been recorded in mangroves in the Indo-West Pacific region, but at Koh Surin Nua, as on Phuket Island, members of the families Mytilidae, Isognomonidae, Veneridae and Teredinidae were represented (see Frith *et al.*, 1976).

It is extremely noteworthy that the majority of identified species found within the Koh Surin Nua study area have been previously found in similar biotopes on Phuket Island (Lundøer 1974, Frith *et al.*, 1976, Tantanasiriwong – *in prep.*) with the exception of those discussed below. The presence of the fiddler crab *Uca dussumieri dussumieri* (see Frith & Frith, 1977), the grapsid crab *Helice leachi* (Serene, R., pers. comm.), and the gastropod mollusc *Clithon peguensis* (Wium-Andersen, 1977) and *Nerita grayana* (Wium-Andersen, G., pers. comm.) at Koh Surin Nua, however, represent new records for Thailand. In addition it would appear that the polychaete worms *Marphysa macintoshi*, *Dasybranchus caducus*, *Petaloproctus terricola* and *Loimia medusa* have not previously been recorded for Thailand, and in this respect represent new records to the fauna thereof. Their presence is, however, to be expected in view of the distributional ranges given for these species by Fauvel (1953). It should be noted that there has been some previous confusion with regard to the taxonomy of the *Periophthalmus koelreuteri* and *P. vulgaris* gobioid fish groups (see Macnae 1968, p.185). For the purposes of the present study and for clarity, however, only the characters and names presented by Eggert (1935) and Koumans (1942) have been used in determining the identifications of the Koh Surin Nua specimens. This convention results in the satisfactory identifications of *P. koelreuteri* and *P. vulgaris* by the use of the last mentioned author's works. It is noteworthy that no fish resembling the Koh Surin Nua *P. koelreuteri* was found during the intensive mangrove studies on Phuket Island (Frith *et al.*, 1976) and this species was not recorded by Berry (1963, 1972) or Sasekumar (1974) for Malaysian mangroves under that name. The

presence of this species in Thailand is, however, to be expected in view of its general distribution (Koumans 1942).

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APPENDIX 1

A PRELIMINARY LIST OF MACROFAUNAL SPECIES FOUND AT THE KOH SURIN STUDY AREA, WESTERN PENINSULAR THAILAND

<i>Number of samples (N):</i>	MANGROVE			SAND FLAT	MUD FLAT
	Zone 1 <i>N</i> = 3	Zone 2 <i>N</i> = 10	Zone 3 <i>N</i> = 8	<i>N</i> = 36	<i>N</i> = 7
TAXA:					
COELENTERATA					
ACTINOZOA					
Sea anemone sp. (unidentified)	-	-	+	-	-
SIPUNCULA					
Sipunculid sp. (unidentified)	-	-	+	0.6	0.8
ANNELIDA					
POLYCHAETA ERRANTIA					
Amphinomidae					
<i>Pseudeurythoe acarunculata</i> (?)	-	-	-	0.1	-
Eunicidae					
† <i>Marphysa macintoshi</i> Crossland	-	-	-	-	1.2
<i>M. mossambica</i> (Peters)	-	-	+	2.7	0.4
POLYCHAETA SEDENATRIA					
Capitellidae					
† <i>Dasybranchus caducus</i> (Grube)	-	-	-	-	0.6
<i>Paraheteromastus tenuis</i> Monro	-	-	0.5	-	-
Maldanidae					
† <i>Petaloproctus terricola</i> Quatrefages	-	-	-	0.3	-
Terebellidae					
† <i>Loimia medusa</i> (Savigny)	-	-	-	0.2	1.2
Serpulidae					
Spirorbinid sp. (unidentified)	-	-	+	-	-
CRUSTACEA					
AMPHIPODA					
Amphipod sp. (unidentified)	-	-	+	-	-
ISOPODA					
<i>Ligia</i> sp.	-	-	-	0.1	-
Isopod sp. (unidentified)	-	-	+	-	-
DECAPODA ANOMURA					
Callianassidae					
<i>Thalassinia anomala</i> (Herbst)	-	-	1.4	-	-

Notes: The mean density values (the number of animals per metre square) are given for epifaunal and infaunal species where possible.

+ = Macrofaunal species present, no density values.

- = Macrofaunal species absent.

† = Macrofaunal species not recorded on Phuket Island, western Peninsular Thailand.

APPENDIX 1 (Cont'd)

Number of samples (N):	MANGROVE			SAND FLAT	MUD FLAT
	Zone 1 N = 3	Zone 2 N = 10	Zone 3 N = 8	N = 36	N = 7
Paguridae					
<i>Clibanarius padavensis</i> de Man	-	-	+	-	-
<i>Diogenes</i> sp.	1.3	-	-	-	-
Penaeidae					
Prawn sp. (unidentified)	-	-	+	-	-
DECAPODA BRACHYURA					
Xanthidae					
<i>Baptozius venosus</i> (H. Milne-Edwards)	-	-	-	-	+
<i>Epixanthus dentatus</i> (White)	-	-	0.5	-	-
Ocypodidae					
<i>Macrophthalmus parvimanus</i> Guerin	-	-	-	0.4	1.2
† <i>Uca dussumieri dussumieri</i> (H. Milne-Edwards)	-	-	8.0	-	-
<i>U. lactea annulipes</i> (H. Milne-Edwards)	-	2.0	14.5	9.0	-
<i>U. tetragonon</i> (Herbst)	-	-	-	27.9	-
<i>U. vocans vocans</i> (L.)	-	-	-	1.1	20.0
Grapsidae					
<i>Chiromantes indiarum</i> (de Man)	2.7	0.4	-	-	-
<i>Helice leachi</i> Hess	-	7.2	2.0	-	-
<i>Metopograpsus oceanicus</i> (Jacquinot)	-	-	+	-	-
<i>Parasesarma plicatum</i> (Latreille)	-	-	0.5	-	-
<i>Sesarmoides kraussi</i> (de Man)	-	-	+	-	-
INSECTA					
LEPIDOPTERA					
Larva sp. (unidentified)	-	-	+	-	-
MOLLUSCA					
GASTROPODA					
Neritidae					
† <i>Clithon peguensis</i> (Blandford)	+	-	-	-	-
<i>Nerita grayana</i> Recluz	-	-	+	-	-
<i>N. chamaeleon</i> L.	-	-	+	-	-
<i>N. planospira</i> Anton	-	+	+	-	-
Trochidae					
<i>Monodonta labio</i> (L.)	-	-	+	-	-
Littorinidae					
<i>Littorina scabra</i> L.	-	+	+	-	-
Cerithiidae					
<i>Cerithium patulum</i> Sowerby	-	-	+	-	-
Muricidae					
<i>Cronia margaritcola</i> (Broderip)	-	-	+	-	-

APPENDIX 1 (Cont'd)

Number of samples (N):	MANGROVE			SAND FLAT	MUD FLAT
	Zone 1 N = 3	Zone 2 N = 10	Zone 3 N = 8	N = 36	N = 7
Nassaridae					
<i>Nassarius globosus</i> Quoy & Gaimard	-	-	-	0.3	-
<i>N. olivaceus</i> Bruguière	-	-	-	-	+
Ellobiidae					
<i>Melampus flavus</i> (?)	-	-	+	-	-
Thiariidae					
<i>Stenomelania dautzenbergiana</i> (Morlet)	+	-	-	-	-
LAMELLIBRANCHIA					
Mytilidae					
<i>Brachidontes rostratus</i> Duncket	-	-	+	-	-
Isognomididae					
<i>Isognomon ephippium</i> (Sowerby)	-	-	+	-	-
Ostreidae					
<i>Saccostrea cucullata</i> (Born)	-	-	+	-	-
Veneridae					
<i>Gafrarium tumidum</i> (Röding)	-	-	0.5	-	0.6
Teredinidae					
<i>Teredo</i> spp.(2)	-	+	+	-	-
FISHES					
<i>Periophthalmus koelreuteri</i> Pallas	-	-	-	-	+
<i>P. vulgaris</i> Eggert	+	+	+	-	-
Eleotrid sp.(unidentified)	-	-	+	-	-
TOTAL NUMBER OF SPECIES	5	8	34	11	11
	38				