Anal

#291

Testing the Use of Marine Protected Areas to Restore and Manage Tropical Multispecies Invertebrate Fisheries at the Arnavon Islands, Solomon Islands

# ABUNDANCE AND SIZE FREQUENCY DISTRIBUTIONS OF INVERTEBRATES, AND THE NATURE OF HABITATS, PRIOR TO DECLARATION OF THE MARINE CONSERVATION AREA

APRIL, 1996

M.P. Lincoln Smith[1] and J.D. Bell[2]

[1] The Ecology Lab Pty Ltd
25/28-34 Roseberry Street
Balgowlah, New South Wales, Australia

[2] ICLARM Coastal Aquaculture Centre
Honiara, Solomon Islands

# CONTENTS

TABLES

FIGURES

APPENDICES

Gift

From ODG

23 April 1999

## TABLES

## FIGURES

## APPENDICES

# SUMMARY

## BACKGROUND

Scientists have identified a number of potential benefits of marine reserves, including i) conservation of habitats and biodiversity; ii) maintenance of large populations of organisms and of larger individuals within such populations, leading to increased egg production; iii) sources of propagules (e.g. eggs and "seeds") to replenish areas depleted by over-exploitation; and iv) replenishment of adjacent areas by movement of larger individuals. Although there are strong theoretical arguments in support of these benefits, definitive studies have yet to be done for most marine reserves and habitats. One reason for this is the difficulty (i.e. lack of opportunities) to document changes within reserves prior to and after their declaration. In fact, to demonstrate unambiguously the effects of marine reserves, it is necessary to monitor populations within the reserve and at suitable reference locations prior to, and for some time after, declaration. This type of approach is analogous to sampling that has been developed recently for detecting environmental impact, where predicted changes in mean diversity and abundance at an impact site are compared against appropriate spatial and temporal controls.

The tropical Pacific encompasses a vast area and many independent states. Many of the people living in the region rely almost totally on marine resources for food, recreation, culture and cash income. Management of fisheries stocks on coral reefs is difficult using traditional methods and marine reserves potentially offer an effective management tool. Programs seeking to encourage declaration of marine reserves within the tropical Pacific will be able to promote this management tool more easily if the benefits of reserves are evaluated and documented. The planning and management of a marine conservation area (MCA) at the Arnavon Islands, Solomon Islands, has provided such an opportunity to test the use of a marine reserve on the management of exploited tropical marine invertebrates. The MCA has been implemented in conjunction with a rigorous, quantitative survey program to assess the effects of the MCA on commercially exploited invertebrates, including trochus, sea cucumbers, giant clams and pearl oysters.

With the assistance of The Nature Conservancy, local fishermen implemented a total closure on fishing of commercially important invertebrates for three years around much of the coastline of two islands within an MCA of 83 km$^2$ at the Arnavon Islands, located between Choiseul and Ysabel Islands, in the north of Solomon Islands. The Great Barrier Reef Marine Park Authority (GBRMPA) and the International Centre for Living Aquatic Resources Management (ICLARM) have organised the monitoring program. The overall aim of the monitoring program is to determine if the number and size of commercially important invertebrates increases in the MCA relative to fished areas.

## METHODS

Under the original study proposal, three surveys of exploitable invertebrates using underwater visual census were to be done prior to the closure of fishing at the Arnavon Islands in August 1995, followed by a further three surveys in 1998. A pilot study was done in October 1994 to select sampling sites and refine the methodology. Based on the results of the pilot study, sampling was done at four Groups of islands (The Arnavons and three reference Groups - Waghena, Ysabel and Suavanao), at two Islands within each of the Groups and at four Sites within each of the Islands. This approach provided an assessment of changes in the abundance and size of invertebrates at three spatial scales - there was no prior information to suggest the scale at which the MCA may have its greatest effect. In addition, sampling was done in two habitats: the shallow habitat, situated on reef terrace at depths of 0.5 - 3.5 m; and the deep habitat, located on steep sand and rubble slopes below the terrace at depths of 15 - 22 m. Because different species tended to occur within each habitat, separate survey methods were developed for each one. Surveys were done in January-February, April-May and July-August, 1995.

In the shallow habitat, six transects were surveyed by diving at each site during each survey. The transects were 50 m long and 2 m wide and were laid haphazardly over the reef. Trochus (*Trochus niloticus*), giant clams (Tridacnidae), pearl oysters (mainly blacklip pearl oyster, *Pinctada margaritifera*) and several species of sea cucumbers (Holothuria), such as greenfish (*Stichopus chloronotus*) and lollyfish (*Holothuria atra*) were recorded on slates for each transect. Specimens of each invertebrate were also measured. In the deep habitat, six transects were surveyed per site and survey. The transects were 50 long and 5 m wide and were laid across rather than down the slope. Species recorded were restricted to sea cucumbers such as white teatfish (*Holothuria fuscogilva*) and prickly redfish (*Thelanota ananas*) and pearl oysters (including also the goldlip pearl oyster, *P. maxima*). During Surveys 2 and 3, the benthic characteristics of each habitat were quantified in transects under categories such as rock pavement, sand, rubble, hard corals, algae and seagrasses.

The data obtained on abundance of invertebrates were analysed using a statistical procedure known as asymmetrical analysis of variance (ANOVA), which compared abundance at the Arnavons to all of the reference Groups, at the spatial scales of Groups, Islands and Sites. It also compared variation in abundance over the three survey times. The data on lengths of invertebrates were rather limited due to small numbers of specimens and interpretation of trends was restricted to inspection of means, standard errors and graphs of length-frequency distributions. Habitat characteristics were compared among groups and sites using multivariate procedures, including multidimensional scaling, (MDS), analysis of similarities (ANOSIM) and similarity percentages (SIMPER).

## RESULTS

### Shallow Habitat

Eighteen species of exploited invertebrates were recorded in the shallow habitat during the three surveys. The false trochus (*Pyramis tectus*) was also recorded. Of the 2021 individuals recorded, the most abundant group was the giant clams, which were represented by six species and made up 60% of all individuals. Among the giant clams, *Tridacna maxima* was the most abundant (39% of all individuals), followed by *T.crocea* (14%) and *T. derasa* and *Hippopus hippopus* (2% each). Ten species of sea cucumbers and 212 individuals were also recorded. Of these, *Bohadschia graeffei* and *Holothuria atra* were the most abundant (3% each of all individuals) followed by *Stichopus chloronotus* (2%). The gastropod *Trochus niloticus* made up 5% of all individuals and the pearl oyster *Pinctada margaritifera*, with only 12 individuals, made up < 1% of all invertebrates recorded.

ANOVA was used to compare the exploited invertebrates on the shallow habitat. The data collected prior to the declaration of the MCA showed that there were statistically significant differences in diversity and abundance of invertebrates at the small spatial scale of Sites within Islands and Groups. Four variables showed significant differences at the largest scale (Groups) and all 10 variables showed significant differences among sites. No variable showed significant differences at the intermediate scale of Islands within Groups. None of the variables showed consistent variability across survey times. Rather, there was inconsistent variation through time among Groups and/or Sites. Comparisons of size-frequency distributions of invertebrates among Groups of islands were limited by the very large variability in sample sizes obtained. Where sample sizes were reasonable (i.e. $n > 50$), some differences among Groups of islands in size-frequency distributions were apparent. Very few individuals were recorded from the smaller size intervals, probably reflecting either the cryptic nature of small juveniles or the presence of separate nursery habitats for non-sessile species.

The shallow habitat was generally made up of rock pavement, rubble and sand, although the proportions of each substratum varied among Groups of islands. Rock was the predominant substratum at Waghena, the Arnavons and Suavanao, comprising over 70% of the habitat within each of these Groups. At Ysabel, rock comprised only 30% of the habitat, while coral rubble was the most common substratum (38%). Hard and soft corals and algae made up comparatively little (< 5%) of the shallow habitat. ANOSIM indicated that there were significant differences in the shallow habitat between all Groups. SIMPER analysis generally identified sand, rubble and rock as the characteristics of the habitat that explained most of the dissimilarity in habitat between paired comparisons of Groups.

### Deep Habitat

Fifteen species of exploited invertebrates were recorded in the deep habitat during the three surveys. All but one of the 804 invertebrates recorded were sea cucumbers; the exception was a goldlip pearl oyster (*Pinctada maxima*). Among the sea cucumbers, *Holothuria atra* was the most abundant (24% of all individuals), followed by *Thelanota anax* (22%) and *Holothuria fuscogilva* (17%). ANOVA was used to compare the exploited invertebrates on the deep habitat for 8 variables, all including sea cucumbers. Six of the variates showed significant site effects that were consistent through time, one varied among sites inconsistently through time and one variate showed no significant differences through time or at any spatial scale. Comparisons of size-frequency distributions among Groups of islands were limited by large variability in sample sizes. Size ranges tended to be relatively narrow and unimodal. Several species of sea cucumbers showed trends in size-frequencies among Groups of islands, but these must be interpreted cautiously due to the small sample sizes obtained.

The deep habitat was dominated by sand and rubble substrata, with rock comprising less than 7% of the habitat at all Groups of islands. This was due largely to the selection of sampling sites, as we sought to maximise the habitat utilised by sea cucumbers. The percentage cover of sand ranged from 63% at Waghena to 83% at Suavanao and the cover of rubble ranged from 4% at Suavanao to 28% at Waghena. Massive/brain corals and soft corals made up a small proportion of the habitat, occurring on the rock substrata and algae, occurred occasionally on the soft substrata. ANOSIM indicated a global difference among sites, but we could not detect any significant pairwise comparisons among Groups. Similarly, the MDS plot did not suggest any trends in habitat characteristics among Groups.

## DISCUSSION AND RECOMMENDATIONS

We expect that this study will be able to provide a sound test of the ability of the MCA to facilitate an increase in the numbers of invertebrates, due to: 1) the small abundances occurring prior to declaration of the MCA; 2) the similar levels of variability at the Arnavon Islands compared to the reference groups; and 3) the very sensitive test (i.e. many degrees of freedom) that will be used in assessing the effects of the MCA. The data on invertebrate size may be problematic, however, because small sample sizes prior to declaration of the MCA limit the scope for analysis of data. Good recruitment of juveniles over the next three years would provide additional opportunities to detect the effects of the MCA on size frequency distributions.

The survey of habitat characteristics provides a measure of differences among Sites and Groups of islands throughout the study region. Existing information is limited on the extent to which the invertebrates of interest may be affected by habitat, although there is some information on particular species, such as trochus. Our knowledge of the habitat structure at each spatial scale, however, should have the potential to explain some of the patterns of variation seen after the MCA has been in effect for three years.

The sampling design used prior to declaration of the MCA should be continued during future surveys. The logistics, including the use of the Fisheries vessel "Daula", surveys by Solomon Islands fisheries officers and the MCA conservation officers, and the co-ordination provided by ICLARM have all proved very effective and should be maintained.

In addition to the three surveys planned for 1998, we strongly recommend that one interim survey be done each in 1996 and 1997. These surveys would have the following benefits: 1) they will provide an indication of trends in the stocks of invertebrates at the MCA and reference Groups; 2) they will provide information that could assist with the ongoing management of the MCA; 3) they will provide some "insurance" in the event that some unexpected disturbance occurs just prior to the 1998 surveys (e.g. a cyclone, poaching within the MCA, etc); and 4) they will help to maintain the interest of local communities and MCA wardens in the project. Finally, dissemination of the findings of the study to the Management Committee of the MCA, and to the scientific community, should be given a high priority.

# 1. INTRODUCTION

## 1.1 Background to the Study

A major problem in evaluating the effects of existing marine reserves on harvested populations and communities has been the lack of data collected prior to establishment of the refuge (Dugan and Davies 1993). There are numerous examples of this problem from both temperate and tropical regions, including the Philippines (Russ and Alcala 1989), Australia's Great Barrier Reef (Ferreira and Russ 1995), Africa (McClanahan 1995, Watson and Ormond 1994), the Caribbean (Roberts and Polunin 1993, Roberts 1995), California (Carr and Reed 1993) and New Zealand (Cole *et al.* 1990). Many scientists have argued that marine reserves have substantial benefits for conservation of aquatic communities and maintenance of harvestable stocks (Ballantine 1991, Ivanovici *et al.* 1993 and papers therein, Roberts and Polunin 1991, 1993, Russ 1991, Bohnsack 1993, Carr and Reed 1993, Dugan and Davies 1993). Others have pointed-out, however, that setting aside areas for marine reserves can have great social and economic cost for those who previously derived food, employment or recreational benefit from those areas (Bergin 1993). Therefore, scientists and managers need to assess whether specific reserves deliver the benefits attributed to them, and then inform those whose livelihoods are affected of any such benefits.

Bohnsack (1993), Carr and Reed (1993), Dugan and Davies (1993) and Polunin and Roberts (1993) provide good summaries of the potential benefits of marine reserves to the management of fisheries. Briefly, these include: 1) conservation of habitats, species diversity and genetic diversity; 2) maintenance of large populations of organisms and of large individuals within such populations, leading to increased egg production; 3) sources of propagules that can replenish other areas that may have been depleted by over-exploitation; and 4) replenishment of adjacent, non-protected areas by movement of larger individuals (e.g. either by random movement or density dependent processes).

Whilst there are strong theoretical arguments in support of these benefits, there is much less compelling evidence from field investigations. At present, it would be very difficult to demonstrate unequivocally the replenishment of non-protected areas, either through supply of propagules or movement of larger individuals. Carr and Reed (1993) argued that the extent to which reserves may supply propagules to non-protected areas depends on numerous factors, including locations of reserves and non-protected areas relative to larval duration, local currents and the size of reserves. Demonstrating a significant reserve effect in terms of larval supply may require examination of samples at the genetic level to trace biota between sites (Carr and Reed 1993).

De Martini (1993) examined potential replenishment of non-protected areas adjacent to marine reserves by computer modelling based on growth curves and mobility of Pacific coral reef fishes. He asserted that there was little empirical evidence to suggest that reserves replenished non-protected areas, citing Russ and Alcala (1989) as the best (but still inconclusive) evidence from the field. De Martini's (1993) modelling indicated that small, relatively mobile and fast-growing fishes (e.g. small Acanthuridae such as *Ctenochaetus striatus*) occurring in reserves were the species most likely to replenish adjacent, non-protected areas. Moreover, his models indicated that large, highly mobile and slow-growing fishes (e.g. Carangidae) and small, site-attached fishes (e.g. Pomacentridae) were unlikely to provide significant replenishment of non-protected areas.

Most of the work done on marine reserves has focused on the first two benefits listed above, namely, species diversity/abundance and size (or, more recently, age structure - see Ferreira and

Russ 1995). The design of field studies for this work usually includes sampling the reserve and one or more non-protected areas (as control or reference sites) but excludes, in most cases, sampling of reserve and non-protected areas prior to declaration of the reserve. Thus, in most cases, there is no measure of the extent to which reserve and non-protected areas differ due to natural variability, or to an effect due to the reserve.

In order to cast doubt on many of the earlier studies, one merely needs to demonstrate that: 1) variability among sites in the absence of a marine reserve is of a similar magnitude to that reported between reserve and non-protected sites; or 2) that variability through time within a site not subject to protection is comparable to variability within a site before and after it is declared a marine reserve.

Two examples of the former are contained in Lincoln Smith *et al.* (1995). In the first example, the authors surveyed coral reef fish subject to fishing to the same extent at two sites within four zones on the edge of the lagoon at the Cocos (Keeling) Islands, in the Indian Ocean. Natural variability was found to be large at relatively small spatial scales. Total abundance of harvestable fishes varied between sites within zones by a factor of four, and varied for Scaridae by a factor of 11. The second example involves the spider shell (*Lambis lambis*: Strombidae) known locally as gong gong, which is harvested from specific areas in the Cocos (Keeling) Lagoon. Lincoln Smith *et al.* (1995) surveyed gong gong at three sites within three locations in the main harvesting area and at three sites within two locations in a similar habitat on the far side of the lagoon where no harvesting took place (due to distance required for travel) and thus may be considered to be a natural reserve. Differences in abundance of gong gong among sites within the harvested area varied by up to 4.7 times. Differences between the harvested and non-harvested sites varied by up to 11 times, with greater numbers within the harvested area (Lincoln Smith *et al.* 1995).

Dugan and Davies (1993) summarised studies comparing reserve and non-protected areas; and found that reserves had two to 13 times more individuals than non-protected areas. However, this trend may be explained by the original selection of the reserves, which may have had intrinsic natural features that supported naturally large populations of marine organisms.

To demonstrate unambiguously the effects of marine reserves, it is necessary to monitor populations within the reserve and at reference locations prior to, and for some time after, declaration. This type of approach is analogous to sampling often done for environmental impact assessment, where predicted changes in mean diversity and abundance at an impact site are compared against appropriate spatial and temporal controls. Carr and Reed (1993) suggested that, for the purpose of such analysis, the reserve can be considered an "impact" on species of interest within the range of replenishment of the reserve.

The tropical Pacific encompasses a vast area and many independent states. Many of the people living in the region rely almost totally on marine resources for food, recreation, culture and cash income. Management of fisheries stocks on coral reefs is difficult using traditional methods and marine reserves potentially offer an effective management tool (Roberts and Polunin 1993). The World Conservation Union (IUCN) and the South Pacific Regional Environment Program (SPREP) have initiated a co-operative program to promote the establishment of a system of marine protected areas (MPAs) within the tropical Pacific. Despite the large size of the region, only 67 MPAs have been identified (Kenchington and Bleakley 1994) and, until the present project commenced, none had been declared in Solomon Islands, other than two small closures to fishing in the vicinity of the ICLARM research facilities.

Programs seeking to encourage declaration of marine reserves within the tropical Pacific will be able to promote this management tool far better if the benefits of reserves are evaluated and documented. In the present study, the planning and management of a marine conservation area (MCA) at the Arnavon Islands has been implemented in conjunction with a program to monitor the success of the MCA in facilitating an increase in the populations and sizes of harvestable invertebrates. This has been done using a rigorous, quantitative survey program based on the procedures developed for environmental impact assessment (Underwood 1989, 1993).

Large invertebrates are an important part of the local fisheries in Solomon Islands, because they are relatively easy to harvest, many of the products can be preserved without refrigeration and provide a significant export income (Richards *et al.* 1994). Important groups of invertebrates include giant clams, pearl oysters, trochus and holothurians, known commonly as sea cucumbers and processed into beche-de-mer. There is increasing information - mostly in terms of export volumes - to suggest that these invertebrates are either fully or over-exploited (Richards *et al.* 1994 and references therein). There is some regulation of harvesting at the government level (e.g. maximal and minimal size limits on trochus and bans on the export of giant clams and pearl oysters) and at the community level, for example, in Ontong Java harvesting of white teatfish (*Holothuria fuscogilva*) sea cucumber is prohibited during alternate years (Holland 1994). The limited information available suggests, however, that these measures are not enough to sustain the present rates of harvest. One management measure that has been suggested is the establishment of sanctuaries to provide stock which can replenish surrounding areas on a regular basis (Richards *et al.* 1994).

This report presents the findings of surveys of harvested invertebrates - including trochus, sea cucumbers, giant clams and pearl oysters - done prior to the declaration of the MCA at the Arnavon Islands and discusses the survey program for the next 3 to 4 years, spanning what is considered to be the post-harvesting recovery period. Thus, the outcomes of the present study will indicate the potential benefits that such reserves could have for the management of invertebrate fisheries within Solomon Islands and, hopefully, enable managers to encourage local communities to declare more reserves to assist in the management of their fisheries resources.

## 1.2 Study Participants

The Nature Conservancy (TNC) has negotiated with local fishermen a total closure on fishing of commercially important invertebrates (sea cucumbers, giant clams and trochus) for three years around much of the coastline of two islands within a Marine Conservation Area of 83 km$^2$ that has been declared at the Arnavon Islands, which lie between Choiseul and Ysabel Islands.

The International Centre for Living Aquatic Resources Management (ICLARM) informed the Great Barrier Reef Marine Park Authority (GBRMPA) of the opportunity to study the effects of fishing protection on commercially exploited invertebrates at the Arnavon Islands. GBRMPA obtained an ACIAR Small Grant to work with ICLARM and TNC to study the effects of the fishing closure. GBRMPA has engaged Mr Marcus Lincoln Smith of The Ecology Lab Pty Limited as Project Scientist.

During the study, the Division of Fisheries of Solomon Islands has provided logistical support and Fisheries Officers, who have been trained in survey procedures and transcription of data. These officers have participated in all of the surveys done so far. In addition, TNC has arranged for the

MCA to be staffed by six wardens from local communities. The wardens live on the islands and their major role is to ensure that the designated closures are observed. Some of the wardens have also been trained to scuba dive and have assisted in the surveys of invertebrates.

## 1.3 Study Aims and Rationale

The overall aim of the study may be summarised as follows:

> *To determine if the number and size of commercially important invertebrates increases in the MCA relative to fished areas.*

The closure of fishing at the Arnavon Islands commenced in August 1995 and will extend at least until 1998. Abundances of invertebrates within the MCA, and at reference areas (i.e. places not subject to fishing closure), were estimated on three occasions prior to closure and will be re-assessed on three occasions in 1998. This procedure will allow us to make a relatively unambiguous test of the effectiveness of the MCA. In fact, the experimental design is based on models developed over the last fifteen years to assess the impacts of human activities on aquatic ecosystems (Green 1979, Bernstein and Zaliniski 1983, Hurlbert 1984, Stewart-Oaten *et al.* 1986, Underwood 1993). In simple terms, we would conclude that the MCA was effective if the following conditions are met:

1. Differences in the number and/or size of exploitable invertebrates between the Arnavon Islands and reference areas are relatively small prior to the closure to fishing of the Arnavon Islands; and

2. Exploitable invertebrates at the Arnavon Islands become relatively more abundant and/or larger than those surveyed at reference areas some time after the closure of fishing at the Arnavon Islands.

Note that under these conditions, even if exploitable stocks in the reference areas vary over time, or if there is a statistically significant difference in numbers and/or size between the Arnavon Islands and the reference areas prior to closure, it is the relative difference through time between the reference areas and the Arnavon Islands that is crucial to determining the success of the MCA. However, the success of this empirical test depends on four assumptions:

1. That the fishing closure at the Arnavon Islands is effective;

2. That fishing effort in the reference areas does not change during the study;

3. That the period of time between the before and after surveys is sufficient to allow for a) significant recruitment to the exploitable stocks and/or b) a significant increase in the mean size of individuals of the exploitable stocks; and

4. That the small numbers of exploitable invertebrates reported from the Arnavon Islands (Ramohia and Tiroba 1993) are due to the effect of fishing rather than ecological processes (e.g. unsuitable habitat, poor natural settlement of larvae during the study period, etc).

The effectiveness of the closure will depend on the acceptance of the MCA by the local communities and/or the ability of the wardens to discourage people from harvesting invertebrates within the MCA. Given the presence of the wardens and detailed negotiations with the community and their commitment to the success of the MCA, illicit fishing is not anticipated to be a problem. In relation to the second assumption, if fishing effort increased in the reference areas during the study with a subsequent decrease in the number of exploitable invertebrates, the analysis may lead us to conclude that the MCA was effective when in fact it was not. This is because there would be relatively more invertebrates at the Arnavons compared to the reference groups after the closure than before. This outcome is unlikely in practice, however, because the numbers of invertebrates at the reference areas were found to be so small that it would be very difficult to detect a significant decline in their numbers there. Also, unless there was an increase in numbers of invertebrates at the Arnavons after the closure relative to the Arnavons prior to the closure, we would be unlikely to conclude that the MCA was effective.

Of potentially greater concern is the possibility that fishing effort in the reference areas decreased during the study, with a subsequent increase in the number of exploitable invertebrates, leading to the false conclusion that the MCA at the Arnavons was not effective when in fact it may have been. This is because there would be relatively similar numbers of invertebrates at the Arnavons compared to the reference groups before and after closure. In such an event, an increase in abundance at all sites through time would probably be interpreted as a natural phenomenon (e.g. large, widespread settlement events) rather than an effect due to reduced fishing at all sites.

The period of time allowed for recruitment of stocks is dependent upon the arrangements negotiated with the local residents who fish the Arnavon Islands. However, three years should be sufficient for a recovery of trochus (Nash 1993) and to observe significant growth in giant clams (ICLARM, unpublished data). Consequently the third assumption is reasonable, although little is known about the settlement and growth rates of sea cucumbers. The fourth assumption also seems reasonable on the basis that Ramohia and Tiroba (1993) identified numerous locations at the Arnavon Islands that they considered to be suitable habitat for the invertebrates of interest, and that anecdotal information suggests that sea cucumbers and trochus were previously abundant at the Arnavon Islands. Moreover, according to Holland (1994), Ysabel Province is the third largest producer of sea cucumbers in the Solomon Islands, with most purchases coming from Kia, the closest major village to the MCA.

# 2. METHODS

## 2.1 Pilot Investigations

Under the original study proposal accepted by ACIAR, three surveys of exploitable invertebrates using underwater visual census were to be done prior to the closure of fishing at the Arnavon Islands (i.e. from January to August 1995). This was to be followed by a further three surveys at the nominated end of the closure (approximately 1998). The first of each of the prior- and post-closure surveys would be done by the project scientist, who would also train officers from Solomon Islands Fisheries Division in the survey procedures. The second and third of each of the prior- and post-closure surveys would be led by fisheries officers. Prior to designing the main survey procedure, however, a pilot study was done at the Arnavons in October/November 1994 to determine the optimal sampling procedures, select sampling sites and to commence the training of in survey procedures. The findings of the pilot study are presented in Lincoln Smith (1994). A brief summary is provided here.

A review of the scientific literature revealed that several procedures have been developed to provide quantitative estimates of coral reef invertebrates (English *et al.* 1994), including the use of line-intercept methods for estimating abundance or proportional size of sessile organisms per distance of seabed surveyed; quadrats and strip transects to provide estimates of abundance per unit are of seabed surveyed; and timed counts to provide estimates per unit of search time. Other methods combine area and time - for example, manta tows are often done for a fixed time and tow-speed, in an estimated area on either side of the observer (Harriott 1984). Strip transect methods have been used by other workers to survey the species of interest in this study (e.g. Harriott 1984, Nash *et al.* 1995, Nash 1993, Munro 1993). On the basis of their experience and logistical considerations, strip transects were adopted for the present study.

As the exploitable invertebrates in the MCA occur over a depth range of at least 0 - 30 m (Wright and Hill 1993), we decided to sample in two distinct habitats: "shallow" and "deep" habitat. The shallow reef habitat ranged in depth from about 0.5 to 3.5 m and consisted mostly of flat terrace with live and dead coral. The deep habitat ranged in depth from about 15 m to 22 m and consisted of a relatively steep slope with sand and rubble substratum. Shallow reef was surveyed for trochus, giant clams, pearl oysters and sea cucumbers; the deep slope was surveyed only for sea cucumbers and pearl oysters.

We used the pilot investigations to evaluate the appropriate size of transects (i.e. length and width) and the optimal number of replicates, based on statistical considerations (maximising the power of tests to detect spatial and temporal variation), logistics and safe scuba diving practices. Detailed results of these evaluations are in Lincoln Smith (1994). The final survey procedure, based on these results, is presented in Section 2.3.

## 2.2 Study Sites and Survey Times

Within each of the two habitats, sampling was done at four sites within each of the two Arnavon Islands and at two reefs or islands in each of three references groups, Waghena, Ysabel and Suavanao (Figure 1). Thus, a total of 32 sites were sampled in both the shallow and deep habitats. During the first survey, the latitude and longitude of each site was recorded using a Global Positioning System (GPS, see Appendix 1). During subsequent surveys, sites were relocated using land marks and the original GPS positions. Since the pilot investigation, three surveys have been completed at every site. The times of these surveys were January-February 1995, April-May 1995 and July-August 1995.

## 2.3 Survey Procedures

To ensure that the procedures developed during the pilot investigations were standardised, a manual was written with explicit instructions and site descriptions. In addition, a series of colour photographs of the target invertebrates was included to assist with identification. All data were recorded on underwater writing slates and transferred nightly onto data sheets bound into a single booklet. The data sheets had spaces at the top to record the Area, Island, Site, Habitat, GPS position, date and comments on conditions at the time of the survey. Other information recorded for each of the six replicate transects surveyed at each site included the replicate number, the diver undertaking the survey, his assistant, the water depth and time at the start and end of each replicate and the number and size of each invertebrate observed within the transect. At the conclusion of each survey, the data sheets were returned to the Project Scientist where they were checked for completeness and entered onto a computer spreadsheet (Excel 5.0). The details of survey procedures for the shallow and deep habitats are presented in the next two sections.

### 2.3.1 Invertebrates in the Shallow Habitat

Surveys in this habitat were done along relatively flat coral terrace, including coral pavement, rubble, live corals and occasional patches of sand. The depth range was from about 0.5 - 3.5 m, with most sampling done between 1.5 m and 2.5 m.

Invertebrates counted in this habitat included giant clams, trochus (*Trochus niloticus*), sea cucumbers, pearl oysters and false trochus (*Pyramis tectus*). The false trochus is not of commercial value; they were recorded but not measured. The sea cucumbers usually included lollyfish (*Holothuria atra*), orangefish (*Bohadschia graeffei*), greenfish (*Chloronotus stichopus*), surf redfish (*Actinopyga mauritiana*) and stonefish (*Actinopyga miliaris*). Another species of sea cucumber, *Holothuria coluber*, was often very common, but is of little or no economic value. This species was recorded but not measured.

The survey procedure for the shallow habitat was as follows. One diver descended to the terrace, anchored a tape and swam in a straight line over the terrace to the 50 m mark on the tape. If there was a noticeable current, the diver laid the transect swimming into the current, so that it was easier for the observer to do the survey. The line was laid haphazardly with respect to depth, rather than along a depth contour.

A second diver (the observer) swam along the tape holding a pvc "t-bar", which was a 2 m long pipe with a handle used to define the transect width of 2 m. The observer counted invertebrates within each transect and recorded the depth and time at the start and finish of each transect. Once the transect was surveyed, the first diver retrieved the tape and, after swimming for 10-20 m, re-laid the tape in a different direction. If the water depth was < 1.5 m deep, observers did the shallow survey using snorkel rather than scuba. If the depth was > 1.5 m, the observer always used scuba to maintain the efficiency of the survey.

Two teams of divers sampled invertebrates along three transects at each site, giving a total of six transects for each site.

All the exploitable invertebrates counted within transects were measured to the nearest 5 mm in length, except trochus, which were measured to the nearest 1 mm. When time permitted, invertebrates seen outside the transect were also measured (but not counted) to increase the sample size for estimating size-frequency distributions. Measurements were done as follows. Sea cucumbers were measured from the mouth to the anus of the animal, over the top of the body, using a fibreglass tape measure. Each sea cucumber was disturbed as little as possible and the measurements taken quickly, so that there was minimal chance of the sea cucumber changing shape. Clams were measured along the top of the shell, as it was not possible to measure shell width because many individuals were buried. Trochus (*Trochus niloticus*) were measured across the widest point of the shell base. Pearl oysters were measured dorso-ventrally, i.e. from the apex to the hinge of the shell.

### 2.3.2 Invertebrates in the Deep Habitat

Surveys in the deep habitat were done along coral, rubble and sand slopes. Sea cucumbers and goldlip and blacklip pearl oysters occurring in the deep habitat were counted and measured. The deep habitat contains some of the most valuable species of sea cucumbers, including white teatfish (*Holothuria fuscogilva*), black teatfish (*Holothuria nobilis*), elephant's trunkfish (*Holothuria fuscopunctata*) and prickly redfish (*Thelanota ananas*).

At each site, two teams of divers each laid their transect line three times to count and measure sea cucumbers and pearl oysters, giving a total of 6 counts per site. Each transect was 50 m long (defined by the tape measure) and 5 m wide (defined by a 5 m length of rope with a small float in the middle connecting the two divers). Each team of divers consisted of one diver who counted and measured invertebrates and another diver who laid and retrieved the transect. Invertebrates were measured as described in the previous section. Animals outside the transect were also measured if time permitted.

### 2.3.3 Habitat Characteristics

During Surveys 2 and 3, an additional diver quantified the benthic characteristics of the substratum at each site. This diver recorded the proportion of substratum made up of live coral, rubble, sand, algae, coral type, etc along 20 m sections of each transect. All features below the transect to the width of the writing slate (i.e. approximately 30 cm) were recorded. These data were collected to allow a comparison of sites in terms of habitat, and to determine whether any variability in abundance of important invertebrates among sites was correlated with habitat differences.

## 2.4 Statistical Analysis of Data

### 2.4.1 Abundance of Invertebrates

The abundance of invertebrates was compared among various spatial scales over time using an asymmetrical analysis of variance (ANOVA)(see Winer *et al.* 1991, Underwood 1993). Within the overall study region, the spatial scales were defined as Groups, which included, the Arnavons, and the three reference areas of Waghena, Ysabel and Suavanao, Islands within each Group and Sites within each Group and Island. Sites were the individual places where transects were laid. Separate analyses were done for the shallow and deep habitats, because different species of invertebrates generally occurred in each habitat and different survey methods were used. The factors examined using statistical analysis are summarised as follows:

1. Times, which was considered orthogonal and random;
2. Groups, which was considered random and included a comparison of The Arnavon Islands vs the 3 reference Groups, which was asymmetrical, and orthogonal with respect to Times;

3. Islands (Groups), which was orthogonal to Times, nested within Groups and a random factor; and

4. Sites (Islands(Groups)), which was orthogonal to Times, nested within Groups and Islands and a random factor.

Using this statistical model, potential variability in the abundance of invertebrates was partitioned according to several spatial scales over time (Table 1). Broadly, there were four main effects in the model, including Time and variability at the three spatial scales considered - Groups, Islands and Sites. A significant effect of Time would be interpreted as indicating that broad-scale changes occurred independently of sites during the period before declaration of the MCA. Within these spatial scales the analysis was partitioned to provide a 1) comparison of the reference or control Groups amongst each other, and 2) a comparison of the reference Groups with the Arnavon Islands (i.e. the MCA). Where the latter was statistically significant, we would conclude that, for the species analysed, the Arnavons varied significantly from the reference groups to an extent greater than the reference groups varied among each other prior to declaration of the MCA. The same conclusion would be reached for significant comparisons of reference areas versus the MCA for the smaller spatial scales of Islands and Sites.

In addition to the main effects, there were three sets of interactions, each involving Time and one of the spatial scales examined (Table 1). Where these interactions were significant, we would conclude that there was significant variability among Groups, Islands or Sites, but that this variability was not consistent through time. Where the interaction of Time and MCA vs reference Groups was significant, we would conclude that, for the species being compared, there was relatively large variability among islands and/or sites within the MCA prior to declaration.

The analysis used 6 replicates (i.e. the counts of invertebrates made along transects). Prior to analysis, data were tested for heteroscedasticity using Cochran's Test (Winer *et al.* 1991) and transformed as required. If transformation failed to stabilise the variances, the untransformed data were analysed and the test was interpreted conservatively. Under the statistical model used, there was no direct test of the main effects of Groups or Islands. Pooling of non-significant interactions ($P \geq 0.25$) sometimes allowed a test of these effects (Winer *et al.* 1991) and this was done where possible. Data analysed included total abundance of invertebrates, number of species and abundance of selected species.

### 2.4.2 Size-frequency Distributions

The size range, mean size and standard error was calculated for each species of invertebrate measured. Sample sizes were generally small, however, and data were pooled among transects, sites, islands and survey times, allowing a broad comparison of groups. For those species where 50 or more individuals were measured from one Group, or 100 or more were measured from all Groups, size-frequency distributions were graphed. No statistical analysis of the size-frequency data was done. Rather, the results have been presented and interpreted graphically.

### 2.4.3 Habitat Characteristics

Multivariate analyses (using the PRIMER Program) were used to characterise habitats across spatial scales of interest. Dissimilarities were calculated using the Bray-Curtis index and data were transformed to the fourth root. Relationships were graphed using non-dimensional multidimensional scaling (MDS). Analysis of similarities (ANOSIM) was used to test for significant differences in habitat characteristics among Sites and/or Groups and, where significant, similarity percentages (SIMPER) analysis was used to identify those features of the habitat that contributed most to dissimilarities among Sites and/or Groups. Details of all these analyses are provided in Clark (1993).

Separate analyses were done for the shallow and deep habitats. A processing limitation in the PRIMER program meant that the entire set of data for each habitat could not be analysed simultaneously. To overcome this limitation, analysis was done at the spatial scales of Groups and Sites.

# 3. RESULTS

## 3.1 Invertebrates in the Shallow Habitat

### 3.1.1 Abundance of Invertebrates

Eighteen species of exploited invertebrates were recorded in the shallow habitat during the three surveys. The false trochus (*Pyramis tectus*) was also recorded (Table 2, Appendix 2). Of the 2021 individuals recorded, the most abundant group was the giant clams, which were represented by six species and made up 60% of all individuals. Among the giant clams, *Tridacna maxima* was the most abundant (39% of all individuals), followed by *T.crocea* (14%) and *T. derasa* and *Hippopus hippopus* (2% each). Ten species of sea cucumbers and 212 individuals were also recorded (Table 2, Appendix 2). Of these, *Bohadschia graeffei* was the most abundant (3% of all individuals), followed by *Holothuria atra* ( 3%) and *Stichopus chloronotus* (2%). The gastropod *Trochus niloticus* made up 5% of all individuals and the pearl oyster *Pinctada margaritifera*, with only 12 individuals, made up < 1% of all invertebrates recorded.

The total abundance of individuals varied little through time, with an average of 674 (SE = 12) invertebrates recorded per survey. Also, the numbers individual species showed little variation through time (Table 2). This suggests that, in the months before the declaration of the MCA, the abundance of exploited invertebrates was relatively constant. This general trend was supported by the statistical analyses described below.

ANOVA was used to examine 10 variables (Table 3, Figures 2-11, Appendix 3). Every variable showed statistically significant differences at the small spatial scale of Sites within Islands and Groups. Four variables showed significant differences at the largest scale (Groups), but no variable showed significant differences at the intermediate scale of Islands within Groups. None of the variables showed consistent significant variability across survey times. Rather, there was inconsistent variation through time among Groups and/or Sites for seven of the 10 variables (Table 3). Details of some of these analyses are set out below.

The mean number of all species of invertebrates showed inconsistent variation among sites through time. This is shown by a significant interaction between Time and Sites, and between Time and Sites within the Arnavon Islands (Table 3) and is illustrated in Figure 2 (e.g. see inconsistent variation among sites through time at Is4, in the Arnavon Islands). A similar result was obtained for the abundance of *Tridacna maxima* (Figure 5).

On the other hand, the mean abundance of sea cucumbers showed consistent differences among sites, independent of the survey time (Table 3, Figure 3). For example, at Ysabel, Site 17 at Is5 had consistently larger numbers of sea cucumbers than most other sites within that island group.

The boring clam (*Tridacna crocea*), and the porcelain clam (*Hippopus hippopus*), both showed site differences that were consistent through time, but they also showed differences among Groups that were not consistent through time. For *T. crocea*, this was due to a slight increase in abundance at the Reference Groups in Survey 2 followed by a decrease in Survey 3. At the Arnavons, however, the opposite occurred, with a slight decrease in Survey 2 and an increase in Survey 3 (Figures 5 and 8). This species is slow-growing and we would not expect a significant change in numbers during the times surveyed. The variability recorded may therefore be an artifact of the sampling. For *H. hippopus*, the numbers of individuals remained relatively constant at the reference Groups over the three surveys, but at the Arnavons, a decrease was observed through time (Figures 8 and 9).

The smooth clam *(Tridacna derasa)* showed consistent site differences and interactions between time and group and between time and the reference areas (Table 3). The abundance of *T.derasa* was very small, but relatively greater at Ysabel (Figure 6). The Figure suggests there may have been an interaction between Islands at Ysabel, but this comparison was not statistically significant (Appendix 3).

Trochus shell (*Trochus niloticus*) and orangefish (*Bohadschia graeffei*) both showed significant variability at the scale of Sites (Table 3, Figure 10). Abundance of trochus was generally small. They were most abundant at Suavanao where average counts occasionally exceeded one individual per transect (Figure 10). Lollyfish (*Holothuria atra*) varied among sites inconsistently through time (Table 3). In the shallow habitat, they tended to be most abundant at Site 17, at Ysabel, and the interaction is attributed to changes in the relative abundance of lollyfish at that site through time (Figure 11).

In summary, the abundances of exploited invertebrates in the shallow habitat were generally small among all the sites surveyed. There was often variability among Sites, some variability among Groups, but no significant variability among Islands was detected. In general, there was little variability in abundance through time in the period prior to the declaration of the MCA. The structure of variability found in populations before the MCA was declared suggests that we would have a good chance of statistically detecting a moderate increase in abundance of invertebrates within the MCA following a period of recovery from exploitation. This is discussed further in the Discussion (Section 4).

### 3.1.2 Size-frequency Distributions

Comparisons of size-frequency distributions among Groups were limited by the very large variability in sample sizes (Table 4). In most cases, the number of invertebrates measured was small, even though individuals outside the transects were measured to increase sample sizes. Where sample sizes were reasonable (e.g. $n > 50$), some differences among Groups in size-frequency distributions were apparent. Very few individuals were recorded from the smaller size intervals, probably reflecting either the cryptic nature of small juveniles or the presence of separate nursery habitats for non-sessile species. Four examples of species with relatively large sample sizes are shown in Figures 12 - 15 and discussed below.

Combined over all surveys, the size frequencies of *Tridacna maxima* were essentially unimodal (Figure 12). Graphs for each Group suggest that the sizes at Waghena were small compared to the other Groups. The modal size for Waghena was 16-20 cm, compared to 26-30 at the Arnavons and 21-25 at Ysabel. The mode for *T. maxima* at Suavanao was 16-20 cm, but there was a greater proportion of larger individuals there than at Waghena. The Coefficient of Variation (CV) ranged from about 28 - 41% (Table 4), indicating a moderate spread in the data across all size classes. Note also that the mean size of *T. maxima* tended to be larger at all Groups in Survey 1 than Surveys 2 and 3 (Table 4). This may be an artefact of the sampling procedures, as one observer (MLS) made a large proportion of the measurements in Survey 1, but none in the subsequent surveys (Appendix 2).

*Tridacna derasa* were not recorded at Waghena in any of the surveys and numbers at the Arnavons and Suavanao were very small (Figure 13). At Ysabel, individual sizes were spread widely over a large number of size intervals, with the modal size being 51-55 cm. During Survey 1 we observed extensive collecting of giant clams - particularly *T. derasa* and *T. gigas* - at Ysabel. In subsequent surveys, the numbers recorded declined, suggesting that the gathering may have significantly affected populations at Ysabel.

*Tridacna crocea* were abundant at several sites at Suavanao, moderately abundant at Waghena and Ysabel and rare at the Arnavons (Table 4, Figure 14). At Waghena, the modal size was 13 - 14 cm and at Ysabel it was 11 - 12 cm (Figure 14). At Suavanao, individuals measuring 7 - 12 cm were common. Sample sizes were too small at the Arnavons to evaluate (Figure 14).

*Trochus niloticus* were very rare at Waghena (only seven individuals) (Table 4, Figure 15). At the Arnavons, the modal size was 9 - 10 cm whereas at Suavanao, which had the most individuals, the mode was 11 - 12 cm. Two modes occurred at Ysabel, 9 -10 cm and 13 - 14 cm.

In summary, numbers of individuals measured were small, limiting our ability to compare sizes across times and spatial scales. We suspect that it will be relatively difficult to statistically detect an increase in the size of exploited invertebrates in the shallow habitat as a consequence of the MCA (see Discussion).

### 3.1.3 Habitat Characteristics

The shallow habitat was generally made up of rock pavement, rubble and sand, although the proportions of each of these components varied among Groups (Table 5). Rock was the predominant substratum type at Waghena, the Arnavons and Suavanao, comprising over 70% of the habitat within each Group. At Ysabel, rock comprised only 30% of the habitat, while coral rubble was the most common substratum type, comprising 38% of the habitat. Biological categories made up comparatively little of the habitat, with hard and soft corals and algae typically comprising < 5% of the substratum (Table 5).

ANOSIM indicated that there were significant differences in the shallow habitat between all Groups (Table 6). The MDS plot shows some separation of Groups, particularly for Ysabel, but the plot does not reflect the clear separation suggested by the ANOSIM (Figure 16). This is not surprising, given the relatively large number of sites used in the plot. The MDS was plotted in three dimensions to provide an acceptable level of stress for the plot (see Clark 1993).

SIMPER analysis identified those characteristics of the habitat that explained most of the dissimilarity between paired comparisons of Groups (Table 5, Appendix 4). Comparing the three largest discriminators of the shallow habitat at the Arnavons and Suavanao, the rubble character was the largest discriminator, occupying a relatively larger proportion of the substratum at the Arnavons. The percentage cover of soft coral (Suavanao > Arnavons) and sand (Arnavons > Suavanao) were the other important differences between the two Groups (Appendix 4). Comparing the Arnavons to Ysabel, sand was the greatest discriminator between these Groups (Ysabel > Arnavons), followed by rubble (Ysabel > Arnavons) and rock (Arnavons > Ysabel). Comparing the Arnavons to Waghena, sand was the largest discriminator (Arnavons > Waghena), followed by thin encrusting coral (Arnavons > Waghena) and rubble (Arnavons > Waghena). The data for percentage cover, and the analyses of these data, indicate that the shallow habitat is a complex mosaic of substrata, which differs to some extent among Sites and Groups within the region.

## 3.2 Invertebrates in the Deep Habitat

### 3.2.1 Abundance of Invertebrates

Fifteen species of exploited invertebrates were recorded in the deep habitat during the three surveys (Table 8). All but one of the 804 invertebrates recorded were sea cucumbers, the exception was a single goldlip pearl oyster (*Pinctada maxima*). Among the sea cucumbers, *Holothuria atra* was the most abundant (24% of all individuals), followed by *Thelanota anax* (22%) and *Holothuria fuscogilva* (17%). As in the shallow habitat, the total abundance of individuals varied little through time, with an average of 268 (SE = 10) invertebrates recorded per survey. Moreover, the numbers of many of the species showed little variation through time (Table 8) and this trend was supported by the statistical analyses described below.

ANOVA was used to compare the harvested invertebrates on the deep habitat for 8 variables, all involving sea cucumbers (Table 9, Figures 17-25). In contrast to the shallow habitat, most of the variables showed significant variation among Sites within Groups and Islands that did not vary significantly through time. Only one variable (species richness of sea cucumbers) showed a significant Time by Group (MCA vs reference groups) interaction, indicating that variation among Groups was inconsistent through time. The interaction was due to a slight increase in the number of sea cucumbers recorded during Survey 2 at the Arnavons, while the reference Groups showed a gradual decline over the three surveys (Figure 18). Apart from the previous example, none of the variables varied at the larger spatial scales of Groups or Islands, indicating that the numbers at the Arnavons, prior to the declaration of the MCA, were statistically similar to the reference areas which, in turn, were similar to each other (Table 4).

In summary, the abundances of exploited invertebrates in the deep habitat were generally small at all the sites surveyed. As in the shallow habitat, there was little variability in abundance through time in the period prior to the declaration of the MCA and so there is a good chance that we will be able to statistically detect a moderate increase in abundance of invertebrates within the MCA following a period of recovery from exploitation (see Discussion).

### 3.2.2 Size-frequency Distributions

As in the shallow habitat, comparisons of size-frequency distributions among Groups were limited by the large variability in sample sizes (Table 10). In general, size ranges were relatively narrow and unimodal. Several species of sea cucumbers showed trends in size-frequencies among Groups, but these must be interpreted cautiously due to the small sample sizes obtained. Four examples of species with relatively large sample sizes are shown in Figures 26 - 29 and discussed below.

The size-frequency distribution of amberfish (*Thelanota anax*) was similar at all areas (Figure 26) but estimated best at Waghena and Suavanao where sample sizes exceeded 100. At these two Groups of islands, most individuals were in the size range of 51 - 65 cm.

Sample sizes of lollyfish (*Holothuria atra*) were highly variable among Groups, with the most being measured at the Arnavons (124 individuals) and the least at Ysabel (9). The modal size was 46 - 50 cm at Waghena, the Arnavons and Suavanao, and 41 - 45 cm at Ysabel (Figure 27).

Sample sizes of elephants trunk fish (*Holothuria fuscopunctata*) were similar but relatively small among Groups (Figure 28). Size frequencies of this species at the Arnavons were similar to Ysabel (modal size 46 - 50 cm). The modal size at Waghena and Suavanao was mode 41 - 45 cm. The modal size of white teatfish (*Holothuria fuscogilva*), one of the most valuable sea cucumbers, was 41 - 45 cm at all Groups of islands, except at Waghena, where it was 36 - 40 cm (Figure 29).

### 3.2.3 Habitat Characteristics

Unlike the shallow habitat, the deep habitat was dominated by sand and rubble substrata, with rock comprising less than 7% of the habitat surveyed at all Groups (Table 11). This finding is due largely to the selection of the sampling sites, as we sought to maximise the habitat utilised by sea cucumbers. The percentage cover of sand ranged from 63% at Waghena to 83% at Suavanao and the cover of rubble ranged from 4% at Suavanao to 28% at Waghena (Table 11). Biological categories made up a small proportion of the habitat, with massive/brain corals and soft corals occurring on the rock substrata and algae occurring occasionally on the soft substrata.

ANOSIM did not detect any significant pairwise comparisons among Groups of islands, although there was a global difference among sites (Sites: Global R = 0.414, $P < 0.01$; Groups: Global R = 0.051, $P > 0.05$). Similarly, the MDS plot (in three dimensions) does not reveal any trends in habitat characteristics among Groups (Figure 30). Due to the non-significant ANOSIM, no SIMPER analysis was done.

# 4. DISCUSSION

## 4.1 Assessment of Stocks within the Study Region Compared to Studies in other Regions

The baseline information gathered in the vicinity of the Arnavon Islands indicates that the stocks of exploited invertebrates within the study region are relatively small compared to studies done elsewhere. Table 12 lists the range of densities across all study groups and survey times for selected species of invertebrates and the mean and maximum densities reported in the literature. Among the giant clams, *Tridacna maxima* was the most common species recorded among all study Groups. Their densities ranged from 98 (Suavanao, Survey 3) to 194 per hectare (Waghena, Survey 2). Munro (1993) reported densities of over 1,000 individuals per hectare in French Polynesia. Munro also reported average densities of *T. derasa* and *T. gigas* of around 5 ha$^{-1}$. In the present study, estimates of the density of these species ranged from 0 - 56 ha$^{-1}$ for *T. derasa* and 0 - 10 ha$^{-1}$ for *T. gigas*, with largest densities occurring at sites within the Ysabel Group. As noted in the previous section, there may have been a decline in the mean densities of *T. derasa* at Ysabel during the study due to gathering. Estimated densities at Ysabel ranged from 56 ha$^{-1}$ during Survey 1, to 21 and 15 ha$^{-1}$ during Surveys 2 and 3, respectively.

Densities of sea cucumbers were also low in the study region - often by orders of magnitude - compared to other studies (Table 12). For example, the greatest density of *Stichopus chloronotus* recorded during the study was 31 individuals ha$^{-1}$ at the Arnavons during Survey 1, whereas densities of over 4,000 individuals ha$^{-1}$ have been reported in the literature. Densities of *Holothuria fuscopunctata* ranged from 1.6 - 13.2 ha$^{-1}$ in the study region; Preston (1993) reported mean densities of 22 ha$^{-1}$ and maximum densities of up to 106 individuals ha$^{-1}$. One of the most valuable species of sea cucumber, *Holothuria fuscogilva* (white teatfish), was present in densities of up to 16 individuals ha$^{-1}$. This is comparable to mean densities reported by Preston (1993).

*Trochus niloticus* ranged in density from 4 to 38 individuals ha$^{-1}$ during the study. In contrast, densities reported within the literature tended to be much greater, with maximum densities of > 2,500 individuals ha$^{-1}$ reported (Table 12).

Whilst the stock densities of exploited invertebrates tended to be relatively small, the sizes of invertebrates do not generally appear to be small relative to other published accounts, and most of the individuals measured were adults. This conclusion should be treated cautiously, however, because small juveniles of several species are highly cryptic and can be overlooked even by experienced observers (Munro 1993). According to research summarised by Munro (1993), *Tridacna gigas* mature as males at 25 - 35 cm and as females at about 50 cm. During the present study, two individuals measured less than 20 cm, but most ranged from over 40 cm to 96 cm. Munro also reported that *T. maxima* and *T. squamosa* matured as males at 5 cm and as females at 6 - 8 cm and 15 cm, respectively. On this basis, all the *T. squamosa* recorded during our study were mature as females. Similarly, most of the *T. maxima* were also mature, with a large proportion of clams being relatively large individuals.

Comparisons of the lengths of sea cucumbers recorded during the study with published accounts of length at maturity indicate that most individuals were adults. Interestingly, *Holothuria atra* tended to be smaller in the shallow habitat than the deep habitat, which is consistent with reports that this species uses tropical shallow (particularly in lagoons) as nursery habitat (Harriott 1984). All the *H.*

*atra* measured from the deep habitat were larger than the reported length at first maturity of 16.5 cm (Preston 1993). According to Preston, *H. fuscopunctata* matures at 35 cm; in our study few individuals were ≤ 35 cm and the modal lengths were between 41 and 50 cm. As a final example, *H. fuscogilva* mature at 32 cm (Preston 1993) but most individuals we measured were ≥ 36 cm.

Nash (1993) reported that trochus mature as males at 5 - 8 cm and as females at 5 - 9 cm. In the Solomon Islands, only individuals in the size range 8 - 12 cm may be collected. On this basis, many of the trochus measured were adults above the minimum legal size. The maximum size of trochus ranges from 15 - 16.5 cm, although in some areas their growth may be stunted, with individuals growing to no more than 8.5 cm (Nash 1993). According to Nash, mean lengths of trochus at ages 2 and 3 years are 5.8 and 7.6 cm respectively. Thus, if the Marine Conservation Area is successful, we may observe distinct cohorts of trochus > 8 cm at the Arnavons but not the reference Groups during the surveys done three years following declaration of the MCA.

## 4.2 Patterns of Variability Observed in Exploited Invertebrates and Implications for Monitoring the Success of the MCA

This study was designed to assess variability in abundance and size of exploited invertebrates at a number of spatial scales through time. At this stage of the study, the sample sizes available for length frequency analysis are too small to provide an appropriate test of any but the largest spatial scale considered (i.e. Groups). Ultimately, the type of analysis used to assess the effect of the MCA on the lengths of invertebrates will depend on the sample sizes obtained in the next three years, and to a lesser extent on the shape of the distribution of size frequency plots (which will determine the most suitable tests to use). To date, many of the plots obtained are unimodal and we may be able to use ANOVA (subject particularly to the assumption of normality) to compare the sizes of invertebrates among Groups over time in a before-and-after contrast. Alternatively, we may obtain sufficient data to compare numbers of biologically meaningful cohorts through time (e.g. > 8 cm trochus, see previous sub-section).

On the other hand, the data obtained on the abundance of invertebrates fits well within the structure of the original study design, which will be expanded to incorporate the data to be collected in the next three years. Power analyses done on a simpler model as part of the Pilot investigations suggested that the sampling design used for the main study would have sufficient statistical power to detect a realistic increase in abundance of invertebrates at the MCA compared to three reference Groups (Lincoln Smith 1994). Power analyses have not been done on the more complex design using the data for the first three surveys, but we expect that the study will be able to provide a very sound test of the ability of the MCA to facilitate an increase in the abundance of invertebrates, given: 1) the small abundances reported prior to declaration of the MCA compared to published accounts in other areas; 2) the similar levels of variability at the Arnavons compared to the reference Groups; and 3) the very sensitive test (i.e. many degrees of freedom) that will be used in assessing the effects of the MCA.

Table 1 described the factors compared statistically for the three surveys done prior to the declaration of the MCA. These comparisons were essentially the "Before" components utilised in monitoring environmental impact assessment and now often referred to as the Beyond BACI design (Underwood 1993). Table 13 describes the factors that will be compared once the data have been obtained for the three surveys to be done after declaration of the MCA. This final set of comparisons incorporates the "Before" and "After" component of the Beyond BACI design and will be used to assess whether the MCA has significantly greater numbers of exploited invertebrates than other Sites, Islands and/or Groups within the study region.

Of the 20 terms examined in our Beyond BACI design, any one of six factors could indicate a significant effect due to the MCA (Table 13). The first factor indicating a significant effect of the MCA is the interaction between the Before and After contrast against impact versus reference Groups (i.e. the BA x IC term in Table 13). In other words, if this factor is significant the relationship between the MCA and the reference Groups before declaration would be different to the relationship after declaration. These are the largest spatial and temporal scales considered within the model and, if significant, we would conclude that an average effect occurred throughout the MCA over the three surveys done before and after declaration of the MCA. The next two terms (BA x Is(G(I)) and BA x S(Is(G(I)))) would indicate significant effects of the MCA, but at smaller spatial scales. A significant BA x Is(G(I)) term (Table 13) would occur, for example, if there was an increase in abundance of an invertebrate species at, say, Sikopo Island, relative to Kerehikapa and the islands within the reference Groups.

The last three terms that could indicate an effect due to the MCA, include interactions between each of the spatial factors and times nested within the Before and After contrast (T(aft) x IC; T(aft) x Is(G(I)); T(aft) x S(Is(G(I))) - see Table 13). Any one of these terms would be interpreted as indicating that the MCA had a relatively short term effect on the abundance of invertebrates at the spatial scale being considered. For example, it is plausible that a short term effect may be detected as a result of a poaching incident occurring within the MCA between two of the post-declaration surveys. It is also plausible that the effect of the MCA does not become apparent until the very end of the study, when a significant effect is detected only in the sixth survey. Either of these examples could explain significant "short-term" effects of the MCA. If the T(Aft) x IC interaction was significant, we would conclude that abundances at the scale of the whole MCA varied significantly from the reference Groups after the declaration <u>and</u> that this variation was greater than any differences that had been recorded prior to declaration. Note here that we need to satisfy conditions about spatial relationships before and after declaration of the MCA (Table 13). The same approach is adopted in regard to variation at the scales of Islands and Sites.

## 4.3 Potential Consequences of Variation in Habitat Characteristics for the Study

As reviewed in the Introduction to this report, Beyond BACI procedures were designed to assess the effects of human activities or developments, such as discharge of pollutants, construction of marinas, etc on the aquatic environment. In these situations, the sampling done before the development establishes the relationship between the putatively impacted site(s) and reference sites before any impact occurs. Thus, this relationship is established in the absence of the impact. In the present study, the relationship between the MCA and the reference groups has been established in the presence of a human activity (i.e. fishing) and the Beyond BACI framework will be used to assess variability at different spatial scales when the impact of fishing is removed from the MCA.

One of the crucial assumptions of the study is that the conditions within the MCA would be suitable to support more and/or larger invertebrates than occur there now in the absence of exploitation. The ability of the MCA to support exploited invertebrates depends on numerous factors, such as larval supply, and the characteristics of the habitat. We have no information on the hydrodynamic conditions of the study region, but, given the close proximity of the Arnavons to other reef systems, we expect that there would be adequate supply of larvae to the Group. Moreover, there is some indirect evidence to suggest relatively homogeneous populations of giant clams throughout Solomon Islands, based on analysis of genetic characteristics of *Tridacna gigas* obtained from sites throughout the country, including Santa Ysabel (Benzie and Williams 1995).

The survey of habitat characteristics provides a measure of differences among Sites and Groups throughout the study region. Existing information is limited on the extent to which the invertebrates of interest may be affected by habitat. The most informative example is for trochus. Studies on this species suggest that juveniles recruit to intertidal areas and that they move into deep water as they grow (Nash 1993). However, it has also been found that adult trochus can occupy a variety of habitats, including intertidal areas, shallow reef terrace and reef extending as deep as 25 m (Nash 1993; Nash pers. comm.). Long *et al.* (1993) quantified abundances of trochus in relation to habitat on reefs in the Torres Strait. They found that densities on algal pavement, mixed rubble/algal pavement and rubble zone were statistically similar (density range: 445 - 590 trochus.ha$^{-1}$) and greater than on two categories of macroalgae and sand (range: 0 - 85.8 trochus.ha$^{-1}$). There was one habitat - coral garden - with intermediate densities (242 trochus.ha$^{-1}$) that did not differ significantly from either of the other two groups of habitats.

Given the small densities of trochus and other exploited invertebrates, it is not realistic to define the relationships between density (or size) and habitat using the data collected prior to declaration of the MCA. Our knowledge of the habitat structure at each spatial scale, however, may help to explain some of the patterns of variation seen after the MCA has been in effect for three years.

## 4.4 Recommendations and Conclusions

The selection of sampling sites and the sampling methods that have been developed should be continued during future surveys. The logistics, including the use of the Fisheries vessel "Daula", surveys by Solomon Islands fisheries officers and the MCA wardens, and the co-ordination provided by ICLARM have all proved very effective and should be maintained to ensure the continued success of the study.

In addition to the three surveys planned for 1998, we strongly recommended that one interim survey be done each in 1996 and 1997. These surveys would have the following benefits: 1) they will provide an indication of trends in the stocks of invertebrates at the MCA and reference Groups; 2) they will provide information that could assist with the ongoing management of the MCA; 3) they will provide some "insurance" in the event that some unexpected disturbance occurs just prior to the 1998 surveys (e.g. a cyclone, poaching within the MCA, etc); and 4) they will help to maintain the interest of local communities and MCA wardens in the project.

In conclusion, the research done for this project has contributed to achieving the original study aims by developing survey procedures, selecting sampling sites and obtaining a quantitative baseline of abundance and size of exploited invertebrates at the Arnavon Islands and reference Groups prior to the declaration of the MCA. We have also gathered and analysed data on the physical characteristics of both the shallow and deep habitat and this information may be useful for interpreting the final results of the study. In addition, a procedure for analysing the data upon completion of the study has been formulated which will allow us to examine, using a single test, all the abundance data for each variable considered. The interim sampling proposed annually over the next two years will have a number of direct and indirect benefit on the study. Finally, given the relevance of this research to scientific understanding of conservation and management of aquatic fauna, dissemination of the findings of the study to the Management Committee of the MCA and to the scientific community, should be given a high priority.

# 6. ACKNOWLEDGMENTS

The success of this study so far has been due to the contribution of a large number of organisations and individuals. The study has been funded through the Great Barrier Reef Marine Park Authority (GBRMPA) by the Australian Centre for International Agricultural Research (ACIAR). The International Centre for Living Aquatic Resources Management (ICLARM) has co-ordinated the study, the Nature Conservancy (TNC), Solomon Islands Ministry of Agriculture and Fisheries (Fisheries Division) and Solomon Islands Ministry for Forests, Environment and Conservation have provided logistical support. Dr Bruce Mapstone from James Cook University has provided statistical advice. The Ecology Lab Pty Ltd provided computer facilities and technical support.

Individuals who assisted the authors at numerous stages of the study include R. Kenchington (GBRMPA), B. Mapstone (JCU) and B. Smith (ACIAR) for review and comment; M. Gervis, Idris Lane and other staff at the ICLARM Coastal Aquaculture Centre for logistical co-ordination of the field studies; E. Mayer and M. Orr (TNC) for liaison with communities affected by the MCA and P. Holthus (TNC) for assistance in the field during the pilot study and the second survey and collection of data on habitat characteristics; N. Kile and P. Ramohia (Fisheries Division) for undertaking the majority of the data-gathering and the crew of the M.V. Daula (Fisheries Division) for operating the work platform during field studies; and the MCA wardens for their assistance with surveys. In addition, we thank S. Connell, K. Astles, L. Howitt and K. Dempsey who assisted with data entry, statistical analysis and preparation of figures for this report; and the many local residents within the study region, who have enthusiastically embraced the concept of the MCA and have allowed members of the study team to stay in their villages or camp on their islands.

# 7. REFERENCES

Ballantine, B. (1991). *Marine Reserves for New Zealand.* University of Auckland, Auckland, NZ, 196 pp.

Benzie, J.A.H. and Williams, S.T. (1995). Gene flow among giant clams (*Tridacna gigas*) populations in Pacific does not parallel ocean circulation. *Marine Biology, 123: 781-787.*

Bergin, T. (1993). Marine and estaurine protected areas: where did Australia go wrong? In *Protection of marine and estuarine areas - a challenge for all Australians. Proceedings of the fourth Fenner conference on the environment,* Canberra, 9-11 October 1991. Ivanovic, A.M., Tarte, D. and Olson, M. (eds). Occassional Paper No. 4. Australian Committee for

IUCN, Sydney.

Bernstein, B.B. and Zalinski, J. (1983). An optimum sampling design and power tests for environmental biologists. *Journal of Environmental Management*, 16: 335-343.

Bohnsack, J.A. (1993). Marine reserves - they enhance fisheries, reduce conflicts and protect resources. *Oceanus 36:63-72.*

Carr, M.H., and Reed, D.C. (1993). Conceptual issues relevant to marine harvest refuges - examples from temperate reef fishes. *Canadian Journal of Fisheries Aquatic Science, 50: 2019-2028.*

Clarke, K.R. (1993). Non-parametric multivariate analyses of change in community structure. *Australain Journal of Ecology, 18:117-143.*

Cole, R.G., Ayling, T.M. and Creese, R.G. (1990). Effects of marine reserve protection at Goat Island northern New Zealand. *New Zealand Journal of Marine and Freshwater Research, 24:197-210.*

Demartini, E.E. (1993). Modeling the potential of fishery reserves for managing Pacific coral reef fishes. *Fisheries Bulletin, 91: 414-427.*

Dugan, J.E., and Davis, G.E. (1993). Applications of marine refugia to coastal fisheries management. *Canadian Journal of Fisheries Aquatic Science, 50: 2029-2042.*

Ferreira, B.P. and Russ, G.R. (1995). Population structure of the leopard coralgrouper, *Plectropomus leopardus,* on the fished and unfished reefs off Townsville, Central Great Barrier Reef, Australia. *Fishery Bulletin, 93:629-642.*

Green, R.H. (1979). *Sampling Design and Statistical Methods for Environmental Biologists.* Wiley, Chichester.

Harriott, V.J. (1984). Census techniques, distribution, abundance and processing of large sea-cucumber species (Echinodermata: Holothuroidea) on the Great Barrier Reef. Report to GBRMPA, June 1984. 39 pages.

Heslinga, G.A., Orak, O. and Ngiramengior, M. (1984). Coral reef sanctuaries for *Trochus* shells. *Marine Fisheries Review, 46: 169-172.*

Holland, A. (1994). The Sea cucumbers industry in the Solomon Islands: recent trends and suggestions for management. *SPC Sea cucumbers Information Bulletin,* 6: 2-9.

Hurlbert, S.H. (1984). Pseudoreplication and the design of ecological field experiments. *Ecological Monographs,* 54: 187-211.

Ivanovic, A.M., Tarte, D. and Olson, M. (eds) (1993). *Protection of marine and estuarine areas - a challenge for all Australians. Proceedings of the fourth Fenner conference on the environment,* Canberra, 9-11 October 1991. Occassional Paper No. 4. Australian Committee for IUCN, Sydney.

Kenchington, R., and Bleakley, C. (1994). Identifying priorities for marine protected areas in the insular pacific. *Marine Pollution Bulletin, 29: 3-9.*

Lincoln Smith M.P. (1994). *Testing the Use of Marine Protected Areas to Restore and Manage Tropical Multispecies Invertebrate Fisheries at the Arnavon Islands, Solomon Islands.* Report on Pilot Investigations. Unpublished report to the Great Barrier Reef Marine Park Authority, Canberra, pp 24 plus appendices.

Lincoln Smith, M.P., Skilleter, G.A. and Underwood, A.J. (1995). Cocos (Keeling) Islands: managing the harvesting of marine organisms. In *Recent Advances in Marine Science and Technology '94.* Bellwood, O., Choat, H. and Saxena, N. (eds). Pacon International and James Cook University of North Queensland, pp.605-613.

Long, B.G., Poiner, I. R. and Harris, A.N.M. (1993). Method of estimating the standing stock of *Trochus niloticus* incorporating Landsat satellite data, with application to the trochus resources of the Bourke Isles, Torres Strait, Australia. *Marine Biology,* 115: 587-593.

McClanahan, T.R.; Nugues, M., and Mwachireya, S. (1994). Fish and sea urchin herbivory and competition in Kenyan Coral Reef Lagoons: the role of reef management. *Journal experimental marine Biology and Ecology, 184:237-254.*

McClanahan, T.R. and Obura, D. (1994) Status of Kenyan coral reefs. *Coastal Management, 23: 57-76.*

Mohamed-Pauzi, A. Mohd.-Adib, H., Ahmad, A and Abdul-Aziz, Y. (1994). A preliminary survey of giant clams research in Malaysia. *Proceedings of Fisheries Research Conference, DOF, Mal., IV: 481-487.*

✓ Munro, J.L. (1993). Giant clams. pp 431-450 in, A. Wright and L. Hill (eds), *Nearshore Marine Resources of the South Pacific.* Institute of Pacific Studies, Suva, Forum Fisheries Agency, Honiara and International Centre for Ocean Development, Canada.

Nash, W.J. (1993). Trochus. pp 451-498 in, A. Wright and L. Hill (eds), *Nearshore Marine Resources of the South Pacific.* Institute of Pacific Studies, Suva, Forum Fisheries Agency, Honiara and International Centre for Ocean Development Canada.

Nash, W.J., Tuara, P., Terekia, O., Munro, D., Amos, M., Leqata, J., Mataiti, N., Teopa, M., Whitford, J. and Adams, T. (1995). *The Aitutaki trochus fishery: a case study.* Inshore Fisheries Research Project Technical Document No. 9, pp72.

Preston, G.L. (1993). Beche-de-Mer. pp 371-408 in, A. Wright and L. Hill (eds), *Nearshore Marine Resources of the South Pacific.* Institute of Pacific Studies, Suva, Forum Fisheries Agency, Honiara and International Centre for Ocean Development, Canada.

Quinn, J.F.; Wing, S.R., and Botsford, L.W. (1993). Harvest refugia in marine invertebrate fisheries: models and applications to the red sea urchin, *Strongylocentrotus franciscanus. American Zoologist, 33: 537-550.*

Ramohia, P.C. and Tiroba, G. (1993). The status of sedentary marine resources in the Arnavon Group. A report on a survey carried out between 12-26 April, 1993. *Report to The Nature Conversancy. 15 pages + appendices.*

Richards, A.H.; Bell, L.J., and Bell, J.D. (1994). Inshore fisheries resources of Solomon Islands. *Marine Pollution Bulletin 29: 90-98.*

Roberts, C.M. (1995). Rapid build up of fish biomass in a Caribbean marine reserve. *Conservation Biology, 9: 815-826.*

Roberts, C.M and Polunin, N.V.C., (1991) Are marine reserves effective in management of reef fisheries ?. *Reviews in Fish Biology and Fisheries, 1:65-91.*

Roberts, C.M and Polunin, N.V.C., (1993) Marine reserves: simple solutions to managing complex fisheries? *Ambio, 22: 363-368.*

Russ, G.R. (1991). Coral reef fisheries: effects and yeilds. In *The Ecology of Fishes on Coral Reefs.* Sale, P.F. (ed) Academic Press, San Diego, USA, 754 pp.

Russ, G.R. and Alcala, A.C. (1989). Effects of intense fishing pressure on an assemblage of coral reef fisheries. *Marine Ecology Progress Series, 56: 13-27.*

Sale, P. F. (1991). *The Ecology of Fishes on Coral Reefs.* Academic Press, San Diego, USA, 754 pp.

Stewart-Oaten, A., Murdoch, W.M. and Parker, K.R. (1986). Environmental impact assessment: Pseudoreplication in time? *Ecology,* 67: 929-940.

Tsutsui, I and Sigrah, R. (1994). Natural broodstock resources in Kosrae, Federated States of Micronesia. *SPC Trochus Information Bulletin, 3: 9-11.*

Watson, M., and Ormond, R.F.G. (1994). Effect of an artisanal fishery on the fish and urchin populations of a Kenyan coral reef. *Marine Ecology Progress Series 109: 115-129.*

Wright, A., and Hill, L.E.). (1993). *Nearshore marine Resources of the South Pacific.* Institute of Pacific Studies, Suva, 710 pp.

Underwood, A.J. (1991). Experimental designs for detecting human environmental impacts on temporal variations in natural populations. *Australian Journal of marine and freshwater Research, 42: 569-587.*

Underwood, A.J. (1993). The mechanics of spatially replicated sampling programmes to detect environmental impacts in a variable world. *Australian Journal of Ecology,* 18: 99-118.

Winer, B. J., Brown, D.R. and Michels, K.M. (1991). *Statistical Principles in Experimental Design, 3rd Edition.* McGraw-Hill, New York.

# TABLES

Table 1. Summary of Beyond BACI for before survey with explanation of implications for the MCA. ns = non-significant ($p > 0.05$), sig = significant ($p < 0.05$)

| Source of Variance | | Df | | F - Ratio denominator | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | I | II (If I is ns) | III (If I is sig) | Interpretation if sig. | Implications for MCA |
| Times | | 2 | | T x G | | | * Universal change at one or more times in both MCA and reference groups. | Natural variation exits through time prior to MCA declaration & is consistent among groups |
| Groups | | 3 | | | | | | |
| | Among C | | 2 | T x G' | | | * Reference groups differ from each other independently of time | Natural variation exits among references groups prior to MCA declaration |
| | I vs C [=IC] | | 1 | | T x G' | Among C | * MCA groups are different from reference groups irrespective of time | Natural variation exits among MCA groups prior to MCA declaration |
| Islands(G) | | 4 | | | | | | |
| | Is(G(C)) | | 3 | T x Is(G)'<br>or<br>Sites (Is(G))' | | | * Reference islands differ from each other independently of time | Natural variation exits among references islands prior to MCA declaration |
| | Is(G(I)) | | 1 | | T x Is(G)'<br>or<br>Sites (Is(G))' | Is(G(C)) | * MCA islands are different from reference islands irrespective of time | Natural variation exits among MCA islands prior to MCA declaration |
| Sites(Is(G)) | | 24 | | | | | | |
| | S(Is(G(C))) | | 18 | T x S(Is(G)) | | | * Reference sites differ from each other independently of time | Natural variation exits among references sites prior to MCA declaration |
| | S(Is(G(I))) | | 6 | | T x S(Is(G)) | S(Is(G(I))) | * MCA sites are different from reference sites irrespective of time | Natural variation exits among MCA sites prior to MCA declaration |
| T x G | | 6 | | | | | | |
| | T xG(C) | | 4 | T x Is(G) | | | Either no short term temporal change among reference groups or significant short term temporal change among reference groups. | Natural short term changes in the abundances of species at the scale of groups exits prior to MCA declaration. |

Table 1, continued

| Source of Variance | | Df | | F - Ratio denominator | | | Interpretation if sig. | Implications for MCA |
|---|---|---|---|---|---|---|---|---|
| | | | | I | II (If I is ns) | III (If I is sig) | | |
| | T xG(I) | | 2 | | T x Is(G) | T xG(C) | Short term changes among MCA groups that is different from the short term changes among reference groups. | MCA and reference groups follow different time courses to each other prior to MCA declaration |
| T x Is(G) | | 8 | | | | | | |
| | T x Is(G(C)) | | 6 | T x S(Is(G)) | | | Either no short term temporal change among reference islands or significant short term temporal change among reference islands. | Natural short term changes in the abundances of species at the scale of islands exits prior to MCA declaration. |
| | T x Is(G(I)) | | 2 | | T x S(Is(G)) | T x Is(G(C)) | Short term changes among MCA islands that is different from the short term changes among reference islands. | MCA and reference islands follow different time courses to each other prior to MCA declaration |
| T x S(Is(G)) | | 48 | | | | | | |
| | T x S(Is(G(C))) | | 36 | Residual | | | Either no short term temporal change among reference sites or significant short term temporal change among reference sites. | Natural short term changes in the abundances of species at the scale of sites exits prior to MCA declaration. |
| | T x S(Is(G(I))) | | 12 | | Residual | T x S(Is(G(C))) | Short term changes among MCA sites that is different from the short term changes among reference sites. | MCA and reference sites follow different time courses to each other prior to MCA declaration |
| Residual | | 480 | | | | | | |
| Total | | 575 | | | | | | |

I = Impact
C = Control
$n=6$

# after post hoc elimination of ns terms (p>0.25)

* This is only valid if there are no short term temporal changes at any of the spatial scales

Table 2. Summary of abundance data for the shallow habitat - Islands and Sites pooled within areas ($n$ =48), Mean number per 100 m$^2$ transect. * indicates identification uncertain.

| | | Species | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna squamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chlorontus* | *Bohadschia graeffei* | *Bohadschi argus* | *Holothuria atra* | *Actinopyga mauritaniana* | Brown stonefish* | *Thelanota anax* | *Actinopyga milaris* | *Thelanota ananas* | *Holothuria nobilis* | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | **Total** |
| **Survey 1** | | | | | | | | | | | | | | | | | | | | | |
| Waghena | Mean | **1.40** | **0.02** | **0.00** | **0.04** | **0.13** | **0.00** | **0.00** | **0.13** | **0.00** | **0.00** | **0.02** | **0.02** | **0.00** | **0.00** | **0.00** | **0.00** | **0.75** | **0.04** | **0.02** | **2.56** |
| | SE | 0.24 | 0.02 | 0.00 | 0.03 | 0.06 | 0.00 | 0.00 | 0.07 | 0.00 | 0.00 | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.14 | 0.04 | 0.02 | 0.31 |
| Arnavons | Mean | **1.33** | **0.00** | **0.00** | **0.02** | **0.04** | **0.17** | **0.31** | **0.15** | **0.06** | **0.04** | **0.17** | **0.02** | **0.00** | **0.00** | **0.00** | **0.00** | **0.88** | **0.15** | **0.02** | **3.35** |
| | SE | 0.23 | 0.00 | 0.00 | 0.02 | 0.03 | 0.07 | 0.11 | 0.06 | 0.04 | 0.03 | 0.05 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.16 | 0.05 | 0.02 | 0.39 |
| Ysabel | Mean | **1.38** | **0.10** | **0.56** | **0.13** | **0.15** | **0.23** | **0.17** | **0.17** | **0.06** | **0.15** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **1.08** | **0.08** | **0.02** | **4.27** |
| | SE | 0.24 | 0.04 | 0.14 | 0.06 | 0.06 | 0.07 | 0.06 | 0.07 | 0.04 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.21 | 0.05 | 0.02 | 0.31 |
| Suavanao | Mean | **1.13** | **0.00** | **0.02** | **0.02** | **1.17** | **0.02** | **0.00** | **0.06** | **0.00** | **0.02** | **0.02** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.77** | **0.32** | **0.00** | **3.54** |
| | SE | 0.21 | 0.00 | 0.02 | 0.02 | 0.60 | 0.02 | 0.00 | 0.04 | 0.00 | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.15 | 0.10 | 0.00 | 0.70 |
| | Total number | 251 | 6 | 28 | 10 | 71 | 20 | 23 | 24 | 6 | 10 | 10 | 2 | 0 | 0 | 0 | 0 | 167 | 28 | 3 | 659 |
| **Survey 2** | | | | | | | | | | | | | | | | | | | | | |
| Waghena | Mean | **1.94** | **0.00** | **0.00** | **0.06** | **0.25** | **0.00** | **0.04** | **0.06** | **0.00** | **0.00** | **0.02** | **0.02** | **0.02** | **0.00** | **0.00** | **0.00** | **0.56** | **0.02** | **0.00** | **3.00** |
| | SE | 0.28 | 0.00 | 0.00 | 0.04 | 0.10 | 0.00 | 0.04 | 0.05 | 0.00 | 0.00 | 0.02 | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | 0.14 | 0.02 | 0.00 | 0.34 |
| Arnavons | Mean | **1.31** | **0.02** | **0.02** | **0.00** | **0.00** | **0.08** | **0.10** | **0.08** | **0.00** | **0.06** | **0.10** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.73** | **0.06** | **0.00** | **2.58** |
| | SE | 0.23 | 0.02 | 0.02 | 0.00 | 0.00 | 0.04 | 0.04 | 0.05 | 0.00 | 0.04 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.12 | 0.04 | 0.00 | 0.32 |
| Ysabel | Mean | **1.31** | **0.04** | **0.21** | **0.06** | **0.40** | **0.23** | **0.17** | **0.17** | **0.00** | **0.42** | **0.06** | **0.02** | **0.02** | **0.00** | **0.00** | **0.00** | **1.13** | **0.19** | **0.06** | **4.48** |
| | SE | 0.16 | 0.03 | 0.07 | 0.04 | 0.09 | 0.08 | 0.08 | 0.08 | 0.00 | 0.16 | 0.05 | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | 0.21 | 0.06 | 0.04 | 0.38 |
| Suavanao | Mean | **1.31** | **0.00** | **0.00** | **0.06** | **1.75** | **0.04** | **0.00** | **0.04** | **0.00** | **0.00** | **0.04** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.85** | **0.38** | **0.00** | **4.48** |
| | SE | 0.20 | 0.00 | 0.00 | 0.04 | 0.79 | 0.03 | 0.00 | 0.03 | 0.00 | 0.00 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.16 | 0.10 | 0.00 | 0.92 |
| | Total number | 282 | 3 | 11 | 9 | 115 | 17 | 15 | 17 | 0 | 23 | 11 | 2 | 2 | 0 | 0 | 0 | 157 | 31 | 3 | 698 |

Table 2, continued

| | | Species | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna squamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chlorontus* | *Bohadschia graeffei* | *Bohadschi argus* | *Holothuria atra* | *Actinopyga mauritaniana* | Brown stonefish* | *Thelanota anax* | *Actinopyga milaris* | *Thelanota ananas* | *Holothuria nobilis* | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | Total |
| **Survey 3** | | | | | | | | | | | | | | | | | | | | | |
| Waghena | Mean | **1.44** | **0.02** | **0.00** | **0.04** | **0.25** | **0.00** | **0.02** | **0.08** | **0.00** | **0.04** | **0.04** | **0.00** | **0.02** | **0.02** | **0.02** | **0.02** | **0.65** | **0.04** | **0.09** | **2.90** |
| | SE | 0.19 | 0.02 | 0.00 | 0.03 | 0.12 | 0.00 | 0.02 | 0.05 | 0.00 | 0.03 | 0.03 | 0.00 | 0.02 | 0.02 | 0.02 | 0.02 | 0.11 | 0.03 | 0.04 | 0.28 |
| Arnavons | Mean | **1.43** | **0.00** | **0.04** | **0.06** | **0.10** | **0.02** | **0.06** | **0.15** | **0.02** | **0.02** | **0.04** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **1.25** | **0.23** | **0.02** | **3.52** |
| | SE | 0.23 | 0.00 | 0.03 | 0.04 | 0.04 | 0.02 | 0.05 | 0.08 | 0.02 | 0.02 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.28 | 0.07 | 0.02 | 0.44 |
| Ysabel | Mean | **1.69** | **0.06** | **0.15** | **0.13** | **0.58** | **0.19** | **0.13** | **0.13** | **0.04** | **0.35** | **0.02** | **0.02** | **0.00** | **0.00** | **0.00** | **0.00** | **0.83** | **0.08** | **0.02** | **4.94** |
| | SE | 0.16 | 0.04 | 0.07 | 0.06 | 0.19 | 0.08 | 0.07 | 0.06 | 0.03 | 0.12 | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.14 | 0.04 | 0.02 | 0.44 |
| Suavanao | Mean | **0.98** | **0.00** | **0.00** | **0.00** | 1.04 | **0.02** | **0.00** | **0.02** | **0.00** | **0.02** | **0.13** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.67** | **0.35** | **0.00** | **3.46** |
| | SE | 0.15 | 0.00 | 0.00 | 0.00 | 0.54 | 0.02 | 0.00 | 0.02 | 0.00 | 0.02 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.13 | 0.09 | 0.00 | 0.63 |
| | Total number | 263 | 4 | 9 | 11 | 95 | 11 | 10 | 18 | 3 | 21 | 11 | 1 | 1 | 1 | 1 | 1 | 163 | 34 | 6 | 664 |

Table 3. Summary of asymmetrical ANOVAs for derived and individual species of invertebrates in the shallow habitat.
Tests of a number of terms were not possible in the original model. See Appendix 3 for more details of the ANOVAs. I = Impact (i.e. MCA), C = Control.

| Source of variation | Total number species | Total abundance sea cucumbers | Total abundance giant clams | *Tridacna maxima* | *Tridacna derasa* | *Tridacna crocea* | *Hippopus hippopus* | *Bohadschia graeffei* | *Holothuria atra* | *Trochus niloticus* |
|---|---|---|---|---|---|---|---|---|---|---|
| Transformation | none | log | none | log | none | none | none | none | none | none |
| Time | ns | ns | ns | ns | ns | ns | ns | ns | ns | ns |
| Among Groups | No Test | No Test | No Test | No Test | No Test | No Test | No Test | No Test | No Test | No Test |
| I vs C | No Test | No Test | No Test | No Test | No Test | No Test | No Test | No Test | No Test | No Test |
| Among C | No Test | No Test | No Test | No Test | No Test | No Test | No Test | No Test | No Test | No Test |
| Islands (G) | No Test | No Test | No Test | No Test | No Test | No Test | No Test | No Test | No Test | No Test |
| Is(G(C)) | No Test | No Test | No Test | No Test | No Test | No Test | No Test | No Test | No Test | No Test |
| Is(G(I)) | No Test | No Test | No Test | No Test | No Test | No Test | No Test | No Test | No Test | No Test |
| Sites(Is(G)) | ** | ** | * | * | * | * | * | * | * | * |
| S(Is(G(C))) | ** | ** | * | * | * | * | * | * | * | * |
| S(Is(G(I))) | ns | ns | ns | * | ns | * | ns | ns | ns | ns |
| T x Among Groups | ns | ns | ns | ns | * | ns | ns | ns | ns | ns |
| T x I vs C | ns | ns | ns | ns | ns | * | * | ns | ns | ns |
| T x Among C | ns | ns | ns | ns | * | ns | ns | ns | ns | ns |
| T x Islands (G) | ns | ns | ns | ns | ns | ns | ns | ns | ns | ns |
| T x Is(G(C)) | ns | ns | ns | ns | ns | ns | ns | ns | ns | ns |
| T x Is(G(I)) | ns | ns | ns | ns | ns | ns | ns | ns | ns | ns |
| T x Sites(Is(G)) | ** | ns | * | ns | ns | ns | ns | ns | * | ns |
| T x S(Is(G(C))) | ns | ns | * | ns | ns | ns | ns | ns | * | ns |
| T x S(Is(G(I))) | ** | ns | ns | * | ns | ns | ns | ns | ns | ns |
| Residual | | | | | | | | | | |

Table 4. Summary of length frequency data for the shallow habitat. Coefficient of variation, cv = standard deviation / mean.

| | | Species | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna squamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chlorontus* | *Bohadschia graeffei* | *Bohadschi argus* | *Holothuria atra* | *Actinopyga mauritiana* | Brown stonefish* | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | *Thelanota anax* | *Thelanota ananas* | *Actinopyga milaris* | *Holothuria nobilis* |
| **Survey 1** | | | | | | | | | | | | | | | | | | | | |
| Waghena | Number | 74 | 1 | 0 | 2 | 15 | 0 | 0 | 10 | 0 | 0 | 2 | 1 | 0 | 3 | 1 | 0 | 0 | 0 | 0 |
| | Min | 4.50 | 44.50 | | 13.00 | 5.50 | | | 31.50 | | | 26.50 | 33.00 | | 10.50 | 11.50 | | | | |
| | Max | 50.00 | 44.50 | | 18.00 | 15.00 | | | 43.00 | | | 28.00 | 33.00 | | 12.50 | 11.50 | | | | |
| | Mean | 19.08 | | | 15.50 | 10.47 | | | 35.70 | | | 27.25 | | | 11.50 | | | | | |
| | SE | 0.92 | | | 2.50 | 0.69 | | | 1.11 | | | 0.75 | | | 0.58 | | | | | |
| | CV | 41.38 | | | 22.81 | 25.56 | | | 9.80 | | | 3.89 | | | 8.70 | | | | | |
| Arnavons | Number | 51 | 0 | 3 | 1 | 1 | 3 | 17 | 4 | 1 | 18 | 9 | 1 | 0 | 9 | 0 | 0 | 0 | 0 | 0 |
| | Min | 7.50 | | 55.50 | 46.00 | 14.50 | 16.00 | 17.50 | 29.50 | 25.00 | 22.00 | 23.00 | 25.50 | | 8.00 | | | | | |
| | Max | 36.00 | | 70.50 | 46.00 | 14.50 | 45.50 | 30.00 | 46.00 | 25.00 | 39.50 | 34.50 | 25.50 | | 14.00 | | | | | |
| | Mean | 26.72 | | 60.67 | | | 27.50 | 23.56 | 38.50 | | 31.31 | 27.06 | | | 10.10 | | | | | |
| | SE | 0.92 | | 4.92 | | | 9.12 | 1.08 | 3.81 | | 1.05 | 1.44 | | | 0.67 | | | | | |
| | CV | 24.73 | | 14.04 | | | 57.41 | 18.91 | 19.81 | | 14.18 | 15.99 | | | 19.99 | | | | | |
| Ysabel | Number | 60 | 13 | 33 | 6 | 7 | 18 | 17 | 4 | 3 | 10 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 |
| | Min | 10.00 | 46.00 | 13.50 | 9.50 | 5.00 | 23.00 | 20.30 | 15.50 | 26.00 | 21.00 | | | | 10.50 | | | | | |
| | Max | 32.50 | 80.50 | 70.00 | 41.00 | 13.50 | 45.50 | 45.50 | 32.00 | 47.00 | 49.50 | | | | 12.50 | | | | | |
| | Mean | 23.01 | 58.42 | 43.17 | 28.50 | 9.64 | 33.03 | 28.02 | 25.50 | 34.00 | 33.10 | | | | 12.08 | | | | | |
| | SE | 0.76 | 2.59 | 2.08 | 5.07 | 1.13 | 1.44 | 1.45 | 3.55 | 6.56 | 3.21 | | | | 0.40 | | | | | |
| | CV | 25.58 | 15.99 | 27.69 | 43.57 | 31.07 | 18.47 | 21.36 | 27.87 | 33.41 | 30.64 | | | | 7.32 | | | | | |
| Suavanao | Number | 83 | 1 | 2 | 1 | 61 | 2 | 0 | 14 | 1 | 3 | 1 | 0 | 0 | 46 | 0 | 0 | 0 | 0 | 0 |
| | Min | 6.00 | 95.50 | 28.00 | 44.50 | 2.50 | 23.00 | | 25.00 | 34.00 | 26.50 | 28.00 | | | 6.50 | | | | | |
| | Max | 39.00 | 95.50 | 28.00 | 44.50 | 15.00 | 32.00 | | 39.50 | 34.00 | 34.00 | 28.00 | | | 12.50 | | | | | |
| | Mean | 22.54 | | 28.00 | | 8.61 | 27.50 | | 32.64 | | 30.83 | | | | 10.62 | | | | | |
| | SE | 0.84 | | 0.00 | | 0.41 | 4.50 | | 1.18 | | 2.24 | | | | 0.20 | | | | | |
| | CV | 34.01 | | 0.00 | | 37.35 | 23.14 | | 13.51 | | 12.60 | | | | 12.63 | | | | | |

Table 4, continued.

| | | Species | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna squamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chlorontus* | *Bohadschia graeffei* | *Bohadschi argus* | *Holothuria atra* | *Actinopyga mauritaniana* | Brown stonefish* | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | *Thelanota anax* | *Thelanota ananas* | *Actinopyga milaris* | *Holothuria nobilis* |
| **Survey 2** | | | | | | | | | | | | | | | | | | | | |
| Waghena | Number | 93 | 0 | 0 | 3 | 12 | 0 | 2 | 4 | 0 | 0 | 1 | 1 | 0 | 2 | 1 | 1 | 0 | 0 | 0 |
| | Min | 5.50 | | | 9.50 | 2.00 | | 26.00 | 34.00 | | | 31.00 | 26.00 | | 10.60 | 7.00 | 27.50 | | | |
| | Max | 32.00 | | | 32.00 | 16.50 | | 30.00 | 37.00 | | | 31.00 | 26.00 | | 11.90 | 7.00 | 27.50 | | | |
| | Mean | 17.58 | | | 21.50 | 9.38 | | 28.00 | 35.38 | | | | | | 11.25 | | | | | |
| | SE | 0.58 | | | 6.54 | 1.21 | | 2.00 | 0.69 | | | | | | 0.65 | | | | | |
| | CV | 31.63 | | | 52.67 | 44.80 | | 10.10 | 3.89 | | | | | | 8.17 | | | | | |
| Arnavons | Number | 64 | 1 | 1 | 0 | 0 | 6 | 5 | 4 | 1 | 1 | 9 | 0 | 0 | 7 | 1 | 0 | 1 | 0 | 0 |
| | Min | 5.00 | 43.00 | 51.00 | | | 13.50 | 18.00 | 21.00 | 1.00 | 36.00 | 23.00 | | | 7.60 | 7.00 | | 29.00 | | |
| | Max | 34.00 | 43.00 | 51.00 | | | 39.00 | 40.00 | 32.00 | 1.00 | 36.00 | 32.00 | | | 12.10 | 7.00 | | 29.00 | | |
| | Mean | 22.90 | | | | | 24.17 | 28.10 | 27.38 | | | 28.11 | | | 9.01 | | | | | |
| | SE | 0.94 | | | | | 4.37 | 3.93 | 2.66 | | | 1.19 | | | 0.58 | | | | | |
| | CV | 32.77 | | | | | 44.27 | 31.29 | 19.41 | | | 12.66 | | | 17.04 | | | | | |
| Ysabel | Number | 63 | 2 | 11 | 3 | 18 | 11 | 12 | 8 | 0 | 20 | 2 | 2 | 0 | 10 | 3 | 2 | 0 | 1 | 0 |
| | Min | 8.00 | 59.00 | 28.00 | 11.50 | 5.00 | 22.00 | 15.00 | 23.00 | | 16.00 | 30.00 | 27.00 | | 9.00 | 15.00 | 32.00 | | 42.00 | |
| | Max | 33.50 | 67.00 | 62.00 | 50.00 | 15.00 | 44.50 | 47.00 | 39.00 | | 38.00 | 30.00 | 27.00 | | 13.00 | 15.00 | 33.00 | | 42.00 | |
| | Mean | 21.37 | 63.00 | 49.73 | 30.83 | 11.17 | 32.05 | 29.46 | 30.06 | | 24.45 | 30.00 | 27.00 | | 10.91 | 15.00 | 32.50 | | | |
| | SE | 0.76 | 4.00 | 2.61 | 11.11 | 0.70 | 2.02 | 2.42 | 1.84 | | 1.17 | 0.00 | 0.00 | | 0.45 | 0.00 | 0.50 | | | |
| | CV | 28.08 | 8.98 | 17.42 | 62.43 | 26.65 | 20.93 | 28.52 | 17.29 | | 21.33 | 0.00 | 0.00 | | 13.91 | 0.00 | 2.18 | | | |
| Suavanao | Number | 63 | 0 | 0 | 3 | 83 | 2 | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 26 | 1 | 0 | 0 | 0 | 0 |
| | Min | 2.50 | | | 10.50 | 2.00 | 37.00 | | 20.50 | | | 25.00 | | | 7.80 | 12.50 | | | | |
| | Max | 31.00 | | | 32.00 | 14.00 | 54.00 | | 24.00 | | | 31.00 | | | 13.00 | 12.50 | | | | |
| | Mean | 18.64 | | | 24.17 | 7.70 | 45.50 | | 22.25 | | | 28.00 | | | 10.47 | | | | | |
| | SE | 0.78 | | | 6.86 | 3.20 | 8.50 | | 1.75 | | | 3.00 | | | 0.28 | | | | | |
| | CV | 33.23 | | | 49.15 | 42.10 | 26.42 | | 11.12 | | | 15.15 | | | 13.47 | | | | | |

Table 4, continued.

| | | Species | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna squamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chlorontus* | *Bohadschia graeffei* | *Bohadschi argus* | *Holothuria atra* | *Actinopyga mauritaniana* | Brown stonefish* | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | *Thelanota anax* | *Thelanota ananas* | *Actinopyga milaris* | *Holothuria nobilis* |
| **Survey 3** | | | | | | | | | | | | | | | | | | | | |
| Waghena | Number | 70 | 1 | 0 | 2 | 12 | 0 | 1 | 4 | 0 | 2 | 2 | 0 | 0 | 2 | 4 | 1 | 1 | 1 | 0 |
| | Min | 2.00 | 16.00 | | 12.00 | 2.50 | | 37.50 | 26.00 | | 16.00 | 29.00 | | | 10.50 | 12.00 | 74.00 | 49.00 | 25.00 | |
| | Max | 33.00 | 16.00 | | 26.50 | 13.00 | | 37.50 | 36.00 | | 44.00 | 31.50 | | | 12.00 | 13.00 | 74.00 | 49.00 | 25.00 | |
| | Mean | 18.57 | | | 19.25 | 9.46 | | | 30.75 | | 30.00 | 30.25 | | | 11.25 | 12.38 | | | | |
| | SE | 0.85 | | | 7.25 | 0.97 | | | 2.50 | | 14.00 | 1.25 | | | 0.75 | 0.24 | | | | |
| | CV | 38.36 | | | 53.26 | 35.53 | | | 16.23 | | 66.00 | 5.84 | | | 9.43 | 3.87 | | | | |
| Arnavons | Number | 69 | 0 | 2 | 3 | 5 | 1 | 3 | 7 | 1 | 1 | 2 | 0 | 0 | 17 | 1 | 0 | 0 | 0 | 0 |
| | Min | 5.00 | | 11.00 | 8.00 | 4.00 | 15.00 | 28.00 | 20.00 | 27.00 | 43.00 | 22.00 | | | 6.00 | 5.00 | | | | |
| | Max | 35.00 | | 30.00 | 28.00 | 13.00 | 15.00 | 32.50 | 32.50 | 27.00 | 43.00 | 31.00 | | | 14.10 | 5.00 | | | | |
| | Mean | 20.26 | | 20.50 | 15.67 | 8.40 | | 29.50 | 26.29 | | | 26.50 | | | 10.24 | | | | | |
| | SE | 0.91 | | 9.50 | 6.23 | 1.77 | | 1.50 | 1.73 | | | 4.50 | | | 0.67 | | | | | |
| | CV | 37.33 | | 65.54 | 68.85 | 47.13 | | 8.81 | 17.43 | | | 24.01 | | | 26.83 | | | | | |
| Ysabel | Number | 81 | 5 | 8 | 6 | 28 | 9 | 6 | 6 | 2 | 17 | 1 | 1 | 0 | 6 | 2 | 0 | 0 | 0 | 1 |
| | Min | 3.00 | 13.00 | 23.00 | 9.50 | 2.00 | 20.50 | 17.50 | 14.00 | 16.50 | 16.50 | 30.00 | 32.00 | | 4.30 | 9.00 | | | | 29.00 |
| | Max | 32.00 | 67.00 | 56.00 | 40.00 | 14.00 | 32.00 | 45.00 | 41.00 | 29.00 | 38.00 | 30.00 | 32.00 | | 14.00 | 13.00 | | | | 29.00 |
| | Mean | 18.38 | 38.40 | 38.88 | 24.08 | 9.45 | 27.61 | 30.92 | 29.33 | 22.75 | 26.68 | | | | 7.82 | 11.00 | | | | |
| | SE | 0.78 | 10.22 | 3.98 | 5.31 | 0.67 | 1.54 | 4.40 | 3.59 | 6.25 | 1.35 | | | | 1.36 | 2.00 | | | | |
| | CV | 38.22 | 59.49 | 28.92 | 53.99 | 37.60 | 16.71 | 34.87 | 30.01 | 38.85 | 20.88 | | | | 42.56 | 25.71 | | | | |
| Suavanao | Number | 47 | 0 | 0 | 0 | 37 | 1 | 0 | 1 | 0 | 1 | 6 | 0 | 0 | 18 | 0 | 0 | 0 | 0 | 0 |
| | Min | 4.00 | | | | 3.50 | 35.00 | | 33.50 | | 31.00 | 24.00 | | | 6.50 | | | | | |
| | Max | 32.50 | | | | 16.00 | 35.00 | | 33.50 | | 31.00 | 27.00 | | | 13.20 | | | | | |
| | Mean | 20.05 | | | | 9.55 | | | | | | 25.33 | | | 10.18 | | | | | |
| | SE | 1.04 | | | | 0.51 | | | | | | 0.54 | | | 0.44 | | | | | |
| | CV | 35.69 | | | | 32.47 | | | | | | 5.247 | | | 18.39 | | | | | |

Table 5. Mean proportion ($n$ = 32) and Standard error (SE) of habitat characteristics within the shallow habitat at each study Group.

| Category | Type | Waghena | | Arnavons | | Ysabel | | Suavanao | |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | SE | Mean | SE | Mean | SE | Mean | SE |
| Abiotic | Sand | 1.66 | 0.56 | 1.88 | 0.49 | 11.83 | 2.93 | 0.50 | 0.21 |
| | Rubble | 9.29 | 4.54 | 10.34 | 2.81 | 38.38 | 4.36 | 4.89 | 2.73 |
| | Rock | 76.78 | 4.68 | 71.55 | 2.91 | 30.17 | 3.90 | 75.22 | 3.04 |
| | Water(gully/fissure) | 0.00 | 0.00 | 0.69 | 0.48 | 0.25 | 0.25 | 0.00 | 0.00 |
| Hard coral | Massive/brain | 1.89 | 0.51 | 2.78 | 0.55 | 2.34 | 0.50 | 2.91 | 0.39 |
| | Encrusting(+digitate) | 0.28 | 0.16 | 0.34 | 0.21 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Digitate | 2.81 | 0.72 | 5.06 | 0.61 | 6.61 | 1.17 | 6.20 | 0.67 |
| | Tabulate | 0.38 | 0.15 | 0.48 | 0.16 | 0.97 | 0.29 | 0.45 | 0.17 |
| | Branching (1°+2°) | 0.27 | 0.09 | 0.13 | 0.10 | 1.19 | 0.31 | 1.88 | 0.84 |
| | Thin encrusting | 0.34 | 0.15 | 2.19 | 0.42 | 2.36 | 0.58 | 2.52 | 0.35 |
| | Mushroom | 0.10 | 0.05 | 0.14 | 0.09 | 0.00 | 0.00 | 0.09 | 0.07 |
| Other fauna | Soft coral | 2.42 | 0.72 | 0.39 | 0.11 | 0.94 | 0.28 | 3.16 | 0.70 |
| | Sponges | 1.50 | 0.46 | 0.23 | 0.07 | 1.28 | 0.29 | 0.20 | 0.15 |
| | Sea fans/pens | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.02 |
| | Others | 0.88 | 0.43 | 0.14 | 0.08 | 0.58 | 0.20 | 0.25 | 0.10 |
| Algae | Coralline | 0.34 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.44 | 0.27 |
| | *Halimeda* | 0.63 | 0.20 | 2.09 | 0.67 | 1.56 | 0.40 | 0.27 | 0.13 |
| | Macroalgae | 0.06 | 0.04 | 0.97 | 0.27 | 0.52 | 0.15 | 1.02 | 0.64 |
| | Turf-mixture | 0.38 | 0.38 | 0.59 | 0.22 | 1.03 | 0.33 | 0.00 | 0.00 |

Table 6. Results of two-way ANOSIM test of differences of habitat variates among Groups for the shallow habitat. Pairwise comparisons among Groups are shown. Critical value for pairwise comparisons = 0.833

| Test | Global R |
|---|---|
| Sites | 0.41 *** |
| Groups | 0.375*** |

Pairwise tests

| Areas compared | Significant statistics | Probability |
|---|---|---|
| Arnavons vs. Suavanao | 36 | 0.007 |
| Arnavons vs. Waghena | 17 | 0.004 |
| Arnavons vs. Ysabel | 17 | 0.004 |
| Suavanao vs. Waghena | 28 | 0.006 |
| Suavanao vs. Ysabel | 3 | 0.001 |
| Waghena vs. Ysabel | 4 | 0.001 |

Table 7. Rank contribution of shallow habitat types to differences between Groups as determined by SIMPER. Ranks are presented for the eight variates primarily responsible for differences.

| Species | Arnavons Suavanao | Arnavons Ysabel | Arnavons Waghena | Suavanao Waghena | Suavanao Ysabel | Waghena Ysabel |
|---|---|---|---|---|---|---|
| Rubble | 1 | 2 | 3 | 2 | 1 | 1 |
| Soft coral | 2 | 8 | 4 | 3 | 4 | 6 |
| Sand | 3 | 1 | 1 | 7 | 2 | 2 |
| Thin encrusting | 4 | 4 | 2 | 1 | 6 | 4 |
| Massive/brain | 5 | 6 | 7 | 5 |  |  |
| Branching | 6 | 7 |  | 8 | 8 |  |
| Tabulate | 7 |  | 8 |  |  |  |
| Digitate | 8 |  | 5 | 4 |  | 5 |
| Rock |  | 3 |  |  | 3 | 3 |
| Sponges |  | 5 | 6 | 6 | 7 | 7 |
| Halimeda |  |  |  |  | 5 | 8 |

Table 8. Summary of abundance data for the deep habitat. Islands and Sites pooled within Groups (*n* = 48), mean number of each species and of total abundance (all species pooled) per 250 m2 transect. Total number = total count per species

| | | Species | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | *Actinopyga miliaris* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* | Brown stonefish* | Total |
| **Survey 1** | | | | | | | | | | | | | | | | | |
| Wagbena | Mean | 0.04 | 0.58 | 0.02 | 0.02 | 0.00 | 0.10 | 0.00 | 0.00 | 0.33 | 0.08 | 0.02 | 0.15 | 0.00 | 0.02 | 0.00 | 1.35 |
| | SE | 0.03 | 0.19 | 0.02 | 0.02 | 0.00 | 0.04 | 0.00 | 0.00 | 0.12 | 0.05 | 0.02 | 0.06 | 0.00 | 0.02 | 0.00 | 0.23 |
| Arnavons | Mean | 0.15 | 0.10 | 0.04 | 0.00 | 0.02 | 0.13 | 0.06 | 0.00 | 0.90 | 0.13 | 0.02 | 0.17 | 0.13 | 0.00 | 0.00 | 1.83 |
| | SE | 0.02 | 0.19 | 0.02 | 0.02 | 0.00 | 0.04 | 0.00 | 0.00 | 0.12 | 0.06 | 0.02 | 0.06 | 0.00 | 0.00 | 0.00 | 0.22 |
| Ysabel | Mean | 0.10 | 0.06 | 0.00 | 0.00 | 0.04 | 0.04 | 0.00 | 0.00 | 0.17 | 0.40 | 0.02 | 0.21 | 0.00 | 0.00 | 0.00 | 1.04 |
| | SE | 0.05 | 0.04 | 0.00 | 0.00 | 0.03 | 0.03 | 0.00 | 0.00 | 0.06 | 0.16 | 0.02 | 0.07 | 0.00 | 0.00 | 0.00 | 0.19 |
| Suavanao | Mean | 0.04 | 0.69 | 0.02 | 0.00 | 0.00 | 0.04 | 0.00 | 0.04 | 0.08 | 0.15 | 0.00 | 0.21 | 0.21 | 0.00 | 0.00 | 1.48 |
| | SE | 0.03 | 0.16 | 0.02 | 0.00 | 0.00 | 0.03 | 0.00 | 0.03 | 0.04 | 0.11 | 0.00 | 0.09 | 0.07 | 0.00 | 0.00 | 0.27 |
| | Total number | 16 | 69 | 4 | 1 | 3 | 15 | 3 | 2 | 71 | 36 | 3 | 35 | 16 | 0 | 0 | 274 |
| **Survey 2** | | | | | | | | | | | | | | | | | |
| Wagbena | Mean | 0.02 | 0.65 | 0.04 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.40 | 0.27 | 0.00 | 0.21 | 0.00 | 0.00 | 0.00 | 1.38 |
| | SE | 0.02 | 0.16 | 0.03 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.13 | 0.08 | 0.00 | 0.08 | 0.00 | 0.00 | 0.00 | 0.23 |
| Arnavons | Mean | 0.10 | 0.10 | 0.04 | 0.00 | 0.04 | 0.08 | 0.02 | 0.00 | 0.83 | 0.33 | 0.00 | 0.23 | 0.04 | 0.00 | 0.00 | 1.83 |
| | SE | 0.04 | 0.05 | 0.03 | 0.00 | 0.03 | 0.04 | 0.02 | 0.00 | 0.26 | 0.10 | 0.00 | 0.07 | 0.03 | 0.00 | 0.00 | 0.33 |
| Ysabel | Mean | 0.21 | 0.08 | 0.04 | 0.00 | 0.04 | 0.04 | 0.02 | 0.00 | 0.19 | 0.33 | 0.02 | 0.21 | 0.00 | 0.00 | 0.00 | 1.19 |
| | SE | 0.08 | 0.04 | 0.03 | 0.00 | 0.03 | 0.03 | 0.02 | 0.00 | 0.08 | 0.11 | 0.02 | 0.10 | 0.00 | 0.00 | 0.00 | 0.20 |
| Suavanao | Mean | 0.04 | 0.52 | 0.00 | 0.00 | 0.00 | 0.08 | 0.00 | 0.00 | 0.08 | 0.15 | 0.00 | 0.23 | 0.38 | 0.00 | 0.00 | 1.48 |
| | SE | 0.03 | 0.12 | 0.00 | 0.00 | 0.00 | 0.04 | 0.00 | 0.00 | 0.05 | 0.09 | 0.00 | 0.09 | 0.08 | 0.00 | 0.00 | 0.22 |
| | Total number | 18 | 65 | 6 | 0 | 5 | 10 | 2 | 0 | 72 | 52 | 1 | 42 | 20 | 0 | 0 | 282 |
| **Survey 3** | | | | | | | | | | | | | | | | | |
| Wagbena | Mean | 0.02 | 0.36 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | 0.10 | 0.29 | 0.00 | 0.19 | 0.00 | 0.00 | 0.00 | 1.02 |
| | SE | 0.02 | 0.11 | 0.00 | 0.00 | 0.00 | 0.04 | 0.00 | 0.00 | 0.04 | 0.10 | 0.00 | 0.08 | 0.00 | 0.00 | 0.00 | 0.16 |
| Arnavons | Mean | 0.13 | 0.06 | 0.00 | 0.00 | 0.04 | 0.08 | 0.00 | 0.00 | 0.73 | 0.21 | 0.02 | 0.33 | 0.04 | 0.00 | 0.00 | 1.65 |
| | SE | 0.05 | 0.04 | 0.00 | 0.00 | 0.04 | 0.04 | 0.00 | 0.00 | 0.26 | 0.07 | 0.02 | 0.10 | 0.03 | 0.00 | 0.00 | 0.33 |
| Ysabel | Mean | 0.15 | 0.11 | 0.02 | 0.00 | 0.06 | 0.02 | 0.04 | 0.00 | 0.17 | 0.31 | 0.02 | 0.31 | 0.00 | 0.00 | 0.02 | 1.23 |
| | SE | 0.05 | 0.05 | 0.02 | 0.00 | 0.05 | 0.02 | 0.03 | 0.00 | 0.06 | 0.10 | 0.02 | 0.17 | 0.00 | 0.00 | 0.02 | 0.23 |
| Suavanao | Mean | 0.04 | 0.38 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | 0.08 | 0.27 | 0.00 | 0.04 | 0.35 | 0.02 | 0.02 | 1.27 |
| | SE | 0.03 | 0.08 | 0.00 | 0.00 | 0.00 | 0.04 | 0.00 | 0.00 | 0.05 | 0.13 | 0.00 | 0.03 | 0.09 | 0.02 | 0.02 | 0.21 |
| | Total number | 16 | 43 | 1 | 0 | 5 | 11 | 2 | 0 | 52 | 52 | 2 | 42 | 19 | 1 | 2 | 248 |

Table 9. Summary of asymmetrical ANOVAs for derived and individual species of sea cucumbers for the deep habitat. Tests of a number of terms were not possible in the original model. I = Impact, C = Control.

| Source of variation | Total number of species of sea cucumbers | Total abundance of sea cucumbers | *Stichopus variegatus* | *Thelenota anax* | *Holothuria atra* | *Holothuria edulis* | *Holothuria fuscopuntat* | *Holothuria* sp. |
|---|---|---|---|---|---|---|---|---|
| Transformation | none | log | none | none | none | none | none | none |
| Times | ns | ns | ns | ns | ns | ns | ns | ns |
| Among Groups | No Test | No Test | No Test | No Test | No Test | No Test | No Test | No Test |
| I vs C | No Test | No Test | No Test | No Test | No Test | No Test | No Test | No Test |
| Among C | No Test | No Test | No Test | No Test | No Test | No Test | No Test | No Test |
| Islands (Groups) | No Test | No Test | No Test | No Test | No Test | No Test | No Test | No Test |
| Is(G(C)) | No Test | No Test | No Test | No Test | No Test | No Test | No Test | No Test |
| Is(G(I)) | No Test | No Test | No Test | No Test | No Test | No Test | No Test | No Test |
| Sites(Is(G)) | ** | ** | * | ** | * | ns | * | * |
| S(Is(G(C))) | ** | ** | * | ** | * | ns | * | * |
| S(Is(G(I))) | ns | ns | ns | ns | ** | ns | ns | ns |
| T x Among Groups | ns | ns | ns | ns | ns | ns | ns | ns |
| T x I vs C | * | ns | ns | ns | ns | ns | ns | ns |
| T x Among C | ns | ns | ns | ns | ns | ns | ns | ns |
| T x Islands (G) | ns | ns | ns | ns | ns | ns | ns | ns |
| T x Is(G(C)) | ns | ns | ns | ns | ns | ns | ns | ns |
| T x Is(G(I)) | ns | ns | ns | ns | ns | ns | ns | ns |
| T x Sites(Is(AG) | ns | ns | ns | ns | ns | ns | ns | ns |
| T x S(Is(G(C))) | ns | ns | ns | ns | ns | ns | ns | ns |
| T x S(Is(G(I))) | ns | ns | ns | ns | ns | ns | ns | ns |
| Residual | | | | | | | | |

Table 10. Summary of length frequency data for the deep habitat. Coefficient of variation, cv = standard devation / mean.

| | | Species | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | *Actinopyga milaris* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* | Brownstone fish* |
| **Survey 1** | | | | | | | | | | | | | | | | |
| Waghena | Number | 2 | 36 | 1 | 1 | 0 | 5 | 0 | 1 | 21 | 6 | 1 | 9 | 0 | 1 | 0 |
| | Min | 50.00 | 42.00 | 43.50 | 33.00 | | 27.00 | | 41 | 35 | 31.5 | 36.5 | 35 | | 15.6 | |
| | Max | 56.00 | 79.50 | 43.50 | 33.00 | | 51.00 | | 41 | 49 | 46 | 36.5 | 52.5 | | 15.6 | |
| | Mean | 53.00 | 55.99 | | | | 39.90 | | | 43 | 36.583 | | 43.33 | | | |
| | SE | 3.00 | 1.17 | | | | 3.90 | | | 0.9 | 2.4813 | | 1.71 | | | |
| | CV | 8.00 | 12.51 | | | | 21.86 | | | 10 | 16.614 | | 11.84 | | | |
| Arnavons | Number | 9 | 2 | 1 | 0 | 2 | 5 | 2 | 1 | 45 | 6 | 4 | 10 | 4 | 0 | 0 |
| | Min | 45.00 | 54.00 | 66.00 | | 26.00 | 28.00 | 28.00 | 35 | 31.5 | 40 | 31 | 25 | 26.5 | | |
| | Max | 62.50 | 61.50 | 66.00 | | 29.50 | 47.00 | 30.50 | 35 | 55 | 48.5 | 46 | 54 | 42 | | |
| | Mean | 55.09 | 57.75 | | | 27.75 | 37.90 | 29.25 | | 42.71 | 44.417 | 38 | 48.5 | 36.13 | | |
| | SE | 1.98 | 3.75 | | | 1.75 | 3.68 | 1.25 | | 0.938 | 1.3504 | 3.102 | 2.689 | 3.496 | | |
| | CV | 10.78 | 9.18 | | | 8.92 | 21.73 | 6.04 | | 14.73 | 7.4472 | 16.33 | 17.54 | 19.36 | | |
| Ysabel | Number | 5 | 4 | 0 | 0 | 2 | 2 | 0 | 0 | 8 | 21 | 1 | 10 | 1 | 0 | 0 |
| | Min | 46.00 | 61.50 | | | 31.00 | 30.00 | | | 29.5 | 25.5 | 39.5 | 37.5 | 45 | | |
| | Max | 57.50 | 74.50 | | | 32.00 | 49.50 | | | 46.5 | 45.5 | 39.5 | 49 | 45 | | |
| | Mean | 52.40 | 66.38 | | | 31.50 | 39.75 | | | 40.75 | 36.643 | | 45.25 | | | |
| | SE | 2.28 | 3.03 | | | 0.50 | 9.75 | | | 1.991 | 1.1803 | | 1.07 | | | |
| | CV | 9.72 | 9.13 | | | 2.24 | 34.69 | | | 13.82 | 14.76 | | 7.481 | | | |
| Suavanao | Number | 5 | 50 | 1 | 0 | 0 | 2 | 0 | 2 | 8 | 8 | 0 | 13 | 14 | 0 | 0 |
| | Min | 53.50 | 45.00 | 74.00 | | | 40.00 | | 28 | 41.8 | 36 | | 41 | 14 | | |
| | Max | 61.00 | 111.00 | 74.00 | | | 45.00 | | 38 | 60.5 | 45 | | 55 | 37 | | |
| | Mean | 57.80 | 60.58 | | | | 42.50 | | 33 | 50.29 | 42.25 | | 48.08 | 29.82 | | |
| | SE | 1.40 | 1.50 | | | | 2.50 | | 5 | 2.03 | 1.199 | | 1.431 | 1.838 | | |
| | CV | 5.42 | 17.47 | | | | 8.32 | | 21.43 | 11.42 | 8.0264 | | 10.73 | 23.06 | | |

Table 10, continued.

| | | Species | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | *Actinopyga milaris* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* | Brownstone fish* |
| **Survey 2** | | | | | | | | | | | | | | | | |
| Waghena | Number | 1 | 43 | 2 | 0 | 1 | 0 | 0 | 0 | 20 | 16 | 0 | 11 | 0 | 0 | 0 |
| | Min | 54.00 | 42.00 | 63.00 | | 33.50 | | | | 38.5 | 20 | | 40 | | | |
| | Max | 54.00 | 71.00 | 72.00 | | 33.50 | | | | 58 | 43 | | 54 | | | |
| | Mean | | 57.06 | 67.50 | | | | | | 48.13 | 35.531 | | 45.45 | | | |
| | SE | | 1.10 | 4.50 | | | | | | 0.981 | 1.3201 | | 1.139 | | | |
| | CV | | 12.67 | 9.43 | | | | | | 9.113 | 14.861 | | 8.311 | | | |
| Arnavons | Number | 6 | 5 | 4 | 0 | 2 | 4 | 1 | 0 | 44 | 18 | 6 | 14 | 2 | 0 | 0 |
| | Min | 47.50 | 57.00 | 45.00 | | 27.00 | 34.00 | 37.00 | | 36 | 22 | 34 | 41 | 33 | | |
| | Max | 55.00 | 72.00 | 59.00 | | 27.00 | 43.00 | 37.00 | | 54.5 | 52.5 | 58 | 54 | 42.5 | | |
| | Mean | 51.00 | 63.40 | 52.13 | | 27.00 | 37.75 | | | 44.95 | 39.806 | 48.75 | 47.75 | 37.75 | | |
| | SE | 1.12 | 2.66 | 3.57 | | 0.00 | 1.89 | | | 0.76 | 1.9609 | 4.613 | 1.22 | 4.75 | | |
| | CV | 5.37 | 9.37 | 13.71 | | 0.00 | 10.00 | | | 11.22 | 20.9 | 23.18 | 9.56 | 17.79 | | |
| Ysabel | Number | 10 | 5 | 3 | 0 | 2 | 4 | 1 | 0 | 10 | 24 | 2 | 13 | 3 | 0 | 0 |
| | Min | 46.00 | 65.00 | 56.00 | | 30.00 | 35.50 | 28.50 | | 43 | 36.5 | 40.5 | 48 | 22.5 | | |
| | Max | 62.50 | 74.00 | 62.00 | | 33.00 | 40.50 | 28.50 | | 55 | 48.5 | 42 | 55.5 | 31 | | |
| | Mean | 53.55 | 68.20 | 58.17 | | 31.50 | 37.75 | | | 49.5 | 43.188 | 41.25 | 50.65 | 27.83 | | |
| | SE | 1.38 | 1.53 | 1.92 | | 1.50 | 1.05 | | | 1.41 | 0.6025 | 0.75 | 0.654 | 2.682 | | |
| | CV | 8.13 | 5.02 | 5.72 | | 6.73 | 5.57 | | | 9.009 | 6.8349 | 2.571 | 4.654 | 16.69 | | |
| Suavanao | Number | 2 | 30 | 1 | 0 | 1 | 1 | 0 | 0 | 4 | 10 | 0 | 12 | 17 | 0 | 0 |
| | Min | 51.50 | 44.50 | 64.50 | | 42.00 | 34.00 | | | 31.5 | 40 | | 26 | 16.5 | | |
| | Max | 61.50 | 80.00 | 64.50 | | 42.00 | 34.00 | | | 52 | 49 | | 57.5 | 46.5 | | |
| | Mean | 56.50 | 65.23 | | | | | | | 44.63 | 44.2 | | 44.96 | 30.82 | | |
| | SE | 5.00 | 1.53 | | | | | | | 4.543 | 1.0493 | | 2.206 | 1.619 | | |
| | CV | 12.52 | 12.88 | | | | | | | 20.36 | 7.5075 | | 17 | 21.66 | | |

Table 10, continued.

| | | Species | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | *Actinopyga milaris* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* | Brownstone fish* |
| **Survey 3** | | | | | | | | | | | | | | | | |
| Waghena | Number | 1 | 24 | 1 | 0 | 0 | 3 | 0 | 0 | 6 | 17 | 0 | 10 | 0 | 0 | 0 |
| | Min | 60.00 | 49.00 | 57.00 | | | 40.00 | | | 43 | 34 | | 32 | | | |
| | Max | 60.00 | 72.00 | 57.00 | | | 42.00 | | | 56 | 51 | | 47 | | | |
| | Mean | | 59.10 | | | | 41.00 | | | 46.75 | 41 | | 42.45 | | | |
| | SE | | 1.60 | | | | 0.58 | | | 1.896 | 1.1632 | | 1.334 | | | |
| | CV | | 13.28 | | | | 2.44 | | | 9.936 | 11.697 | | 9.94 | | | |
| Arnavons | Number | 7 | 5 | 1 | 0 | 4 | 6 | 0 | 0 | 35 | 11 | 1 | 17 | 2 | 0 | 0 |
| | Min | 46.50 | 48.00 | 47.00 | | 27.00 | 22.00 | | | 26.5 | 39 | 31.5 | 35 | 37.5 | | |
| | Max | 61.50 | 64.50 | 47.00 | | 34.50 | 41.00 | | | 60 | 52 | 31.5 | 56 | 48 | | |
| | Mean | 52.71 | 55.10 | | | 29.13 | 34.07 | | | 45.06 | 44.136 | | 48.15 | 42.75 | | |
| | SE | 2.30 | 2.74 | | | 1.81 | 2.78 | | | 1.165 | 1.2794 | | 1.335 | 5.25 | | |
| | CV | 11.55 | 11.14 | | | 12.41 | 20.01 | | | 15.3 | 9.6138 | | 11.43 | 17.37 | | |
| Ysabel | Number | 7 | 6 | 1 | 0 | 4 | 1 | 2 | 0 | 9 | 19 | 1 | 23 | 0 | 0 | 0 |
| | Min | 47.00 | 55.00 | 66.00 | | 25.00 | 36.00 | 31.00 | | 32 | 36.5 | 45 | 39 | | | |
| | Max | 59.50 | 75.00 | 66.00 | | 39.00 | 36.00 | 33.00 | | 55 | 52 | 45 | 57 | | | |
| | Mean | 52.57 | 63.83 | | | 32.50 | | 32.00 | | 44.61 | 43.132 | | 49.11 | | | |
| | SE | 1.62 | 2.89 | | | 2.87 | | 1.00 | | 2.451 | 0.8591 | | 0.967 | | | |
| | CV | 8.15 | 11.10 | | | 17.68 | | 4.42 | | 16.48 | 8.6822 | | 9.442 | | | |
| Suavanao | Number | 2 | 26 | 0 | 0 | 0 | 3 | 0 | 0 | 4 | 14 | 0 | 2 | 17 | 1 | 1 |
| | Min | 62.00 | 46.00 | | | | 33.00 | | | 34 | 41 | | 48 | 17 | 24.5 | 25 |
| | Max | 66.00 | 72.00 | | | | 40.00 | | | 44 | 56 | | 51 | 40 | 24.5 | 25 |
| | Mean | 64.00 | 58.98 | | | | 36.33 | | | 40 | 46.25 | | 49.5 | 30.79 | | |
| | SE | 2.00 | 1.28 | | | | 2.03 | | | 2.16 | 1.0092 | | 1.5 | 1.434 | | |
| | CV | 4.4194 | 11.096 | | | | 9.666 | | | 10.8 | 8.1647 | | 4.285 | 19.2 | | |

Table 11. Mean proportion ( *n* = 32) and Standard error (SE) of habitat characteristics within the deep habitat at each study Group.

| Category | Type | Waghena | | Arnavons | | Ysabel | | Suavanao | |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | SE | Mean | SE | Mean | SE | Mean | SE |
| Abiotic | Sand | 63.42 | 6.36 | 69.89 | 3.95 | 74.89 | 4.59 | 82.78 | 3.10 |
| | Rubble | 28.14 | 5.51 | 14.02 | 2.68 | 9.38 | 2.30 | 3.52 | 0.77 |
| | Rock | 3.50 | 1.45 | 6.16 | 1.52 | 5.44 | 1.38 | 5.42 | 2.16 |
| Hard coral | Massive/brain | 0.38 | 0.13 | 2.45 | 1.10 | 1.20 | 0.34 | 2.42 | 0.57 |
| | Encrusting(+digitate) | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.00 | 0.00 |
| | Digitate | 0.13 | 0.05 | 0.63 | 0.41 | 0.22 | 0.09 | 0.34 | 0.18 |
| | Tabulate | 0.08 | 0.06 | 0.16 | 0.08 | 0.33 | 0.28 | 0.06 | 0.06 |
| | Branching (1°+2° ) | 0.25 | 0.18 | 0.98 | 0.32 | 0.05 | 0.03 | 0.72 | 0.33 |
| | Thin encrusting | 0.09 | 0.09 | 2.58 | 0.77 | 2.25 | 1.25 | 1.06 | 0.41 |
| | Mushroom | 0.07 | 0.03 | 0.30 | 0.12 | 0.05 | 0.03 | 0.13 | 0.05 |
| Other fauna | Soft coral | 1.09 | 0.26 | 1.20 | 0.22 | 3.63 | 1.24 | 1.64 | 0.46 |
| | Sponges | 0.56 | 0.17 | 0.84 | 0.23 | 1.34 | 0.28 | 1.19 | 0.35 |
| | Black coral | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 |
| | Sea fans/pens | 0.20 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.13 | 0.07 |
| | Others | 0.02 | 0.02 | 0.28 | 0.13 | 0.59 | 0.23 | 0.00 | 0.00 |
| Algae | Coralline | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.02 |
| | *Halimeda* | 1.67 | 1.26 | 0.14 | 0.06 | 0.44 | 0.32 | 0.30 | 0.12 |
| | Macroalgae | 0.28 | 0.20 | 0.33 | 0.12 | 0.16 | 0.08 | 0.20 | 0.16 |
| | Turf-mixture | 0.06 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 |
| Seagrass | *Halophila ovalis* | 0.05 | 0.03 | 0.05 | 0.05 | 0.02 | 0.02 | 0.03 | 0.03 |

Table 12. Comparison of densities of exploited invertebrates recorded during the present study (averaged over each Group) with estimates for other Indo Pacific Islands. nd = no data; * indicates no differentiation between deep and shallow habitats.

| Invertebrate species | Range of density across study groups in the study region (no./ha) | Reported densities | | Reference |
|---|---|---|---|---|
| | | Mean density (no/ha) | Maximum density (no./ha) | |
| Giant clams (shallow habitat): | | | | |
| *Tridacna maxima* | 98 - 194 | nd | > 1000 | Munro 1993 |
| *Tridacna gigas* | 0 - 10 | 5 | 50 | Munro 1993 |
| *Tridacna derasa* | 0 - 56 | 5 | 33 | Munro 1993 |
| *Tridacna squamosa* | 0 - 13 | 400 | nd | Mohamed-Pauzi *et al*. 1994 |
| *Tridacna crocea* | 0 - 175 | 1390 | >3000 | Munro 1993 |
| *Hippopus hippopus* | 0 - 23 | 30 - 39 | nd | Munro 1993 |
| Sea Cucumbers (shallow & deep habitat): | | | | |
| *Actinopyga mauritaniana (shallow)* | 0 - 17 | nd | 304 | Preston 1993 |
| *Actinopyga miliaris (shallow)* | 0- 2 | 512* | 5,970 - 78,900* | Preston 1993 |
| *Actinopyga miliaris (deep)* | 0 -2.4 | " | " | Preston 1993 |
| *Stichopus chloronotus (shallow)* | 0 - 31 | nd | 4,258 | Preston 1993 |
| *Stichopus variegatus (deep)* | 0.8 - 8.4 | nd | 456 | Preston 1993 |
| *Holothuria atra (shallow)* | 0 - 42 | 545* | 7,270* | Preston 1993 |
| *Holothuria atra (deep)* | 3.2 - 36 | " | " | Preston 1993 |
| *Holothuria fuscopunctata (deep)* | 1.6 - 13.2 | 22 | 106 | Preston 1993 |
| *Holothuria fuscogilva (deep)* | 3.2 - 16 | 11 - 18.4 | 43 - 81.7 | Preston 1993 |
| *Holothuria nobilis (shallow)* | 0 - 2 | 13 - 18.7* | 43 - 275* | Preston 1993 |
| *Holothuria nobilis (deep)* | 0 - 0.8 | " | " | Preston 1993 |
| *Thelanota ananas (shallow)* | 0 - 2 | 16.8 - 18* | 31.4 - 141* | Preston 1993 |
| *Thelanota ananas (deep)* | 0 - 1.6 | " | " | Preston 1993 |
| *Thelanota anax (shallow)* | 0 - 2 | 41* | 241* | Preston 1993 |
| *Thelanota anax (deep)* | 2.4 - 15.2 | " | " | Preston 1993 |
| Trochus (shallow habitat): | | | | |
| *Trochus niloticus* | 4 - 38 | 222 - 2,016 | 2,775 | Nash *et al*. 1995 |
| | | | 1,290 | Tsutsui & Sigrah 1994 |
| | | 62 - 590 | nd | Long *et al*. 1993 |

Table 13. Summary of Beyond BACI design for full survey with explanation of implications for the MCA. ns = non-significant ($p > 0.05$), sig = significant ($p < 0.05$) Shaded boxes indicate a significant effect due to the MCA. See text for explanation of Beyond BACI. I = Impact, C = Control

| | | | | F-Ratio denominator | | | | |
|---|---|---|---|---|---|---|---|---|
| Source of Variance | | Df | | I | II (If I is ns) | III (If I is sig) | Interpretation if significant | Implications for MCA |
| Before vs After [=BA] | | 1 | | T(BA) x G' | | | Universal change over period of study in both MCA and reference areas. | No effect of the existence of MCA detected |
| Times(BA) | | 4 | | T(BA) x Is(G) | | | Universal change at one or more times in both MCA and reference areas. | No effect of the existence of MCA detected |
| Groups | | 3 | | | | | | |
| | Among C | | 2 | T(BA) x G' | | | Reference groups differ from each other independently of time declaration. | No effect of the existence of MCA detected |
| | I vs C [=IC] | | 1 | | T(BA) x G' | Among C | MCA groups are different from reference groups irrespective of time of declaration | No effect of the existence of MCA detected |
| Islands(G) | | 4 | | | | | | |
| | Is(G(C)) | | 3 | T(BA) x Is(G)' | | | Reference islands differ from each other independently of time declaration. | No effect of the existence of MCA detected |
| | Is(G(I)) | | 1 | | T(BA) x Is(G)' | Is(G(C)) | MCA islands are different from reference islands irrespective of time of declaration | No effect of the existence of MCA detected |
| Sites(Is(G)) | | 24 | | | | | | |
| | S(Is(G(C))) | | 18 | T(BA) x S(Is(G)) | | | Reference sites differ from each other independently of time declaration. | No effect of the existence of MCA detected |
| | S(Is(G(I))) | | 6 | | T(BA) x S(Is(G)) | S(Is(G(I))) | MCA sites are different from reference islands irrespective of time of declaration | No effect of the existence of MCA detected |

Table 13, continued

|  |  |  |  | F-Ratio denominator |  |  |  |  |
|---|---|---|---|---|---|---|---|---|
| Source of Variance |  | Df |  | I | II (If I is ns) | III (If I is sig) | Interpretation if significant | Implications for MCA |
| BA x G |  | 3 |  |  |  |  |  |  |
|  | BA x C |  | 2 | Resid |  |  | * Significant change overall among reference groups. | Reference groups differ from before to after declaration of MCA but may only be coincidential |
|  | BA x IC |  | 1 |  | Resid | BA x C | Overall change in the abundances of species among MCA groups from before to after declaration of MCA | MCA has had an overall effect on species abundances at the spatial scale of the whole MCA Group. |
| BA x Is(G) |  | 4 |  |  |  |  |  |  |
|  | BA x Is(G(C)) |  | 3 | Resid |  |  | * Significant change overall among reference islands. | Reference islands differ from before to after declaration of MCA but may only be coincidential |
|  | BA x Is(G(I)) |  | 1 |  | Resid | BA x Is(G(C)) | Overall change in the abundances of species among MCA islands from before to after declaration of MCA | MCA has had an overall effect on species abundances at the spatial scale of islands. |
| BA x S(Is(G)) |  | 24 |  |  |  |  |  |  |
|  | BA x S(Is(G(C)) |  | 18 | Resid |  |  | * Significant change overall among reference sites. | Reference sites differ from before to after declaration of MCA but may only be coincidential |
|  | BA x S(Is(G(I)) |  | 6 |  | Resid | BA x S(Is(G(C)) | Overall change in the abundances of species among MCA sites from before to after declaration of MCA | MCA has had an overall effect on species abundances at the spatial scale of sites. |

Table 13, continued

| Source of Variance | | | Df | | | F-Ratio denominator | | | Interpretation if significant | Implications for MCA |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | I | II (If I is ns) | III (If I is sig) | | |
| T(BA) x G | | | 12 | | | | | | | |
| | T(bef) x G | | | 6 | | | | | | |
| | | T(bef) x C | | | 4 | | | | | |
| | | T(bef) x IC | | | 2 | | | | | |
| | T(aft) x G | | | 6 | | | | | | |
| | | T(aft) x C | | | 4 | Resid | | | Significant short term temporal change overall among reference groups | Reference groups have different short term variation after declaration of MCA from before but may be coincidential |
| | | T(aft) x IC | | | 2 | | Resid | i) T(aft) x C<br>ii) T(bef) x IC<br>iii) T(bef) x C | Short term temporal changes among MCA groups that differs from short term changes in reference groups | MCA has caused short term changes in the abundances of species at the scale of groups. |
| T(BA) x Is(G) | | | 16 | | | | | | | |
| | T(bef) x Is(G) | | | 8 | | | | | | |
| | | T(bef) x Is(G(C)) | | | 6 | | | | | |
| | | T(bef) x Is(G(I)) | | | 2 | | | | | |
| | T(aft) x Is(G) | | | 8 | | | | | | |
| | | T(aft) x Is(G(C)) | | | 6 | Resid | | | Significant short term temporal change overall among reference islands | Reference islands have different short term variation after declaration of MCA from before but may be coincidential |
| | | T(aft) x Is(G(I)) | | | 2 | | Resid | i) T(aft) x Is(G(C))<br>ii) T(bef) x Is(G(I))<br>iii) T(bef) x Is(G(C)) | Short term temporal changes among MCA groups that differs from short term changes in reference islands | MCA has caused short term changes in the abundances of species at the scale of islands |

Table 13, continued

| Source of Variance | Df | F-Ratio denominator<br>I | <br>II (If I is ns) | <br>III (If I is sig) | Interpretation if significant | Implications for MCA |
|---|---|---|---|---|---|---|
| T(BA) x S(Is(G)) | 96 | | | | | |
| T(bef) x S(Is(G)) | 48 | | | | | |
| T(bef) x S(Is(G(C))) | 36 | | | | | |
| T(bef) x S(Is(G(I))) | 12 | | | | | |
| T(aft) x S(Is(G)) | 48 | | | | | |
| T(aft) x S(Is(G(C))) | 36 | Resid | | | Significant short term temporal change overall among reference sites | Reference sites have different short term variation after declaration of MCA from before but may be coincidential |
| T(aft) x S(Is(G(I))) | 12 | | Resid | i) T(aft) x S(Is(G(C)))<br>ii) T(bef) x S(Is(G(I)))<br>iii) T(bef) x S(Is(G(C))) | Short term temporal changes among MCA groups that differs from short term changes in reference sites | MCA has caused short term changes in the abundances of species at the scale of sites |
| Residual | 960 | | | | | |
| Total | 1151 | | | | | |

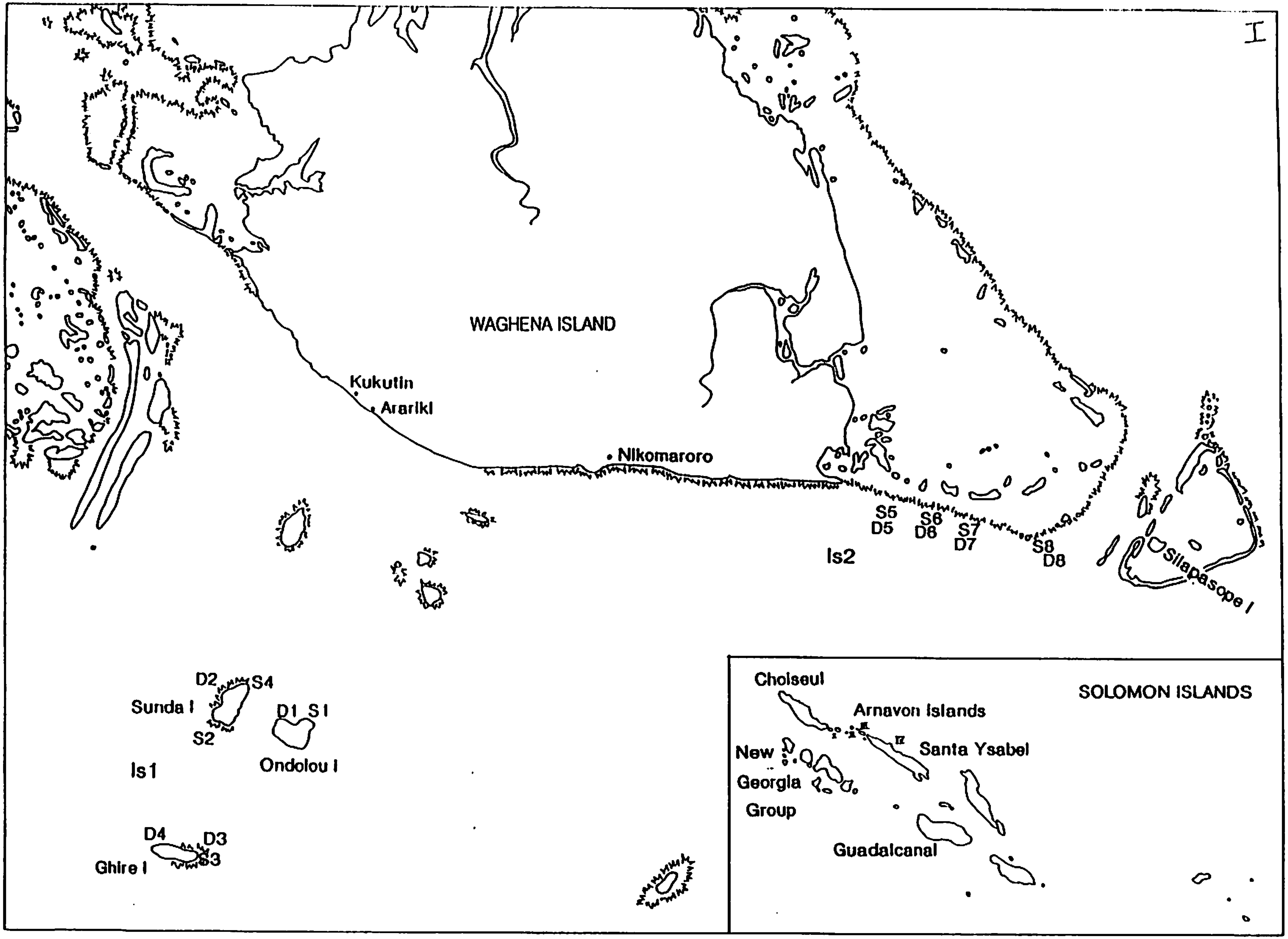
I = Impact
C = Control
n=6

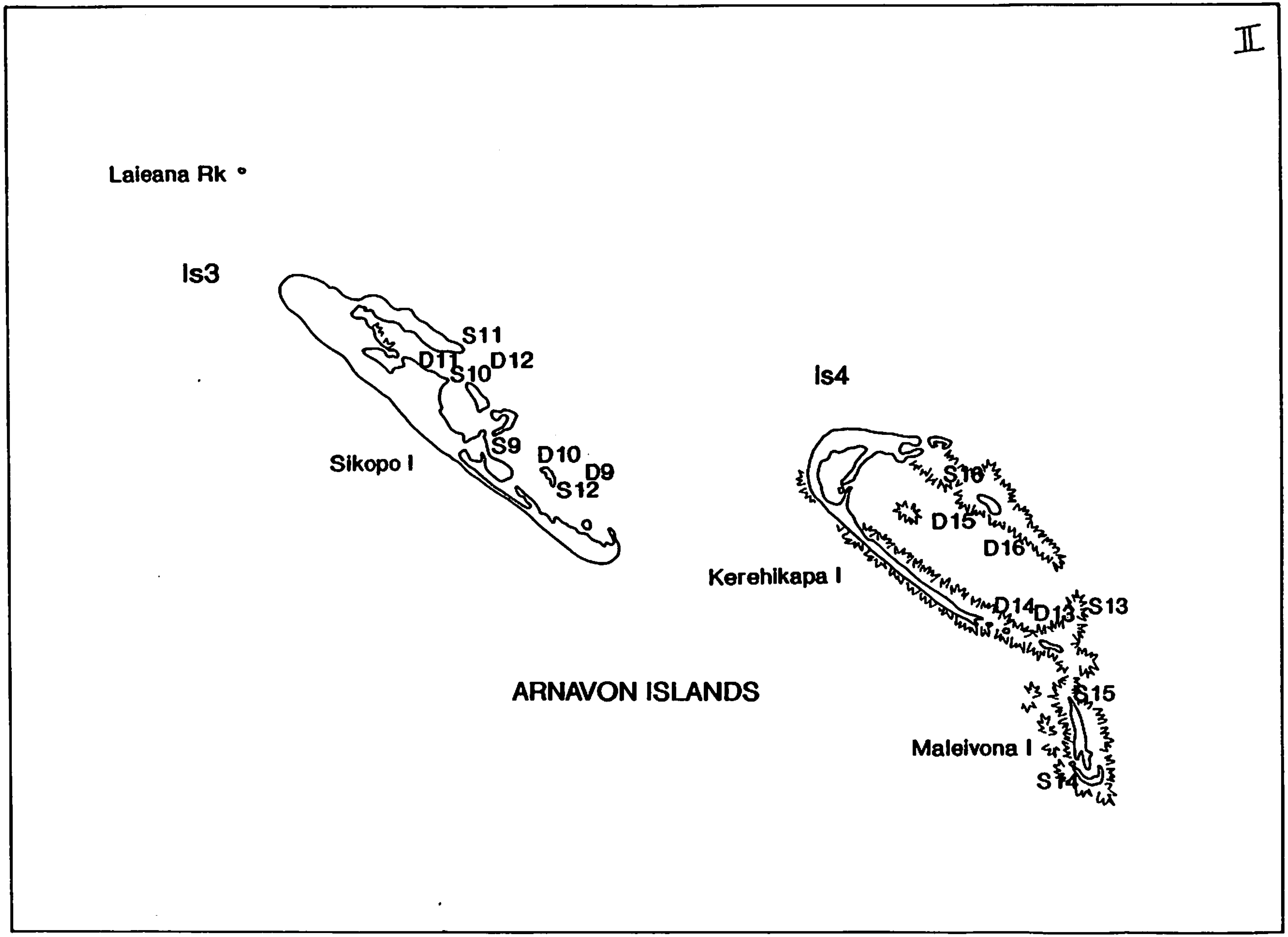
# after post hoc elimination of non-significant terms

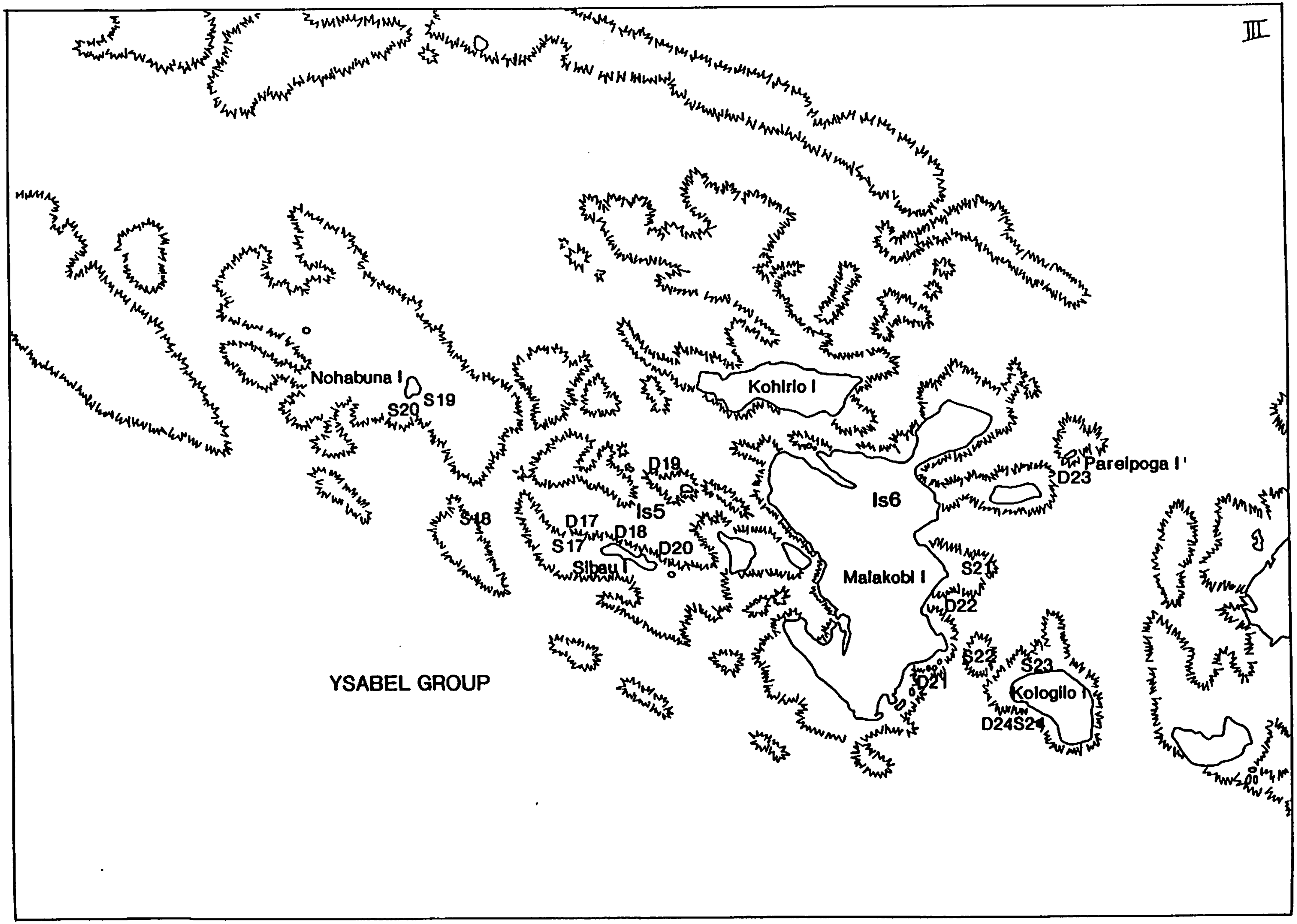
* This is only valid if there are no short term temporal changes at any of the spatial scales

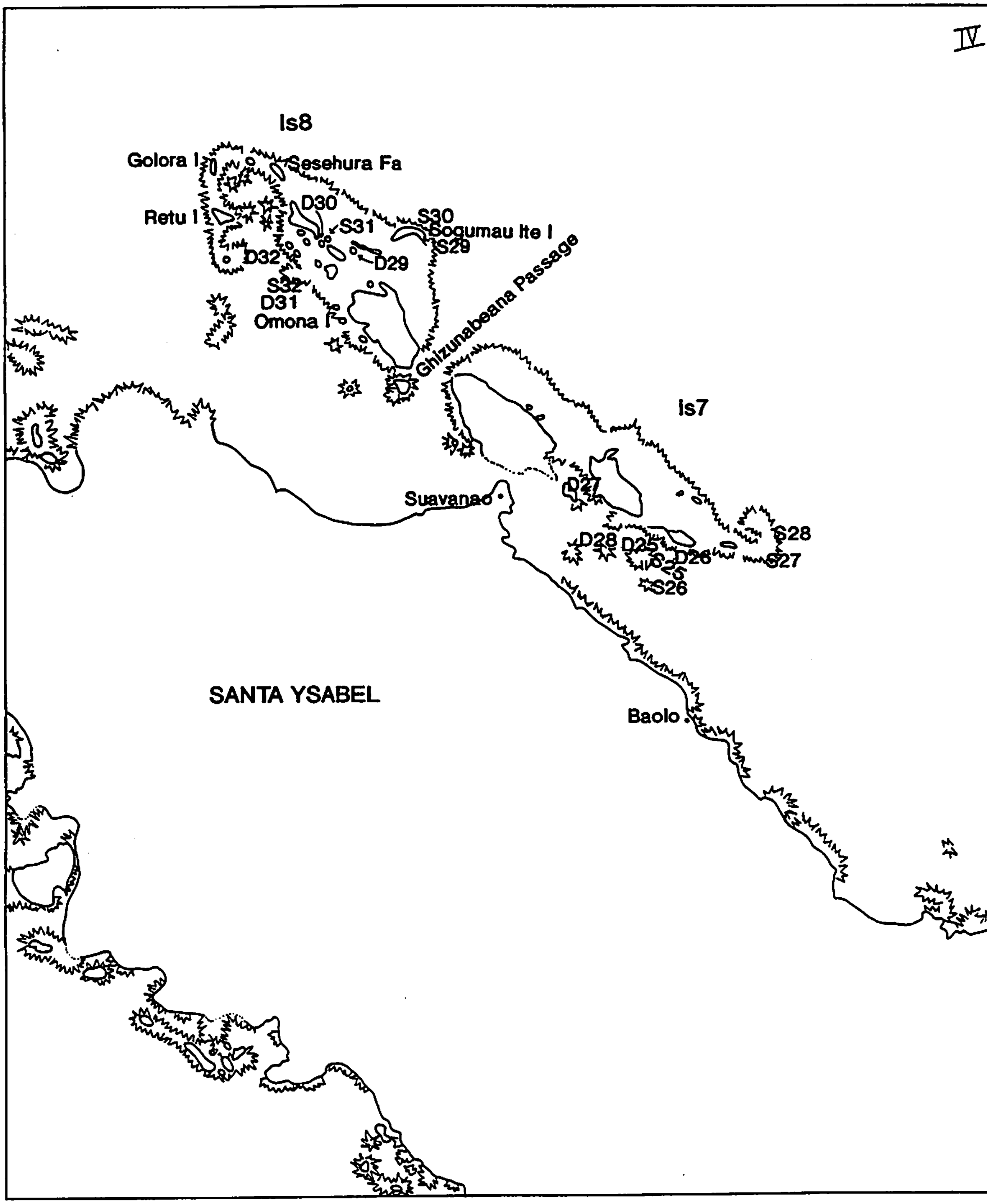
# FIGURES

Figure 1. The study area and sampling sites on following pages. Map I = Waghena Group and inset of Solomon Islands, showing approximate position of Groups (I - IV) within the study region. Map II = Arnavon Islands Group; Map III = Ysabel Group; Map IV = Suavanao Group.

I
WAGHENA ISLAND
Kukutin
Arariki
Nikomaroro
S5
D5
S6
D6
S7
D7
S8
D8
Is2
Silapasope I
D2
S4
Sunda I
S2
D1 S1
Ondolou I
Is1
D4
D3
S3
Ghire I
SOLOMON ISLANDS
Choiseul
Arnavon Islands
New
Georgia
Group
Santa Ysabel
Guadalcanal


II
Laieana Rk
Is3
S11
D11
S10
D12
Sikopo I
S9
D10
D9
S12
Is4
S16
D15
D16
Kerehikapa I
D14
D13
S13
ARNAVON ISLANDS
S15
Maleivona I
S14


III
Nohabuna I
S19
S20
Kohlrio I
D19
Is5
S18
D17
D18
S17
D20
Sibau I
Is6
Malakobi I
Pareipoga I'
D23
S21
D22
S22
D21
S23
Kologilo I
D24S24
YSABEL GROUP


IV
Is8
Golora I
Sesehura Fa
D30
Retu I
S31
S30
Sogumau Ite I
S29
D32
D29
S32
D31
Omona I
Ghizunabeana Passage
Is7
Suavanao
D27
D28
D25
S25
D26
S28
S27
S26
SANTA YSABEL
Baolo

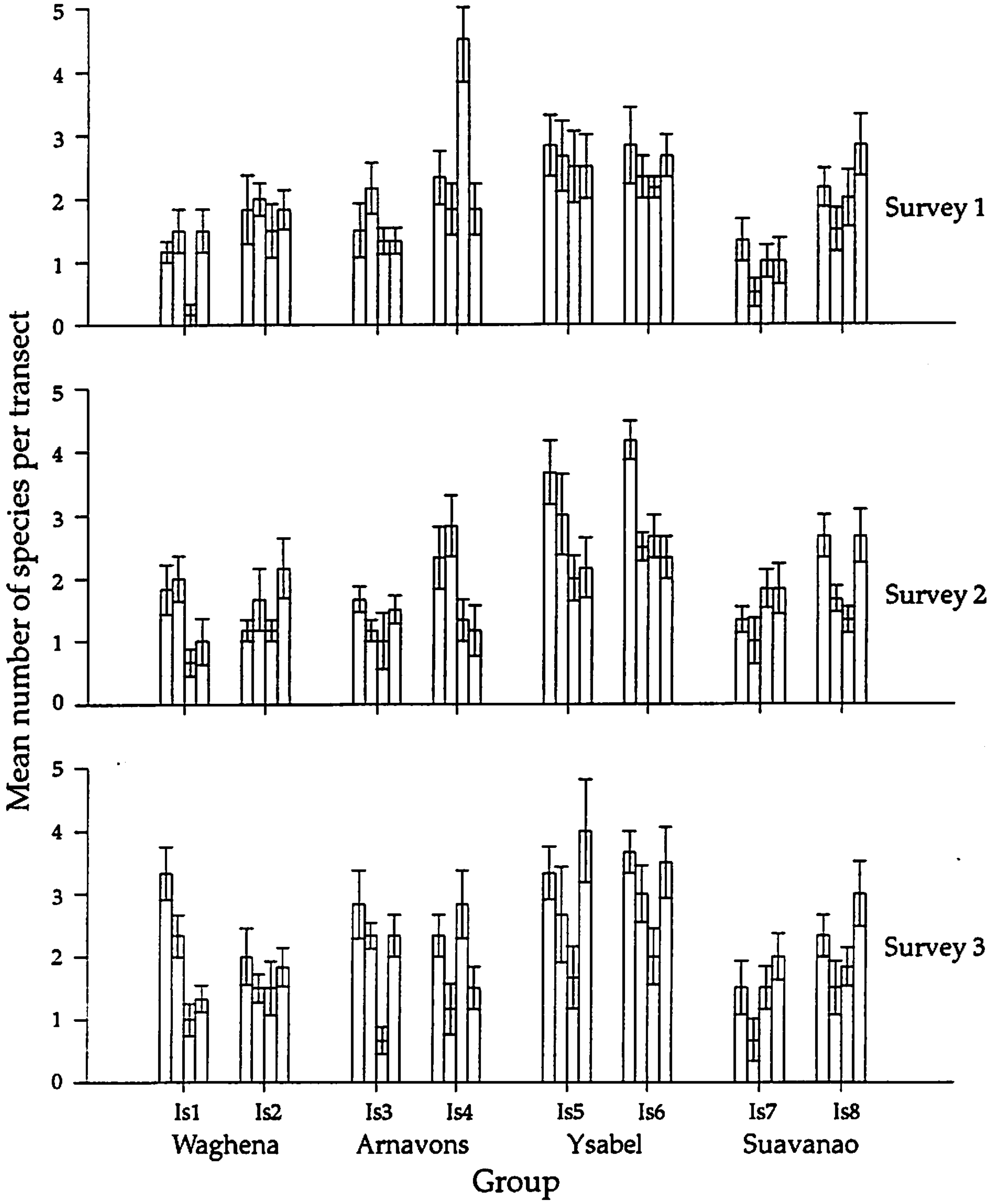


Figure 2 Mean number (+/- SE; $n = 6$) of species for each of four sites at two islands (Is1 - Is8) within four groups in the shallow habitat during each survey. Site numbers (S1 - S32) are presented in ascending order from left to right, thus, Sites 1 to 4 are in Is1, 5-8 in Is2 etc.

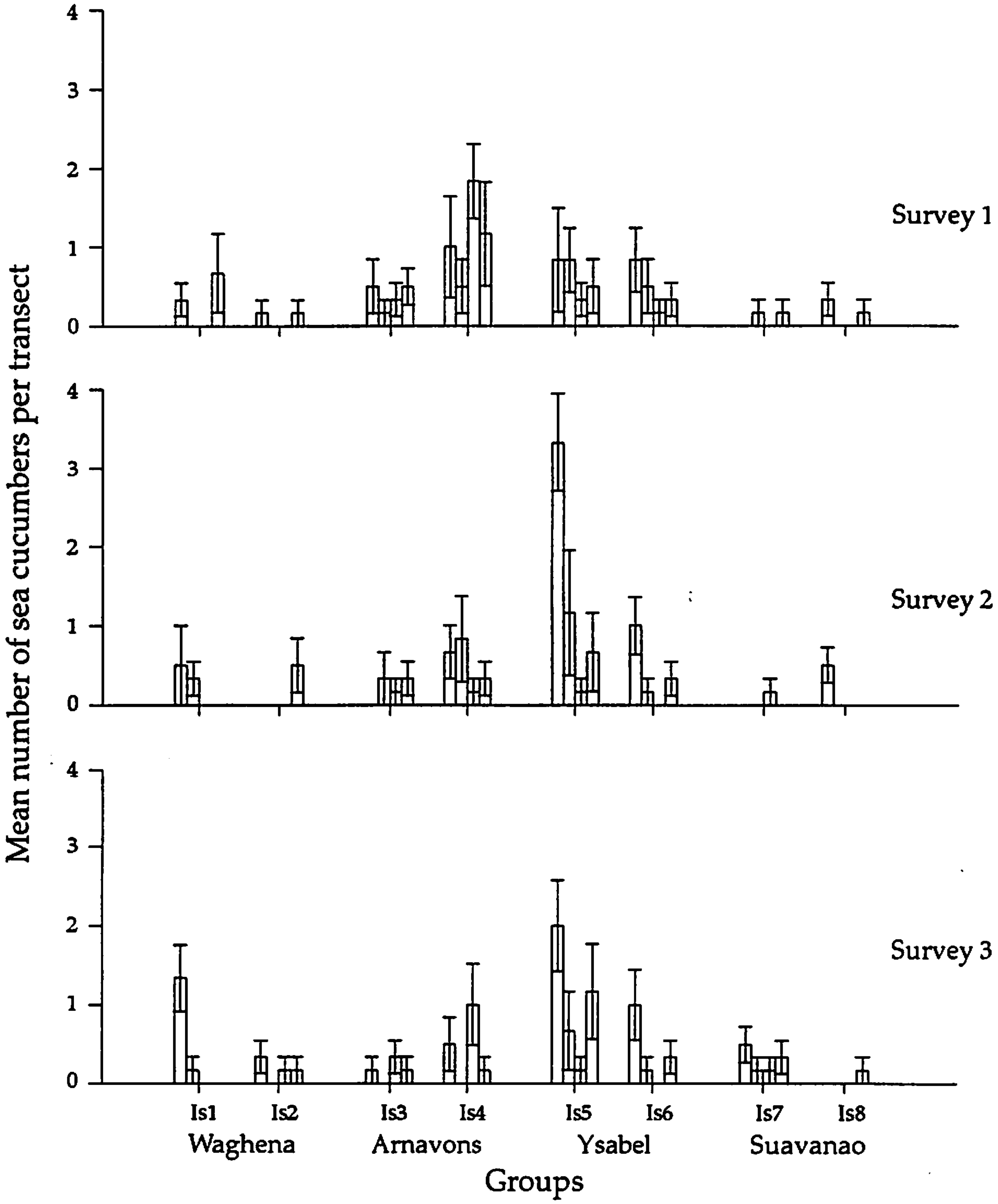


Figure 3 Mean number (+/- SE; $n = 6$) of all sea cucumbers for each of four sites at two islands (Is1 - Is8) within four groups in the shallow habitat for each survey. Site numbers (S1 - S32) are presented in ascending order from left to right, thus, Sites 1 to 4 are in Is1, 5-8 in Is2 etc.

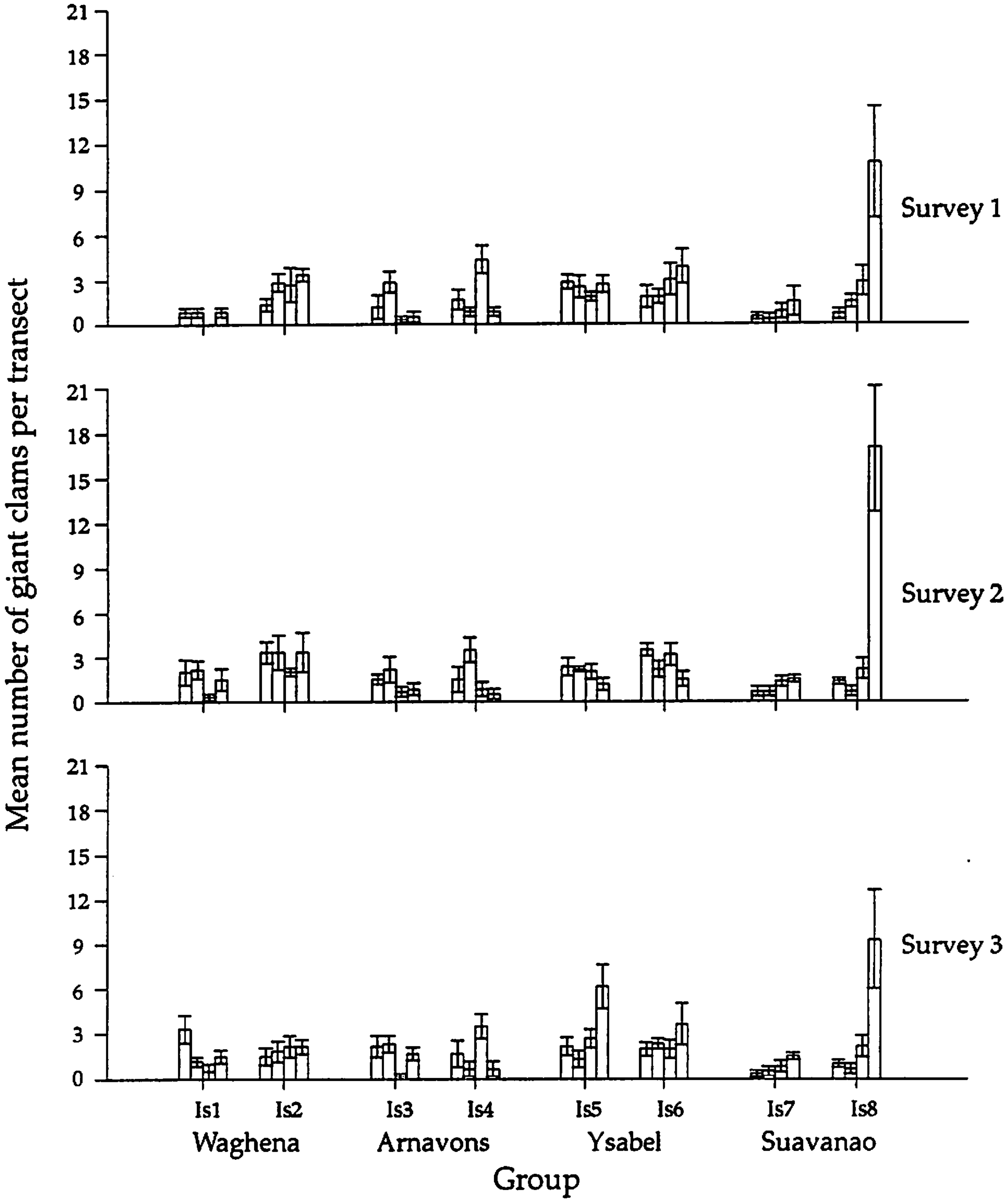


Figure 4 Mean number (+ / - SE; *n* = 6) of giant clams for each of four sites at two islands (Is1 - Is8) within four groups in the shallow habitat for each survey. Site numbers (S1 - S32) are presented in ascending order from left to right, thus, Sites 1 to 4 are in Is1, 5-8 in Is2 etc.

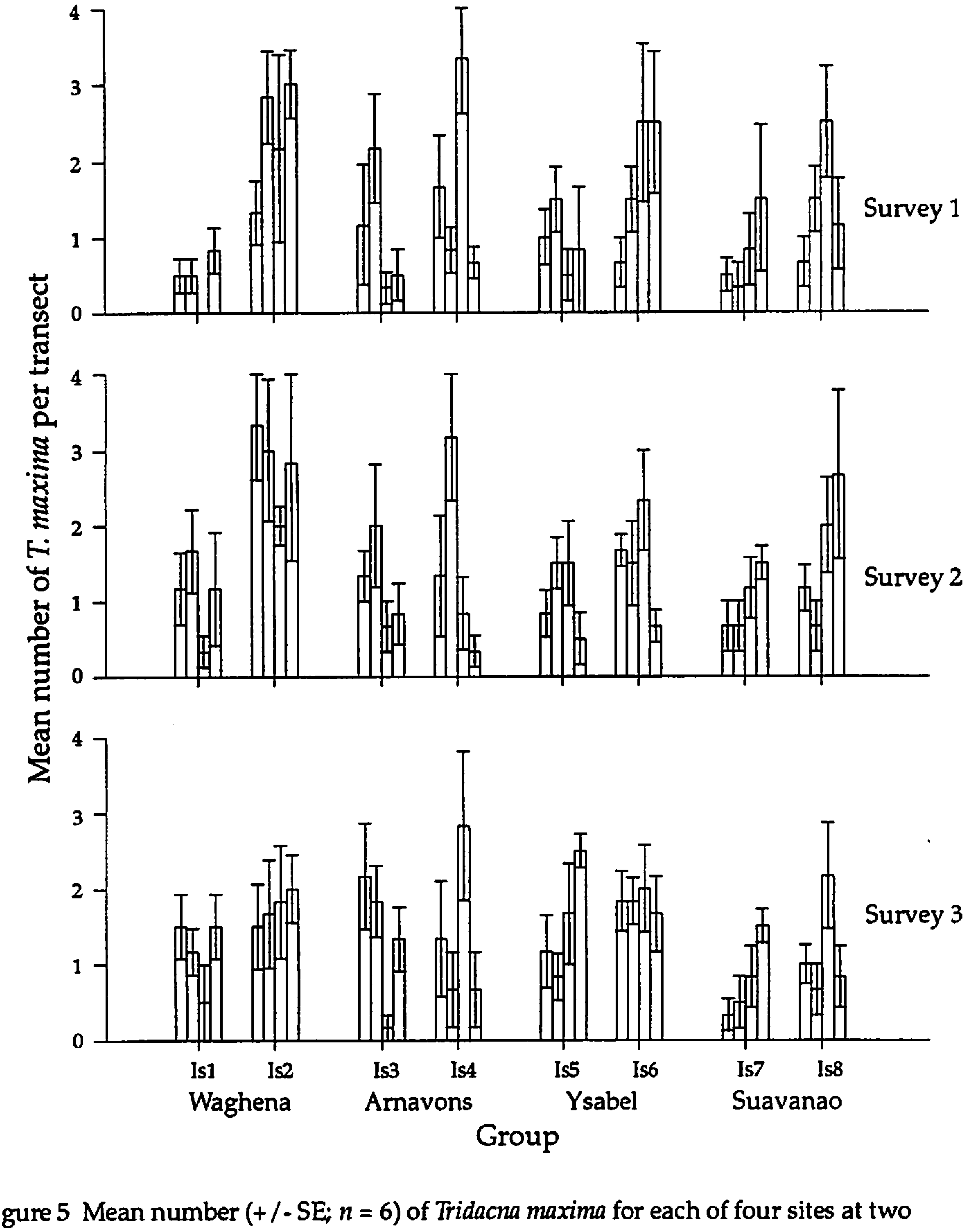


Figure 5 Mean number (+/- SE; $n = 6$) of *Tridacna maxima* for each of four sites at two islands (Is1 - Is8) within four groups in the shallow habitat for each survey. Site numbers (S1 - S32) are presented in ascending order from left to right, thus, Sites 1 to 4 are in Is1, 5-8 in Is2 etc.

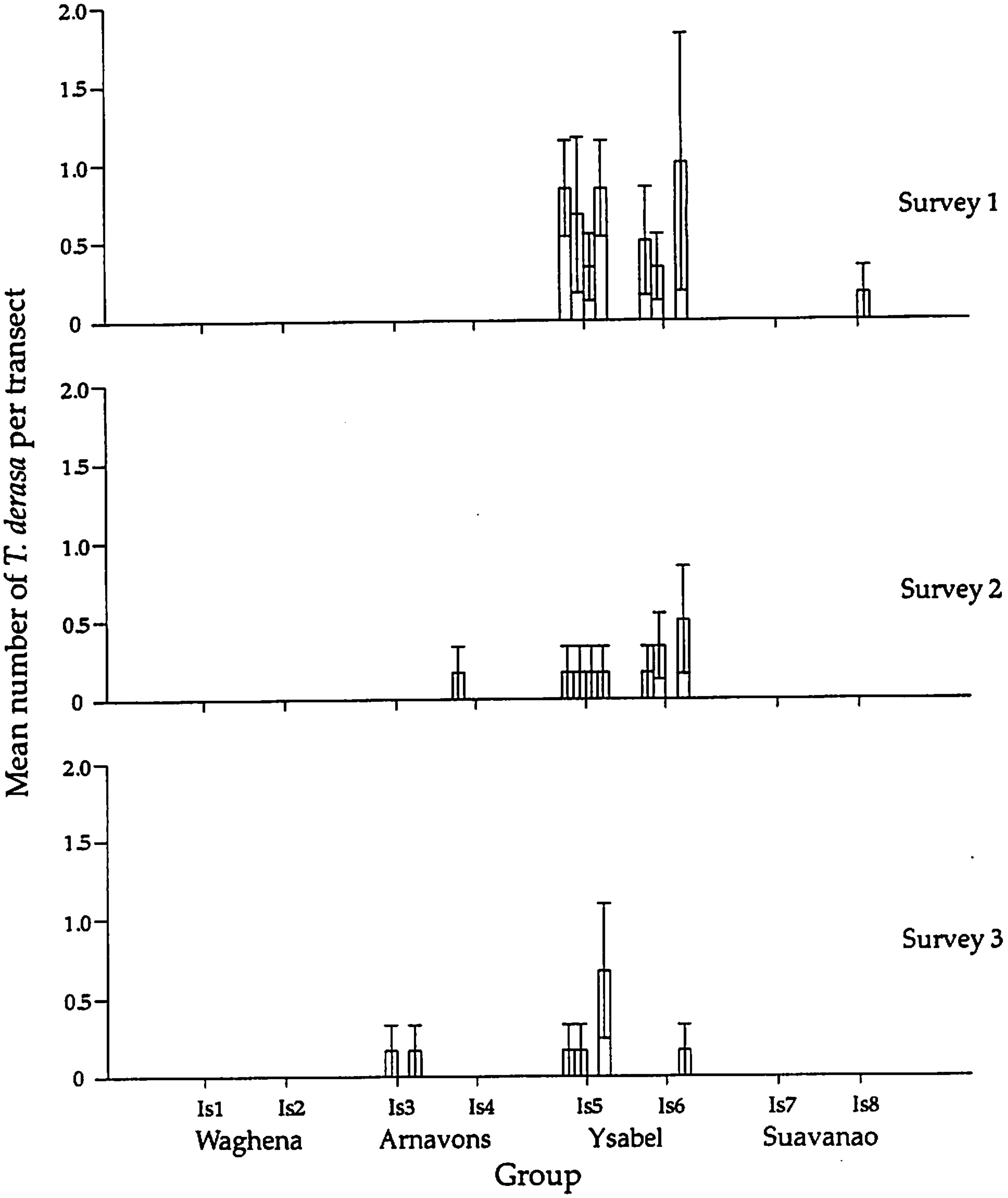


Figure 6 Mean number (+ / - SE; $n = 6$) of *Tridacna derasa* for each of four sites at two islands (Is1 - Is8) within four areas in the shallow habitat for each survey. Site numbers (S1 - S32) are presented in ascending order from left to right, thus Sites 1 to 4 in Is1, 5-8 in Is2 etc.

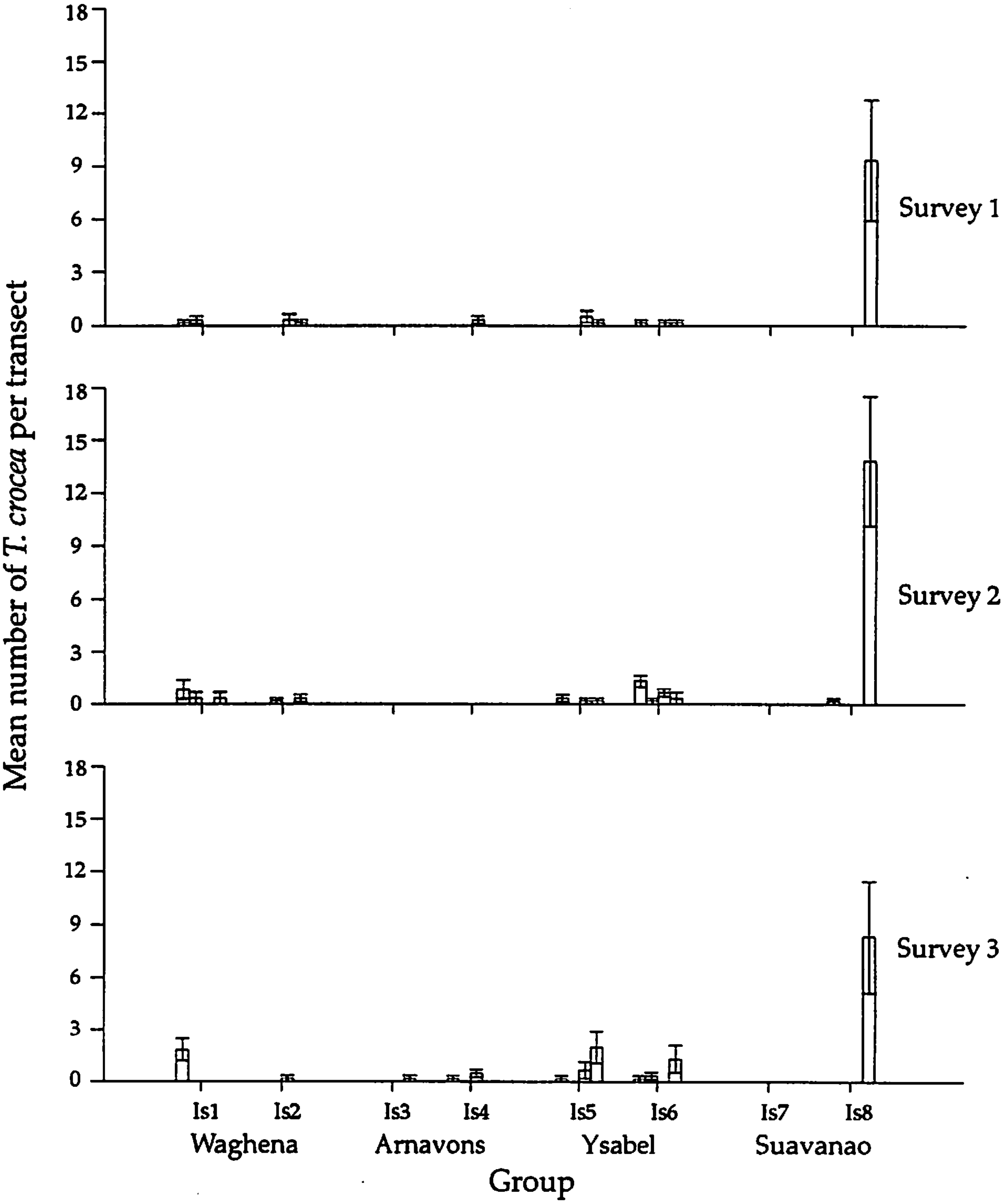


Figure 7 Mean number (+ / - SE; *n* = 6) of *Tridacna crocea* for each of four sites at two islands (Is1 - Is8) within four areas in the shallow habitat for each survey. Site numbers (S1 - S32) are presented in ascending order from left to right, thus, Sites 1 to 4 are in Is1, 5-8 in Is2 etc.

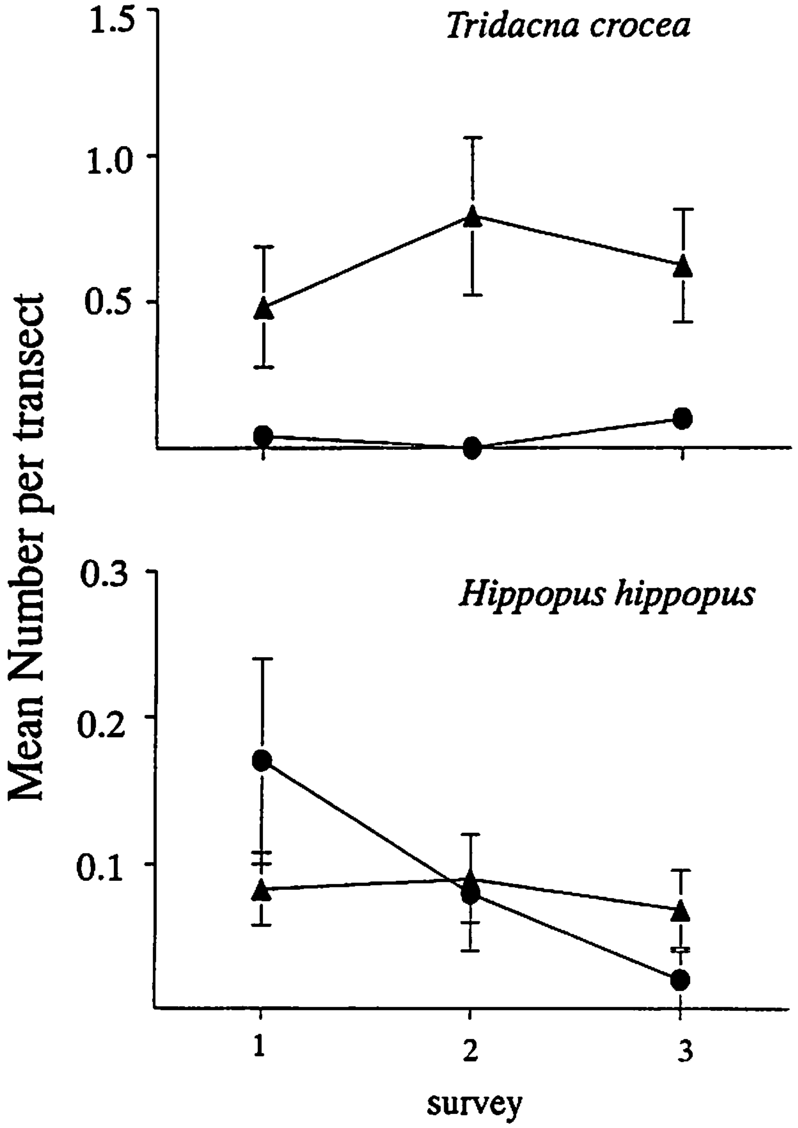


Figure 8 Mean number (+/- SE) of two species of giant clams from the shallow habitat within Arnavon Islands Marine Conservation Area ($n$=48) and reference groups ($n$=144) for the Surveys 1-3. ● MCA (Arnarvon), ▲ Reference groups.

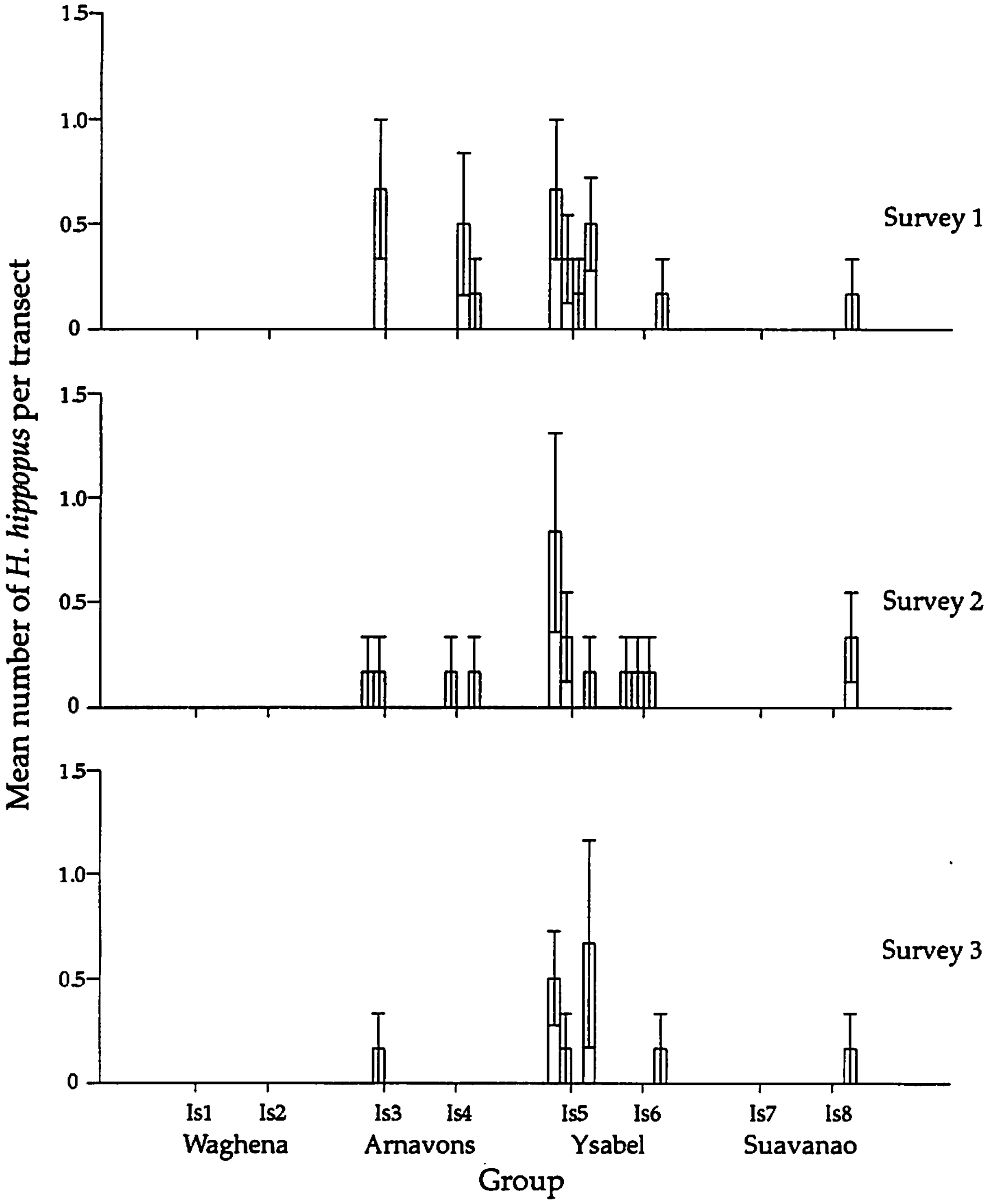


Figure 9 Mean number (+ / - SE; $n$ = 6) of *Hippopus hippopus* for each of four sites at two islands (Is1 - Is8) within four groups in the shallow habitat for each survey. Site numbers (S1 - S32) are presented in ascending order from left to right, thus, Sites 1 to 4 are in Is1, 5-8 in Is2 etc.

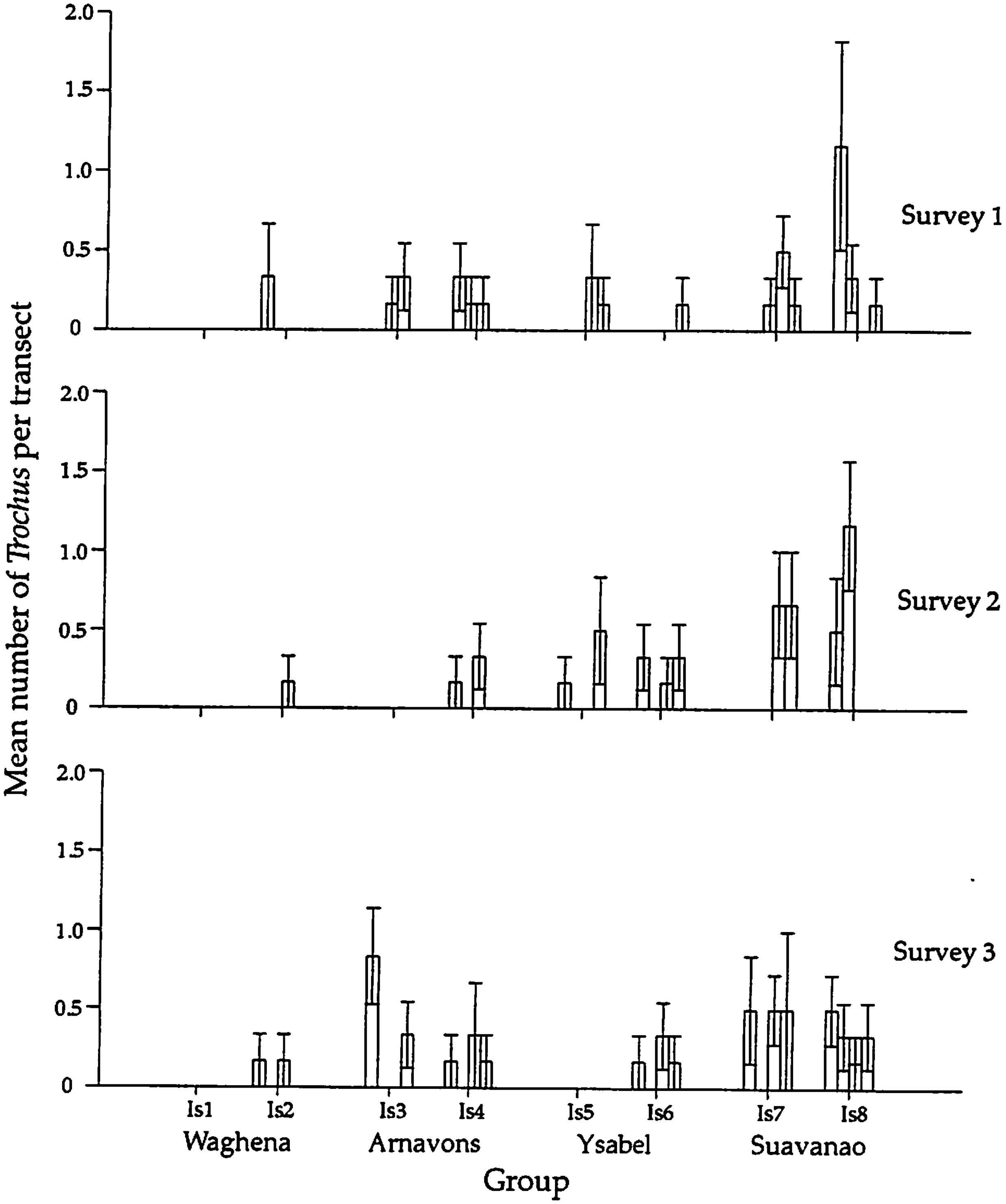


Figure 10 Mean number (+/- SE; *n* = 6) of *Trochus niloticus* for each of four sites at two islands (Is1 - Is8) within four groups in the shallow habitat for each survey. Site numbers (S1 - S32) are presented in ascending order from left to right, thus, Sites 1 to 4 are in Is1, 5-8 in Is2 etc.

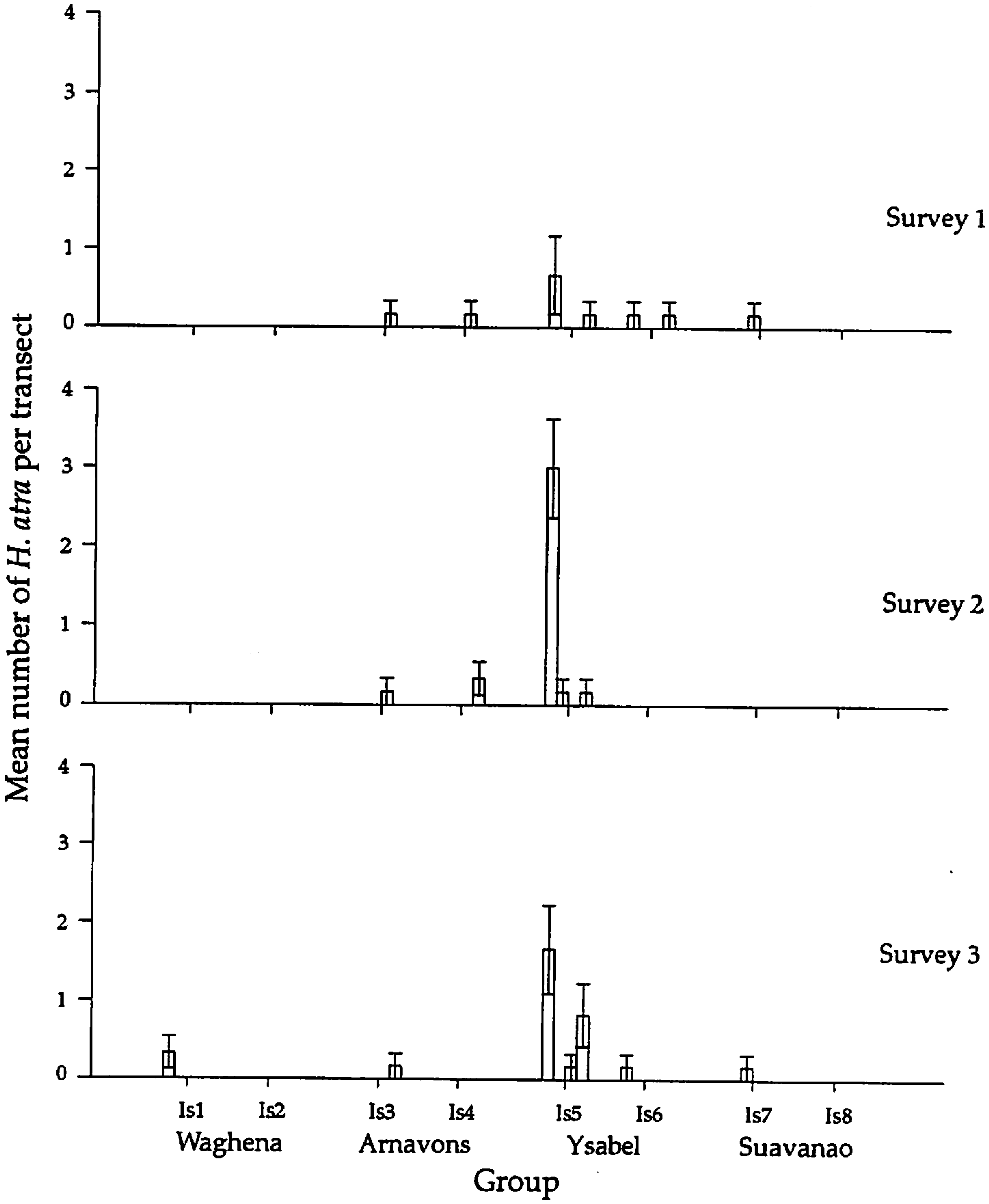


Figure 11 Mean number (+ / - SE; $n = 6$) of *Holothuria atra* for each of four sites at two islands (Is1 - Is8) within four groups in the shallow habitat for each survey. Site numbers (S1 - S32) are presented in ascending order from left to right, thus, Sites 1 to 4 are in Is1, 5-8 in Is2 etc.

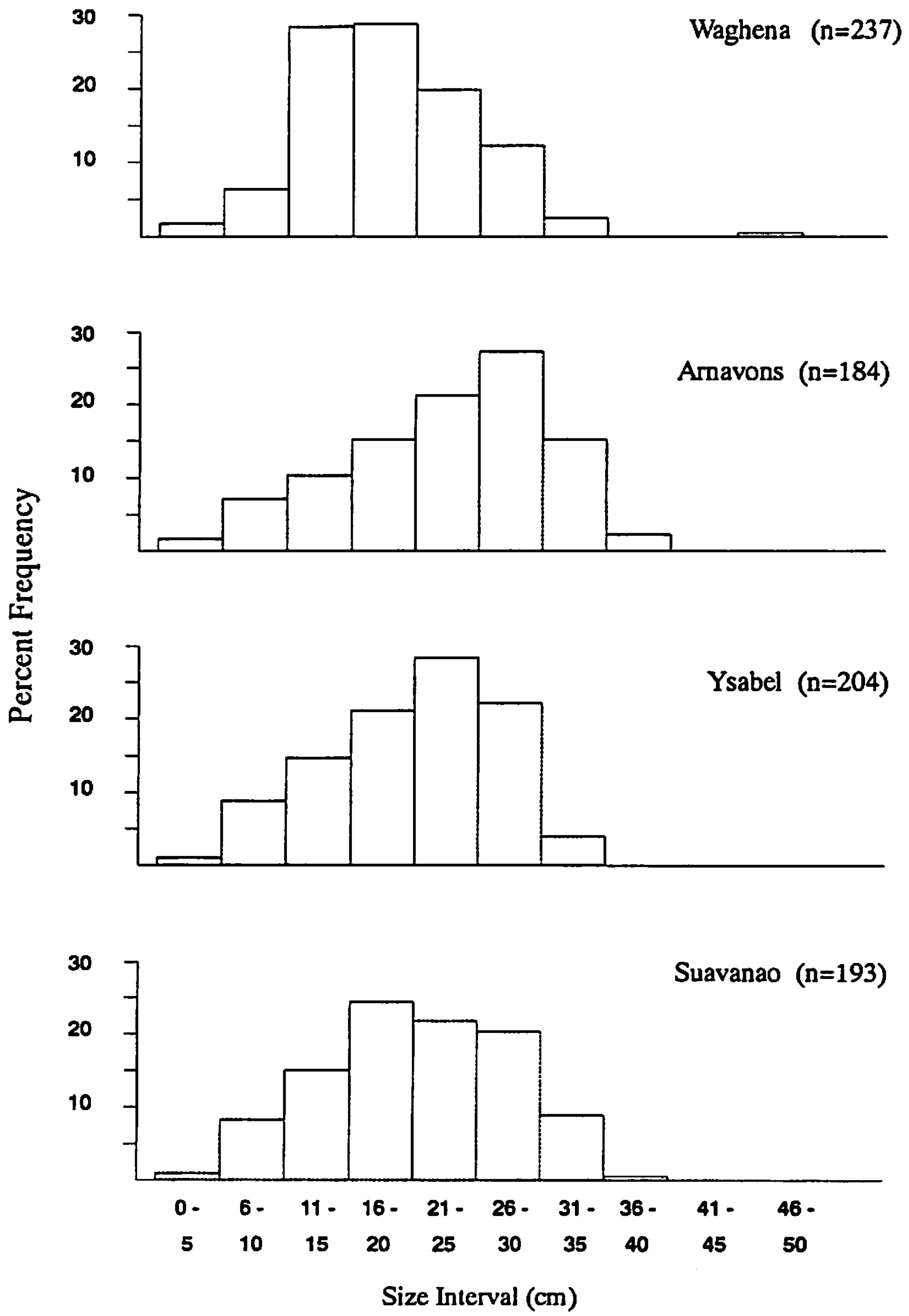


Figure 12 Length-frequency distributions of *Tridacna maxima* from the shallow habitat for each group.

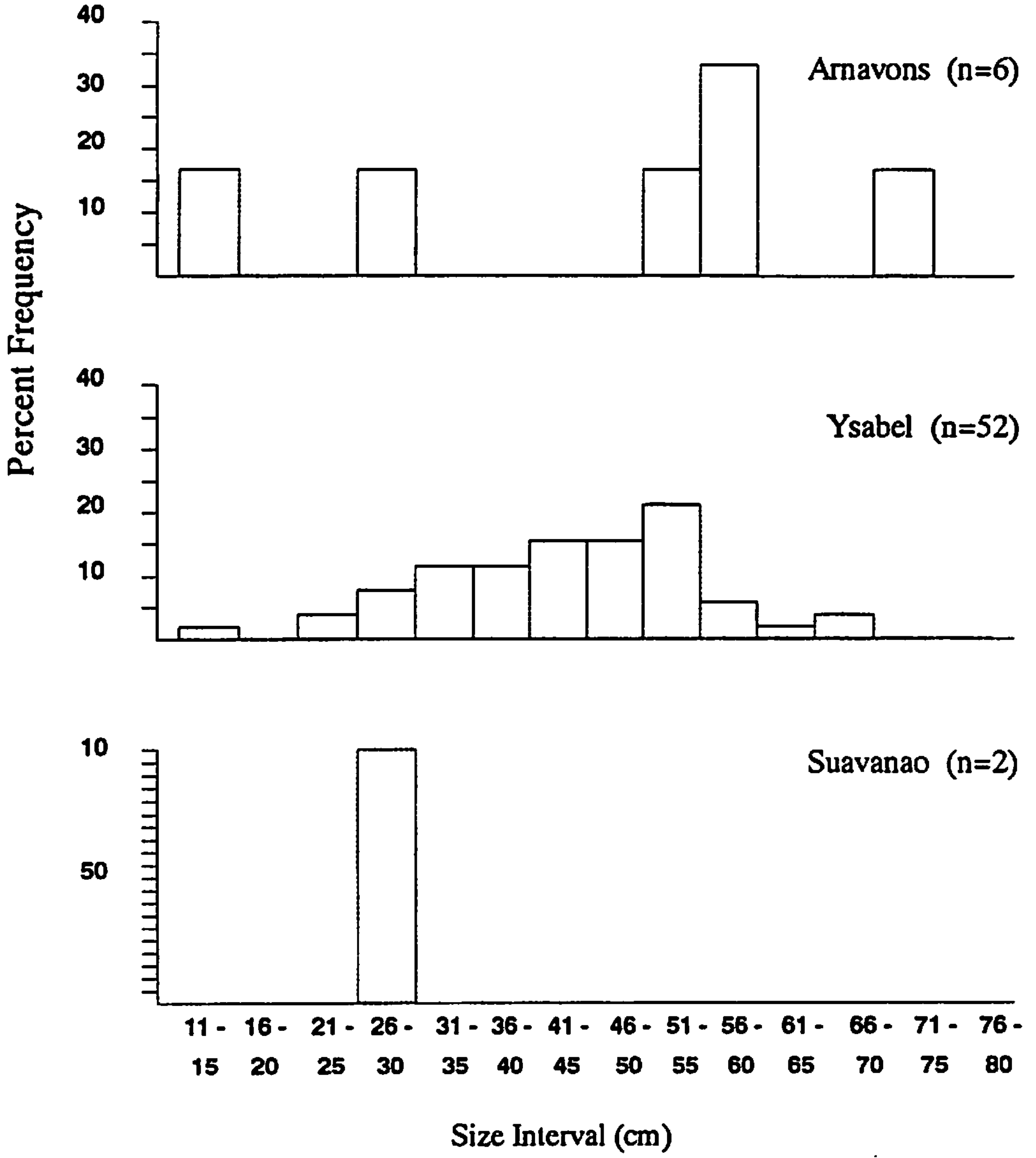


Figure 13 Length-frequency distributions of *Tridacna derasa* from the shallow habitat for each group. Note: No *Tridacna derasa* were recorded at Waghena.

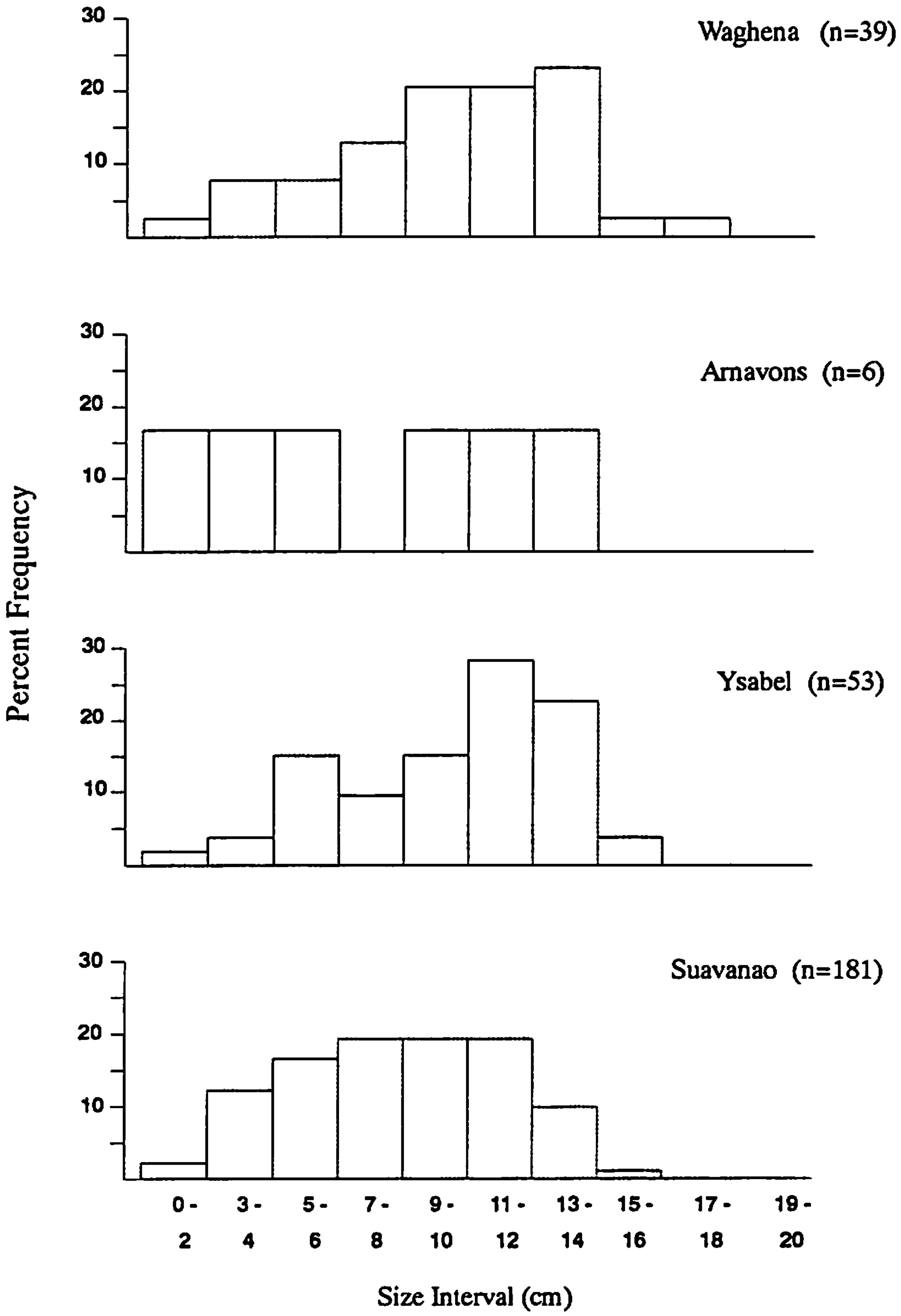


Figure 14 Length-frequency distributions of *Tridacna crocea* from the shallow habitat for each group.

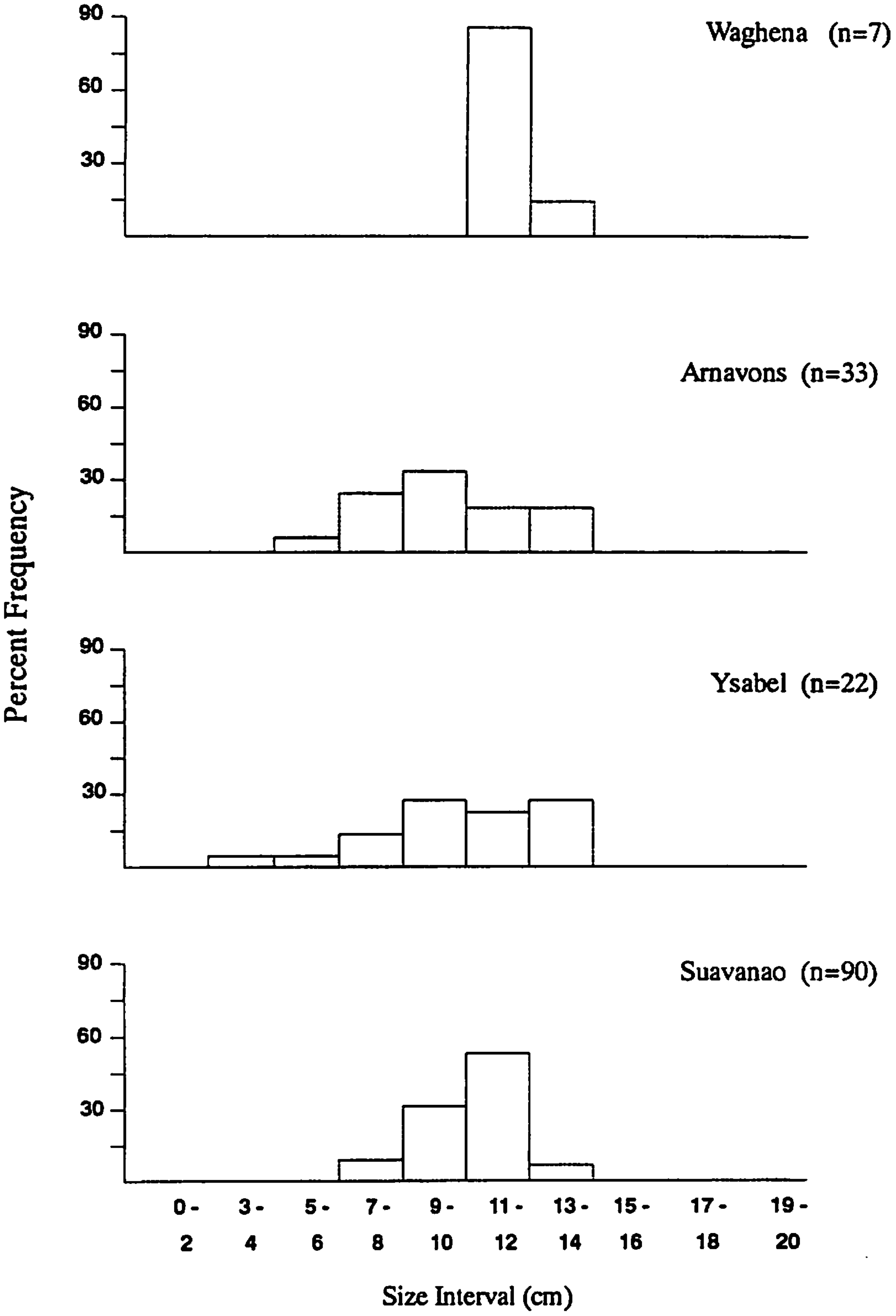


Figure 15 Length-frequency distributions of *Trochus niloticus* from the shallow habitat for each group.

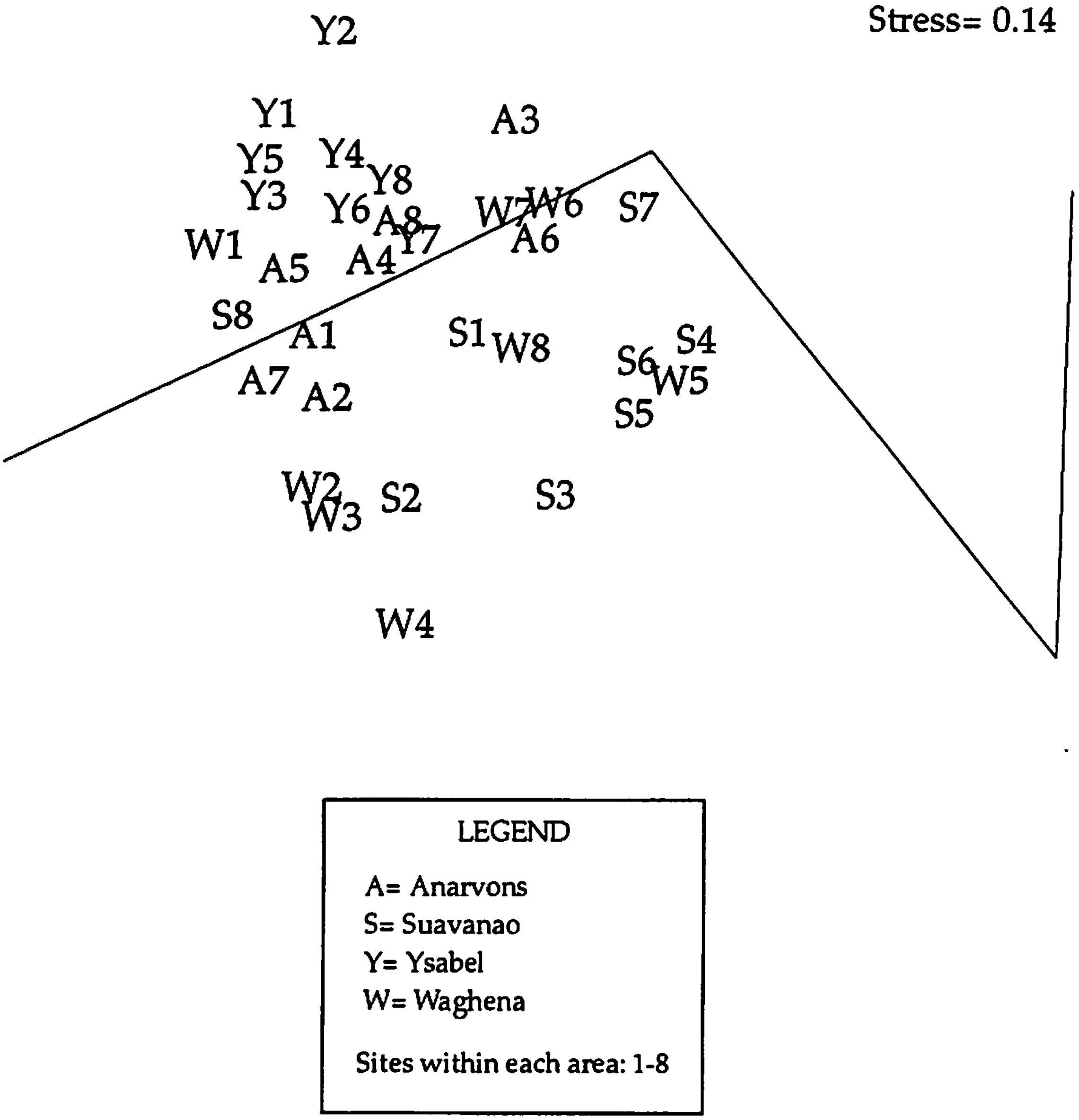


Figure 16 Three dimensional MDS plot of habitat variables (% cover) among all Sites and Groups sampled in the shallow habitat (*n*= 32). Replicates (*n*= 4) were pooled over sites.

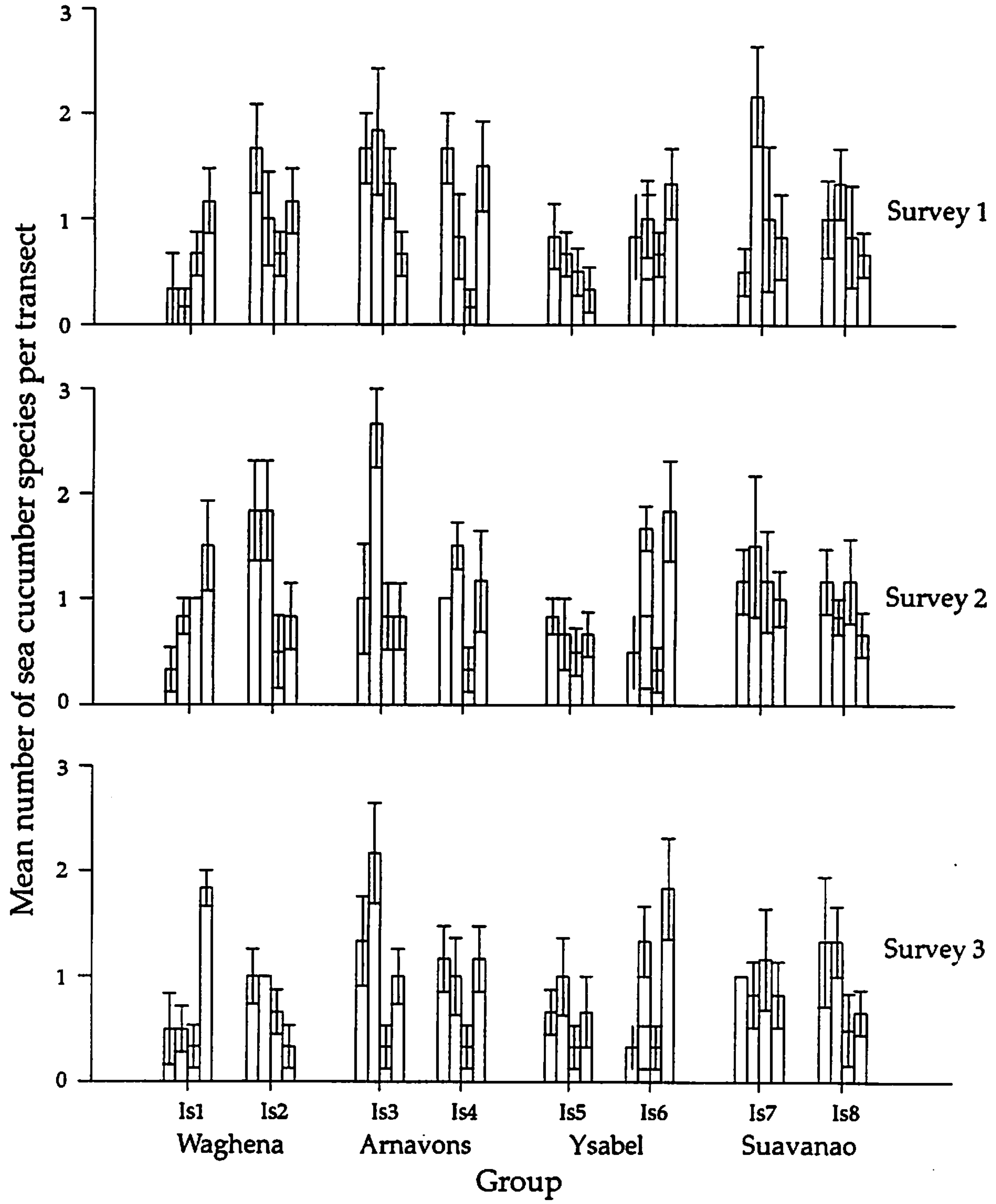


Figure 17 Mean number (+/- SE; $n$ = 6) of species of sea cucumbers for each of four sites at two islands (Is1 - Is8) within four groups in the deep habitat for each survey. Site numbers (D1 -D32) are presented in ascending order from left to right, thus, Sites 1 to 4 are in Is1, 5-8 in Is2 etc.

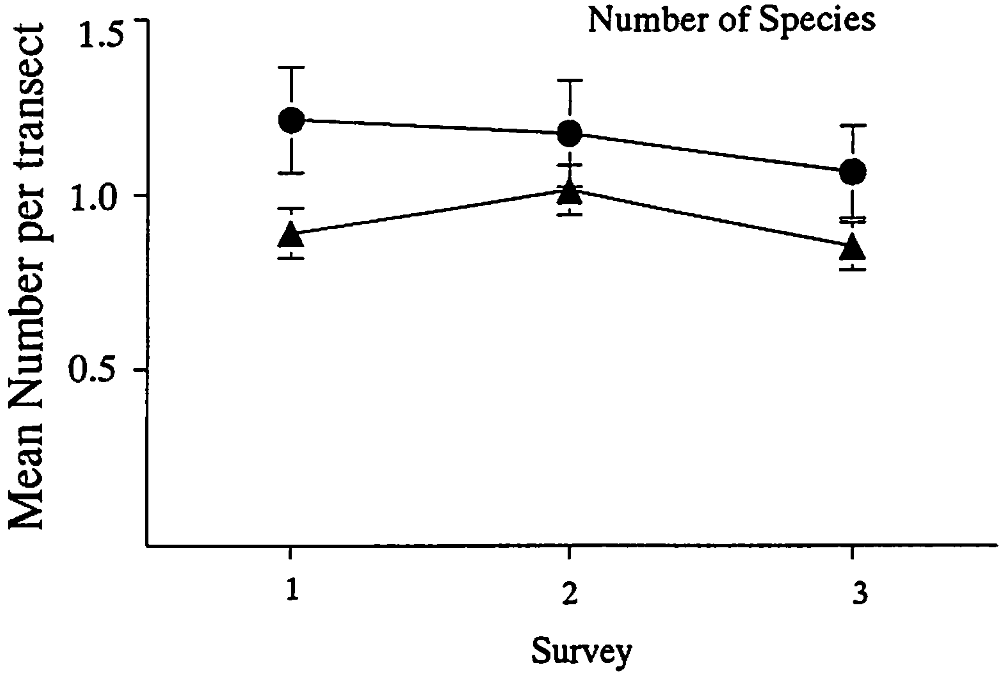


Figure 18 Mean number (+/- SE) of species of sea cucumbers from the deep habitat for the Arnavon Islands Marine Conservation Area (*n*=48) and reference groups (*n*=144) for the first three surveys. ● MCA (Arnavon), ▲ Reference groups.

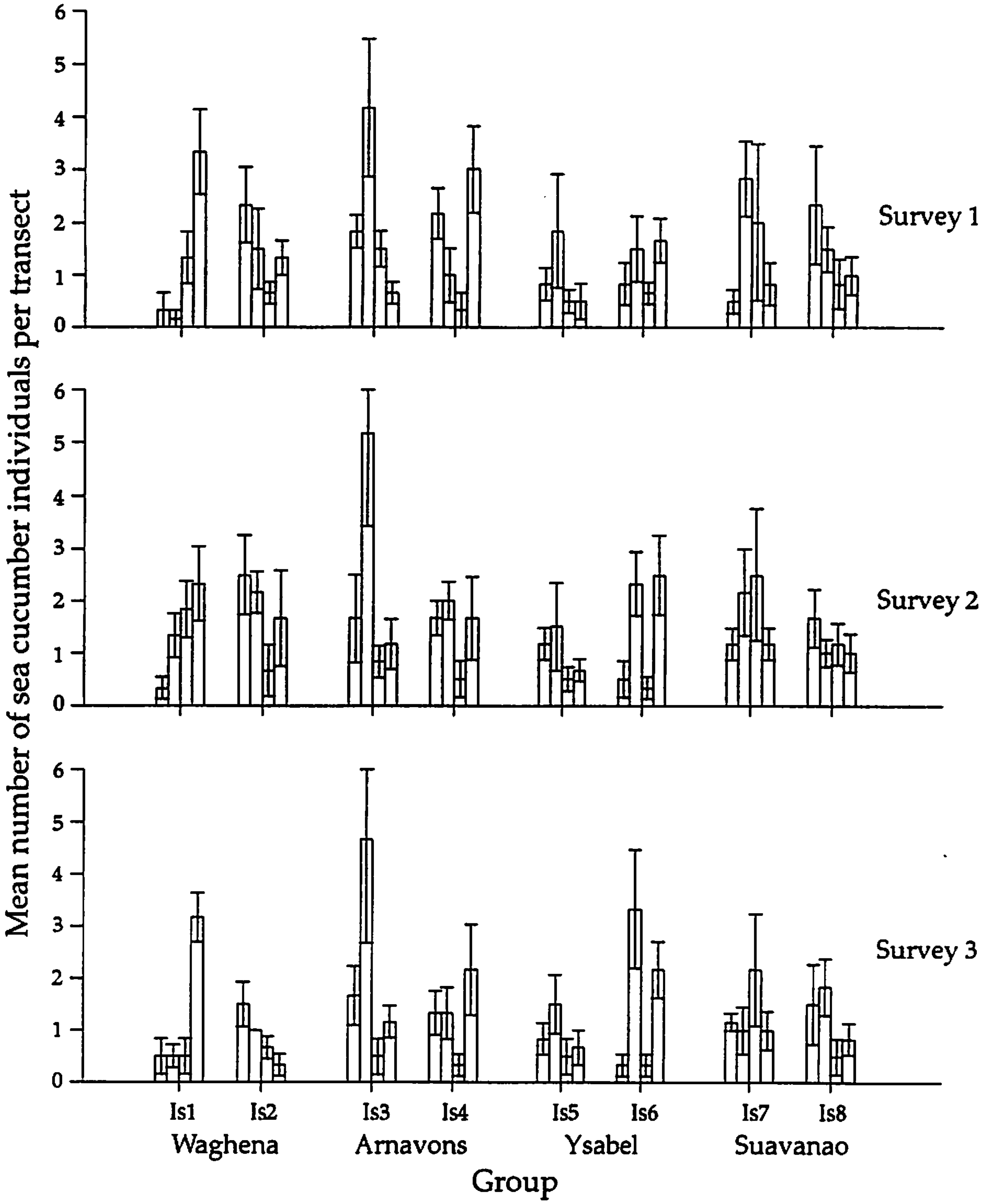


Figure 19 Mean number (+/- SE; $n = 6$) of individuals of sea cucumbers for each of four sites at two islands (Is1 - Is8) within four groups in the deep habitat for each survey. Site numbers (D1 - D32) are presented in ascending order from left to right, thus, Sites 1 to 4 are in Is1, 5-8 in Is2.

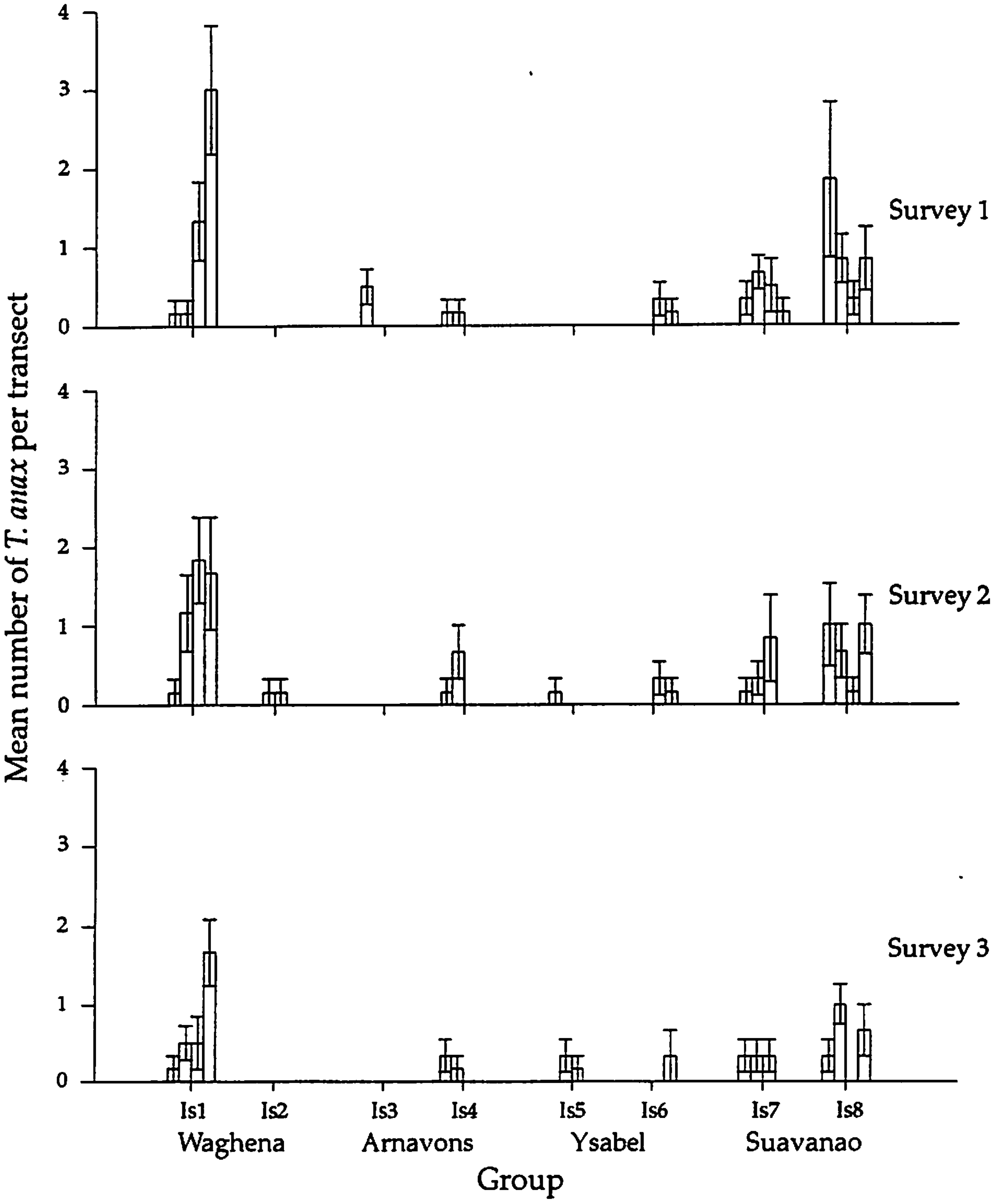


Figure 20 Mean number (+/- SE; $n = 6$) of *Thelanota anax* for each of four sites at two islands (Is1 - Is8) within four groups in the deep habitat for each survey. Site numbers (D1 - D32) are presented in ascending order from left to right, thus, Sites 1 to 4 are in Is1, 5-8 in Is2 etc.

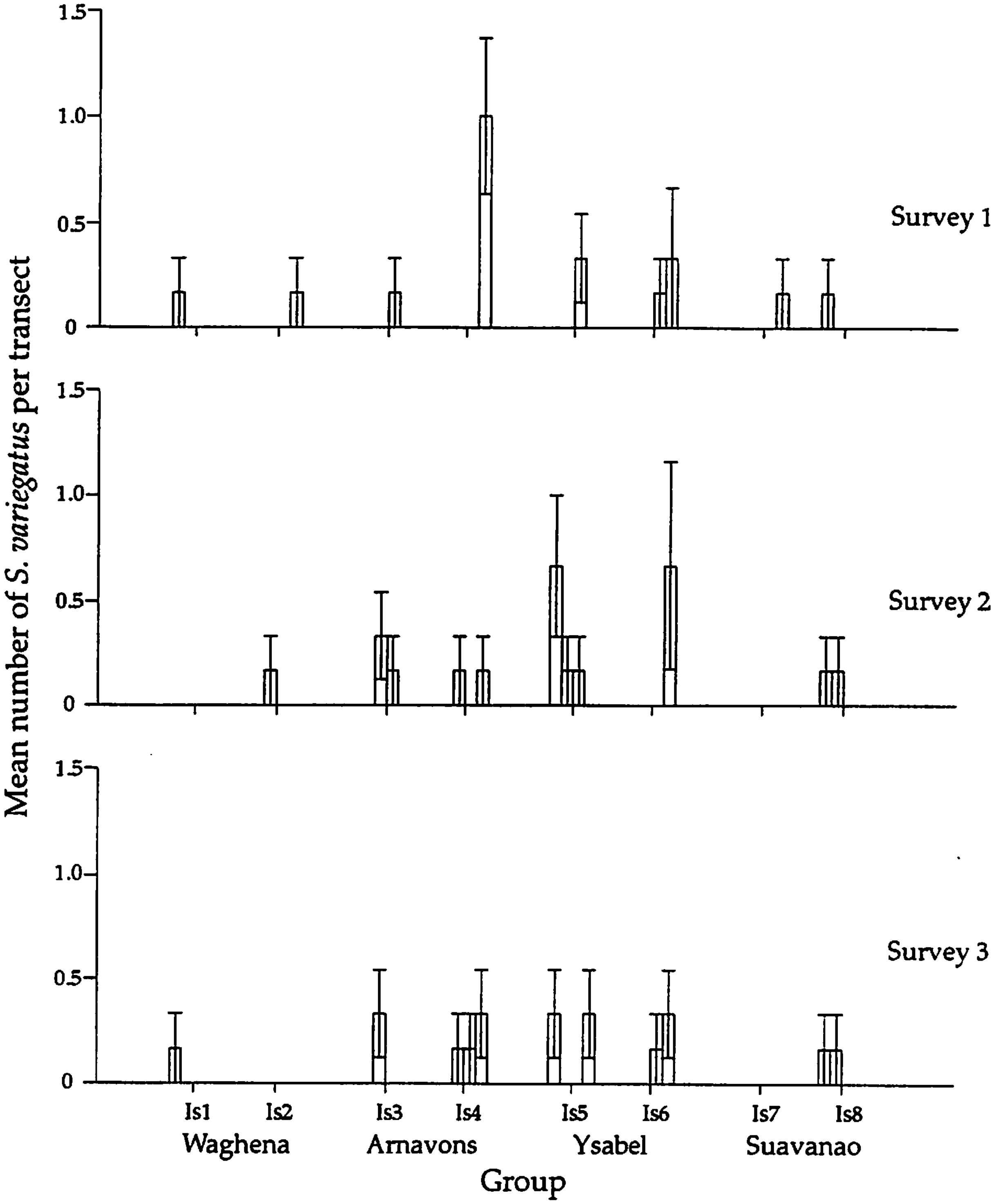


Figure 21 Mean number (+/- SE; $n = 6$) of *Stichopus variegatus* for each of four sites at two islands (Is1 - Is8) within four groups in the deep habitat for each survey. Site numbers (D1 - D32) are presented in ascending order from left to right, thus, Sites 1 to 4 are in Is1, 5-8 in Is2 etc.

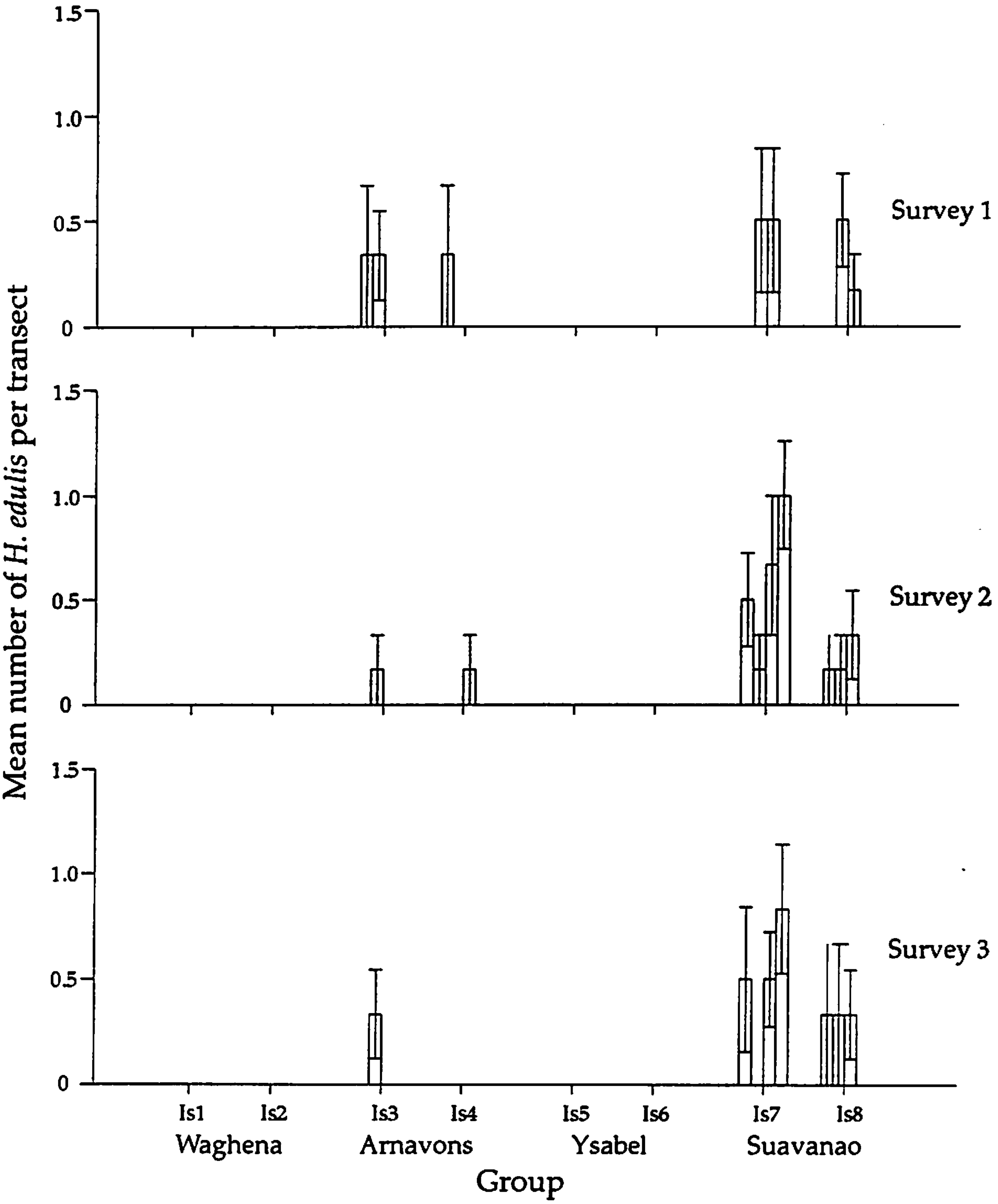


Figure 22 Mean number (+/- SE; $n = 6$) of *Holothuria edulis* for each of four sites at two islands (Is1 - Is8) within four groups in the deep habitat for each survey. Site numbers (D1 - D32) are presented in ascending order from left to right, thus, Sites 1 to 4 are in Is1, 5-8 in Is2 etc.

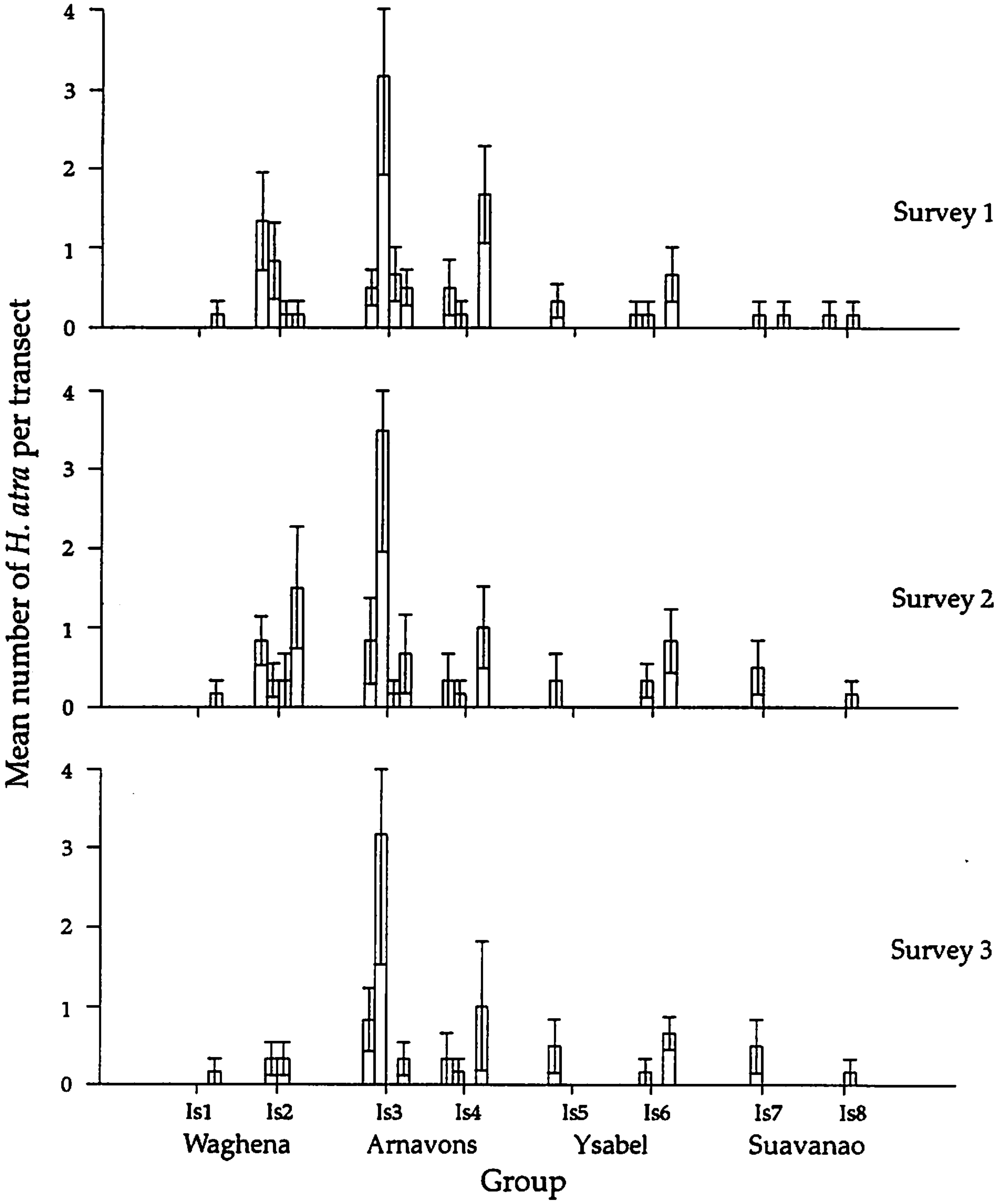


Figure 23 Mean number (+/-SE; $n = 6$) of *Holothuria atra* for each of four sites at two islands (Is1 - Is8) within four groups in the deep habitat for each survey. Site numbers (D1 - D32) are presented in ascending order from left to right, thus, Sites 1 to 4 are in Is1, 5-8 in Is2 etc.

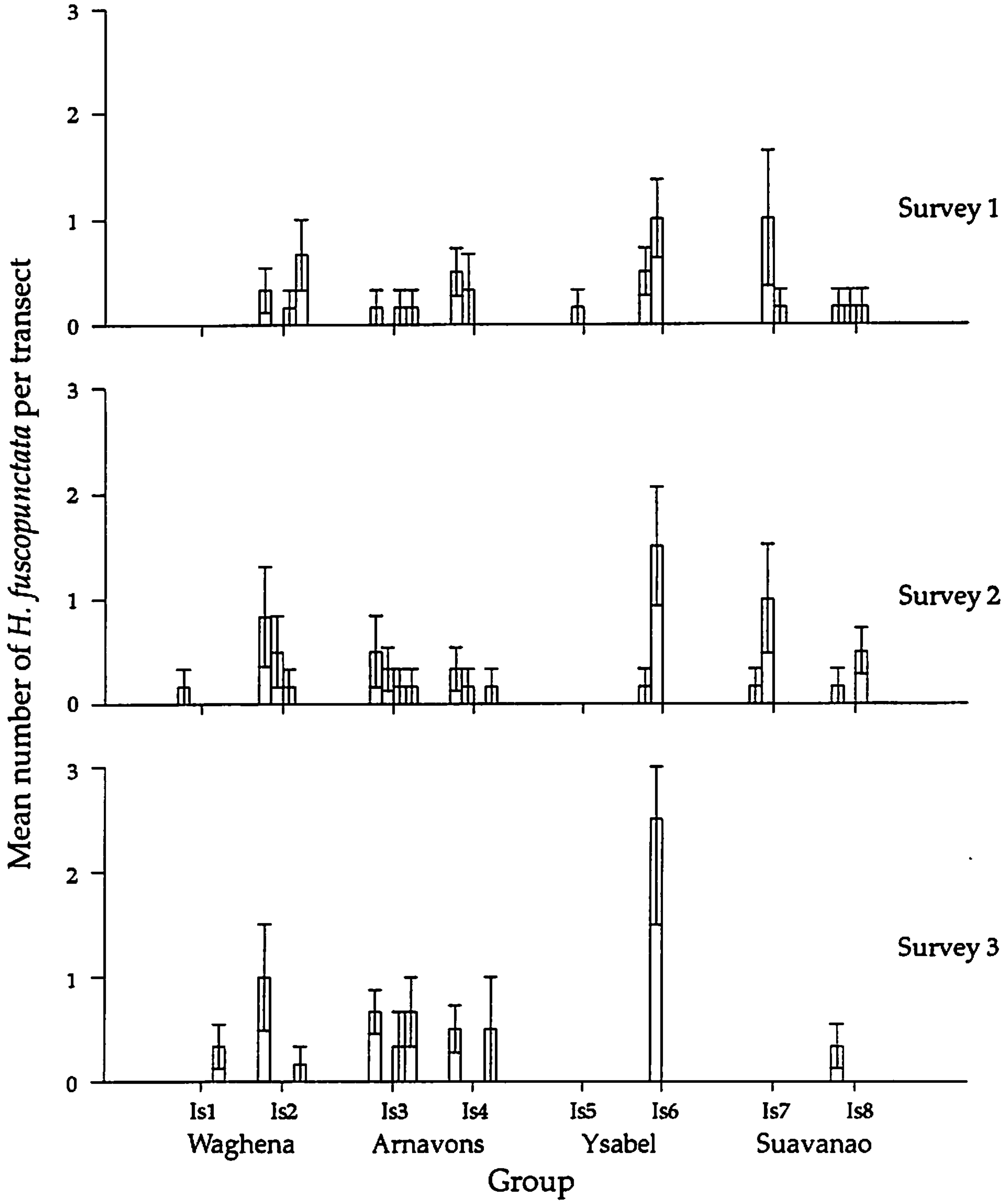


Figure 24 Mean number (+/- SE; $n = 6$) of *Holothuria fuscopunctata* for each of four sites at two islands (Is1 - Is8) within four groups in the deep habitat for each survey. Site numbers (D1 - D32) are presented in ascending order from left to right, thus, Sites 1 to 4 are in Is1, 5-8 in Is2 etc.

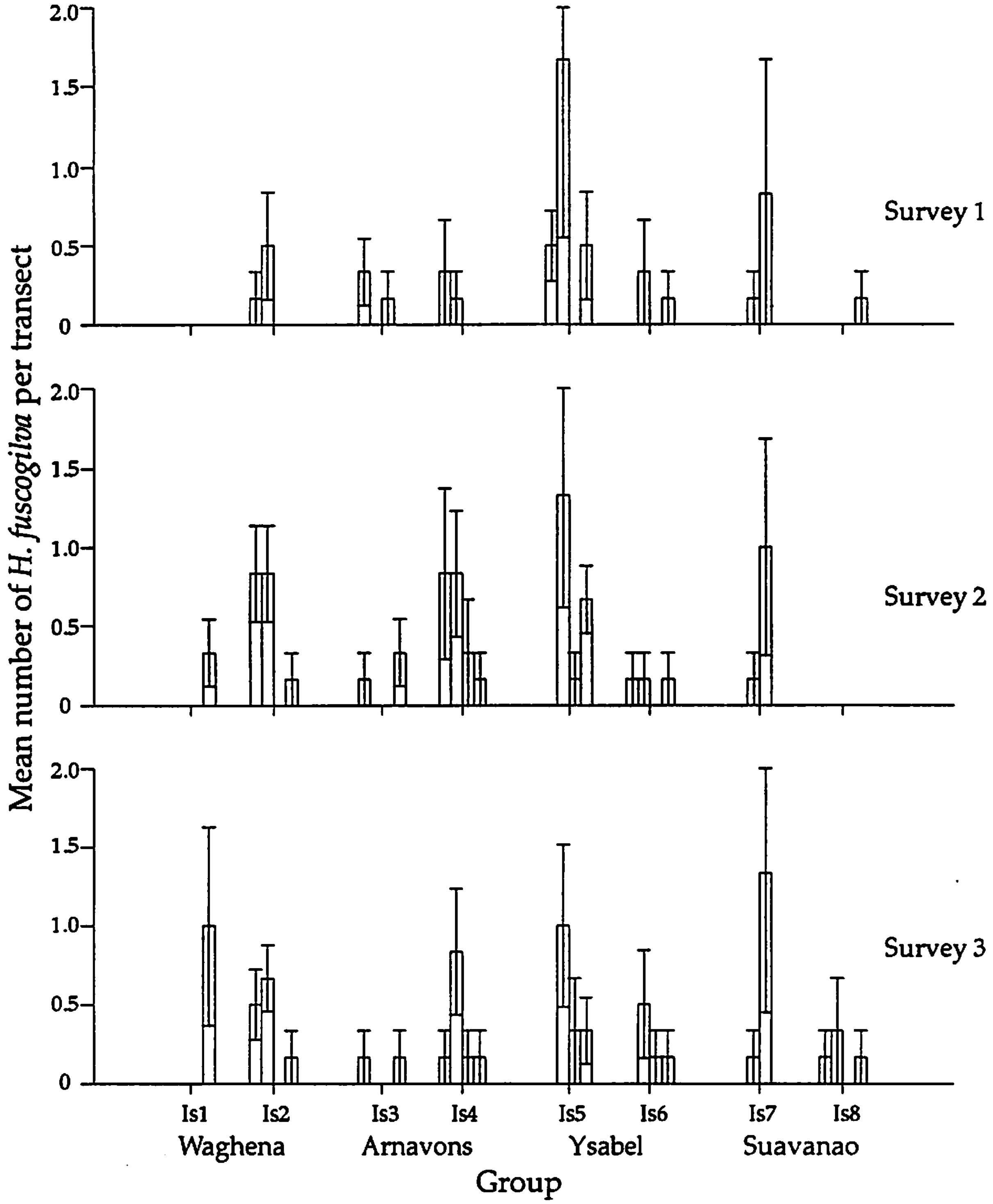


Figure 25 Mean number (+/- SE; $n = 6$) of *Holothuria fuscogilva* for each of four sites at two islands (Is1 - Is8) within four groups in the deep habitat for each survey. Site numbers (D1 - D32) are presented in ascending order from left to right, thus, Sites 1 to 4 are in Is1, 5-8 in Is2 etc.

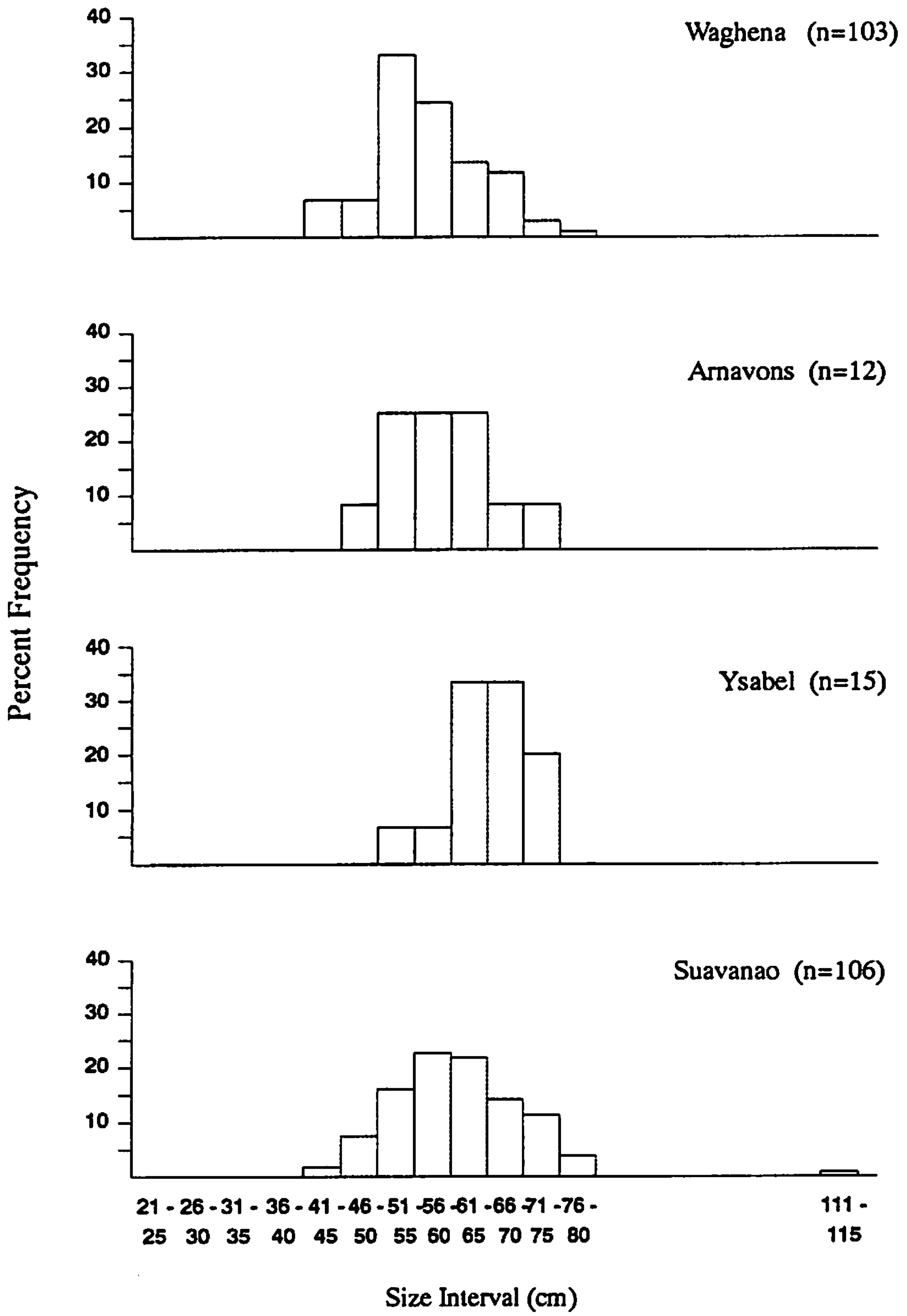


Figure 26 Length-frequency distributions of *Thelanota anax* from the deep habitat for each group.

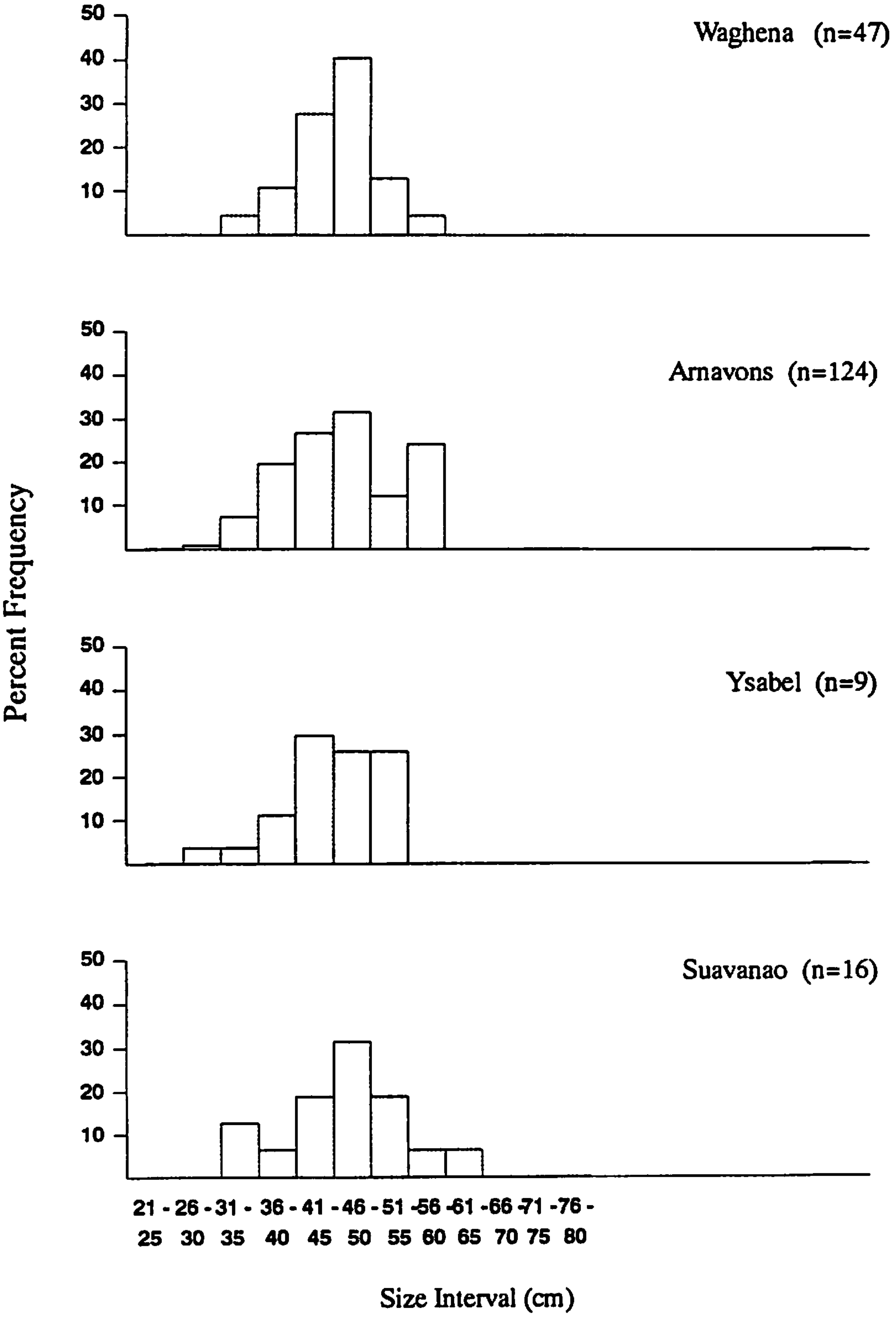


Figure 27 Length-frequency distributions of *Holothuria atra* from the deep habitat for each group.

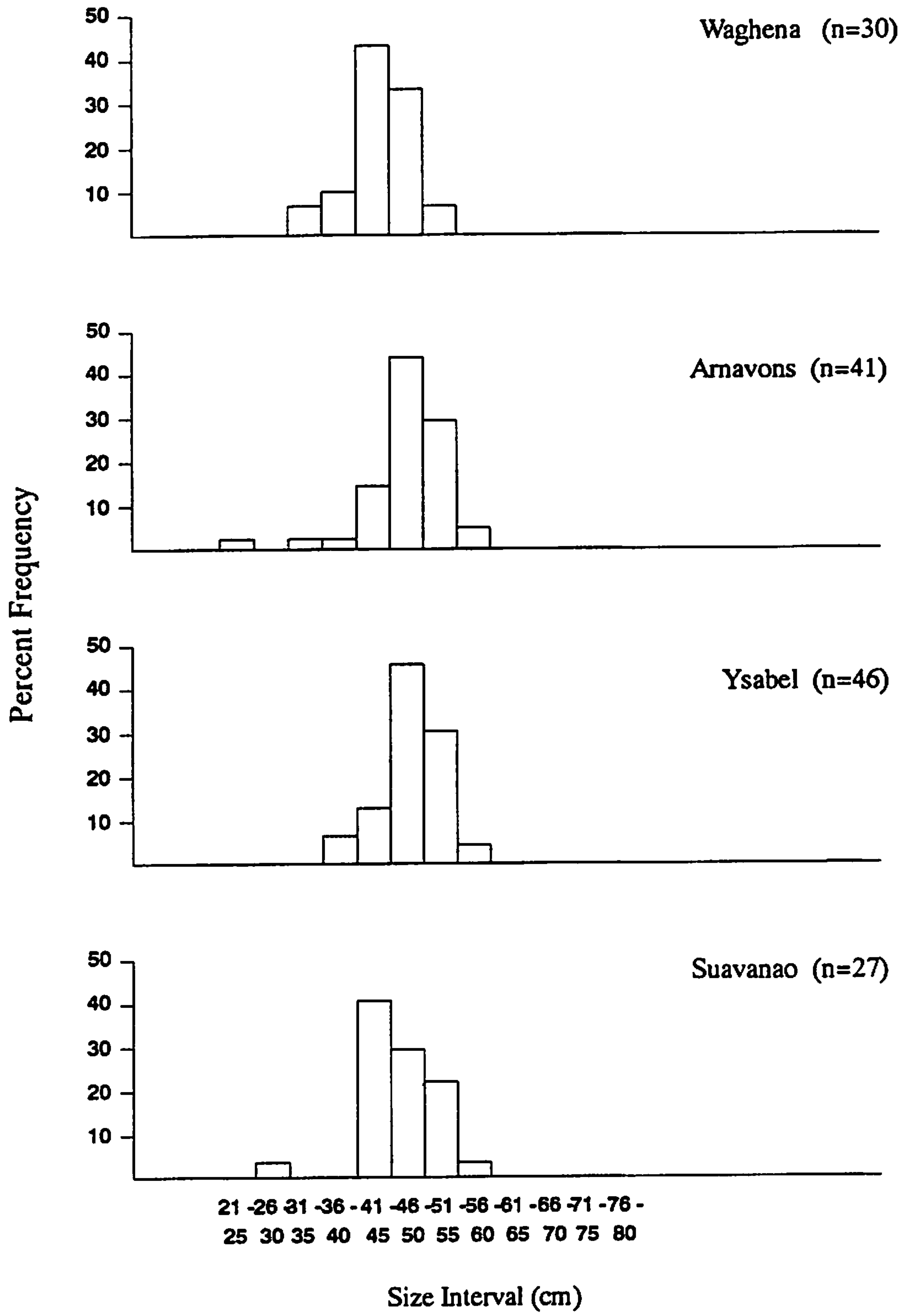


Figure 28 Length-frequency distributions of *Holothuria fuscopunctata* from the deep habitat for each group.

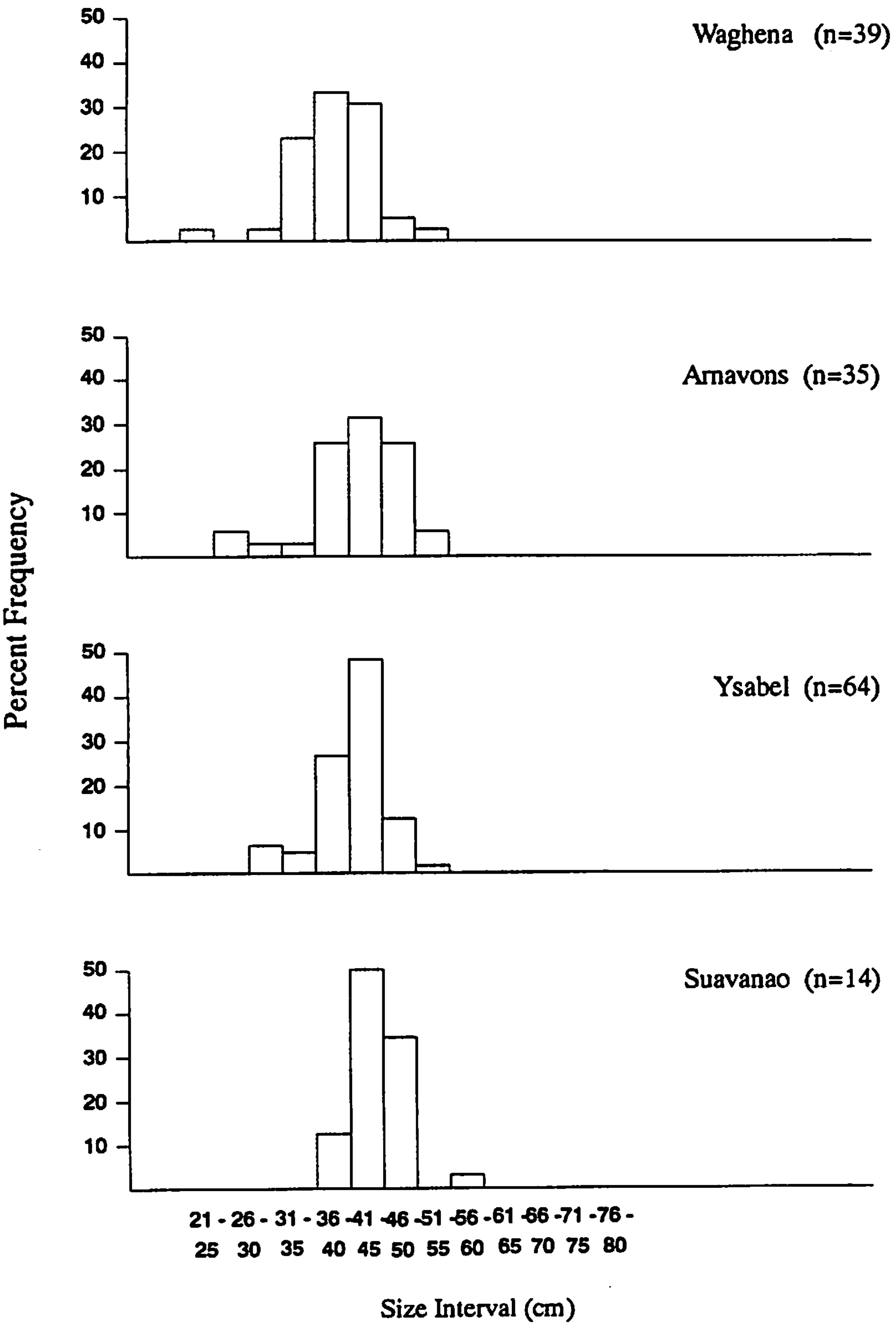


Figure 29 Length-frequency distributions of *Holothuria fuscogilva* from the deep habitat for each group.

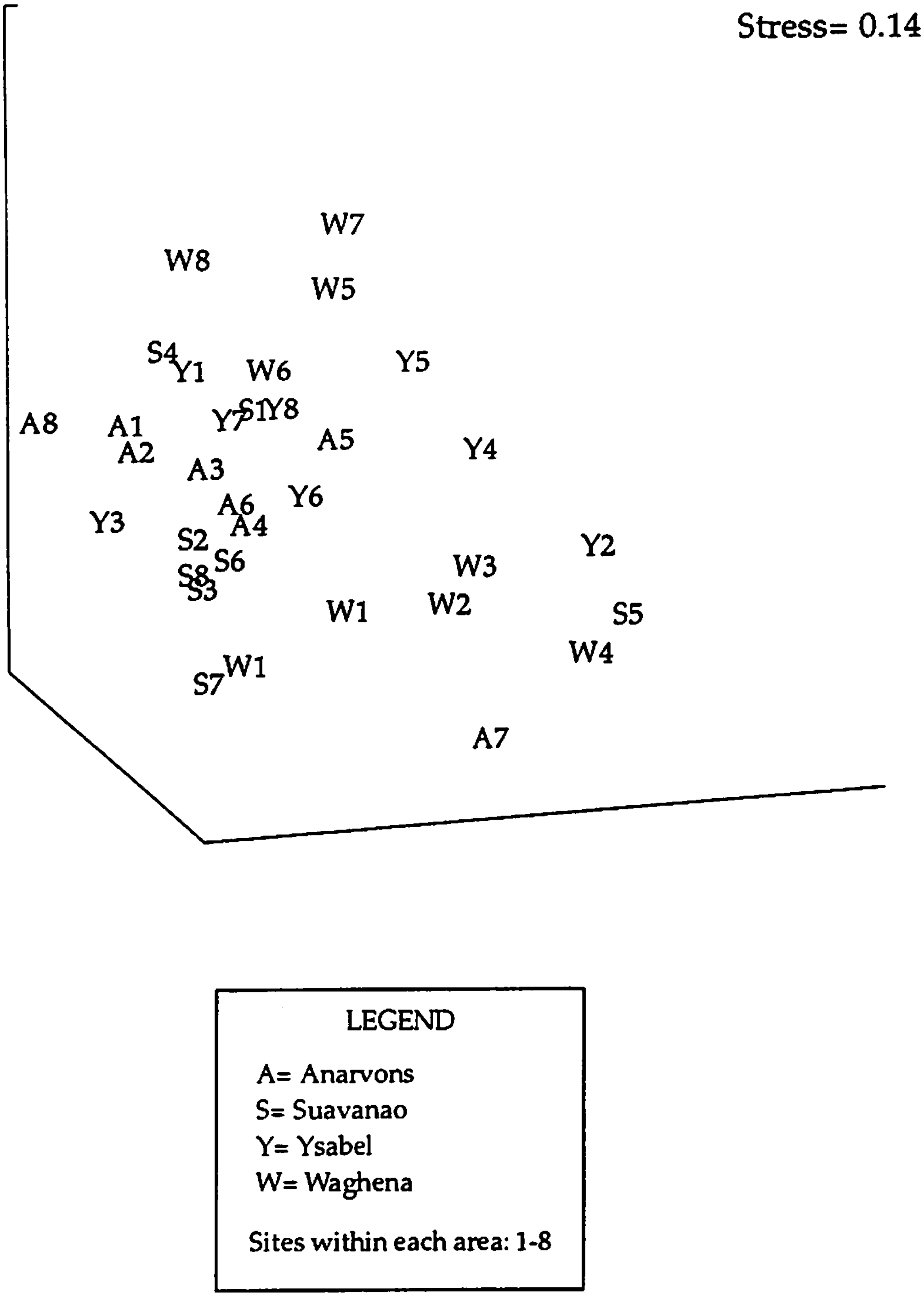


Figure 30 Three dimensional MDS plot of habitat variables (% cover) among all Sites and Groups sampled in the deep habitat ($n$= 32). Replicates ($n$= 4) were pooled over sites.

# APPENDICES

# Appendix 1. GPS positions (Latitude and Longitude) for all Sites.

**APPENDIX 1.** Latitude & Longitude for each sampling site, measured using a Global Positioning System (GPS).

## 1. Shallow Habitat

| Group | Island | Site | Lat. (South) | Long. (East) |
|---|---|---|---|---|
| Waghena | 1 | S1 | 7° 31' 05" | 157° 43' 48" |
| | | S2 | 7° 31' 13" | 157° 43' 02" |
| | | S3 | 7° 32' 26" | 157° 42' 46" |
| | | S4 | 7° 30' 55" | 157° 43' 16" |
| | 2 | S5 | 7° 28' 56" | 157° 49' 37" |
| | | S6 | 7° 29' 04" | 157° 50' 09" |
| | | S7 | 7° 29' 19" | 157° 50' 43" |
| | | S8 | 7° 29' 15" | 157° 51' 00" |
| Arnavons | 3 | S9 | 7° 26' 54" | 157° 59' 14" |
| | | S10 | 7° 26' 35" | 157° 58' 59" |
| | | S11 | 7° 26' 16" | 157° 58' 59" |
| | | S12 | 7° 27' 18" | 157° 59' 38" |
| | 4 | S13 | 7° 28' 13" | 158° 03' 03" |
| | | S14 | 7°29' 09" | 158° 02' 50" |
| | | S15 | 7° 28' 48" | 158° 03' 02" |
| | | S16 | 7° 26' 58" | 158° 02' 12" |
| Ysabel | 5 | S17 | 7° 22' 57" | 158° 05' 52" |
| | | S18 | 7° 22' 45" | 158° 05' 10" |
| | | S19 | 7° 22' 00" | 158° 04' 42" |
| | | S20 | 7° 22' 00" | 158° 04' 39" |
| | 6 | S21 | 7° 23' 25" | 158° 09' 04" |
| | | S22 | 7° 24' 01" | 158° 09' 53" |
| | | S23 | 7° 24' 01" | 158° 09' 53" |
| | | S24 | 7° 23' 57" | 158° 09' 20" |
| Suavanao | 7 | S25 | 7° 36' 42" | 158° 47' 22" |
| | | S26 | 7° 37' 15" | 158° 47' 23" |
| | | S27 | 7° 36' 37" | 158° 49' 43" |
| | | S28 | 7° 35' 52" | 158° 49' 52" |
| | 8 | S29 | 7° 30' 21" | 158° 42' 16" |
| | | S30 | 7° 29' 48" | 158° 42' 30" |
| | | S31 | 7° 29' 49" | 158° 40' 15" |
| | | S32 | 7° 30' 25" | 158° 39' 40" |

## 2. Deep Habitat

| Group | Island | Site | Lat. (South) | Long. (East) |
|---|---|---|---|---|
| Waghena | 1 | D1 | 7° 31’ 06" | 157° 43’ 41" |
|  |  | D2 | 7° 30’ 55" | 157° 42’ 57" |
|  |  | D3 | 7° 32’ 20" | 157° 42’ 46" |
|  |  | D4 | 7° 32’ 18" | 157° 42’ 25" |
|  | 2 | D5 | 7° 28’ 56" | 157° 49’ 37" |
|  |  | D6 | 7° 29’ 07" | 157° 50’ 11" |
|  |  | D7 | 7° 29’ 18" | 157° 50’ 43" |
|  |  | D8 | 7° 29’ 16" | 157° 50’ 55" |
|  | 3 | D9 | 7° 27’ 21" | 157° 59’ 45" |
|  |  | D10 | 7° 27’ 06" | 157° 59’ 26" |
|  |  | D11 | 7° 26’ 24" | 157° 58’ 46" |
|  |  | D12 | 7° 26’ 25" | 157° 59’ 02" |
|  | 4 | D13 | 7° 28’ 13" | 158° 02’ 56" |
|  |  | D14 | 7° 28’ 06" | 158° 02’ 40" |
|  |  | D15 | 7° 27’ 25" | 158° 02’ 15" |
|  |  | D16 | 7° 27’ 42" | 158° 02’ 38" |
|  | 5 | D17 | 7° 22’ 56" | 158° 05’ 56" |
|  |  | D18 | 7° 22’ 58" | 158° 06’ 20" |
|  |  | D19 | 7° 22’ 30" | 158° 06’ 45" |
|  |  | D20 | 7° 23’ 06" | 158° 06’ 35" |
|  | 6 | D21 | 7° 23’ 30" | 158° 08’ 52" |
|  |  | D22 | 7° 23’ 09" | 158° 09’ 09" |
|  |  | D23 | 7° 22’ 49" | 158° 09’ 19" |
|  |  | D24 | 7° 23’ 57" | 158° 09’ 20" |
|  | 7 | D25 | 7° 36’ 32" | 158° 47’ 00" |
|  |  | D26 | 7° 36’ 19" | 158° 47’ 57" |
|  |  | D27 | 7° 34’ 53" | 158° 46’ 00" |
|  |  | D28 | 7° 36’ 35" | 158° 46’ 36" |
|  | 8 | D29 | 7° 29’ 51" | 158° 40’ 54" |
|  |  | D30 | 7° 29’ 53" | 158° 40’ 10" |
|  |  | D31 | 7° 30’ 27" | 158° 39’ 37" |
|  |  | D32 | 7° 29’ 58" | 158° 39’ 51" |

# Appendix 2. Abundance and length frequency data for all Sites during Surveys 1 - 3.

## Appendix 2a. Raw data for shallow habitat, Survey 1, January/February, 1995.

**Rep = relicate number, Obs = initials of observer, * indicates uncertain identification**

| Group | Island | Site | Rep | Obs | Species |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia agrus* | *Holothuria atra* | *Actinopyga mauritaniana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* |  |
| Waghena | 1 | S1 | 1 | NK |  |  |  |  |  |  |  | 1 |  |  |  |  |  |  |  | 1 |
|  |  |  | 2 | NK |  |  |  |  |  |  |  | 1 |  |  |  |  |  |  |  | 1 |
|  |  |  | 3 | NK | 1 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  | 2 |
|  |  |  | 4 | PR | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1 |
|  |  |  | 5 | PR | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1 |
|  |  |  | 6 | PR |  |  |  |  | 1 |  |  |  |  |  |  |  |  |  |  | 1 |
|  |  | S2 | 1 | PR | 1 |  |  |  | 1 |  |  |  |  |  |  |  |  |  |  | 2 |
|  |  |  | 2 | PR |  |  |  |  | 1 |  |  |  |  |  |  |  | 3 |  |  | 4 |
|  |  |  | 3 | PR | 1 |  |  |  |  |  |  |  |  |  |  |  | 1 |  |  | 2 |
|  |  |  | 4 | NK | 1 |  |  |  |  |  |  |  |  |  |  |  | 1 |  |  | 2 |
|  |  |  | 5 | NK |  |  |  |  |  |  |  |  |  |  |  |  | 2 |  |  | 2 |
|  |  |  | 6 | NK |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0 |
|  |  | S3 | 1 | NK |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0 |
|  |  |  | 2 | NK |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0 |
|  |  |  | 3 | NK |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0 |
|  |  |  | 4 | PR |  |  |  |  |  |  |  |  |  |  |  |  | 1 |  |  | 1 |
|  |  |  | 5 | PR |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0 |
|  |  |  | 6 | PR |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0 |
|  |  | S4 | 1 | NK |  |  |  |  |  |  |  |  |  |  |  |  | 2 |  |  | 2 |
|  |  |  | 2 | NK | 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 2 |
|  |  |  | 3 | NK | 1 |  |  |  |  |  |  |  |  |  |  |  | 3 |  |  | 4 |
|  |  |  | 4 | PR |  |  |  |  |  |  |  | 1 |  |  |  |  |  |  |  | 1 |
|  |  |  | 5 | PR | 1 |  |  |  |  |  |  | 3 |  |  |  |  | 2 |  |  | 6 |
|  |  |  | 6 | PR | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1 |
|  | 2 | S5 | 1 | NK | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1 |
|  |  |  | 2 | NK |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0 |
|  |  |  | 3 | NK | 3 |  |  |  |  |  |  |  |  |  |  |  | 1 |  |  | 4 |
|  |  |  | 4 | PR | 1 |  |  |  |  |  |  |  |  |  |  |  | 2 |  |  | 3 |
|  |  |  | 5 | PR | 1 |  |  |  |  |  |  |  |  |  | 1 |  | 1 | 2 |  | 5 |
|  |  |  | 6 | PR | 2 |  |  |  |  |  |  |  |  |  |  |  | 1 |  |  | 3 |
|  |  | S6 | 1 | NK | 3 |  |  |  |  |  |  |  |  |  |  |  | 3 |  |  | 6 |
|  |  |  | 2 | MLS | 1 |  |  |  |  |  |  |  |  |  |  |  | 1 |  |  | 2 |
|  |  |  | 3 | MLS | 2 |  |  |  |  |  |  |  |  |  |  |  | 1 |  |  | 3 |
|  |  |  | 4 | PR | 5 |  |  |  |  |  |  |  |  |  |  |  | 1 |  |  | 6 |
|  |  |  | 5 | PR | 4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 4 |
|  |  |  | 6 | PR | 2 |  |  |  |  |  |  |  |  |  |  |  | 1 |  | 1 | 4 |
|  |  | S7 | 1 | NK | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1 |
|  |  |  | 2 | NK | 8 |  |  |  |  |  |  |  |  |  |  |  | 2 |  |  | 10 |
|  |  |  | 3 | NK | 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 2 |
|  |  |  | 4 | PR |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0 |
|  |  |  | 5 | PR | 2 |  |  | 1 |  |  |  |  |  |  |  |  | 1 |  |  | 4 |
|  |  |  | 6 | PR |  |  |  |  | 2 |  |  |  |  |  |  |  | 3 |  |  | 5 |
|  |  | S8 | 1 | NK | 3 |  |  |  |  |  |  |  |  |  |  | 1 | 2 |  |  | 6 |
|  |  |  | 2 | NK | 3 |  |  |  | 1 |  |  |  |  |  |  |  |  |  |  | 4 |
|  |  |  | 3 | NK | 2 |  |  | 1 |  |  |  |  |  |  |  |  |  |  |  | 3 |
|  |  |  | 4 | PR | 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 5 |
|  |  |  | 5 | PR | 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 2 |
|  |  |  | 6 | PR | 3 |  |  |  |  |  |  |  |  |  |  |  | 1 |  |  | 4 |

## Shallow, Survey 1, abundance

| Group | Island | Site | Rep | Obs | Species | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia agrus* | *Holothuria atra* | *Actinopyga mauritaniana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | |
| Arnavons | 3 | S9 | 1 | NK | 5 | | | | | | | | | | | | 1 | | | 6 |
| | | | 2 | NK | | | | | | | | | | | | | 1 | | | 1 |
| | | | 3 | NK | | | | | | | | | | | | | | | | 0 |
| | | | 4 | PR | 1 | | | | | | | | | | 1 | | 2 | | | 4 |
| | | | 5 | PR | 1 | | | | | | | 2 | | | | | | | | 3 |
| | | | 6 | PR | | | | | | | | | | | | | 1 | | | 1 |
| | | S10 | 1 | NK | 2 | | | | | | | | | | | | | | | 2 |
| | | | 2 | NK | 1 | | | | | | | | | | | | | | | 1 |
| | | | 3 | NK | | | | | | 2 | | | | | | | 2 | 1 | | 5 |
| | | | 4 | PR | 5 | | | | | 1 | | | | | | | | | | 6 |
| | | | 5 | PR | 2 | | | | | 1 | | | | | | | 1 | | | 4 |
| | | | 6 | PR | 3 | | | | | | | | | | 1 | | 3 | | | 7 |
| | | S11 | 1 | NK | 1 | | | | | | | | 1 | | | | | | | 2 |
| | | | 2 | NK | | | | | | | | | | | | | | 1 | | 1 |
| | | | 3 | NK | | | | | | | | | | 1 | | | | | | 1 |
| | | | 4 | PR | | | | | | | | | | | | | 1 | | | 1 |
| | | | 5 | PR | 1 | | | | | | | | | | | | | | | 1 |
| | | | 6 | PR | | | | | | | | | | | | | 2 | 1 | | 3 |
| | | S12 | 1 | NK | | | | | | | 1 | | | | | | | | | 1 |
| | | | 2 | NK | | | | | | | | | | | | | 2 | | | 2 |
| | | | 3 | NK | | | | | | | | | | | 1 | | 1 | | | 2 |
| | | | 4 | PR | 1 | | | | | | | | | | | | | | | 1 |
| | | | 5 | PR | 2 | | | | | | | | | | | | 1 | | | 3 |
| | | | 6 | PR | | | | | | | | | 1 | | | | | | | 1 |
| | 4 | S13 | 1 | PR | 1 | | | | | | | | | | | | 1 | | | 2 |
| | | | 2 | PR | | | | | | | | | | | | | | 1 | | 1 |
| | | | 3 | PR | 4 | | | | | | | | | | | | 2 | | | 6 |
| | | | 4 | NK | | | | | | | 3 | | | | 1 | | 2 | | | 6 |
| | | | 5 | NK | 3 | | | | | | 1 | | | | | | 1 | 1 | | 6 |
| | | | 6 | NK | 2 | | | | | | | | | | 1 | | | | | 3 |
| | | S14 | 1 | PR | 2 | | | | | | | | | | | | | 1 | | 3 |
| | | | 2 | PR | 1 | | | | | | | | | | | | | | | 1 |
| | | | 3 | PR | | | | | | | | | | | | | 1 | | | 1 |
| | | | 4 | NK | 1 | | | | | | 2 | | | | | | 3 | | | 6 |
| | | | 5 | NK | | | | | | | | | | | | | 2 | | | 2 |
| | | | 6 | NK | 1 | | | | | | 1 | | | | | | 4 | | | 6 |
| | | S15 | 1 | PR | 2 | | | | | | | | | | | | 1 | | | 3 |
| | | | 2 | PR | 3 | | | 1 | 1 | 2 | | 1 | | | | | 4 | | | 12 |
| | | | 3 | PR | 6 | | | | | | 1 | 1 | | | | | 1 | 1 | | 10 |
| | | | 4 | NK | 2 | | | | | | | 1 | | | 1 | | | | | 4 |
| | | | 5 | NK | 5 | | | | 1 | | | 1 | 1 | | | 1 | 1 | | | 10 |
| | | | 6 | NK | 2 | | | | | 1 | | 1 | | 1 | 1 | | | | | 6 |
| | | S16 | 1 | PR | 1 | | | | | | | | | | | | 1 | | | 2 |
| | | | 2 | PR | 1 | | | | | | 2 | | | | | | | | | 3 |
| | | | 3 | PR | 1 | | | | | | 3 | | | | 1 | | | | | 5 |
| | | | 4 | NK | | | | | | | 1 | | | | | | | | 1 | 2 |
| | | | 5 | NK | | | | | | | | | | | | | | | | 0 |
| | | | 6 | NK | 1 | | | | | 1 | | | | | | | | | | 2 |
| Ysabel | 5 | S17 | 1 | PR | | | 1 | | | 2 | | | | | | | | | | 3 |
| | | | 2 | PR | 1 | | 2 | | | 1 | | | | | | | 1 | | | 5 |
| | | | 3 | PR | 1 | | | | | 1 | | | 1 | 3 | | | | | | 6 |
| | | | 4 | NK | 2 | | 1 | 1 | | | | | | | | | | | | 4 |
| | | | 5 | NK | 2 | | 1 | | | | | | | 1 | | | | | | 4 |
| | | | 6 | NK | | 1 | | | | | | | | | | | | | | 1 |

## Shallow, Survey 1, abundance

| Group | Island | Site | Rep | Obs | Species | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia argus* | *Holothuria atra* | *Actinopyga mauritiana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | |
| | | S18 | 1 | PR | 1 | | 1 | | | | | 2 | | | | | 1 | | | 5 |
| | | | 2 | PR | | | | | | | | | | | | | 1 | | | 1 |
| | | | 3 | PR | 2 | | | | | | 1 | | | | | | | | 1 | 4 |
| | | | 4 | NK | 3 | | | | | 1 | | 2 | | | | | | | | 6 |
| | | | 5 | NK | 1 | | 3 | | | 1 | | | | | | | 1 | | | 6 |
| | | | 6 | NK | 2 | | | | | | | | | | | | | | | 2 |
| | | S19 | 1 | NK | 1 | | | | 1 | | 1 | | | | | | | | | 3 |
| | | | 2 | NK | | | | | 2 | | | | | | | | 1 | | | 3 |
| | | | 3 | NK | 2 | | | | | | | | | | | | | | | 2 |
| | | | 4 | PR | | 1 | | | | | 1 | | | | | | 1 | 2 | | 5 |
| | | | 5 | PR | | | 1 | 1 | | 1 | | | | | | | 1 | | | 4 |
| | | | 6 | PR | | | 1 | | | | | | | | | | | | | 1 |
| | | S20 | 1 | PR | | | 2 | | | 1 | | | | | | | | | | 3 |
| | | | 2 | PR | 5 | | | | | | | | | | | | | 1 | | 6 |
| | | | 3 | PR | | | 1 | | | 1 | | | | | | | | | | 2 |
| | | | 4 | NK | | | 1 | | | 1 | | | | | | | | | | 2 |
| | | | 5 | NK | | | | | 1 | | 1 | | | | | | | | | 2 |
| | | | 6 | NK | | 1 | 1 | 1 | | | 1 | | | 1 | | | | | | 5 |
| | 6 | S21 | 1 | PR | 2 | 1 | | | | | | 1 | | | | | | | | 4 |
| | | | 2 | PR | 1 | | | | | | | | | | | | 1 | | | 2 |
| | | | 3 | PR | 1 | | 2 | 2 | | | | 2 | | | | | 1 | | | 8 |
| | | | 4 | NK | | | | | 1 | | | | | | | | 2 | | | 3 |
| | | | 5 | NK | | | | | | | | | | | | | 3 | | | 3 |
| | | | 6 | NK | | | 1 | | | | | 1 | | 1 | | | 1 | | | 4 |
| | | S22 | 1 | PR | 1 | | | | | | | | | | | | 1 | | | 2 |
| | | | 2 | PR | | | 1 | | | | | | | | | | | | | 1 |
| | | | 3 | PR | 1 | | | | | | 2 | | | | | | 2 | | | 5 |
| | | | 4 | NK | 2 | | | | | | | | 1 | | | | 5 | | | 8 |
| | | | 5 | NK | 3 | | 1 | | | | | | | | | | 4 | | | 8 |
| | | | 6 | NK | 2 | | | | | | | | | | | | 2 | | | 4 |
| | | S23 | 1 | NK | 7 | 1 | | | | | | | | | | | | | | 8 |
| | | | 2 | NK | 1 | | | | | | 1 | | | | | | | | | 2 |
| | | | 3 | NK | 3 | | | | | | | | | | | | 4 | | | 7 |
| | | | 4 | PR | 3 | | | | | | | | | | | | 1 | | | 4 |
| | | | 5 | PR | | | | 1 | 1 | | | | | | | | 2 | | | 4 |
| | | | 6 | PR | 1 | | | | | | | | | | | | 4 | | | 5 |
| | | S24 | 1 | NK | 4 | | | | | 1 | | | 1 | | | | | | | 6 |
| | | | 2 | NK | 1 | | 5 | | | | | | | | | | 1 | | | 7 |
| | | | 3 | NK | 1 | | | | | | | | | | | | 2 | | | 3 |
| | | | 4 | PR | 6 | | | | 1 | | | | | | | | | | | 7 |
| | | | 5 | PR | | | | | | | | | | 1 | | | 5 | | | 6 |
| | | | 6 | PR | 3 | | 1 | | | | | | | | | | 4 | 1 | | 9 |
| uavanao | 7 | S25 | 1 | PR | 1 | | | | | | | | | | | | 2 | | | 3 |
| | | | 2 | PR | | | | | | | | | | | | | 4 | | | 4 |
| | | | 3 | PR | 1 | | | | | | | | | | | | 1 | | | 2 |
| | | | 4 | NK | | | | | | | | | | | | | 3 | | | 3 |
| | | | 5 | NK | 1 | | | | | | | | | | | | 3 | | | 4 |
| | | | 6 | NK | | | | | | | | | | | | | | | | 0 |
| | | S26 | 1 | MLS | | | | | | | | | | | | | | 1 | | 1 |
| | | | 2 | MLS | | | | | | | | | | | | | | | | 0 |
| | | | 3 | MLS | 2 | | | | | | | | | | | | | | | 2 |
| | | | 4 | PR | | | | | | | | | | | | | | | | 0 |
| | | | 5 | PR | | | | | | | | | | 1 | | | | | | 1 |
| | | | 6 | PR | | | | | | | | | | | | | | | | 0 |

Shallow, Survey 1, abundance

| Group | Island | Site | Rep | Obs | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia agrus* | *Holothuria atra* | *Actinopyga mauritaniana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | S27 | 1 | MLS | 1 | | | | | | | | | | | | | | | 1 |
| | | | 2 | MLS | | | | | | | | | | | | | | 1 | | 1 |
| | | | 3 | MLS | 3 | | | | | | | | | | | | | | | 3 |
| | | | 4 | PR | | | | | | | | | | | | | | | | 0 |
| | | | 5 | PR | | | | | | | | | | | | | | 1 | | 1 |
| | | | 6 | PR | 1 | | | | | | | | | | | | | 1 | | 2 |
| | | S28 | 1 | NK | | | | | | | | | | | | | | | | 0 |
| | | | 2 | NK | 2 | | | | | | | | | | 1 | | | | | 3 |
| | | | 3 | NK | 6 | | | | | | | | | | | | | | | 6 |
| | | | 4 | PR | | | | | | | | | | | | | | | | 0 |
| | | | 5 | PR | | | | | | | | | | | | | 2 | | | 2 |
| | | | 6 | PR | 1 | | | | | | | | | | | | | 1 | | 2 |
| | 8 | S29 | 1 | NK | 2 | | | | | | | | | | | | | | | 2 |
| | | | 2 | NK | | | | | | | | | | | | | 1 | 2 | | 3 |
| | | | 3 | NK | | | | | | | | 1 | | | | | 2 | 4 | | 7 |
| | | | 4 | PR | 1 | | | | | | | | | | | | 1 | | | 2 |
| | | | 5 | PR | 1 | | | | | | | 1 | | | | | 1 | | | 3 |
| | | | 6 | PR | | | | | | | | | | | | | 1 | 1 | | 2 |
| | | S30 | 1 | PR | 1 | | | | | | | | | | | | | 1 | | 2 |
| | | | 2 | PR | 2 | | | | | | | | | | | | | 1 | | 3 |
| | | | 3 | PR | | | | | | | | | | | | | | | | 0 |
| | | | 4 | NK | 3 | | | | | | | | | | | | 2 | | | 5 |
| | | | 5 | NK | 2 | | | | | | | | | | | | 1 | | | 3 |
| | | | 6 | NK | 1 | | | | | | | | | | | | | | | 1 |
| | | S31 | 1 | PR | 1 | | | | | | | | | | | | | | | 1 |
| | | | 2 | PR | 1 | | | | | | | | | | | | | | | 1 |
| | | | 3 | PR | 3 | | | | | | | | | | | | 2 | | | 5 |
| | | | 4 | NK | 4 | | | | | | | | | | | | 1 | | | 5 |
| | | | 5 | NK | 5 | | 1 | 1 | | | | | | | | | 1 | | | 8 |
| | | | 6 | NK | 1 | | | | | | | | | | | | 2 | | | 3 |
| | | S32 | 1 | PR | | | | | 2 | | | | | | | | 2 | | | 4 |
| | | | 2 | PR | 1 | | | | 6 | | | | | | | | | | | 7 |
| | | | 3 | PR | 4 | | | | 9 | 1 | | | | | | | | | | 14 |
| | | | 4 | NK | 1 | | | | 23 | | | | | | | | 2 | | | 26 |
| | | | 5 | NK | 1 | | | | 15 | | | 1 | | | | | 2 | 1 | | 20 |
| | | | 6 | NK | | | | | 1 | | | | | | | | 1 | | | 2 |
| Total | | | | | 251 | 6 | 28 | 10 | 71 | 20 | 23 | 24 | 6 | 10 | 10 | 2 | 167 | 28 | 3 | 659 |

## Appendix 2b. Length-frequency data for shallow habitat, Survey 1, January/February 1995

Specimen = replicate, * indicates uncertain identification.

| Group | Island | Site | Specimen | Observer | Species | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia agrus* | *Holothuria atra* | *Actinopyga mauritaniana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* |
| Waghena | 1 | S1 | 1 | MLS | 23.5 | | | | 5.5 | | | 34.0 | | | | | | | |
| | | | 2 | MLS | | | | | | | | 39.0 | | | | | | | |
| | | | 3 | MLS | | | | | | | | 31.5 | | | | | | | |
| | | | 4 | PR | 16.5 | | | | 14.0 | | | | | | | | | | |
| | | | 5 | PR | 28.0 | | | | | | | | | | | | | | |
| | | | 6 | NK | 28.0 | 44.5 | | | | | | 36.0 | | | | | | | |
| | | | 7 | NK | | | | | | | | 33.5 | | | | | | | |
| | | S2 | 1 | MLS | | | | | 10.0 | | | 35.5 | | | | | | | |
| | | | 2 | PR | 15.0 | | | | 13.0 | | | | | | | | | | |
| | | | 3 | PR | 27.0 | | | | 8.0 | | | | | | | | | | |
| | | | 4 | NK | 21.0 | | | | | | | | | | | | | | |
| | | S4 | 1 | MLS | | | | | 15.0 | | | | | | 28.0 | | | | |
| | | (S3 NO | 2 | PR | | | | | | | | 32.0 | | | | | | | |
| | | MEASUREMENTS) | 3 | PR | | | | | | | | 43.0 | | | | | | | |
| | | | 4 | PR | | | | | | | | 34.5 | | | | | | | |
| | | | 5 | PR | | | | | | | | 38.0 | | | | | | | |
| | | | 6 | NK | 14.0 | | | | | | | | | | | | | | |
| | | | 7 | NK | 11.5 | | | | | | | | | | | | | | |
| | | | 8 | NK | 14.5 | | | | | | | | | | | | | | |
| | 2 | S5 | 1 | MLS | 18.0 | | | | 11.0 | | | | | | | | | | |
| | | | 2 | MLS | 20.0 | | | | 12.5 | | | | | | | | | | |
| | | | 3 | MLS | | | | | 10.5 | | | | | | | | | | |
| | | | 4 | MLS | | | | | 10.5 | | | | | | | | | | |
| | | | 5 | MLS | | | | | 8.0 | | | | | | | | | | |
| | | | 6 | NK | 24.0 | | | | | | | | | | | | | | |
| | | | 7 | NK | 29.0 | | | | | | | | | | | | | | |
| | | | 8 | NK | 18.0 | | | | | | | | | | | | | | |
| | | | 9 | NK | 12.5 | | | | | | | | | | | | | | |
| | | | 10 | PR | 15.0 | | | | 8.5 | | | | | | 26.5 | | | 12.5 | |
| | | | 11 | PR | 20.5 | | | | | | | | | | | | | 10.5 | |
| | | | 12 | PR | 50.0 | | | | | | | | | | | | | | |
| | | | 13 | PR | 14.0 | | | | | | | | | | | | | | |
| | | S6 | 1 | MLS | 25.0 | | | | | | | | | | | | | | |
| | | | 2 | MLS | 7.0 | | | | | | | | | | | | | | |
| | | | 3 | MLS | 17.0 | | | | | | | | | | | | | | |
| | | | 4 | MLS | 8.0 | | | | | | | | | | | | | | |
| | | | 5 | MLS | 13.0 | | | | | | | | | | | | | | |
| | | | 6 | MLS | 17.0 | | | | | | | | | | | | | | |
| | | | 7 | MLS | 17.0 | | | | | | | | | | | | | | |
| | | | 8 | PR | 9.0 | | | | | | | | | | | | | | 11.5 |
| | | | 9 | PR | 22.0 | | | | | | | | | | | | | | |
| | | | 10 | PR | 22.0 | | | | | | | | | | | | | | |
| | | | 11 | PR | 18.0 | | | | | | | | | | | | | | |
| | | | 12 | PR | 5.0 | | | | | | | | | | | | | | |
| | | | 13 | PR | 30.0 | | | | | | | | | | | | | | |
| | | | 14 | PR | 30.0 | | | | | | | | | | | | | | |
| | | | 15 | PR | 24.0 | | | | | | | | | | | | | | |
| | | | 16 | PR | 14.0 | | | | | | | | | | | | | | |
| | | | 17 | PR | 25.0 | | | | | | | | | | | | | | |
| | | | 18 | PR | 22.0 | | | | | | | | | | | | | | |
| | | S7 | 1 | MLS | 30.0 | | | | | | | | | | | | | | |

## Shallow, Survey 1, Length data

| Group | Island | Site | Specimen Number varies by site | Observer | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia agrus* | *Holothuria atra* | *Actinopyga mauritaniana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2 | MLS | 30.0 | | | | | | | | | | | | | | |
| | | | 3 | MLS | 12.5 | | | | | | | | | | | | | | |
| | | | 4 | MLS | 31.0 | | | | | | | | | | | | | | |
| | | | 5 | MLS | 19.5 | | | | | | | | | | | | | | |
| | | | 6 | NK | 24.5 | | | | | | | | | | | | | | |
| | | | 7 | NK | 17.0 | | | | | | | | | | | | | | |
| | | | 8 | NK | 24.0 | | | | | | | | | | | | | | |
| | | | 9 | NK | 7.0 | | | | | | | | | | | | | | |
| | | | 10 | NK | 18.5 | | | | | | | | | | | | | | |
| | | | 11 | NK | 24.0 | | | | | | | | | | | | | | |
| | | | 12 | NK | 18.0 | | | | | | | | | | | | | | |
| | | | 13 | NK | 13.5 | | | | | | | | | | | | | | |
| | | | 14 | NK | 23.5 | | | | | | | | | | | | | | |
| | | | 15 | NK | 10.5 | | | | | | | | | | | | | | |
| | | | 16 | NK | 23.5 | | | | | | | | | | | | | | |
| | | | 17 | PR | 9.5 | | | 18.0 | 10.0 | | | | | | | | | | |
| | | | 18 | PR | 13.0 | | | | 7.5 | | | | | | | | | | |
| | | S8 | 1 | MLS | | | | | | | | | | | | | | 11.5 | |
| | | | 2 | NK | 19.5 | | | 13.0 | 13.0 | | | | | | | 33.0 | | | |
| | | | 3 | NK | 4.5 | | | | | | | | | | | | | | |
| | | | 4 | NK | 12.0 | | | | | | | | | | | | | | |
| | | | 5 | NK | 28.5 | | | | | | | | | | | | | | |
| | | | 6 | NK | 6.5 | | | | | | | | | | | | | | |
| | | | 7 | NK | 30.5 | | | | | | | | | | | | | | |
| | | | 8 | NK | 20.5 | | | | | | | | | | | | | | |
| | | | 9 | NK | 13.5 | | | | | | | | | | | | | | |
| | | | 10 | PR | 32.0 | | | | | | | | | | | | | | |
| | | | 11 | PR | 18.0 | | | | | | | | | | | | | | |
| | | | 12 | PR | 25.0 | | | | | | | | | | | | | | |
| | | | 13 | PR | 16.5 | | | | | | | | | | | | | | |
| | | | 14 | PR | 22.5 | | | | | | | | | | | | | | |
| | | | 15 | PR | 16.0 | | | | | | | | | | | | | | |
| | | | 16 | PR | 9.0 | | | | | | | | | | | | | | |
| | | | 17 | PR | 15.5 | | | | | | | | | | | | | | |
| | | | 18 | PR | 12.5 | | | | | | | | | | | | | | |
| | | | 19 | PR | 15.0 | | | | | | | | | | | | | | |
| Arnavons | 3 | S9 | 1 | MLS | 22.0 | | 70.5 | | | | | | | | | | | | |
| | | | 2 | MLS | 33.5 | | | | | | | | | | | | | | |
| | | | 3 | MLS | 34.5 | | | | | | | | | | | | | | |
| | | | 4 | MLS | 34.5 | | | | | | | | | | | | | | |
| | | | 5 | MLS | 30.5 | | | | | | | | | | | | | | |
| | | | 6 | NK | 29.0 | | | | | | | | | | | | | | |
| | | | 7 | NK | 20.0 | | | | | | | | | | | | | | |
| | | | 8 | NK | 29.5 | | | | | | | | | | | | | | |
| | | | 9 | NK | 24.0 | | | | | | | | | | | | | | |
| | | | 10 | NK | 28.0 | | | | | | | | | | | | | | |
| | | S10 | 1 | MLS | 29.5 | | | 46.0 | 14.5 | | | | | 39.5 | | | | | |
| | | | 2 | MLS | 25.0 | | | | | | | | | 24.5 | | | | | |
| | | | 3 | MLS | 27.5 | | | | | | | | | | | | | | |
| | | | 4 | MLS | 23.5 | | | | | | | | | | | | | | |
| | | | 5 | MLS | 19.0 | | | | | | | | | | | | | | |
| | | | 6 | MLS | 23.5 | | | | | | | | | | | | | | |
| | | | 7 | MLS | 32.0 | | | | | | | | | | | | | | |
| | | | 8 | MLS | 27.5 | | | | | | | | | | | | | | |

## Shallow, Survey 1, Length data

| Group | Island | Site | Specimen | Observer | Species | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | *Number varies by site* | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia argus* | *Holothuria atra* | *Actinopyga mauritiana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* |
| | | | 9 | NK | 32.0 | | | | | 45.5 | | | | | | | | 10.5 | |
| | | | 10 | NK | 32.5 | | | | | 16.0 | | | | | | | | | |
| | | | 11 | NK | 36.0 | | | | | | | | | | | | | | |
| | | S11 | 1 | MLS | 36.0 | | | | | | | | | | | | | 10.0 | |
| | | | 2 | MLS | 36.0 | | | | | | | | | | | | | 8.9 | |
| | | | 3 | NK | | | | | | | | | | 36.0 | | | | | |
| | | | 4 | PR | | | | | | | | | | | | | | 9.0 | |
| | | S12 | 1 | NK | | | | | | | 29.0 | | | | 23.0 | | | | |
| | | | 2 | PR | 17.5 | | | | | | | | 25.0 | | | | | | |
| | | | 3 | PR | 28.5 | | | | | | | | | | | | | | |
| | | | 4 | PR | 9.5 | | | | | | | | | | | | | | |
| | 4 | S13 | 1 | PR | | | | | | | | | | | | | | 14.0 | |
| | | | 2 | NK | | | | | | | | | | | | | | 8.0 | |
| | | | 3 | MLS | 23.5 | | | | | | 27.0 | | | 32.0 | 24.0 | | | | |
| | | | 4 | MLS | 22.5 | | | | | | | | | 36.5 | 24.0 | | | | |
| | | | 5 | MLS | 30.0 | | | | | | | | | 32.0 | | | | | |
| | | | 6 | MLS | 26.0 | | | | | | | | | 32.5 | | | | | |
| | | | 7 | MLS | 23.0 | | | | | | | | | 33.0 | | | | | |
| | | | 8 | MLS | 26.0 | | | | | | | | | 34.0 | | | | | |
| | | | 9 | MLS | 36.0 | | | | | | | | | | | | | | |
| | | | 10 | MLS | 25.5 | | | | | | | | | | | | | | |
| | | | 11 | MLS | 34.0 | | | | | | | | | | | | | | |
| | | | 12 | MLS | 28.0 | | | | | | | | | | | | | | |
| | | S14 | 1 | PR | | | | | | | | | | | | | | 8.0 | |
| | | | 2 | PR | | | | | | | | | | | | | | 12.5 | |
| | | | 3 | MLS | 26.5 | | 55.5 | | | | 20.0 | 46.0 | | 30.0 | | | | | |
| | | | 4 | MLS | 29.0 | | | | | | 20.0 | | | 29.5 | | | | | |
| | | | 5 | MLS | 32.0 | | | | | | 17.5 | | | 36.0 | | | | | |
| | | | 6 | MLS | 25.5 | | | | | | 20.0 | | | 28.0 | | | | | |
| | | | 7 | MLS | | | | | | | 19.5 | | | 30.5 | | | | | |
| | | | 8 | MLS | | | | | | | | | | 26.0 | | | | | |
| | | | 9 | MLS | | | | | | | | | | 29.0 | | | | | |
| | | | 10 | MLS | | | | | | | | | | 22.0 | | | | | |
| | | | 11 | MLS | | | | | | | | | | 32.5 | | | | | |
| | | S15 | 1 | MLS | 7.5 | | 56.0 | | | | | 29.5 | | | 31.0 | | | | |
| | | | 2 | MLS | 29.0 | | | | | | | 35.0 | | | | | | | |
| | | | 3 | MLS | 8.5 | | | | | | | | | | | | | | |
| | | | 4 | MLS | 25.0 | | | | | | | | | | | | | | |
| | | | 5 | MLS | 30.0 | | | | | | | | | | | | | | |
| | | | 6 | MLS | 17.0 | | | | | | | | | | | | | | |
| | | | 7 | PR | | | | | | | | | | | | | | 10.0 | |
| | | S16 | 1 | MLS | 26.5 | | | | | | 23.5 | 43.5 | | | 28.0 | 25.5 | | | |
| | | | 2 | MLS | | | | | | | 30.0 | | | | 24.5 | | | | |
| | | | 3 | MLS | | | | | | | 29.0 | | | | 31.5 | | | | |
| | | | 4 | PR | 25.0 | | | | | | 27.5 | | | | 23.0 | | | | |
| | | | 5 | PR | 28.0 | | | | | | 28.0 | | | | 34.5 | | | | |
| | | | 6 | PR | 32.5 | | | | | | 18.5 | | | | | | | | |
| | | | 7 | PR | | | | | | | 26.5 | | | | | | | | |
| | | | 8 | PR | | | | | | | 26.0 | | | | | | | | |
| | | | 9 | PR | | | | | | | 18.5 | | | | | | | | |
| | | | 10 | NK | 25.0 | | | | | 21.0 | 20.0 | | | | | | | | |
| Ysabel | 5 | S17 | 1 | MLS | 32.5 | | 67.0 | | 5.0 | 45.5 | | 32.0 | | 35.5 | | | | | |
| | | | 2 | MLS | 18.0 | | 44.0 | | | 35.0 | | | | | | | | | |
| | | | 3 | MLS | 22.5 | | 49.5 | | | 35.0 | | | | | | | | | |

## Shallow, Survey 1, Length data

| Group | Island | Site | Specimen | Observer | Species | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia argus* | *Holothuria atra* | *Actinopyga mauritiana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* |
| | | | 4 | MLS | 17.0 | | 40.0 | | | | | | | | | | | | |
| | | | 5 | MLS | 14.3 | | 13.5 | | | | | | | | | | | | |
| | | | 6 | MLS | | | 33.0 | | | | | | | | | | | | |
| | | | 7 | PR | 25.0 | | 29.5 | | | 26.5 | | | 29.0 | 21.0 | | | | | |
| | | | 8 | PR | 19.0 | | 43.0 | | | 31.0 | | | | 26.0 | | | | | |
| | | | 9 | PR | | | 22.0 | | | 38.5 | | | | 29.0 | | | | | |
| | | | 10 | PR | | | | | | 36.5 | | | | | | | | | |
| | | | 11 | NK | 30.5 | 49.0 | 48.0 | 9.5 | | | | | | 46.0 | | | | | |
| | | | 12 | NK | 24.0 | | 39.0 | | | | | | | | | | | | |
| | | | 13 | NK | 13.0 | | | | | | | | | | | | | | |
| | | | 14 | NK | 21.0 | | | | | | | | | | | | | | |
| | | S18 | 1 | MLS | 18.5 | 56.0 | 33.0 | | | 45.5 | 32.0 | | | 49.5 | | | | | |
| | | | 2 | MLS | | 58.0 | 52.0 | | | 32.5 | 30.5 | | | | | | | | |
| | | | 3 | MLS | | 59.0 | 59.5 | | | | | | | | | | | | |
| | | | 4 | MLS | | 67.0 | 46.5 | | | | | | | | | | | | |
| | | | 5 | PR | 22.0 | | 38.0 | | | | 25.0 | 26.0 | | | | | | 12.5 | |
| | | | 6 | PR | 10.0 | | | | | | | 28.5 | | | | | | | |
| | | | 7 | PR | 31.0 | | | | | | | | | | | | | | |
| | | | 8 | NK | 28.0 | | 28.0 | | | 32.0 | | | | | | | | | |
| | | | 9 | NK | 30.5 | | 70.0 | | | | | | | | | | | | |
| | | | 10 | NK | 15.5 | | 51.0 | | | | | | | | | | | | |
| | | S19 | 1 | MLS | | 52.5 | | | | | 27.0 | | 47.0 | 44.5 | | | | | |
| | | | 2 | MLS | | | | | | | 29.0 | | | | | | | | |
| | | | 3 | MLS | | | | | | | 26.5 | | | | | | | | |
| | | | 4 | NK | 13.0 | | | | 9.0 | | 25.0 | | | | | | | | |
| | | | 5 | NK | 25.0 | | | | 12.0 | | | | | | | | | | |
| | | | 6 | NK | 30.0 | | | | 8.5 | | | | | | | | | | |
| | | | 7 | PR | | 46.0 | 47.0 | 39.0 | | 23.0 | 27.0 | | | | | | | 12.5 | |
| | | | 8 | PR | | | 48.0 | | | | | | | | | | | 12.5 | |
| | 6 | S20 | 1 | MLS | 17.5 | 60.0 | 43.0 | | | 32.0 | 45.5 | | | 26.0 | | | | | |
| | | | 2 | MLS | 29.5 | 80.5 | 40.0 | | | 35.5 | 21.0 | | | | | | | | |
| | | | 3 | MLS | 18.5 | 67.0 | | | | 32.0 | 20.3 | | | | | | | | |
| | | | 4 | MLS | 13.0 | | | | | 31.0 | 26.5 | | | | | | | | |
| | | | 5 | MLS | 20.0 | | | | | | | | | | | | | | |
| | | | 6 | MLS | 27.0 | | | | | | | | | | | | | | |
| | | | 7 | PR | 18.0 | | 51.0 | | | 31.0 | | | | | | | | 10.5 | |
| | | | 8 | PR | 23.0 | | 45.0 | | | 28.0 | | | | | | | | | |
| | | | 9 | PR | 25.0 | | 51.0 | | | | | | | | | | | | |
| | | | 10 | PR | 25.0 | | | | | | | | | | | | | | |
| | | | 11 | PR | 30.0 | | | | | | | | | | | | | | |
| | | | 12 | NK | | 62.0 | 34.0 | 19.5 | 7.5 | 24.0 | 31.0 | | | 24.5 | | | | | |
| | | | 13 | NK | | | 57.0 | | | | 35.0 | | | | | | | | |
| | | S21 | 1 | PR | 28.5 | 53.5 | 36.0 | 26.0 | | | | | | | | | | 12.4 | |
| | | | 2 | PR | 26.0 | | 35.0 | 41.0 | | | | | | | | | | | |
| | | | 3 | PR | 26.0 | | | | | | | | | | | | | | |
| | | | 4 | PR | 29.0 | | | | | | | | | | | | | | |
| | | | 5 | NK | | | 46.0 | | 13.5 | | | 15.5 | | 29.0 | | | | | |
| | | S22 | 1 | PR | 15.0 | | 53.0 | | | | 24.0 | | | | | | | | |
| | | | 2 | PR | 27.5 | | | | | | 22.0 | | | | | | | | |
| | | | 3 | NK | 23.0 | | 32.0 | | | | | | 26.0 | | | | | | |
| | | | 4 | NK | 12.5 | | | | | | | | | | | | | | |
| | | | 5 | NK | 12.0 | | | | | | | | | | | | | | |
| | | | 6 | NK | 26.0 | | | | | | | | | | | | | | |
| | | | 7 | NK | 30.0 | | | | | | | | | | | | | | |

## Shallow, Survey 1, Length data

| Group | Island | Site | Specimen | Observer | Species | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia agrus* | *Holothuria atra* | *Actinopyga mauritiana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* |
| | | | 8 | NK | 20.5 | | | | | | | | | | | | | | |
| | | | 9 | NK | 24.0 | | | | | | | | | | | | | | |
| | | S23 | 1 | NK | 29.5 | 49.0 | | | | | 29.0 | | | | | | | | |
| | | | 2 | NK | 27.0 | | | | | | | | | | | | | | |
| | | | 3 | NK | 29.0 | | | | | | | | | | | | | | |
| | | | 4 | NK | 30.0 | | | | | | | | | | | | | | |
| | | | 5 | NK | 20.5 | | | | | | | | | | | | | | |
| | | | 6 | NK | 23.5 | | | | | | | | | | | | | | |
| | | | 7 | NK | 22.5 | | | | | | | | | | | | | | |
| | | | 8 | NK | 27.0 | | | | | | | | | | | | | | |
| | | | 9 | NK | 26.0 | | | | | | | | | | | | | | |
| | | | 10 | NK | 24.0 | | | | | | | | | | | | | | |
| | | | 11 | NK | 17.0 | | | | | | | | | | | | | | |
| | | | 12 | PR | 29.0 | | | 36.0 | 12.0 | | | | | | | | | | |
| | | | 13 | PR | 28.0 | | | | | | | | | | | | | | |
| | | | 14 | PR | 25.0 | | | | | | | | | | | | | | |
| | | | 15 | PR | 16.0 | | | | | | | | | | | | | | |
| Suavanao | 7 | S24 | 1 | NK | 22.5 | 95.5 | | | | 32.0 | | | 34.0 | | | | | | |
| | | | 2 | NK | 17.0 | | | | | | | | | | | | | | |
| | | | 3 | NK | 28.5 | | | | | | | | | | | | | | |
| | | | 4 | NK | 7.5 | | | | | | | | | | | | | | |
| | | | 5 | PR | 12.0 | | 28.0 | | 12.5 | | | | | 34.0 | | | | 12.4 | |
| | | | 6 | PR | 20.5 | | | | | | | | | | | | | | |
| | | | 7 | PR | 21.0 | | | | | | | | | | | | | | |
| | | | 8 | PR | 14.0 | | | | | | | | | | | | | | |
| | | | 9 | PR | 18.5 | | | | | | | | | | | | | | |
| | | | 10 | PR | 18.0 | | | | | | | | | | | | | | |
| | | | 11 | PR | 24.0 | | | | | | | | | | | | | | |
| | | | 12 | PR | 25.0 | | | | | | | | | | | | | | |
| | | | 13 | PR | 33.0 | | | | | | | | | | | | | | |
| | | S25 | 1 | PR | 30.0 | | | | | | | | | | | | | | |
| | | | 2 | PR | 26.0 | | | | | | | | | | | | | | |
| | | | 3 | NK | 32.0 | | | | | | | | | | | | | | |
| | | | 4 | MLS | 16.0 | | | | | | | | | 26.5 | | | | 8.4 | |
| | | | 5 | MLS | | | | | | | | | | | | | | 6.5 | |
| | | S26 | 1 | MLS | 39.0 | | | | | | | | | | | | | 11.8 | |
| | | | 2 | MLS | 34.0 | | | | | | | | | | | | | | |
| | | | 3 | PR | | | | | | | | | | 32.0 | | | | | |
| | | S27 | 1 | MLS | 27.5 | | | | | | | | | | | | | 11.5 | |
| | | | 2 | MLS | 8.0 | | | | | | | | | | | | | | |
| | | | 3 | MLS | 19.5 | | | | | | | | | | | | | | |
| | | | 4 | MLS | 19.5 | | | | | | | | | | | | | | |
| | | | 5 | PR | 25.0 | | | | | | | | | | | | | 7.8 | |
| | | | 6 | PR | | | | | | | | | | | | | | 11.2 | |
| | | | 7 | PR | | | | | | | | | | | | | | 11.2 | |
| | | | 8 | PR | | | | | | | | | | | | | | 11.6 | |
| | | | 9 | PR | | | | | | | | | | | | | | 12.3 | |
| | | | 10 | PR | | | | | | | | | | | | | | 11.4 | |
| | | | 11 | PR | | | | | | | | | | | | | | 11.4 | |
| | | | 12 | PR | | | | | | | | | | | | | | 11.0 | |
| | | | 13 | PR | | | | | | | | | | | | | | 11.5 | |
| | | | 14 | PR | | | | | | | | | | | | | | 11.2 | |
| | | | 15 | PR | | | | | | | | | | | | | | 11.2 | |
| | | | 16 | PR | | | | | | | | | | | | | | 10.6 | |

## Shallow, Survey 1, Length data

| Group | Island | Site | Specimen | Observer | Species | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia agrus* | *Holothuria atra* | *Actinopyga mauritaniana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* |
| | | | 17 | PR | | | | | | | | | | | | | | 11.1 | |
| | 8 | S28 | 1 | NK | 22.5 | | | | | | | | | | 28.0 | | | | |
| | | | 2 | NK | 24.0 | | | | | | | | | | | | | | |
| | | | 3 | NK | 26.0 | | | | | | | | | | | | | | |
| | | | 4 | NK | 25.0 | | | | | | | | | | | | | | |
| | | | 5 | NK | 28.0 | | | | | | | | | | | | | | |
| | | | 6 | NK | 32.0 | | | | | | | | | | | | | | |
| | | | 7 | NK | 16.0 | | | | | | | | | | | | | | |
| | | | 8 | NK | 22.0 | | | | | | | | | | | | | | |
| | | | 9 | PR | 26.0 | | | | | | | | | | | | | 9.5 | |
| | | S29 | 1 | NK | 34.0 | | | | | | | 33.5 | | | | | | 11.5 | |
| | | | 2 | NK | 30.0 | | | | | | | | | | | | | 10.5 | |
| | | | 3 | NK | | | | | | | | | | | | | | 10.8 | |
| | | | 4 | NK | | | | | | | | | | | | | | 12.5 | |
| | | | 5 | NK | | | | | | | | | | | | | | 10.5 | |
| | | | 6 | NK | | | | | | | | | | | | | | 11.0 | |
| | | | 7 | NK | | | | | | | | | | | | | | 11.0 | |
| | | | 8 | NK | | | | | | | | | | | | | | 12.5 | |
| | | | 9 | PR | 26.0 | | | | | | | 34.0 | | | | | | 9.8 | |
| | | | 10 | PR | 23.0 | | | | | | | | | | | | | 12.1 | |
| | | | 11 | PR | | | | | | | | | | | | | | 10.5 | |
| | | | 12 | MLS | 30.5 | | | | 14.0 | | | 34.0 | | | | | | 11.5 | |
| | | | 13 | MLS | 12.0 | | | | 10.5 | | | 36.0 | | | | | | 11.5 | |
| | | | 14 | MLS | 33.0 | | | | 4.0 | | | 39.5 | | | | | | 10.4 | |
| | | | 15 | MLS | 24.0 | | | | | | | 38.5 | | | | | | 11.3 | |
| | | | 16 | MLS | 29.0 | | | | | | | 33.0 | | | | | | 11.1 | |
| | | | 17 | MLS | 27.0 | | | | | | | 33.5 | | | | | | 11.2 | |
| | | | 18 | MLS | 29.5 | | | | | | | 34.0 | | | | | | 9.5 | |
| | | | 19 | MLS | 33.5 | | | | | | | 29.5 | | | | | | 11.2 | |
| | | | 20 | MLS | 34.0 | | | | | | | 25.5 | | | | | | 10.4 | |
| | | | 21 | MLS | | | | | | | | 27.0 | | | | | | 11.4 | |
| | | | 22 | MLS | | | | | | | | 34.0 | | | | | | | |
| | | S30 | 1 | PR | 23.0 | | | | | | | | | | | | | 9.0 | |
| | | | 2 | PR | 28.0 | | | | | | | | | | | | | 8.0 | |
| | | | 3 | PR | 20.0 | | | | | | | | | | | | | 8.7 | |
| | | | | PR | | | | | | | | | | | | | | 8.8 | |
| | | | 4 | NK | 25.0 | | | | | | | | | | | | | | |
| | | | 5 | NK | 27.0 | | | | | | | | | | | | | | |
| | | | 6 | NK | 25.0 | | | | | | | | | | | | | | |
| | | | 7 | NK | 29.0 | | | | | | | | | | | | | | |
| | | | 8 | NK | 26.5 | | | | | | | | | | | | | | |
| | | | 9 | NK | 14.5 | | | | | | | | | | | | | | |
| | | | 10 | MLS | 17.0 | | | | | | | | | | | | | 8.8 | |
| | | | 11 | MLS | 26.5 | | | | | | | | | | | | | | |
| | | S31 | 1 | PR | 31.0 | | | | | | | | | | | | | | |
| | | | 2 | PR | 28.0 | | | | | | | | | | | | | | |
| | | | 3 | PR | 32.0 | | | | | | | | | | | | | | |
| | | | 4 | PR | 28.0 | | | | | | | | | | | | | | |
| | | | 5 | PR | 24.0 | | | | | | | | | | | | | | |
| | | | 6 | NK | 27.0 | | 28.0 | 44.5 | | | | | | | | | | | |
| | | | 7 | NK | 18.5 | | | | | | | | | | | | | | |
| | | | 8 | NK | 6.0 | | | | | | | | | | | | | | |
| | | | 9 | NK | 16.5 | | | | | | | | | | | | | | |
| | | | 10 | NK | 27.0 | | | | | | | | | | | | | | |

## Shallow, Survey 1, Length data

| Group | Island | Site | Specimen | Observer | Species | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia agrus* | *Holothuria atra* | *Actinopyga mauritaniana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* |
| | | | 11 | NK | 13.0 | | | | | | | | | | | | | | |
| | | | 12 | NK | 14.5 | | | | | | | | | | | | | | |
| | | | 13 | NK | 24.0 | | | | | | | | | | | | | | |
| | | | 14 | NK | 6.5 | | | | | | | | | | | | | | |
| | | | 15 | NK | 26.0 | | | | | | | | | | | | | | |
| | | S32 | 1 | PR | 17.0 | | | | 8.0 | 23.0 | | | | | | | | | |
| | | | 2 | PR | 17.0 | | | | 8.0 | | | | | | | | | | |
| | | | 3 | PR | 18.0 | | | | 4.0 | | | | | | | | | | |
| | | | 4 | PR | 15.0 | | | | 4.0 | | | | | | | | | | |
| | | | 5 | PR | 10.0 | | | | 8.0 | | | | | | | | | | |
| | | | 6 | PR | | | | | 13.0 | | | | | | | | | | |
| | | | 7 | PR | | | | | 15.0 | | | | | | | | | | |
| | | | 8 | PR | | | | | 10.0 | | | | | | | | | | |
| | | | 9 | PR | | | | | 9.0 | | | | | | | | | | |
| | | | 10 | PR | | | | | 10.0 | | | | | | | | | | |
| | | | 11 | PR | | | | | 9.0 | | | | | | | | | | |
| | | | 12 | PR | | | | | 10.0 | | | | | | | | | | |
| | | | 13 | PR | | | | | 10.0 | | | | | | | | | | |
| | | | 14 | PR | | | | | 5.0 | | | | | | | | | | |
| | | | 15 | PR | | | | | 5.0 | | | | | | | | | | |
| | | | 16 | PR | | | | | 8.0 | | | | | | | | | | |
| | | | 17 | PR | | | | | 10.0 | | | | | | | | | | |
| | | | 18 | NK | 9.5 | | | | 14.0 | | | 25.0 | | | | | | 9.5 | |
| | | | 19 | NK | 22.0 | | | | 12.0 | | | | | | | | | | |
| | | | 20 | NK | | | | | 7.0 | | | | | | | | | | |
| | | | 21 | NK | | | | | 12.5 | | | | | | | | | | |
| | | | 22 | NK | | | | | 2.5 | | | | | | | | | | |
| | | | 23 | NK | | | | | 8.0 | | | | | | | | | | |
| | | | 24 | NK | | | | | 6.5 | | | | | | | | | | |
| | | | 25 | NK | | | | | 10.0 | | | | | | | | | | |
| | | | 26 | NK | | | | | 11.0 | | | | | | | | | | |
| | | | 27 | NK | | | | | 10.5 | | | | | | | | | | |
| | | | 28 | NK | | | | | 6.0 | | | | | | | | | | |
| | | | 29 | NK | | | | | 10.0 | | | | | | | | | | |
| | | | 30 | NK | | | | | 12.0 | | | | | | | | | | |
| | | | 31 | NK | | | | | 5.0 | | | | | | | | | | |
| | | | 32 | NK | | | | | 3.0 | | | | | | | | | | |
| | | | 33 | NK | | | | | 6.0 | | | | | | | | | | |
| | | | 34 | NK | | | | | 13.0 | | | | | | | | | | |
| | | | 35 | NK | | | | | 9.5 | | | | | | | | | | |
| | | | 36 | MLS | 6.0 | | | | 5.5 | | | | | | | | | | |
| | | | 37 | MLS | 13.0 | | | | 6.0 | | | | | | | | | | |
| | | | 38 | MLS | 25.5 | | | | 5.5 | | | | | | | | | | |
| | | | 39 | MLS | 9.0 | | | | 12.0 | | | | | | | | | | |
| | | | 40 | MLS | | | | | 12.0 | | | | | | | | | | |
| | | | 41 | MLS | | | | | 9.5 | | | | | | | | | | |
| | | | 42 | MLS | | | | | 11.0 | | | | | | | | | | |
| | | | 43 | MLS | | | | | 11.0 | | | | | | | | | | |
| | | | 44 | MLS | | | | | 5.5 | | | | | | | | | | |
| | | | 45 | MLS | | | | | 7.0 | | | | | | | | | | |
| | | | 46 | MLS | | | | | 7.5 | | | | | | | | | | |
| | | | 47 | MLS | | | | | 5.0 | | | | | | | | | | |
| | | | 48 | MLS | | | | | 7.0 | | | | | | | | | | |
| | | | 49 | MLS | | | | | 10.5 | | | | | | | | | | |

## Shallow, Survey 1, Length data

| Group | Island | Site | Specimen | Observer | Species | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia agrus* | *Holothuria atra* | *Actinopyga mauritaniana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* |
| | | | 50 | MLS | | | | | 12.0 | | | | | | | | | | |
| | | | 51 | MLS | | | | | 8.0 | | | | | | | | | | |
| | | | 52 | MLS | | | | | 9.5 | | | | | | | | | | |
| | | | 53 | MLS | | | | | 3.0 | | | | | | | | | | |
| | | | 54 | MLS | | | | | 3.0 | | | | | | | | | | |
| | | | 55 | MLS | | | | | 5.0 | | | | | | | | | | |
| | | | 56 | MLS | | | | | 13.0 | | | | | | | | | | |
| | | | 57 | MLS | | | | | 11.0 | | | | | | | | | | |

## ppendix 2c. Raw data for deep habitat, Survey 1, January/February 1995.

**ep = replicate number, Obs = initials of observer, * indicates uncertain identification**

| roup | Island | Site | Rep | Obs | Species | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* | |
| Vaghena | 1 | D1 | 1 | NK | | | | | | | | | | | | | | | 0 |
| | | | 2 | NK | 1 | 1 | | | | | | | | | | | | | 2 |
| | | | 3 | NK | | | | | | | | | | | | | | | 0 |
| | | | 4 | PR | | | | | | | | | | | | | | | 0 |
| | | | 5 | PR | | | | | | | | | | | | | | | 0 |
| | | | 6 | PR | | | | | | | | | | | | | | | 0 |
| | | D2 | 1 | NK | | | | | | | | | | | | | | | 0 |
| | | | 2 | NK | | | | | | | | | | | | | | | 0 |
| | | | 3 | NK | | 1 | | | | | | | | | | | | | 1 |
| | | | 4 | PR | | | | | | | | | | | | | | | 0 |
| | | | 5 | PR | | | | | | | | | | | | | | | 0 |
| | | | 6 | PR | | | | | | | | | | | | | | | 0 |
| | | D3 | 1 | PR | | | | | | | | | | | | | | | 0 |
| | | | 2 | PR | | 2 | | | | | | | | | | | | | 2 |
| | | | 3 | PR | | | | | | | | | | | | | | | 0 |
| | | | 4 | NK | | 1 | | | | | | | | | | | | | 1 |
| | | | 5 | NK | | 2 | | | | | | | | | | | | | 2 |
| | | | 6 | NK | | 3 | | | | | | | | | | | | | 3 |
| | | D4 | 1 | NK | | | | | | | | | | | | | | | 0 |
| | | | 2 | NK | | 1 | | 1 | | | | | | | | | | | 2 |
| | | | 3 | NK | | 4 | | | | | | | | | | | | | 4 |
| | | | 4 | PR | | 4 | | | | | | | | | | | | | 4 |
| | | | 5 | PR | | 4 | | | | | | | 1 | | | | | | 5 |
| | | | 6 | PR | | 5 | | | | | | | | | | | | | 5 |
| | 2 | D5 | 1 | NK | | | | | | | | | | | | | | | 0 |
| | | | 2 | NK | | | | | | | | | 1 | | | | | | 1 |
| | | | 3 | NK | | | | | | 1 | | | 2 | | | | | | 3 |
| | | | 4 | PR | | | | | | | | | 1 | 1 | | | | | 2 |
| | | | 5 | PR | | | 1 | | | | | | | | 1 | 1 | | | 3 |
| | | | 6 | PR | | | | | | | | | 4 | | | 1 | | | 5 |
| | | D6 | 1 | NK | | | | | | | | | 1 | | | | | | 1 |
| | | | 2 | NK | | | | | | | | | | 2 | | | | | 2 |
| | | | 3 | NK | | | | | | | | | | | | | | | 0 |
| | | | 4 | PR | | | | | | | | | | | | | | | 0 |
| | | | 5 | PR | | | | | | 1 | | | 3 | 1 | | | | | 5 |
| | | | 6 | PR | | | | | | | | | 1 | | | | | | 1 |
| | | D7 | 1 | NK | | | | | | | | | 1 | | | | | | 1 |
| | | | 2 | NK | | | | | | | | | | | | | | | 0 |
| | | | 3 | NK | | | | | | 1 | | | | | | | | | 1 |
| | | | 4 | PR | | | | | | | | | | | | 1 | | | 1 |
| | | | 5 | PR | | | | | | 1 | | | | | | | | | 1 |
| | | | 6 | PR | | | | | | | | | | | | | | | 0 |
| | | D8 | 1 | PR | | | | | | | | | | | | 2 | | | 2 |
| | | | 2 | PR | | | | | | | | | | | | | | | 0 |
| | | | 3 | PR | | | | | | | | | 1 | | | | | | 1 |
| | | | 4 | NK | | | | | | 1 | | | | | | | | | 1 |
| | | | 5 | NK | 1 | | | | | | | | | | | 1 | | | 2 |
| | | | 6 | NK | | | | | | | | | | | | 1 | | 1 | 2 |
| mavons | 3 | D9 | 1 | NK | | | | | | | | | 1 | 1 | | | | | 2 |
| | | | 2 | NK | | | | | | | | | | 1 | | | | | 1 |
| | | | 3 | NK | | 1 | | | | | | | 1 | | | | | | 2 |

## Deep, Survey 1, abundance

| Group | Island | Site | Rep | Obs | Species | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* | |
| | | | 4 | PR | | 1 | | | | | | | 1 | | | 1 | | | 3 |
| | | | 5 | PR | | | | | | | | | | | | | 2 | | 2 |
| | | | 6 | PR | | 1 | | | | | | | | | | | | | 1 |
| | | D10 | 1 | NK | | | | | 1 | 1 | | | 3 | | | | | | 5 |
| | | | 2 | NK | | | | | | 1 | 1 | | 3 | | | | 1 | | 6 |
| | | | 3 | NK | | | | | | | | | | | | | | | 0 |
| | | | 4 | PR | | | | | | | | | 9 | | | | | | 9 |
| | | | 5 | PR | | | | | | | | | 2 | | | | | | 2 |
| | | | 6 | PR | | | | | | | | | 2 | | | | 1 | | 3 |
| | | D11 | 1 | NK | | | | | | | | | 2 | | | | | | 2 |
| | | | 2 | NK | | | | | | | | | | | | | | | 0 |
| | | | 3 | NK | | | | | | | | | 1 | | | 1 | | | 2 |
| | | | 4 | PR | 1 | | | | | 1 | | | | | | | | | 2 |
| | | | 5 | PR | | | | | | 1 | | | 1 | | | | | | 2 |
| | | | 6 | PR | | | | | | | | | | 1 | | | | | 1 |
| | | D12 | 1 | PR | | | | | | | | | | | | | | | 0 |
| | | | 2 | PR | | | | | | | | | 1 | | | | | | 1 |
| | | | 3 | PR | | | | | | | | | 1 | | | | | | 1 |
| | | | 4 | NK | | | | | | | | | | | | | | | 0 |
| | | | 5 | NK | | | | | | | | | | | | 1 | | | 1 |
| | | | 6 | NK | | | | | | | | | 1 | | | | | | 1 |
| | 4 | D13 | 1 | PR | | | 1 | | | | | | 2 | | | 1 | | | 4 |
| | | | 2 | PR | | | | | | | | | | | | 1 | | | 1 |
| | | | 3 | PR | | | | | | | | | | | | 1 | | | 1 |
| | | | 4 | NK | | | | | | | | | | | | | 2 | | 2 |
| | | | 5 | NK | | | | | | | | | 1 | 2 | | | | | 3 |
| | | | 6 | NK | | 1 | 1 | | | | | | | | | | | | 2 |
| | | D14 | 1 | PR | | | | | | | | | | | 1 | | | | 1 |
| | | | 2 | PR | | | | | | | | | | 1 | | 2 | | | 3 |
| | | | 3 | PR | | 1 | | | | | | | 1 | | | | | | 2 |
| | | | 4 | NK | | | | | | | | | | | | | | | 0 |
| | | | 5 | NK | | | | | | | | | | | | | | | 0 |
| | | | 6 | NK | | | | | | | | | | | | | | | 0 |
| | | D15 | 1 | PR | | | | | | | 2 | | | | | | | | 2 |
| | | | 2 | PR | | | | | | | | | | | | | | | 0 |
| | | | 3 | PR | | | | | | | | | | | | | | | 0 |
| | | | 4 | NK | | | | | | | | | | | | | | | 0 |
| | | | 5 | NK | | | | | | | | | | | | | | | 0 |
| | | | 6 | NK | | | | | | | | | | | | | | | 0 |
| | | D16 | 1 | NK | 2 | | | | | | | | 2 | | | | | | 4 |
| | | | 2 | NK | 1 | | | | | | | | | | | | | | 1 |
| | | | 3 | NK | 1 | | | | | 2 | | | 2 | | | | | | 5 |
| | | | 4 | PR | 2 | | | | | | | | 2 | | | | | | 4 |
| | | | 5 | PR | | | | | | | | | 4 | | | | | | 4 |
| | | | 6 | PR | | | | | | | | | | | | | | | 0 |
| Ysabel | 5 | D17 | 1 | NK | | | | | | | | | | | | | | | 0 |
| | | | 2 | NK | | | | | | | | | | 1 | | | | | 1 |
| | | | 3 | NK | | | | | | | | | 1 | 1 | | | | | 2 |
| | | | 4 | PR | | | | | | | | | | 1 | | | | | 1 |
| | | | 5 | PR | | | | | | | | | 1 | | | | | | 1 |
| | | | 6 | PR | | | | | | | | | | | | | | | 0 |
| | | D18 | 1 | PR | | | | | | | | | | 1 | | | | | 1 |
| | | | 2 | PR | | | | | | | | | | | | | | | 0 |
| | | | 3 | PR | | | | | | | | | | | | 1 | | | 1 |

## Deep, Survey 1, abundance

| roup | Island | Site | Rep | Obs | Species | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* | |
| | | | 4 | NK | | | | | | | | | | 7 | | | | | 7 |
| | | | 5 | NK | | | | | | | | | | 2 | | | | | 2 |
| | | | 6 | NK | | | | | | | | | | | | | | | 0 |
| | | D19 | 1 | PR | | | | | | | | | | | | | | | 0 |
| | | | 2 | PR | | | | | | 1 | | | | | | | | | 1 |
| | | | 3 | PR | | | | | | | | | | | | | | | 0 |
| | | | 4 | NK | 1 | | | | | | | | | | | | | | 1 |
| | | | 5 | NK | 1 | | | | | | | | | | | | | | 1 |
| | | | 6 | NK | | | | | | | | | | | | | | | 0 |
| | | D20 | 1 | NK | | | | | | | | | | 2 | | | | | 2 |
| | | | 2 | NK | | | | | | | | | | 1 | | | | | 1 |
| | | | 3 | NK | | | | | | | | | | | | | | | 0 |
| | | | 4 | PR | | | | | | | | | | | | | | | 0 |
| | | | 5 | PR | | | | | | | | | | | | | | | 0 |
| | | | 6 | PR | | | | | | | | | | | | | | | 0 |
| | 6 | D21 | 1 | PR | | | | | | | | | | | | | | | 0 |
| | | | 2 | PR | | | | | | | | | | | | | | | 0 |
| | | | 3 | PR | | | | | | | | | | | 1 | 1 | | | 2 |
| | | | 4 | NK | | | | | | | | | | | | | | | 0 |
| | | | 5 | NK | | | | | | | | | | | | 1 | | | 1 |
| | | | 6 | NK | | | | | | | | | 1 | | | 1 | | | 2 |
| | | D22 | 1 | PR | | | | | | | | | | | | | | | 0 |
| | | | 2 | PR | | | | | | | | | | | | | | | 0 |
| | | | 3 | PR | | | | | | | | | | | | 1 | | | 1 |
| | | | 4 | NK | | | | | | | | | | | | 2 | | | 2 |
| | | | 5 | NK | | | | | | | | | | 2 | | 2 | | | 4 |
| | | | 6 | NK | | | | | | | | | 1 | | | 1 | | | 2 |
| | | D23 | 1 | PR | | 1 | | | | | | | | | | | | | 1 |
| | | | 2 | PR | | | | | | | | | | | | | | | 0 |
| | | | 3 | PR | | | | | | | | | | | | | | | 0 |
| | | | 4 | NK | | | | | | 1 | | | | | | | | | 1 |
| | | | 5 | NK | 1 | | | | | | | | | | | | | | 1 |
| | | | 6 | NK | | 1 | | | | | | | | | | | | | 1 |
| | | D24 | 1 | NK | | | | | | | | | 1 | | | | | | 1 |
| | | | 2 | NK | | | | | 1 | | | | | 1 | | | | | 2 |
| | | | 3 | NK | | | | | 1 | | | | 1 | | | | | | 2 |
| | | | 4 | PR | | 1 | | | | | | | 2 | | | | | | 3 |
| | | | 5 | PR | 2 | | | | | | | | | | | | | | 2 |
| | | | 6 | PR | | | | | | | | | | | | | | | 0 |
| uavanao | 7 | D25 | 1 | PR | | | | | | | | | | | | | | | 0 |
| | | | 2 | PR | | 1 | | | | | | | | | | | | | 1 |
| | | | 3 | PR | | 1 | | | | | | | | | | | | | 1 |
| | | | 4 | NK | | | | | | | | | | | | | | | 0 |
| | | | 5 | NK | | | | | | | | | | | | | | | 0 |
| | | | 6 | NK | | | | | | | | 1 | | | | | | | 1 |
| | | D26 | 1 | MLS | | | | | | | | | | 1 | | 4 | | | 5 |
| | | | 2 | MLS | | 1 | | | | 1 | | | | | | | 2 | | 4 |
| | | | 3 | MLS | | 1 | | | | | | | | | | 1 | | | 2 |
| | | | 4 | NK | | 1 | | | | | | | | | | | | | 1 |
| | | | 5 | NK | | 1 | 1 | | | | | | 1 | | | | 1 | | 4 |
| | | | 6 | NK | | | | | | | | | | | | 1 | | | 1 |
| | | D27 | 1 | NK | | | | | | | | | | | | | | | 0 |
| | | | 2 | NK | | | | | | | | | | | | | | | 0 |
| | | | 3 | NK | | 1 | | | | | | | | | | | 2 | | 3 |

## Deep, Survey 1, abundance

| Group | Island | Site | Rep | Obs | Species | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* | |
| | | | 4 | PR | | | | | | | | | | | | | | | 0 |
| | | | 5 | PR | | | | | | | | | | | | | | | 0 |
| | | | 6 | PR | | 2 | | | | | | | | 5 | | 1 | 1 | | 9 |
| | | D28 | 1 | NK | 1 | | | | | | | | | | | | | | 1 |
| | | | 2 | NK | | | | | | | | | | | | | | | 0 |
| | | | 3 | NK | | | | | | | | | | | | | | | 0 |
| | | | 4 | PR | | | | | | | | | | | | | | | 0 |
| | | | 5 | PR | | | | | | | | 1 | 1 | | | | | | 2 |
| | | | 6 | PR | | 1 | | | | 1 | | | | | | | | | 2 |
| | 8 | D29 | 1 | NK | | 6 | | | | | | | | | | 1 | | | 7 |
| | | | 2 | NK | 1 | 3 | | | | | | | | | | | | | 4 |
| | | | 3 | NK | | | | | | | | | | | | | | | 0 |
| | | | 4 | PR | | | | | | | | | | | | | | | 0 |
| | | | 5 | PR | | 2 | | | | | | | | | | | | | 2 |
| | | | 6 | PR | | | | | | | | | 1 | | | | | | 1 |
| | | D30 | 1 | NK | | 1 | | | | | | | | | | | | | 1 |
| | | | 2 | NK | | | | | | | | | | | | | | | 0 |
| | | | 3 | NK | | 2 | | | | | | | | | | | 1 | | 3 |
| | | | 4 | PR | | | | | | | | | | | | 1 | 1 | | 2 |
| | | | 5 | PR | | 1 | | | | | | | | | | | | | 1 |
| | | | 6 | PR | | 1 | | | | | | | | | | | 1 | | 2 |
| | | D31 | 1 | NK | | | | | | | | | | | | | | | 0 |
| | | | 2 | NK | | 1 | | | | | | | 1 | | | | 1 | | 3 |
| | | | 3 | NK | | 1 | | | | | | | | | | | | | 1 |
| | | | 4 | PR | | | | | | | | | | | | | | | 0 |
| | | | 5 | PR | | | | | | | | | | | | 1 | | | 1 |
| | | | 6 | PR | | | | | | | | | | | | | | | 0 |
| | | D32 | 1 | NK | | | | | | | | | | | | | | | 0 |
| | | | 2 | NK | | 2 | | | | | | | | | | | | | 2 |
| | | | 3 | NK | | | | | | | | | | 1 | | | | | 1 |
| | | | 4 | PR | | 1 | | | | | | | | | | | | | 1 |
| | | | 5 | PR | | 2 | | | | | | | | | | | | | 2 |
| | | | 6 | PR | | | | | | | | | | | | | | | 0 |
| Total | | | | | 16 | 69 | 4 | 1 | 3 | 15 | 3 | 2 | 71 | 36 | 3 | 35 | 16 | 1 | 275 |

## Appendix 2d. Length-frequency data for deep habitat, Survey 1, January/February1995

Specimen = replicate, * indicates uncertain identification.

| Group | Island | Site | Specimen | Observer | Species | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia græffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* |
| Waghena | 1 | D1 | 1 | NK | 56.0 | 64.5 | | | | | | | | | | | | |
| | | | 2 | MLS | | 68.5 | | | | | | 41.0 | | | | | | |
| | | | 3 | MLS | | 79.5 | | | | | | | | | | | | |
| | | D2 | 1 | NK | | 57.0 | | | | | | | | | | | | |
| | | D3 | 1 | MLS | | 66.0 | | | | | | | | | | | | |
| | | | 2 | MLS | | 63.5 | | | | | | | | | | | | |
| | | | 3 | PR | | 57.5 | | | | | | | | | | | | |
| | | | 4 | PR | | 56.0 | | | | | | | | | | | | |
| | | | 5 | NK | | 56.0 | | | | | | | | | | | | |
| | | | 6 | NK | | 58.5 | | | | | | | | | | | | |
| | | | 7 | NK | | 55.0 | | | | | | | | | | | | |
| | | | 8 | NK | | 42.0 | | | | | | | | | | | | |
| | | | 9 | NK | | 53.0 | | | | | | | | | | | | |
| | | | 10 | NK | | 53.0 | | | | | | | | | | | | |
| | | D4 | 1 | MLS | | 54.5 | | | | | | | 35.0 | 31.5 | | | | |
| | | | 2 | MLS | | 54.0 | | | | | | | | | | | | |
| | | | 3 | MLS | | 53.5 | | | | | | | | | | | | |
| | | | 4 | MLS | | 51.0 | | | | | | | | | | | | |
| | | | 5 | NK | | 45.0 | | 33.0 | | | | | | | | | | |
| | | | 6 | NK | | 54.5 | | | | | | | | | | | | |
| | | | 7 | NK | | 55.5 | | | | | | | | | | | | |
| | | | 8 | NK | | 49.0 | | | | | | | | | | | | |
| | | | 9 | NK | | 45.0 | | | | | | | | | | | | |
| | | | 10 | PR | | 55.5 | | | | | | | 43.0 | | | | | |
| | | | 11 | PR | | 63.0 | | | | | | | | | | | | |
| | | | 12 | PR | | 56.0 | | | | | | | | | | | | |
| | | | 13 | PR | | 54.5 | | | | | | | | | | | | |
| | | | 14 | PR | | 56.5 | | | | | | | | | | | | |
| | | | 15 | PR | | 53.5 | | | | | | | | | | | | |
| | | | 16 | PR | | 51.0 | | | | | | | | | | | | |
| | | | 17 | PR | | 52.0 | | | | | | | | | | | | |
| | | | 18 | PR | | 52.0 | | | | | | | | | | | | |
| | | | 19 | PR | | 63.5 | | | | | | | | | | | | |
| | | | 20 | PR | | 61.0 | | | | | | | | | | | | |
| | | | 21 | PR | | 51.0 | | | | | | | | | | | | |
| | | | 22 | PR | | 54.0 | | | | | | | | | | | | |
| | 2 | D5 | 1 | NK | | | | | | 27.0 | | | 46.5 | | | | | |
| | | | 2 | NK | | | | | | | | | 42.5 | | | | | |
| | | | 3 | NK | | | | | | | | | 46.5 | | | | | |
| | | | 4 | PR | | | 43.5 | | | | | | 37.0 | 33.0 | 36.5 | 39.5 | | |
| | | | 5 | PR | | | | | | | | | 40.0 | | | 35.0 | | |
| | | | 6 | PR | | | | | | | | | 48.0 | | | | | |
| | | | 7 | PR | | | | | | | | | 46.0 | | | | | |
| | | | 8 | PR | | | | | | | | | 41.0 | | | | | |
| | | | 9 | MLS | | | | | | | | | 46.5 | | | 43.5 | | |
| | | | 10 | MLS | | | | | | | | | 40.5 | | | 46.5 | | |
| | | | 11 | MLS | | | | | | | | | 38.5 | | | | | |
| | | | 12 | MLS | | | | | | | | | 35.0 | | | | | |
| | | D6 | 1 | MLS | | | | | | | | | 38.0 | | | | | |

## Deep, Survey 1, Length Data

| Group | Island | Site | Specimen | Observer | Species | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* |
| | | | 2 | PR | | | | | | 37.5 | | | 43.0 | 33.0 | | | | |
| | | | 3 | PR | | | | | | | | | 46.5 | | | | | |
| | | | 4 | PR | | | | | | | | | 47.0 | | | | | |
| | | | 5 | NK | | | | | | | | | 46.0 | 46.0 | | | | |
| | | | 6 | NK | | | | | | | | | | 33.5 | | | | |
| | | D7 | 1 | NK | | | | | | 51.0 | | | 49.0 | | | | | |
| | | | 2 | PR | | | | | | 42.0 | | | | | | 39.0 | | |
| | | | 3 | MLS | | | | | | | | | | 42.5 | | | | |
| | | D8 | 1 | PR | | | | | | | | | 42.5 | | | 42.5 | | |
| | | | 2 | PR | | | | | | | | | | | | 46.5 | | |
| | | | 3 | MLS | 50.0 | | | | | 42.0 | | | | | | 52.5 | | 15.6 |
| | | | 4 | MLS | | | | | | | | | | | | 45.0 | | |
| Arnavons | 3 | D9 | 1 | MLS | | 61.5 | | | | | | | 50.0 | 43.0 | | | | |
| | | | 2 | MLS | | | | | | | | | 43.5 | 42.5 | | | | |
| | | | 3 | MLS | | | | | | | | | 36.5 | | | | | |
| | | D10 | 1 | MLS | 57.8 | | | | 29.5 | 30.5 | 30.5 | | 43.5 | | | | | |
| | | | 2 | MLS | | | | | | | | | 35.0 | | | | | |
| | | | 3 | MLS | | | | | | | | | 48.5 | | | | | |
| | | | 4 | MLS | | | | | | | | | 33.5 | | | | | |
| | | | 5 | NK | | | | | 26.0 | 28.0 | | | 36.5 | | | | 35.5 | |
| | | | 6 | NK | | | | | | | | | 34.0 | | | | | |
| | | | 7 | NK | | | | | | | | | 38.0 | | | | | |
| | | | 8 | NK | | | | | | | | | 31.5 | | | | | |
| | | | 9 | NK | | | | | | | | | 34.0 | | | | | |
| | | | 10 | NK | | | | | | | | | 32.0 | | | | | |
| | | | 11 | PR | | | | | | | | | 42.0 | | | | 40.5 | |
| | | | 12 | PR | | | | | | | | | 37.0 | | | | | |
| | | | 13 | PR | | | | | | | | | 39.5 | | | | | |
| | | | 14 | PR | | | | | | | | | 42.0 | | | | | |
| | | D11 | 1 | MLS | | | | | | | | 35.0 | 38.5 | | | 50.0 | 26.5 | |
| | | | 2 | MLS | | | | | | | | | 42.5 | | | | 42.0 | |
| | | | 3 | MLS | | | | | | | | | 49.0 | | | | | |
| | | | 4 | MLS | | | | | | | | | 52.0 | | | | | |
| | | | 5 | MLS | | | | | | | | | 48.5 | | | | | |
| | | | 6 | PR | | | | | | | | | | 40.0 | | | | |
| | | D12 | 1 | MLS | | | | | | | | | 49.0 | | 31.0 | | | |
| | | | 2 | MLS | | | | | | | | | | | 38.5 | | | |
| | | | 3 | MLS | | | | | | | | | | | 36.5 | | | |
| | | | 4 | NK | | | | | | | | | 46.0 | | | 25.0 | | |
| | 4 | D13 | 1 | MLS | | | 66.0 | | | 41.0 | | | 39.0 | | | 50.0 | | |
| | | | 2 | MLS | | | | | | | | | 53.0 | | | 51.0 | | |
| | | | 3 | MLS | | | | | | | | | 49.0 | | | 54.0 | | |
| | | | 4 | MLS | | | | | | | | | 46.0 | | | 48.0 | | |
| | | D14 | 1 | MLS | 62.5 | 54.0 | | | | | | | 41.5 | 44.5 | 46.0 | 52.0 | | |
| | | | 2 | MLS | | | | | | | | | 46.0 | 48.0 | | 48.5 | | |
| | | | 3 | MLS | | | | | | | | | 43.0 | | | 53.5 | | |
| | | D15 | 1 | MLS | | | | | | | 28.0 | | | 48.5 | | | | |
| | | D16 | 1 | MLS | | | | | | | | | 38.0 | | | 53.0 | | |
| | | | 2 | MLS | | | | | | | | | 55.0 | | | | | |
| | | | 3 | MLS | | | | | | | | | 46.0 | | | | | |
| | | | 4 | MLS | | | | | | | | | 47.0 | | | | | |
| | | | 5 | NK | 60.0 | | | | | 43.0 | | | 43.0 | | | | | |

## Deep, Survey 1, Length Data

| Group | Island | Site | Specimen | Observer | Species | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* |
| | | | 6 | NK | 54.0 | | | | | 47.0 | | | 53.5 | | | | | |
| | | | 7 | NK | 45.0 | | | | | | | | 55.0 | | | | | |
| | | | 8 | NK | 57.5 | | | | | | | | 45.0 | | | | | |
| | | | 9 | PR | 50.0 | | | | | | | | 43.0 | | | | | |
| | | | 10 | PR | 49.0 | | | | | | | | 35.0 | | | | | |
| | | | 11 | PR | | | | | | | | | 41.5 | | | | | |
| | | | 12 | PR | | | | | | | | | 42.0 | | | | | |
| | | | 13 | PR | | | | | | | | | 38.5 | | | | | |
| | | | 14 | PR | | | | | | | | | 39.5 | | | | | |
| Ysabel | 5 | D17 | 1 | NK | | | | | | | | | 45.5 | 37.5 | | | | |
| | | | 2 | NK | | | | | | | | | | 37.5 | | | | |
| | | | 3 | PR | | | | | | | | | 46.5 | 38.0 | | | | |
| | | D18 | 1 | PR | | | | | | | | | | 38.0 | | 43.0 | | |
| | | | 2 | NK | | | | | | | | | | 29.5 | | | | |
| | | | 3 | NK | | | | | | | | | | 38.0 | | | | |
| | | | 4 | NK | | | | | | | | | | 39.5 | | | | |
| | | | 5 | NK | | | | | | | | | | 34.5 | | | | |
| | | | 6 | NK | | | | | | | | | | 38.0 | | | | |
| | | | 7 | NK | | | | | | | | | | 35.5 | | | | |
| | | | 8 | NK | | | | | | | | | | 29.5 | | | | |
| | | | 9 | NK | | | | | | | | | | 35.0 | | | | |
| | | | 10 | NK | | | | | | | | | | 37.0 | | | | |
| | | D19 | 1 | MLS | | 74.5 | | | | | | | | | | | 45.0 | |
| | | | 2 | MLS | | 67.5 | | | | | | | | | | | | |
| | | | 3 | PR | | | | | | 30.0 | | | | | | | | |
| | | | 4 | NK | 56.0 | | | | | | | | | | | | | |
| | | | 5 | NK | 48.0 | | | | | | | | | | | | | |
| | | D20 | 1 | NK | | | | | | | | | | 44.5 | | | | |
| | | | 2 | NK | | | | | | | | | | 44.0 | | | | |
| | | | 3 | NK | | | | | | | | | | 44.0 | | | | |
| | 6 | D21 | 1 | PR | | | | | | | | | | 33.5 | 39.5 | 47.5 | | |
| | | | 2 | PR | | | | | | | | | | 37.0 | | | | |
| | | | 3 | NK | | | | | | | | | | | | 46.0 | | |
| | | | 4 | NK | | | | | | | | | 36.0 | | | 48.0 | | |
| | | D22 | 1 | PR | | | | | | | | | | | | 46.0 | | |
| | | | 2 | NK | | | | | | | | | | 45.5 | | 49.0 | | |
| | | | 3 | NK | | | | | | | | | | 28.0 | | 47.5 | | |
| | | | 4 | NK | | | | | | | | | 43.5 | | | 37.5 | | |
| | | | 5 | NK | | | | | | | | | | | | 43.0 | | |
| | | | 6 | NK | | | | | | | | | | | | 45.0 | | |
| | | D23 | 1 | PR | | 61.5 | | | | | | | | | | | | |
| | | | 2 | NK | 46.0 | | | | | 49.5 | | | | | | | | |
| | | D24 | 1 | NK | | 62.0 | | | 32.0 | | | | 43.0 | 25.5 | | | | |
| | | | 2 | NK | | | | | 31.0 | | | | 42.5 | | | | | |
| | | | 3 | PR | 57.5 | | | | | | | | 29.5 | | | | | |
| | | | 4 | PR | 54.5 | | | | | | | | 39.5 | | | | | |
| Suavanao | 7 | D25 | 1 | MLS | | | | | | | | | 50.5 | | | 54.5 | | |
| | | | 2 | PR | | 57.0 | | | | | | | | | | | | |
| | | | 3 | PR | | 46.0 | | | | | | | | | | | | |
| | | | 4 | NK | | | | | | | | 38.0 | | | | | | |
| | | D26 | 1 | MLS | | 59.0 | | | | 40.0 | | | | 43.5 | | 44.5 | 33.0 | |
| | | | 2 | MLS | | 52.0 | | | | | | | | 36.0 | | 41.0 | 35.5 | |
| | | | 3 | MLS | | | | | | | | | | | | 44.0 | | |

# Deep, Survey 1, Length Data

| Group | Island | Site | Specimen | Observer | Species | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* |
| | | | 4 | MLS | | | | | | | | | | | | 41.5 | | |
| | | | 5 | MLS | | | | | | | | | | | | 52.5 | | |
| | | | 6 | NK | | 53.0 | 74.0 | | | | | | 47.5 | | | 50.0 | 30.0 | |
| | | | 7 | NK | | 56.0 | | | | | | | | | | | 34.5 | |
| | | | 8 | NK | | 58.0 | | | | | | | | | | | | |
| | | D27 | 1 | NK | | 68.5 | | | | | | | | | | | 37.0 | |
| | | | 2 | NK | | | | | | | | | | | | | 32.0 | |
| | | | 3 | PR | | 69.0 | | | | | | | | 43.5 | | 47.5 | 18.5 | |
| | | | 4 | PR | | 59.0 | | | | | | | | 38.0 | | | | |
| | | | 5 | PR | | | | | | | | | | 42.5 | | | | |
| | | | 6 | PR | | | | | | | | | | 45.0 | | | | |
| | | | 7 | PR | | | | | | | | | | 44.5 | | | | |
| | | | 8 | MLS | | | | | | | | | | | | | 36.0 | |
| | | | 9 | MLS | | | | | | | | | | | | | 24.5 | |
| | | D28 | 1 | NK | 56.0 | | | | | | | | | | | | | |
| | | | 2 | PR | | 63.0 | | | | 45.0 | | 28.0 | 48.5 | | | | | |
| | 8 | D29 | 1 | NK | 58.0 | 45.0 | | | | | | | 56.0 | | | 46.0 | | |
| | | | 2 | NK | | 50.0 | | | | | | | | | | 43.0 | | |
| | | | 3 | NK | | 56.0 | | | | | | | | | | | | |
| | | | 4 | NK | | 111.0 | | | | | | | | | | | | |
| | | | 5 | NK | | 49.5 | | | | | | | | | | | | |
| | | | 6 | NK | | 50.0 | | | | | | | | | | | | |
| | | | 7 | NK | | 61.0 | | | | | | | | | | | | |
| | | | 8 | NK | | 67.5 | | | | | | | | | | | | |
| | | | 9 | NK | | 57.0 | | | | | | | | | | | | |
| | | | 10 | NK | | 52.5 | | | | | | | | | | | | |
| | | | 11 | PR | | 64.0 | | | | | | | 47.0 | | | | | |
| | | | 12 | PR | | 54.0 | | | | | | | | | | | | |
| | | | 13 | MLS | 53.5 | 54.5 | | | | | | | 60.5 | | | | 30.0 | |
| | | | 14 | MLS | | 52.0 | | | | | | | 50.5 | | | | | |
| | | | 15 | MLS | | 61.0 | | | | | | | | | | | | |
| | | | 16 | MLS | | 52.0 | | | | | | | | | | | | |
| | | | 17 | MLS | | 58.0 | | | | | | | | | | | | |
| | | | 18 | MLS | | 57.5 | | | | | | | | | | | | |
| | | | 19 | MLS | | 51.0 | | | | | | | | | | | | |
| | | | 20 | MLS | | 53.0 | | | | | | | | | | | | |
| | | | 21 | MLS | | 59.0 | | | | | | | | | | | | |
| | | | 22 | MLS | | 61.0 | | | | | | | | | | | | |
| | | D30 | 1 | NK | | 61.0 | | | | | | | | | | | 14.0 | |
| | | | 2 | NK | | 55.0 | | | | | | | | | | | | |
| | | | 3 | NK | | 51.5 | | | | | | | | | | | | |
| | | | 4 | NK | | 65.0 | | | | | | | | | | | | |
| | | | 5 | PR | | 67.5 | | | | | | | | | | 55.0 | 36.0 | |
| | | | 6 | PR | | 69.0 | | | | | | | | | | | 30.0 | |
| | | D31 | 1 | NK | | 71.0 | | | | | | | 41.8 | | | | 26.5 | |
| | | | 2 | PR | | | | | | | | | | | | 55.0 | | |
| | | D32 | 1 | NK | | 70.5 | | | | | | | | 45.0 | | | | |
| | | | 2 | NK | | 80.0 | | | | | | | | | | | | |
| | | | 3 | PR | | 73.5 | | | | | | | | | | | | |
| | | | 4 | PR | | 72.5 | | | | | | | | | | | | |
| | | | 5 | PR | | 55.0 | | | | | | | | | | | | |
| | | | 6 | MLS | | 67.5 | | | | | | | | | | | | |
| | | | 7 | MLS | | 62.5 | | | | | | | | | | | | |

## Deep, Survey 1, Length Data

| Group | Island | Site | Specimen | Observer | Species | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* |
| | | | 8 | NK | 60.5 | 66.0 | | | | | | | | | | 50.5 | | |
| | | | 9 | NK | 61.0 | 64.5 | | | | | | | | | | | | |
| | | | 10 | NK | | 60.0 | | | | | | | | | | | | |

# Appendix 2e. Raw data for shallow habitat, Survey 2, April/May, 1995.

**Rep = relicate number, Obs = initials of observer, * indicates uncertain identification**

| Group | Island | Site | Rep | Obs | Species | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia agrus* | *Holothuria atra* | *Actinopyga mauritaniana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | *Holothuria nobilis* | |
| Waghena | 1 | S1 | 1 | PR | | | | | | | | | | | | | 4 | | | | |
| | | | 2 | PR | 1 | | | | 3 | | | | | | | | 3 | | | | |
| | | | 3 | PR | 2 | | | | | | | | | | | | | | | | |
| | | | 4 | NK | | | | | | | | | | | | | 1 | | | | |
| | | | 5 | NK | 1 | | | | | | | 2 | | | 1 | | | | | | |
| | | | 6 | NK | 3 | | | | 2 | | | | | | | | | | | | |
| | | S2 | 1 | PR | 2 | | | | 2 | | | | | | | | | | | | |
| | | | 2 | PR | 4 | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 1 | | | | | | | | | | | | 1 | | | | |
| | | | 4 | NK | 1 | | | | | | | | | | | 1 | 1 | | | | |
| | | | 5 | NK | 2 | | | | | | | | | | | | | | | | |
| | | | 6 | NK | | | | 1 | | | | 1 | | | | | 1 | | | | |
| | | S3 | 1 | PR | 1 | | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | 1 | | | | | | | | | | | | | | | | |
| | | | 5 | NK | | | | | | | | | | | | | 3 | | | | |
| | | | 6 | NK | | | | | | | | | | | | | 1 | | | | |
| | | S4 | 1 | NK | | | | | | | | | | | | | 1 | | | | |
| | | | 2 | NK | | | | | | | | | | | | | | | | | |
| | | | 3 | NK | | | | | | | | | | | | | | | | | |
| | | | 4 | PR | | | | | 2 | | | | | | | | 1 | | | | |
| | | | 5 | PR | 3 | | | | | | | | | | | | 1 | | | | |
| | | | 6 | PR | 4 | | | | | | | | | | | | | | | | |
| | 2 | S5 | 1 | PR | 6 | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 3 | | | | | | | | | | | | 1 | | | | |
| | | | 3 | PR | 4 | | | | | | | | | | | | | | | | |
| | | | 4 | NK | 4 | | | | | | | | | | | | | | | | |
| | | | 5 | NK | 1 | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 2 | | | | | | | | | | | | | | | | |
| | | S6 | 1 | PR | 4 | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 6 | | | 1 | 1 | | | | | | | | 1 | | | | |
| | | | 3 | PR | 5 | | | | | | | | | | | | 2 | | | | |
| | | | 4 | NK | 1 | | | | | | | | | | | | | | | | |
| | | | 5 | NK | 1 | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 1 | | | | | | | | | | | | | | | | |
| | | S7 | 1 | PR | 1 | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 2 | | | | | | | | | | | | | 1 | | | |
| | | | 3 | PR | 2 | | | | | | | | | | | | | | | | |
| | | | 4 | NK | 2 | | | | | | | | | | | | | | | | |

Shallow, Survey 2, abundance

| Group | Island | Site | Rep | Obs | Species | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia agrus* | *Holothuria atra* | *Actinopyga mauritaniana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | *Holothuria nobilis* | |
| | | | 5 | NK | 3 | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 2 | | | | | | | | | | | | | | | | |
| | | S8 | 1 | NK | 2 | | | | | | 2 | | | | | | | | | | |
| | | | 2 | NK | | | | | | | | | | | | | | | | 1 | |
| | | | 3 | NK | 1 | | | | | | | | | | | | | | | | |
| | | | 4 | PR | 3 | | | 1 | 1 | | | | | | | | 1 | | | | |
| | | | 5 | PR | 9 | | | | | | | | | | | | 2 | | | | |
| | | | 6 | PR | 2 | | | | 1 | | | | | | | | 2 | | | | |
| Arnavons | 3 | S9 | 1 | NK | 1 | | | | | 1 | | | | | | | | | | | |
| | | | 2 | NK | | | | | | | | | | | | | 1 | | | | |
| | | | 3 | NK | 2 | | | | | | | | | | | | | | | | |
| | | | 4 | PR | 2 | | | | | | | | | | | | 2 | | | | |
| | | | 5 | PR | 1 | | | | | | | | | | | | 2 | | | | |
| | | | 6 | PR | 2 | | | | | | | | | | | | 1 | | | | |
| | | S10 | 1 | NK | 1 | | | | | | | | | | | | | | | | |
| | | | 2 | NK | | | | | | | | | | | | | 1 | | | | |
| | | | 3 | NK | | | | | | | | | | | 2 | | | | | | |
| | | | 4 | PR | 5 | | | | | | | | | | | | | | | | |
| | | | 5 | PR | 3 | | | | | | | | | | | | | | | | |
| | | | 6 | PR | 3 | | | | | 1 | | | | | | | | | | | |
| | | S11 | 1 | PR | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 1 | | | | | | | | | | | | 1 | | | | |
| | | | 3 | PR | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | 2 | | | | | | | | | | | | 1 | | | | |
| | | | 5 | NK | 1 | | | | | | | | | 1 | | | | | | | |
| | | | 6 | NK | | | | | | | | | | | | | | | | | |
| | | S12 | 1 | PR | 1 | | | | | | | | | | | | 1 | | | | |
| | | | 2 | PR | | | | | | | | | | | 1 | | 1 | | | | |
| | | | 3 | PR | | | | | | | | | | | | | 1 | | | | |
| | | | 4 | NK | 2 | | | | | | | | | | | | | | | | |
| | | | 5 | NK | 2 | | | | | | | | | | | | 2 | | | | |
| | | | 6 | NK | | | | | | | | 1 | | | | | | | | | |
| | 4 | S13 | 1 | PR | | | | | | | | | | | | | 1 | | | | |
| | | | 2 | PR | | | | | | | | | | | 1 | | 2 | 1 | | | |
| | | | 3 | PR | | | | | | | | | | | | | 2 | | | | |
| | | | 4 | NK | 1 | | | | | | 1 | | | | 1 | | 1 | | | | |
| | | | 5 | NK | 5 | | | | | | | | | | | | 2 | | | | |
| | | | 6 | NK | 2 | | 1 | | | | 1 | | | | | | | | | | |
| | | S14 | 1 | PR | 7 | | | | | | 1 | 2 | | | | | 3 | | | | |
| | | | 2 | PR | 2 | | | | | | 1 | 1 | | | | | 2 | | | | |
| | | | 3 | PR | 1 | | | | | | | | | | | | 1 | | | | |
| | | | 4 | NK | 3 | 1 | | | | | | | | | | | 1 | | | | |
| | | | 5 | NK | 3 | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 3 | | | | | 1 | | | | | | | 1 | | | | |

## Shallow, Survey 2, abundance

| Group | Island | Site | Rep | Obs | Species | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia agrus* | *Holothuria atra* | *Actinopyga mauritaniana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | *Holothuria nobilis* | |
| | | S15 | 1 | NK | | | | | | | | | | | | | 1 | | | | |
| | | | 2 | NK | | | | | | | 1 | | | | | | | 1 | | | |
| | | | 3 | NK | 3 | | | | | | | | | | | | | | | | |
| | | | 4 | PR | 1 | | | | | | | | | | | | | 1 | | | |
| | | | 5 | PR | | | | | | | | | | | | | | | | | |
| | | | 6 | PR | 1 | | | | | | | | | | | | 2 | | | | |
| | | S16 | 1 | NK | | | | | | | | | | 1 | | | 1 | | | | |
| | | | 2 | NK | 1 | | | | | 1 | | | | | | | | | | | |
| | | | 3 | NK | | | | | | | | | | 1 | | | | | | | |
| | | | 4 | PR | | | | | | | | | | | | | | | | | |
| | | | 5 | PR | | | | | | | | | | | | | | | | | |
| | | | 6 | PR | 1 | | | | | | | | | | | | 1 | | | | |
| Ysabel | 5 | S17 | 1 | NK | 2 | | | | | | | | | 2 | | | | 1 | | | |
| | | | 2 | NK | 1 | | | | | 1 | | 1 | | 2 | | 1 | | | | | |
| | | | 3 | NK | 1 | | | 1 | | 3 | | | | 4 | | | | | 1 | | |
| | | | 4 | PR | 1 | | | | 1 | 1 | | | | 5 | | | | | | | |
| | | | 5 | PR | | | | | 1 | | | | | 4 | | | 2 | | | | |
| | | | 6 | PR | | | 1 | | | | | | | 1 | | | | | | | |
| | | S18 | 1 | NK | 1 | | 1 | | | | 2 | 3 | | | | | 5 | | 1 | | |
| | | | 2 | NK | 1 | | | | | 1 | | | | | | | | | | | |
| | | | 3 | NK | 1 | | | 1 | | | | | | 1 | | | | | | | |
| | | | 4 | PR | 1 | | | | | 1 | | | | | | | 1 | | | | |
| | | | 5 | PR | 3 | | | | | | | | | | | | 1 | | | | |
| | | | 6 | PR | 2 | | | | | | | 1 | | | | | | | | | |
| | | S19 | 1 | PR | | | 1 | | | | | | | | | | | | | | |
| | | | 2 | PR | 4 | | | | | | | | | | | | 1 | | | | |
| | | | 3 | PR | 1 | | | | 1 | | | | | | | | 1 | | | | |
| | | | 4 | NK | 2 | | | 1 | | | | | | | | | 1 | | | | |
| | | | 5 | NK | 1 | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 1 | | | | | | 1 | | | | | | | | | | |
| | | S20 | 1 | PR | | 1 | | | | | | | | | | | 1 | | | | |
| | | | 2 | PR | | | | | 1 | | | | | | | | 1 | | | | |
| | | | 3 | PR | 2 | | | | | 1 | 3 | | | | | | | 2 | | | |
| | | | 4 | NK | 1 | | | | | | | | | | | | | | | | |
| | | | 5 | NK | | | 1 | | | | | | | 1 | | | | 1 | | | |
| | | | 6 | NK | | | | | | | | | | | | | 1 | | | | |
| | 6 | S21 | 1 | PR | 2 | | | | | | | 2 | | | | | 1 | | | | |
| | | | 2 | PR | 2 | 1 | | | 1 | | | | | | | | | 1 | | | |
| | | | 3 | PR | 2 | | | | 2 | 1 | | 1 | | | | | 4 | | | | |
| | | | 4 | NK | 1 | | | | 2 | | | | | | 2 | | 3 | | | | |
| | | | 5 | NK | 2 | | 1 | | 1 | | | | | | 1 | | 1 | | | | |
| | | | 6 | NK | 1 | | | | 2 | | | | | | | | 1 | 1 | | | |
| | | S22 | 1 | NK | | | 1 | | | | | | | | | | 1 | | 1 | | |
| | | | 2 | NK | 1 | | | | | | 1 | | | | | | 1 | | | | |

## Shallow, Survey 2, abundance

| Group | Island | Site | Rep | Obs | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia agrus* | *Holothuria atra* | *Actinopyga mauritaniana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | *Holothuria nobilis* | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 3 | NK | 2 | | 1 | | | | | | | | | | 2 | | | | |
| | | | 4 | PR | 3 | | | | | 1 | | | | | | | | | | | |
| | | | 5 | PR | | | | | 1 | | | | | | | | 4 | | | | |
| | | | 6 | PR | 3 | | | | | | | | | | | | 4 | | | | |
| | | S23 | 1 | NK | 4 | | | | | | | | | | | | 1 | | | | |
| | | | 2 | NK | 1 | | | | | | | | | | | | 1 | 1 | | | |
| | | | 3 | NK | 2 | | | | 1 | | | | | | | | | | | | |
| | | | 4 | PR | 3 | | | | 1 | 1 | | | | | | | 3 | | | | |
| | | | 5 | PR | 4 | | | | 1 | | | | | | | | 1 | | | | |
| | | | 6 | PR | | | | | 1 | | | | | | | | 5 | | | | |
| | | S24 | 1 | NK | 1 | | 2 | | | | | | | | | | | | | | |
| | | | 2 | NK | 1 | | | | 2 | | | | | | | | 1 | | | | |
| | | | 3 | NK | | | | | | | 1 | | | | | | | | | | |
| | | | 4 | PR | 1 | | | | | | | | | | | | 1 | | | 1 | |
| | | | 5 | PR | 1 | | | | | | | | | | | | | 1 | | | |
| | | | 6 | PR | | | 1 | | | | | | | | | | 4 | 1 | | | |
| Suavanao | 7 | S25 | 1 | PR | 2 | | | | | | | | | | | | 1 | | | | |
| | | | 2 | PR | | | | | | | | | | | | | 2 | | | | |
| | | | 3 | PR | 1 | | | | | | | | | | | | 1 | | | | |
| | | | 4 | NK | 1 | | | | | | | | | | | | | | | | |
| | | | 5 | NK | | | | | | | | | | | | | 1 | | | | |
| | | | 6 | NK | | | | | | | | | | | | | 1 | | | | |
| | | S26 | 1 | PR | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 1 | | | | | | | | | | | | 1 | | | | |
| | | | 3 | PR | 2 | | | | | | | | | | | | 2 | | | | |
| | | | 4 | NK | | | | | | | | | | | | | 1 | | | | |
| | | | 5 | NK | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 1 | | | | | | | | | | | | | | | | |
| | | S27 | 1 | PR | 3 | | | | | | | | | | | | | 1 | | | |
| | | | 2 | PR | 1 | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 1 | | | | | | | | | | 1 | | | | | | |
| | | | 4 | NK | 1 | | | | | | | | | | | | | 1 | | | |
| | | | 5 | NK | | | | 1 | | | | | | | | | 3 | 2 | | | |
| | | | 6 | NK | 1 | | | | | | | | | | | | | | | | |
| | | S28 | 1 | PR | 2 | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 2 | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 1 | | | | | | | | | | | | 3 | 1 | | | |
| | | | 4 | NK | 1 | | | | | | | | | | | | | | | | |
| | | | 5 | NK | 2 | | | | | | | | | | | | | 1 | | | |
| | | | 6 | NK | 1 | | | | | | | | | | | | 2 | 2 | | | |
| | 8 | S29 | 1 | PR | 2 | | | | | | | | | | | | 5 | | | | |
| | | | 2 | PR | 1 | | | | | | | | | | | | 2 | | | | |
| | | | 3 | PR | 1 | | | | | | | | | | | | | 1 | | | |
| | | | 4 | NK | 1 | | | | | | | 1 | | | | | 1 | | | | |

# Shallow, Survey 2, abundance

| Group | Island | Site | Rep | Obs | Species | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia agrus* | *Holothuria atra* | *Actinopyga mauritaniana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | *Holothuria nobilis* | |
| | | | 5 | NK | | | | | 1 | | | | | | 1 | | 1 | 2 | | | |
| | | | 6 | NK | 2 | | | | | | | 1 | | | | | 1 | | | | |
| | | S30 | 1 | PR | 2 | | | | | | | | | | | | | 2 | | | |
| | | | 2 | PR | 1 | | | | | | | | | | | | | 1 | | | |
| | | | 3 | PR | | | | | | | | | | | | | | 2 | | | |
| | | | 4 | NK | 1 | | | | | | | | | | | | 3 | | | | |
| | | | 5 | NK | | | | | | | | | | | | | 1 | | | | |
| | | | 6 | NK | | | | | | | | | | | | | 1 | 2 | | | |
| | | S31 | 1 | PR | 3 | | | | | | | | | | | | 2 | | | | |
| | | | 2 | PR | | | | | | | | | | | | | 1 | | | | |
| | | | 3 | PR | | | | | | | | | | | | | 1 | | | | |
| | | | 4 | NK | 3 | | | | | | | | | | | | | | | | |
| | | | 5 | NK | 3 | | | 1 | | | | | | | | | | | | | |
| | | | 6 | NK | 3 | | | | | | | | | | | | | | | | |
| | | S32 | 1 | PR | 6 | | | | 32 | | | | | | | | 1 | | | | |
| | | | 2 | PR | 2 | | | | 9 | | | | | | | | 1 | | | | |
| | | | 3 | PR | 6 | | | 1 | 10 | | | | | | | | 2 | | | | |
| | | | 4 | NK | | | | | 13 | | | | | | | | | | | | |
| | | | 5 | NK | 2 | | | | 10 | 1 | | | | | | | | | | | |
| | | | 6 | NK | | | | | 9 | 1 | | | | | | | | | | | |
| Total | | | | | | | | | | | | | | | | | | | | | |

## Appendix 2f. Length-frequency data for shallow habitat, Survey 2, April/May 1995

**Specimen = replicate, * indicates uncertain identification.**

| Group | Island | Site | Specimen | Obs | Species |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  | Number varies by site |  | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia argus* | *Holothuria atra* | *Actinopyga mauritiana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | *Holothuria nobilis* | *Actinopyga miliaris* | *Thelanota anax* |
| Waghena | 1 | S1 | 2 | PR | 16 |  |  |  | 11 |  |  | 34 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 3.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 3 | PR | 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 23 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 5 | NK | 17 |  |  |  |  |  |  | 36 |  |  | 31 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 37 |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 6 | NK | 16 |  |  |  | 11 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 18 |  |  |  | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 15 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | S2 | 1 | PR | 20 |  |  |  | 9 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 24 |  |  |  | 11 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 2 | PR | 14.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 28 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 29 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 28 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 3 | PR | 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 4 | NK | 12 |  |  |  |  |  |  |  |  |  |  | 26 |  |  |  |  |  |  |
|  |  |  | 5 | NK | 19 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 23 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 6 | NK |  |  |  | 32 |  |  |  | 34.5 |  |  |  |  |  |  |  |  |  |  |
|  |  | S3 | 1 | PR | 23 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 4 | NK | 32 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | S4 | 4 | PR |  |  |  |  | 6 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 16.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 5 | PR | 12 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 19 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 6 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 6 | PR | 13.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 25 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 11 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | S5 | 1 | PR | 15.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 15.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 10.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 17 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 5.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 24 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 2 | PR | 16.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 17 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 17 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 3 | PR | 15 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 17 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 16.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 4 | NK | 19.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 18 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 17 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 20.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 5 | NK | 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 6 | NK | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 20 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | S6 | 1 | PR | 15 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 20 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 6.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 20 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 2 | PR | 16 |  |  | 9.5 | 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |

## Shallow, Survey 2, length data

| Group | Island | Site | Specimen | Obs | Species | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia agrus* | *Holothuria atra* | *Actinopyga mauritaniana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | *Holothuria nobilis* | *Actinopyga miliaris* | *Thelanota anax* |
| | | | | | 16.5 | | | | | | | | | | | | | | | | | |
| | | | | | 16 | | | | | | | | | | | | | | | | | |
| | | | | | 13 | | | | | | | | | | | | | | | | | |
| | | | | | 18 | | | | | | | | | | | | | | | | | |
| | | | | | 14 | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 12.5 | | | | | | | | | | | | | | | | | |
| | | | | | 14.5 | | | | | | | | | | | | | 10.6 | | | | |
| | | | | | 13 | | | | | | | | | | | | | | | | | |
| | | | | | 18 | | | | | | | | | | | | | | | | | |
| | | | | | 7.5 | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | 24 | | | | | | | | | | | | | | | | | |
| | | | 5 | NK | 20 | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 28 | | | | | | | | | | | | | | | | | |
| | | S7 | 1 | PR | 18 | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 16.5 | | | | | | | | | | | | | 11.9 | | | | |
| | | | | | 22 | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 20.5 | | | | | | | | | | | | | | 7 | | | |
| | | | | | 12 | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | 12 | | | | | | | | | | | | | | | | | |
| | | | | | 21 | | | | | | | | | | | | | | | | | |
| | | | 5 | NK | 16 | | | | | | | | | | | | | | | | | |
| | | | | | 25 | | | | | | | | | | | | | | | | | |
| | | | | | 19 | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 23.5 | | | | | | | | | | | | | | | | | |
| | | | | | 18 | | | | | | | | | | | | | | | | | |
| | | S8 | 1 | NK | 11.5 | | | | | | 30 | | | | | | | | | | | |
| | | | | | 14 | | | | | | 26 | | | | | | | | | | | |
| | | | 2 | NK | | | | | | | | | | | | | | | | 27.5 | | |
| | | | 3 | NK | 32 | | | | | | | | | | | | | | | | | |
| | | | 4 | PR | 20 | | | 23 | 6.5 | | | | | | | | | | | | | |
| | | | | | 13.5 | | | | | | | | | | | | | | | | | |
| | | | | | 22.5 | | | | | | | | | | | | | | | | | |
| | | | 5 | PR | 21 | | | | | | | | | | | | | | | | | |
| | | | | | 23.5 | | | | | | | | | | | | | | | | | |
| | | | | | 11.5 | | | | | | | | | | | | | | | | | |
| | | | | | 17 | | | | | | | | | | | | | | | | | |
| | | | | | 23 | | | | | | | | | | | | | | | | | |
| | | | | | 11 | | | | | | | | | | | | | | | | | |
| | | | | | 23 | | | | | | | | | | | | | | | | | |
| | | | | | 16 | | | | | | | | | | | | | | | | | |
| | | | | | 11 | | | | | | | | | | | | | | | | | |
| | | | 6 | PR | 16 | | | | 13 | | | | | | | | | | | | | |
| | | | | | 14 | | | | | | | | | | | | | | | | | |
| Arnavons | 3 | S9 | 1 | NK | 13.5 | | | | | 15 | | | | | | | | | | | | |
| | | | 3 | NK | 11 | | | | | | | | | | | | | | | | | |
| | | | | | 14 | | | | | | | | | | | | | | | | | |
| | | | 4 | PR | 25 | | | | | | | | | | | | | | | | | |
| | | | 5 | PR | 29.5 | | | | | | | | | | | | | | | | | |
| | | | 6 | PR | 5 | | | | | | | | | | | | | | | | | |
| | | | | | 26 | | | | | | | | | | | | | | | | | |
| | | S10 | 1 | NK | 30 | | | | | | | | | | | | | | | | | |
| | | | 2 | NK | 31.5 | | | | | | | | | | | | | | | | | |
| | | | 3 | NK | | | | | | | | | | | 29.5 | | | | | | | |
| | | | | | | | | | | | | | | | 30 | | | | | | | |
| | | | 4 | PR | 21 | | | | | | | | | | | | | | | | | |
| | | | | | 20 | | | | | | | | | | | | | | | | | |
| | | | | | 5.5 | | | | | | | | | | | | | | | | | |
| | | | | | 5 | | | | | | | | | | | | | | | | | |
| | | | | | 32 | | | | | | | | | | | | | | | | | |
| | | | 5 | PR | 13 | | | | | | | | | | | | | | | | | |

## Shallow, Survey 2, length data

| Group | Island | Site | Specimen | Obs | Species | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia argus* | *Holothuria atra* | *Actinopyga mauritiana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | *Holothuria nobilis* | *Actinopyga miliaris* | *Thelanota anax* |
| | | | | | 18 | | | | | | | | | | | | | | | | | |
| | | | | | 22 | | | | | | | | | | | | | | | | | |
| | | | 6 | PR | 17 | | | | | 13.5 | | | | | | | | | | | | |
| | | | | | 29 | | | | | | | | | | | | | | | | | |
| | | | | | 25.5 | | | | | | | | | | | | | | | | | |
| | | S11 | 2 | PR | 27.5 | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | 30 | | | | | | | | | | | | | | | | | |
| | | | | | 33 | | | | | | | | | | | | | | | | | |
| | | | 5 | NK | 23.5 | | | | | | | | | 36 | | | | | | | | |
| | | S12 | 1 | PR | 27 | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | | | | | | | 1 | | 23 | | | | | | | |
| | | | | | | | | | | | | | | | 23 | | | | | | 29 | |
| | | | 3 | PR | | | | | | | | | | | | | | 7.6 | | | | |
| | | | 4 | NK | 22 | | | | | | | | | | | | | | | | | |
| | | | | | 34 | | | | | | | | | | | | | | | | | |
| | | | 5 | NK | 32 | | | | | | | | | | | | | | | | | |
| | | | | | 29 | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | | | | | | | | 25 | | | | | | | | | | |
| | | S13 | 2 | PR | | | | | | | | | | | 24.5 | | | 12.1 | | | | |
| | | | 3 | PR | | | | | | | | | | | | | | | 7 | | | |
| | | | | PR | | | | | | | | | | | 30 | | | | | | | |
| | | | 4 | NK | 20 | | | | | | 40 | | | | 32 | | | | | | | |
| | | | 5 | NK | 11.5 | | | | | | | | | | | | | | | | | |
| | | | | | 27 | | | | | | | | | | | | | | | | | |
| | | | | | 20 | | | | | | | | | | | | | | | | | |
| | | | | | 25 | | | | | | | | | | | | | | | | | |
| | | | | | 26.5 | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 21 | | 51 | | | | 21 | | | | | | | | | | | |
| | | | | | 23 | | | | | | | | | | | | | | | | | |
| | | S14 | 1 | PR | 12 | | | | | | 31.5 | 31.5 | | | | | | | | | | |
| | | | | | 31 | | | | | | | 32 | | | | | | | | | | |
| | | | | | 20 | | | | | | | | | | | | | | | | | |
| | | | | | 21 | | | | | | | | | | | | | | | | | |
| | | | | | 23 | | | | | | | | | | | | | | | | | |
| | | | | | 28 | | | | | | | | | | | | | | | | | |
| | | | | | 18 | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 26 | | | | | | 18 | 21 | | | | | | 9.9 | | | | |
| | | | | | 23 | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 23 | | | | | | | | | | | | | 8.6 | | | | |
| | | | 4 | NK | 30.5 | 43 | | | | | | | | | | | | | | | | |
| | | | | | 14 | | | | | | | | | | | | | | | | | |
| | | | | | 7.5 | | | | | | | | | | | | | | | | | |
| | | | 5 | NK | 15.5 | | | | | | | | | | | | | | | | | |
| | | | | | 33 | | | | | | | | | | | | | | | | | |
| | | | | | 17 | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 24 | | | | | 31.5 | | | | | | | | | | | | |
| | | | | | 28 | | | | | | | | | | | | | | | | | |
| | | | | | 31 | | | | | | | | | | | | | | | | | |
| | | S15 | 2 | NK | | | | | | | 30 | | | | | | | 8 | | | | |
| | | | 3 | NK | 27 | | | | | | | | | | | | | | | | | |
| | | | | | 31 | | | | | | | | | | | | | | | | | |
| | | | | | 21 | | | | | | | | | | | | | | | | | |
| | | | 4 | PR | 32 | | | | | | | | | | | | | 8.4 | | | | |
| | | | 5 | PR | | | | | | | | | | | | | | 8.5 | | | | |
| | | | 6 | PR | 24 | | | | | | | | | | | | | | | | | |
| | | S16 | 1 | NK | | | | | | | | | | | 31 | | | | | | | |
| | | | 2 | NK | 33 | | | | | 16 | | | | | | | | | | | | |
| | | | 3 | NK | | | | | | | | | | | 30 | | | | | | | |
| | | | 6 | PR | 25.5 | | | | | 30 | | | | | | | | | | | | |
| | | | | | 21 | | | | | 39 | | | | | | | | | | | | |

## Shallow, Survey 2, length data

| Group | Island | Site | Specimen | Obs | Species | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia agrus* | *Holothuria atra* | *Actinopyga mauritaniana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | *Holothuria nobilis* | *Actinopyga miliaris* | *Thelanota anax* |
| Ysabel | 5 | S17 | 1 | NK | 22 | | | | | | | | | 27 | | | | 12 | | | | |
| | | | | | 17 | | | | | | | | | 23 | | | | | | | | |
| | | | 2 | NK | 10.5 | | | | | 24.5 | | 35 | | 24 | | 27 | | | | | | |
| | | | | | | | | | | | | | | 32 | | | | | | | | |
| | | | 3 | NK | 23.5 | | | 11.5 | | 39 | | | | 29 | | | | | 15 | | | |
| | | | | | | | | | | 38.5 | | | | 22 | | | | | | | | |
| | | | | | | | | | | 34 | | | | 25 | | | | | | | | |
| | | | | | | | | | | | | | | 24 | | | | | | | | |
| | | | 4 | PR | 27 | | | | 12 | 29 | 47 | | | 27 | | | | | | | | |
| | | | | | | | | | | | | | | 22 | | | | | | | | |
| | | | | | | | | | | | | | | 18 | | | | | | | | |
| | | | | | | | | | | | | | | 16 | | | | | | | | |
| | | | | | | | | | | | | | | 21 | | | | | | | | |
| | | | 5 | PR | | | | | 12 | | | | | 25 | | | | | | | | |
| | | | | | | | | | | | | | | 23 | | | | | | | | |
| | | | | | | | | | | | | | | 16 | | | | | | | | |
| | | | | | | | | | | | | | | 26 | | | | | | | | |
| | | | 6 | PR | | | 55 | | | | | | | 22 | | | | | | | | |
| | | S18 | 1 | NK | 15.5 | | 44 | | | | 18.5 | 31.5 | | | | | | | 15 | | | |
| | | | | | | | | | | | 36 | 26 | | | | | | | | | | |
| | | | | | | | | | | | | 30 | | | | | | | | | | |
| | | | 2 | NK | 26 | | | | | 44.5 | | | | | | | | | | | | |
| | | | 3 | NK | 29 | | | 50 | | | | | | 38 | | | | | | | | |
| | | | 4 | PR | 16.5 | | | | | 29 | | | | | | | | | | | | |
| | | | 5 | PR | 16 | | 53 | | | | | | | | | 27 | | | | | | 42 |
| | | | | | 10 | | | | | | | | | | | | | | | | | |
| | | | | | 8 | | | | | | | | | | | | | | | | | |
| | | | 6 | PR | 21 | | | | | | 33 | 23 | | | | | | | | | | |
| | | | | | 19 | | | | | | 28 | | | | | | | | | | | |
| | | S19 | 1 | PR | | | 28 | | | | | | | | | | | | | | | |
| | | | 2 | PR | 33.5 | | | | | | | | | | | | | | | | | |
| | | | | | 27 | | | | | | | | | | | | | | | | | |
| | | | | | 21 | | | | | | | | | | | | | | | | | |
| | | | | | 9.5 | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 23 | | | | 7 | | | | | | | | | | | | | |
| | | | 4 | NK | 29 | | | 31 | | | | | | | | | | | | | | |
| | | | | | 23 | | | | | | | | | | | | | | | | | |
| | | | 5 | NK | 22 | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 33 | | | | | | 28 | | | | | | | | | | | |
| | | S20 | 1 | PR | | 59 | | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | | | 15 | | | | | | | | | | | | | |
| | | | 3 | PR | 22 | | | | | 28 | 15 | | | | | | | 9 | | | | |
| | | | | | 20 | | | | | | 25 | | | | | | | 11.6 | | | | |
| | | | | | | | | | | | 24.5 | | | | | | | 10.4 | | | | |
| | | | 4 | NK | 25 | | | | | | | | | 29 | | | | | | | | |
| | | | 5 | NK | | | 53 | | | | | | | | | | | 10 | | | | |
| | | | 6 | NK | | | | | | | 33.5 | | | | | | | | | | | |
| | | S21 | 1 | PR | 27.5 | | | | | | | 26 | | | | | | | | | | |
| | | | | | 18 | | | | | | | 30 | | | | | | | | | | |
| | | | 2 | PR | 25 | 67 | | | 6 | | | | | | | | | 12.5 | | | | |
| | | | | | 23 | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 14 | | | | 10 | 34 | | 39 | | | | | | | | | | |
| | | | | | 21 | | | | 11 | | | | | | | | | | | | | |
| | | | 4 | NK | 19.5 | | | | 15 | | | | | | 30 | | | | | 33 | | |
| | | | 5 | NK | 19.5 | | 53 | | 13 | | | | | | 30 | | | | | | | |
| | | | | | 10 | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 15 | | | | 5 | | | | | | | | | 13 | | | | |
| | | | | | | | | | 10 | | | | | | | | | | | | | |
| | | S22 | 1 | NK | | | 53 | | | | | | | | | | | | 15 | | | |
| | | | 2 | NK | 10.5 | | | | | | 32 | | | | | | | | | | | |

## Shallow, Survey 2, length data

| Group | Island | Site | Specimen | Obs | Species | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia agrus* | *Holothuria atra* | *Actinopyga mauritaniana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | *Holothuria nobilis* | *Actinopyga miliaris* | *Thelanota anax* |
| | | | 3 | NK | 18 | | 51 | | | | | | | | | | | | | | | |
| | | | | | 17 | | | | | | | | | | | | | | | | | |
| | | | 4 | PR | 24 | | | | | 22 | | | | | | | | | | | | |
| | | | | | 30 | | | | | | | | | | | | | | | | | |
| | | | | | 23 | | | | | | | | | | | | | | | | | |
| | | | 5 | PR | | | | | 12 | | | | | | | | | | | | | |
| | | | 6 | PR | 22 | | | | | | | | | | | | | | | | | |
| | | | | | 26 | | | | | | | | | | | | | | | | | |
| | | | | | 19 | | | | | | | | | | | | | | | | | |
| | | S23 | 1 | NK | 28.5 | | | | | | | | | | | | | | | | | |
| | | | | | 10 | | | | | | | | | | | | | | | | | |
| | | | | | 23 | | | | | | | | | | | | | | | | | |
| | | | | | 27.5 | | | | | | | | | | | | | | | | | |
| | | | 2 | NK | 32 | | | | | | | | | | | | | 9 | | | | |
| | | | 3 | NK | 16 | | | | 14 | | | | | | | | | | | | | |
| | | | | | 23 | | | | | | | | | | | | | | | | | |
| | | | 4 | PR | 18 | | | | 13 | 30 | | | | | | | | | | | | |
| | | | | | 26 | | | | | | | | | | | | | | | | | |
| | | | | | 25 | | | | | | | | | | | | | | | | | |
| | | | 5 | PR | 25 | | | | 12 | | | | | | | | | | | | | |
| | | | | | 19 | | | | | | | | | | | | | | | | | |
| | | | | | 22.5 | | | | | | | | | | | | | | | | | |
| | | | | | 22 | | | | | | | | | | | | | | | | | |
| | | | 6 | PR | | | | | 8 | | | | | | | | | | | | | |
| | | S24 | 1 | NK | 26 | | 62 | | | | | | | | | | | | | | | |
| | | | | | | | 50 | | | | | | | | | | | | | | | |
| | | | 2 | NK | 27 | | | | 14 | | | | | | | | | | | | | |
| | | | | | | | | | 12 | | | | | | | | | | | | | |
| | | | 3 | NK | | | | | | | 33 | | | | | | | | | | | |
| | | | 4 | PR | 22 | | | | | | | | | | | | | | | 32 | | |
| | | | 5 | PR | 23 | | | | | | | | | | | | | 11.7 | | | | |
| | | | 6 | PR | | | 45 | | | | | | | | | | | 9.9 | | | | |
| | | | | | | | | | | | | | | | | | | 8.7 | | | | |
| Suavanao | 7 | S25 | 1 | PR | 17 | | | | | | | | | | | | | | | | | |
| | | | | | 11 | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 24 | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | 20 | | | | | | | | | | | | | | | | | |
| | | S26 | 2 | PR | 29 | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 19 | | | | | | | | | | | | | | | | | |
| | | | | | 30 | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 28.5 | | | | | | | | | | | | | | | | | |
| | | S27 | 1 | PR | 26 | | | | | | | | | | | | | 11.2 | | | | |
| | | | | | 18 | | | | | | | | | | | | | 9.9 | | | | |
| | | | | | 17.5 | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 17 | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 21.5 | | | | | | | | | | 25 | | | | | | | |
| | | | 4 | NK | 27 | | | | | | | | | | | | | | | | | |
| | | | 5 | NK | | | | 30 | | | | | | | | | | 11.5 | | | | |
| | | | | | | | | | | | | | | | | | | 13 | | | | |
| | | | | | | | | | | | | | | | | | | 12 | | | | |
| | | | 6 | NK | 21 | | | | | | | | | | | | | | | | | |
| | | S28 | 1 | PR | 25 | | | | | | | | | | | | | | | | | |
| | | | | | 19 | | | | | | | | | | | | | 12.6 | | | | |
| | | | 2 | PR | 14 | | | | | | | | | | | | | | | | | |
| | | | | | 19 | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 22 | | | | | | | | | | | | | 10 | | | | |
| | | | 4 | NK | 25 | | | | | | | | | | | | | | | | | |
| | | | 5 | NK | 27.5 | | | | | | | | | | | | | 11.5 | | | | |
| | | | | | 21.5 | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 25.5 | | | | | | | | | | | | | 10 | | | | |

## Shallow, Survey 2, length data

| Group | Island | Site | Specimen | Obs | Species | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia agrus* | *Holothuria atra* | *Actinopyga mauritiana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | *Holothuria nobilis* | *Actinopyga miliaris* | *Thelanota anax* |
| | | | | | | | | | | | | | | | | | | 12 | | | | |
| | | S29 | 1 | PR | 16 | | | | | | | | | | | | | | | | | |
| | | | | | 16 | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 24 | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 16 | | | | | | | | | | | | | 11.6 | | | | |
| | | | 4 | NK | 11 | | | | | | | 24 | | | | | | | | | | |
| | | | 5 | NK | | | | | 11.5 | | | | | | 31 | | | 11 | | | | |
| | | | | | | | | | | | | | | | | | | 11.5 | | | | |
| | | | 6 | NK | 22.5 | | | | | | | 20.5 | | | | | | | | | | |
| | | | | | 18 | | | | | | | | | | | | | | | | | |
| | | S30 | 1 | PR | 25 | | | | | | | | | | | | | 11.5 | | | | |
| | | | | | 24 | | | | | | | | | | | | | 11.3 | | | | |
| | | | | | | | | | | | | | | | | | | 9 | | | | |
| | | | 2 | PR | 20 | | | | | | | | | | | | | 8.1 | | | | |
| | | | 3 | PR | | | | | | | | | | | | | | 9.2 | | | | |
| | | | | | | | | | | | | | | | | | | 7.8 | | | | |
| | | | | | | | | | | | | | | | | | | 9.6 | | | | |
| | | | | | | | | | | | | | | | | | | 10.1 | | | | |
| | | | 4 | NK | 9.5 | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | | | | | | | | | | | | | | 9 | | | | |
| | | | | | | | | | | | | | | | | | | 11.5 | | | | |
| | | | | | | | | | | | | | | | | | | 9 | | | | |
| | | S31 | 1 | PR | 10.5 | | | | | | | | | | | | | | | | | |
| | | | | | 26.5 | | | | | | | | | | | | | | | | | |
| | | | | | 9.5 | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | 18 | | | | | | | | | | | | | | | | | |
| | | | | | 18.5 | | | | | | | | | | | | | | | | | |
| | | | | | 31 | | | | | | | | | | | | | | | | | |
| | | | 5 | NK | 30.5 | | | 10.5 | | | | | | | | | | | | | | |
| | | | | | 12 | | | | | | | | | | | | | | | | | |
| | | | | | 22.5 | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 15.5 | | | | | | | | | | | | | | | | | |
| | | | | | 17.5 | | | | | | | | | | | | | | | | | |
| | | | | | 11.5 | | | | | | | | | | | | | | | | | |
| | | S32 | 1 | PR | 15 | | | | 8 | | | | | | | | | | | | | |
| | | | | | 14 | | | | 7 | | | | | | | | | | | | | |
| | | | | | 13 | | | | 5 | | | | | | | | | | | | | |
| | | | | | 14 | | | | 5 | | | | | | | | | | | | | |
| | | | | | 12 | | | | 12 | | | | | | | | | | | | | |
| | | | | | 13 | | | | 8 | | | | | | | | | | | | | |
| | | | | | | | | | 2 | | | | | | | | | | | | | |
| | | | | | | | | | 3 | | | | | | | | | | | | | |
| | | | | | | | | | 4 | | | | | | | | | | | | | |
| | | | | | | | | | 7 | | | | | | | | | | | | | |
| | | | | | | | | | 7.5 | | | | | | | | | | | | | |
| | | | | | | | | | 7 | | | | | | | | | | | | | |
| | | | | | | | | | 6 | | | | | | | | | | | | | |
| | | | | | | | | | 9 | | | | | | | | | | | | | |
| | | | | | | | | | 8 | | | | | | | | | | | | | |
| | | | | | | | | | 9 | | | | | | | | | | | | | |
| | | | | | | | | | 6 | | | | | | | | | | | | | |
| | | | | | | | | | 8.5 | | | | | | | | | | | | | |
| | | | | | | | | | 8 | | | | | | | | | | | | | |
| | | | | | | | | | 6.5 | | | | | | | | | | | | | |
| | | | | | | | | | 6 | | | | | | | | | | | | | |
| | | | | | | | | | 6 | | | | | | | | | | | | | |
| | | | | | | | | | 6 | | | | | | | | | | | | | |
| | | | | | | | | | 3 | | | | | | | | | | | | | |
| | | | | | | | | | 2 | | | | | | | | | | | | | |
| | | | | | | | | | 12 | | | | | | | | | | | | | |

## Shallow, Survey 2, length data

| Group | Island | Site | Specimen | Obs | Species | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia agrus* | *Holothuria atra* | *Actinopyga mauritiana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | *Holothuria nobilis* | *Actinopyga miliaris* | *Thelanota anax* |
| | | | | | | | | | 12 | | | | | | | | | | | | | |
| | | | | | | | | | 7 | | | | | | | | | | | | | |
| | | | | | | | | | 12 | | | | | | | | | | | | | |
| | | | | | | | | | 13 | | | | | | | | | | | | | |
| | | | | | | | | | 6.5 | | | | | | | | | | | | | |
| | | | | | | | | | 8.5 | | | | | | | | | | | | | |
| | | | 2 | PR | 16 | | | | 6 | | | | | | | | | 9.1 | | | | |
| | | | | | 14 | | | | 5 | | | | | | | | | | | | | |
| | | | | | | | | | 6.5 | | | | | | | | | | | | | |
| | | | | | | | | | 14 | | | | | | | | | | | | | |
| | | | | | | | | | 3.5 | | | | | | | | | | | | | |
| | | | | | | | | | 2 | | | | | | | | | | | | | |
| | | | | | | | | | 6 | | | | | | | | | | | | | |
| | | | | | | | | | 2 | | | | | | | | | | | | | |
| | | | | | | | | | 11 | | | | | | | | | | | | | |
| | | | 3 | PR | 24 | | | 32 | 13 | | | | | | | | | 9.2 | | | | |
| | | | | | 12 | | | | 10 | | | | | | | | | | | | | |
| | | | | | 12 | | | | 14 | | | | | | | | | | | | | |
| | | | | | 2.5 | | | | 13 | | | | | | | | | | | | | |
| | | | | | 12 | | | | 12 | | | | | | | | | | | | | |
| | | | | | 20 | | | | 7.5 | | | | | | | | | | | | | |
| | | | | | | | | | 5 | | | | | | | | | | | | | |
| | | | | | | | | | 14 | | | | | | | | | | | | | |
| | | | | | | | | | 12 | | | | | | | | | | | | | |
| | | | | | | | | | 7 | | | | | | | | | | | | | |
| | | | 4 | NK | | | | | 4 | | | | | | | | | | 12.5 | | | |
| | | | | | | | | | 4.5 | | | | | | | | | | | | | |
| | | | | | | | | | 5.5 | | | | | | | | | | | | | |
| | | | | | | | | | 6.5 | | | | | | | | | | | | | |
| | | | | | | | | | 5 | | | | | | | | | | | | | |
| | | | | | | | | | 10 | | | | | | | | | | | | | |
| | | | | | | | | | 6.5 | | | | | | | | | | | | | |
| | | | | | | | | | 11.5 | | | | | | | | | | | | | |
| | | | | | | | | | 8.5 | | | | | | | | | | | | | |
| | | | | | | | | | 10.5 | | | | | | | | | | | | | |
| | | | | | | | | | 2.5 | | | | | | | | | | | | | |
| | | | | | | | | | 4 | | | | | | | | | | | | | |
| | | | | | | | | | 4.5 | | | | | | | | | | | | | |
| | | | 5 | NK | 13.5 | | | | 9 | 54 | | | | | | | | | | | | |
| | | | | | 17 | | | | 9.5 | | | | | | | | | | | | | |
| | | | | | | | | | 10.5 | | | | | | | | | | | | | |
| | | | | | | | | | 8 | | | | | | | | | | | | | |
| | | | | | | | | | 11.5 | | | | | | | | | | | | | |
| | | | | | | | | | 11 | | | | | | | | | | | | | |
| | | | | | | | | | 3.5 | | | | | | | | | | | | | |
| | | | | | | | | | 7 | | | | | | | | | | | | | |
| | | | | | | | | | 10 | | | | | | | | | | | | | |
| | | | | | | | | | 9 | | | | | | | | | | | | | |
| | | | 6 | NK | | | | | 5 | 37 | | | | | | | | | | | | |
| | | | | | | | | | 5.5 | | | | | | | | | | | | | |
| | | | | | | | | | 3 | | | | | | | | | | | | | |
| | | | | | | | | | 12 | | | | | | | | | | | | | |
| | | | | | | | | | 6.5 | | | | | | | | | | | | | |
| | | | | | | | | | 7.5 | | | | | | | | | | | | | |
| | | | | | | | | | 8.5 | | | | | | | | | | | | | |
| | | | | | | | | | 10.5 | | | | | | | | | | | | | |
| | | | | | | | | | 34 | | | | | | | | | | | | | |

## Appendix 2g. Raw data for deep habitat, Survey 2, April/May, 1995.

**Rep = replicate number, Obs = initials of observer, * indicates uncertain identification**

| Group | Island | Site | Rep | Obs | Species | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* | |
| Waghena | 1 | D1 | 1 | PR | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | | | | | | | | | | 1 | | | 1 |
| | | | 3 | PR | | | | | | | | | | | | | | | |
| | | | 4 | NK | | | | | | | | | | | | | | | |
| | | | 5 | NK | | 1 | | | | | | | | | | | | | 1 |
| | | | 6 | NK | | | | | | | | | | | | | | | |
| | | D2 | 1 | PR | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | 1 | | | | | | | | | | | | 1 |
| | | | 3 | PR | | 1 | | | | | | | | | | | | | 1 |
| | | | 4 | NK | | 1 | | | | | | | | | | | | | 1 |
| | | | 5 | NK | | 3 | | | | | | | | | | | | | 3 |
| | | | 6 | NK | | 2 | | | | | | | | | | | | | 2 |
| | | D3 | 1 | PR | | 1 | | | | | | | | | | | | | |
| | | | 2 | PR | | 1 | | | | | | | | | | | | | |
| | | | 3 | PR | | 4 | | | | | | | | | | | | | |
| | | | 4 | NK | | 1 | | | | | | | | | | | | | |
| | | | 5 | NK | | 1 | | | | | | | | | | | | | |
| | | | 6 | NK | | 3 | | | | | | | | | | | | | |
| | | D4 | 1 | PR | | 1 | | | | | | | | 1 | | | | | 2 |
| | | | 2 | PR | | 1 | 1 | | | | | | 1 | | | | | | 3 |
| | | | 3 | PR | | 1 | | | | | | | | | | | | | 1 |
| | | | 4 | NK | | 2 | | | | | | | | 1 | | | | | 3 |
| | | | 5 | NK | | | | | | | | | | | | | | | |
| | | | 6 | NK | | 5 | | | | | | | | | | | | | 5 |
| | 2 | D5 | 1 | PR | | | | | | | | | 1 | 1 | | 1 | | | 3 |
| | | | 2 | PR | | | | | | | | | 1 | 1 | | | | | 2 |
| | | | 3 | PR | | | | | | | | | 1 | | | 3 | | | 4 |
| | | | 4 | NK | | | | | | | | | | | | | | | |
| | | | 5 | NK | | | | | | | | | | 1 | | | | | 1 |
| | | | 6 | NK | | | | | | | | | 2 | 2 | | 1 | | | 5 |
| | | D6 | 1 | PR | | 1 | | | 1 | | | | | 1 | | 1 | | | 4 |
| | | | 2 | PR | | | | | | | | | 1 | 1 | | | | | 2 |
| | | | 3 | PR | | | | | | | | | | 1 | | | | | 1 |
| | | | 4 | NK | 1 | | | | | | | | 1 | | | | | | 2 |
| | | | 5 | NK | | | | | | | | | | | | 2 | | | 2 |
| | | | 6 | NK | | | | | | | | | | 2 | | | | | 2 |
| | | D7 | 1 | NK | | | | | | | | | | | | | | | |
| | | | 2 | NK | | | | | | | | | | | | | | | |
| | | | 3 | NK | | | | | | | | | | | | | | | |
| | | | 4 | PR | | | | | | | | | | | | | | | |
| | | | 5 | PR | | | | | | | | | | | | 1 | | | 1 |
| | | | 6 | PR | | 1 | | | | | | | 2 | | | | | | 3 |
| | | D8 | 1 | PR | | | | | | | | | 2 | | | | | | 2 |
| | | | 2 | PR | | | | | | | | | 1 | | | | | | 1 |
| | | | 3 | PR | | | | | | | | | 5 | 1 | | | | | 6 |
| | | | 4 | NK | | | | | | | | | 1 | | | | | | 1 |
| | | | 5 | NK | | | | | | | | | | | | | | | |
| | | | 6 | NK | | | | | | | | | | | | | | | |
| Amavons | 3 | D9 | 1 | PR | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | | | | | | | 3 | | | | | | 3 |
| | | | 3 | PR | | | 1 | | | | | | 2 | | | 2 | | | 5 |

## Deep, survey 2, abundance

| Group | Island | Site | Rep | Obs | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 4 | NK | | | | | | | | | | | | | | | |
| | | | 5 | NK | | | | | | | | | | | | | | | |
| | | | 6 | NK | | | | | | | | | | 1 | | 1 | | | 2 |
| | | D10 | 1 | PR | | | 1 | | | | | | 3 | | | 1 | 1 | | 6 |
| | | | 2 | PR | | | | | 1 | | | | 11 | | | 1 | | | 13 |
| | | | 3 | PR | | | | | 1 | 1 | | | 2 | | | | | | 4 |
| | | | 4 | NK | 1 | | | | | | 1 | | 3 | | | | | | 5 |
| | | | 5 | NK | 1 | | | | | | | | 1 | | | | | | 2 |
| | | | 6 | NK | | | | | | | | | 1 | | | | | | 1 |
| | | D11 | 1 | NK | 1 | | | | | 1 | | | | | | | | | 2 |
| | | | 2 | NK | | | | | | | | | 1 | | | | | | 1 |
| | | | 3 | NK | | | | | | | | | | | | 1 | | | 1 |
| | | | 4 | PR | | | | | | | | | | | | | | | |
| | | | 5 | PR | | | | | | 1 | | | | | | | | | 1 |
| | | | 6 | PR | | | | | | | | | | | | | | | |
| | | D12 | 1 | PR | | | | | | | | | 3 | | | | | | 3 |
| | | | 2 | PR | | | | | | | | | 1 | | | | | | 1 |
| | | | 3 | PR | | | | | | | | | | 1 | | 1 | | | 2 |
| | | | 4 | NK | | | | | | | | | | | | | | | |
| | | | 5 | NK | | | | | | | | | | 1 | | | | | 1 |
| | | | 6 | NK | | | | | | | | | | | | | | | |
| | 4 | D13 | 1 | PR | | | | | | | | | 2 | | | | | | 2 |
| | | | 2 | PR | | | | | | | | | | | | 1 | | | 1 |
| | | | 3 | PR | | 1 | | | | | | | | | | | | | 1 |
| | | | 4 | NK | | | | | | | | | | | | 1 | | | 1 |
| | | | 5 | NK | | | | | | | | | | 3 | | | | | 3 |
| | | | 6 | NK | | | | | | | | | | 2 | | | | | 2 |
| | | D14 | 1 | NK | | 1 | | | | | | | | 2 | | | | | 3 |
| | | | 2 | NK | | | | | | | | | | 1 | | 1 | | | 2 |
| | | | 3 | NK | 1 | 2 | | | | | | | | | | | | | 3 |
| | | | 4 | PR | | | | | | | | | | 2 | | | | | 2 |
| | | | 5 | PR | | 1 | | | | | | | | | | | | | 1 |
| | | | 6 | PR | | | | | | | | | 1 | | | | | | 1 |
| | | D15 | 1 | PR | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | | | | | | | | | | | | | |
| | | | 3 | PR | | | | | | | | | | | | | 1 | | 1 |
| | | | 4 | NK | | | | | | | | | | | | | | | |
| | | | 5 | NK | | | | | | | | | | 2 | | | | | 2 |
| | | | 6 | NK | | | | | | | | | | | | | | | |
| | | D16 | 1 | PR | | | | | | | | | | | | | | | |
| | | | 2 | PR | 1 | | | | | | | | 3 | | | 1 | | | 5 |
| | | | 3 | PR | | | | | | | | | | | | | | | |
| | | | 4 | NK | | | | | | | | | | 1 | | | | | 1 |
| | | | 5 | NK | | | | | | | | | 1 | | | | | | 1 |
| | | | 6 | NK | | | | | | 1 | | | 2 | | | | | | 3 |
| Ysabel | 5 | D17 | 1 | NK | | 1 | | | | | | | | | | | | | 1 |
| | | | 2 | NK | 1 | | | | | | | | | | | | | | 1 |
| | | | 3 | NK | | | | | | | | | 2 | | | | | | 2 |
| | | | 4 | PR | 2 | | | | | | | | | | | | | | 2 |
| | | | 5 | PR | | | | | | | | | | | | | | | |
| | | | 6 | PR | 1 | | | | | | | | | | | | | | 1 |
| | | D18 | 1 | NK | | | | | | | | | | 1 | | | | | 1 |
| | | | 2 | NK | 1 | | | | | | | | | 4 | | | | | 5 |
| | | | 3 | NK | | | | | | | | | | | | | | | |

## Deep, survey 2, abundance

| Group | Island | Site | Rep | Obs | *Stichopus variegatus* | *Thelenota anax* | *Thelenota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 4 | PR | | | | | | | | | | 3 | | | | | 3 |
| | | | 5 | PR | | | | | | | | | | | | | | | |
| | | | 6 | PR | | | | | | | | | | | | | | | |
| | | D19 | 1 | PR | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | | | | | | | | 1 | | | | | 1 |
| | | | 3 | PR | | | | | | 1 | | | | | | | | | 1 |
| | | | 4 | NK | 1 | | | | | | | | | | | | | | 1 |
| | | | 5 | NK | | | | | | | | | | | | | | | |
| | | | 6 | NK | | | | | | | | | | | | | | | |
| | | D20 | 1 | PR | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | | | | | | | | 1 | | | | | 1 |
| | | | 3 | PR | | | | | | | | | | | | | | | |
| | | | 4 | NK | | | | | | | | | | 1 | | | | | 1 |
| | | | 5 | NK | | | | | | | | | | 1 | | | | | 1 |
| | | | 6 | NK | | | | | | | | | | 1 | | | | | 1 |
| | 6 | D21 | 1 | NK | | | | | | | | | | | | | | | |
| | | | 2 | NK | | | | | | | | | | 1 | | 1 | | | 2 |
| | | | 3 | NK | | | | | | | 1 | | | | | | | | 1 |
| | | | 4 | PR | | | | | | | | | | | | | | | |
| | | | 5 | PR | | | | | | | | | | | | | | | |
| | | | 6 | PR | | | | | | | | | | | | | | | |
| | | D22 | 1 | PR | | | | | | | | | | | | 1 | | | 1 |
| | | | 2 | PR | | | | | | | | | | | | 1 | | | 1 |
| | | | 3 | PR | | | 1 | | | | | | | | | 2 | | | 3 |
| | | | 4 | NK | | | | | | 1 | | | | | | 1 | | | 2 |
| | | | 5 | NK | | | | | | | | | 1 | 1 | | | | | 2 |
| | | | 6 | NK | | | | | | | | | 1 | | | 4 | | | 5 |
| | | D23 | 1 | PR | | | | | | | | | | | | | | | |
| | | | 2 | PR | | 1 | | | | | | | | | | | | | 1 |
| | | | 3 | PR | | | | | | | | | | | | | | | |
| | | | 4 | NK | | | | | | | | | | | | | | | |
| | | | 5 | NK | | | | | | | | | | | | | | | |
| | | | 6 | NK | | 1 | | | | | | | | | | | | | 1 |
| | | D24 | 1 | PR | 3 | | | | | | | | 2 | | | | | | 5 |
| | | | 2 | PR | | | 1 | | | | | | | | | | | | 1 |
| | | | 3 | PR | | | | | | | | | | | | | | | |
| | | | 4 | NK | | 1 | | | 1 | | | | 1 | | | | | | 3 |
| | | | 5 | NK | | | | | 1 | | | | | | 1 | | | | 2 |
| | | | 6 | NK | 1 | | | | | | | | 2 | 1 | | | | | 4 |
| Suavanao | 7 | D25 | 1 | PR | | | | | | | | | | | | 1 | | | 1 |
| | | | 2 | PR | | | | | | 1 | | | | | | | 1 | | 2 |
| | | | 3 | PR | | 1 | | | | | | | | | | | | | 1 |
| | | | 4 | NK | | | | | | 1 | | | | | | | 1 | | 2 |
| | | | 5 | NK | | | | | | | | | | | | | 1 | | 1 |
| | | | 6 | NK | | | | | | | | | | | | | | | |
| | | D26 | 1 | PR | | | | | | | | | | | | 2 | | | 2 |
| | | | 2 | PR | | | | | | | | | 2 | | | | | | 2 |
| | | | 3 | PR | | 1 | | | | | | | 1 | 1 | | 1 | | | 4 |
| | | | 4 | NK | | | | | | | | | | | | | | | |
| | | | 5 | NK | | 1 | | | | | | | | | | 3 | 1 | | 5 |
| | | | 6 | NK | | | | | | | | | | | | | | | |
| | | D27 | 1 | PR | | | | | | | | | | | | | | | |
| | | | 2 | PR | | 3 | | | | | | | | 4 | | | 1 | | 8 |
| | | | 3 | PR | | 2 | | | | | | | | 2 | | | | | 4 |

## Deep, survey 2, abundance

| Group | Island | Site | Rep | Obs | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 4 | NK | | | | | | | | | | | | | 1 | | 1 |
| | | | 5 | NK | | | | | | | | | | | | | | | |
| | | | 6 | NK | | | | | | | | | | | | | 2 | | 2 |
| | | D28 | 1 | PR | | | | | | | | | | | | | 2 | | 2 |
| | | | 2 | PR | | | | | | | | | | | | | 1 | | 1 |
| | | | 3 | PR | | | | | | | | | | | | | 1 | | 1 |
| | | | 4 | NK | | | | | | 1 | | | | | | | 1 | | 2 |
| | | | 5 | NK | | | | | | | | | | | | | 1 | | 1 |
| | | | 6 | NK | | | | | | | | | | | | | | | |
| | 8 | D29 | 1 | PR | | 2 | | | | | | | | | | | | | 2 |
| | | | 2 | PR | | | | | | | | | | | | | | | |
| | | | 3 | PR | | 1 | | | | 1 | | | | | | | | | 2 |
| | | | 4 | NK | | 3 | | | | | | | | | | 1 | | | 4 |
| | | | 5 | NK | 1 | | | | | | | | | | | | | | 1 |
| | | | 6 | NK | | | | | | | | | | | | | 1 | | 1 |
| | | D30 | 1 | PR | | | | | | | | | | | | | | | |
| | | | 2 | PR | | 1 | | | | | | | | | | | | | 1 |
| | | | 3 | PR | 1 | | | | | | | | | | | | | | 1 |
| | | | 4 | NK | | | | | | | | | | | | | 1 | | 1 |
| | | | 5 | NK | | 1 | | | | | | | | | | | | | 1 |
| | | | 6 | NK | | 2 | | | | | | | | | | | | | 2 |
| | | D31 | 1 | PR | | 1 | | | | | | | | | | 1 | | | 2 |
| | | | 2 | PR | | | | | | | | | | | | 1 | 1 | | 2 |
| | | | 3 | PR | | | | | | | | | | | | 1 | 1 | | 2 |
| | | | 4 | NK | | | | | | | | | | | | | | | |
| | | | 5 | NK | | | | | | | | | 1 | | | | | | 1 |
| | | | 6 | NK | | | | | | | | | | | | | | | |
| | | D32 | 1 | NK | | | | | | | | | | | | | | | |
| | | | 2 | NK | | | | | | | | | | | | | | | |
| | | | 3 | NK | | 1 | | | | | | | | | | | | | 1 |
| | | | 4 | PR | | 2 | | | | | | | | | | | | | 2 |
| | | | 5 | PR | | 1 | | | | | | | | | | | | | 1 |
| | | | 6 | PR | | 2 | | | | | | | | | | | | | 2 |
| Total | | | | | 18 | 65 | 6 | | 5 | 10 | 2 | | 72 | 52 | 1 | 42 | 20 | | 282 |

## Appendix 2h. Length-frequency data for deep habitat, Survey 2, April/May 1995

Specimen = replicate, * indicates uncertain identification.

| Group | Island | Site | Specimen | Obs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* |
| Waghena | 1 | D1 | 2 | PR | | | | | | | | | | | | 54.0 | | |
| | | | 5 | NK | | 65.5 | | | | | | | | | | | | |
| | | D2 | 2 | PR | | | 63.0 | | | | | | | | | | | |
| | | | 3 | PR | | 54.0 | | | | | | | | | | | | |
| | | | 4 | NK | | 58.0 | | | | | | | | | | | | |
| | | | 5 | NK | | 69.5 | | | | | | | | | | | | |
| | | | | | | 62.5 | | | | | | | | | | | | |
| | | | | | | 66.5 | | | | | | | | | | | | |
| | | | 6 | NK | | 63.0 | | | | | | | | | | | | |
| | | | | | | 71.0 | | | | | | | | | | | | |
| | | D3 | 1 | PR | | 51.0 | | | | | | | | | | | | |
| | | | 2 | PR | | 63.5 | | | | | | | | | | | | |
| | | | 3 | PR | | 67.0 | | | | | | | | | | | | |
| | | | | | | 60.5 | | | | | | | | | | | | |
| | | | | | | 61.0 | | | | | | | | | | | | |
| | | | | | | 68.9 | | | | | | | | | | | | |
| | | | 4 | NK | | 47.0 | | | | | | | | | | | | |
| | | | | | | 54.0 | | | | | | | | | | | | |
| | | | 5 | NK | | 60.0 | | | | | | | | | | | | |
| | | | | | | 42.0 | | | | | | | | | | | | |
| | | | 6 | NK | | 56.0 | | | | | | | | | | | | |
| | | | | | | 64.0 | | | | | | | | | | | | |
| | | | | | | 60.0 | | | | | | | | | | | | |
| | | | | | | 56.0 | | | | | | | | | | | | |
| | | | | | | 63.5 | | | | | | | | | | | | |
| | | | | | | 43.0 | | | | | | | | | | | | |
| | | | | | | 55.0 | | | | | | | | | | | | |
| | | D4 | 1 | PR | | 59.5 | | | | | | | | 35.0 | | | | |
| | | | 2 | PR | | 55.0 | 72.0 | | | | | | 45.5 | | | | | |
| | | | 3 | PR | | 54.0 | | | | | | | | | | | | |
| | | | | | | 51.0 | | | | | | | | | | | | |
| | | | 4 | NK | | 50.0 | | | | | | | | 40.5 | | | | |
| | | | | | | 61.5 | | | | | | | | 37.0 | | | | |
| | | | | | | 45.0 | | | | | | | | | | | | |
| | | | | | | 51.0 | | | | | | | | | | | | |
| | | | 5 | NK | | 52.0 | | | | | | | | | | | | |
| | | | 6 | NK | | 51.5 | | | | | | | | 41.0 | | | | |
| | | | | | | 49.0 | | | | | | | | | | | | |
| | | | | | | 60.0 | | | | | | | | | | | | |
| | | | | | | 45.0 | | | | | | | | | | | | |
| | | | | | | 56.5 | | | | | | | | | | | | |
| | | | | | | 53.0 | | | | | | | | | | | | |
| | | | | | | 57.0 | | | | | | | | | | | | |
| | | D5 | 1 | PR | | | | | | | | | 46.0 | 37.0 | | 44.0 | | |
| | | | | | | | | | | | | | | 36.0 | | | | |
| | | | 2 | PR | | | | | | | | | 50.0 | 38.0 | | | | |
| | | | 3 | PR | | | | | | | | | 41.0 | | | 46.5 | | |

## Deep, Survey 2, length data

| Group | Island | Site | Specimen | Obs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* |
| | | | | | | | | | | | | | | | | 45.5 | | |
| | | | | | | | | | | | | | | | | 47.0 | | |
| | | | 5 | NK | | | | | | | | | | 28.5 | | | | |
| | | | 6 | NK | | | | | | | | | 38.5 | 36.0 | | 40.0 | | |
| | | | | | | | | | | | | | 44.0 | 20.0 | | 45.5 | | |
| | | D6 | 1 | PR | | 60.0 | | | 33.5 | | | | | 36.0 | | 46.0 | | |
| | | | 2 | PR | | | | | | | | | 44.0 | 34.0 | | | | |
| | | | 3 | PR | | | | | | | | | | 36.5 | | | | |
| | | | 4 | NK | 54.0 | | | | | | | | 51.0 | | | | | |
| | | | 5 | NK | | | | | | | | | | | | 42.0 | | |
| | | | | | | | | | | | | | | | | 48.0 | | |
| | | | 6 | NK | | | | | | | | | | 36.0 | | | | |
| | | | | | | | | | | | | | | 34.0 | | | | |
| | | D7 | 5 | PR | | | | | | | | | | | | 41.5 | | |
| | | | 6 | PR | | 60.0 | | | | | | | 51.0 | | | | | |
| | | | | | | | | | | | | | 52.0 | | | | | |
| | | D8 | 1 | PR | | | | | | | | | 50.0 | | | | | |
| | | | | | | | | | | | | | 58.0 | | | | | |
| | | | 2 | PR | | | | | | | | | 52.0 | | | | | |
| | | | 3 | PR | | | | | | | | | 49.0 | 43.0 | | | | |
| | | | | | | | | | | | | | 48.0 | | | | | |
| | | | | | | | | | | | | | 51.0 | | | | | |
| | | | | | | | | | | | | | 51.0 | | | | | |
| | | | | | | | | | | | | | 48.0 | | | | | |
| | | | | | | | | | | | | | 47.0 | | | | | |
| | | | 4 | NK | | | | | | | | | 45.5 | | | | | |
| Arnavons | | D9 | 2 | PR | | | 59.0 | | | | | | 51.5 | | | | | |
| | | | | | | | | | | | | | 51.0 | | | | | |
| | | | | | | | | | | | | | 48.0 | | | | | |
| | | | 3 | PR | | | 47.0 | | | | | | 36.0 | | | 48.0 | | |
| | | | | | | | | | | | | | 40.5 | | | 52.0 | | |
| | | | 6 | NK | | | | | | | | | 43.0 | 29.0 | | 43.0 | | |
| | | | | | | | | | | | | | | 42.0 | | | | |
| | | D10 | 1 | PR | | | 57.5 | | | | | | 46.0 | | | 41.0 | 33.0 | |
| | | | | | | | | | | | | | 47.0 | | | | | |
| | | | | | | | | | | | | | 49.0 | | | | | |
| | | | 2 | PR | | | | | 27.0 | | | | 42.0 | | | 51.0 | | |
| | | | | | | | | | | | | | 39.0 | | | | | |
| | | | | | | | | | | | | | 48.5 | | | | | |
| | | | | | | | | | | | | | 49.0 | | | | | |
| | | | | | | | | | | | | | 44.0 | | | | | |
| | | | | | | | | | | | | | 48.0 | | | | | |
| | | | | | | | | | | | | | 36.0 | | | | | |
| | | | | | | | | | | | | | 46.0 | | | | | |
| | | | | | | | | | | | | | 43.0 | | | | | |
| | | | | | | | | | | | | | 41.0 | | | | | |
| | | | | | | | | | | | | | 41.0 | | | | | |
| | | | 3 | PR | | | | | 27.0 | 34.0 | | | 46.0 | | | | | |
| | | | | | | | | | | | | | 40.0 | | | | | |
| | | | 4 | NK | 47.5 | | | | | | 37.0 | | 39.0 | | | | | |

## Deep, Survey 2, length data

| Group | Island | Site | Specimen | Obs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* |
| | | | | | | | | | | | | | 43.0 | | | | | |
| | | | | | | | | | | | | | 46.0 | | | | | |
| | | | 5 | NK | 49.0 | | | | | | | | 47.5 | | | | | |
| | | | 6 | NK | | | | | | | | | 45.5 | | | | | |
| | | D11 | 1 | NK | 50.0 | | | | | 37.0 | | | | | | | | |
| | | | 2 | NK | | | | | | | | | 40.5 | | | | | |
| | | | 3 | NK | | | | | | | | | | | | 44.0 | | |
| | | | 5 | PR | | | | | | 37.0 | | | | | | | | |
| | | | 6 | PR | | | | | | | | | 45.5 | | 54.5 | | | |
| | | | | | | | | | | | | | 43.0 | | 58.0 | | | |
| | | | | | | | | | | | | | | | 56.5 | | | |
| | | | | | | | | | | | | | | | 55.0 | | | |
| | | D12 | 1 | PR | | | | | | | | | 52.0 | | | | | |
| | | | | | | | | | | | | | 47.0 | | | | | |
| | | | | | | | | | | | | | 54.0 | | | | | |
| | | | 2 | PR | | | | | | | | | 52.0 | | | | | |
| | | | 3 | PR | | | 45.0 | | | | | | | 40.0 | 34.5 | 54.0 | | |
| | | | | | | | | | | | | | | 36.5 | 34.0 | | | |
| | | | 5 | NK | | | | | | | | | | 47.0 | | | | |
| | | D13 | 1 | PR | | | | | | | | | 52.5 | | | | | |
| | | | | | | | | | | | | | 42.0 | | | | | |
| | | | 2 | PR | | | | | | | | | | | | 48.0 | | |
| | | | | | | | | | | | | | | | | 49.5 | | |
| | | | | | | | | | | | | | | | | 41.5 | | |
| | | | 3 | PR | | 59.0 | | | | | | | | | | | | |
| | | | 4 | NK | | | | | | | | | | | | 50.0 | | |
| | | | 5 | NK | | | | | | | | | | 42.0 | | | | |
| | | | | | | | | | | | | | | 35.0 | | | | |
| | | | | | | | | | | | | | | 22.0 | | | | |
| | | | 6 | NK | | | | | | | | | | 39.0 | | | | |
| | | | | | | | | | | | | | | 23.0 | | | | |
| | | D14 | 1 | NK | | 66.0 | | | | | | | | 40.0 | | | | |
| | | | | | | | | | | | | | | 52.5 | | | | |
| | | | 2 | NK | | | | | | | | | | 40.0 | | 42.0 | | |
| | | | 3 | NK | 55.0 | 57.0 | | | | | | | | | | | | |
| | | | | | | 63.0 | | | | | | | | | | | | |
| | | | 4 | PR | | | | | | | | | | 44.5 | | | | |
| | | | | | | | | | | | | | | 41.5 | | | | |
| | | | 5 | PR | | 72.0 | | | | | | | | | | | | |
| | | | 6 | PR | | | | | | | | | 54.5 | | | | | |
| | | D15 | 3 | PR | | | | | | | | | | | | | 42.5 | |
| | | | 5 | NK | | | | | | | | | | 47.5 | | | | |
| | | | | | | | | | | | | | | 47.0 | | | | |
| | | D16 | 2 | PR | 51.5 | | | | | | | | 38.0 | | | 52.0 | | |
| | | | | | | | | | | | | | 41.0 | | | | | |
| | | | | | | | | | | | | | 38.0 | | | | | |
| | | | 4 | NK | 53.0 | | | | | | | | | 48.0 | | | | |
| | | | 5 | NK | | | | | | | | | 36.0 | | | | | |
| | | | | | | | | | | | | | 49.0 | | | | | |
| | | | 6 | NK | | | | | | 43.0 | | | 50.5 | | | 52.5 | | |

# Deep, Survey 2, length data

| Group | Island | Site | Specimen | Obs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* |
| | | | | | | | | | | | | | 46.0 | | | | | |
| Ysabel | | D17 | 1 | NK | | 67.0 | | | | | | | | | | | | |
| | | | 2 | NK | 57.0 | | | | | | | | | | | | | |
| | | | 3 | NK | | | | | | | | | 53.5 | | | | | |
| | | | | | | | | | | | | | 43.0 | | | | | |
| | | | 4 | PR | 50.0 | | | | | | | | | | | | | |
| | | | | | 52.0 | | | | | | | | | | | | | |
| | | | 6 | PR | 55.5 | | | | | | | | | | | | | |
| | | D18 | 1 | NK | | | | | | | | | | 45.0 | 40.5 | | | |
| | | | | | | | | | | | | | | 41.0 | | | | |
| | | | | | | | | | | | | | | 40.5 | | | | |
| | | | 2 | NK | 62.5 | | | | | | | | | 42.0 | | | | |
| | | | | | | | | | | | | | | 42.0 | | | | |
| | | | | | | | | | | | | | | 41.5 | | | | |
| | | | | | | | | | | | | | | 42.0 | | | | |
| | | | | | | | | | | | | | | 42.5 | | | | |
| | | | | | | | | | | | | | | 42.5 | | | | |
| | | | | | | | | | | | | | | 36.5 | | | | |
| | | | | | | | | | | | | | | 41.0 | | | | |
| | | | 4 | PR | | | | | | | | | | 42.0 | | | | |
| | | | | | | | | | | | | | | 44.5 | | | | |
| | | | | | | | | | | | | | | 39.0 | | | | |
| | | D19 | 2 | PR | | | | | | | | | | 48.0 | | | | |
| | | | 3 | PR | | | | | | 38.0 | | | | | | | | |
| | | | 4 | NK | 52.0 | | | | | | | | | | | | | |
| | | D20 | 2 | PR | | | | | | | | | | 44.0 | | | | |
| | | | 4 | NK | | | | | | | | | | 47.5 | | | | |
| | | | 5 | NK | | | | | | | | | | 46.0 | | | | |
| | | | | | | | | | | | | | | 45.0 | | | | |
| | | | 6 | NK | | | | | | | | | | 46.5 | | | | |
| | | D21 | 2 | NK | | | | | | | | | | 44.0 | | 48.0 | | |
| | | | 3 | NK | | | | | | | 28.5 | | 54.5 | | | | | |
| | | D22 | 1 | PR | | | | | | | | | | | | 49.5 | | |
| | | | 2 | PR | | | | | | | | | | | | 55.0 | | |
| | | | | | | | | | | | | | | | | 50.0 | | |
| | | | 3 | PR | | | 56.5 | | | | | | | | | 48.5 | | |
| | | | | | | | | | | | | | | 45.0 | | 55.5 | | |
| | | | 4 | NK | | | | | | 40.5 | | | | | | 48.5 | | |
| | | | 5 | NK | | | | | | | | | 47.0 | 40.0 | | | | |
| | | | 6 | NK | | | | | | | | | | | | 51.5 | | |
| | | | | | | | | | | | | | | | | 51.0 | | |
| | | | | | | | | | | | | | | | | 52.0 | | |
| | | | | | | | | | | | | | 55.0 | | | 49.0 | | |
| | | | | | | | | | | | | | | | | 50.0 | | |
| | | D23 | 2 | PR | | 65.0 | | | | | | | | | | | | |
| | | | 6 | NK | | 68.0 | | | | | | | | | | | | |
| | | D24 | 1 | PR | 53.5 | | | | | | | | 54.0 | | | | | |
| | | | | | 53.0 | | | | | | | | 48.0 | | | | | |
| | | | | | 54.0 | | | | | | | | | | | | | |
| | | | 2 | PR | | | 56.0 | | | | | | | | | | | |

# Deep, Survey 2, length data

| Group | Island | Site | Specimen<br>Number varies by site | Obs | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 4 | NK | | 67.0 | | | 33.0 | | | | 47.0 | | | | | |
| | | | 5 | NK | | | | | 30.0 | | | | | | 42.0 | | | |
| | | | 6 | NK | 46.0 | | | | | | | | 44.0 | 48.5 | | | | |
| | | | | | | | | | | | | | 49.0 | | | | | |
| | | D25 | 1 | PR | | | | | | | | | | | | 50.0 | | |
| | | | 2 | PR | | | | | | 35.5 | | | | | | | 31.0 | |
| | | | 3 | PR | | 74.0 | 62.0 | | | | | | | | | | | |
| | | | 4 | NK | | | | | | 37.0 | | | | | | | 30.0 | |
| | | | 5 | NK | | | | | | | | | | | | | 22.5 | |
| Suavanao | | D26 | 1 | PR | | | | | | | | | | | | 46.0 | | |
| | | | | | | | | | | | | | | | | 41.0 | | |
| | | | 2 | PR | | | | | | | | | 52.0 | 48.5 | | 44.5 | | |
| | | | | | | | | | | | | | 46.0 | | | | | |
| | | | 3 | PR | | 54.0 | | | | | | | 49.0 | 46.0 | | 26.0 | | |
| | | | 5 | NK | | 44.5 | | | | | | | | | | 52.5 | 30.0 | |
| | | | | | | | | | | | | | | | | 44.5 | | |
| | | | | | | | | | | | | | | | | 50.0 | | |
| | | D27 | 2 | PR | | 72.0 | | | | | | | | 44.5 | | | 30.0 | |
| | | | | | | 66.0 | | | | | | | | 42.0 | | | | |
| | | | | | | 72.5 | | | | | | | | 46.0 | | | | |
| | | | | | | | | | | | | | | 40.0 | | | | |
| | | | | | | | | | | | | | | 40.0 | | | | |
| | | | 3 | PR | | 61.5 | | | | | | | | 45.0 | | | | |
| | | | | | | 79.5 | | | | | | | | 49.0 | | | | |
| | | | | | | | | | | | | | | 41.0 | | | | |
| | | | 4 | NK | | | | | | | | | | | | | 26.5 | |
| | | | 6 | NK | | | | | | | | | | | | | 28.0 | |
| | | | | | | | | | | | | | | | | | 16.5 | |
| | | D28 | 1 | PR | | | 64.5 | | | | | | | | | | 27.0 | |
| | | | | | | | | | | | | | | | | | 46.5 | |
| | | | | | | | | | | | | | | | | | 34.0 | |
| | | | 2 | PR | | | | | | | | | | | | | 30.0 | |
| | | | 3 | PR | | | | | | | | | | | | | 32.5 | |
| | | | 4 | NK | | | | | 42.0 | | | | | | | | 26.0 | |
| | | | 5 | NK | | | | | | | | | | | | | 32.0 | |
| | | D29 | 1 | PR | | 60.0 | | | | | | | | | | | | |
| | | | | | | 57.0 | | | | | | | | | | | | |
| | | | | | | 55.5 | | | | | | | | | | | | |
| | | | | | | 56.0 | | | | | | | | | | | | |
| | | | 3 | PR | | 60.5 | | | | 34.0 | | | | | | | | |
| | | | | | | 53.0 | | | | | | | | | | | | |
| | | | 4 | NK | | 61.0 | | | | | | | | | | 42.0 | | |
| | | | | | | 62.0 | | | | | | | | | | | | |
| | | | | | | 67.5 | | | | | | | | | | | | |
| | | | 5 | NK | 51.5 | | | | | | | | | | | | | |
| | | | 6 | NK | | | | | | | | | | | | | 35.5 | |
| | | D30 | 2 | PR | | 74.0 | | | | | | | | | | | | |
| | | | | | | 71.0 | | | | | | | | | | | | |
| | | | 3 | PR | 61.5 | | | | | | | | | | | | | |
| | | | 4 | NK | | | | | | | | | | | | | 31.5 | |

## Deep, Survey 2, length data

| Group | Island | Site | Specimen | Obs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* |
| | | | 5 | NK | | 72.5 | | | | | | | | | | | | |
| | | | 6 | NK | | 64.0 | | | | | | | | | | | | |
| | | | | | | 66.5 | | | | | | | | | | | | |
| | | D31 | 1 | PR | | 68.0 | | | | | | | | | | 48.5 | 25.0 | |
| | | | 2 | PR | | | | | | | | | | | | 44.0 | 31.0 | |
| | | | | | | | | | | | | | | | | 57.5 | | |
| | | | 3 | PR | | | | | | | | | | | | 43.0 | 42.0 | |
| | | | 5 | NK | | | | | | | | | 31.5 | | | | | |
| | | | 6 | NK | | 68.5 | | | | | | | | | | | | |
| | | D32 | 1 | NK | | 69.5 | | | | | | | | | | | | |
| | | | 3 | NK | | 73.5 | | | | | | | | | | | | |
| | | | 4 | PR | | 76.0 | | | | | | | | | | | | |
| | | | | | | 80.0 | | | | | | | | | | | | |
| | | | 5 | PR | | 71.0 | | | | | | | | | | | | |
| | | | 6 | PR | | 59.0 | | | | | | | | | | | | |
| | | | | | | 61.0 | | | | | | | | | | | | |

## Appendix 2i. Raw data for shallow habitat, Survey 3, July/August, 1995.

**Rep = relicate number, Obs = initials of observer, * indicates uncertain identification**

| Group | Island | Site | Rep | Obs | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia argus* | *Holothuria atra* | *Actinopyga mauritiana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | *Holothuria nobilis* | *Actinopyga miliaris* | *Thelanota ananas* | *Thelanota anax* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Waghena | 1 | S1 | 1 | PR | 1 | | | | | | | 2 | | | | | 1 | | | | | | |
| | | | 2 | PR | 2 | | | | 4 | | | 1 | | 1 | | | 1 | | | | | | |
| | | | 3 | PR | 2 | | | | 3 | | | | | | | | 1 | | | | | | |
| | | | 4 | NK | | | | | 2 | | | | | | | | 2 | | | | | | |
| | | | 5 | NK | 3 | | | | 2 | | | 1 | | | 1 | | | | | | | | |
| | | | 6 | NK | 1 | | | | | | | | | 1 | | | | | | | | | 1 |
| | | S2 | 1 | PR | 2 | | | | | | | | | | 1 | | | | | | | | |
| | | | 2 | PR | 1 | | | | | | | | | | | | 1 | | | | | | |
| | | | 3 | PR | 2 | | | | | | | | | | | | 1 | | | | | | |
| | | | 4 | NK | | | | | | | | | | | | | 1 | | | | | | |
| | | | 5 | NK | 1 | | | | | | | | | | | | 2 | | 1 | | | | |
| | | | 6 | NK | 1 | | | | | | | | | | | | 2 | | | | | | |
| | | S3 | 1 | PR | | | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | | | | | | | | | | | 1 | | | | | | |
| | | | 3 | PR | | | | | | | | | | | | | 1 | | | | | | |
| | | | 4 | NK | 3 | | | | | | | | | | | | | | | | | | |
| | | | 5 | NK | | | | | | | | | | | | | 1 | | | | | | |
| | | | 6 | NK | | | | | | | | | | | | | 3 | | | | | | |
| | | S4 | 1 | PR | 3 | | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 1 | | | | | | | | | | | | 1 | | | | | | |
| | | | 3 | PR | 2 | | | | | | | | | | | | 2 | | | | | | |
| | | | 4 | NK | 2 | | | | | | | | | | | | | | | | | | |
| | | | 5 | NK | | | | | | | | | | | | | 1 | | | | | | |
| | | | 6 | NK | 1 | | | | | | | | | | | | | | | | | | |
| | 2 | S5 | 1 | PR | 2 | | | | | | | | | | | | 1 | | | | | | |
| | | | 2 | PR | | | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 4 | | | | | | | | | | | | | | | | | 1 | |
| | | | 4 | NK | 1 | | | | | | | | | | | | | 1 | 1 | | | | |
| | | | 5 | NK | 1 | | | | | | | | | | | | 2 | | | | | | |
| | | | 6 | NK | 1 | | | | | | | | | | | | 1 | | | | 1 | | |
| | | S6 | 1 | PR | | | | | | | | | | | | | 1 | | | | | | |
| | | | 2 | PR | 2 | | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 5 | | | | | | | | | | | | | | 1 | | | | |
| | | | 4 | NK | 1 | | | 1 | | | | | | | | | | | | | | | |
| | | | 5 | NK | 1 | | | | | | | | | | | | | | 1 | | | | |
| | | | 6 | NK | 1 | | | | | | | | | | | | | | | | | | |
| | | S7 | 1 | PR | 2 | | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 5 | | | | | | | | | | | | 1 | 1 | | | | | |
| | | | 3 | PR | 2 | | | | 1 | | | | | | | | | | | | | | |
| | | | 4 | NK | | | | 1 | | | | | | | | | | | | 1 | | | |
| | | | 5 | NK | | | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 2 | | | | | | | | | | | | | | | | | | |
| | | S8 | 1 | PR | 1 | | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 2 | | | | | | | | | | | | 1 | | | | | | |
| | | | 3 | PR | 4 | | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | 1 | | | | | | 1 | | | | | | | | | | | | |
| | | | 5 | NK | 2 | | | | | | | | | | | | 1 | | | | | | |
| | | | 6 | NK | 2 | 1 | | | | | | | | | | | 1 | | | | | | |
| Amavons | 3 | S9 | 1 | PR | 2 | | | | | | | 1 | | | | | 1 | 1 | | | | | |
| | | | 2 | PR | 3 | | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 5 | | | | | | | | | | | | 1 | 1 | | | | | |
| | | | 4 | NK | 2 | | | | | | | | | | | | 2 | | | | | | |
| | | | 5 | NK | 1 | | | | | | | | | | | | | 1 | | | | | |
| | | | 6 | NK | | | | | | | | | | | | | 2 | 2 | | | | | |
| | | S10 | 1 | PR | 4 | | | | | | | | | | | | 1 | | | | | | |
| | | | 2 | PR | 2 | | 1 | | | 1 | | | | | | | | | | | | | |
| | | | 3 | PR | 2 | | | | | | | | | | | | 11 | | | | | | |
| | | | 4 | NK | 1 | | | 1 | | | | | | | | | | | | | | | |
| | | | 5 | NK | 1 | | | | | | | | | | | | 1 | | | | | | |
| | | | 6 | NK | 1 | | | | | | | | | | | | 1 | | | | | | |

Shallow, Survey 3, abundance

| Group | Island | Site | Rep | Obs | Tridacna maxima | Tridacna gigas | Tridacna derasa | Tridacna sqamosa | Tridacna crocea | Hippopus hippopus | Stichopus chloronotus | Bohadschia graeffei | Bohadschia agrus | Holothuria atra | Actinopyga mauritaniana | Brown stonefish * | Tectus pyramis | Trochus niloticus | Pinctada margaritifera | Holothuria nobilis | Actinopyga miliaris | Thelanota ananas | Thelanota anas |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | S11 | 1 | PR | | | | | | | | | | | | | 1 | | | | | | |
| | | | 2 | PR | | | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | | | | | | | | | | | 1 | | | | | | | | |
| | | | 4 | NK | | | | | | | | | | | 1 | | | | | | | | |
| | | | 5 | NK | | | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 1 | | | | | | | | | | | | | | | | | | |
| | | S12 | 1 | PR | 3 | | | | | | | | | | | | 3 | 1 | | | | | |
| | | | 2 | PR | 1 | | | | | | | | | | | | 2 | | | | | | |
| | | | 3 | PR | 1 | | | | | | | | | 1 | | | 2 | | | | | | |
| | | | 4 | NK | 2 | | | | 1 | | | | | | | | | | | | | | |
| | | | 5 | NK | | | 1 | | | | | | | | | | 1 | 1 | | | | | |
| | | | 6 | NK | 1 | | | | | | | | | | | | | | | | | | |
| | 4 | S13 | 1 | PR | 1 | | | | | | | | | | | | 1 | | | | | | |
| | | | 2 | PR | 1 | | | | | | | | | | | | 3 | | | | | | |
| | | | 3 | PR | 5 | | | 1 | | | 2 | | | | | | | | | | | | |
| | | | 4 | Franci | 1 | | | | | | | | | | | | 1 | 1 | | | | | |
| | | | 5 | Franci | | | | | | | | | | | | | 2 | | | | | | |
| | | | 6 | Franci | | | | | 1 | | 1 | | | | | | 6 | | | | | | |
| | | S14 | 1 | PR | | | | | | | | | | | | | 1 | | | | | | |
| | | | 2 | PR | 3 | | | | | | | | | | | | 1 | | 1 | | | | |
| | | | 3 | PR | | | | | | | | | | | | | 1 | | | | | | |
| | | | 4 | Mote | 1 | | | | | | | | | | | | | | | | | | |
| | | | 5 | Mote | | | | | | | | | | | | | | | | | | | |
| | | | 6 | Mote | | | | | | | | | | | | | 1 | | | | | | |
| | | S15 | 1 | PR | 7 | | | | | | | 3 | | | | | 2 | 2 | | | | | |
| | | | 2 | PR | | | | | 1 | | | 1 | | | | | | | | | | | |
| | | | 3 | PR | 3 | | | | | | | | | | | | 1 | | | | | | |
| | | | 4 | NK | 3 | | | | 1 | | | | | | | | | | | | | | |
| | | | 5 | NK | 1 | | | 1 | 1 | | | 2 | | | | | 1 | | | | | | |
| | | | 6 | NK | 3 | | | | | | | | | | | | 1 | | | | | | |
| | | S16 | 1 | PR | | | | | | | | | | | | | 1 | | | | | | |
| | | | 2 | PR | | | | | | | | | 1 | | | | 2 | | | | | | |
| | | | 3 | PR | 1 | | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | | | | | | | | | | | | | 5 | 1 | | | | | |
| | | | 5 | NK | | | | | | | | | | | | | 1 | | | | | | |
| | | | 6 | NK | 3 | | | | | | | | | | | | | | | | | | |
| Ysabel | 5 | S17 | 1 | PR | 3 | 1 | | | | 1 | | | | 4 | | | 2 | | | | | | |
| | | | 2 | PR | 1 | | | | | 1 | | | | | | | | | | | | | |
| | | | 3 | PR | 2 | | | | | | | | | 1 | | | 1 | | | | | | |
| | | | 4 | NK | | | | | 1 | | | | | 2 | | | | | | | | | |
| | | | 5 | NK | | | | | | 1 | | 1 | | 1 | | 1 | | | | | | | |
| | | | 6 | NK | 1 | | 1 | | | | | | | 2 | | | | | | | | | |
| | | S18 | 1 | PR | 1 | | | | | | | 1 | | | | | 2 | | | | | | |
| | | | 2 | PR | 2 | | | | | 1 | | | | | | | 4 | | | | | | |
| | | | 3 | PR | | | | | | | | | | | | | 1 | | | | | | |
| | | | 4 | NK | | | | | | | 3 | | | | | | | | | | | | |
| | | | 5 | NK | 1 | | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 1 | | 1 | 1 | | | | | | | | | 2 | | | | | | |
| | | S19 | 1 | PR | 4 | | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | | | | | | | | | | | 1 | | | | | | |
| | | | 3 | PR | 3 | | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | 2 | | | | | | | | | | | | | | | | | | |
| | | | 5 | NK | 1 | | | | 3 | | | | | | | | | | | | | | |
| | | | 6 | NK | | | | 2 | 1 | | | | | 1 | | | | | | | | | |
| | | S20 | 1 | PR | 2 | | | | 6 | | | | | 1 | | | 1 | | | | | | |
| | | | 2 | PR | 3 | | 2 | 1 | 3 | 3 | 1 | | | 2 | | | | | | | | | |
| | | | 3 | PR | 3 | | | | 1 | | 1 | | | 2 | | | 1 | | | | | | |
| | | | 4 | NK | 3 | 1 | 2 | | | 1 | | | | | | | | | | | | | |
| | | | 5 | NK | 2 | | | | 2 | | | | | | | | | | 1 | | | | |
| | | | 6 | NK | 2 | | | | | | | | | | | | | | | | | | |
| | 6 | S21 | 1 | PR | 2 | | | | | | | 1 | | | | | 1 | | | | | | |
| | | | 2 | PR | 2 | | | | | | | 1 | | | | | 2 | | | | | | |
| | | | 3 | PR | 2 | | | | | | | 2 | | 1 | | | 1 | | | | | | |

## Appendix 2j. Length-frequency data for shallow habitat, Survey 3, July/August 1995

Specimen = replicate, * indicates uncertain identification.

| Group | Island | Site | Specimen<br>Number varies by site | Obs | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna squamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia argus* | *Holothuria atra* | *Actinopyga mauritiana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | *Thelenota anax* | *Thelenota ananas* | *Actinopyga miliaris* | *Holothuria nobilis* | *Holothuria edulis* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Waghena | 1 | S1 | 1 | PR | 4.0 | | | | | | | 34.0 | | | | | | | | | | | | |
| | | | | | | | | | | | | 26.0 | | | | | | | | | | | | |
| | | | 2 | PR | 16.0 | | | | 10.0 | | | 27.0 | | 16.0 | | | | | | | | | | |
| | | | | | 22.0 | | | | 2.5 | | | | | | | | | | | | | | | |
| | | | | | | | | | 12.5 | | | | | | | | | | | | | | | |
| | | | | | | | | | 7.5 | | | | | | | | | | | | | | | |
| | | | 3 | PR | 22.0 | | | | 13.0 | | | | | | | | | | | | | | | |
| | | | | | 26.0 | | | | 8.5 | | | | | | | | | | | | | | | |
| | | | | | | | | | 12.0 | | | | | | | | | | | | | | | |
| | | | 4 | NK | | | | | 4.0 | | | | | | | | | | | | | | | |
| | | | | | | | | | 9.5 | | | | | | | | | | | | | | | |
| | | | 5 | NK | 24.5 | | | | 12.5 | | | 36.0 | | | 31.5 | | | | | | | | | |
| | | | | | 16.5 | | | | 11.0 | | | | | | | | | | | | | | | |
| | | | | | 15.5 | | | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 15.0 | | | | | | | | | 44.0 | | | | | | 74 | | | | |
| | | S2 | 1 | PR | 21.0 | | | | | | | | | | 29.0 | | | | | | | | | |
| | | | | | 30.0 | | | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 14.0 | | | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 30.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 29.0 | | | | | | | | | | | | | | | | | | | |
| | | | 5 | NK | 12.0 | | | | | | | | | | | | | | 12.5 | | | | | |
| | | | 6 | NK | 27.0 | | | | | | | | | | | | | | | | | | | |
| | | S3 | 4 | NK | 29.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 29.5 | | | | | | | | | | | | | | | | | | | |
| | | | | | 33.0 | | | | | | | | | | | | | | | | | | | |
| | | S4 | 1 | PR | 13.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 16.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 11.0 | | | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 13.0 | | | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 14.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 12.0 | | | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | 28.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 27.0 | | | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 20.0 | | | | | | | | | | | | | | | | | | | |
| | | S5 | 1 | PR | 24.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 15.0 | | | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 24.0 | | | | | | | | | | | | | | | | 49 | | | |
| | | | | | 26.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 16.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 14.0 | | | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | 16.0 | | | | | | | | | | | | | 12.0 | 13.0 | | | | | |
| | | | 5 | NK | 21.0 | | | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 5.5 | | | | | | | | | | | | | | | | | 25 | | |
| | | S6 | 2 | PR | 12.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 11.0 | | | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 12.0 | | | | | | | | | | | | | | 12.0 | | | | | |
| | | | | | 2.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 11.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 27.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 7.0 | | | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | 26.0 | | | 26.5 | | | | | | | | | | | | | | | | |
| | | | 5 | NK | 13.0 | | | | | | | | | | | | | | 12.0 | | | | | |
| | | | 6 | NK | 12.0 | | | | | | | | | | | | | | | | | | | |
| | | S7 | 1 | PR | 11.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 17.0 | | | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 20.0 | | | | | | | | | | | | | 10.5 | | | | | | |
| | | | | | 26.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 18.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 20.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 15.0 | | | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 18.0 | | | | 10.5 | | | | | | | | | | | | | | | |
| | | | | | 19.0 | | | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | | | | 12.0 | | | | | | | | | | | | | | | | |

## Shallow, Survey 3, length data

| Group | Island | Site | Specimen | Obs | Species | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna squamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia argus* | *Holothuria atra* | *Actinopyga mauritiana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | *Thelenota anax* | *Thelenota ananas* | *Actinopyga miliaris* | *Holothuria nobilis* | *Holothuria edulis* |
| | | | 6 | NK | 17.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 24.0 | | | | | | | | | | | | | | | | | | | |
| | | S8 | 1 | PR | 30.0 | | | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 10.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 25.0 | | | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 23.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 11.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 28.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 19.0 | | | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | 22.5 | | | | | | 37.5 | | | | | | | | | | | | | |
| | | | 5 | NK | 13.5 | | | | | | | | | | | | | | | | | | | |
| | | | | | 22.5 | | | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 13.5 | 16.0 | | | | | | | | | | | | | | | | | | |
| | | | | | 12.5 | | | | | | | | | | | | | | | | | | | |
| Arnavons | 3 | S9 | 1 | PR | 28.0 | | | | | | | 32.5 | | | | | | 6.4 | | | | | | |
| | | | | | 9.5 | | | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 25.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 9.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 20.0 | | | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 11.0 | | | | | | | | | | | | | 10.4 | | | | | | |
| | | | | | 15.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 12.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 24.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 26.0 | | | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | 5.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 32.0 | | | | | | | | | | | | | | | | | | | |
| | | | 5 | NK | 27.0 | | | | | | | | | | | | | 7.0 | | | | | | |
| | | | | | | | | | | | | | | | | | | 7.5 | | | | | | |
| | | | 6 | NK | | | | | | | | | | | | | | 6.5 | | | | | | |
| | | | | | | | | | | | | | | | | | | 13.5 | | | | | | |
| | | S10 | 1 | PR | 22.5 | | | | | | | | | | | | | | | | | | | |
| | | | | | 11.5 | | | | | | | | | | | | | | | | | | | |
| | | | | | 13.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 11.0 | | | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 20.5 | | 11.0 | | | 15.0 | | | | | | | | 12.1 | | | | | | |
| | | | | | 26.5 | | | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 19.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 27.0 | | | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | 32.0 | | | 8.0 | | | | | | | | | | | | | | | | |
| | | | 5 | NK | 8.0 | | | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 26.5 | | | | | | | | | | | | | | | | | | | |
| | | S11 | 2 | PR | | | | | | | | | | | | | | 14.1 | | | | | | |
| | | | | | | | | | | | | | | | | | | 10.0 | | | | | | |
| | | | 3 | PR | | | | | | | | | | | 31.0 | | | 11.1 | | | | | | |
| | | | 4 | NK | | | | | | | | | | | 22.0 | | | | | | | | | |
| | | | 6 | NK | 28.0 | | | | | | | | | | | | | | | | | | | |
| | | S12 | 1 | PR | 15.0 | | | | | | | | | | | | | 6.0 | | | | | | |
| | | | | | 30.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 18.0 | | | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 8.0 | | | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 15.0 | | | | | | | | | 43.0 | | | | | | | | | | |
| | | | 4 | NK | 22.0 | | | | 5.5 | | | | | | | | | | | | | | | |
| | | | | | 11.0 | | | | | | | | | | | | | | | | | | | |
| | | | 5 | NK | | | 30.0 | | | | | | | | | | | 10.0 | | | | | | |
| | | | 6 | NK | 13.0 | | | | | | | | | | | | | | | | | | | |
| | | S13 | 1 | PR | 17.5 | | | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 16.5 | | | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 32.0 | | | 28.0 | | | 28.0 | | | | | | | | | | | | | |
| | | | | | 28.0 | | | | | | 32.5 | | | | | | | | | | | | | |
| | | | | | 25.6 | | | | | | | | | | | | | | | | | | | |
| | | | | | 32.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 17.5 | | | | | | | | | | | | | | | | | | | |
| | | | 4 | Franci | 16.5 | | | | | | | | | | | | | 13.5 | | | | | | |
| | | | 6 | Franci | | | | | 4.0 | | 28.0 | | | | | | | | | | | | | |
| | | S14 | 1 | PR | 16.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 18.5 | | | | | | | | | | | | | | | | | | | |

## Shallow, Survey 3, abundance

| Group | Island | Site | Rep | Obs | Species | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia agrus* | *Holothuria atra* | *Actinopyga mauritaniana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | *Holothuria nobilis* | *Actinopyga miliaris* | *Thelanota ananas* | *Thelanota anax* |
| | | | 4 | NK | 3 | | | | | | | | | | | | 1 | 1 | | | | | |
| | | | 5 | NK | | | | | | | | | | | 1 | | 1 | | | | | | |
| | | | 6 | NK | 2 | | | | 1 | | | | | | | | 2 | | | | | | |
| | | S22 | 1 | PR | 3 | | | | | | | | | | | | 2 | | | | | | |
| | | | 2 | PR | 1 | | | | | | | | | | | | 1 | | | | | | |
| | | | 3 | PR | 2 | | | | 1 | | | | | | | | | | | | | | |
| | | | 4 | NK | 2 | | | | | | | | 1 | | | | 1 | | | | | | |
| | | | 5 | NK | 2 | | | 1 | | | | | | | | | 1 | | | | | | |
| | | | 6 | NK | 1 | | | | 1 | | | | | | | | 1 | | | | | | |
| | | S23 | 1 | PR | 3 | | | | | | | | | | | | 1 | 1 | | | | | |
| | | | 2 | PR | 1 | | | | | | | | | | | | | 1 | | | | | |
| | | | 3 | PR | 2 | | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | 4 | | | | | | | | | | | | 2 | | | | | | |
| | | | 5 | NK | 2 | | | | | | | | | | | | 2 | | | | | | |
| | | | 6 | NK | | | | | | | | | | | | | | | | | | | |
| | | S24 | 1 | PR | 2 | | | 1 | 5 | 1 | | | | | | | | | | | | | |
| | | | 2 | PR | 1 | | | | | | | | | | | | 4 | 1 | | | | | |
| | | | 3 | PR | 1 | | | | 1 | | 1 | | | | | | 1 | | | | | | |
| | | | 4 | NK | 3 | | 1 | | | | | | | | | | | | | | | | |
| | | | 5 | NK | 3 | 1 | | | 2 | | | | | | | | 1 | | | | | | |
| | | | 6 | NK | | | | | | | | | 1 | | | | | | | | | | |
| Suavanao | 7 | S25 | 1 | PR | | | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | | | | | | | | | | | | 1 | | | | | |
| | | | 3 | PR | | | | | | | | | | | | | 2 | | | | | | |
| | | | 4 | NK | | | | | | | | | | | 1 | | | 2 | | | | | |
| | | | 5 | NK | 1 | | | | | | | | | | 1 | | 2 | | | | | | |
| | | | 6 | NK | 1 | | | | | | | | | | 1 | | | | | | | | |
| | | S26 | 1 | PR | | | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | | | | | | | | 1 | | | | | | | | | |
| | | | 3 | PR | | | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | 1 | | | | | | | | | | | | 1 | | | | | | |
| | | | 5 | NK | | | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 2 | | | | | | | | | | | | | | | | | | |
| | | S27 | 1 | PR | 2 | | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 2 | | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | | | | | | | | | | | 1 | | | 1 | | | | | |
| | | | 4 | NK | 1 | | | | | | | | | | | | | 1 | | | | | |
| | | | 5 | NK | | | | | | | | | | | | | | 1 | | | | | |
| | | | 6 | NK | | | | | | | | | | | | | 1 | | | | | | |
| | | S28 | 1 | PR | 1 | | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 1 | | | | | | | | | | | | 1 | | | | | | |
| | | | 3 | PR | 1 | | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | 2 | | | | | | | | | | 1 | | | | | | | | |
| | | | 5 | NK | 2 | | | | | | | | | | 1 | | 1 | | | | | | |
| | | | 6 | NK | 2 | | | | | | | | | | | | | 3 | | | | | |
| | 8 | S29 | 1 | PR | 1 | | | | | | | | | | | | 3 | 1 | | | | | |
| | | | 2 | PR | 1 | | | | | | | | | | | | 2 | | | | | | |
| | | | 3 | PR | 1 | | | | | | | | | | | | 2 | | | | | | |
| | | | 4 | NK | 1 | | | | | | | | | | | | | 1 | | | | | |
| | | | 5 | NK | 2 | | | | | | | | | | | | 3 | | | | | | |
| | | | 6 | NK | | | | | | | | | | | | | | 1 | | | | | |
| | | S30 | 1 | PR | | | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 1 | | | | | | | | | | | | 1 | | | | | | |
| | | | 3 | PR | 1 | | | | | | | | | | | | 1 | 1 | | | | | |
| | | | 4 | NK | | | | | | | | | | | | | 1 | | | | | | |
| | | | 5 | NK | | | | | | | | | | | | | 1 | 1 | | | | | |
| | | | 6 | NK | 2 | | | | | | | | | | | | | | | | | | |
| | | S31 | 1 | PR | 1 | | | | | | | | | | | | 1 | | | | | | |
| | | | 2 | PR | 2 | | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 3 | | | | | | | | | | | | 2 | | | | | | |
| | | | 4 | NK | | | | | | | | | | | | | 2 | | | | | | |
| | | | 5 | NK | 2 | | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 5 | | | | | | | | | | | | | 1 | | | | | |

## Shallow, Survey 3, abundance

| Group | Island | Site | Rep | Obs | Species | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia argus* | *Holothuria atra* | *Actinopyga mauritiana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | *Holothuria nobilis* | *Actinopyga miliaris* | *Thelanota ananas* | *Thelanota anax* |
| | | S32 | 1 | NK | 2 | | | | 5 | | | | | | | | 1 | 1 | | | | | |
| | | | 2 | NK | | | | | | 1 | | | | | | | | | | | | | |
| | | | 3 | NK | 1 | | | | 19 | | | | | | | | 2 | | | | | | |
| | | | 4 | PR | 2 | | | | 17 | | | | | | | | 1 | | | | | | |
| | | | 5 | PR | | | | | 4 | | | | | | | | 1 | | | | | | |
| | | | 6 | PR | | | | | 5 | | | 1 | | | | | | 1 | | | | | |
| Total | | | | | | | | | | | | | | | | | | | | | | | |

## Shallow, Survey 3, length data

| Group | Island | Site | Specimen | Obs | Species | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna squamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia argus* | *Holothuria atra* | *Actinopyga mauritiana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | *Thelenota anax* | *Thelenota ananas* | *Actinopyga miliaris* | *Holothuria nobilis* | *Holothuria edulis* |
| | | | | | 26.0 | | | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 16.5 | | | | | | | | | | | | | | 5.0 | | | | | |
| | | | | | 29.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 14.5 | | | | | | | | | | | | | | | | | | | |
| | | | 4 | Mote | 34.0 | | | | | | | | | | | | | | | | | | | |
| | | S15 | 1 | PR | 22.5 | | | | | | | 20.0 | | | | | | 13.1 | | | | | | |
| | | | | | 25.0 | | | | | | | 23.5 | | | | | | 11.9 | | | | | | |
| | | | | | 15.0 | | | | | | | 29.0 | | | | | | | | | | | | |
| | | | | | 22.5 | | | | | | | | | | | | | | | | | | | |
| | | | | | 22.5 | | | | | | | | | | | | | | | | | | | |
| | | | | | 19.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 22.0 | | | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | | | 13.0 | | | 22.0 | | | | | | | | | | | | |
| | | | 3 | PR | 6.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 10.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 18.0 | | | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | 17.0 | | | | 7.5 | | | | | | | | | | | | | | | |
| | | | | | 17.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 13.5 | | | | | | | | | | | | | | | | | | | |
| | | | 5 | NK | 14.0 | | | 11.0 | 12.0 | | | 27.0 | | | | | | 9.0 | | | | | | |
| | | | | | | | | | | | | 30.0 | | | | | | | | | | | | |
| | | | 6 | NK | 21.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 27.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 35.0 | | | | | | | | | | | | | | | | | | | |
| | | S16 | 2 | PR | | | | | | | | | 27.0 | | | | | | | | | | | |
| | | | 3 | PR | 33.0 | | | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | | | | | | | | | | | | | | 12.0 | | | | | | |
| | | | 6 | NK | 25.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 25.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 27.0 | | | | | | | | | | | | | | | | | | | |
| | Ysabel | S17 | 1 | PR | 19.5 | 47.0 | | | | 31.0 | | | | 28.0 | | | | | | | | | | |
| | | | | | 26.0 | | | | | | | | | 23.0 | | | | | | | | | | |
| | | | | | 23.0 | | | | | | | | | 25.0 | | | | | | | | | | |
| | | | | | | | | | | | | | | 26.0 | | | | | | | | | | |
| | | | 2 | PR | 26.0 | | | | | 22.0 | | | | | | | | | | | | | | |
| | | | 3 | PR | 9.0 | | | | | | | | | 31.5 | | | | | | | | | | |
| | | | | | 7.0 | | | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | | | | | 4.5 | | | | | 29.0 | | | | | | | | | | |
| | | | | | | | | | | | | | | 17.0 | | | | | | | | | | |
| | | | 5 | NK | | | | | | 31.0 | | 41.0 | | 16.5 | | 32.0 | | | | | | | | |
| | | | 6 | NK | 14.5 | | 23.0 | | | | | | | 22.5 | | | | | | | | | | |
| | | | | | | | | | | | | | | 23.0 | | | | | | | | | | |
| | | S18 | 1 | PR | 25.0 | | | | | | | 29.0 | | | | | | 4.3 | | | | | | |
| | | | 2 | PR | 15.0 | | | | | 23.5 | | | | | | | | | | | | | | |
| | | | | | 15.0 | | | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | | | | | | | 17.5 | | | | | | | | | | | | | |
| | | | | | | | | | | | 45.0 | | | | | | | | | | | | | |
| | | | | | | | | | | | 43.0 | | | | | | | | | | | | | |
| | | | 5 | NK | 18.0 | | | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 15.0 | | 42.0 | 23.0 | | | | | | | | | | | 9.0 | | | | | |
| | | S19 | 1 | PR | 8.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 15.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 8.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 28.0 | | | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 9.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 15.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 10.0 | | | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | 7.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 15.0 | | | | | | | | | | | | | | | | | | | |
| | | | 5 | NK | 27.0 | | | | 12.5 | | | | | | | | | | | | | | | |
| | | | | | | | | | 10.0 | | | | | | | | | | | | | | | |
| | | | | | | | | | 12.0 | | | | | | | | | | | | | | | |
| | | | 6 | NK | | | | 9.5 | 6.0 | | | | | 23.0 | | | | | | | | | | |
| | | | | | | | | 12.0 | | | | | | | | | | | | | | | | |
| | | S20 | 1 | PR | 8.0 | | | | 11.0 | | | | | 29.0 | | | | | | | | | | |
| | | | | | 13.5 | | | | 13.0 | | | | | | | | | | | | | | | |

## Shallow, Survey 3, length data

| Group | Island | Site | Specimen | Obs | Species |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  | Number varies by site |  | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna squamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia argus* | *Holothuria atra* | *Actinopyga mauritiana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | *Thelenota anax* | *Thelenota ananas* | *Actinopyga miliaris* | *Holothuria nobilis* | *Holothuria edulis* |
|  |  |  |  |  |  |  |  |  | 12.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 13.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 3.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 2.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 2 | PR | 15.0 |  | 50.0 | 39.0 | 13.0 | 32.0 | 26.0 |  |  | 33.0 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 14.0 |  | 35.0 |  | 6.0 | 20.5 |  |  |  | 31.0 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 3.0 |  |  |  | 14.0 | 26.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 3 | PR | 23.0 |  |  |  | 12.0 |  | 26.0 |  |  | 30.5 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 21.0 |  |  |  |  |  |  |  |  | 27.5 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 25.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 4 | NK | 18.0 | 17.0 | 26.0 |  |  | 31.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 21.0 |  | 43.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 25.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 5 | NK | 24.5 |  |  |  | 9.5 |  |  |  |  |  |  |  |  |  | 13.0 |  |  |  |  |  |
|  |  |  |  |  | 20.0 |  |  |  | 9.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 6 | NK | 17.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 18.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | S21 | 1 | PR | 27.0 | 48.0 |  |  |  |  |  | 32.0 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 29.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 2 | PR | 14.0 | 67.0 | 56.0 |  |  |  |  | 28.0 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 26.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 3 | PR | 10.0 |  |  |  |  |  |  | 14.0 |  | 38.0 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 32.0 |  |  |  |  |  |  | 32.0 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 4 | NK | 18.0 |  |  |  |  |  |  |  |  |  |  |  |  | 14.0 |  |  |  |  |  |  |
|  |  |  |  |  | 11.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 10.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 5 | NK |  |  |  |  |  |  |  |  |  |  | 30.0 |  |  |  |  |  |  |  |  |  |
|  |  |  | 6 | NK | 19.0 |  |  |  | 8.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 23.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | S22 | 1 | PR | 24.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 16.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 27.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 2 | PR | 24.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 3 | PR | 20.5 |  |  |  | 13.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 11.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 4 | NK | 25.0 |  |  |  |  |  |  |  | 29.0 |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 30.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 5 | NK | 27.5 |  |  | 21.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 19.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 6 | NK | 23.0 |  |  |  | 10.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | S23 | 1 | PR | 15.0 |  |  |  |  |  |  |  |  |  |  |  |  | 7.3 |  |  |  |  |  |  |
|  |  |  |  |  | 23.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 20.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 2 | PR | 20.0 |  |  |  |  |  |  |  |  |  |  |  |  | 6.0 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 6.9 |  |  |  |  |  |  |
|  |  |  | 3 | PR | 19.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 22.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 4 | NK | 20.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 25.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 26.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 19.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 5 | NK | 28.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 14.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | S24 | 1 | PR | 3.5 |  |  | 40.0 | 11.0 | 31.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 16.0 |  |  |  | 6.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 5.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 11.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 13.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 2 | PR | 5.5 |  |  |  |  |  |  |  |  |  |  |  |  | 8.4 |  |  |  |  | 29 |  |
|  |  |  | 3 | PR | 12.0 |  |  |  | 7.5 |  | 28.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 4 | NK | 19.5 |  | 36.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 8.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 18.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 5 | NK | 26.0 | 13.0 |  |  | 12.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 29.0 |  |  |  | 3.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 9.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

## Shallow, Survey 3, length data

| Group | Island | Site | Specimen | Obs | Species | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna sqamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia argus* | *Holothuria atra* | *Actinopyga mauritiana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | *Thelenota anax* | *Thelenota ananas* | *Actinopyga miliaris* | *Holothuria nobilis* | *Holothuria edulis* |
| | | | 6 | NK | | | | | | | | | 16.5 | | | | | | | | | | | |
| Suavanao | 7 | S25 | 2 | PR | | | | | | | | | | | | | | 8.6 | | | | | | |
| | | | 4 | NK | | | | | | | | | | | 27.0 | | | 7.5 | | | | | | |
| | | | | | | | | | | | | | | | | | | 11.0 | | | | | | |
| | | | | | | | | | | | | | | | | | | 8.5 | | | | | | |
| | | | 5 | NK | 18.0 | | | | | | | | | | 24.5 | | | | | | | | | |
| | | | 6 | NK | 10.0 | | | | | | | | | | 27.0 | | | | | | | | | |
| | | S26 | 2 | PR | | | | | | | | | | 31.0 | | | | | | | | | | |
| | | | 4 | NK | 9.5 | | | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 32.5 | | | | | | | | | | | | | | | | | | | |
| | | | | | 32.0 | | | | | | | | | | | | | | | | | | | |
| | | S27 | 1 | PR | 22.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 26.0 | | | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 28.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 17.0 | | | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | | | | | | | | | | | 25.0 | | | 11.7 | | | | | | |
| | | | 4 | NK | 29.0 | | | | | | | | | | | | | 11.5 | | | | | | |
| | | | 5 | NK | | | | | | | | | | | | | | 12.4 | | | | | | |
| | | S28 | 1 | PR | 25.0 | | | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 25.5 | | | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 20.0 | | | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | 4.0 | | | | | | | | | | 24.0 | | | | | | | | | |
| | | | | | 21.5 | | | | | | | | | | | | | | | | | | | |
| | | | 5 | NK | 26.0 | | | | | | | | | | 24.5 | | | | | | | | | |
| | | | | | 6.0 | | | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 26.0 | | | | | | | | | | | | | 13.0 | | | | | | |
| | | | | | 24.5 | | | | | | | | | | | | | 13.2 | | | | | | |
| | | | | | | | | | | | | | | | | | | 11.0 | | | | | | |
| | | | | | | | | | | | | | | | | | | 10.7 | | | | | | |
| | | S29 | 1 | PR | 22.0 | | | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 18.0 | | | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 28.0 | | | | | | | | | | | | | | | | | | | |
| | | | 4 | NK | 15.0 | | | | | | | | | | | | | 11.0 | | | | | | |
| | | | 5 | NK | 23.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 21.0 | | | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | | | | | | | | | | | | | | 10.0 | | | | | | |
| | | S30 | 2 | PR | 18.0 | | | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 26.0 | | | | | | | | | | | | | 9.2 | | | | | | |
| | | | 5 | NK | | | | | | | | | | | | | | 10.0 | | | | | | |
| | | | 6 | NK | 20.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 26.0 | | | | | | | | | | | | | | | | | | | |
| | | S31 | 1 | PR | 18.0 | | | | | | | | | | | | | | | | | | | |
| | | | 2 | PR | 17.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 10.0 | | | | | | | | | | | | | | | | | | | |
| | | | 3 | PR | 19.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 31.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 32.0 | | | | | | | | | | | | | | | | | | | |
| | | | 5 | NK | 8.0 | | | | | | | | | | | | | | | | | | | |
| | | | | | 13 | | | | | | | | | | | | | | | | | | | |
| | | | 6 | NK | 19 | | | | | | | | | | | | | 9 | | | | | | |
| | | | | | 9.5 | | | | | | | | | | | | | | | | | | | |
| | | | | | 12 | | | | | | | | | | | | | | | | | | | |
| | | | | | 21.5 | | | | | | | | | | | | | | | | | | | |
| | | | | | 25 | | | | | | | | | | | | | | | | | | | |
| | | S32 | 1 | NK | 20 | | | | 9 | | | | | | | | | 8.5 | | | | | | |
| | | | | | 22 | | | | 14 | | | | | | | | | | | | | | | |
| | | | | | | | | | 8.5 | | | | | | | | | | | | | | | |
| | | | | | | | | | 9 | | | | | | | | | | | | | | | |
| | | | | | | | | | 12 | | | | | | | | | | | | | | | |
| | | | 2 | NK | | | | | | 35 | | | | | | | | | | | | | | |
| | | | 3 | NK | 18 | | | | 3.5 | | | | | | | | | | | | | | | 25 |
| | | | | | | | | | 10.5 | | | | | | | | | | | | | | | |
| | | | | | | | | | 4 | | | | | | | | | | | | | | | |
| | | | | | | | | | 16 | | | | | | | | | | | | | | | |
| | | | | | | | | | 13 | | | | | | | | | | | | | | | |
| | | | | | | | | | 13 | | | | | | | | | | | | | | | |

## Shallow, Survey 3, length data

| Group | Island | Site | Specimen | Obs | Species | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number varies by site | | *Tridacna maxima* | *Tridacna gigas* | *Tridacna derasa* | *Tridacna squamosa* | *Tridacna crocea* | *Hippopus hippopus* | *Stichopus chloronotus* | *Bohadschia graeffei* | *Bohadschia argus* | *Holothuria atra* | *Actinopyga mauritiana* | Brown stonefish * | *Tectus pyramis* | *Trochus niloticus* | *Pinctada margaritifera* | *Thelenota anax* | *Thelenota ananas* | *Actinopyga miliaris* | *Holothuria nobilis* | *Holothuria edulis* |
| | | | 4 | PR | 16 | | | | 4 | | | | | | | | | | | | | | | |
| | | | | | 12 | | | | 11 | | | | | | | | | | | | | | | |
| | | | | | | | | | 10 | | | | | | | | | | | | | | | |
| | | | | | | | | | 4 | | | | | | | | | | | | | | | |
| | | | | | | | | | 8 | | | | | | | | | | | | | | | |
| | | | | | | | | | 10 | | | | | | | | | | | | | | | |
| | | | | | | | | | 6 | | | | | | | | | | | | | | | |
| | | | | | | | | | 11 | | | | | | | | | | | | | | | |
| | | | | | | | | | 6 | | | | | | | | | | | | | | | |
| | | | | | | | | | 8 | | | | | | | | | | | | | | | |
| | | | | | | | | | 12 | | | | | | | | | | | | | | | |
| | | | | | | | | | 10 | | | | | | | | | | | | | | | |
| | | | | | | | | | 13 | | | | | | | | | | | | | | | |
| | | | | | | | | | 8 | | | | | | | | | | | | | | | |
| | | | | | | | | | 7 | | | | | | | | | | | | | | | |
| | | | | | | | | | 10 | | | | | | | | | | | | | | | |
| | | | | | | | | | 10 | | | | | | | | | | | | | | | |
| | | | 5 | PR | | | | | 12 | | | | | | | | | | | | | | | |
| | | | | | | | | | 4 | | | | | | | | | | | | | | | |
| | | | | | | | | | 12 | | | | | | | | | | | | | | | |
| | | | | | | | | | 13 | | | | | | | | | | | | | | | |
| | | | 6 | PR | | | | | 12 | | | 33.5 | | | | | | 6.5 | | | | | | |
| | | | | | | | | | 10 | | | | | | | | | | | | | | | |
| | | | | | | | | | 10 | | | | | | | | | | | | | | | |
| | | | | | | | | | 10 | | | | | | | | | | | | | | | |
| | | | | | | | | | 10 | | | | | | | | | | | | | | | |

## Appendix 2k. Raw data for deep habitat, Survey 3, July/August 1995.

**Rep = replicate number, Obs = initials of observer, * indicates uncertain identification**

| Group | Island | Site | Rep | Obs | Species | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* | Brownstone fish * |
| Waghena | 1 | D1 | 1 | PR | | | | | | | | | | | | | | | |
| | | | 2 | PR | 1 | | | | | | | | | | | | | | |
| | | | 3 | PR | | | | | | | | | | | | | | | |
| | | | 4 | NK | | | | | | | | | | | | | | | |
| | | | 5 | NK | | 1 | | | | 1 | | | | | | | | | |
| | | | 6 | NK | | | | | | | | | | | | | | | |
| | | D2 | 1 | PR | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | | | | | | | | | | | | | |
| | | | 3 | PR | | | | | | | | | | | | | | | |
| | | | 4 | NK | | 1 | | | | | | | | | | | | | |
| | | | 5 | NK | | 1 | | | | | | | | | | | | | |
| | | | 6 | NK | | 1 | | | | | | | | | | | | | |
| | | D3 | 1 | PR | | 1 | | | | | | | | | | | | | |
| | | | 2 | PR | | | | | | | | | | | | | | | |
| | | | 3 | PR | | 2 | | | | | | | | | | | | | |
| | | | 4 | NK | | | | | | | | | | | | | | | |
| | | | 5 | NK | | | | | | | | | | | | | | | |
| | | | 6 | NK | | | | | | | | | | | | | | | |
| | | D4 | 1 | PR | | 2 | | | | | | | | 1 | | | | | |
| | | | 2 | PR | | 3 | | | | | | | 1 | | | | | | |
| | | | 3 | PR | | 2 | | | | | | | | | | | | | |
| | | | 4 | NK | | 2 | | | | | | | | | | 1 | | | |
| | | | 5 | NK | | 1 | | | | | | | | 1 | | | | | |
| | | | 6 | NK | | | | | | | | | | 4 | | 1 | | | |
| | 2 | D5 | 1 | PR | | | | | | | | | | 1 | | 1 | | | |
| | | | 2 | PR | | | | | | | | | | | | | | | |
| | | | 3 | PR | | | | | | | | | | 1 | | | | | |
| | | | 4 | NK | | | | | | | | | | 1 | | | | | |
| | | | 5 | NK | | | | | | | | | | | | 3 | | | |
| | | | 6 | NK | | | | | | | | | | | | 2 | | | |
| | | D6 | 1 | PR | | | | | | | | | | 1 | | | | | |
| | | | 2 | PR | | | | | | | | | 1 | | | | | | |
| | | | 3 | PR | | | | | | | | | | 1 | | | | | |
| | | | 4 | NK | | | | | | | | | | 1 | | | | | |
| | | | 5 | NK | | | | | | | | | | 1 | | | | | |
| | | | 6 | NK | | | | | | | | | 1 | | | | | | |
| | | D7 | 1 | PR | | | | | | | | | 1 | | | | | | |
| | | | 2 | PR | | | | | | 1 | | | | | | | | | |
| | | | 3 | PR | | | | | | | | | | | | | | | |
| | | | 4 | NK | | | | | | | | | 1 | | | | | | |
| | | | 5 | NK | | | | | | 1 | | | | | | | | | |
| | | | 6 | NK | | | | | | | | | | | | | | | |
| | | D8 | 1 | PR | | | | | | | | | | 1 | | | | | |
| | | | 2 | PR | | | | | | | | | | | | | | | |
| | | | 3 | PR | | | | | | | | | | | | | | | |
| | | | 4 | NK | | | | | | | | | | | | | | | |
| | | | 5 | NK | | | | | | | | | | | | | | | |
| | | | 6 | NK | | | | | | | | | | | | 1 | | | |
| Arnavons | 3 | D9 | 1 | PR | | | | | | | | | 2 | | | 1 | | | |
| | | | 2 | PR | | | | | | | | | | | | | | | |
| | | | 3 | PR | | | | | | | | | 2 | | | 1 | | | |
| | | | 4 | NK | | | | | | | | | 1 | | | 1 | | | |
| | | | 5 | NK | | | | | | | | | | | | | | | |
| | | | 6 | NK | | | | | | | | | | 1 | | 1 | | | |
| | | D10 | 1 | PR | | | | | 2 | | | | 11 | | | | 1 | | |
| | | | 2 | PR | 1 | | | | | | | | 1 | | | | 1 | | |
| | | | 3 | PR | | | | | | 1 | | | 3 | | | | | | |
| | | | 4 | NK | 1 | | | | | | | | 1 | | | | | | |
| | | | 5 | NK | | | | | | 1 | | | 3 | | 1 | | | | |

## Deep, Survey 3, abundance

| Group | Island | Site | Rep | Obs | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* | Brownstone fish* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 6 | NK | | | | | | | | | | | | | | | |
| | | D11 | 1 | PR | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | | | | | | | | | | | | | |
| | | | 3 | PR | | | | | | 1 | | | | | | | | | |
| | | | 4 | NK | | | | | | | | | | | | | | | |
| | | | 5 | NK | | | | | | | | | | | | | | | |
| | | | 6 | NK | | | | | | | | | | | | 2 | | | |
| | | D12 | 1 | PR | | | | | | | | | | | | 2 | | | |
| | | | 2 | PR | | | | | | | | | | 1 | | 1 | | | |
| | | | 3 | PR | | | | | | | | | 1 | | | | | | |
| | | | 4 | NK | | | | | | | | | | | | | | | |
| | | | 5 | NK | | | | | | | | | | | | 1 | | | |
| | | | 6 | NK | | | | | | | | | 1 | | | | | | |
| | 4 | D13 | 1 | PR | | | | | | | | | | | | 1 | | | |
| | | | 2 | PR | | 1 | | | | | | | | | | 1 | | | |
| | | | 3 | PR | | | | | | | | | | 1 | | | | | |
| | | | 4 | FRA | | | | | | | | | | | | 1 | | | |
| | | | 5 | FRA | | | | | | | | | | | | | | | |
| | | | 6 | FRA | | 1 | | | | | | | 2 | | | | | | |
| | | D14 | 1 | PR | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | | | | | | | | | | | | | |
| | | | 3 | PR | | 1 | | | | | | | | 2 | | | | | |
| | | | 4 | MOT. | | | | | | | | | | 2 | | | | | |
| | | | 5 | MOT. | 1 | | | | | | | | | 1 | | | | | |
| | | | 6 | MOT. | | | | | | | | | 1 | | | | | | |
| | | D15 | 1 | PR | | | | | | | | | | 1 | | | | | |
| | | | 2 | PR | 1 | | | | | | | | | | | | | | |
| | | | 3 | PR | | | | | | | | | | | | | | | |
| | | | 4 | NK | | | | | | | | | | | | | | | |
| | | | 5 | NK | | | | | | | | | | | | | | | |
| | | | 6 | NK | | | | | | | | | | | | | | | |
| | | D16 | 1 | PR | 1 | | | | | | | | 5 | | | | | | |
| | | | 2 | PR | | | | | | | | | | | | | | | |
| | | | 3 | PR | | | | | | 1 | | | | | | | | | |
| | | | 4 | NK | 1 | | | | | | | | | | | | | | |
| | | | 5 | NK | | | | | | | | | 1 | 1 | | | | | |
| | | | 6 | NK | | | | | | | | | | | | 3 | | | |
| Ysabel | 5 | D17 | 1 | PR | 1 | | | | | | | | | | | | | | |
| | | | 2 | PR | 1 | | | | | | | | | | | | | | |
| | | | 3 | PR | | | | | | | | | 2 | | | | | | |
| | | | 4 | NK | | | | | | | | | | | | | | | |
| | | | 5 | NK | | | | | | | | | 1 | | | | | | |
| | | | 6 | NK | | | | | | | | | | | | | | | 1 |
| | | D18 | 1 | PR | | 1 | | | | | | | | 2 | | | | | |
| | | | 2 | PR | | 1 | | | | | | | | 1 | | | | | |
| | | | 3 | PR | | | | | | | | | | | 1 | | | | |
| | | | 4 | NK | | | | | | | | | | 3 | | | | | |
| | | | 5 | NK | | | | | | | | | | | | | | | |
| | | | 6 | NK | | | | | | | | | | | | | | | |
| | | D19 | 1 | PR | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | | | | | | | | | | | | | |
| | | | 3 | PR | | | | | | | | | | | | | | | |
| | | | 4 | NK | | | | | | | | | | 2 | | | | | |
| | | | 5 | NK | | | | | | | | | | | | | | | |
| | | | 6 | NK | | 1 | | | | | | | | | | | | | |
| | | D20 | 1 | PR | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | | | | | | | | | | | | | |
| | | | 3 | PR | | | | | | | | | | 1 | | | | | |
| | | | 4 | MOT. | 1 | | | | | | | | | | | | | | |
| | | | 5 | MOT. | 1 | | | | | | | | | 1 | | | | | |
| | | | 6 | MOT. | | | | | | | | | | | | | | | |
| | 6 | D21 | 1 | PR | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | | | | | | | | | | | | | |

## Deep, Survey 3, abundance

| Group | Island | Site | Rep | Obs | Species | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* | Brownstone fish * |
| | | | 3 | PR | | | | | | 1 | | | | | | | | | |
| | | | 4 | MOT | | | | | | | 1 | | | | | | | | |
| | | | 5 | MOT | | | | | | | | | | | | | | | |
| | | | 6 | MOT | | | | | | | | | | | | | | | |
| | | D22 | 1 | PR | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | 1 | | | | | | | | | | | | |
| | | | 3 | PR | | | | | | | | | | 1 | | 1 | | | |
| | | | 4 | NK | | | | | | | | | | | | 4 | | | |
| | | | 5 | NK | | | | | | | | | | 2 | | 5 | | | |
| | | | 6 | NK | | | | | | | | | 1 | | | 5 | | | |
| | | D23 | 1 | PR | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | | | | | | | | | | | | | |
| | | | 3 | PR | | | | | | | | | | | | | | | |
| | | | 4 | NK | | | | | | | | | | 1 | | | | | |
| | | | 5 | NK | 1 | | | | | | | | | | | | | | |
| | | | 6 | NK | | | | | | | | | | | | | | | |
| | | D24 | 1 | PR | | | | | | | | | 1 | | | | | | |
| | | | 2 | PR | | | | | 1 | | 1 | | 1 | 1 | | | | | |
| | | | 3 | PR | 1 | | | | | | | | | | | | | | |
| | | | 4 | NK | | | | | 2 | | | | 1 | | | | | | |
| | | | 5 | NK | | | | | | | | | 1 | | | | | | |
| | | | 6 | NK | 1 | 2 | | | | | | | | | | | | | |
| Suavanao | 7 | D25 | 1 | PR | | | | | | 1 | | | | | | | | | |
| | | | 2 | PR | | | | | | 1 | | | | | | | | | |
| | | | 3 | PR | | | | | | | | | | | | | 2 | | |
| | | | 4 | CHRI | | | | | | | | | | | | | 1 | | |
| | | | 5 | CHRI | | 1 | | | | | | | | | | | | | |
| | | | 6 | CHRI | | 1 | | | | | | | | | | | | | |
| | | D26 | 1 | PR | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | | | | | | | | 1 | | | | | |
| | | | 3 | PR | | 1 | | | | | | | 2 | | | | | | 1 |
| | | | 4 | NK | | | | | | | | | 1 | | | | | | |
| | | | 5 | NK | | | | | | | | | | | | | | | |
| | | | 6 | NK | | 1 | | | | | | | | | | | | | |
| | | D27 | 1 | PR | | 1 | | | | | | | | | | | | | |
| | | | 2 | PR | | 1 | | | | | | | | 3 | | | 1 | | |
| | | | 3 | PR | | | | | | | | | | 5 | | | 1 | | |
| | | | 4 | NK | | | | | | | | | | | | | | | |
| | | | 5 | NK | | | | | | | | | | | | | 1 | | |
| | | | 6 | NK | | | | | | | | | | | | | | | |
| | | D28 | 1 | PR | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | | | | | | | | | | | 1 | | |
| | | | 3 | PR | | | | | | | | | | | | | 2 | | |
| | | | 4 | NK | | | | | | | | | | | | | 1 | | |
| | | | 5 | NK | | | | | | | | | | | | | 1 | 1 | |
| | | | 6 | NK | | | | | | | | | | | | | | | |
| | 8 | D29 | 1 | PR | | 1 | | | | | | | | | | | | | |
| | | | 2 | PR | 1 | | | | | 1 | | | | | | 1 | 2 | | |
| | | | 3 | PR | | | | | | | | | | 1 | | 1 | | | |
| | | | 4 | NK | | | | | | | | | | | | | | | |
| | | | 5 | NK | | 1 | | | | | | | | | | | | | |
| | | | 6 | NK | | | | | | | | | | | | | | | |
| | | D30 | 1 | PR | | 1 | | | | | | | | | | | 2 | | |
| | | | 2 | PR | | | | | | | | | | | | | | | |
| | | | 3 | PR | 1 | 2 | | | | | | | | | | | | | |
| | | | 4 | NK | | 1 | | | | | | | | | | | | | |
| | | | 5 | NK | | 1 | | | | | | | | | | | | | |
| | | | 6 | NK | | 1 | | | | | | | | 2 | | | | | |
| | | D31 | 1 | PR | | | | | | | | | | | | | | | |
| | | | 2 | PR | | | | | | | | | | | | | | | |
| | | | 3 | PR | | | | | | | | | | | | | 1 | | |
| | | | 4 | NK | | | | | | | | | | | | | | | |
| | | | 5 | NK | | | | | | | | | 1 | | | | 1 | | |

## Deep, Survey 3, abundance

| Group | Island | Site | Rep | Obs | Species | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* | Brownstone fish * |
| | | | 6 | NK | | | | | | | | | | | | | | | |
| | | D32 | 1 | PR | | 1 | | | | | | | | | | | | | |
| | | | 2 | PR | | 1 | | | | | | | | | | | | | |
| | | | 3 | PR | | | | | | | | | | | | | | | |
| | | | 4 | NK | | 2 | | | | | | | | | | | | | |
| | | | 5 | NK | | | | | | | | | | 1 | | | | | |
| | | | 6 | NK | | | | | | | | | | | | | | | |
| Total | | | | | | | | | | | | | | | | | | | |

## Appendix 21. Length-frequency data for deep habitat, Survey 3, July/August 1995

Specimen = replicate. * indicates uncertain identification.

| Group | Island | Site | Specimen | Obs | Species | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Stichopus variegatus* | *Thelanota anax* | *Thelanota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* | Brownstone fish * |
| Waghena | 1 | D1 | 2 | PR | 60.0 | | | | | | | | | | | | | | |
| | | | 5 | NK | | 69.0 | | | | 40.0 | | | | | | | | | |
| | | D2 | 4 | NK | | 62.0 | | | | | | | | | | | | | |
| | | | 5 | NK | | 67.5 | | | | | | | | | | | | | |
| | | | 6 | NK | | 51.5 | | | | | | | | | | | | | |
| | | D3 | 1 | PR | | 59.0 | | | | | | | | | | | | | |
| | | | | | | 57.0 | | | | | | | | | | | | | |
| | | | | | | 49.0 | | | | | | | | | | | | | |
| | | | 2 | PR | | 72.0 | | | | | | | | | | | | | |
| | | | | | | 49.0 | | | | | | | | | | | | | |
| | | | 3 | PR | | 70.0 | | | | | | | | | | | | | |
| | | | | | | 52.0 | | | | | | | | | | | | | |
| | | D4 | 1 | PR | | 54.0 | | | | | | | | 51.0 | | | | | |
| | | | | | | 57.0 | | | | | | | | | | | | | |
| | | | | | | 50.0 | | | | | | | | | | | | | |
| | | | | | | 52.0 | | | | | | | | | | | | | |
| | | | 2 | PR | | 60.0 | | | | | | | 43.0 | | | | | | |
| | | | | | | 71.0 | | | | | | | | | | | | | |
| | | | | | | 64.0 | | | | | | | | | | | | | |
| | | | 3 | PR | | 70.0 | | | | | | | | | | | | | |
| | | | | | | 66.0 | | | | | | | | | | | | | |
| | | | | | | 52.0 | | | | | | | | | | | | | |
| | | | 4 | NK | | 59.5 | | | | | | | | | | 47.0 | | | |
| | | | | | | 54.0 | | | | | | | | | | | | | |
| | | | 5 | NK | | 51.0 | | | | | | | | 37.0 | | | | | |
| | | | 6 | NK | | | 57.0 | | | | | | | 39.5 | | 44.5 | | | |
| | | | | | | | | | | | | | | 43.5 | | | | | |
| | | | | | | | | | | | | | | 45.0 | | | | | |
| | | | | | | | | | | | | | | 35.0 | | | | | |
| | | D5 | 1 | PR | | | | | | | | | | 37.0 | | 46.0 | | | |
| | | | 3 | PR | | | | | | | | | | 36.0 | | 43.0 | | | |
| | | | 4 | NK | | | | | | | | | | 34.0 | | | | | |
| | | | 5 | NK | | | | | | | | | | | | 44.5 | | | |
| | | | | | | | | | | | | | | | | 43.5 | | | |
| | | | | | | | | | | | | | | | | 43.0 | | | |
| | | | 6 | NK | | | | | | | | | | | | 32.0 | | | |
| | | | | | | | | | | | | | | | | 40.5 | | | |
| | | D6 | 1 | PR | | | | | | | | | | 48.5 | | | | | |
| | | | | | | | | | | | | | | 44.0 | | | | | |
| | | | 2 | PR | | | | | | | | | 46.0 | 41.0 | | | | | |
| | | | | | | | | | | | | | 45.0 | | | | | | |
| | | | 3 | PR | | | | | | | | | | 42.0 | | | | | |
| | | | 4 | NK | | | | | | | | | | 36.0 | | | | | |
| | | | 5 | NK | | | | | | | | | | 44.0 | | | | | |
| | | | 6 | NK | | | | | | | | | 45.0 | | | | | | |
| | | D7 | 1 | PR | | | | | | | | | 56.0 | | | | | | |
| | | | 2 | PR | | | | | | 42.0 | | | | | | | | | |
| | | | 4 | NK | | | | | | | | | 45.5 | | | | | | |
| | | | 5 | NK | | | | | | 41.0 | | | | | | | | | |
| | | D8 | 1 | PR | | | | | | | | | | 41.5 | | | | | |
| | | | 2 | PR | | | | | | | | | | 42.0 | | | | | |
| | | | 6 | NK | | | | | | | | | | | | 40.5 | | | |
| Amavons | 3 | D9 | 1 | PR | | | | | | | | | 48.0 | | | 48.0 | | | |
| | | | | | | | | | | | | | 56.0 | | | | | | |
| | | | 2 | PR | | | 47.0 | | | | | | | | | | | | |
| | | | 3 | PR | | 64.5 | | | | | | | 57.0 | | | 49.5 | | | |
| | | | | | | | | | | | | | 48.0 | | | 50.0 | | | |
| | | | 4 | NK | | | | | | | | | 37.0 | | | 46.0 | | | |
| | | | 6 | NK | | | | | | | | | | 39.0 | | | | | |

# Deep, Survey 3, length data

| Group | Island | Site | Specimen | Obs | Species | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Stichopus variegatus* | *Thelenota anax* | *Thelenota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* | Brownstone fish * |
| | | | | | | | | | | | | | | | | 48.0 | | | |
| | | D10 | 1 | PR | | | | | 27.0 | | | | 41.0 | | | | 37.5 | | |
| | | | | | | | | | 28.0 | | | | 42.0 | | | | | | |
| | | | | | | | | | 27.0 | | | | 48.5 | | | | | | |
| | | | | | | | | | | | | | 34.5 | | | | | | |
| | | | | | | | | | | | | | 43.5 | | | | | | |
| | | | | | | | | | | | | | 45.0 | | | | | | |
| | | | | | | | | | | | | | 52.5 | | | | | | |
| | | | | | | | | | | | | | 48.5 | | | | | | |
| | | | | | | | | | | | | | 39.0 | | | | | | |
| | | | | | | | | | | | | | 39.5 | | | | | | |
| | | | | | | | | | | | | | 47.5 | | | | | | |
| | | | 2 | PR | 51.5 | | | | | | | | 46.5 | | | | 48.0 | | |
| | | | 3 | PR | | | | | | 41.0 | | | 46.0 | | | | | | |
| | | | | | | | | | | | | | 50.0 | | | | | | |
| | | | | | | | | | | | | | 50.0 | | | | | | |
| | | | 4 | NK | 61.5 | | | | | | | | 36.5 | | | | | | |
| | | | 5 | NK | | | | | | 31.5 | | | 45.0 | | 31.5 | | | | |
| | | | | | | | | | | | | | 35.0 | | | | | | |
| | | | | | | | | | | | | | 46.0 | | | | | | |
| | | D11 | 1 | PR | | | | | | 37.0 | | | | | | | | | |
| | | | 2 | PR | | | | | | 38.9 | | | | | | | | | |
| | | | 3 | PR | | | | | | 34.0 | | | | | | | | | |
| | | | 6 | NK | | | | | | | | | | | | 47.5 | | | |
| | | | | | | | | | | | | | | | | 51.5 | | | |
| | | D12 | 1 | PR | | | | | | | | | | | | 44.5 | | | |
| | | | | | | | | | | | | | | | | 35.0 | | | |
| | | | 2 | PR | | | | | | | | | | 48.5 | | 37.0 | | | |
| | | | 3 | PR | | | | | | | | | 54.5 | | | | | | |
| | | | 5 | NK | | | | | | | | | | | | 49.5 | | | |
| | | | 6 | NK | | | | | | | | | 60.0 | | | | | | |
| | | D13 | 1 | PR | | | | | | | | | | | | 56.0 | | | |
| | | | 2 | PR | | 52.0 | | | | | | | | | | 56.0 | | | |
| | | | 3 | PR | | | | | | | | | | 41.5 | | | | | |
| | | | 4 | Franci | | | | | | | | | | | | 53.0 | | | |
| | | | 6 | Franci | | 48.0 | | | | | | | 50.0 | | | | | | |
| | | | | | | | | | | | | | 40.0 | | | | | | |
| | | D14 | 2 | PR | | 54.5 | | | | | | | | | | | | | |
| | | | 3 | PR | | 56.5 | | | | | | | | 44.5 | | | | | |
| | | | | | | | | | | | | | | 52.0 | | | | | |
| | | | 4 | Mote | | | | | | | | | | 39.0 | | | | | |
| | | | | | | | | | | | | | | 40.0 | | | | | |
| | | | 5 | Mote | 54.0 | | | | | | | | | 43.0 | | | | | |
| | | | 6 | Mote | | | | | | | | | 26.5 | | | | | | |
| | | D15 | 1 | PR | | | | | | | | | | 48.0 | | | | | |
| | | | | | | | | | | | | | | 46.5 | | | | | |
| | | | 2 | PR | 60.0 | | | | | | | | | | | | | | |
| | | | 6 | NK | 46.5 | | | | | | | | | | | | | | |
| | | D16 | 1 | PR | 47.0 | | | | | | | | 46.0 | | | | | | |
| | | | | | | | | | | | | | 41.0 | | | | | | |
| | | | | | | | | | | | | | 44.0 | | | | | | |
| | | | | | | | | | | | | | 43.0 | | | | | | |
| | | | | | | | | | | | | | 48.0 | | | | | | |
| | | | 2 | PR | | | | | 34.5 | | | | | | | | | | |
| | | | 3 | PR | | | | | | 22.0 | | | | | | | | | |
| | | | 4 | NK | 48.5 | | | | | | | | | | | | | | |
| | | | 5 | NK | | | | | | | | | 41.5 | 43.5 | | | | | |
| | | | 6 | NK | | | | | | | | | | | | 49.0 | | | |
| | | | | | | | | | | | | | | | | 50.0 | | | |
| | | | | | | | | | | | | | | | | 48.0 | | | |
| Ysabel | 5 | D17 | 1 | PR | 59.5 | | | | | | | | | | | | | | |
| | | | 2 | PR | 52.0 | | | | | | | | | | | | | | |

## Deep, Survey 3, length data

| Group | Island | Site | Specimen | Obs | Species | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Stichopus variegatus* | *Thelanota anax* | *Thelenota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* | Brownstone fish* |
| | | | 3 | PR | | | | | | | | | 35.5 | | | | | | |
| | | | | | | | | | | | | | 55.0 | | | | | | |
| | | | 5 | NK | | | | | | | | | 46.0 | | | | | | |
| | | | 6 | NK | | | | | | | | | | | | | | | |
| | | D18 | 1 | PR | | 75.0 | | | | | | | | 40.5 | | | | | |
| | | | | | | | | | | | | | | 39.5 | | | | | |
| | | | 2 | PR | | 69.0 | | | | | | | | 44.0 | | | | | |
| | | | 3 | PR | | | | | | | | | | | 45.0 | | | | |
| | | | 4 | NK | | | | | | | | | | 38.0 | | | | | |
| | | | | | | | | | | | | | | 42.5 | | | | | |
| | | | | | | | | | | | | | | 42.0 | | | | | |
| | | | | | | | | | | | | | | 36.5 | | | | | |
| | | D19 | 1 | PR | | | | | | | | | | 44.5 | | | | | |
| | | | 3 | PR | | | | | | | | | | 44.0 | | | | | |
| | | | 4 | NK | | | | | | | | | | 42.0 | | | | | |
| | | | | | | | | | | | | | | 43.0 | | | | | |
| | | | 6 | NK | | 62.0 | | | | | | | | | | | | | |
| | | D20 | 3 | PR | | | | | | | | | | 43.0 | | | | | |
| | | | 4 | PR | 49.0 | | | | | | | | | 45.0 | | | | | |
| | | | 5 | Mote | 50.5 | | | | | | | | | 49.5 | | | | | |
| | | D21 | 2 | PR | | | | | | | | | | | | 48.0 | | | |
| | | | | | | | | | | | | | | | | 50.0 | | | |
| | | | 3 | PR | | | | | | 36.0 | | | | | | | | | |
| | | | 4 | Mote | | | | | | | 33.0 | | | | | | | | |
| | | | 6 | Mote | | | | | | | | | | | | 51.0 | | | |
| | | | | | | | | | | | | | | | | 44.0 | | | |
| | | D22 | 1 | PR | | | | | | | | | | | | 52.0 | | | |
| | | | | | | | | | | | | | | | | 53.0 | | | |
| | | | 2 | PR | | | 66.0 | | | | | | | | | | | | |
| | | | 3 | PR | | | | | | | | | | 44.0 | | 57.0 | | | |
| | | | 4 | NK | | | | | | | | | | | | 54.5 | | | |
| | | | | | | | | | | | | | | | | 53.0 | | | |
| | | | | | | | | | | | | | | | | 45.0 | | | |
| | | | | | | | | | | | | | | | | 48.0 | | | |
| | | | 5 | NK | | | | | | | | | | 39.0 | | 46.5 | | | |
| | | | | | | | | | | | | | | 47.0 | | 47.0 | | | |
| | | | | | | | | | | | | | | | | 39.0 | | | |
| | | | | | | | | | | | | | | | | 51.0 | | | |
| | | | 6 | NK | | | | | | | | | 45.0 | | | 53.0 | | | |
| | | | | | | | | | | | | | 50.5 | | | 52.0 | | | |
| | | | | | | | | | | | | | | | | 48.5 | | | |
| | | | | | | | | | | | | | | | | 44.0 | | | |
| | | | | | | | | | | | | | | | | 54.5 | | | |
| | | | | | | | | | | | | | | | | 48.0 | | | |
| | | | | | | | | | | | | | | | | 51.0 | | | |
| | | | | | | | | | | | | | | | | 39.5 | | | |
| | | D23 | 4 | NK | | | | | | | | | | 43.5 | | | | | |
| | | | 5 | NK | 47.0 | | | | | | | | | | | | | | |
| | | D24 | 1 | PR | | 60.0 | | | | | | | 44.0 | | | | | | |
| | | | 2 | PR | | | | | 39.0 | | 31.0 | | 51.0 | 52.0 | | | | | |
| | | | 3 | PR | 56.0 | | | | 33.0 | | | | | | | | | | |
| | | | 4 | NK | | | | | 33.0 | | | | 32.0 | | | | | | |
| | | | | | | | | | 25.0 | | | | | | | | | | |
| | | | 5 | NK | | | | | | | | | 42.5 | | | | | | |
| | | | 6 | NK | 54.0 | 55.0 | | | | | | | | | | | | | |
| | | | | | | 62.0 | | | | | | | | | | | | | |
| Suavanao | 7 | D25 | 1 | PR | | | | | | 36.0 | | | | | | | | | |
| | | | 2 | PR | | | | | | 33.0 | | | | | | | | | |
| | | | 3 | PR | | | | | | | | | | | | | 28.0 | | |
| | | | | | | | | | | | | | | | | | 29.0 | | |
| | | | 4 | Chris | | | | | | | | | | | | | 17.0 | | |

## Deep, Survey 3, length data

| Group | Island | Site | Specimen | Obs | *Stichopus variegatus* | *Thelenota anax* | *Thelenota ananas* | Black sandfish* | Blackfish* | *Bohadschia argus* | *Bohadschia marmorata* | *Bohadschia graeffei* | *Holothuria atra* | *Holothuria fuscogilva* | *Holothuria nobilis* | *Holothuria fuscopunctata* | *Holothuria edulis* | *Pinctada maxima* | Brownstone fish * |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 5 | Chris | | 62.0 | | | | | | | | | | | | | |
| | | | 6 | Chris | | 60.0 | | | | | | | | | | | | | |
| | | | | | | 57.0 | | | | | | | | | | | | | |
| | | D26 | 2 | PR | | 50.0 | | | | | | | | 45.0 | | | | | |
| | | | 3 | PR | | 56.5 | | | | | | | 44.0 | | | | | | 25.0 |
| | | | | | | | | | | | | | 40.0 | | | | | | |
| | | | 4 | NK | | | | | | | | | 42.0 | | | | | | |
| | | | 6 | NK | | 51.0 | | | | | | | | | | | | | |
| | | D27 | 1 | PR | | 65.0 | | | | | | | | | | | | | |
| | | | 2 | PR | | 63.0 | | | | | | | | 47.0 | | | 37.0 | | |
| | | | | | | 67.0 | | | | | | | | 56.0 | | | | | |
| | | | | | | | | | | | | | | 42.0 | | | | | |
| | | | 3 | PR | | | | | | | | | | 46.0 | | | 34.0 | | |
| | | | | | | | | | | | | | | 43.0 | | | | | |
| | | | | | | | | | | | | | | 48.0 | | | | | |
| | | | | | | | | | | | | | | 48.0 | | | | | |
| | | | | | | | | | | | | | | 48.0 | | | | | |
| | | | | | | | | | | | | | | 43.0 | | | | | |
| | | | 5 | NK | | | | | | | | | | | | | 32.0 | | |
| | | D28 | 2 | PR | | | | | | | | | | | | | 21.5 | | |
| | | | 3 | PR | | | | | | | | | | | | | 30.0 | | |
| | | | | | | | | | | | | | | | | | 27.0 | | |
| | | | 4 | NK | | | | | | | | | | | | | 28.0 | | |
| | | | 5 | NK | | | | | | | | | | | | | 34.0 | 24.5 | |
| | | D29 | 1 | PR | | 62.5 | | | | | | | | | | | | | |
| | | | 2 | PR | 62.0 | | | | | 40.0 | | | | | | 48.0 | 28.0 | | |
| | | | | | | | | | | | | | | | | | 32.0 | | |
| | | | 3 | PR | | | | | | | | | | 41.0 | | 51.0 | | | |
| | | | 5 | NK | | 60.0 | | | | | | | | | | | | | |
| | | | 6 | NK | | 60.0 | | | | | | | | | | | | | |
| | | | | | | 46.0 | | | | | | | | | | | | | |
| | | | | | | 61.0 | | | | | | | | | | | | | |
| | | | | | | 48.0 | | | | | | | | | | | | | |
| | | | | | | 55.0 | | | | | | | | | | | | | |
| | | D30 | 1 | PR | | 52.0 | | | | | | | | | | | 39.5 | | |
| | | | | | | | | | | | | | | | | | 35.0 | | |
| | | | 3 | PR | 66.0 | 72.0 | | | | | | | | | | | | | |
| | | | | | | 50.0 | | | | | | | | | | | | | |
| | | | 4 | NK | | 69.0 | | | | | | | | | | | | | |
| | | | 5 | NK | | 59.5 | | | | | | | | | | | | | |
| | | | 6 | NK | | 63.0 | | | | | | | | 49.5 | | | | | |
| | | | | | | | | | | | | | | 45.0 | | | | | |
| | | D31 | 3 | PR | | | | | | | | | | | | | 40.0 | | |
| | | | 5 | NK | | | | | | | | | 34.0 | | | | 31.5 | | |
| | | D32 | 1 | PR | | 65.0 | | | | | | | | | | | | | |
| | | | 2 | PR | | 62.0 | | | | | | | | | | | | | |
| | | | 4 | NK | | 60.0 | | | | | | | | | | | | | |
| | | | | | | 57.0 | | | | | | | | | | | | | |
| | | | 5 | NK | | | | | | | | | | 46.0 | | | | | |

# Appendix 3. Asymmetrical ANOVA's for variates analysed from the shallow habitat.

Appendix 3a: Total number of species

C=ns, no transformation, alpha= 0.05

| Source of variation | df | SS | MS | F-ratio | Sig |
|---|---|---|---|---|---|
| Time | 2 | 7.358 | 3.679 | 2.153 | ns |
| Among Areas | 3 | 127.090 | 42.363 | NO TEST | |
| I vs C | 1 | 1.447 | 0.362 | | |
| Among C | 2 | 125.644 | 62.822 | | |
| Islands (Areas) | 4 | 36.042 | 9.010 | NO TEST | |
| I(A(C)) | 3 | 26.535 | 8.845 | | |
| I(A(I)) | 1 | 9.507 | 9.507 | | |
| Sites(I(A)) | 24 | 115.083 | 4.795 | 2.765 | ** |
| S(I(A(C))) | 18 | 85.375 | 4.743 | 4.139 | ** |
| S(I(A(I))) | 6 | 29.708 | 4.951 | 1.044 | ns |
| T x Among Areas | 6 | 10.254 | 1.709 | 0.824 | ns |
| T x I vs C | 2 | 8.133 | 4.067 | 1.059 | ns |
| T x Among C | 4 | 2.120 | 0.530 | 0.357 | ns |
| T x Islands (Areas) | 8 | 16.583 | 2.073 | 1.195 | ns |
| T x I(A(C)) | 6 | 8.903 | 1.484 | 1.295 | ns |
| T x I(A(I)) | 2 | 7.681 | 3.840 | 1.097 | ns |
| T x Sites(I(A)) | 48 | 83.250 | 1.734 | 1.840 | ** |
| T x S(IA(C))) | 36 | 41.250 | 1.146 | 1.216 | ns |
| T x S(I(A(I))) | 12 | 42.000 | 3.500 | 3.710 | *** |
| Residual | 480 | 452.330 | 0.942 | 0.942 | |

Appendix 3b: Total abundance of sea cucumbers

C= ns, transformation LogE(X+1), alpha= 0.05

| Source of variation | | SS | | | |
|---|---|---|---|---|---|
| | df | Real SS | MS | F-ratio | Sig |
| Time | 2 | 0.135 | 0.068 | 0.041 | ns |
| Among Areas | 3 | 31.729 | 10.576 | NO TEST | |
| I vs C | 1 | 1.688 | 1.688 | | |
| Among C | 2 | 30.042 | 15.021 | | |
| Islands (Areas) | 4 | 23.014 | 5.753 | NO TEST | |
| I(A(C)) | 3 | 15.451 | 5.150 | | |
| I(A(I)) | 1 | 7.563 | 7.563 | | |
| Sites(I(A)) | 24 | 50.694 | 2.112 | 2.892 | ** |
| S(I(A(C))) | 18 | 47.931 | 2.663 | 3.626 | ** |
| S(I(A(I))) | 6 | 2.764 | 0.461 | 0.173 | ns |
| T x Among Areas | 6 | 9.823 | 1.637 | 1.875 | ns |
| T x I vs C | 2 | 7.129 | 3.564 | 3.564 | ns |
| T x Among C | 4 | 2.694 | 0.674 | 0.811 | ns |
| T x Islands (Areas) | 8 | 6.986 | 0.873 | 1.196 | ns |
| T x I(A(C)) | 6 | 4.986 | 0.831 | 1.131 | ns |
| T x I(A(I)) | 2 | 2.000 | 1.000 | 1.393 | ns |
| T x Sites(I(A)) | 48 | 35.056 | 0.730 | 1.408 | ns |
| T x S(IA(C))) | 36 | 26.440 | 0.734 | 1.416 | ns |
| T x S(I(A(I))) | 12 | 8.616 | 0.718 | 1.384 | ns |
| Residual | 480 | 249.000 | 0.519 | 0.519 | |

Appendix 3c: Total abundance of giant clams

C=sig, no transformation, alpha= 0.01

| Source of variation | df | SS | MS | F-ratio | Sig |
|---|---|---|---|---|---|
| Time | 2 | 7.837 | 3.918 | 0.538 | ns |
| Among Areas | 3 | 105.519 | 35.173 | NO TEST | |
| I vs C | 1 | 64.172 | 64.172 | | |
| Among C | 2 | 41.347 | 20.674 | | |
| Islands (Areas) | 4 | 449.660 | 112.415 | NO TEST | |
| I(A(C)) | 3 | 445.319 | 148.440 | | |
| I(A(I)) | 1 | 4.340 | 4.340 | | |
| Sites(I(A)) | 24 | 1787.986 | 74.499 | 9.700 | * |
| S(I(A(C))) | 18 | 1701.556 | 94.531 | 11.673 | * |
| S(I(A(I))) | 6 | 86.431 | 14.405 | 0.152 | ns |
| T x Among Areas | 6 | 43.663 | 7.277 | 1.208 | ns |
| T x I vs C | 2 | 6.510 | 3.255 | 2.392 | ns |
| T x Among C | 4 | 37.153 | 9.288 | 1.226 | ns |
| T x Islands (Areas) | 8 | 48.194 | 6.024 | 0.784 | ns |
| T x I(A(C)) | 6 | 45.472 | 7.579 | 0.936 | ns |
| T x I(A(I)) | 2 | 2.722 | 1.361 | 0.212 | ns |
| T x Sites(I(A)) | 48 | 368.639 | 7.680 | 1.555 | * |
| T x S(IA(C))) | 36 | 291.528 | 8.098 | 1.640 | * |
| T x S(I(A(I))) | 12 | 77.111 | 6.426 | 0.794 | ns |
| Residual | 480 | 2370.167 | 4.938 | 4.938 | |

Appendix 3d: Total abundance of *Tridacna crocea*

C=sig, no transformation, alpha= 0.01

| Source of variation | df | SS | MS | F-ratio | Sig |
|---|---|---|---|---|---|
| Time | 2 | 5.056 | 2.528 | 1.079 | ns |
| Among Areas | 3 | 140.450 | 46.817 | NO TEST | |
| I vs C | 1 | 37.042 | 37.042 | | |
| Among C | 2 | 103.407 | 51.704 | | |
| Islands (Areas) | 4 | 252.757 | 63.189 | NO TEST | |
| I(A(C)) | 3 | 252.583 | 84.194 | | |
| I(A(I)) | 1 | 0.174 | 0.174 | | |
| Sites(I(A)) | 24 | 1503.097 | 62.629 | 29.014 | * |
| S(I(A(C))) | 18 | 1502.111 | 83.451 | 29.175 | * |
| S(I(A(I))) | 6 | 0.986 | 0.164 | 3.087 | * |
| T x Among Areas | 6 | 14.056 | 2.343 | 0.002 | ns |
| T x I vs C | 2 | 2.574 | 1.287 | 26.455 | * |
| T x Among C | 4 | 11.482 | 2.870 | 0.959 | ns |
| T x Islands (Areas) | 8 | 18.056 | 2.257 | 1.046 | ns |
| T x I(A(C)) | 6 | 17.958 | 2.993 | 1.046 | ns |
| T x I(A(I)) | 2 | 0.097 | 0.049 | 0.914 | ns |
| T x Sites(I(A)) | 48 | 103.611 | 2.159 | 0.880 | ns |
| T x S(IA(C))) | 36 | 102.972 | 2.860 | 1.167 | ns |
| T x S(I(A(I))) | 12 | 0.639 | 0.053 | 0.022 | ns |
| Residual | 480 | 1176.833 | 2.452 | 2.452 | |

## Appendix 3e: Total abundance of *Tridacna derasa*

C=sig, no transformation, alpha= 0.01

| Source of variation | df | SS | MS | F-ratio | Sig |
|---|---|---|---|---|---|
| Time | 2 | 1.135 | 0.568 | 0.904 | ns |
| Among Areas | 3 | 9.514 | 3.171 | NO TEST | |
| I vs C | 1 | 0.750 | 0.750 | | |
| Among C | 2 | 8.764 | 4.382 | | |
| Islands (Areas) | 4 | 0.458 | 0.115 | NO TEST | |
| I(A(C)) | 3 | 0.451 | 0.150 | | |
| I(A(I)) | 1 | 0.007 | 0.007 | | |
| Sites(I(A)) | 24 | 4.361 | 0.182 | 3.305 | * |
| S(I(A(C))) | 18 | 4.264 | 0.237 | 3.489 | * |
| S(I(A(I))) | 6 | 0.097 | 0.016 | 0.068 | ns |
| T x Among Areas | 6 | 3.767 | 0.628 | 6.345 | * |
| T x I vs C | 2 | 0.698 | 0.349 | 7.174 | ns |
| T x Among C | 4 | 3.069 | 0.767 | 6.630 | * |
| T x Islands (Areas) | 8 | 0.792 | 0.099 | 1.800 | ns |
| T x I(A(C)) | 6 | 0.694 | 0.116 | 1.705 | ns |
| T x I(A(I)) | 2 | 0.097 | 0.049 | 2.995 | ns |
| T x Sites(I(A)) | 48 | 2.639 | 0.055 | 0.445 | ns |
| T x S(IA(C))) | 36 | 2.444 | 0.068 | 0.549 | ns |
| T x S(I(A(I))) | 12 | 0.195 | 0.016 | 0.131 | ns |
| Residual | 480 | 59.333 | 0.124 | 0.124 | |

## Appendix 3f: Total abundance *Tridacna maxima*

C= ns, transformation LogE (X+1), alpha= 0.05

| Source of variation | df | SS | MS | F-ratio | Sig |
|---|---|---|---|---|---|
| Time | 2 | 0.814 | 0.407 | 1.386 | ns |
| Among Areas | 3 | 2.809 | 0.936 | NO TEST | |
| I vs C | 1 | 0.323 | 0.323 | | |
| Among C | 2 | 2.486 | 1.243 | | |
| Islands (Areas) | 4 | 14.353 | 3.588 | NO TEST | |
| I(A(C)) | 3 | 14.183 | 4.728 | | |
| I(A(I)) | 1 | 0.170 | 0.170 | | |
| Sites(I(A)) | 24 | 19.123 | 0.797 | 2.156 | * |
| S(I(A(C))) | 18 | 10.070 | 0.559 | 1.924 | ns |
| S(I(A(I))) | 6 | 9.053 | 1.509 | 2.697 | * |
| T x Among Areas | 6 | 1.763 | 0.294 | 0.736 | ns |
| T x I vs C | 2 | 0.303 | 0.151 | 0.342 | ns |
| T x Among C | 4 | 1.460 | 0.365 | 0.949 | ns |
| T x Islands (Areas) | 8 | 3.194 | 0.399 | 1.080 | ns |
| T x I(A(C)) | 6 | 2.309 | 0.385 | 1.324 | ns |
| T x I(A(I)) | 2 | 0.885 | 0.442 | 0.730 | ns |
| T x Sites(I(A)) | 48 | 17.736 | 0.370 | 1.344 | ns |
| T x S(IA(C))) | 36 | 10.465 | 0.291 | 1.058 | ns |
| T x S(I(A(I))) | 12 | 7.271 | 0.606 | 2.204 | * |
| Residual | 480 | 131.939 | 0.275 | 0.275 | |

Appendix 3g: Total abundance of *Hippopus hippopus*

C= ns, no transformation, alpha= 0.01

| Source of variation | df | SS | MS | F-ratio | Sig |
|---|---|---|---|---|---|
| Time | 2 | 0.219 | 0.109 | 1.800 | ns |
| Among Areas | 3 | 3.958 | 1.319 | NO TEST | |
| I vs C | 1 | 0.009 | 0.009 | | |
| Among C | 2 | 3.949 | 1.975 | | |
| Islands (Areas) | 4 | 3.181 | 0.795 | NO TEST | |
| I(A(C)) | 3 | 3.174 | 1.058 | | |
| I(A(I)) | 1 | 0.007 | 0.007 | | |
| Sites(I(A)) | 24 | 5.972 | 0.249 | 3.468 | * |
| S(I(A(C))) | 18 | 4.319 | 0.240 | 5.271 | * |
| S(I(A(I))) | 6 | 1.653 | 0.275 | 1.148 | ns |
| T x Among Areas | 6 | 0.365 | 0.061 | 2.501 | ns |
| T x I vs C | 2 | 0.328 | 0.164 | 23.739 | * |
| T x Among C | 4 | 0.037 | 0.009 | 0.307 | ns |
| T x Islands (Areas) | 8 | 0.194 | 0.024 | 0.339 | ns |
| T x I(A(C)) | 6 | 0.181 | 0.030 | 0.661 | ns |
| T x I(A(I)) | 2 | 0.014 | 0.007 | 0.046 | ns |
| T x Sites(I(A)) | 48 | 3.444 | 0.072 | 0.771 | ns |
| T x S(IA(C))) | 36 | 1.639 | 0.046 | 0.489 | ns |
| T x S(I(A(I))) | 12 | 1.805 | 0.150 | 1.617 | ns |
| Residual | 480 | 44.667 | 0.093 | 0.093 | |

Appendix 3h: Total abundance *Trochus niloticus*

C=sig, no transfromation, alpha= 0.01

| Source of variation | df | SS | MS | F-ratio | Sig |
|---|---|---|---|---|---|
| Time | 2 | 0.094 | 0.047 | 0.273 | ns |
| Among Areas | 3 | 7.589 | 2.530 | NO TEST | |
| I vs C | 1 | 0.047 | 0.047 | | |
| Among C | 2 | 7.542 | 3.771 | | |
| Islands (Areas) | 4 | 0.493 | 0.123 | NO TEST | |
| I(A(C)) | 3 | 0.486 | 0.162 | | |
| I(A(I)) | 1 | 0.007 | 0.007 | | |
| Sites(I(A)) | 24 | 11.292 | 0.470 | 1.964 | * |
| S(I(A(C))) | 18 | 10.083 | 0.560 | 2.421 | * |
| S(I(A(I))) | 6 | 1.208 | 0.201 | 0.360 | ns |
| T x Among Areas | 6 | 1.031 | 0.172 | 1.193 | ns |
| T x I vs C | 2 | 0.753 | 0.377 | 1.937 | ns |
| T x Among C | 4 | 0.278 | 0.069 | 0.545 | ns |
| T x Islands (Areas) | 8 | 1.153 | 0.144 | 0.601 | ns |
| T x I(A(C)) | 6 | 0.764 | 0.127 | 0.550 | ns |
| T x I(A(I)) | 2 | 0.389 | 0.194 | 0.736 | ns |
| T x Sites(I(A)) | 48 | 11.500 | 0.240 | 1.295 | ns |
| T x S(IA(C))) | 36 | 8.330 | 0.231 | 1.250 | ns |
| T x S(I(A(I))) | 12 | 3.170 | 0.264 | 1.427 | ns |
| Residual | 480 | 88.833 | 0.185 | 0.185 | |

### Appendix 3i: Total abundance *Bohadschia graeffei*

C=sig, no transformation, alpha= 0.01

| Source of variation | df | SS | MS | F-ratio | Sig |
|---|---|---|---|---|---|
| Time | 2 | 0.149 | 0.075 | 2.633 | ns |
| Among Areas | 3 | 0.991 | 0.330 | NO TEST | |
| I vs C | 1 | 0.098 | 0.098 | | |
| Among C | 2 | 0.894 | 0.447 | | |
| Islands (Areas) | 4 | 2.118 | 0.530 | NO TEST | |
| I(A(C)) | 3 | 1.424 | 0.475 | | |
| I(A(I)) | 1 | 0.695 | 0.695 | | |
| Sites(I(A)) | 24 | 15.681 | 0.653 | 3.789 | * |
| S(I(A(C))) | 18 | 10.847 | 0.603 | 6.008 | * |
| S(I(A(I))) | 6 | 4.833 | 0.806 | 1.337 | ns |
| T x Among Areas | 6 | 0.170 | 0.028 | 0.563 | ns |
| T x I vs C | 2 | 0.105 | 0.053 | 1.083 | ns |
| T x Among C | 4 | 0.065 | 0.016 | 0.318 | ns |
| T x Islands (Areas) | 8 | 0.403 | 0.050 | 0.292 | ns |
| T x I(A(C)) | 6 | 0.306 | 0.051 | 0.508 | ns |
| T x I(A(I)) | 2 | 0.097 | 0.049 | 0.125 | ns |
| T x Sites(I(A)) | 48 | 8.278 | 0.172 | 1.310 | ns |
| T x S(IA(C))) | 36 | 3.611 | 0.100 | 0.762 | ns |
| T x S(I(A(I))) | 12 | 4.667 | 0.389 | 2.955 | ** |
| Residual | 480 | 63.167 | 0.132 | 0.132 | |

### Appendix 3j: Total abundance *Holothuria atra*

C= sig, no transformation, alpha= 0.01

| Source of variation | df | SS | MS | F-ratio | Sig |
|---|---|---|---|---|---|
| Time | 2 | 0.510 | 0.255 | 1.000 | ns |
| Among Areas | 3 | 8.688 | 2.896 | NO TEST | |
| I vs C | 1 | 0.521 | 0.520 | | |
| Among C | 2 | 8.167 | 4.083 | | |
| Islands (Areas) | 4 | 10.083 | 2.521 | NO TEST | |
| I(A(C)) | 3 | 10.083 | 3.361 | | |
| I(A(I)) | 1 | 0.000 | 0.000 | | |
| Sites(I(A)) | 24 | 37.167 | 1.549 | 5.068 | * |
| S(I(A(C))) | 18 | 36.861 | 2.048 | 5.276 | * |
| S(I(A(I))) | 6 | 0.306 | 0.051 | 0.025 | ns |
| T x Among Areas | 6 | 1.531 | 0.255 | 0.620 | ns |
| T x I vs C | 2 | 0.198 | 0.099 | 4.755 | ns |
| T x Among C | 4 | 1.333 | 0.333 | 0.615 | ns |
| T x Islands (Areas) | 8 | 3.292 | 0.411 | 1.347 | ns |
| T x I(A(C)) | 6 | 3.250 | 0.542 | 1.396 | ns |
| T x I(A(I)) | 2 | 0.042 | 0.021 | 0.360 | ns |
| T x Sites(I(A)) | 48 | 14.667 | 0.306 | 3.121 | * |
| T x S(IA(C))) | 36 | 13.972 | 0.388 | 3.964 | * |
| T x S(I(A(I))) | 12 | 0.695 | 0.058 | 0.149 | ns |
| Residual | 480 | 47.000 | 0.098 | 0.098 | |

# Appendix 4. Results of SIMPER analysis comparing habitat characteristics among Groups in the shallow habitat.

Appendix 4 Results of SIMPER comparisons between areas sampled in the shallow habitat. For each area, the average percent cover of habitat characteristics and their contribution (%) to differences between areas are given. These are listed for variables that primarily (up to 80%) contributed to differences.

Suavanao vs Arnavons
AVERAGE DISSIMILARITY BETWEEN GROUPS = 32.43

| Species | % cover Suavanao | % cover Arnavons | Percent Contribution | Cumulative Percent |
|---|---|---|---|---|
| Rubble | 5.05 | 10.34 | 17.91 | 17.91 |
| Soft coral | 3.13 | 0.39 | 13.54 | 31.46 |
| Sand | 0.48 | 1.88 | 10.65 | 42.1 |
| Thin encrusting | 2.47 | 2.19 | 9.04 | 51.15 |
| Massive/brain | 2.84 | 2.78 | 8.27 | 59.42 |
| Branching | 1.92 | 0.13 | 7.38 | 66.8 |
| Tabulate | 0.37 | 0.48 | 7.02 | 73.82 |
| Digitate | 6.15 | 5.06 | 5.84 | 79.65 |

Waghena vs. Arnavons
AVERAGE DISSIMILARITY BETWEEN GROUPS = 38.67

| Species | % cover Waghena | % cover Arnavons | Percent Contribution | Cumulative Percent |
|---|---|---|---|---|
| Sand | 1.71 | 1.88 | 16.01 | 16.01 |
| Thin encrusting | 0.35 | 2.19 | 12.15 | 28.16 |
| Rubble | 9.59 | 10.34 | 10.27 | 38.44 |
| Soft coral | 2.24 | 0.39 | 9.59 | 48.03 |
| Digitate | 2.84 | 5.06 | 8.68 | 56.71 |
| Sponges | 1.39 | 0.23 | 8.33 | 65.03 |
| Massive/brain | 1.79 | 2.78 | 6.94 | 71.98 |
| Tabulate | 0.35 | 0.48 | 6.18 | 78.16 |

Ysabel vs. Arnavons
AVERAGE DISSIMILARITY BETWEEN GROUPS = 42.15

| Species | % cover Ysabel | % cover Arnavons | Percent Contribution | Cumultaive Percent |
|---|---|---|---|---|
| Sand | 11.98 | 1.88 | 16.17 | 16.17 |
| Rubble | 37.69 | 10.34 | 13.43 | 29.61 |
| Rock | 30.44 | 71.55 | 9.64 | 39.25 |
| Thin encrusting | 2.31 | 2.19 | 8.78 | 48.03 |
| Sponges | 1.32 | 0.23 | 7.79 | 55.82 |
| Massive/brain | 2.32 | 2.78 | 7.6 | 63.42 |
| Branching | 1.23 | 0.13 | 6.9 | 70.31 |
| Soft coral | 0.95 | 0.39 | 6.89 | 77.21 |

Appendix 4 continued

Waghena vs. Suavanao
AVERAGE DISSIMILARITY BETWEEN GROUPS = 42.15

| Species | % cover Waghena | % cover Suavanao | Percent Contribution | Cumulative Percent |
|---|---|---|---|---|
| Thin encrusting | 0.35 | 2.47 | 11.46 | 11.46 |
| Rubble | 9.59 | 5.05 | 10.78 | 22.24 |
| Soft coral | 2.24 | 3.13 | 9.43 | 31.66 |
| Digitate | 2.84 | 6.15 | 8.07 | 39.73 |
| Massive/brain | 1.79 | 2.84 | 7.28 | 47 |
| Sponges | 1.39 | 0.21 | 7.27 | 54.27 |
| Sand | 1.71 | 0.48 | 6.83 | 61.1 |
| Branching | 0.27 | 1.92 | 6.57 | 67.67 |
| Halimeda | 0.65 | 0.24 | 5.77 | 73.44 |
| Others | 0.9 | 0.26 | 5.22 | 78.66 |

Ysabel vs. Suavanoa
AVERAGE DISSIMILARITY BETWEEN GROUPS= 46.72

| Species | % cover Ysabel | % cover Suavanao | Percent Contribution | Cumulative Percent |
|---|---|---|---|---|
| Rubble | 37.69 | 5.05 | 16.82 | 16.82 |
| Sand | 11.98 | 0.48 | 11.78 | 28.6 |
| Rock | 30.44 | 75.27 | 7.51 | 36.12 |
| Soft coral | 0.95 | 3.13 | 7.18 | 43.3 |
| Halimeda | 1.61 | 0.24 | 6.83 | 50.13 |
| Thin encrusting | 2.31 | 2.47 | 6.65 | 56.78 |
| Sponges | 1.32 | 0.21 | 6.24 | 63.02 |
| Branching | 1.23 | 1.92 | 6.23 | 69.25 |
| Massive/brain | 2.32 | 2.84 | 6.07 | 75.32 |

Ysabel vs. Waghena
AVERAGE DISSIMILARITY BETWEEN GROUPS = 49.17

| Species | % cover Ysabel | % cover Waghena | Percent Contribution | Cumulative Percent |
|---|---|---|---|---|
| Rubble | 37.69 | 9.59 | 15.81 | 15.81 |
| Sand | 11.98 | 1.71 | 10.91 | 26.72 |
| Rock | 30.44 | 76.74 | 8.49 | 35.21 |
| Thin encrusting | 2.31 | 0.35 | 6.79 | 42 |
| Digitate | 6.69 | 2.84 | 6.42 | 48.42 |
| Soft coral | 0.95 | 2.24 | 6.33 | 54.75 |
| Halimeda | 1.61 | 0.65 | 6.25 | 61 |
| Sponges | 1.32 | 1.39 | 6.11 | 67.1 |
| Massive/brain | 2.32 | 1.79 | 5.66 | 72.77 |
| Branching | 1.23 | 0.27 | 5.26 | 78.02 |

# Appendix 5. Asymmetrical ANOVAs for variates analysed from the deep habitat.

## Appendix 5a: Total number of species of sea cucumber

C= ns, no transformation, alpha=0.05

| Source of variation | df | SS | MS | F-ratio | Sig |
|---|---|---|---|---|---|
| Time | 2 | 2.198 | 1.099 | 4.366 | ns |
| Among Areas | 3 | 8.839 | 2.946 | NO TEST | |
| I vs C | 1 | 5.672 | 5.672 | | |
| Among C | 2 | 3.167 | 1.583 | | |
| Islands (Areas) | 4 | 11.840 | 2.960 | NO TEST | |
| I(A(C)) | 3 | 8.167 | 2.722 | | |
| I(A(I)) | 1 | 3.674 | 3.674 | | |
| Sites(I(A)) | 24 | 87.097 | 3.629 | 5.866 | ** |
| S(I(A(C))) | 18 | 51.556 | 2.864 | 5.148 | ** |
| S(I(A(I))) | 6 | 35.542 | 5.924 | 2.063 | ns |
| T x Among Areas | 6 | 1.510 | 0.252 | 0.775 | ns |
| T x I vs C | 2 | 0.510 | 0.255 | 36.719 | * |
| T x Among C | 4 | 1.000 | 0.250 | 0.581 | ns |
| T x Islands (Areas) | 8 | 2.597 | 0.325 | 0.525 | ns |
| T x I(A(C)) | 6 | 2.583 | 0.431 | 0.774 | ns |
| T x I(A(I)) | 2 | 0.014 | 0.007 | 0.009 | ns |
| T x Sites(I(A)) | 48 | 29.694 | 0.619 | 0.914 | ns |
| T x S(IA(C))) | 36 | 20.028 | 0.556 | 0.822 | ns |
| T x S(I(A(I))) | 12 | 9.667 | 0.806 | 1.190 | ns |
| Residual | 480 | 324.833 | 0.677 | 0.677 | |

## Appendix 5b: Total abundance of sea cucumber

C= ns, tranformation Log E(X+1), alpha= 0.05

| Source of variation | df | SS | MS | F-ratio | Sig |
|---|---|---|---|---|---|
| Time | 2 | 1.046 | 0.523 | 4.398 | * |
| Among Areas | 3 | 3.277 | 1.092 | NO TEST | |
| I vs C | 1 | 2.361 | 2.361 | | |
| Among C | 2 | 0.916 | 0.458 | | |
| Islands (Areas) | 4 | 2.109 | 0.527 | NO TEST | |
| I(A(C)) | 3 | 1.329 | 0.443 | | |
| I(A(I)) | 1 | 0.781 | 0.781 | | |
| Sites(I(A)) | 24 | 44.313 | 1.846 | 7.867 | ** |
| S(I(A(C))) | 18 | 28.015 | 1.556 | 6.884 | ** |
| S(I(A(I))) | 6 | 16.298 | 2.716 | 1.745 | ** |
| T x Among Areas | 6 | 0.714 | 0.119 | 2.163 | ns |
| T x I vs C | 2 | 0.204 | 0.102 | 8.079 | ns |
| T x Among C | 4 | 0.509 | 0.127 | 1.842 | ns |
| T x Islands (Areas) | 8 | 0.440 | 0.055 | 0.234 | ns |
| T x I(A(C)) | 6 | 0.415 | 0.069 | 0.306 | ns |
| T x I(A(I)) | 2 | 0.025 | 0.013 | 0.049 | ns |
| T x Sites(I(A)) | 48 | 11.266 | 0.235 | 0.800 | ns |
| T x S(IA(C))) | 36 | 8.139 | 0.226 | 0.770 | ns |
| T x S(I(A(I))) | 12 | 3.127 | 0.261 | 0.888 | ns |
| Residual | 480 | 140.881 | 0.294 | 0.294 | |

## Appendix 5c. Total abundance of *Thelenota anax*

C=sig, no transformation, alpha= 0.01

| Source of variation | df | SS | MS | F-ratio | Sig |
|---|---|---|---|---|---|
| Time | 2 | 2.042 | 1.021 | 2.297 | ns |
| Among Areas | 3 | 28.005 | 9.335 | NO TEST | |
| I vs C | 1 | 9.042 | 9.042 | | |
| Among C | 2 | 18.963 | 9.482 | | |
| Islands (Areas) | 4 | 41.896 | 10.474 | NO TEST | |
| I(A(C)) | 3 | 41.556 | 13.852 | | |
| I(A(I)) | 1 | 0.340 | 0.340 | | |
| Sites(I(A)) | 24 | 51.764 | 2.157 | 4.904 | ** |
| S(I(A(C))) | 18 | 49.889 | 2.772 | 5.132 | ** |
| S(I(A(I))) | 6 | 1.875 | 0.313 | 0.113 | ns |
| T x Among Areas | 6 | 2.667 | 0.445 | 1.355 | ns |
| T x I vs C | 2 | 0.311 | 0.155 | 0.798 | ns |
| T x Among C | 4 | 2.357 | 0.589 | 1.581 | ns |
| T x Islands (Areas) | 8 | 2.625 | 0.328 | 0.746 | ns |
| T x I(A(C)) | 6 | 2.236 | 0.373 | 0.690 | ns |
| T x I(A(I)) | 2 | 0.389 | 0.194 | 1.400 | ns |
| T x Sites(I(A)) | 48 | 21.111 | 0.440 | 1.196 | ns |
| T x S(IA(C))) | 36 | 19.444 | 0.540 | 1.469 | ns |
| T x S(I(A(I))) | 12 | 1.667 | 0.139 | 0.378 | ns |
| Residual | 480 | 176.500 | 0.368 | 0.368 | |

## Appendix 5d: Total abundance of *Stichopus variegatus*

C=sig, no transformation, alpha= 0.01

| Source of variation | df | SS | MS | F-ratio | Sig |
|---|---|---|---|---|---|
| Time | 2 | 0.014 | 0.007 | 0.136 | ns |
| Among Areas | 3 | 1.632 | 0.544 | NO TEST | |
| I vs C | 1 | 0.280 | 0.280 | | |
| Among C | 2 | 1.352 | 0.676 | | |
| Islands (Areas) | 4 | 0.389 | 0.097 | NO TEST | |
| I(A(C)) | 3 | 0.139 | 0.046 | | |
| I(A(I)) | 1 | 0.250 | 0.250 | | |
| Sites(I(A)) | 24 | 7.194 | 0.300 | 2.590 | * |
| S(I(A(C))) | 18 | 3.806 | 0.211 | 2.660 | * |
| S(I(A(I))) | 6 | 3.389 | 0.565 | 2.671 | ns |
| T x Among Areas | 6 | 0.306 | 0.051 | 0.716 | ns |
| T x I vs C | 2 | 0.088 | 0.044 | 0.235 | ns |
| T x Among C | 4 | 0.218 | 0.054 | 1.679 | ns |
| T x Islands (Areas) | 8 | 0.569 | 0.071 | 0.615 | ns |
| T x I(A(C)) | 6 | 0.194 | 0.032 | 0.408 | ns |
| T x I(A(I)) | 2 | 0.375 | 0.188 | 0.835 | ns |
| T x Sites(I(A)) | 48 | 5.556 | 0.116 | 0.931 | ns |
| T x S(IA(C))) | 36 | 2.861 | 0.079 | 0.639 | ns |
| T x S(I(A(I))) | 12 | 2.695 | 0.225 | 1.807 | ns |
| Residual | 480 | 59.660 | 0.124 | 0.124 | |

## Appendix 5e: Total abundance of *Holothuria edulis*

C= sig, no transformation, alpha= 0.01

| Source of variation | df | SS | MS | F-ratio | Sig |
|---|---|---|---|---|---|
| Time | 2 | 0.045 | 0.023 | 0.140 | ns |
| Among Areas | 3 | 9.505 | 3.168 | NO TEST | |
| I vs C | 1 | 0.130 | 0.130 | | |
| Among C | 2 | 9.375 | 4.688 | | |
| Islands (Areas) | 4 | 2.118 | 0.530 | NO TEST | |
| I(A(C)) | 3 | 2.007 | 0.669 | | |
| I(A(I)) | 1 | 0.111 | 0.111 | | |
| Sites(I(A)) | 24 | 4.069 | 0.170 | 1.487 | ns |
| S(I(A(C))) | 18 | 2.986 | 0.166 | 1.287 | ns |
| S(I(A(I))) | 6 | 1.083 | 0.181 | 2.600 | ns |
| T x Among Areas | 6 | 0.969 | 0.161 | 1.755 | ns |
| T x I vs C | 2 | 0.441 | 0.221 | 7.946 | ns |
| T x Among C | 4 | 0.528 | 0.132 | 1.163 | ns |
| T x Islands (Areas) | 8 | 0.736 | 0.092 | 0.807 | ns |
| T x I(A(C)) | 6 | 0.681 | 0.113 | 0.880 | ns |
| T x I(A(I)) | 2 | 0.056 | 0.028 | 0.400 | ns |
| T x Sites(I(A)) | 48 | 5.472 | 0.114 | 1.168 | ns |
| T x S(IA(C))) | 36 | 4.639 | 0.129 | 1.321 | ns |
| T x S(I(A(I))) | 12 | 0.833 | 0.069 | 0.712 | ns |
| Residual | 480 | 46.833 | 0.098 | 0.098 | |

## Appendix 5f: Total abundance of *Holothuria atra*

C= sig, no transformation, alpha= 0.01

| Source of variation | df | SS | MS | F-ratio | Sig |
|---|---|---|---|---|---|
| Time | 2 | 1.323 | 0.661 | 2.427 | ns |
| Among Areas | 3 | 47.130 | 15.710 | NO TEST | |
| I vs C | 1 | 44.403 | 44.403 | | |
| Among C | 2 | 2.727 | 1.363 | | |
| Islands (Areas) | 4 | 29.229 | 7.307 | NO TEST | |
| I(A(C)) | 3 | 8.979 | 2.993 | | |
| I(A(I)) | 1 | 20.250 | 20.250 | | |
| Sites(I(A)) | 24 | 132.125 | 5.505 | 18.329 | * |
| S(I(A(C))) | 18 | 12.292 | 0.683 | 2.218 | * |
| S(I(A(I))) | 6 | 119.833 | 19.972 | 29.247 | ** |
| T x Among Areas | 6 | 1.635 | 0.273 | 0.737 | ns |
| T x I vs C | 2 | 0.196 | 0.098 | 0.361 | ns |
| T x Among C | 4 | 1.440 | 0.360 | 0.894 | ns |
| T x Islands (Areas) | 8 | 2.958 | 0.370 | 1.231 | ns |
| T x I(A(C)) | 6 | 2.417 | 0.403 | 1.308 | ns |
| T x I(A(I)) | 2 | 0.542 | 0.271 | 0.975 | ns |
| T x Sites(I(A)) | 48 | 14.417 | 0.300 | 0.396 | ns |
| T x S(IA(C))) | 36 | 11.083 | 0.308 | 0.406 | ns |
| T x S(I(A(I))) | 12 | 3.333 | 0.278 | 0.366 | ns |
| Residual | 480 | 364.167 | 0.759 | 0.759 | |

Appendix 5g: Total abundance of *Holothuria fuscopuntata*

C=sig, no transformation, alpha= 0.01

| Source of variation | df | SS | MS | F-ratio | Sig |
|---|---|---|---|---|---|
| Time | 2 | 0.170 | 0.085 | 0.259 | ns |
| Among Areas | 3 | 0.797 | 0.266 | NO TEST | |
| I vs C | 1 | 0.255 | 0.255 | | |
| Among C | 2 | 0.542 | 0.271 | | |
| Islands (Areas) | 4 | 10.688 | 2.672 | NO TEST | |
| I(A(C)) | 3 | 10.511 | 3.504 | | |
| I(A(I)) | 1 | 0.176 | 0.176 | | |
| Sites(I(A)) | 24 | 48.208 | 2.009 | 5.483 | * |
| S(I(A(C))) | 18 | 45.278 | 2.515 | 5.982 | * |
| S(I(A(I))) | 6 | 2.931 | 0.488 | 0.194 | ns |
| T x Among Areas | 6 | 1.969 | 0.328 | 1.750 | ns |
| T x I vs C | 2 | 0.608 | 0.304 | 1.411 | ns |
| T x Among C | 4 | 1.361 | 0.340 | 1.909 | ns |
| T x Islands (Areas) | 8 | 1.500 | 0.188 | 0.512 | ns |
| T x I(A(C)) | 6 | 1.069 | 0.178 | 0.424 | ns |
| T x I(A(I)) | 2 | 0.431 | 0.215 | 1.057 | ns |
| T x Sites(I(A)) | 48 | 17.583 | 0.366 | 1.298 | ns |
| T x S(IA(C))) | 36 | 15.139 | 0.421 | 1.490 | ns |
| T x S(I(A(I))) | 12 | 2.444 | 0.204 | 0.722 | ns |
| Residual | 480 | 135.500 | 0.282 | 0.282 | |

Appendix 5h: Total abundance of *Holothuria fuscogilva*

C=sig, no transformation, alpha= 0.01

| Source of variation | df | SS | MS | F-ratio | Sig |
|---|---|---|---|---|---|
| Time | 2 | 0.889 | 0.444 | 1.263 | ns |
| Among Areas | 3 | 2.181 | 0.727 | NO TEST | |
| I vs C | 1 | 0.083 | 0.083 | | |
| Among C | 2 | 2.097 | 1.049 | | |
| Islands (Areas) | 4 | 10.792 | 2.698 | NO TEST | |
| I(A(C)) | 3 | 9.014 | 3.005 | | |
| I(A(I)) | 1 | 1.778 | 1.778 | | |
| Sites(I(A)) | 24 | 42.889 | 1.787 | 9.772 | * |
| S(I(A(C))) | 18 | 39.333 | 2.185 | 11.799 | * |
| S(I(A(I))) | 6 | 3.556 | 0.593 | 0.271 | ns |
| T x Among Areas | 6 | 2.111 | 0.352 | 1.206 | ns |
| T x I vs C | 2 | 0.667 | 0.334 | 0.632 | ns |
| T x Among C | 4 | 1.444 | 0.361 | 1.695 | ns |
| T x Islands (Areas) | 8 | 2.333 | 0.292 | 1.595 | ns |
| T x I(A(C)) | 6 | 1.278 | 0.213 | 1.150 | ns |
| T x I(A(I)) | 2 | 1.056 | 0.528 | 3.000 | ns |
| T x Sites(I(A)) | 48 | 8.778 | 0.183 | 0.410 | ns |
| T x S(IA(C))) | 36 | 6.667 | 0.185 | 0.415 | ns |
| T x S(I(A(I))) | 12 | 2.111 | 0.176 | 0.395 | ns |
| Residual | 480 | 214.000 | 0.446 | 0.446 | |