



KOSRAE  
COASTAL  
RESOURCE  
ATLAS



US Army Corps  
of Engineers  
Pacific Ocean Division





# KOSRAE COASTAL RESOURCE ATLAS

Prepared for the  
US Army Corps of Engineers  
Pacific Ocean Division  
Contract No. DACW83-87-M-0354

by  
Manoa Mapworks  
Honolulu, Hawaii

October 1987



To accompany the Kosrae Coastal Resource Inventory, prepared by the US Army Corps of Engineers Pacific Ocean Division, 1987.

UNIHI-SEAGRANT-MM-87-01

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# Introduction

The Kosrae Coastal Resource Atlas was prepared by the Environmental Resources Section of the U.S. Army Corps of Engineers, Pacific Ocean Division. It is the companion volume to the Kosrae Coastal Resource Inventory, a report on the same topic prepared by the Corps.

The Corps' coastal resource inventory program has been under the direction of James E. Maragos since its initiation in 1978. The Kosrae Coastal Resource Atlas was coordinated by Dr. Maragos, who also supervised the development of the data base, map editing, and publication, and compiled the maps. Ross Cordy provided the information on coastal archaeological sites, Michael Baker interpreted and mapped the seagrass beds and additional mangrove and swamp areas, and Michael White and Bruce Howell assisted in mapping areas recently modified by dredge and fill operations.

The atlas was designed and produced by Jane J. Eckelman of Manoa Mapworks, Honolulu, with technical assistance by Michael E. Baker and Everett A. Wingert, of Honolulu. The relief shading was drawn by Dr. John C. Sherman of Seattle, Washington. Black and white aerial photographs were taken in 1985 by Perry and Associates, Guam. Funding for the atlas was provided under the authority of Section 22 of the Water Resources Development Act of 1974 (PL 93-251), as amended (Planning Assistance to the States).

## Literature Review

Some data for the atlas were obtained from the aerial photographs and from information collected by earlier scientific studies including: Stemmermann and Proby (1979) on mangrove and swamp forests, Chun et al. (1979) on water quality of the Okat region, and Eldredge et al. (1979) on the marine biology of the Okat region. The station locations for the earlier studies are included on the atlas maps. See page 61 for complete reference citations.

## Field Methods

Most data for the atlas were obtained from field surveys and interviews. Two field surveys totalling three weeks were conducted during May and July-August, 1986. Physical, geological, and biological resources of the inshore and offshore portions of open coastal reefs and embayments were surveyed by a field team at 52 stations chosen to obtain a fairly representative sampling of Kosrae's variety of coastal environments. Some inshore stations included the edge, but not the interior, of the mangrove forests and swamp forests. Snorkeling equipment was used for shallow reef and inshore stations while SCUBA gear was used to examine deeper offshore stations and the sides of reef passes. The survey was qualitative in nature. Each team member, using clipboards, waterproof sheets, and species checklists, was assigned the responsibility for recording or sketching specific organism groups or features. Information on the relative abundance of algae, corals, other invertebrates, fishes, and reef features were recorded. In general only larger, more conspicuous species were recorded, and other small, cryptic or nocturnal species were only incidentally observed. Additional notes were made by all team members on water quality, outstanding features, marine mammals, and marine reptiles. Photographs and specimens were also collected to confirm species identifications and obtain more information. The team members and their areas of concentration were: Rooston Abraham, fishes and invertebrates; Carlos Cianchini, fishes; Peter Galloway, algae and non-coral invertebrates; Mike Gawel, algae and invertebrates; Teddy John, historic ship-

wrecks; James Maragos, reef physiography and corals; Mike Molina, fishes; Jack Sigrah, marine resources; and Mike White, fishes.

## Interviews

The interviews provided virtually all of the mapped information on the use of Kosrae's coastal resources. Interviews were held with the staffs of the Kosrae State Marine Resources Division (MRD), Historic Preservation Office, and Tourism Office in May 1986, and detailed information on the use of Kosrae's reef resources was gathered during a series of meetings held at each of the island's five villages in July-August, 1986: Lelu, Utwe, Malem, Walung, and Tafunsak. The Chief Magistrates and MRD were asked to arrange the meetings and request the attendance of fishermen and other knowledgeable resource users. At each meeting, participants were presented with explanations, in both Kosraean and English, on the purpose of the inventory project and meeting, and they were shown a copy of the resource atlas previously prepared for Pohnpei (Manoa Mapworks, 1985) as well as reference books with pictures of reef fishes and invertebrates. Participants were then asked in both English and Kosraean to indicate on a map the location of various types of resources used in their region. Participants were also asked to describe resource problems, and whether the abundance of each resource category was increasing, declining, or staying the same. All participants who signed attendance sheets are listed in the acknowledgments on page 61.

## Mapping Methods

The atlas' facing page layout shows two different views of each study area. A series of principal thematic maps appear on the right and a series of regional index maps appear on the left.

On the thematic map pages, Corps of Engineers resource use and substrate data are overprinted in color onto a topographic base. The base maps are sections of draft 1:10,000 topographic series produced by the Trust Territory of the Pacific Islands, and based upon 1976 aerial photographs of Kosrae. These maps are currently available through the US Geological Survey. Revisions to reef structure, new airfields, boat marina and dredge/fill sites have been plotted in color onto the base maps as a result of Corps of Engineers fieldwork in 1986.

The index pages are a series of regional maps at a scale of 1:35,000, compiled from a draft 1:20,000 topographic map also produced by the Trust Territory of the Pacific Islands. These maps show the location and overlap of each thematic map and the KCRI section boundaries. A relief shading was substituted for the standard contour network to enhance visualization of Kosrae's high island landscape.

Cross reference between the facing pages, with their contrasting symbolization and scales provides a framework for evaluating the relationships between resource use and substrate classification and the island's physical environment.

The appendix contains 82 black and white aerial photographs that were used in the compilation of seagrass and vegetation cover. The photographs, taken at scales ranging from 1:2,100 to 1:5,200 are reproduced here at scales ranging from 1:4,500 to 1:11,000. To aid the reader in locating and discerning the scale of each photograph, they have been plotted onto a second series of regional indexes that appear at the beginning of the appendix.

This atlas should not be used for navigational purposes.

Cover photograph:

Underwater view of the yellow reef coral, *Turbinaria*.



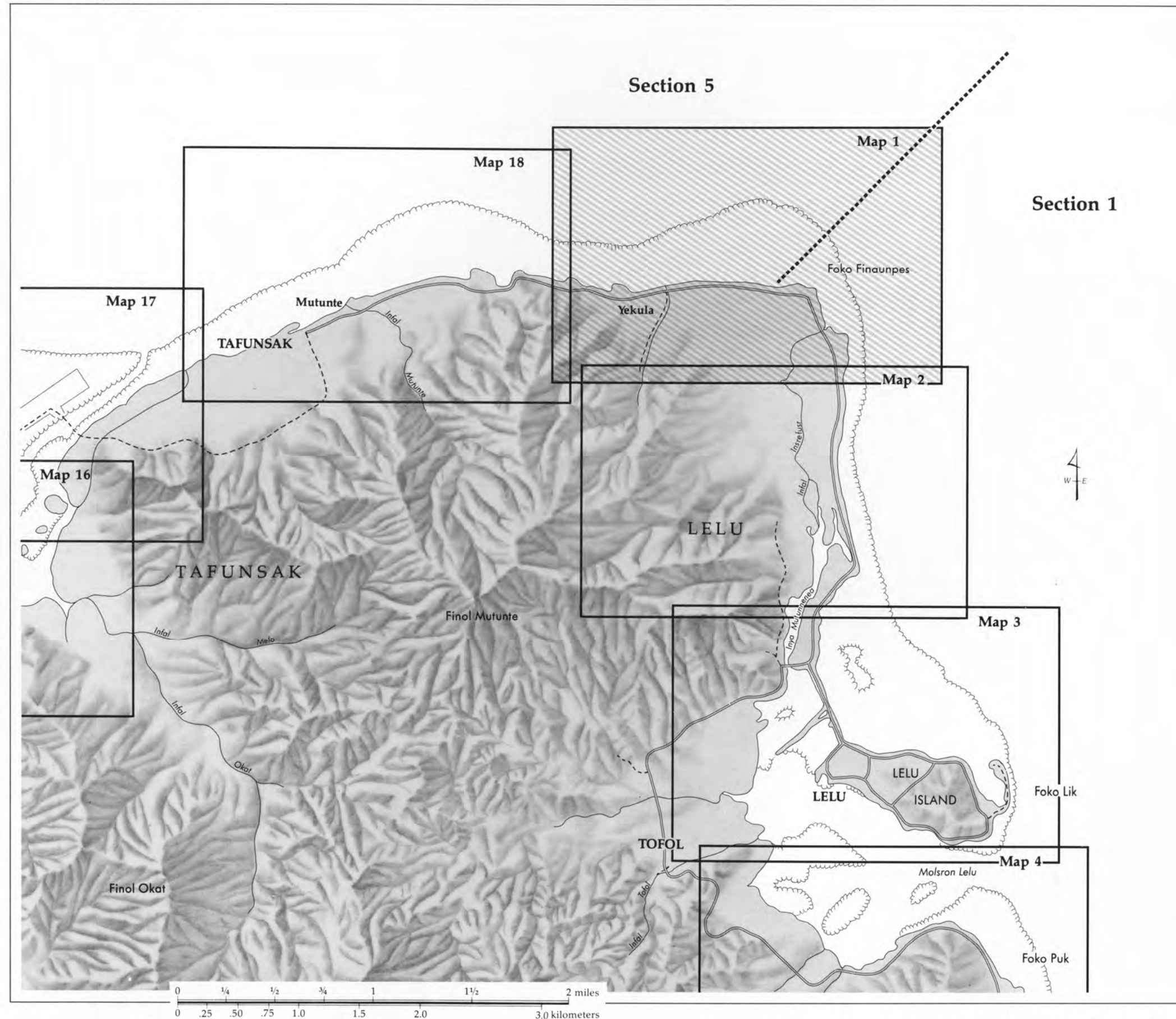
# KOSRAE



## Index to Narrative Sections



# Map Index 1



## Bottom Type and Land Cover Classification

(based on field observation and aerial photographic interpretation)

### OFFSHORE

- s — Sediment
  - sc — Sand bottom in water depths less than 10 meters
  - si — Silt
- rc — Reef Complex
  - rc — Mixed bottom types consisting of reef rock (limestone) associated with shallow reef formations
  - rcl — Consolidated limestone, lacking sediment
  - rcp — Consolidated limestone with a smooth, pavement-like surface
  - rcg — Consolidated reef with well defined groove-and-spur system
  - rcs — Mostly consolidated limestone with some (25-50%) sediment bottom
  - rct — Complex reef bottom type (rc, rcs, or rs) with loose materials formed into tracks by waves or currents
  - rs — Complex reef bottom type consisting mostly of sand, but with some limestone outcrops or boulders
  - co — Areas of greater than 50% live coral cover

### SHORELINE

- ba — Volcanic rock shoreline (basalt)
- bb — Man-made boulder shoreline
- bc — Concrete/cement masonry seawall and shoreline
- sb — White sand beach of predominately calcareous material
- sbc — Calcareous rubble and/or shingle beach

### VEGETATION COVER

- mg — Mangrove forest (source: Stemmermann and Proby, 1978)
- sg — Seagrass bed
- ag — Algae bed
- sw — Swamp forest (source: Stemmermann and Proby, 1978)

### Note:

All patch reef surfaces are substrate type rc unless otherwise designated.



Resource Use

Map 1

RELATED TO BIOTA

- Mullet — Ah  
netting, gill netting, cast net
- Rabbitfish — Mulap  
torch, hook & line, netting, cast net
- Rudderfish — Won  
netting, cast net
- Parrotfish — Mesrik  
netting, spear, casting
- Squirrelfish — Ollol  
handline, spear
- Grouper — Kalsrik  
hook & line, spear
- Goatfish — Futfut  
netting, spear, torch
- Surgeon — Kupat  
netting, hook & line, spear
- Jack trevally — Srapsrap  
handline, trolling, gill netting
- Snapper — Tap, Ku, Srinak  
handline, netting
- Big-eyed scad — Atol  
netting, handline
- Hammerhead shark — Pako hammer  
hook & line
- Barracuda — Tola  
trolling
- Baitfish (Clupeidae) — Tui or Ikinpa  
cast net
- Sea turtles — Ngoe  
spear, net, hand
- Octopus — Koet  
long-handle hook
- Spiny Lobster — Ungung  
hand
- Mangrove crab — Powa  
gleaning, trapping
- Coconut crab — Aie  
hand, stick
- Land crab — Aieng  
hand
- Sea cucumber — Wah  
hand
- Anemone — Lut  
Hibiscus, knife
- Round clam — Popol  
digging, hand
- Giant clam — Natula  
gleaning, prying
- Rare clams — Tuk, Punak  
gleaning, digging
- Shoreline snails (Nerita Polita) — Kufahi  
hand

NOT RELATED TO BIOTA

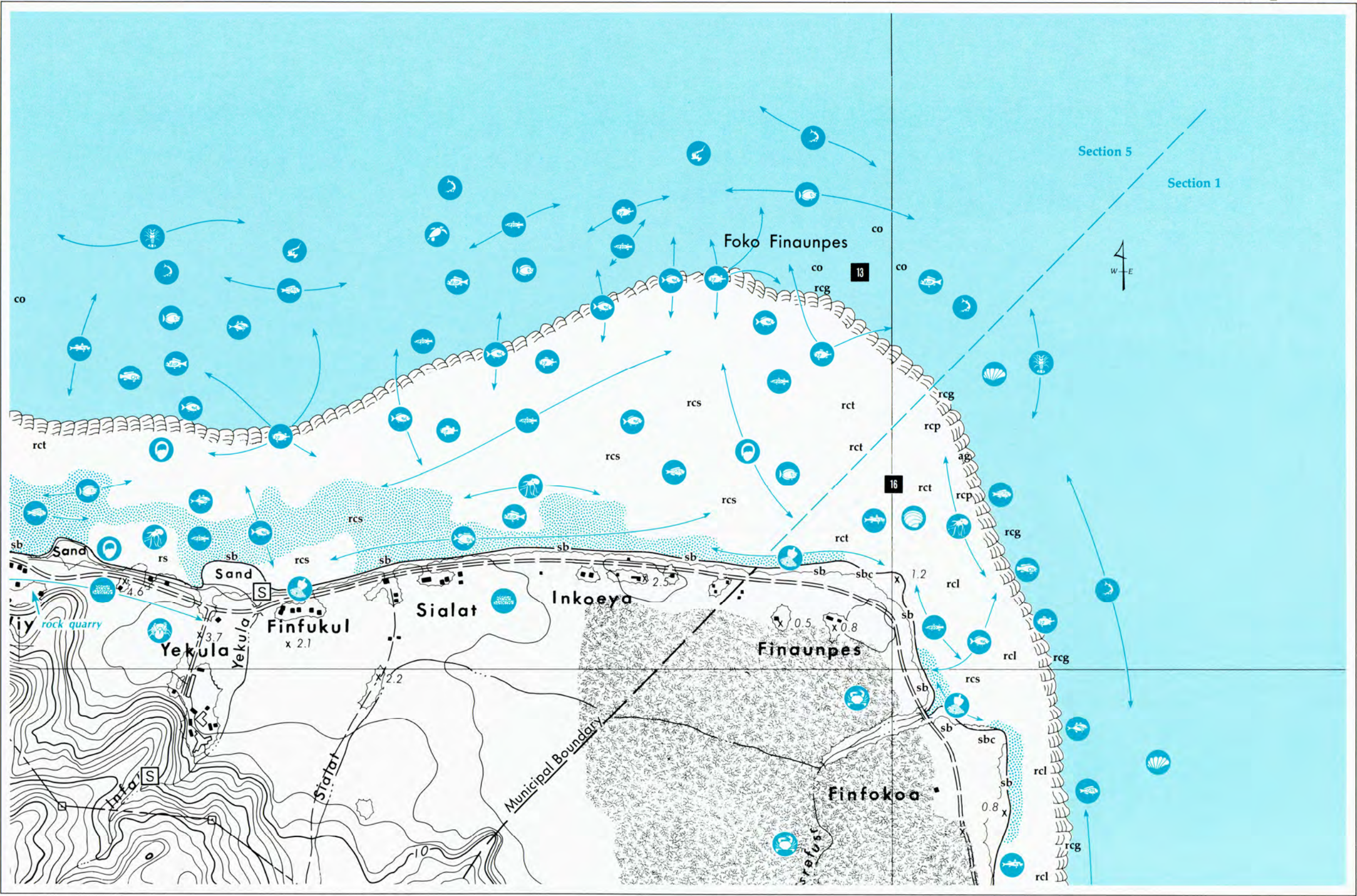
- Archaeological site
- Manual sand removal

Other Symbols

- Seagrass bed
- Mangrove forest
- Swamp forest
- Boat wreck
- Observed range

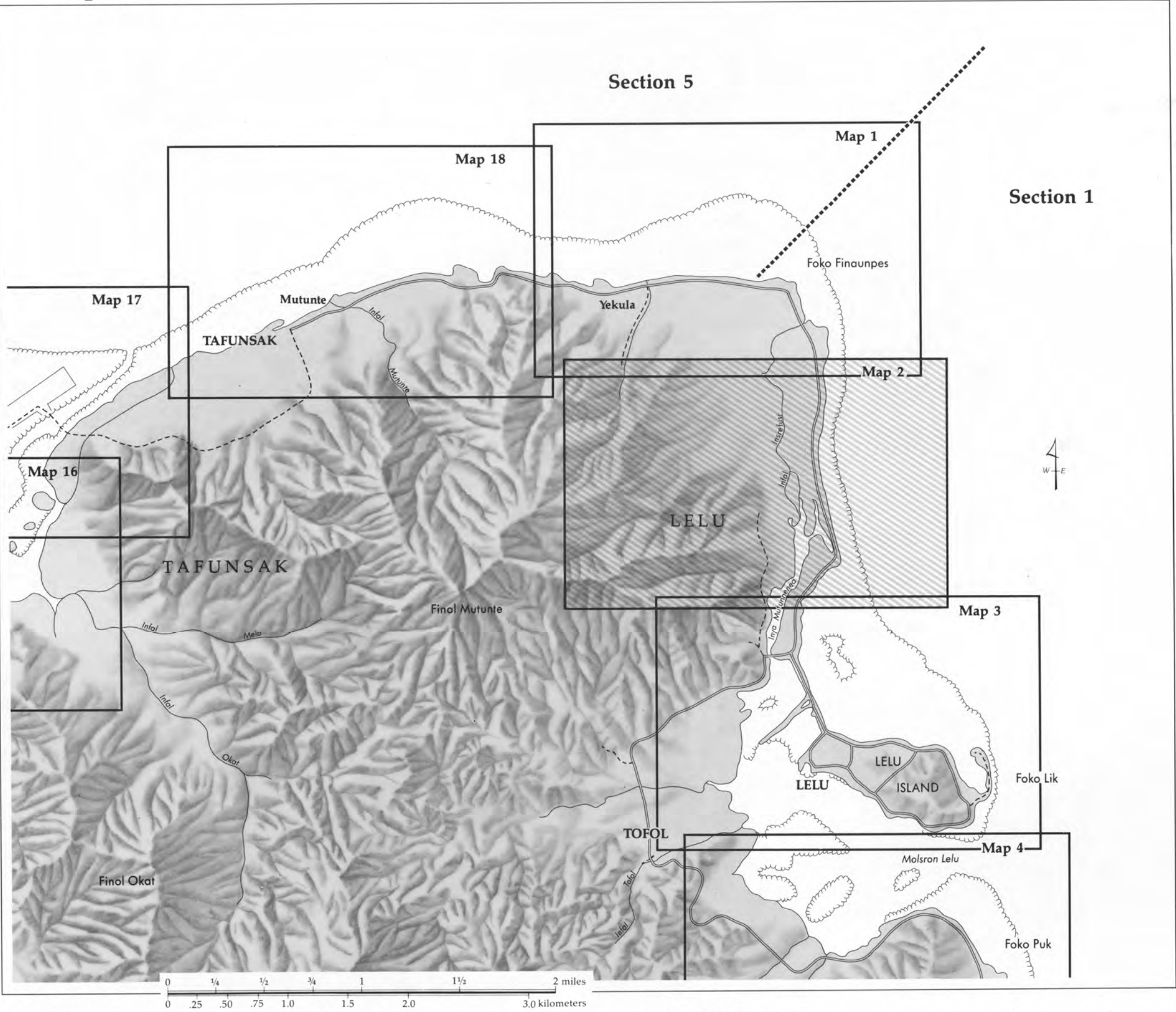
Field Stations

- KCRI Station
- Chun et al., 1979
- Eldredge et al., 1979
- Stemmermann & Proby, 1978





Map Index 1



Bottom Type and Land Cover Classification

(based on field observation and aerial photographic interpretation)

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VEGETATION COVER

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- sg — Seagrass bed
- ag — Algae bed
- sw — Swamp forest (source: Stemmermann and Proby, 1978)

**Note:**  
All patch reef surfaces are substrate type rc unless otherwise designated.








RELATED TO BIOTA





- **Mullet — Ah**  
*netting, gill netting, cast net*
- **Rabbitfish — Mulap**  
*torch, hook & line, netting, cast net*
- **Rudderfish — Won**  
*netting, cast net*
- **Parrotfish — Mesrik**  
*netting, spear, casting*
- **Squirrelfish — Ollol**  
*handline, spear*
- **Grouper — Kalsrik**  
*hook & line, spear*
- **Goatfish — Futfut**  
*netting, spear, torch*
- **Surgeon — Kupat**  
*netting, hook & line, spear*
- **Jack trevally — Srapsrap**  
*handline, trolling, gill netting*
- **Snapper — Tap, Ku, Srinai**  
*handline, netting*
- **Big-eyed scad — Atol**  
*netting, handline*
- **Hammerhead shark — Pako hammer**  
*hook & line*
- **Barracuda — Tola**  
*trolling*
- **Baitfish (Clupeidae) — Tui or Ikinpa**  
*cast net*
- **Sea turtles — Ngoe**  
*spear, net, hand*
- **Octopus — Koet**  
*long-handle hook*
- **Spiny Lobster — Ungung**  
*hand*
- **Mangrove crab — Powa**  
*gleaning, trapping*
- **Coconut crab — Aie**  
*hand, stick*
- **Land crab — Aieng**  
*hand*
- **Sea cucumber — Wah**  
*hand*
- **Anemone — Lut**  
*Hibiscus, knife*
- **Round clam — Popol**  
*digging, hand*
- **Giant clam — Natula**  
*gleaning, prying*
- **Rare clams — Tuk, Punak**  
*gleaning, digging*
- **Shoreline snails (Nerita Polita) — Kufahi**  
*hand*
- **Archaeological site**
- **Manual sand removal**

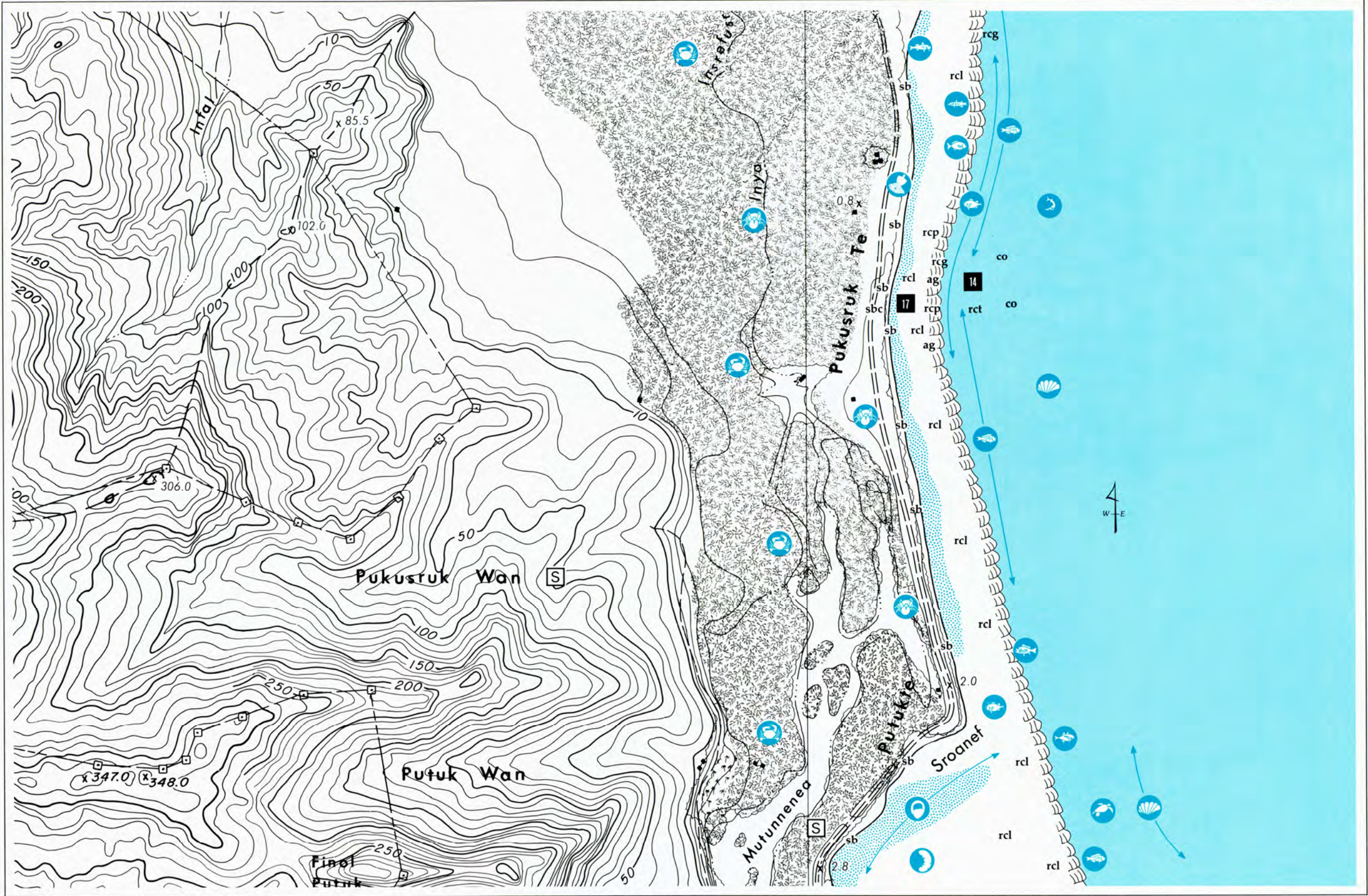
NOT RELATED TO BIOTA

Other Symbols

-  Seagrass bed
-  Mangrove forest
-  Swamp forest
-  Boat wreck
-  Observed range

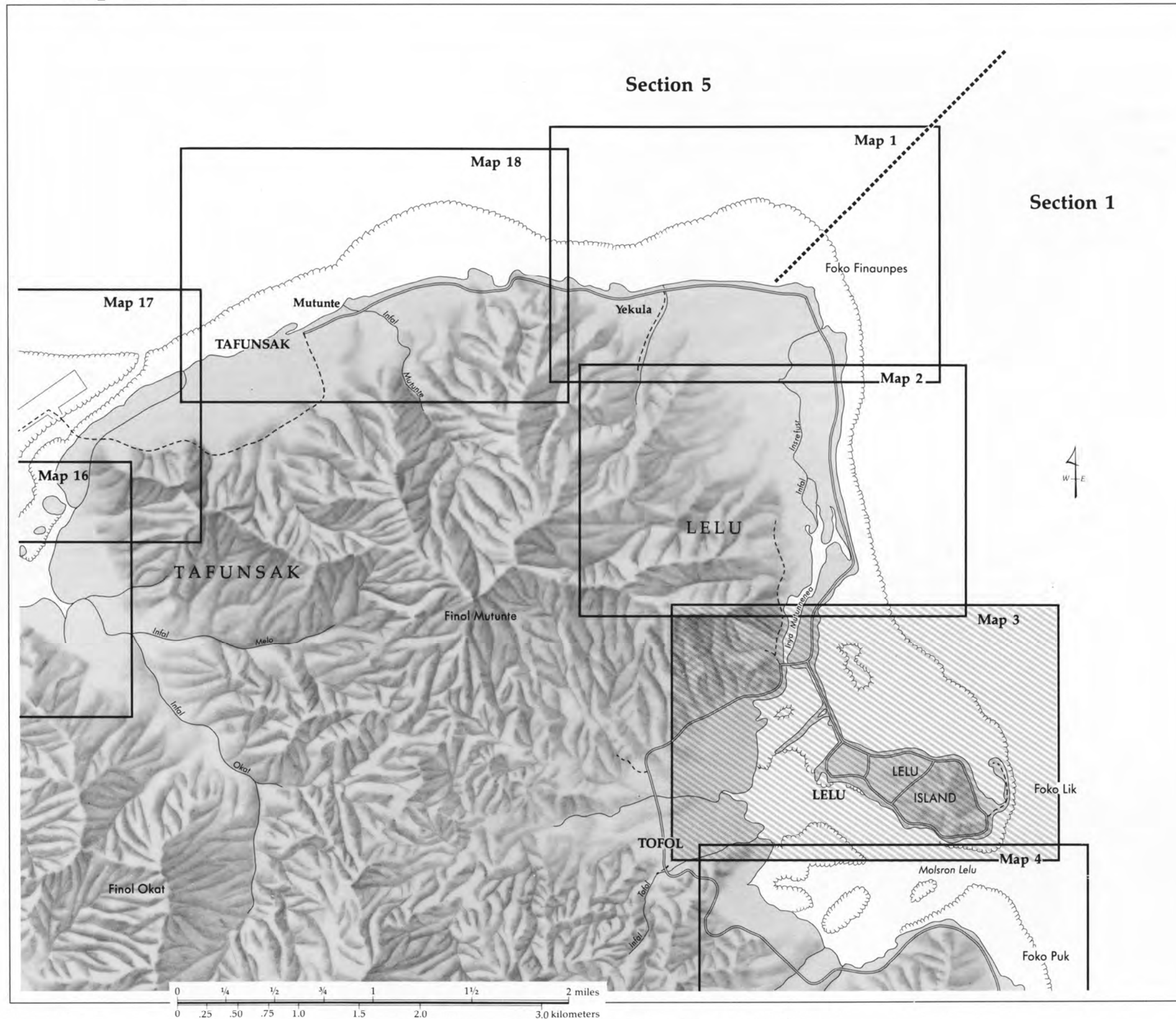
Field Stations

-  KCRI Station
-  Chun et al., 1979
-  Eldredge et al., 1979
-  Stemmermann & Proby, 1978





# Map Index 1



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  - rcs — Mostly consolidated limestone with some (25-50%) sediment bottom
  - rc2 — Complex reef bottom type (rc, rcs, or rs) with loose materials formed into tracks by waves or currents
  - rs — Complex reef bottom type consisting mostly of sand, but with some limestone outcrops or boulders
  - co — Areas of greater than 50% live coral cover

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# Resource Use

# Map 3






## RELATED TO BIOTA

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torch, hook & line, netting, cast net
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netting, cast net
-  **Parrotfish — Mesrik**  
netting, spear, casting
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handline, spear
-  **Grouper — Kalsrik**  
hook & line, spear
-  **Goatfish — Futfut**  
netting, spear, torch
-  **Surgeon — Kupat**  
netting, hook & line, spear
-  **Jack trevally — Srapsrap**  
handline, trolling, gill netting
-  **Snapper — Tap, Ku, Srinai**  
handline, netting
-  **Big-eyed scad — Atol**  
netting, handline
-  **Hammerhead shark — Pako hammer**  
hook & line
-  **Barracuda — Tola**  
trolling
-  **Baitfish (Clupeidae) — Tui or Ikinpa**  
cast net
-  **Sea turtles — Ngoe**  
spear, net, hand
-  **Octopus — Koet**  
long-handle hook
-  **Spiny Lobster — Ungung**  
hand
-  **Mangrove crab — Powa**  
gleaning, trapping
-  **Coconut crab — Aie**  
hand, stick
-  **Land crab — Aieng**  
hand
-  **Sea cucumber — Wah**  
hand
-  **Anemone — Lut**  
Hibiscus, knife
-  **Round clam — Popol**  
digging, hand
-  **Giant clam — Natula**  
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-  **Rare clams — Tuk, Punak**  
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


## NOT RELATED TO BIOTA

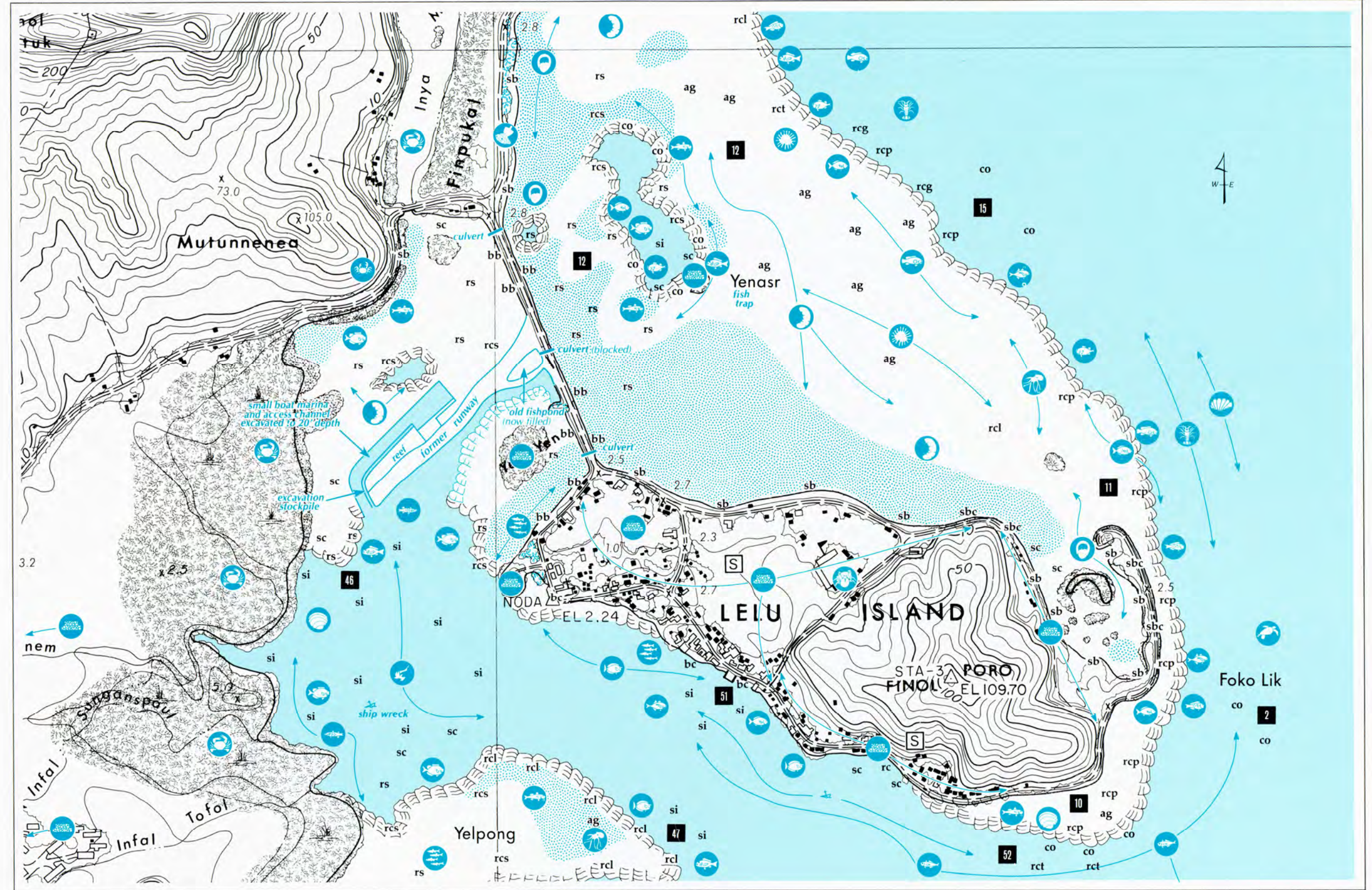
-  **Archaeological site**
-  **Manual sand removal**

## Other Symbols

-  Seagrass bed
-  Mangrove forest
-  Swamp forest
-  Boat wreck
-  Observed range

## Field Stations

-  KCRI Station
-  Chun et al., 1979
-  Eldredge et al., 1979
-  Stemmermann & Proby, 1978





The map displays the Lelu Peninsula with a grid of nine maps (Map 4 to Map 9) and three sections (Section 1 to Section 3). The Lelu River flows from the top left towards the bottom right. Key locations labeled include Finol Okat, TOFOL, LELU, Kaa, Foko Puk, Pilyuul, Molem, Yeseng, Mosral, Kuplu Wan, Taf Je, and UTWE. A scale bar at the bottom shows distances in miles (0 to 2) and kilometers (0 to 3.0). A north arrow is located in the bottom right corner.

(based on field observation and  
aerial photographic interpretation)

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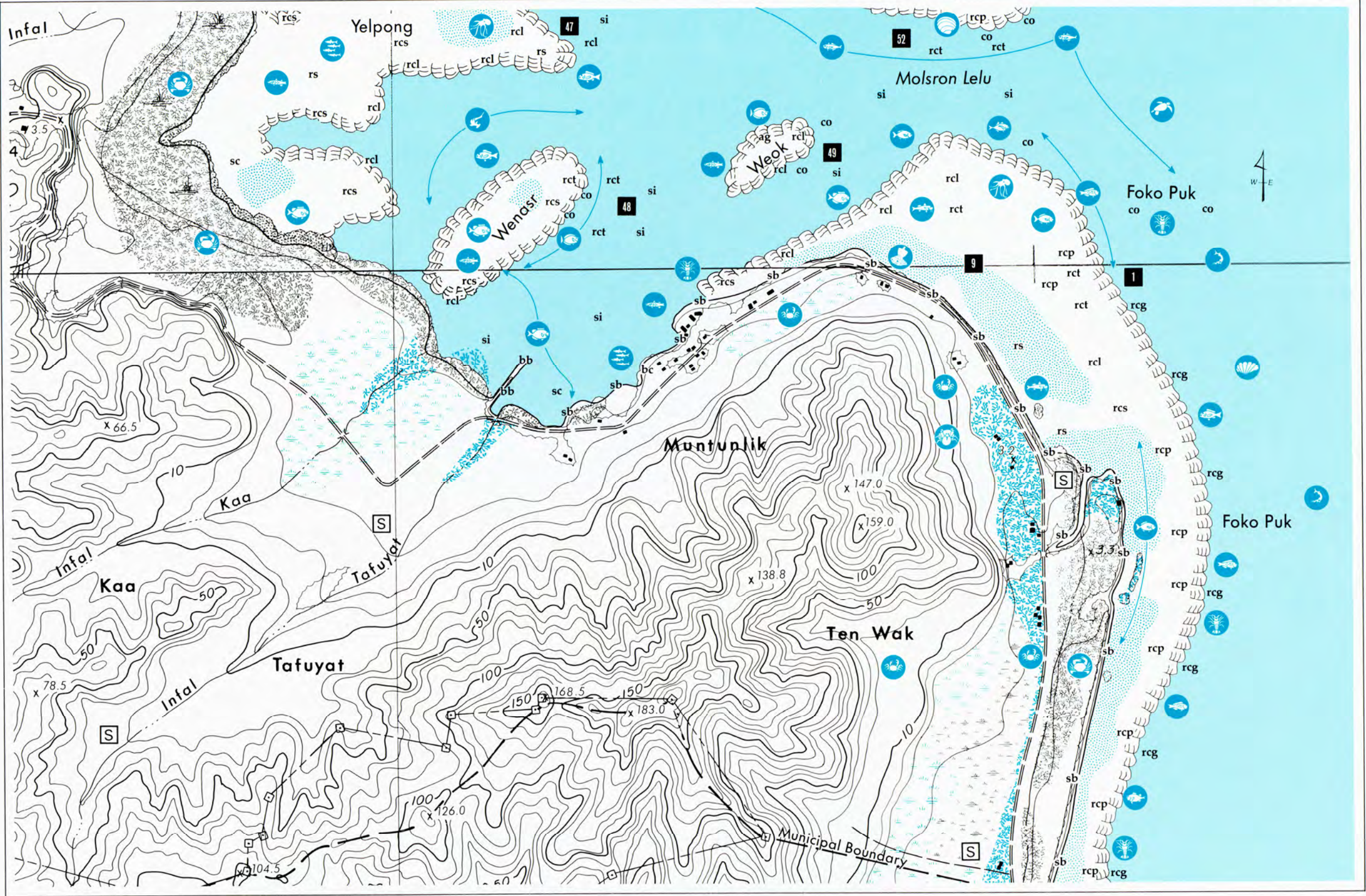
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- NOT RELATED TO BIOTA
- Archaeological site
- Manual sand removal



Other Symbols

- 
- Seagrass bed
- 
- Mangrove forest
- 
- Swamp forest
- 
- Boat wreck
- 
- Observed range

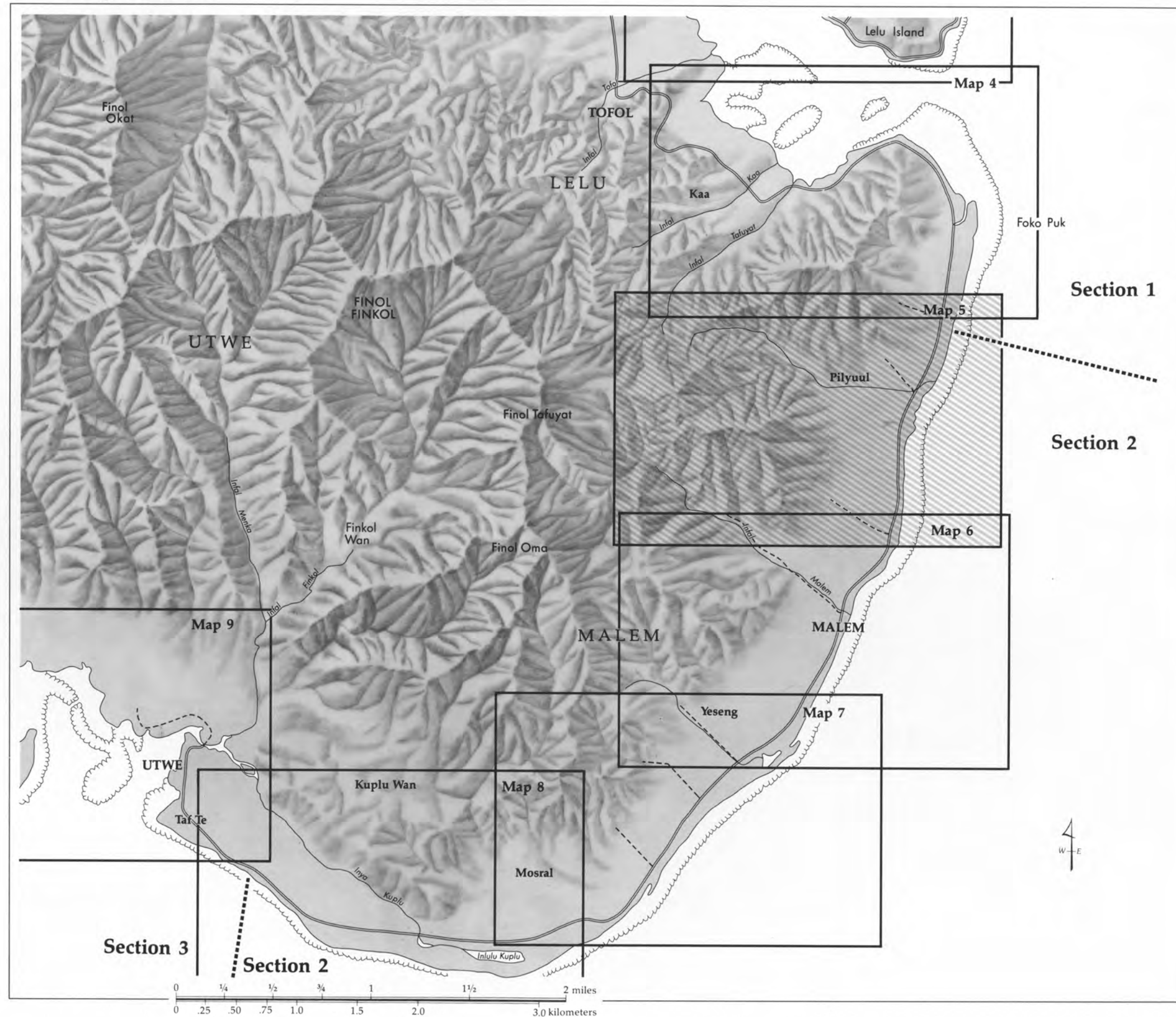
Field Stations

- 
- 52 KCRI Station
- 
- C Chun et al., 1979
- 
- E Eldredge et al., 1979
- 
- S Stemmermann & Proby, 1978





## Map Index 2



### Bottom Type and Land Cover Classification

(based on field observation and aerial photographic interpretation)

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- Rare clams — Tuk, Punak**  
gleaning, digging
- Shoreline snails (Nerita Polita) — Kufahi**  
hand

NOT RELATED TO BIOTA

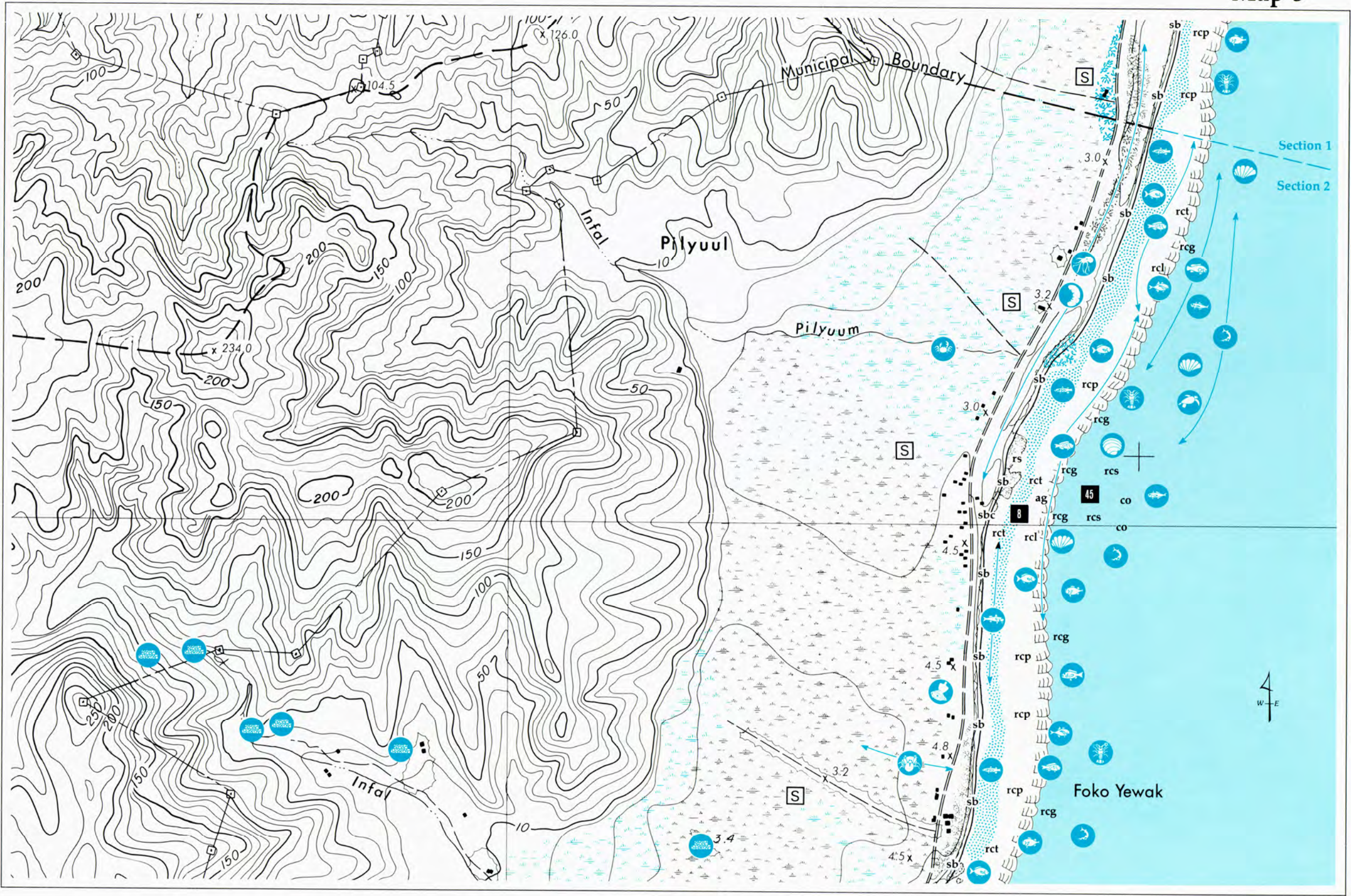
- Archaeological site**
- Manual sand removal**

Other Symbols

- Seagrass bed
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- Boat wreck
- Observed range

Field Stations

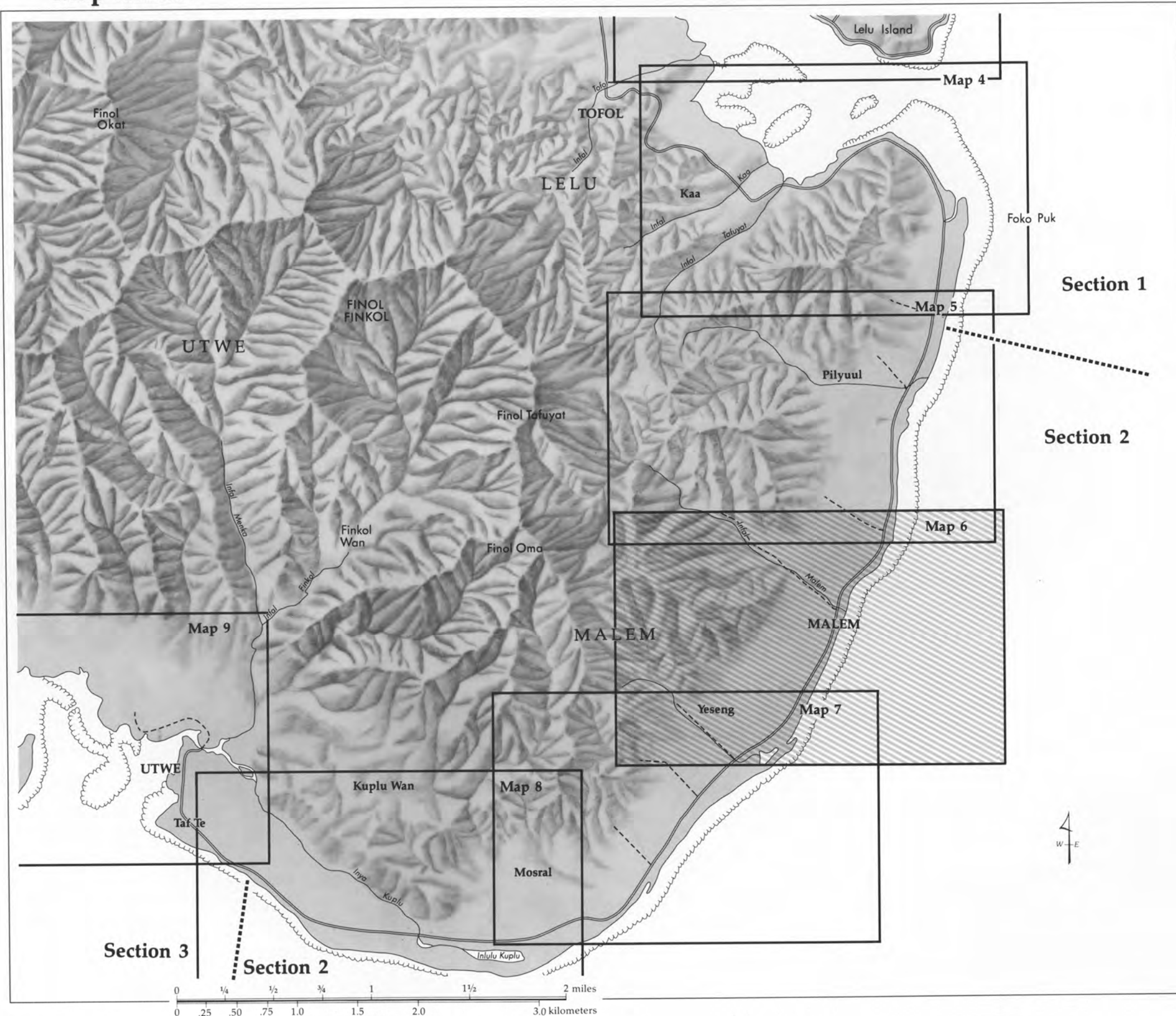
- KCRI Station
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Map 5



## Map Index 2



### Bottom Type and Land Cover Classification

(based on field observation and aerial photographic interpretation)

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- sc — Sand bottom in water depths less than 10 meters
- si — Silt
- rc — Reef Complex
  - rc — Mixed bottom types consisting of reef rock (limestone) associated with shallow reef formations
  - rc1 — Consolidated limestone, lacking sediment
  - rcp — Consolidated limestone with a smooth, pavement-like surface
  - rcg — Consolidated reef with well defined groove-and-spur system
  - rcs — Mostly consolidated limestone with some (25-50%) sediment bottom
  - rct — Complex reef bottom type (rc, rcs, or rs) with loose materials formed into tracks by waves or currents
  - rs — Complex reef bottom type consisting mostly of sand, but with some limestone outcrops or boulders
  - co — Areas of greater than 50% live coral cover

#### SHORELINE

- ba — Volcanic rock shoreline (basalt)
- bb — Man-made boulder shoreline
- bc — Concrete/cement masonry seawall and shoreline
- sb — White sand beach of predominately calcareous material
- sbc — Calcareous rubble and/or shingle beach

#### VEGETATION COVER

- mg — Mangrove forest (source: Stemmermann and Proby, 1978)
- sg — Seagrass bed
- ag — Algae bed
- sw — Swamp forest (source: Stemmermann and Proby, 1978)

#### Note:

All patch reef surfaces are substrate type rc unless otherwise designated.



Resource Use

Map 6

RELATED TO BIOTA

- Mullet** — Ah  
netting, gill netting, cast net
- Rabbitfish** — Mulap  
torch, hook & line, netting, cast net
- Rudderfish** — Won  
netting, cast net
- Parrotfish** — Mesrik  
netting, spear, casting
- Squirrelfish** — Ollol  
handline, spear
- Grouper** — Kalsrik  
hook & line, spear
- Goatfish** — Futfut  
netting, spear, torch
- Surgeon** — Kupat  
netting, hook & line, spear
- Jack trevally** — Srapsrap  
handline, trolling, gill netting
- Snapper** — Tap, Ku, Srinak  
handline, netting
- Big-eyed scad** — Atol  
netting, handline
- Hammerhead shark** — Pako hammer  
hook & line
- Barracuda** — Tola  
trolling
- Baitfish (Clupeidae)** — Tui or Ikinpa  
cast net
- Sea turtles** — Ngoe  
spear, net, hand
- Octopus** — Koet  
long-handle hook
- Spiny Lobster** — Ungung  
hand
- Mangrove crab** — Powa  
gleaning, trapping
- Coconut crab** — Aie  
hand, stick
- Land crab** — Aieng  
hand
- Sea cucumber** — Wah  
hand
- Anemone** — Lut  
Hibiscus, knife
- Round clam** — Popol  
digging, hand
- Giant clam** — Natula  
gleaning, prying
- Rare clams** — Tuk, Punak  
gleaning, digging
- Shoreline snails (Nerita Polita)** — Kufahi  
hand

NOT RELATED TO BIOTA

- Archaeological site**
- Manual sand removal**

Other Symbols

- Seagrass bed
- Mangrove forest
- Swamp forest
- Boat wreck
- Observed range

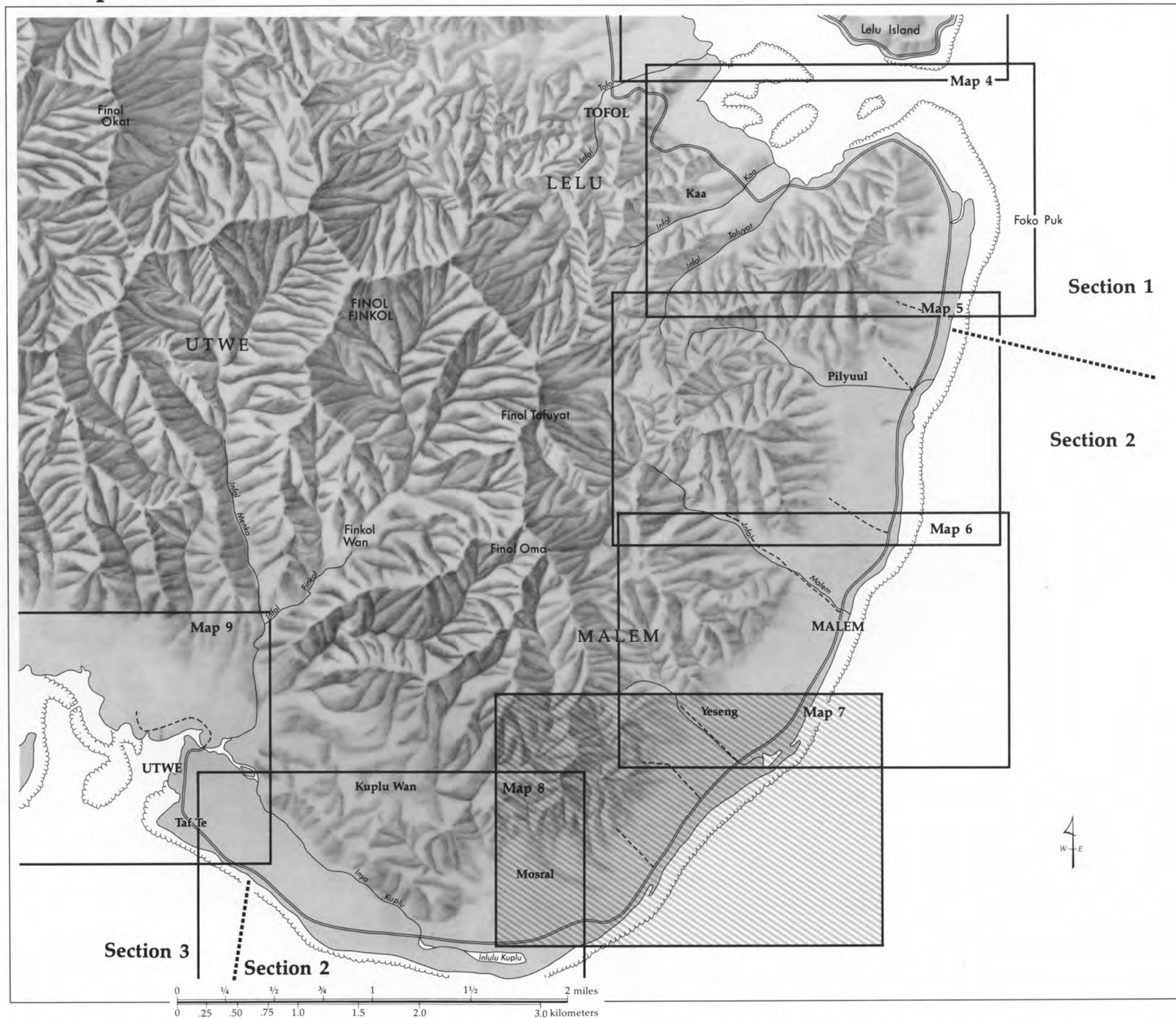
Field Stations

- 52 KCRI Station
- C Chun et al., 1979
- E Eldredge et al., 1979
- S Stemmermann & Proby, 1978





## Map Index 2



### Bottom Type and Land Cover Classification

(based on field observation and aerial photographic interpretation)

#### OFFSHORE

- s — Sediment
- sc — Sand bottom in water depths less than 10 meters
- si — Silt
- rc — Reef Complex
  - rc — Mixed bottom types consisting of reef rock (limestone) associated with shallow reef formations
  - rcl — Consolidated limestone, lacking sediment
  - rcp — Consolidated limestone with a smooth, pavement-like surface
  - rcg — Consolidated reef with well defined groove-and-spur system
  - rcs — Mostly consolidated limestone with some (25-50%) sediment bottom
  - rct — Complex reef bottom type (rc, rcs, or rs) with loose materials formed into tracks by waves or currents
  - rs — Complex reef bottom type consisting mostly of sand, but with some limestone outcrops or boulders
  - co — Areas of greater than 50% live coral cover

#### SHORELINE

- ba — Volcanic rock shoreline (basalt)
- bb — Man-made boulder shoreline
- bc — Concrete/cement masonry seawall and shoreline
- sb — White sand beach of predominately calcareous material
- sbc — Calcareous rubble and/or shingle beach

#### VEGETATION COVER

- mg — Mangrove forest (source: Stemmermann and Proby, 1978)
- sg — Seagrass bed
- ag — Algae bed
- sw — Swamp forest (source: Stemmermann and Proby, 1978)

**Note:**  
All patch reef surfaces are substrate type rc unless otherwise designated.



Resource Use

Map 7

RELATED TO BIOTA

- Mullet** — Ah  
netting, gill netting, cast net
- Rabbitfish** — Mulap  
torch, hook & line, netting, cast net
- Rudderfish** — Won  
netting, cast net
- Parrotfish** — Mesrik  
netting, spear, casting
- Squirrelfish** — Ollol  
handline, spear
- Grouper** — Kalsrik  
hook & line, spear
- Goatfish** — Futfut  
netting, spear, torch
- Surgeon** — Kupat  
netting, hook & line, spear
- Jack trevally** — Srapsrap  
handline, trolling, gill netting
- Snapper** — Tap, Ku, Srinai  
handline, netting
- Big-eyed scad** — Atol  
netting, handline
- Hammerhead shark** — Pako hammer  
hook & line
- Barracuda** — Tola  
trolling
- Baitfish (Clupeidae)** — Tui or Ikinpa  
cast net
- Sea turtles** — Ngoe  
spear, net, hand
- Octopus** — Koet  
long-handle hook
- Spiny Lobster** — Ungung  
hand
- Mangrove crab** — Powa  
gleaning, trapping
- Coconut crab** — Aie  
hand, stick
- Land crab** — Aieng  
hand
- Sea cucumber** — Wah  
hand
- Anemone** — Lut  
Hibiscus, knife
- Round clam** — Popol  
digging, hand
- Giant clam** — Natula  
gleaning, prying
- Rare clams** — Tuk, Punak  
gleaning, digging
- Shoreline snails (Nerita Polita)** — Kufahi  
hand

NOT RELATED TO BIOTA

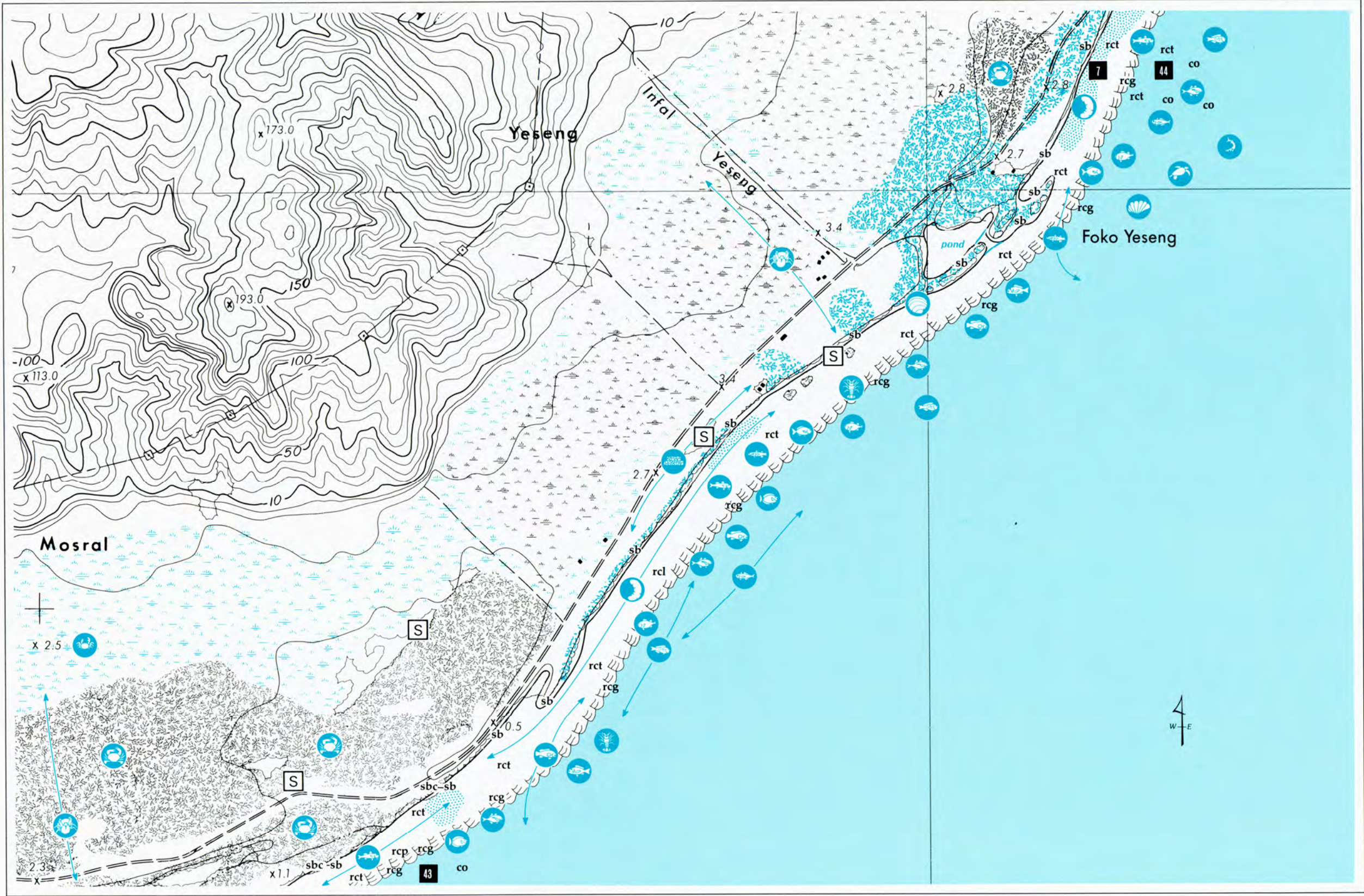
- Archaeological site**
- Manual sand removal**

Other Symbols

- Seagrass bed
- Mangrove forest
- Swamp forest
- Boat wreck
- Observed range

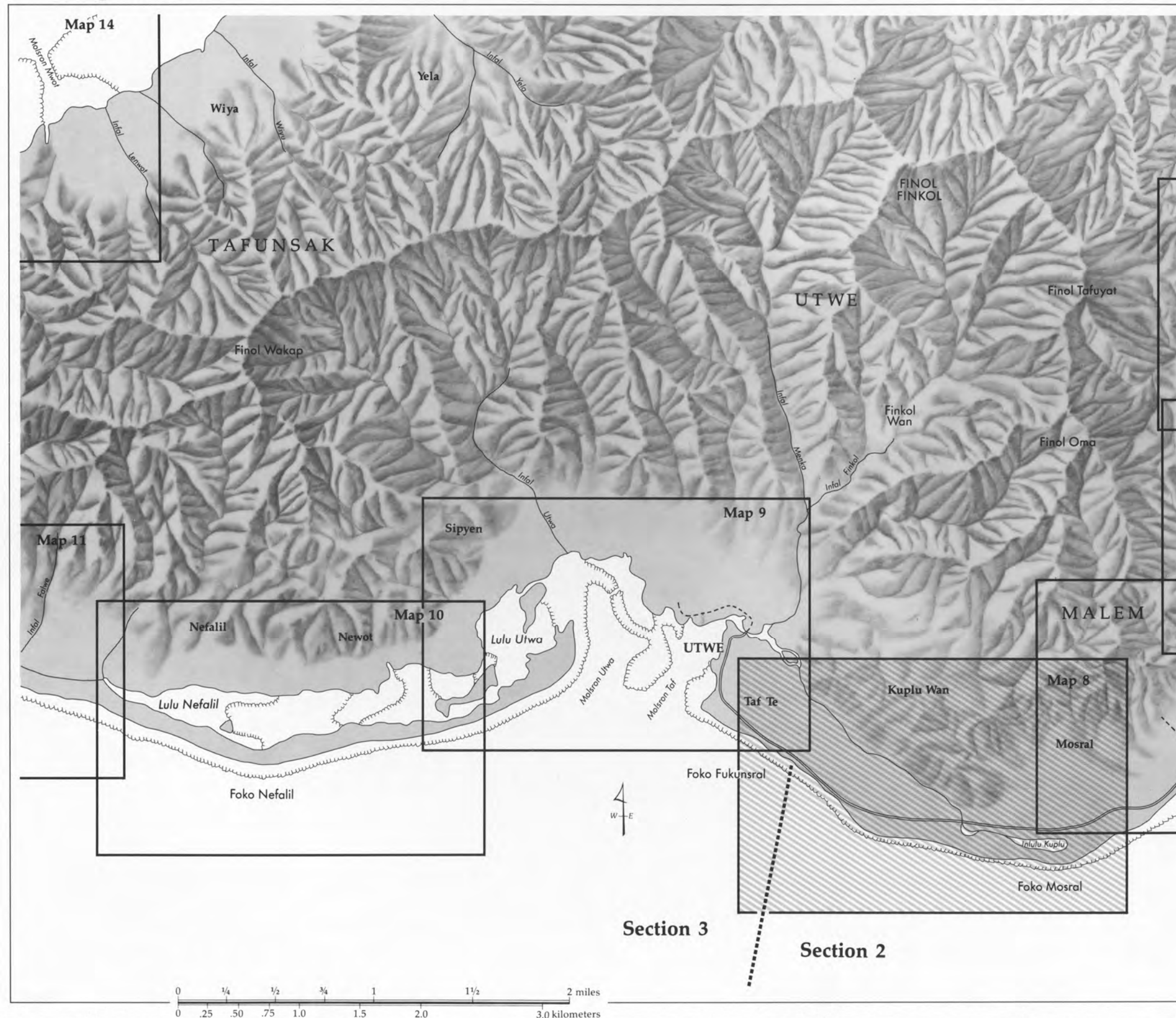
Field Stations

- 52 KCRI Station
- C Chun et al., 1979
- E Eldredge et al., 1979
- S Stemmermann & Proby, 1978





## Map Index 3



## Bottom Type and Land Cover Classification

(based on field observation and aerial photographic interpretation)

### OFFSHORE

- s — Sediment
  - sc — Sand bottom in water depths less than 10 meters
  - si — Silt
- rc — Reef Complex
  - rc — Mixed bottom types consisting of reef rock (limestone) associated with shallow reef formations
  - rc1 — Consolidated limestone, lacking sediment
  - rcp — Consolidated limestone with a smooth, pavement-like surface
  - rcg — Consolidated reef with well defined groove-and-spur system
  - rcs — Mostly consolidated limestone with some (25-50%) sediment bottom
  - rct — Complex reef bottom type (rc, rcs, or rs) with loose materials formed into tracks by waves or currents
  - rs — Complex reef bottom type consisting mostly of sand, but with some limestone outcrops or boulders
  - co — Areas of greater than 50% live coral cover

### SHORELINE

- ba — Volcanic rock shoreline (basalt)
- bb — Man-made boulder shoreline
- bc — Concrete/cement masonry seawall and shoreline
- sb — White sand beach of predominately calcareous material
- sbc — Calcareous rubble and/or shingle beach

### VEGETATION COVER

- mg — Mangrove forest (source: Stemmermann and Proby, 1978)
- sg — Seagrass bed
- ag — Algae bed
- sw — Swamp forest (source: Stemmermann and Proby, 1978)

**Note:**  
All patch reef surfaces are substrate type rc unless otherwise designated.



Resource Use

Map 8

RELATED TO BIOTA

- Mullet — Ah  
netting, gill netting, cast net
- Rabbitfish — Mulap  
torch, hook & line, netting, cast net
- Rudderfish — Won  
netting, cast net
- Parrotfish — Mesrik  
netting, spear, casting
- Squirrelfish — Ollol  
handline, spear
- Grouper — Kalsrik  
hook & line, spear
- Goatfish — Futfut  
netting, spear, torch
- Surgeon — Kupa  
netting, hook & line, spear
- Jack trevally — Srapsrap  
handline, trolling, gill netting
- Snapper — Tap, Ku, Sinal  
handline, netting
- Big-eyed scad — Atol  
netting, handline
- Hammerhead shark — Pako hammer  
hook & line
- Barracuda — Tola  
trolling
- Baitfish (Clupeidae) — Tui or Ikinpa  
cast net
- Sea turtles — Ngoc  
spear, net, hand
- Octopus — Koet  
long-handle hook
- Spiny lobster — Ungung  
hand
- Mangrove crab — Powa  
gleaning, trapping
- Coconut crab — Aie  
hand, stick
- Land crab — Aieng  
hand
- Sea cucumber — Wah  
hand
- Anemone — Lut  
Hibiscus, knife
- Round clam — Popol  
digging, hand
- Giant clam — Natula  
gleaning, prying
- Rare clams — Tuk, Punak  
gleaning, digging
- Shoreline snails (Nerita Polita) — Kufahi  
hand

NOT RELATED TO BIOTA

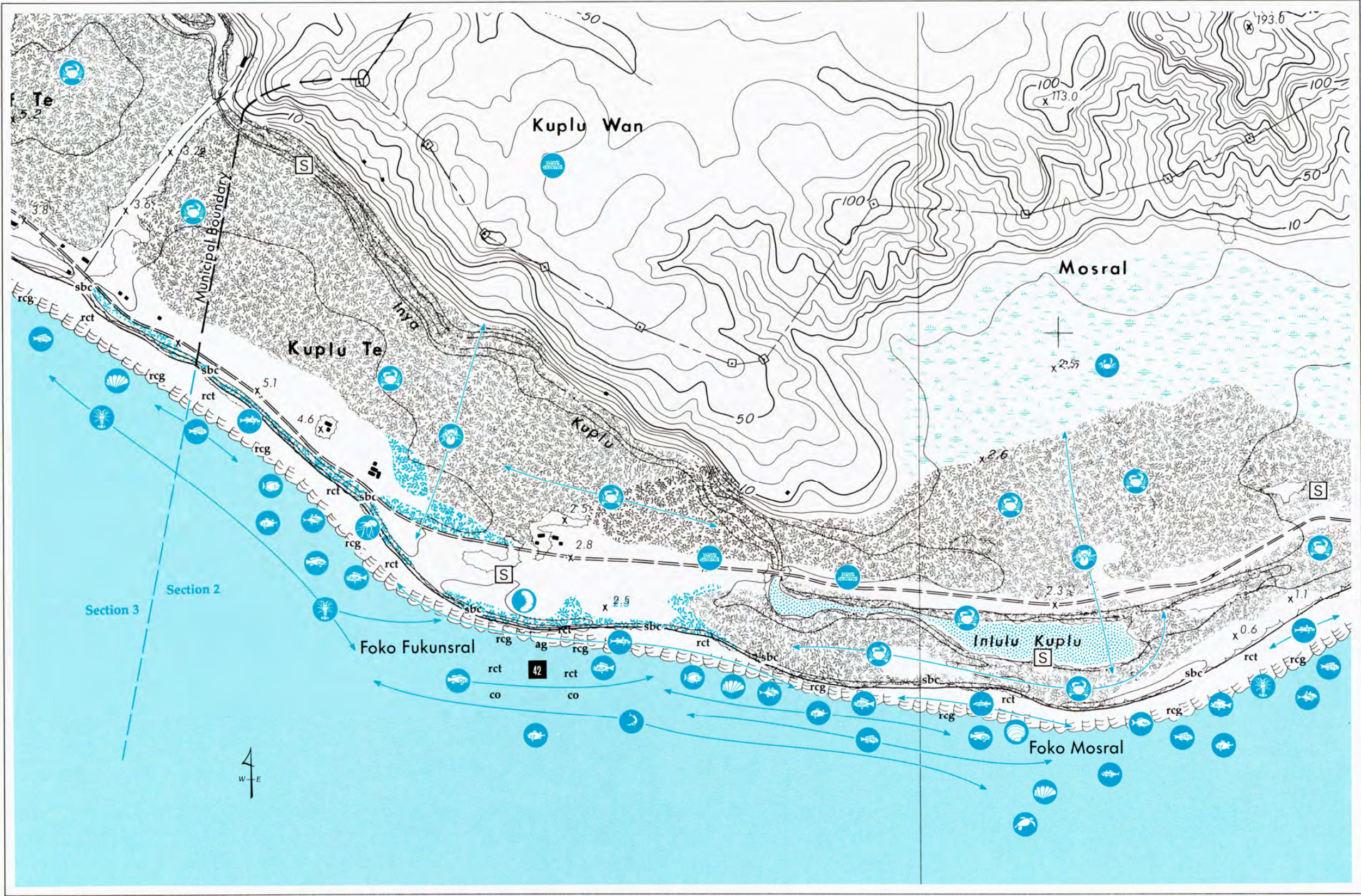
- Archaeological site
- Manual sand removal

Other Symbols

- Seagrass bed
- Mangrove forest
- Swamp forest
- Boat wreck
- Observed range

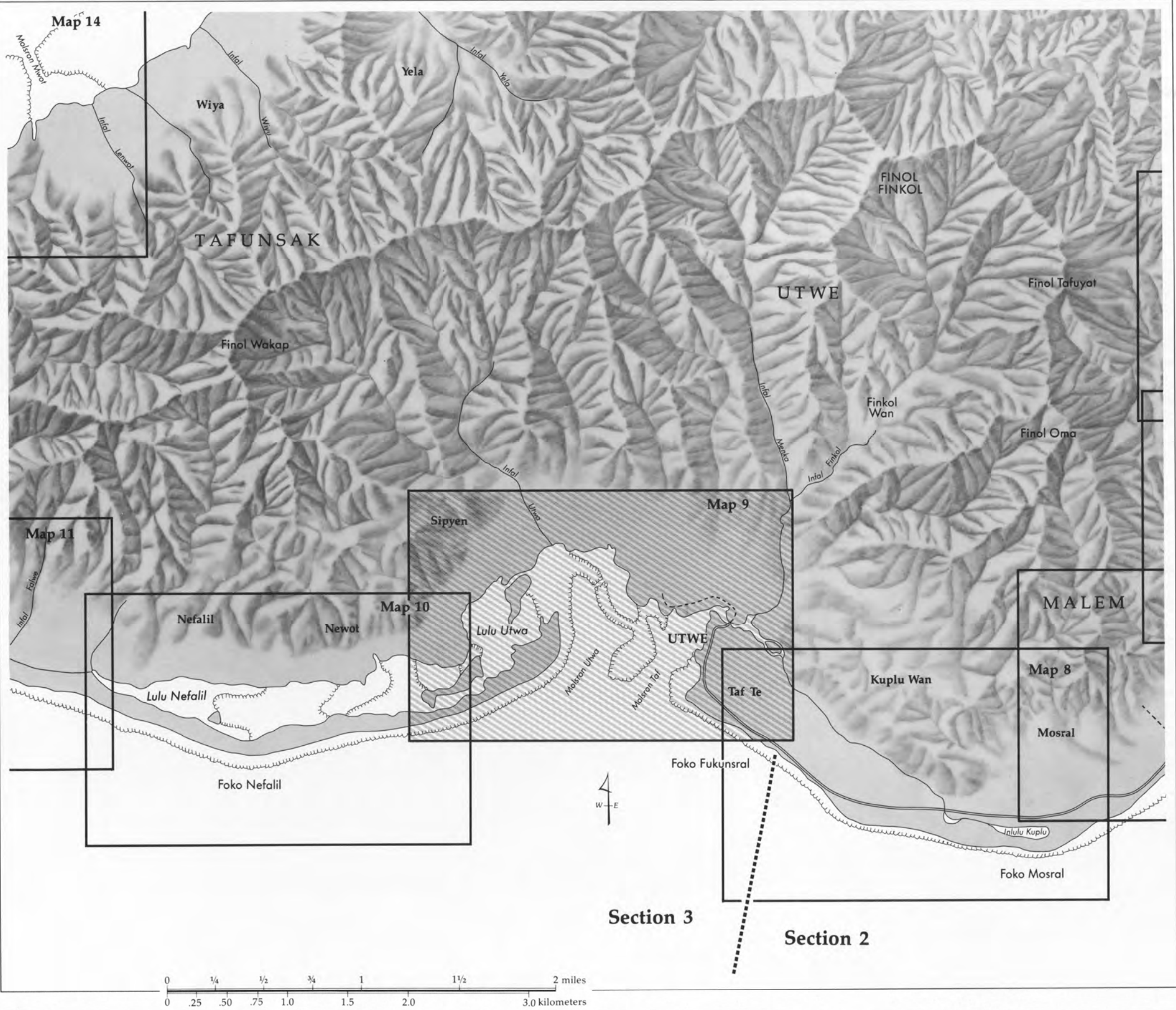
Field Stations

- KCRI Station
- Chun et al., 1979
- Eldredge et al., 1979
- Stemmermann & Proby, 1978





Map Index 3



Bottom Type and Land Cover Classification

(based on field observation and aerial photographic interpretation)

OFFSHORE

- s — Sediment
- sc — Sand bottom in water depths less than 10 meters
- si — Silt
- rc — Reef Complex
  - rc — Mixed bottom types consisting of reef rock (limestone) associated with shallow reef formations
  - rcl — Consolidated limestone, lacking sediment
  - rcp — Consolidated limestone with a smooth, pavement-like surface
  - rcg — Consolidated reef with well defined groove-and-spur system
  - rct — Complex reef bottom type (rc, rcs, or rs) with loose materials formed into tracks by waves or currents
  - rsc — Mostly consolidated limestone with some (25-50%) sediment bottom
  - rs — Complex reef bottom type consisting mostly of sand, but with some limestone outcrops or boulders
  - co — Areas of greater than 50% live coral cover

SHORELINE

- ba — Volcanic rock shoreline (basalt)
- bb — Man-made boulder shoreline
- bc — Concrete/cement masonry seawall and shoreline
- sb — White sand beach of predominately calcareous material
- sbc — Calcareous rubble and/or shingle beach

VEGETATION COVER

- mg — Mangrove forest (source: Stemmermann and Proby, 1978)
- sg — Seagrass bed
- ag — Algae bed
- sw — Swamp forest (source: Stemmermann and Proby, 1978)

Note:  
All patch reef surfaces are substrate type rc unless otherwise designated.



RELATED TO BIOTA

- Mullet** — Ah  
netting, gill netting, cast net
- Rabbitfish** — Mulap  
torch, hook & line, netting, cast net
- Rudderfish** — Won  
netting, cast net
- Parrotfish** — Mesrik  
netting, spear, casting
- Squirrelfish** — Ollol  
handline, spear
- Grouper** — Kalsrik  
hook & line, spear
- Goatfish** — Futfut  
netting, spear, torch
- Surgeon** — Kupat  
netting, hook & line, spear
- Jack trevally** — Srapsrap  
handline, trolling, gill netting
- Snapper** — Tap, Ku, Srinak  
handline, netting
- Big-eyed scad** — Atol  
netting, handline
- Hammerhead shark** — Pako hammer  
hook & line
- Barracuda** — Tola  
trolling
- Baitfish (Clupeidae)** — Tui or Ikinpa  
cast net
- Sea turtles** — Ngoe  
spear, net, hand
- Octopus** — Koet  
long-handle hook
- Spiny Lobster** — Ungung  
hand
- Mangrove crab** — Powa  
gleaning, trapping
- Coconut crab** — Aie  
hand, stick
- Land crab** — Aieng  
hand
- Sea cucumber** — Wah  
hand
- Anemone** — Lut  
Hibiscus, knife
- Round clam** — Popol  
digging, hand
- Giant clam** — Natula  
gleaning, prying
- Rare clams** — Tuk, Punak  
gleaning, digging
- Shoreline snails (Nerita Polita)** — Kufahi  
hand

NOT RELATED TO BIOTA

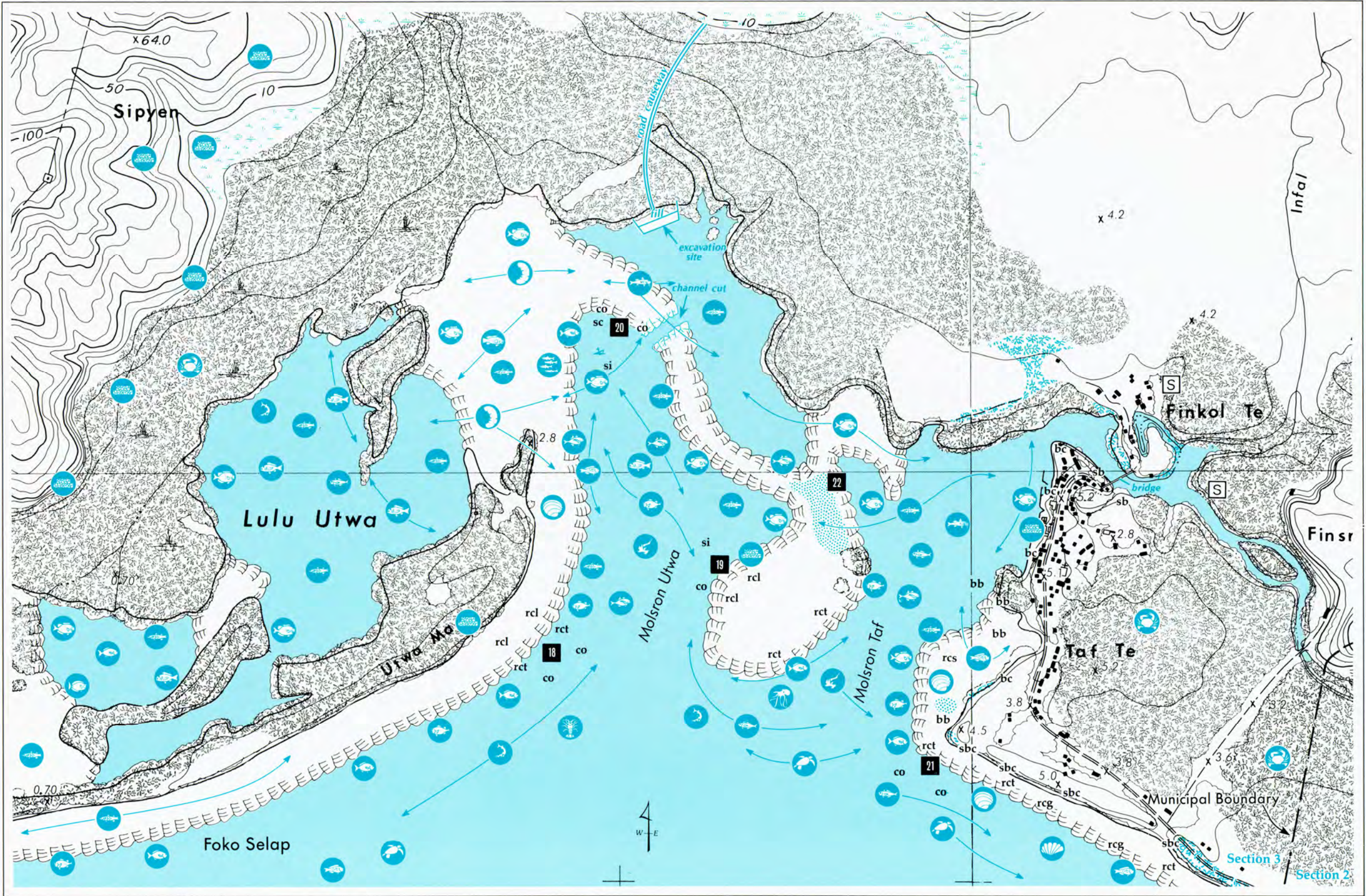
- Archaeological site**
- Manual sand removal**

Other Symbols

- Seagrass bed
- Mangrove forest
- Swamp forest
- Boat wreck
- Observed range

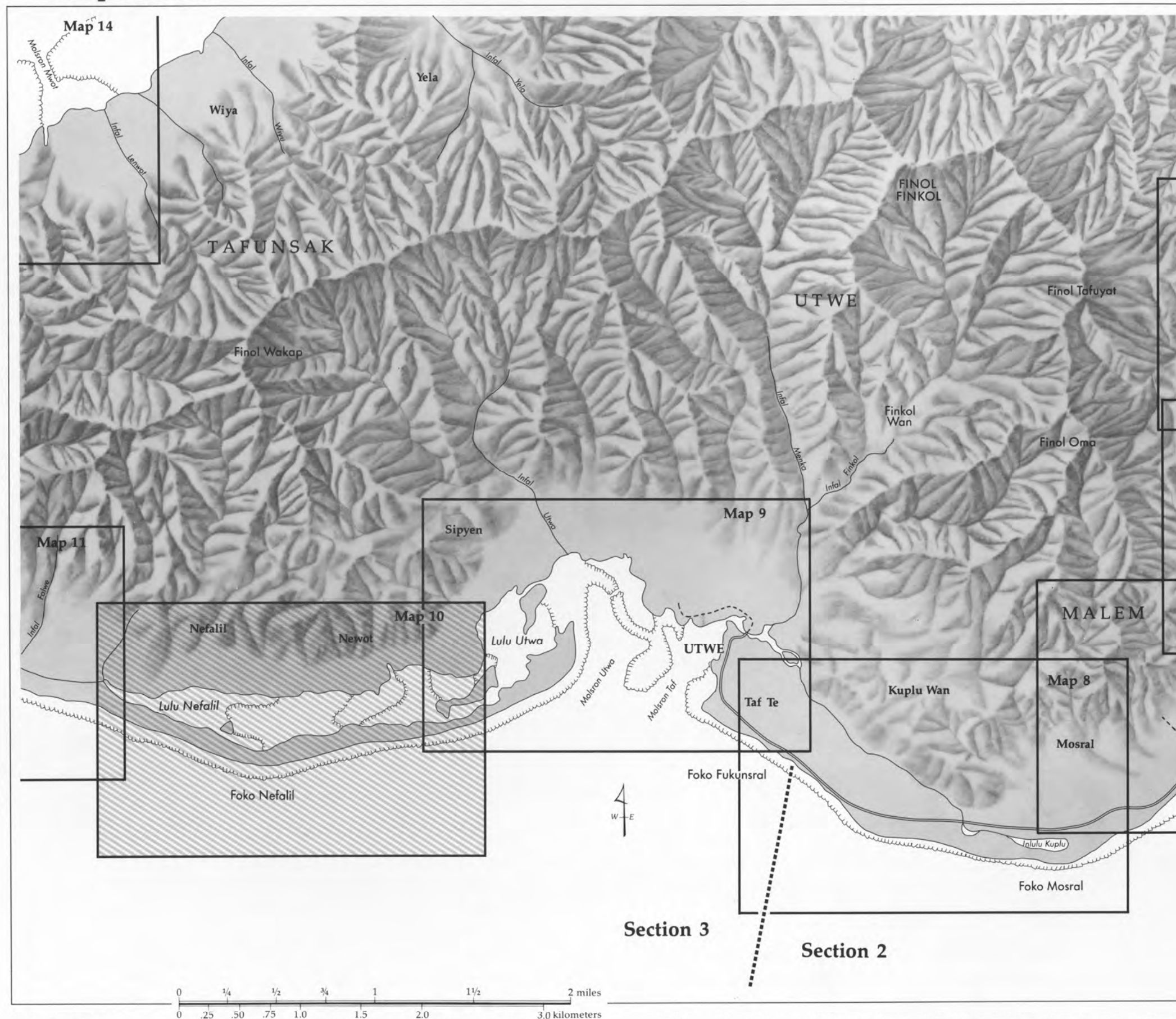
Field Stations

- 52. KCRI Station
- C. Chun et al., 1979
- E. Eldredge et al., 1979
- S. Stemmermann & Proby, 1978





## Map Index 3



## Bottom Type and Land Cover Classification

(based on field observation and aerial photographic interpretation)

### OFFSHORE

- s — Sediment
- sc — Sand bottom in water depths less than 10 meters
- si — Silt
- rc — Reef Complex
  - rc — Mixed bottom types consisting of reef rock (limestone) associated with shallow reef formations
  - rc1 — Consolidated limestone, lacking sediment
  - rcp — Consolidated limestone with a smooth, pavement-like surface
  - rcg — Consolidated reef with well defined groove-and-spur system
  - rcs — Mostly consolidated limestone with some (25-50%) sediment bottom
  - rc2 — Complex reef bottom type (rc, rcs, or rs) with loose materials formed into tracks by waves or currents
  - rs — Complex reef bottom type consisting mostly of sand, but with some limestone outcrops or boulders
- co — Areas of greater than 50% live coral cover

### SHORELINE

- ba — Volcanic rock shoreline (basalt)
- bb — Man-made boulder shoreline
- bc — Concrete/cement masonry seawall and shoreline
- sb — White sand beach of predominately calcareous material
- sbc — Calcareous rubble and/or shingle beach

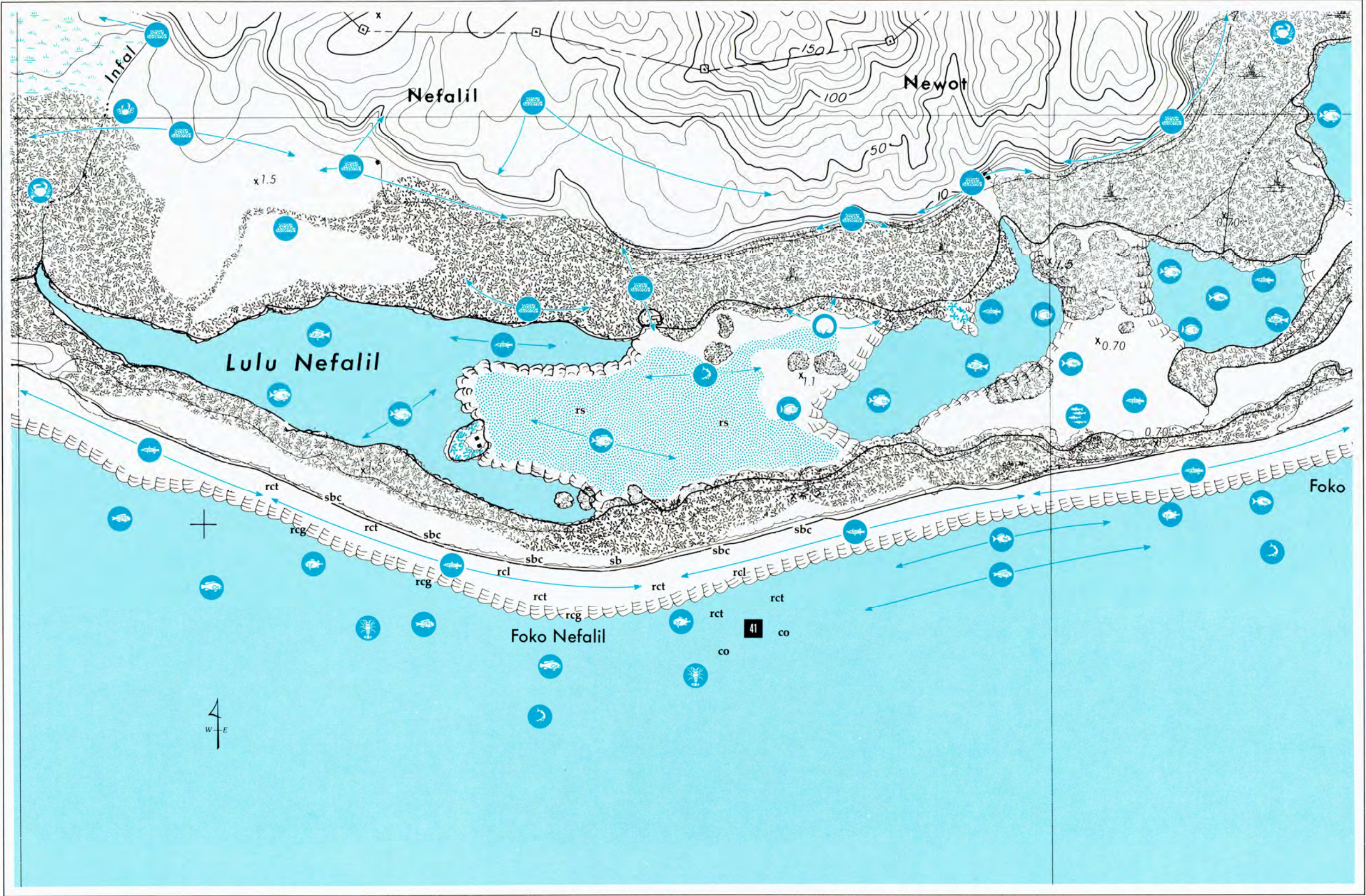
### VEGETATION COVER

- mg — Mangrove forest (source: Stemmermann and Proby, 1978)
- sg — Seagrass bed
- ag — Algae bed
- sw — Swamp forest (source: Stemmermann and Proby, 1978)

**Note:**  
All patch reef surfaces are substrate type rc unless otherwise designated.



- RELATED TO BIOTA**
- Mullet — Ah**  
netting, gill netting, cast net
  - Rabbitfish — Mulap**  
torch, hook & line, netting, cast net
  - Rudderfish — Won**  
netting, cast net
  - Parrotfish — Mesrik**  
netting, spear, casting
  - Squirrelfish — Ollol**  
handline, spear
  - Grouper — Kalsrik**  
hook & line, spear
  - Goatfish — Futfut**  
netting, spear, torch
  - Surgeon — Kupat**  
netting, hook & line, spear
  - Jack trevally — Srapsrap**  
handline, trolling, gill netting
  - Snapper — Tap, Ku, Srial**  
handline, netting
  - Big-eyed scad — Atol**  
netting, handline
  - Hammerhead shark — Pako hammer**  
hook & line
  - Barracuda — Tola**  
trolling
  - Baitfish (Clupeidae) — Tui or Ikinpa**  
cast net
  - Sea turtles — Ngoe**  
spear, net, hand
  - Octopus — Koet**  
long-handle hook
  - Spiny Lobster — Ungung**  
hand
  - Mangrove crab — Powa**  
gleaning, trapping
  - Coconut crab — Aie**  
hand, stick
  - Land crab — Aieng**  
hand
  - Sea cucumber — Wah**  
hand
  - Anemone — Lut**  
Hibiscus, knife
  - Round clam — Popol**  
digging, hand
  - Giant clam — Natula**  
gleaning, prying
  - Rare clams — Tuk, Punak**  
gleaning, digging
  - Shoreline snails (Nerita Polita) — Kufahi**  
hand
- NOT RELATED TO BIOTA**
- Archaeological site**
  - Manual sand removal**



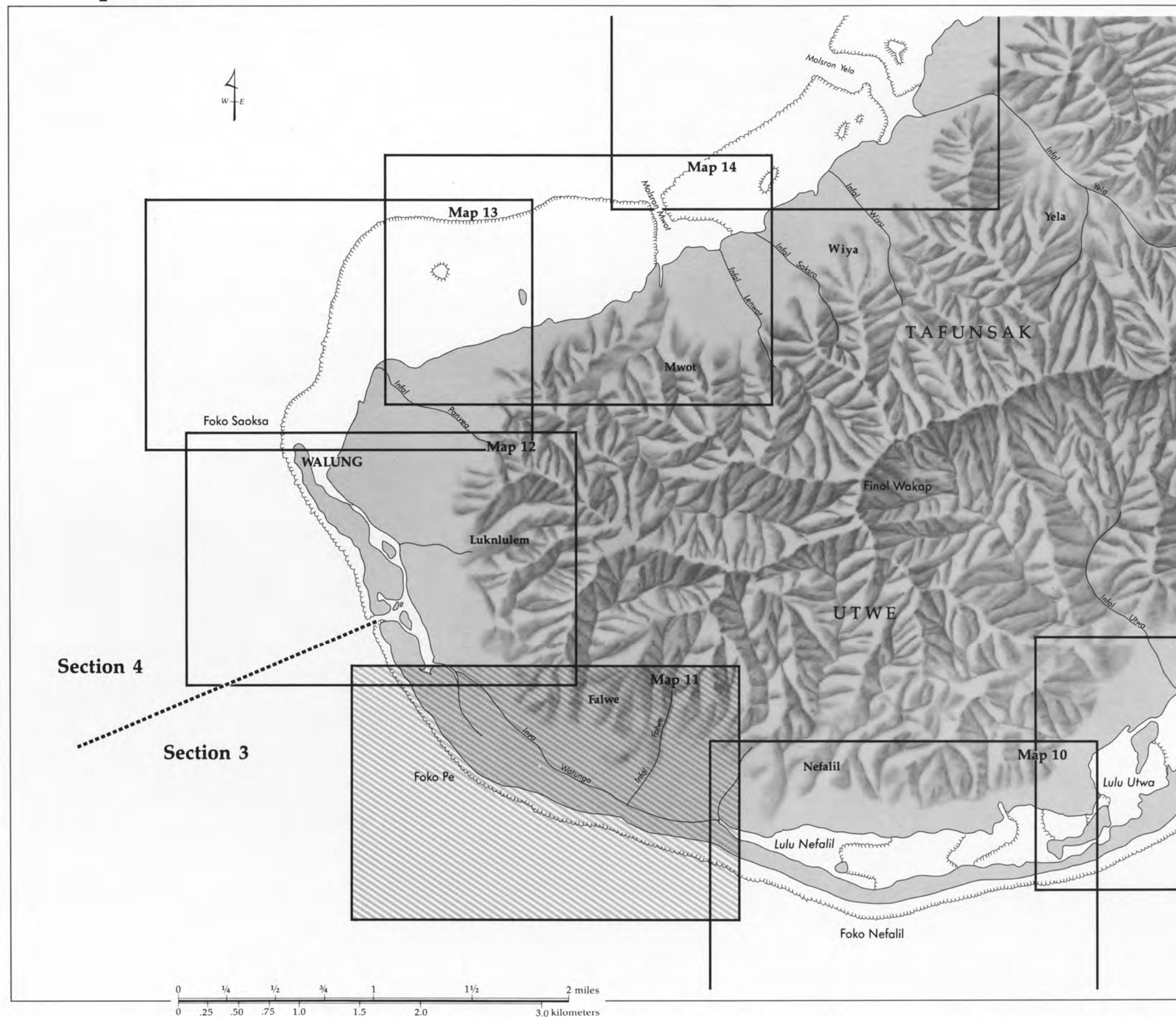
- Other Symbols**
- Seagrass bed
  - Mangrove forest
  - Swamp forest
  - Boat wreck
  - Observed range

- Field Stations**
- KCRI Station
  - Chun et al., 1979
  - Eldredge et al., 1979
  - Stemmermann & Proby, 1978





## Map Index 4



### Bottom Type and Land Cover Classification

(based on field observation and aerial photographic interpretation)

#### OFFSHORE

- s** — Sediment
  - sc** — Sand bottom in water depths less than 10 meters
  - si** — Silt
- rc** — Reef Complex
  - rc** — Mixed bottom types consisting of reef rock (limestone) associated with shallow reef formations
  - rcl** — Consolidated limestone, lacking sediment
  - rcl** — Consolidated limestone with a smooth, pavement-like surface
  - rcg** — Consolidated reef with well defined groove-and-spur system
  - rcs** — Mostly consolidated limestone with some (25-50%) sediment bottom
  - rct** — Complex reef bottom type (rc, rcs, or rs) with loose materials formed into tracks by waves or currents
  - rs** — Complex reef bottom type consisting mostly of sand, but with some limestone outcrops or boulders
  - co** — Areas of greater than 50% live coral cover

#### SHORELINE

- ba** — Volcanic rock shoreline (basalt)
- bb** — Man-made boulder shoreline
- bc** — Concrete/cement masonry seawall and shoreline
- sb** — White sand beach of predominately calcareous material
- sbc** — Calcareous rubble and/or shingle beach

#### VEGETATION COVER

- mg** — Mangrove forest (source: Stemmermann and Proby, 1978)
- sg** — Seagrass bed
- ag** — Algae bed
- sw** — Swamp forest (source: Stemmermann and Proby, 1978)

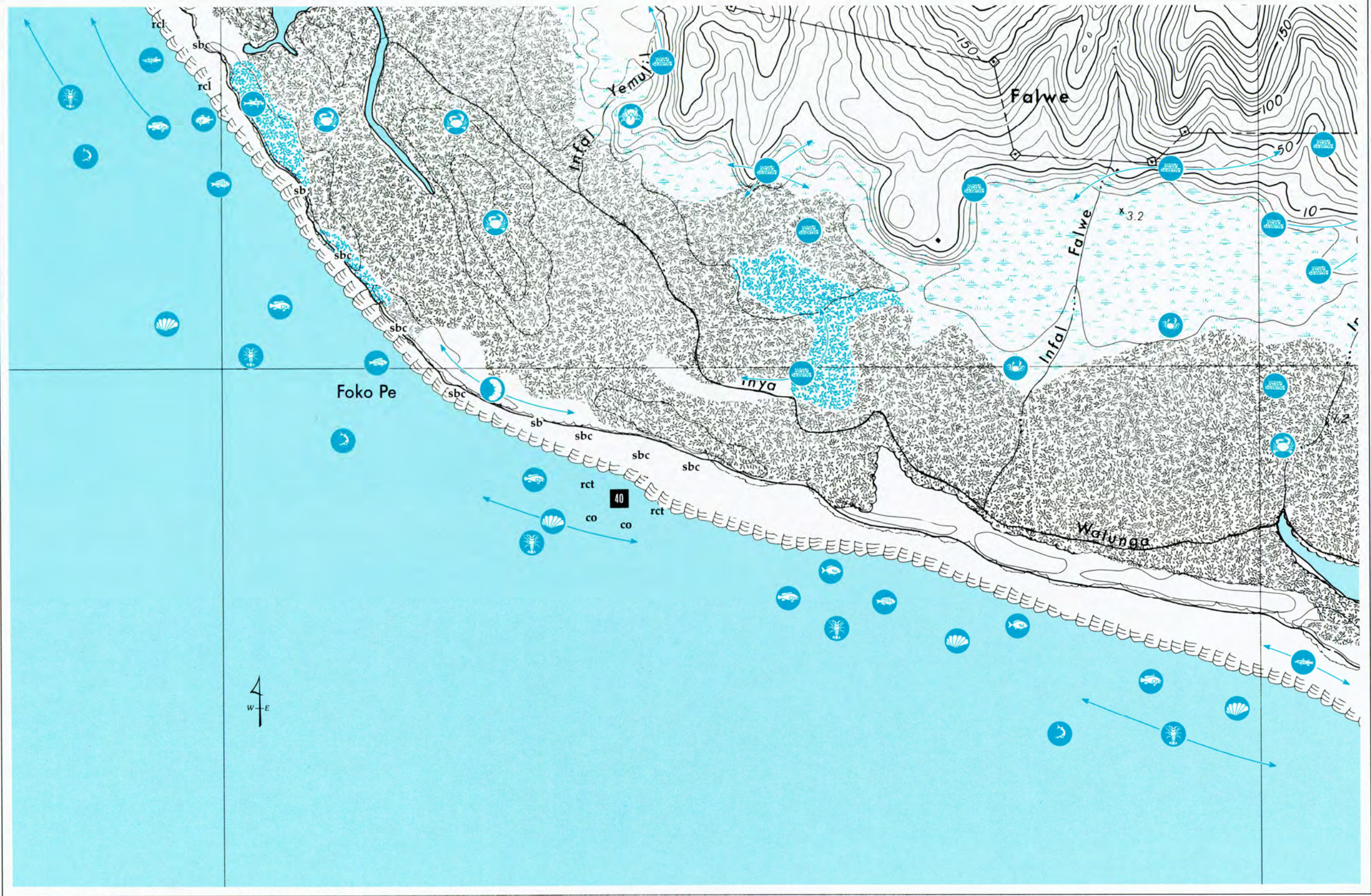
**Note:**  
All patch reef surfaces are substrate type **rc** unless otherwise designated.



Resource Use

Map 11

- RELATED TO BIOTA
- Mullet — Ah  
netting, gill netting, cast net
- Rabbitfish — Mulap  
torch, hook & line, netting, cast net
- Rudderfish — Won  
netting, cast net
- Parrotfish — Mesrik  
netting, spear, casting
- Squirrelfish — Ollol  
handline, spear
- Grouper — Kalsrik  
hook & line, spear
- Goatfish — Futfut  
netting, spear, torch
- Surgeon — Kupat  
netting, hook & line, spear
- Jack trevally — Srapsrap  
handline, trolling, gill netting
- Snapper — Tap, Ku, Srinai  
handline, netting
- Big-eyed scad — Atol  
netting, handline
- Hammerhead shark — Pako hammer  
hook & line
- Barracuda — Tola  
trolling
- Baitfish (Clupeidae) — Tui or Ikinpa  
cast net
- Sea turtles — Ngoe  
spear, net, hand
- Octopus — Koet  
long-handle hook
- Spiny Lobster — Ungung  
hand
- Mangrove crab — Powa  
gleaning, trapping
- Coconut crab — Aie  
hand, stick
- Land crab — Aieng  
hand
- Sea cucumber — Wah  
hand
- Anemone — Lut  
Hibiscus, knife
- Round clam — Popol  
digging, hand
- Giant clam — Natula  
gleaning, prying
- Rare clams — Tuk, Punak  
gleaning, digging
- Shoreline snails (Nerita Polita) — Kufahi  
hand
- NOT RELATED TO BIOTA
- Archaeological site
- Manual sand removal



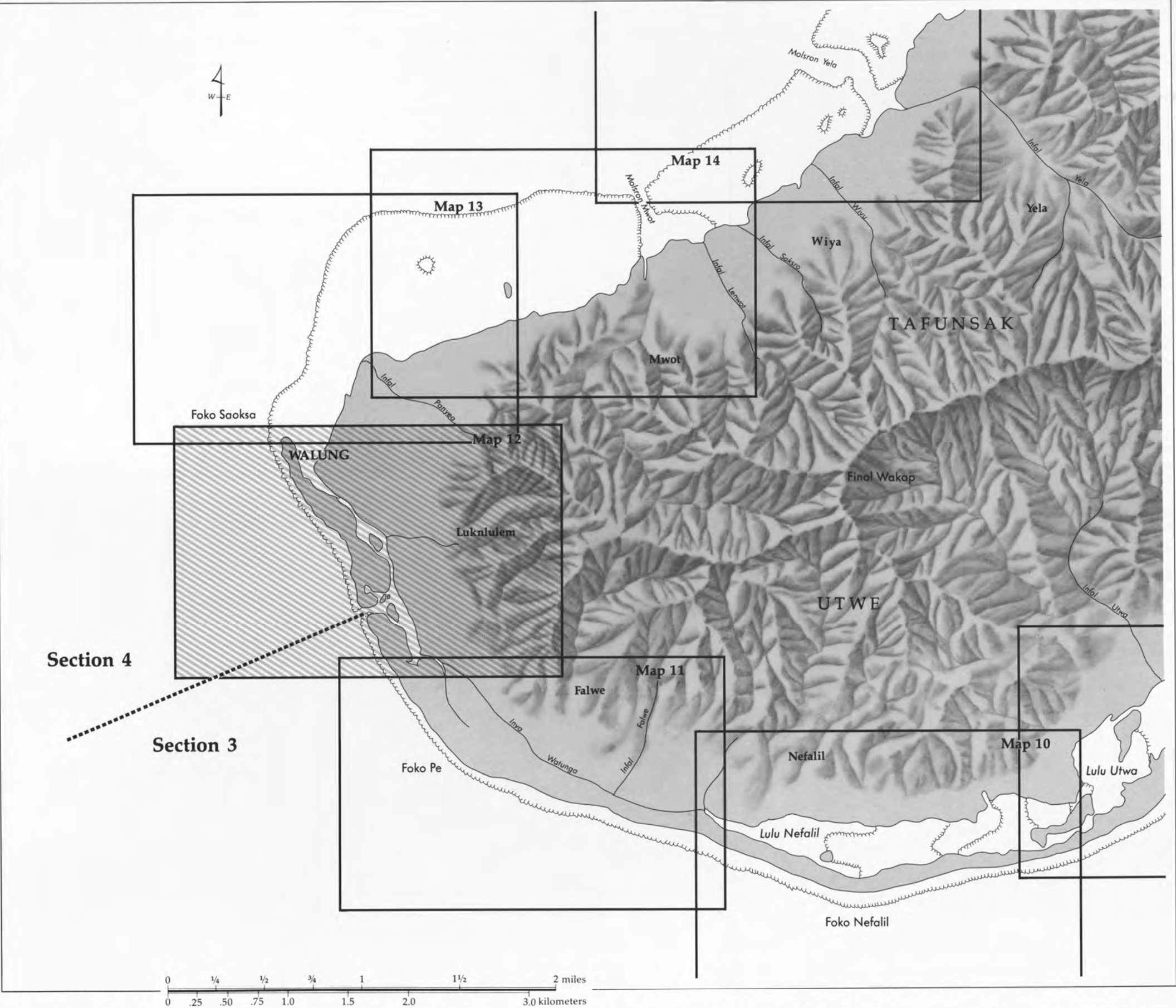
- Other Symbols
- Seagrass bed
- Mangrove forest
- Swamp forest
- Boat wreck
- Observed range

- Field Stations
- KCRI Station
- Chun et al., 1979
- Eldredge et al., 1979
- Stemmermann & Proby, 1978





Map Index 4



Bottom Type and Land Cover Classification

(based on field observation and aerial photographic interpretation)

OFFSHORE

- s — Sediment
- sc — Sand bottom in water depths less than 10 meters
- si — Silt
- rc — Reef Complex
  - rc — Mixed bottom types consisting of reef rock (limestone) associated with shallow reef formations
  - rcl — Consolidated limestone, lacking sediment
  - rcp — Consolidated limestone with a smooth, pavement-like surface
  - rcg — Consolidated reef with well defined groove-and-spur system
  - rcs — Mostly consolidated limestone with some (25-50%) sediment bottom
  - rct — Complex reef bottom type (rc, rcs, or rs) with loose materials formed into tracks by waves or currents
  - rs — Complex reef bottom type consisting mostly of sand, but with some limestone outcrops or boulders
  - co — Areas of greater than 50% live coral cover

SHORELINE

- ba — Volcanic rock shoreline (basalt)
- bb — Man-made boulder shoreline
- bc — Concrete/cement masonry seawall and shoreline
- sb — White sand beach of predominately calcareous material
- sbc — Calcareous rubble and/or shingle beach

VEGETATION COVER

- mg — Mangrove forest (source: Stemmermann and Proby, 1978)
- sg — Seagrass bed
- ag — Algae bed
- sw — Swamp forest (source: Stemmermann and Proby, 1978)

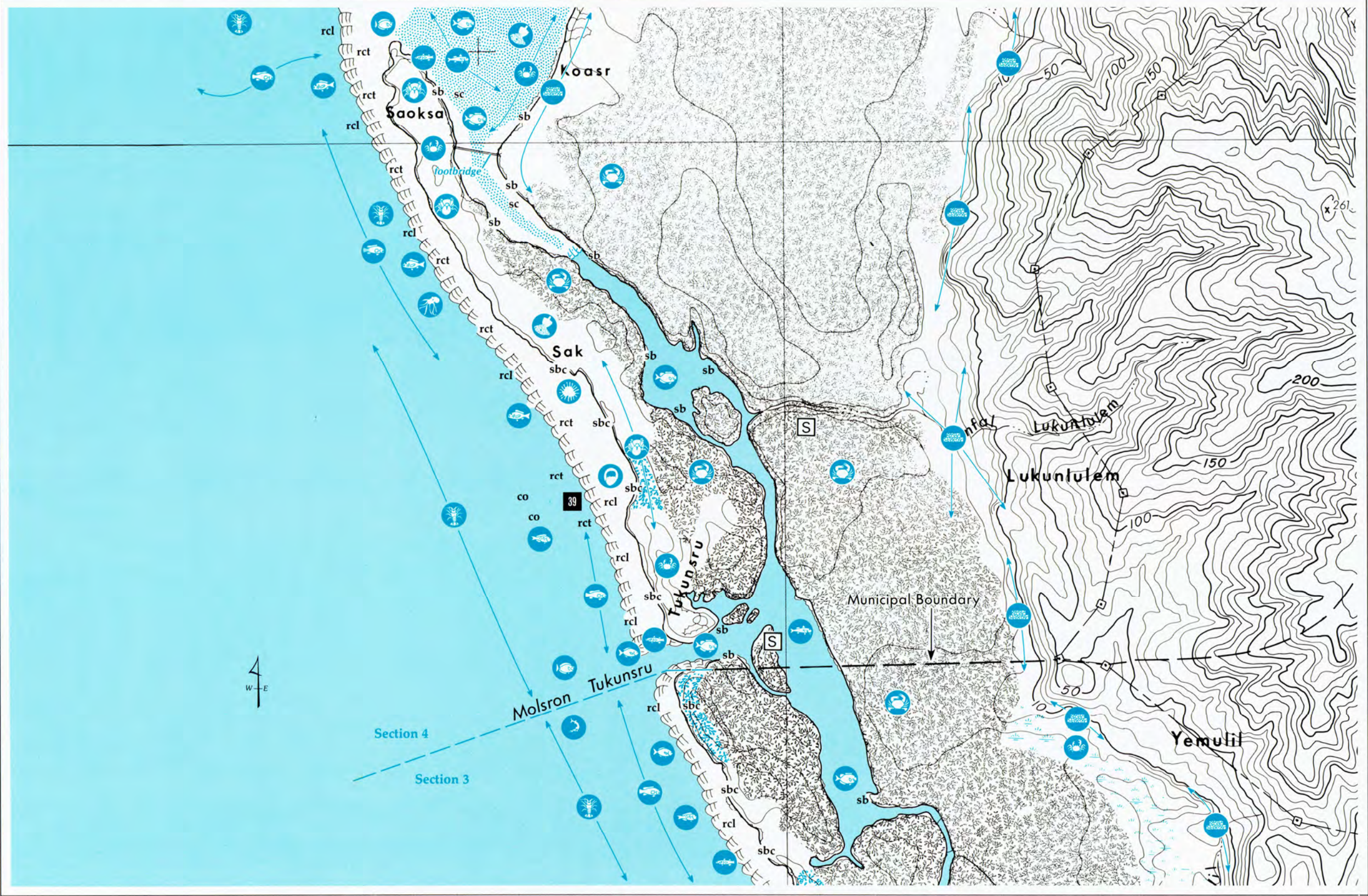
Note:  
All patch reef surfaces are substrate type rc unless otherwise designated.



Resource Use

Map 12

- RELATED TO BIOTA
- Mullet — Ah  
netting, gill netting, cast net
- Rabbitfish — Mulap  
torch, hook & line, netting, cast net
- Rudderfish — Won  
netting, cast net
- Parrotfish — Mesrik  
netting, spear, casting
- Squirrelfish — Ollol  
handline, spear
- Grouper — Kalsrik  
hook & line, spear
- Goatfish — Futfut  
netting, spear, torch
- Surgeon — Kupat  
netting, hook & line, spear
- Jack trevally — Srapsrap  
handline, trolling, gill netting
- Snapper — Tap, Ku, Srinai  
handline, netting
- Big-eyed scad — Atol  
netting, handline
- Hammerhead shark — Pako hammer  
hook & line
- Barracuda — Tola  
trolling
- Baitfish (Clupeidae) — Tui or Ikinpa  
cast net
- Sea turtles — Ngoc  
spear, net, hand
- Octopus — Koet  
long-handle hook
- Spiny Lobster — Ungung  
hand
- Mangrove crab — Powa  
gleaning, trapping
- Coconut crab — Aie  
hand, stick
- Land crab — Aieng  
hand
- Sea cucumber — Wah  
hand
- Anemone — Lut  
Hibiscus, knife
- Round clam — Popol  
digging, hand
- Giant clam — Natula  
gleaning, prying
- Rare clams — Tuk, Punak  
gleaning, digging
- Shoreline snails (Nerita Polita) — Kufahi  
hand
- NOT RELATED TO BIOTA
- Archaeological site
- Manual sand removal

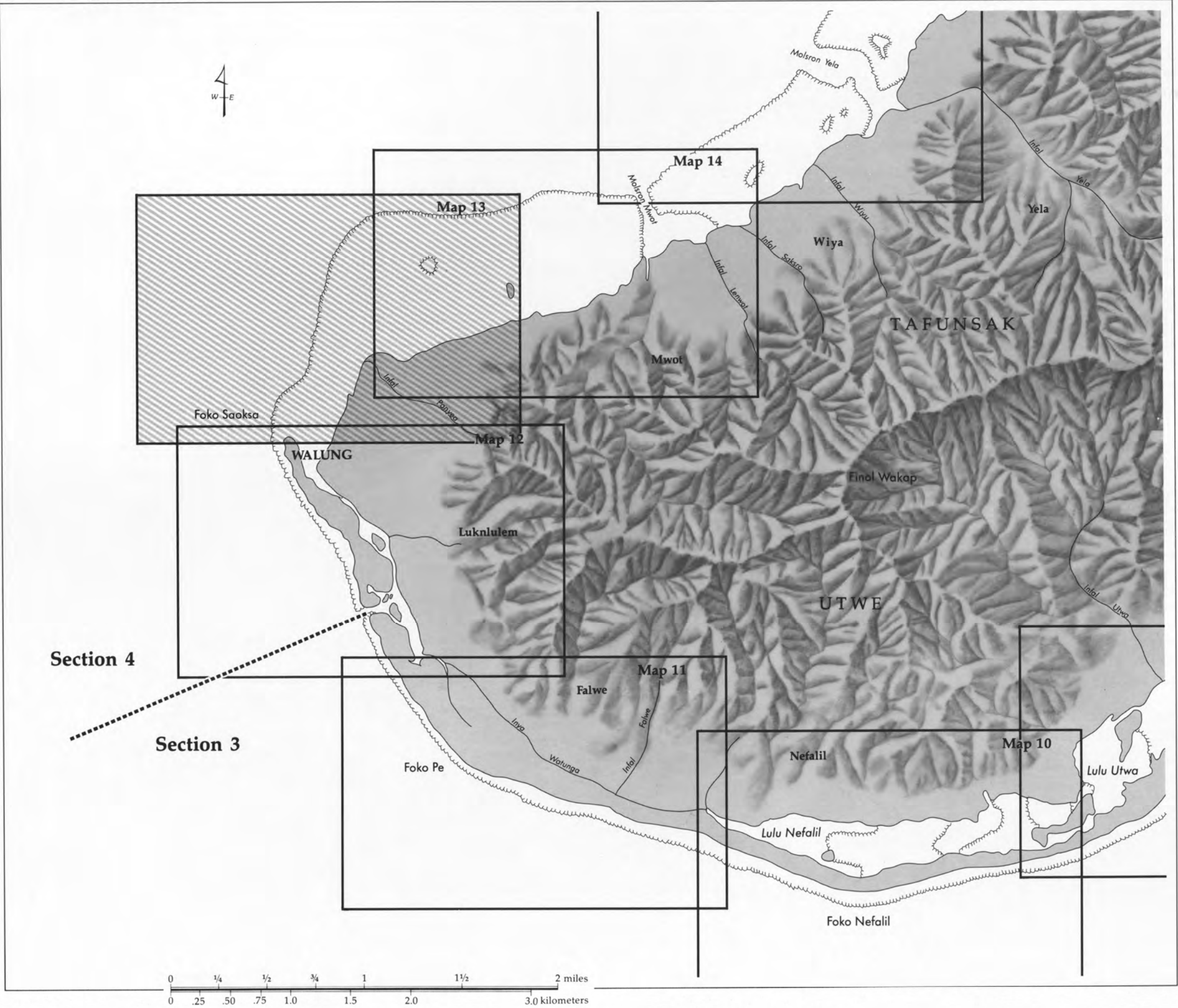


- Other Symbols
- Seagrass bed
- Mangrove forest
- Swamp forest
- Boat wreck
- Observed range
- Field Stations
- 52 KCRI Station
- C Chun et al., 1979
- E Eldredge et al., 1979
- S Stemmermann & Proby, 1978





Map Index 4



Bottom Type and Land Cover Classification

(based on field observation and aerial photographic interpretation)

OFFSHORE

- s — Sediment
- sc — Sand bottom in water depths less than 10 meters
- si — Silt
- rc — Reef Complex
  - rc — Mixed bottom types consisting of reef rock (limestone) associated with shallow reef formations
  - rcl — Consolidated limestone, lacking sediment
  - rcp — Consolidated limestone with a smooth, pavement-like surface
  - rcg — Consolidated reef with well defined groove-and-spur system
  - rcs — Mostly consolidated limestone with some (25-50%) sediment bottom
  - rct — Complex reef bottom type (rc, rcs, or rs) with loose materials formed into tracks by waves or currents
  - rs — Complex reef bottom type consisting mostly of sand, but with some limestone outcrops or boulders
- co — Areas of greater than 50% live coral cover

SHORELINE

- ba — Volcanic rock shoreline (basalt)
- bb — Man-made boulder shoreline
- bc — Concrete/cement masonry seawall and shoreline
- sb — White sand beach of predominately calcareous material
- sbc — Calcareous rubble and/or shingle beach

VEGETATION COVER

- mg — Mangrove forest (source: Stemmermann and Proby, 1978)
- sg — Seagrass bed
- ag — Algae bed
- sw — Swamp forest (source: Stemmermann and Proby, 1978)

Note:  
All patch reef surfaces are substrate type rc unless otherwise designated.



## Resource Use






### RELATED TO BIOTA

-  **Mullet — Ah**  
*netting, gill netting, cast net*
-  **Rabbitfish — Mulap**  
*torch, hook & line, netting, cast net*
-  **Rudderfish — Won**  
*netting, cast net*
-  **Parrotfish — Mesrik**  
*netting, spear, casting*
-  **Squirrelfish — Ollol**  
*handline, spear*
-  **Grouper — Kalsrik**  
*hook & line, spear*
-  **Goatfish — Futfut**  
*netting, spear, torch*
-  **Surgeon — Kupat**  
*netting, hook & line, spear*
-  **Jack trevally — Srapsrap**  
*handline, trolling, gill netting*
-  **Snapper — Tap, Ku, Srinak**  
*handline, netting*
-  **Big-eyed scad — Atol**  
*netting, handline*
-  **Hammerhead shark — Pako hammer**  
*hook & line*
-  **Barracuda — Tola**  
*trolling*
-  **Baitfish (Clupeidae) — Tui or Ikinpa**  
*cast net*
-  **Sea turtles — Ngoe**  
*spear, net, hand*
-  **Octopus — Koet**  
*long-handle hook*
-  **Spiny Lobster — Ungung**  
*hand*
-  **Mangrove crab — Powa**  
*gleaning, trapping*
-  **Coconut crab — Aie**  
*hand, stick*
-  **Land crab — Aieng**  
*hand*
-  **Sea cucumber — Wah**  
*hand*
-  **Anemone — Lut**  
*Hibiscus, knife*
-  **Round clam — Popol**  
*digging, hand*
-  **Giant clam — Natula**  
*gleaning, prying*
-  **Rare clams — Tuk, Punak**  
*gleaning, digging*
-  **Shoreline snails (Nerita Polita) — Kufahi**  
*hand*

NOT RELATED TO BIOTA

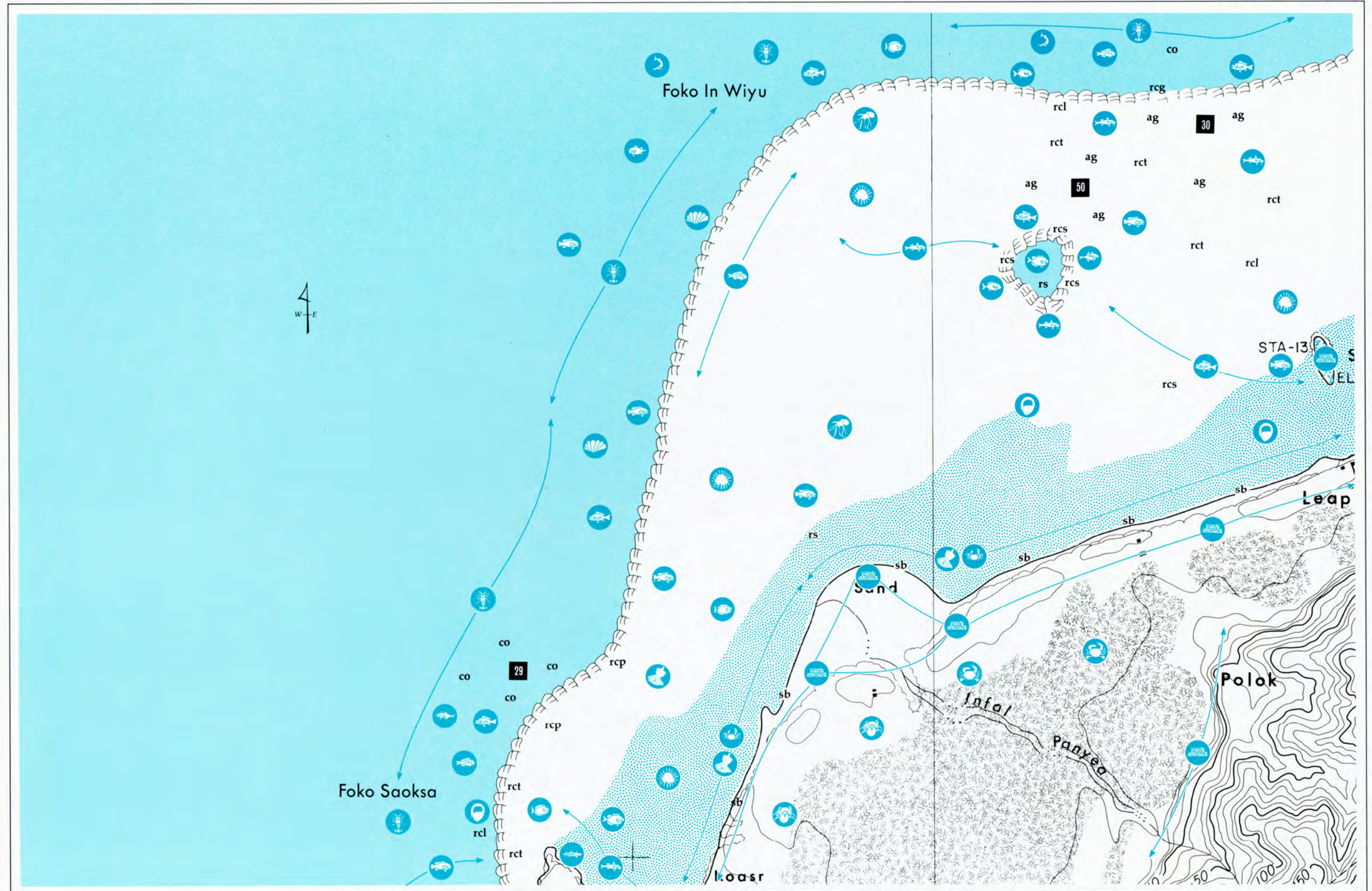
- Archaeological site
- Manual sand removal

## Other Symbols

-  Seagrass bed  
 Mangrove forest  
 Swamp forest  
 Boat wreck  
 Observed range

## Field Stations

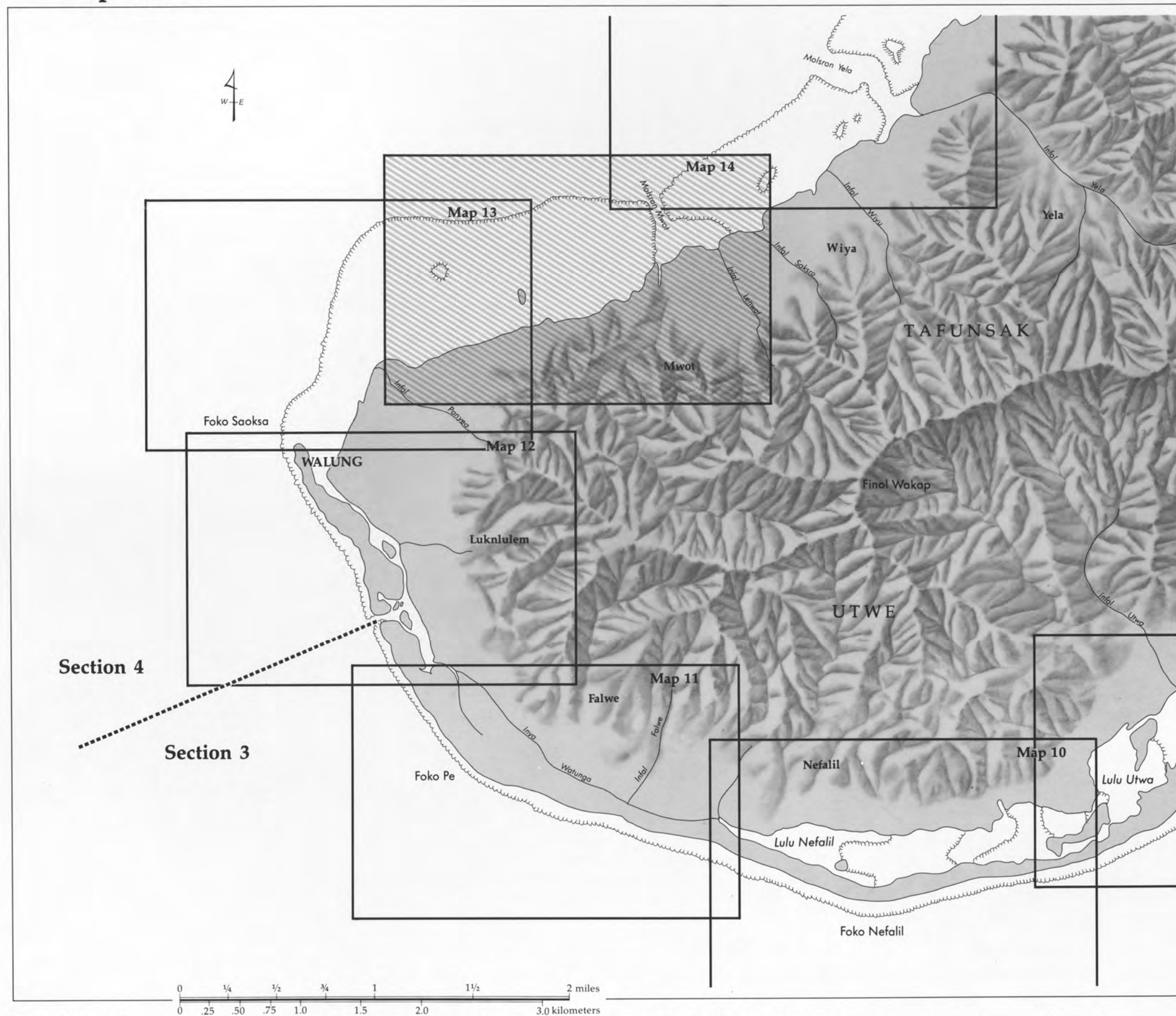
- 52** KCRI Station  
**C** Chun et al., 1979  
**E** Eldredge et al., 1979  
**S** Stemmermann & Proby, 1978



A number line illustrating the conversion of 3/4 mile to kilometers. The top scale is labeled "mile" and has markings at 0, 1/4, 1/2, and 3/4. The bottom scale is labeled "kilometer" and has markings at 0, .25, .50, .75, and 1.0. The 3/4 mile mark corresponds to the .75 kilometer mark.



## Map Index 4



### Bottom Type and Land Cover Classification

(based on field observation and aerial photographic interpretation)

#### OFFSHORE

- s** — Sediment
- sc** — Sand bottom in water depths less than 10 meters
- si** — Silt
- rc** — Reef Complex
  - rc** — Mixed bottom types consisting of reef rock (limestone) associated with shallow reef formations
  - rcl** — Consolidated limestone, lacking sediment
  - rcp** — Consolidated limestone with a smooth, pavement-like surface
  - rcg** — Consolidated reef with well defined groove-and-spur system
  - rct** — Mostly consolidated limestone with some (25-50%) sediment bottom
  - rct** — Complex reef bottom type (**rc**, **rct**, or **rs**) with loose materials formed into tracks by waves or currents
  - rs** — Complex reef bottom type consisting mostly of sand, but with some limestone outcrops or boulders
  - co** — Areas of greater than 50% live coral cover

#### SHORELINE

- ba** — Volcanic rock shoreline (basalt)
- bb** — Man-made boulder shoreline
- bc** — Concrete/cement masonry seawall and shoreline
- sb** — White sand beach of predominately calcareous material
- sbc** — Calcareous rubble and/or shingle beach

#### VEGETATION COVER

- mg** — Mangrove forest (source: Stemmermann and Proby, 1978)
- sg** — Seagrass bed
- ag** — Algae bed
- sw** — Swamp forest (source: Stemmermann and Proby, 1978)

**Note:**  
All patch reef surfaces are substrate type **rc** unless otherwise designated.



Resource Use

Map 14

RELATED TO BIOTA

- Mullet** — Ah  
netting, gill netting, cast net
- Rabbitfish** — Mulap  
torch, hook & line, netting, cast net
- Rudderfish** — Won  
netting, cast net
- Parrotfish** — Mesrik  
netting, spear, casting
- Squirrelfish** — Ollol  
handline, spear
- Grouper** — Kalsrik  
hook & line, spear
- Goatfish** — Futfut  
netting, spear, torch
- Surgeon** — Kapat  
netting, hook & line, spear
- Jack trevally** — Srapsrap  
handline, trolling, gill netting
- Snapper** — Tap, Ku, Srinak  
handline, netting
- Big-eyed scad** — Atol  
netting, handline
- Hammerhead shark** — Pako hammer  
hook & line
- Barracuda** — Tola  
trolling
- Baitfish (Clupeidae)** — Tui or Ikinpa  
cast net
- Sea turtles** — Ngoe  
spear, net, hand
- Octopus** — Koet  
long-handle hook
- Spiny Lobster** — Ungung  
hand
- Mangrove crab** — Powa  
gleaning, trapping
- Coconut crab** — Aie  
hand, stick
- Land crab** — Aieng  
hand
- Sea cucumber** — Wah  
hand
- Anemone** — Lut  
Hibiscus, knife
- Round clam** — Popol  
digging, hand
- Giant clam** — Natula  
gleaning, prying
- Rare clams** — Tuk, Punak  
gleaning, digging
- Shoreline snails (Nerita Polita)** — Kufahi  
hand

NOT RELATED TO BIOTA

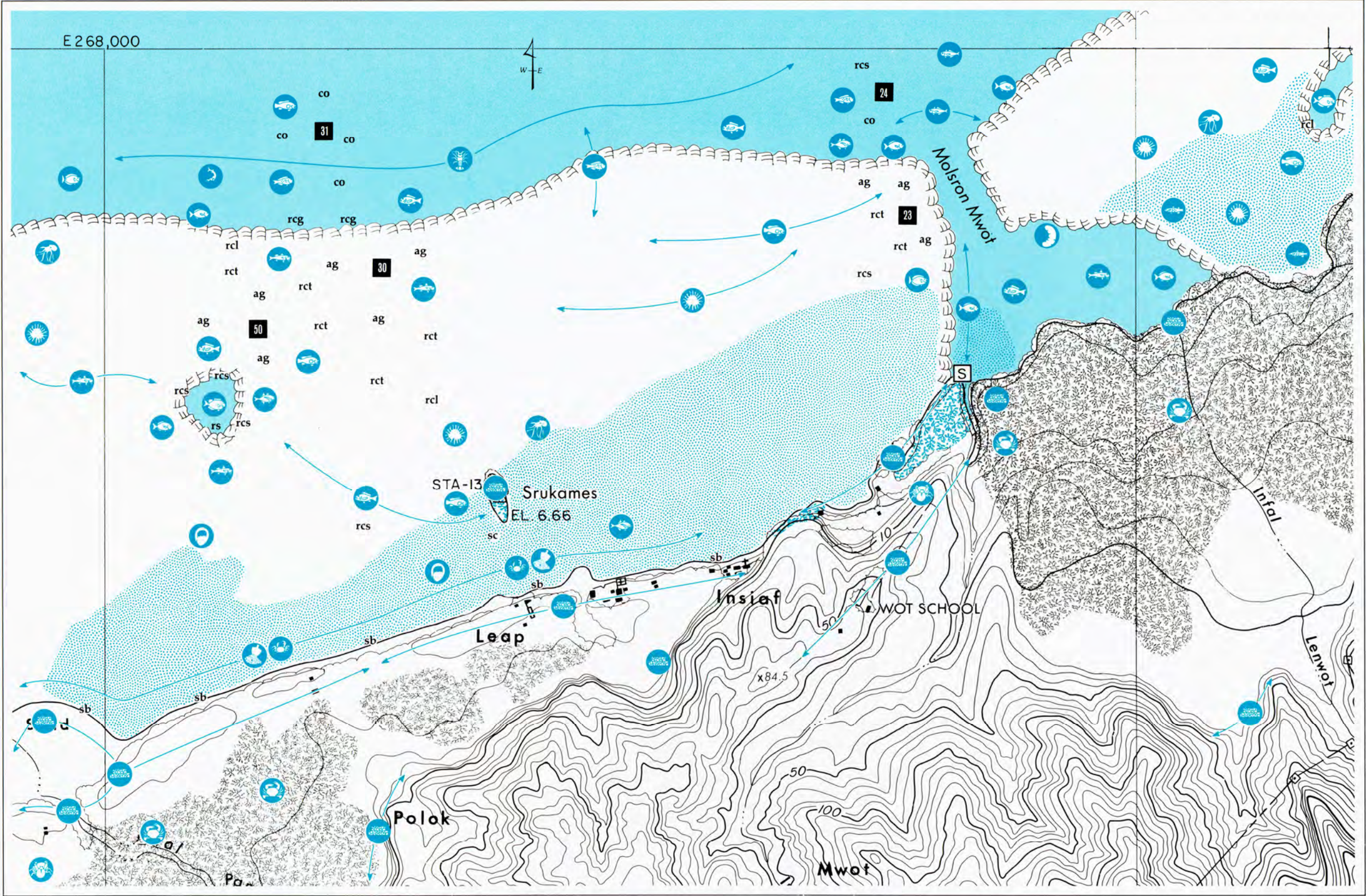
- Archaeological site**
- Manual sand removal**

Other Symbols

- Seagrass bed
- Mangrove forest
- Swamp forest
- Boat wreck
- Observed range

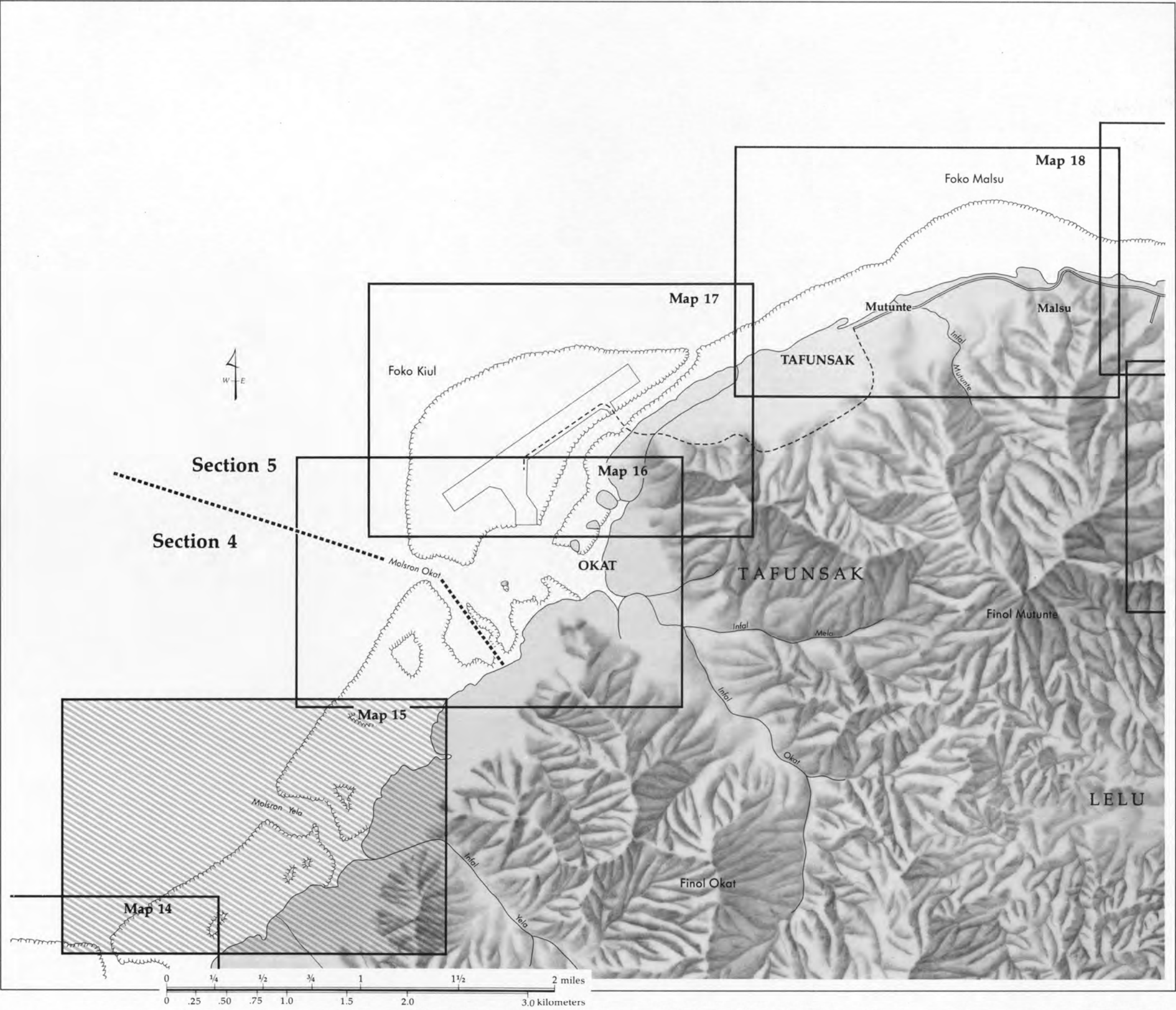
Field Stations

- KCRI Station
- Chun et al., 1979
- Eldredge et al., 1979
- Stemmermann & Proby, 1978





Map Index 5



Bottom Type and Land Cover Classification

(based on field observation and aerial photographic interpretation)

OFFSHORE

- s — Sediment
- sc — Sand bottom in water depths less than 10 meters
- si — Silt
- rc — Reef Complex
  - rc — Mixed bottom types consisting of reef rock (limestone) associated with shallow reef formations
  - rcl — Consolidated limestone, lacking sediment
  - rcp — Consolidated limestone with a smooth, pavement-like surface
  - rcg — Consolidated reef with well defined groove-and-spur system
  - rcs — Mostly consolidated limestone with some (25-50%) sediment bottom
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  - rs — Complex reef bottom type consisting mostly of sand, but with some limestone outcrops or boulders
- co — Areas of greater than 50% live coral cover

SHORELINE

- ba — Volcanic rock shoreline (basalt)
- bb — Man-made boulder shoreline
- bc — Concrete/cement masonry seawall and shoreline
- sb — White sand beach of predominately calcareous material
- sbc — Calcareous rubble and/or shingle beach

VEGETATION COVER

- mg — Mangrove forest (source: Stemmermann and Proby, 1978)
- sg — Seagrass bed
- ag — Algae bed
- sw — Swamp forest (source: Stemmermann and Proby, 1978)

Note:  
All patch reef surfaces are substrate type rc unless otherwise designated.



Resource Use

Map 15

RELATED TO BIOTA

- Mullet** — Ah  
netting, gill netting, cast net
- Rabbitfish** — Mulap  
torch, hook & line, netting, cast net
- Rudderfish** — Won  
netting, cast net
- Parrotfish** — Mesrik  
netting, spear, casting
- Squirrelfish** — Ollol  
handline, spear
- Grouper** — Kalsrik  
hook & line, spear
- Goatfish** — Futfut  
netting, spear, torch
- Surgeon** — Kupat  
netting, hook & line, spear
- Jack trevally** — Srapsrap  
handline, trolling, gill netting
- Snapper** — Tap, Ku, Srinai  
handline, netting
- Big-eyed scad** — Atol  
netting, handline
- Hammerhead shark** — Pako hammer  
hook & line
- Barracuda** — Tola  
trolling
- Baitfish (Clupeidae)** — Tui or Ikinpa  
cast net
- Sea turtles** — Ngoc  
spear, net, hand
- Octopus** — Koet  
long-handle hook
- Spiny Lobster** — Ungung  
hand
- Mangrove crab** — Powa  
gleaning, trapping
- Coconut crab** — Aie  
hand, stick
- Land crab** — Aieng  
hand
- Sea cucumber** — Wah  
hand
- Anemone** — Lut  
Hibiscus, knife
- Round clam** — Popol  
digging, hand
- Giant clam** — Natula  
gleaning, prying
- Rare clams** — Tuk, Punak  
gleaning, digging
- Shoreline snails (Nerita Polita)** — Kufahi  
hand

NOT RELATED TO BIOTA

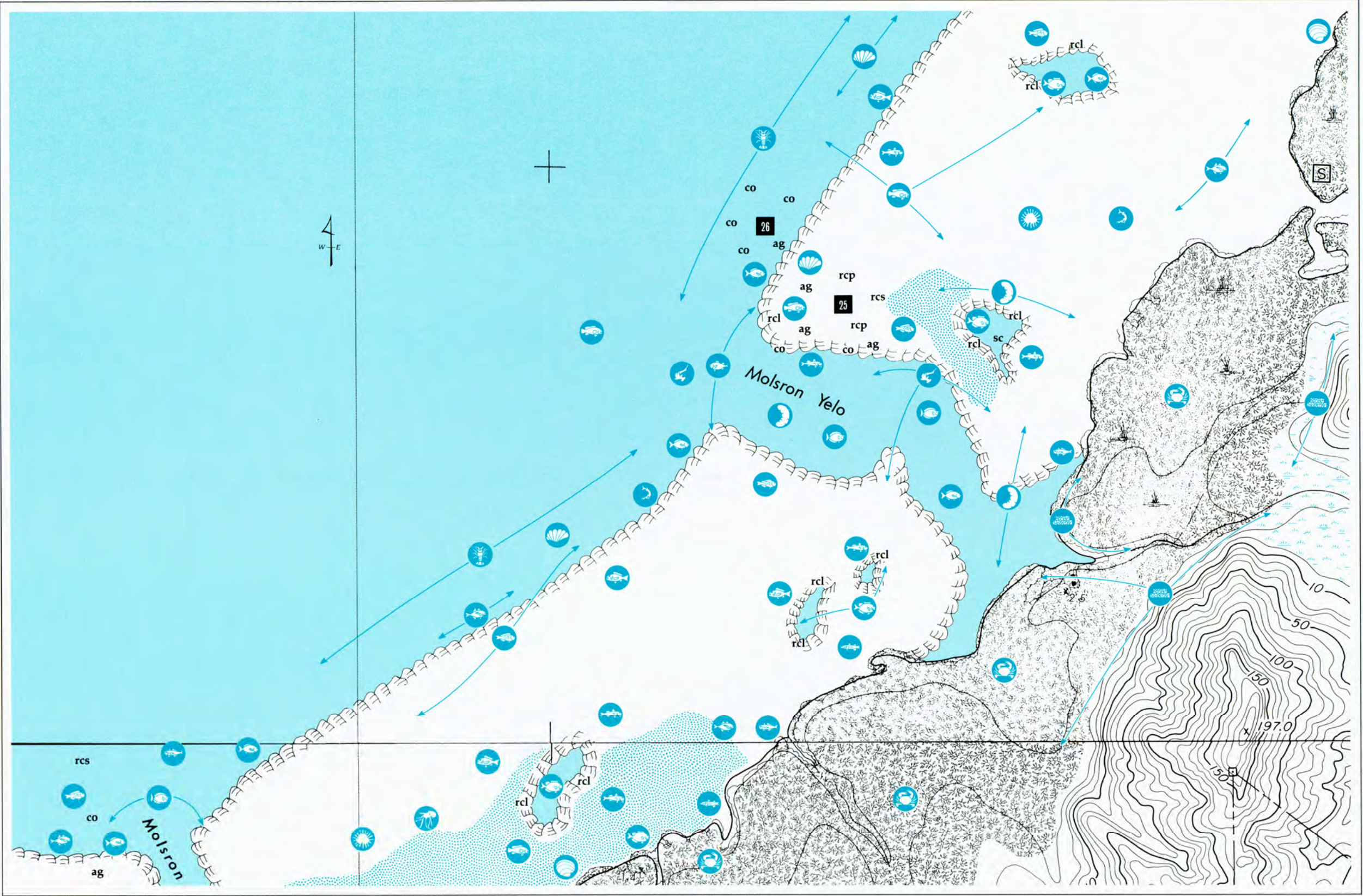
- Archaeological site**
- Manual sand removal**

Other Symbols

- Seagrass bed
- Mangrove forest
- Swamp forest
- Boat wreck
- Observed range

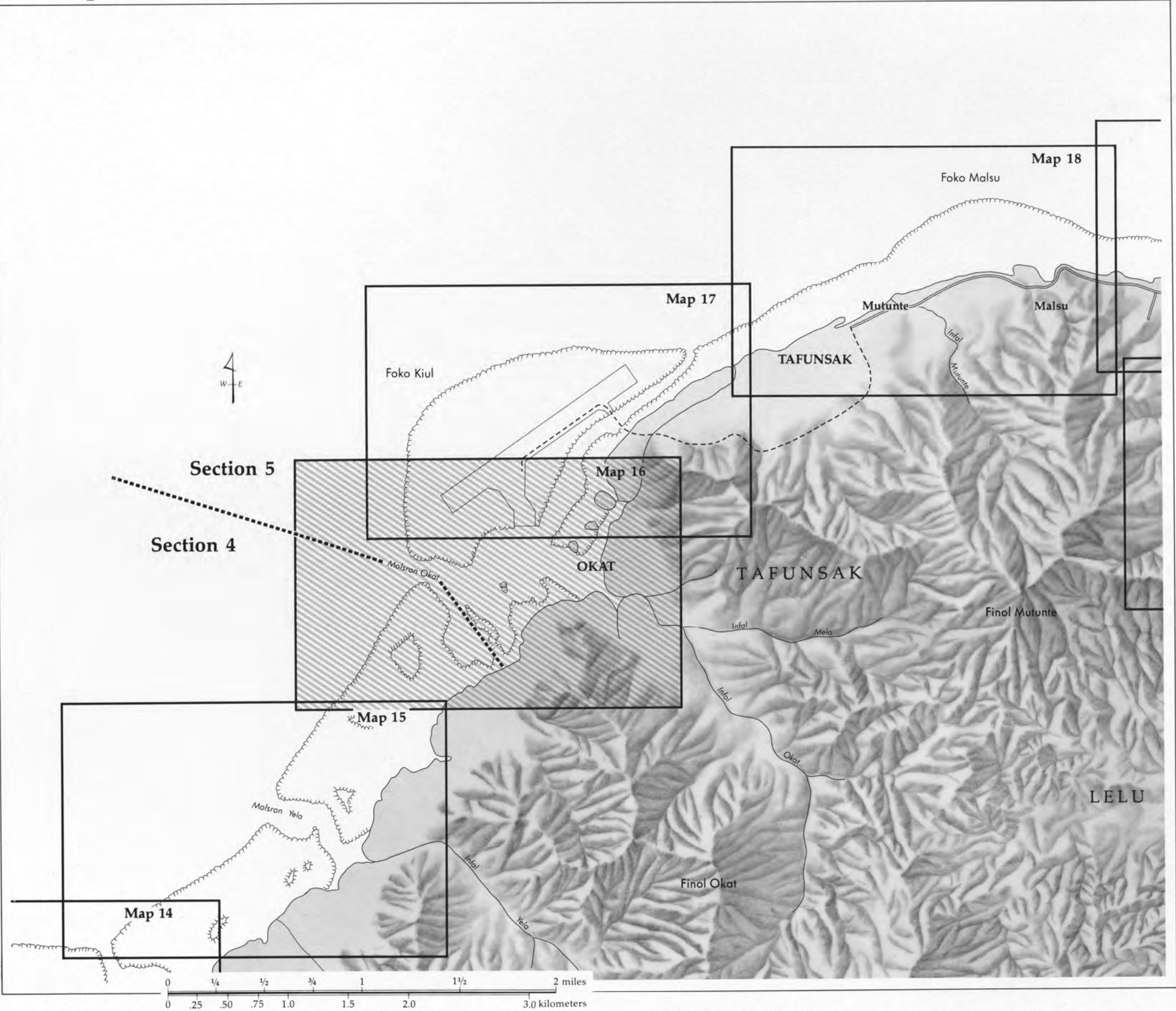
Field Stations

- KCRI Station
- Chun et al., 1979
- Eldredge et al., 1979
- Stemmermann & Proby, 1978





Map Index 5



Bottom Type and Land Cover Classification

(based on field observation and aerial photographic interpretation)

OFFSHORE

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- si — Silt
- rc — Reef Complex
  - rc — Mixed bottom types consisting of reef rock (limestone) associated with shallow reef formations
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SHORELINE

- ba — Volcanic rock shoreline (basalt)
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- bc — Concrete/cement masonry seawall and shoreline
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- sbc — Calcareous rubble and/or shingle beach

VEGETATION COVER

- mg — Mangrove forest (source: Stemmermann and Proby, 1978)
- sg — Seagrass bed
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Note:  
All patch reef surfaces are substrate type rc unless otherwise designated.



RELATED TO BIOTA

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- Rudderfish** — Won  
netting, cast net
- Parrotfish** — Mesrik  
netting, spear, casting
- Squirrelfish** — Ollol  
handline, spear
- Grouper** — Kalsrik  
hook & line, spear
- Goatfish** — Futfut  
netting, spear, torch
- Surgeon** — Kupat  
netting, hook & line, spear
- Jack trevally** — Srapsrap  
handline, trolling, gill netting
- Snapper** — Tap, Ku, Ssrinal  
handline, netting
- Big-eyed scad** — Atol  
netting, handline
- Hammerhead shark** — Pako hammer  
hook & line
- Barracuda** — Tola  
trolling
- Baitfish (Clupeidae)** — Tui or Ikinpa  
cast net
- Sea turtles** — Ngoe  
spear, net, hand
- Octopus** — Koet  
long-handle hook
- Spiny Lobster** — Ungung  
hand
- Mangrove crab** — Powa  
gleaning, trapping
- Coconut crab** — Aie  
hand, stick
- Land crab** — Aieng  
hand
- Sea cucumber** — Wah  
hand
- Anemone** — Lut  
Hibiscus, knife
- Round clam** — Popol  
digging, hand
- Giant clam** — Natula  
gleaning, prying
- Rare clams** — Tuk, Punak  
gleaning, digging
- Shoreline snails (Nerita Polita)** — Kufahi  
hand

NOT RELATED TO BIOTA

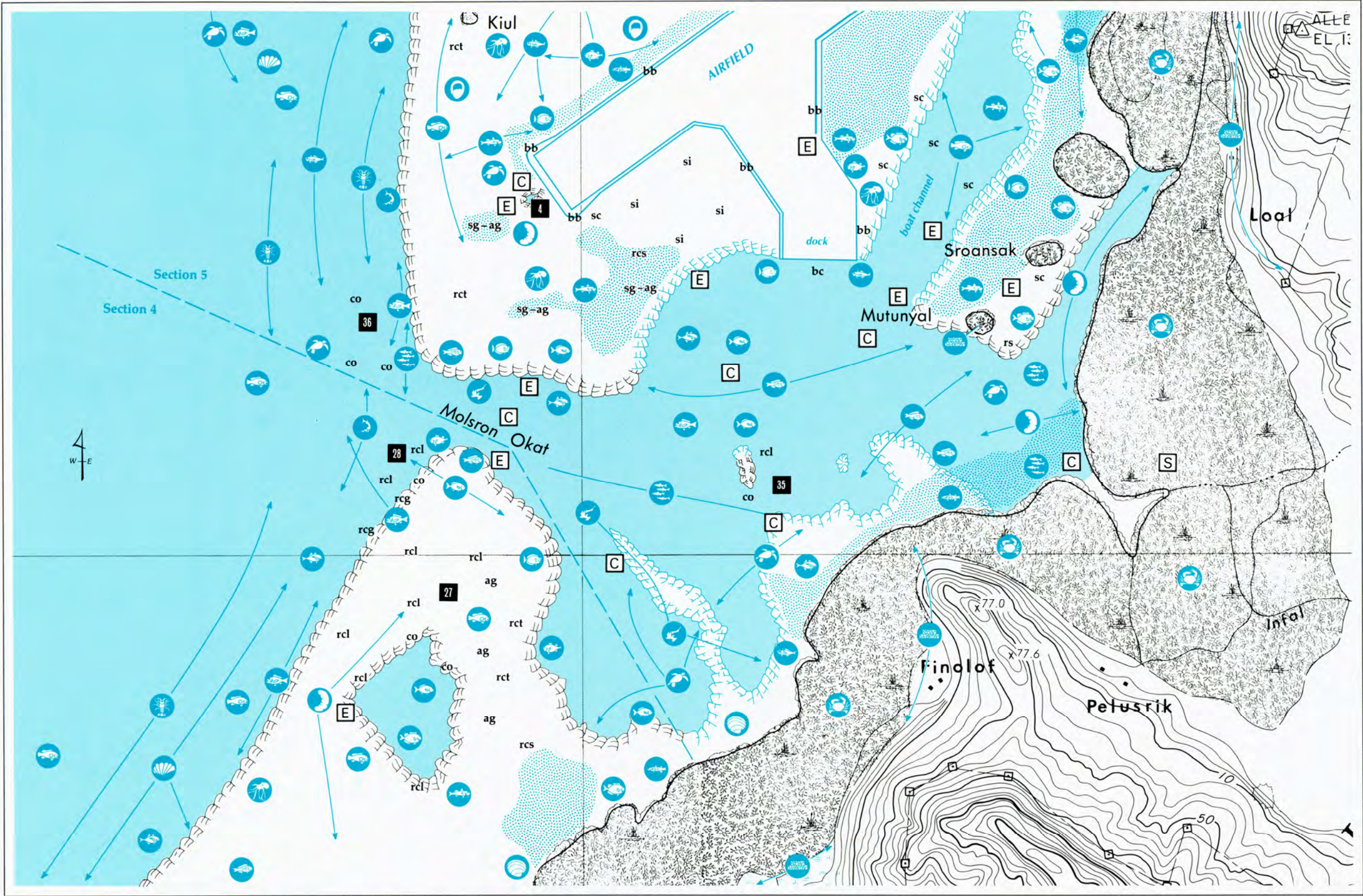
- Archaeological site**
- Manual sand removal**

Other Symbols

- Seagrass bed
- Mangrove forest
- Swamp forest
- Boat wreck
- Observed range

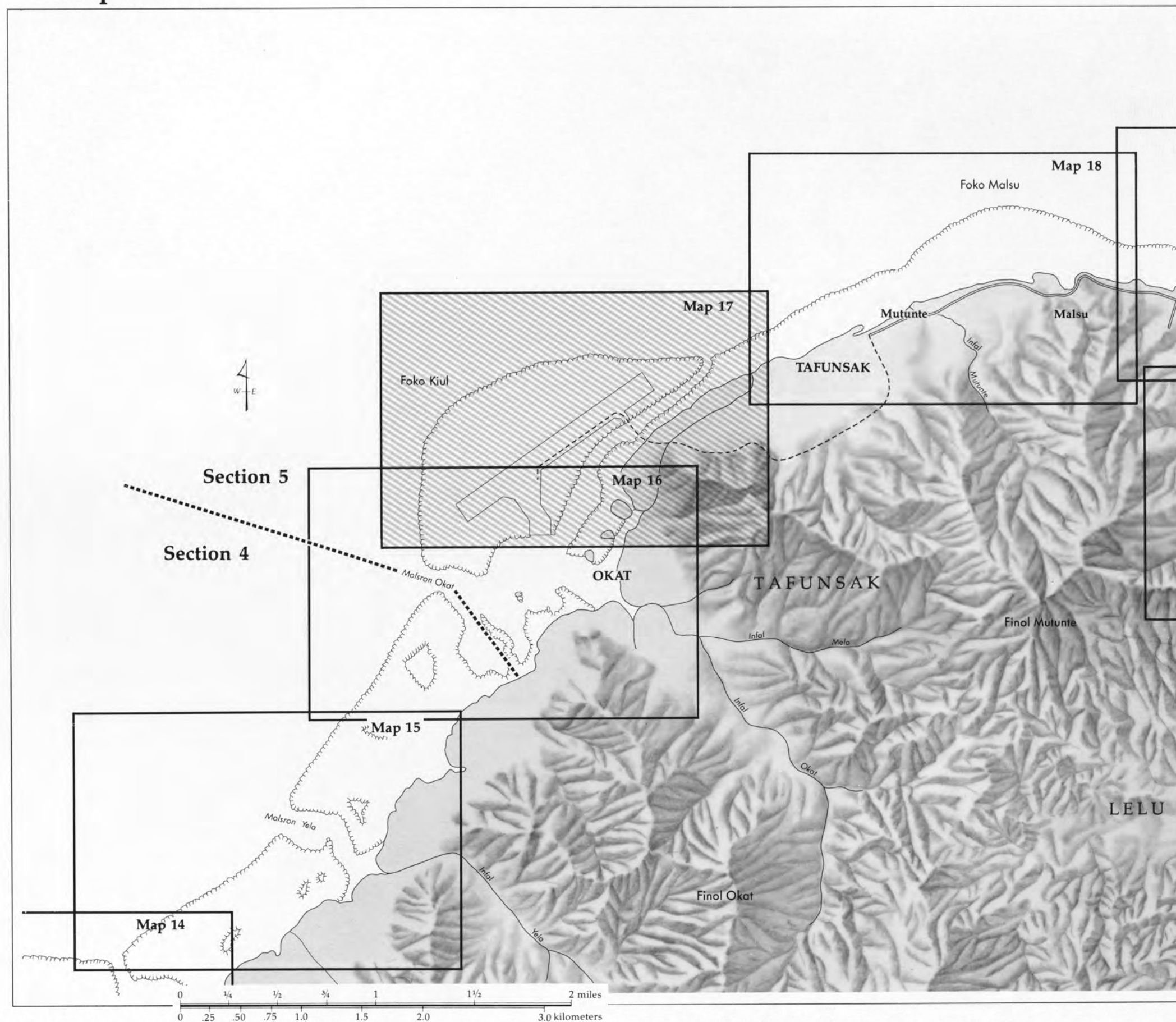
Field Stations

- 52 KCRI Station
- C Chun et al., 1979
- E Eldredge et al., 1979
- S Stemmermann & Proby, 1978





## Map Index 5



### Bottom Type and Land Cover Classification

(based on field observation and aerial photographic interpretation)

#### OFFSHORE

- s** — Sediment
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  - si** — Silt
- rc** — Reef Complex
  - rc** — Mixed bottom types consisting of reef rock (limestone) associated with shallow reef formations
  - rc1** — Consolidated limestone, lacking sediment
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  - rcg** — Consolidated reef with well defined groove-and-spur system
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- ba** — Volcanic rock shoreline (basalt)
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- sbc** — Calcareous rubble and/or shingle beach

#### VEGETATION COVER

- mg** — Mangrove forest (source: Stemmermann and Proby, 1978)
- sg** — Seagrass bed
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**Note:**  
All patch reef surfaces are substrate type **rc** unless otherwise designated.



RELATED TO BIOTA

- Mullet — Ah  
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- Rabbitfish — Mulap  
torch, hook & line, netting, cast net
- Rudderfish — Won  
netting, cast net
- Parrotfish — Mesrik  
netting, spear, casting
- Squirrelfish — Ollol  
handline, spear
- Grouper — Kalsrik  
hook & line, spear
- Goatfish — Futfut  
netting, spear, torch
- Surgeon — Kupat  
netting, hook & line, spear
- Jack trevally — Srapsrap  
handline, trolling, gill netting
- Snapper — Tap, Ku, Srinak  
handline, netting
- Big-eyed scad — Atol  
netting, handline
- Hammerhead shark — Pako hammer  
hook & line
- Barracuda — Tola  
trolling
- Baitfish (Clupeidae) — Tui or Ikinpa  
cast net
- Sea turtles — Ngoe  
spear, net, hand
- Octopus — Koet  
long-handle hook
- Spiny Lobster — Ungung  
hand
- Mangrove crab — Powa  
gleaning, trapping
- Coconut crab — Aie  
hand, stick
- Land crab — Aieng  
hand
- Sea cucumber — Wah  
hand
- Anemone — Lut  
Hibiscus, knife
- Round clam — Popol  
digging, hand
- Giant clam — Natula  
gleaning, prying
- Rare clams — Tuk, Punak  
gleaning, digging
- Shoreline snails (Nerita Polita) — Kufahi  
hand

NOT RELATED TO BIOTA

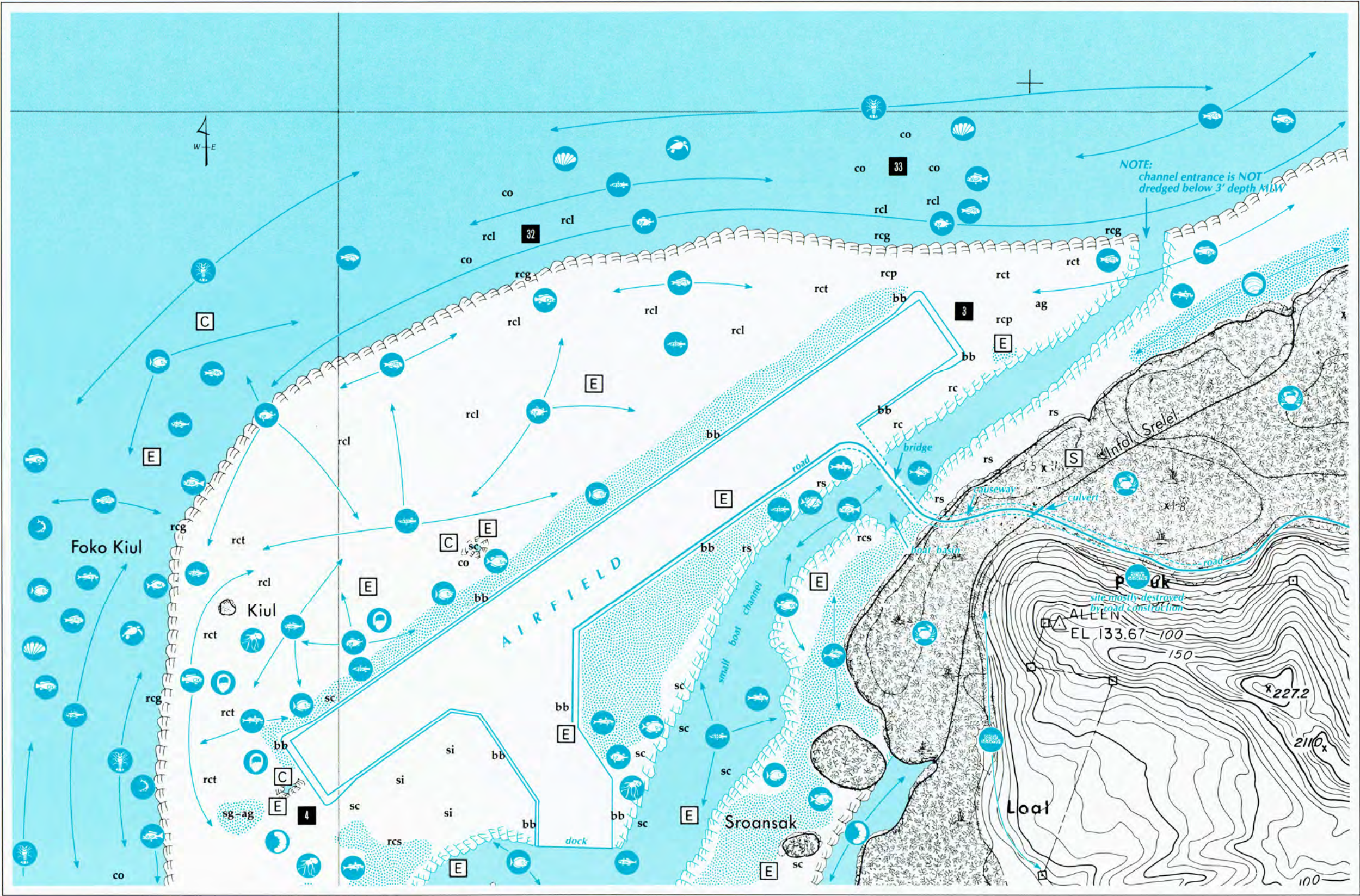
- Archaeological site
- Manual sand removal

Other Symbols

- Seagrass bed
- Mangrove forest
- Swamp forest
- Boat wreck
- Observed range

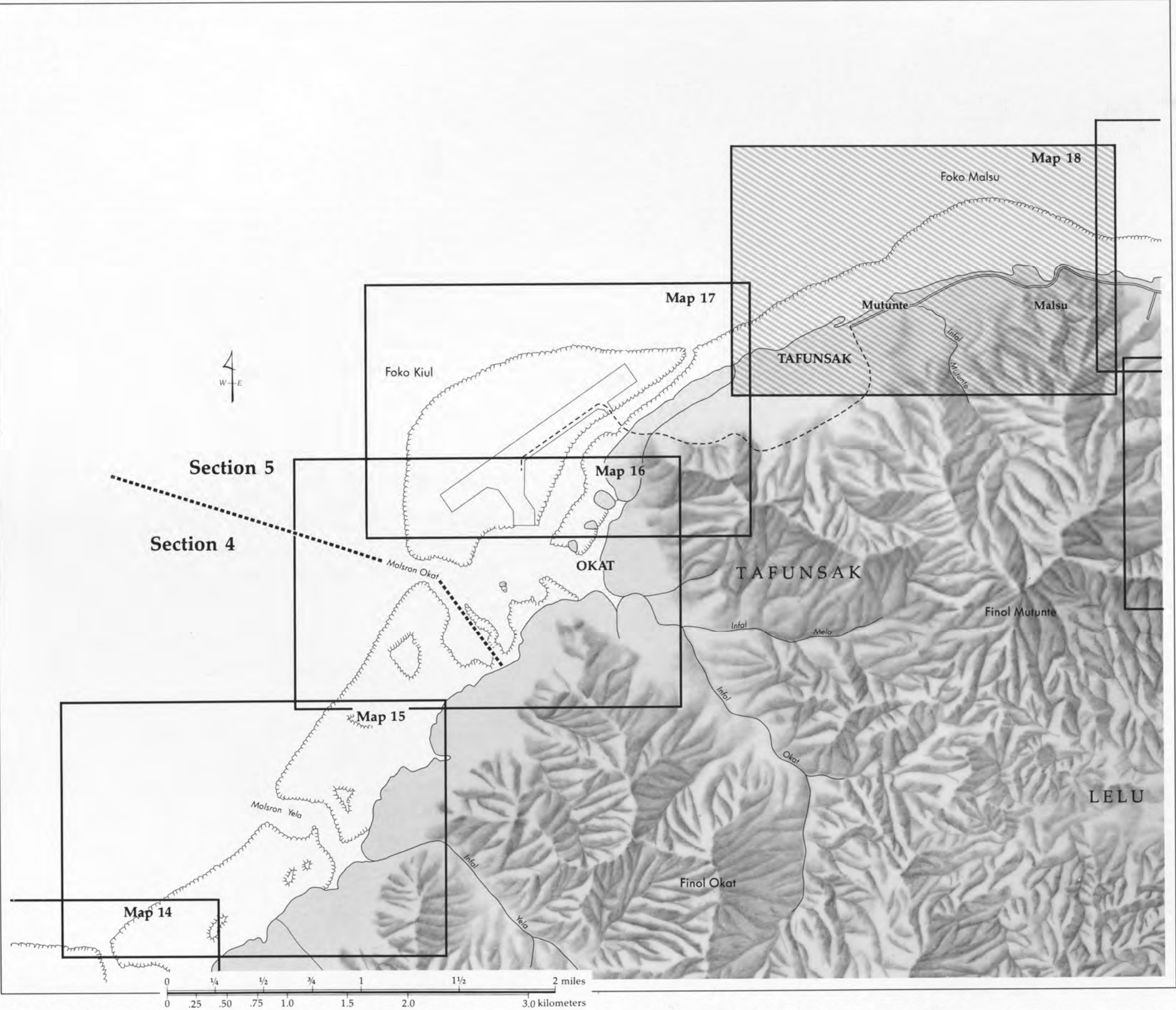
Field Stations

- KCRI Station
- Chun et al., 1979
- Eldredge et al., 1979
- Stemmermann & Proby, 1978





Map Index 5



Bottom Type and Land Cover Classification

(based on field observation and aerial photographic interpretation)

OFFSHORE

- s — Sediment
- sc — Sand bottom in water depths less than 10 meters
- si — Silt
- rc — Reef Complex
  - rc — Mixed bottom types consisting of reef rock (limestone) associated with shallow reef formations
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  - rcs — Mostly consolidated limestone with some (25-50%) sediment bottom
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- ba — Volcanic rock shoreline (basalt)
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- bc — Concrete/cement masonry seawall and shoreline
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- sbc — Calcareous rubble and/or shingle beach

VEGETATION COVER

- mg — Mangrove forest (source: Stemmermann and Proby, 1978)
- sg — Seagrass bed
- ag — Algae bed
- sw — Swamp forest (source: Stemmermann and Proby, 1978)






Note:  
All patch reef surfaces are substrate type rc unless otherwise designated.







RELATED TO BIOTA

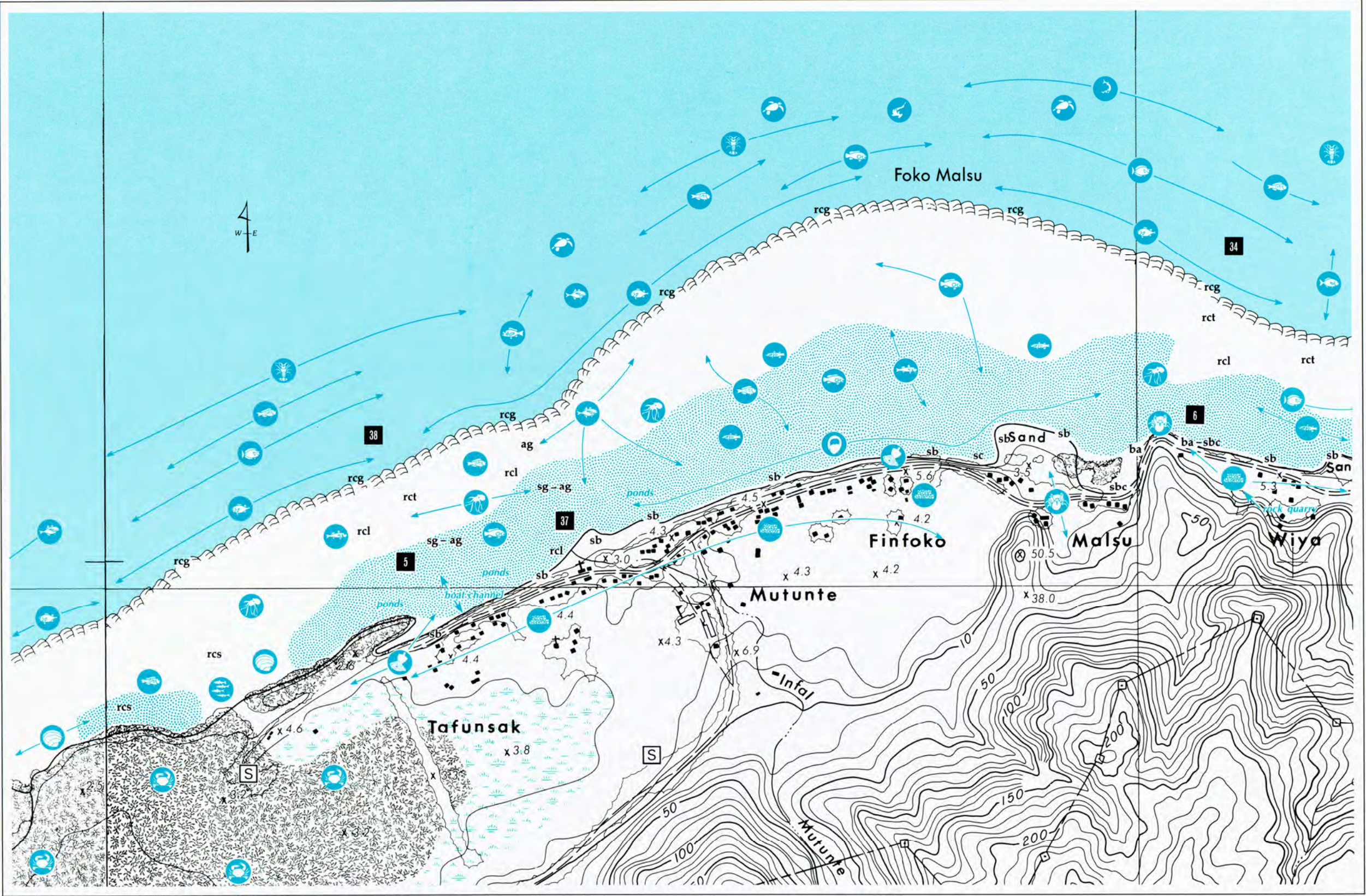
- **Mullet** — Ah  
netting, gill netting, cast net
- **Rabbitfish** — Mulap  
torch, hook & line, netting, cast net
- **Rudderfish** — Won  
netting, cast net
- **Parrotfish** — Mesrik  
netting, spear, casting
- **Squirrelfish** — Ollol  
handline, spear
- **Grouper** — Kalsrik  
hook & line, spear
- **Goatfish** — Futfut  
netting, spear, torch
- **Surgeon** — Kupat  
netting, hook & line, spear
- **Jack trevally** — Srapsrap  
handline, trolling, gill netting
- **Snapper** — Tap, Ku, Srinak  
handline, netting
- **Big-eyed scad** — Atol  
netting, handline
- **Hammerhead shark** — Pako hammer  
hook & line
- **Barracuda** — Tola  
trolling
- **Baitfish (Clupeidae)** — Tui or Ikinpa  
cast net
- **Sea turtles** — Ngoe  
spear, net, hand
- **Octopus** — Koet  
long-handle hook
- **Spiny Lobster** — Ungung  
hand
- **Mangrove crab** — Powa  
gleaning, trapping
- **Coconut crab** — Aie  
hand, stick
- **Land crab** — Aieng  
hand
- **Sea cucumber** — Wah  
hand
- **Anemone** — Lut  
Hibiscus, knife
- **Round clam** — Popol  
digging, hand
- **Giant clam** — Natula  
gleaning, prying
- **Rare clams** — Tuk, Punak  
gleaning, digging
- **Shoreline snails (Nerita Polita)** — Kufahi  
hand
- **Archaeological site**
- **Manual sand removal**

NOT RELATED TO BIOTA

- **Seagrass bed**
- **Mangrove forest**
- **Swamp forest**
- **Boat wreck**
- **Observed range**

Field Stations

- **52** KCRI Station
- **C** Chun et al., 1979
- **E** Eldredge et al., 1979
- **S** Stemmermann & Proby, 1978









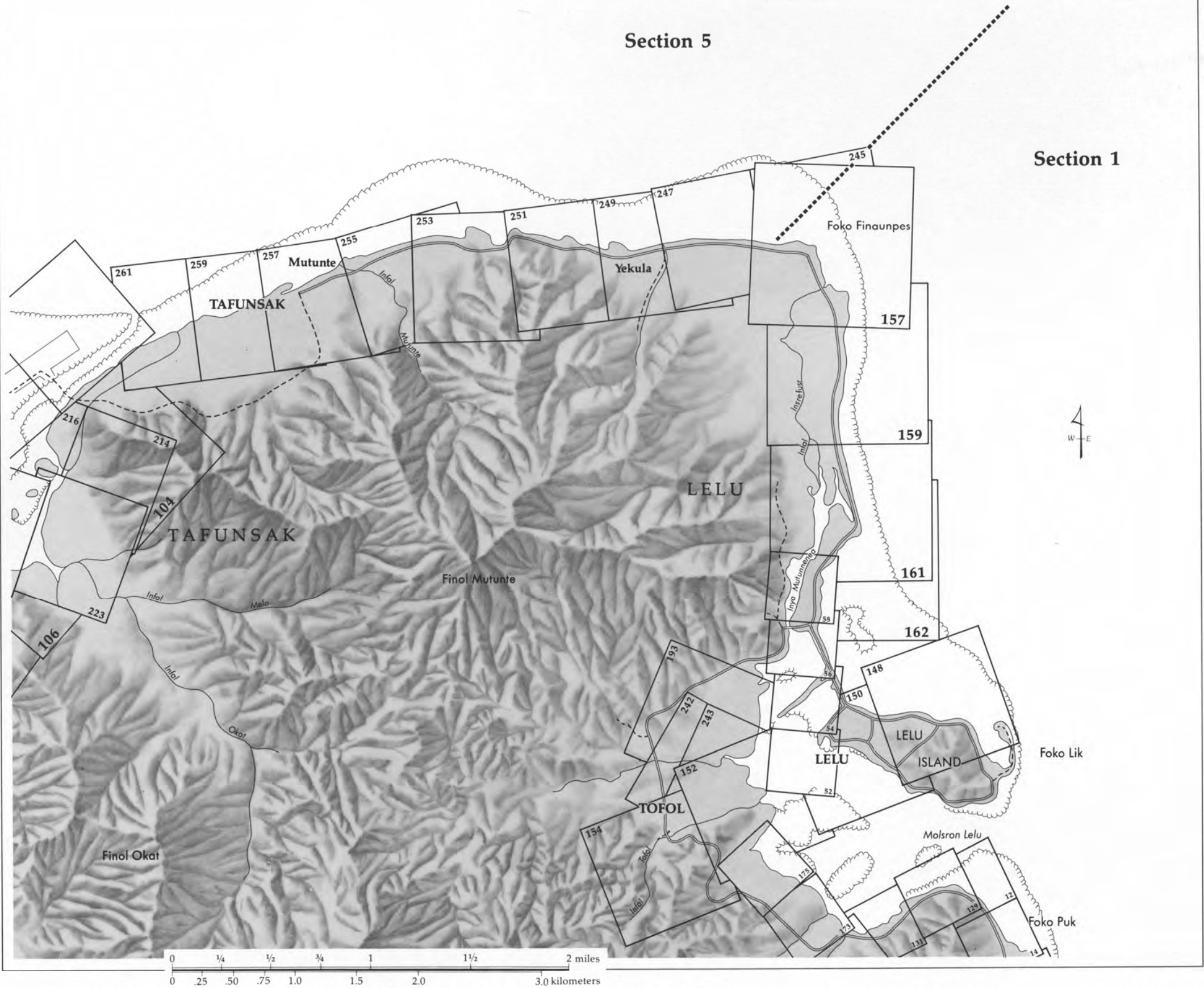
# APPENDIX

## Aerial Photograph Indexes and Aerial Photographs

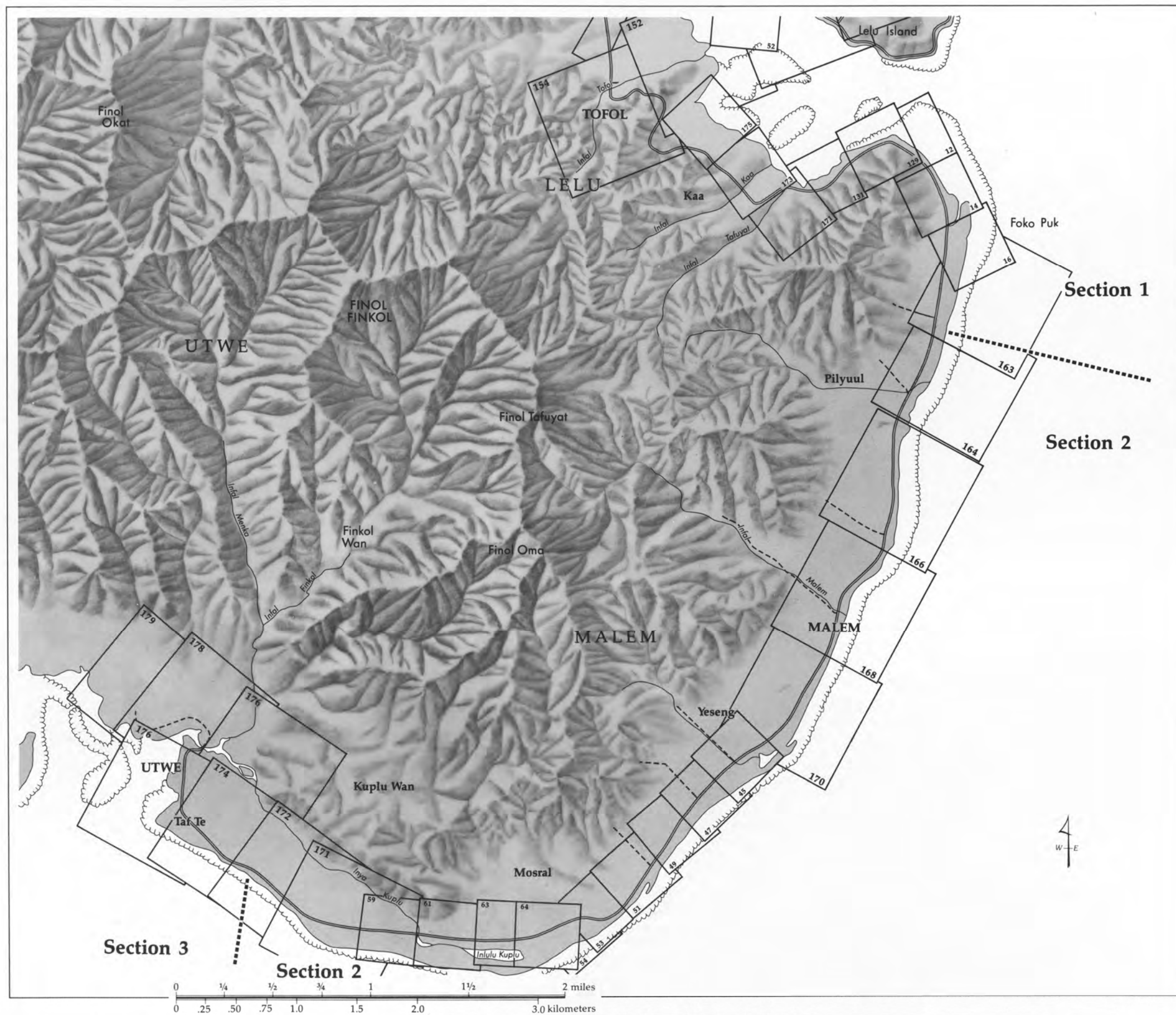
Photographs vary in scale from 1:2500 to 1:5000. See Aerial Photograph Indexes to determine approximate scale of individual shots.



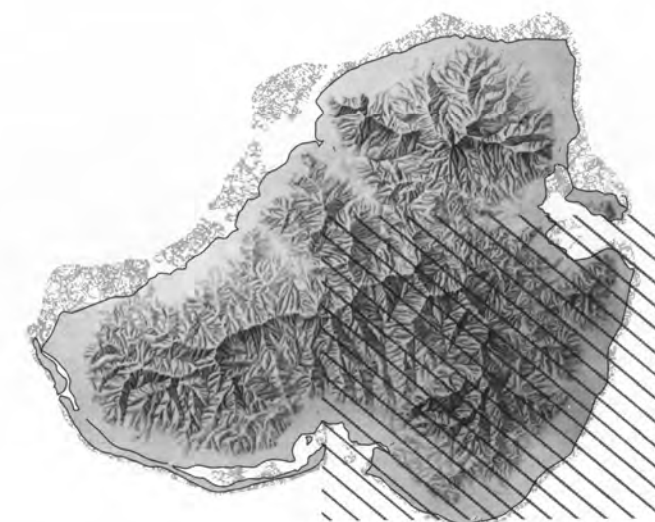
Aerial Photograph Index 1





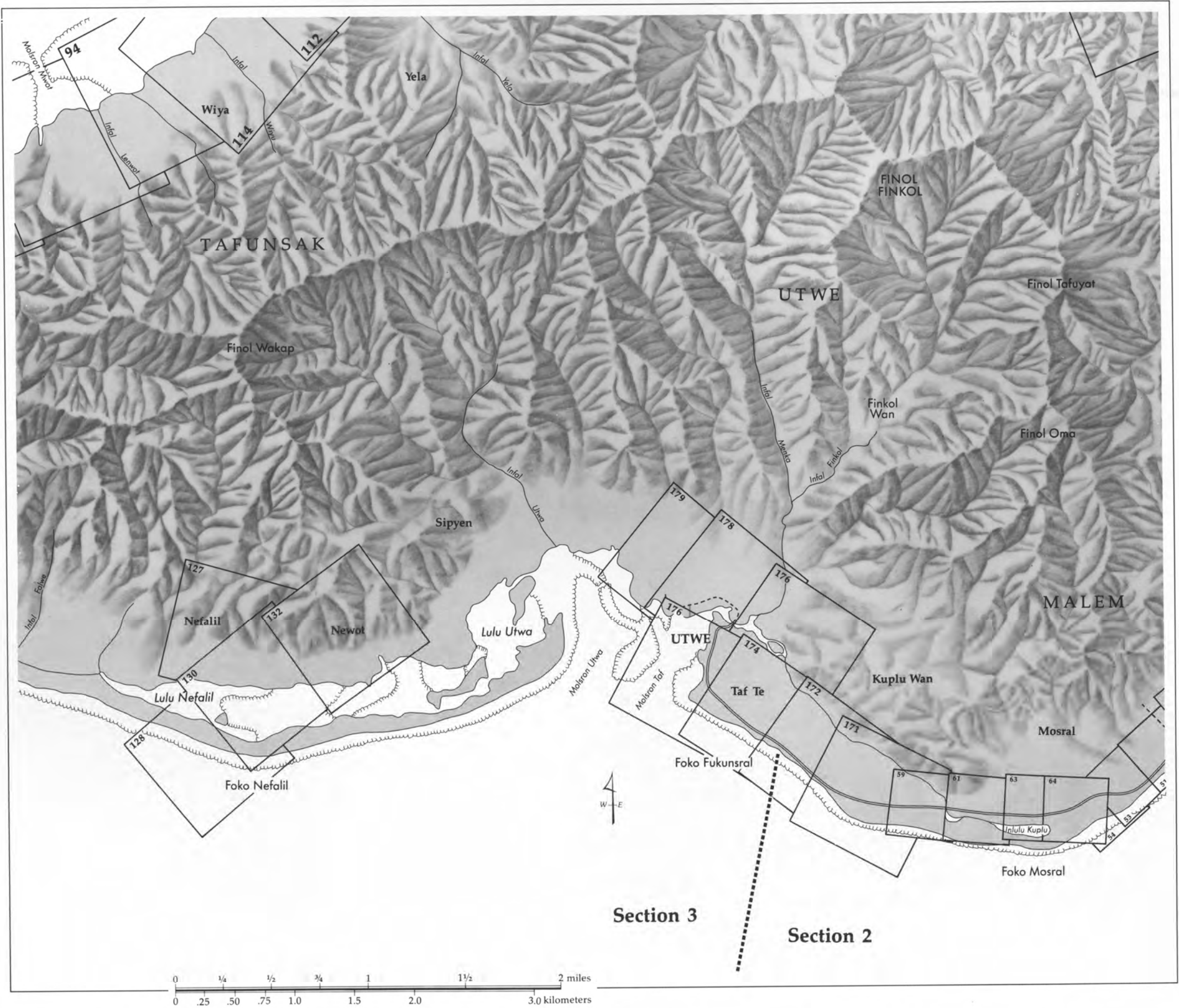


Aerial Photograph Index 2

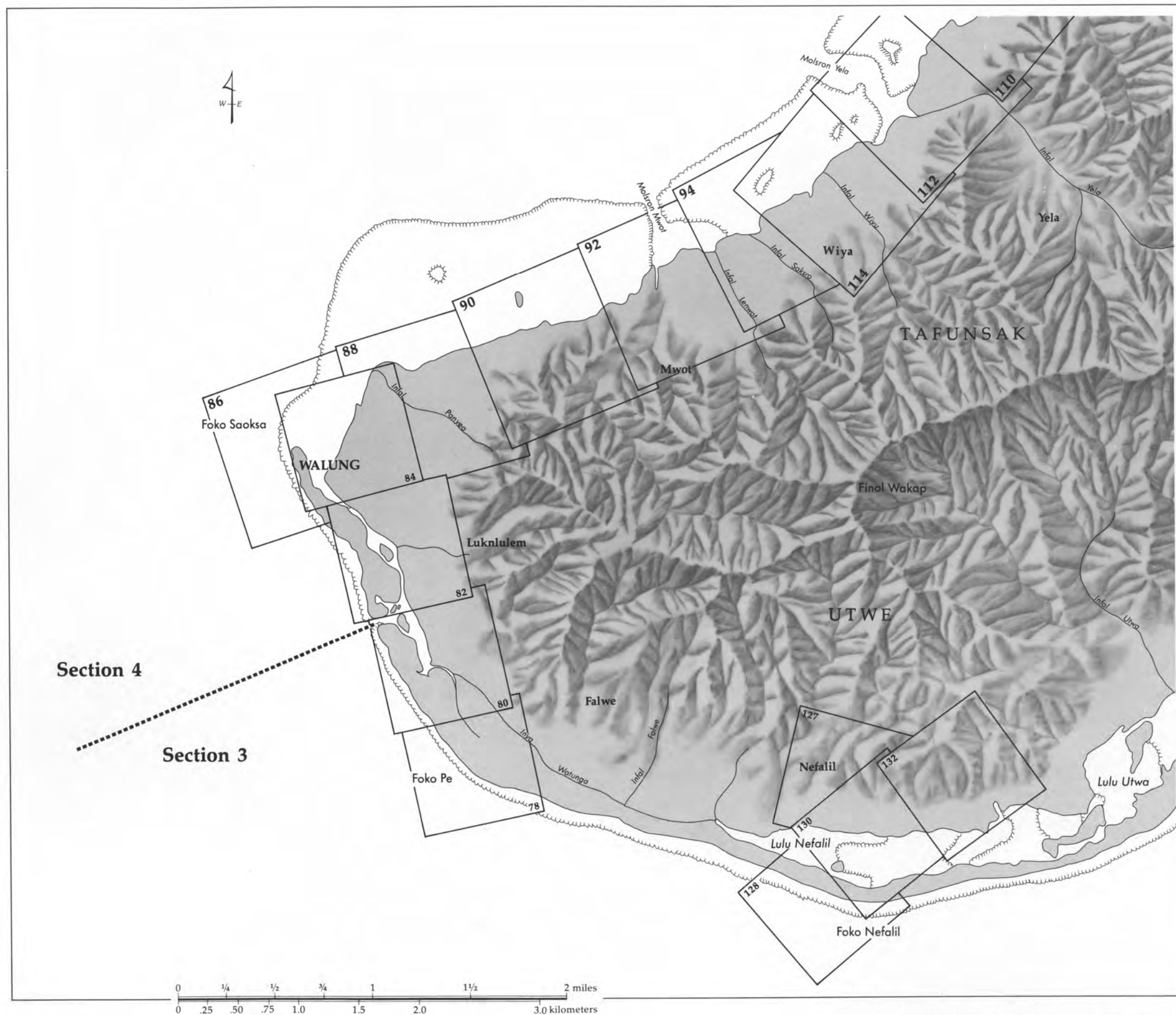




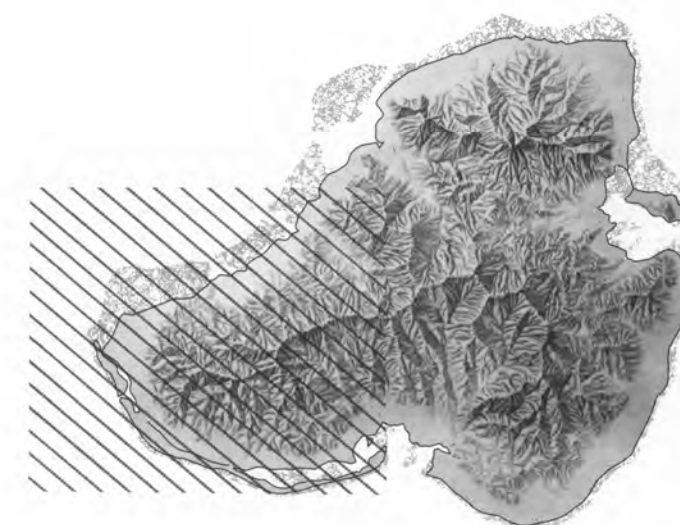
Aerial Photograph Index 3





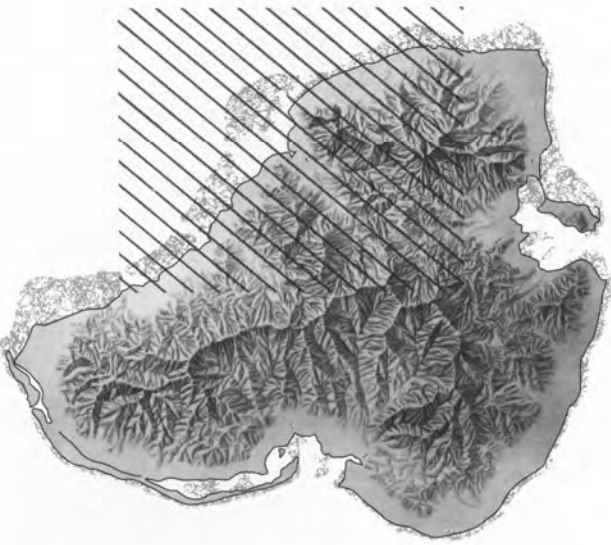
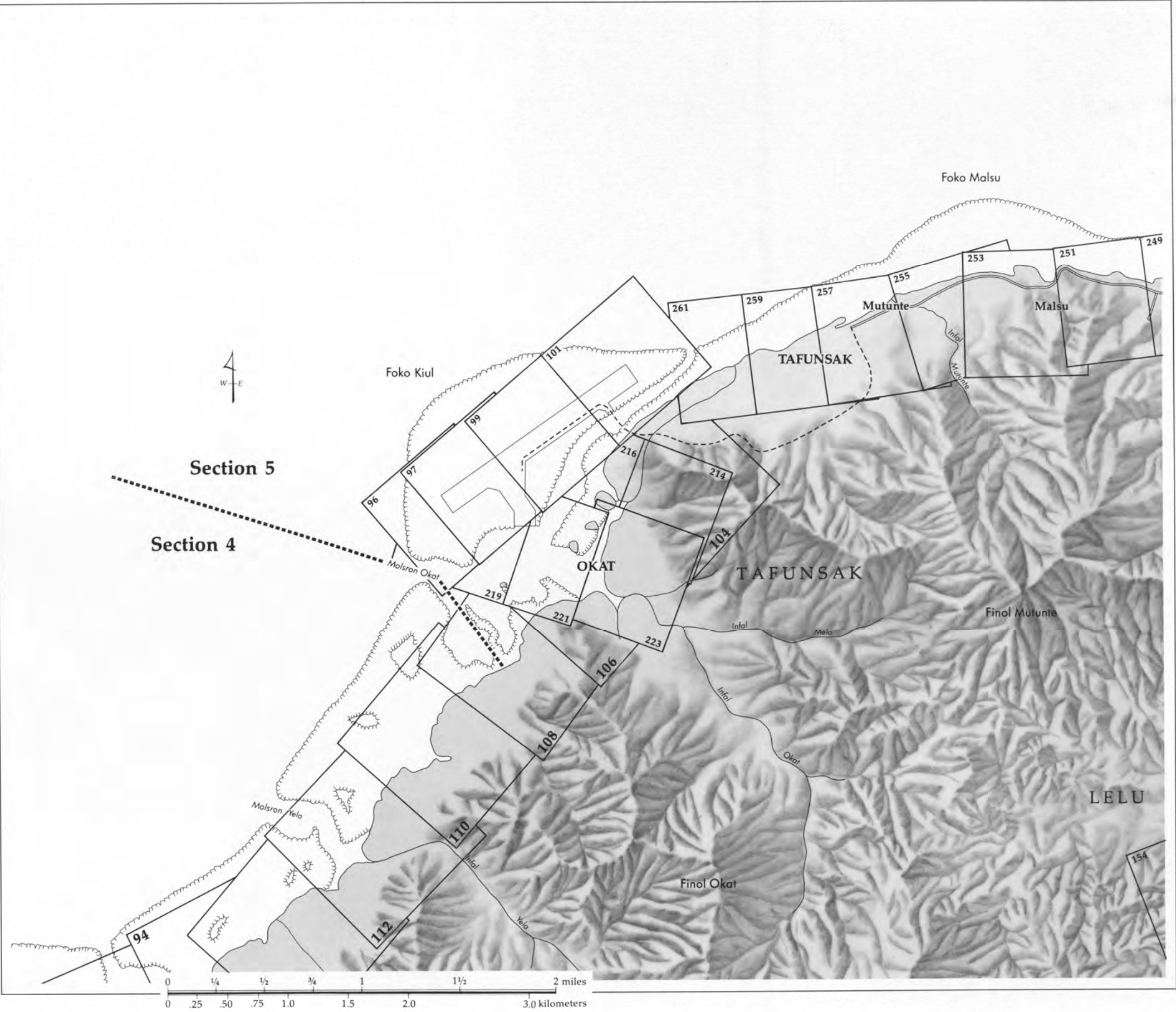


Aerial Photograph Index 4





Aerial Photograph Index 5

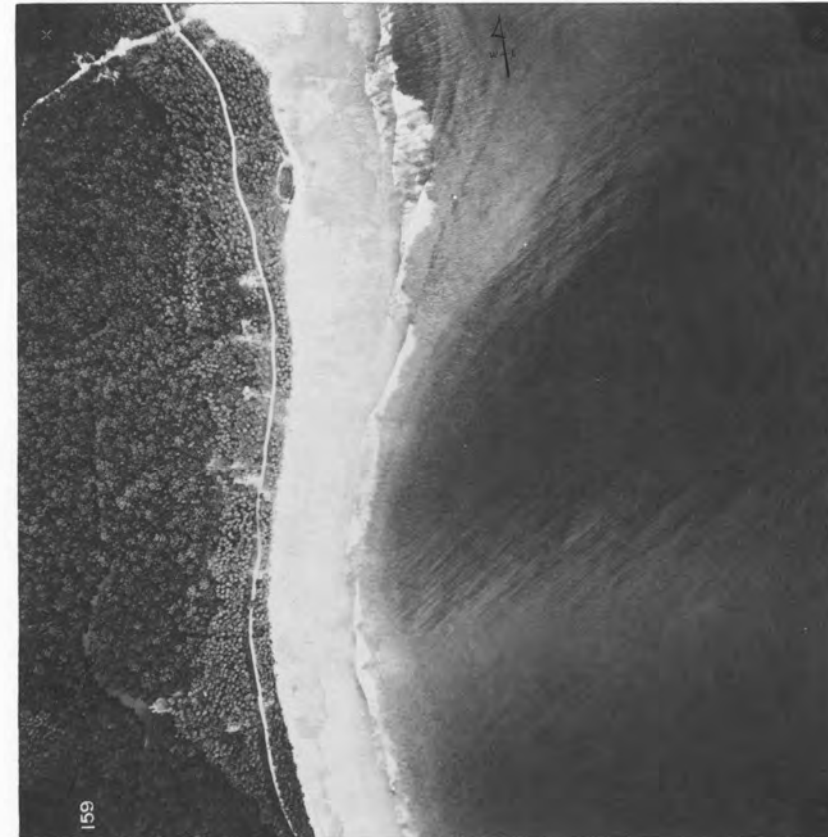




Photograph 157



Photograph 159



Photograph 161



Photograph 162



Photograph 58



Photograph 56





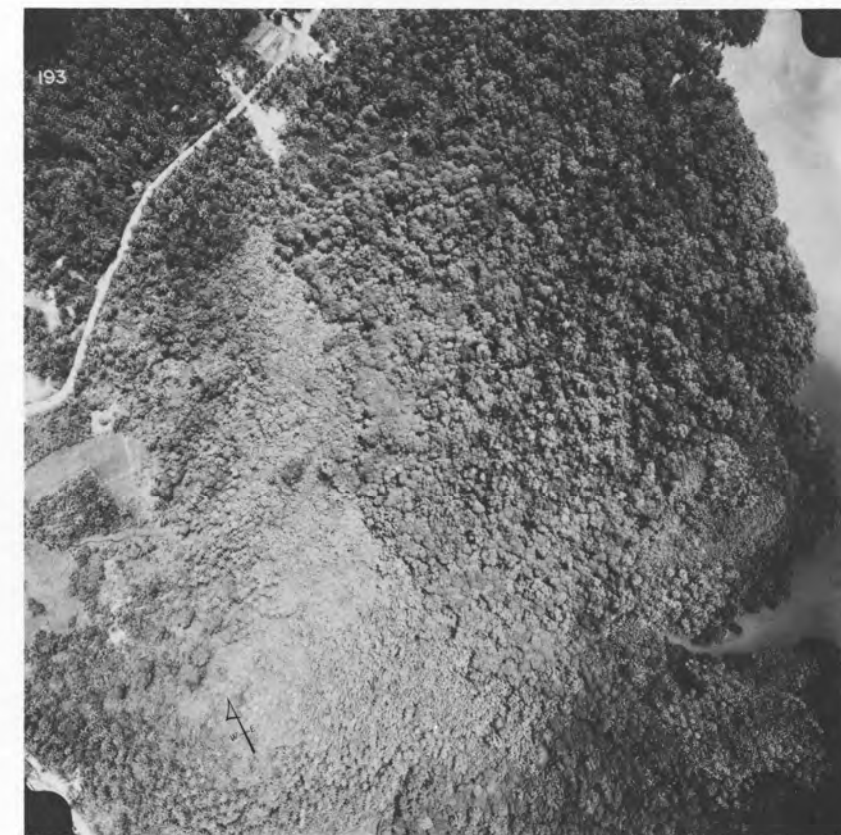
Photograph 54



Photograph 52



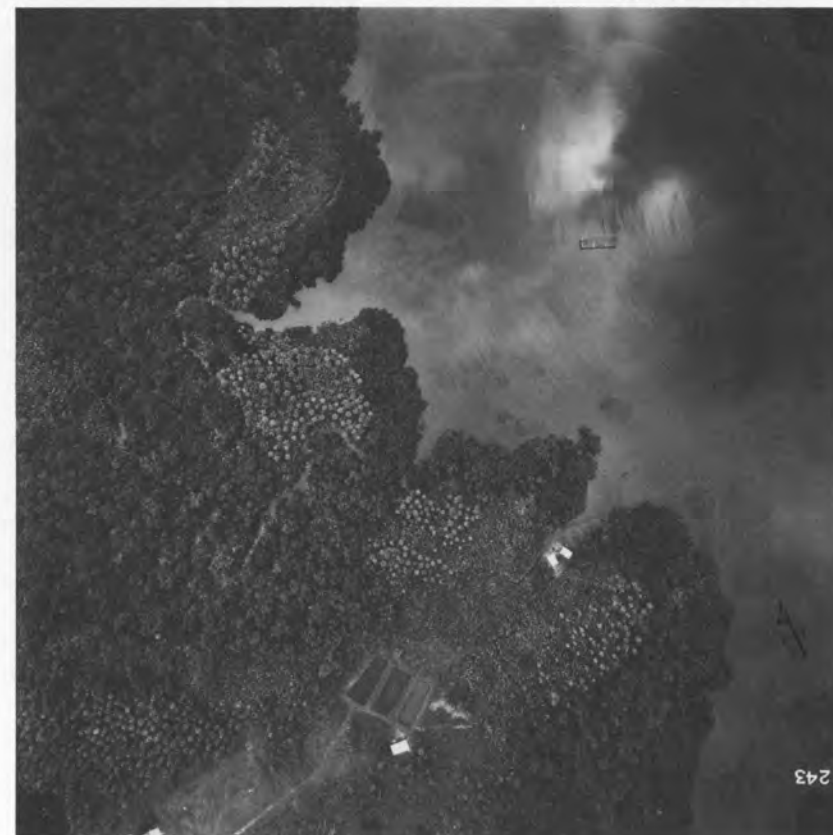
Photograph 193



Photograph 242



Photograph 243



Photograph 154





Photograph 152



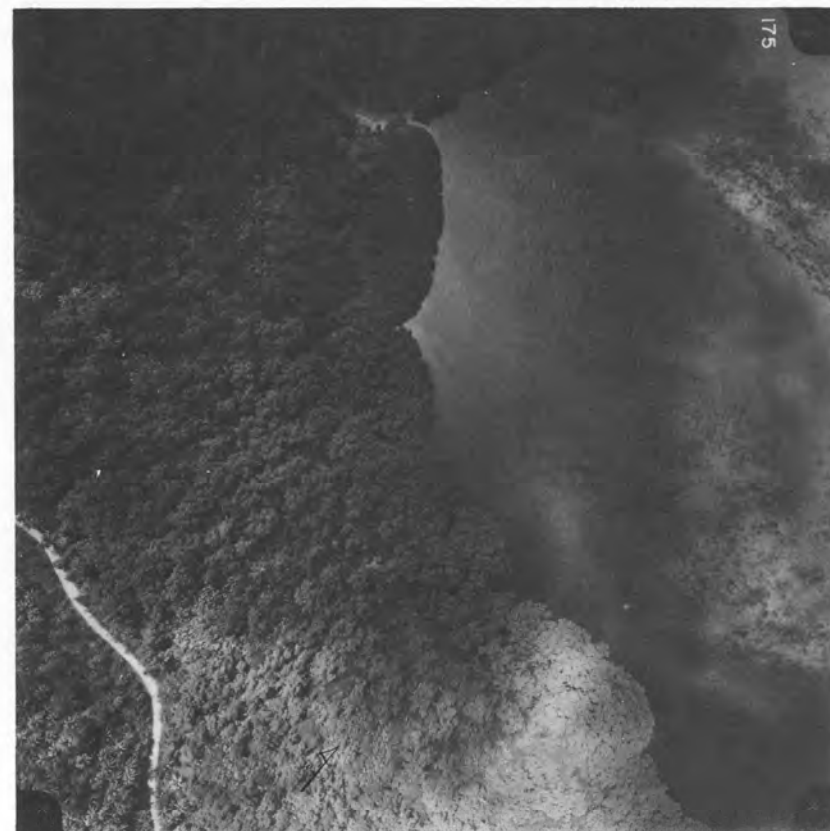
Photograph 150



Photograph 148



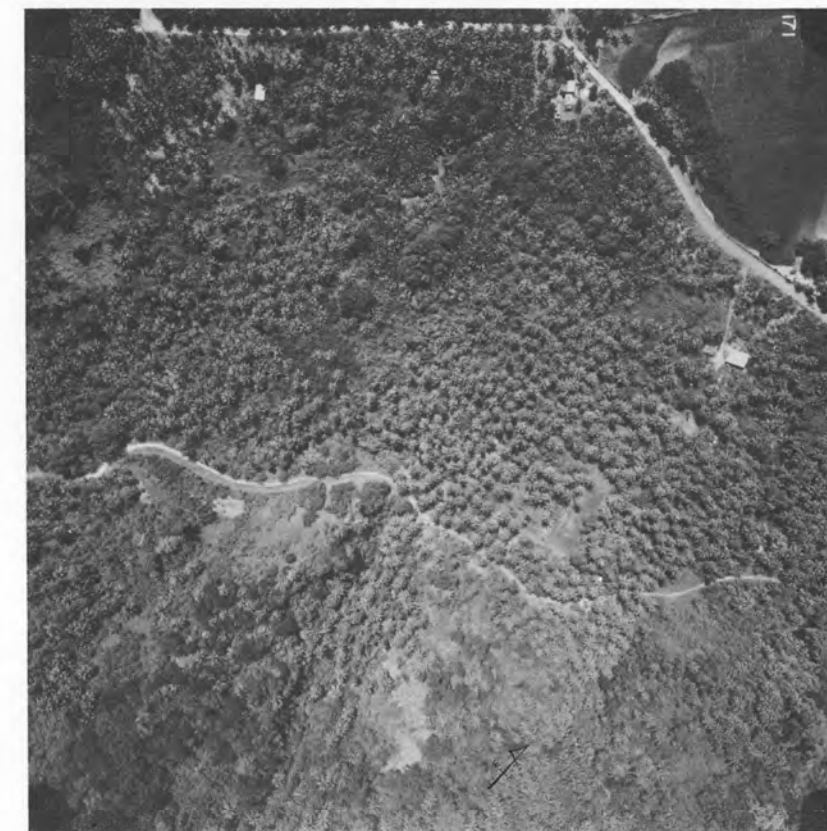
Photograph 175



Photograph 173



Photograph 171

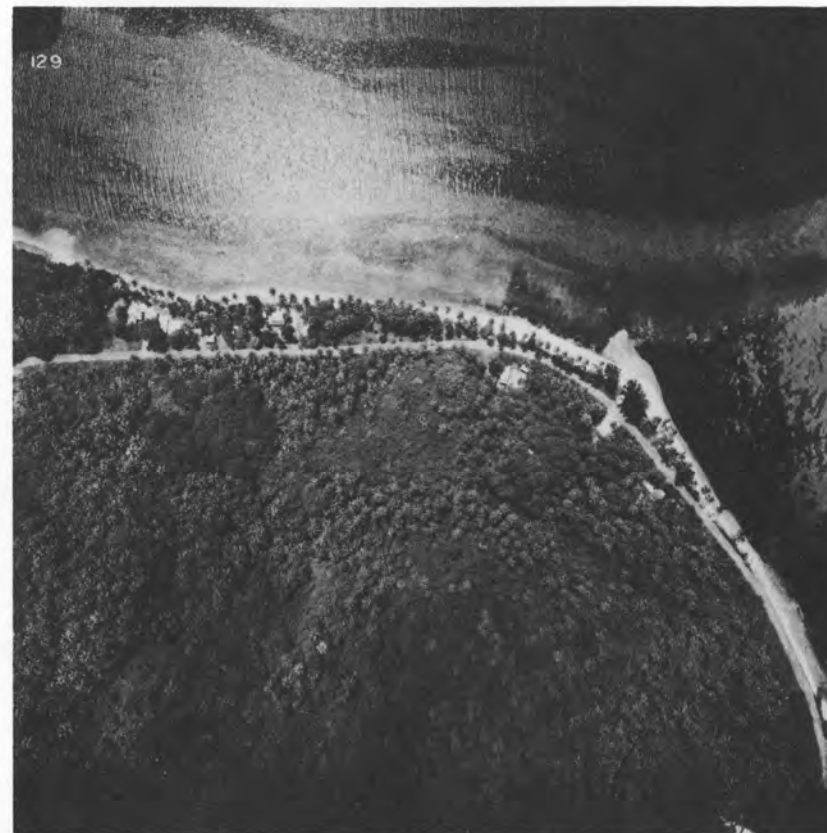




Photograph 131



Photograph 129



Photograph 12



Photograph 14



Photograph 16



Photograph 163





Photograph 164



Photograph 166



Photograph 168



Photograph 170



Photograph 45



Photograph 47





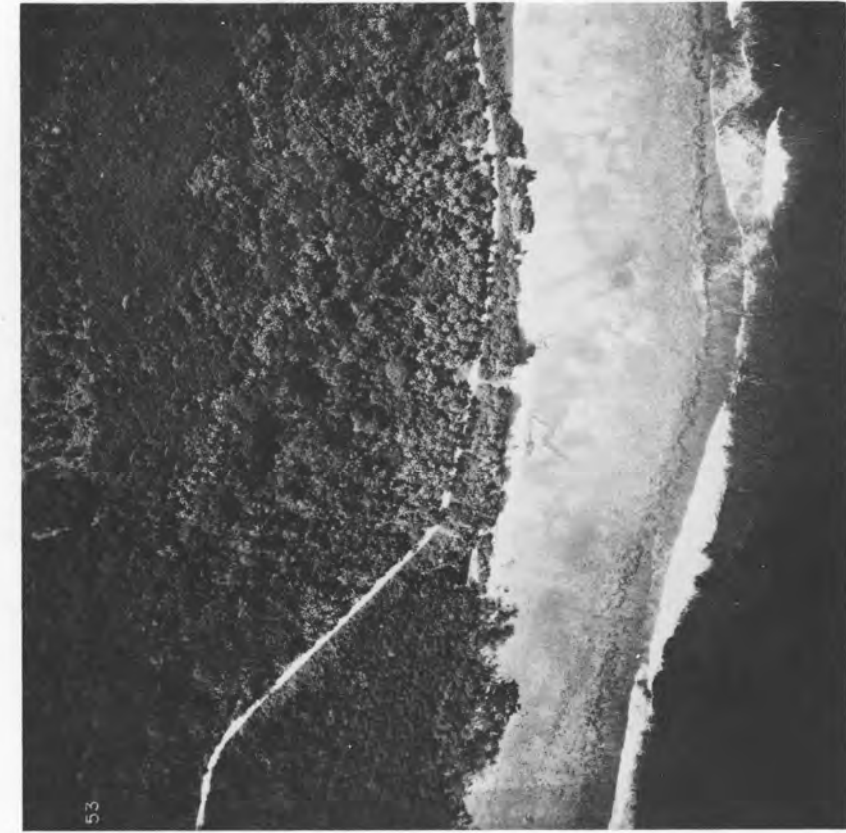
Photograph 49



Photograph 51



Photograph 53



Photograph 54



Photograph 64

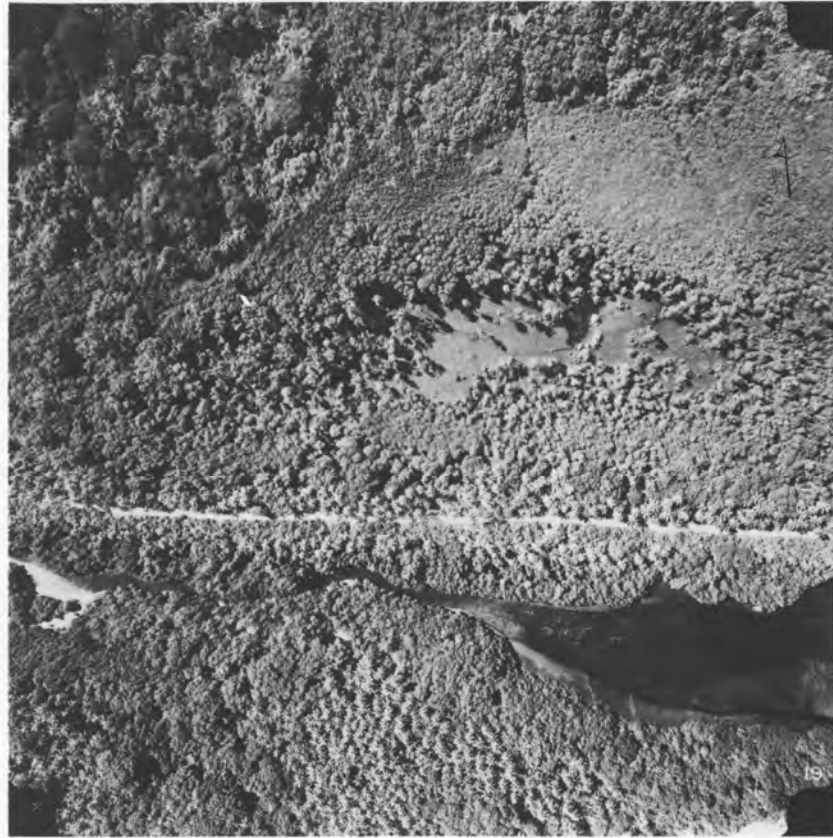


Photograph 63





Photograph 61



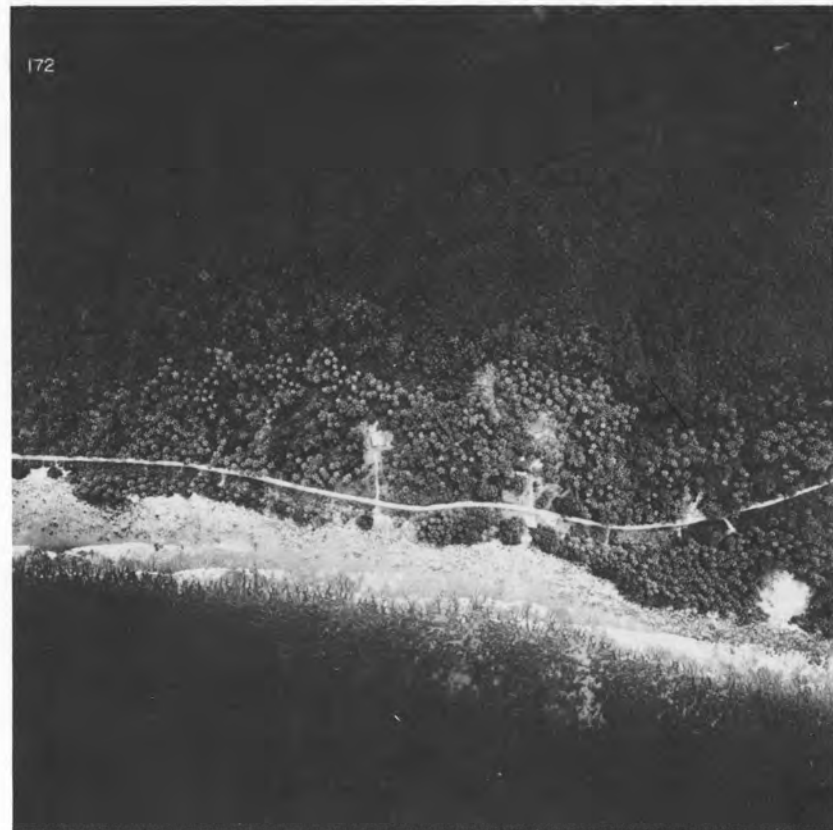
Photograph 59



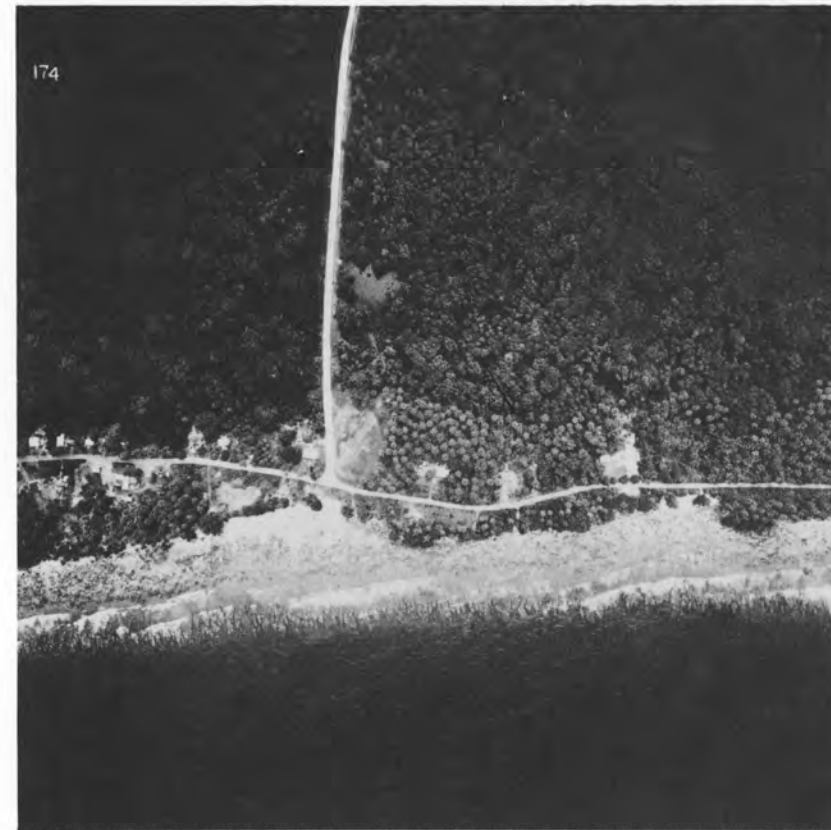
Photograph 171



Photograph 172



Photograph 174



Photograph 176





Photograph 176



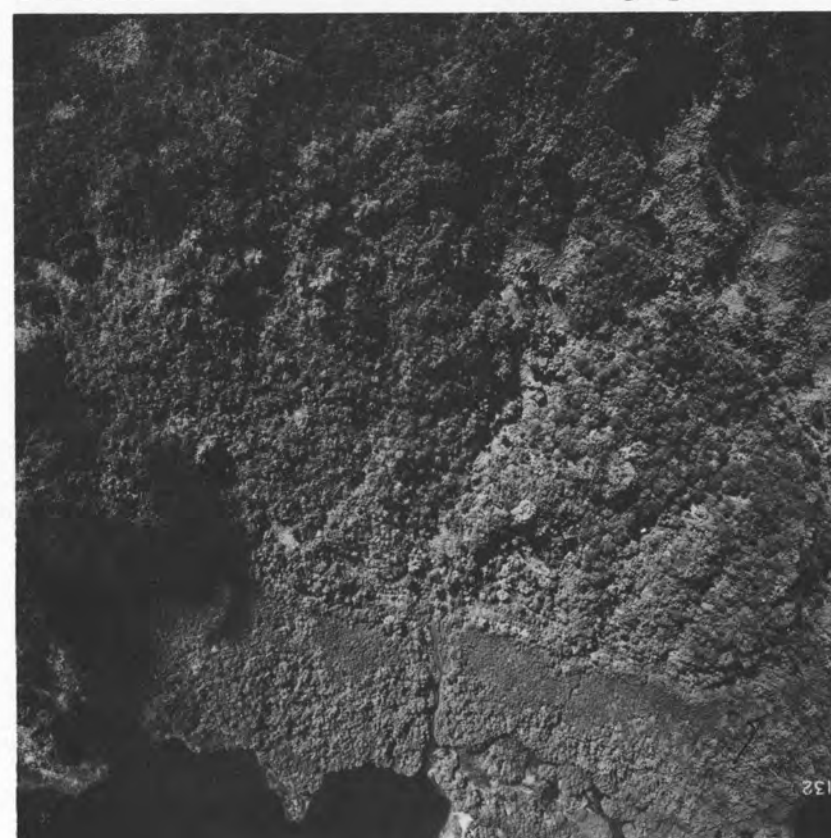
Photograph 178



Photograph 179



Photograph 132



Photograph 130

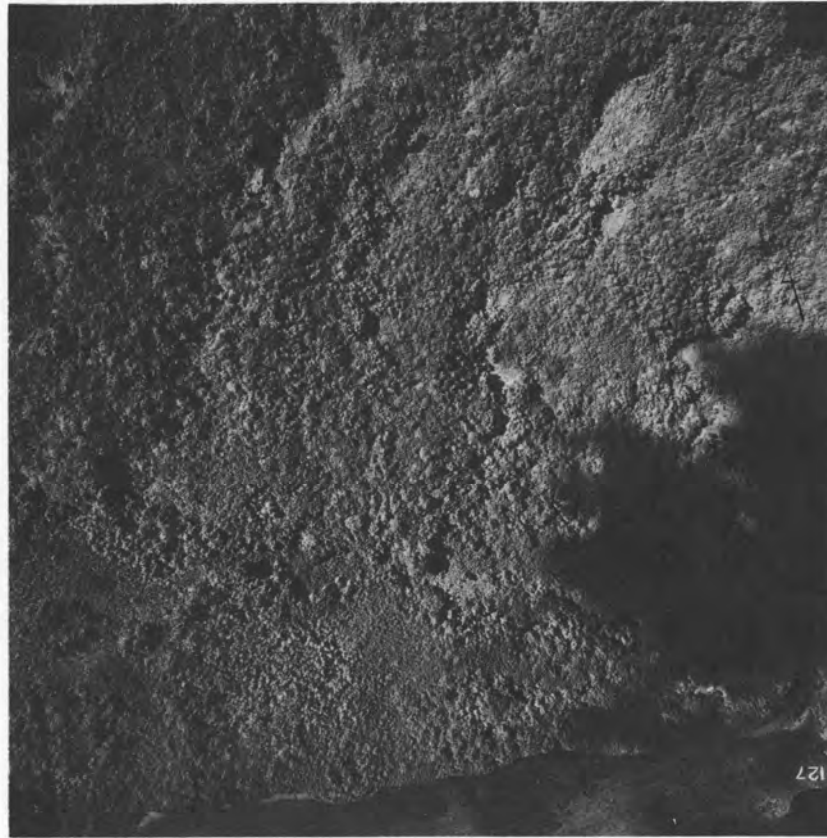


Photograph 128





Photograph 127



Photograph 78



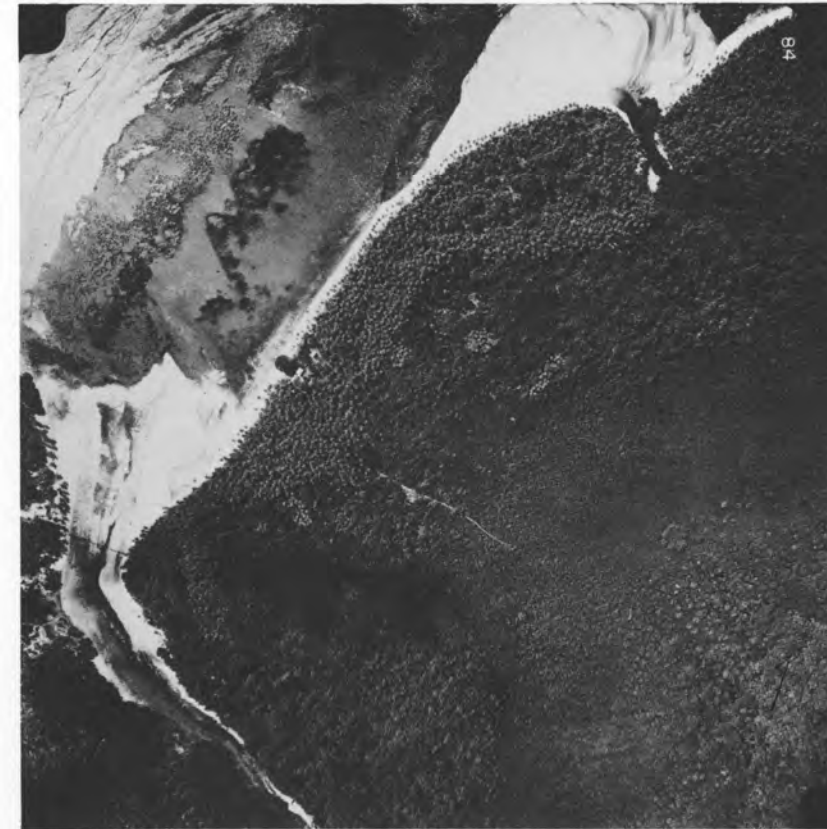
Photograph 80



Photograph 82



Photograph 84



Photograph 86

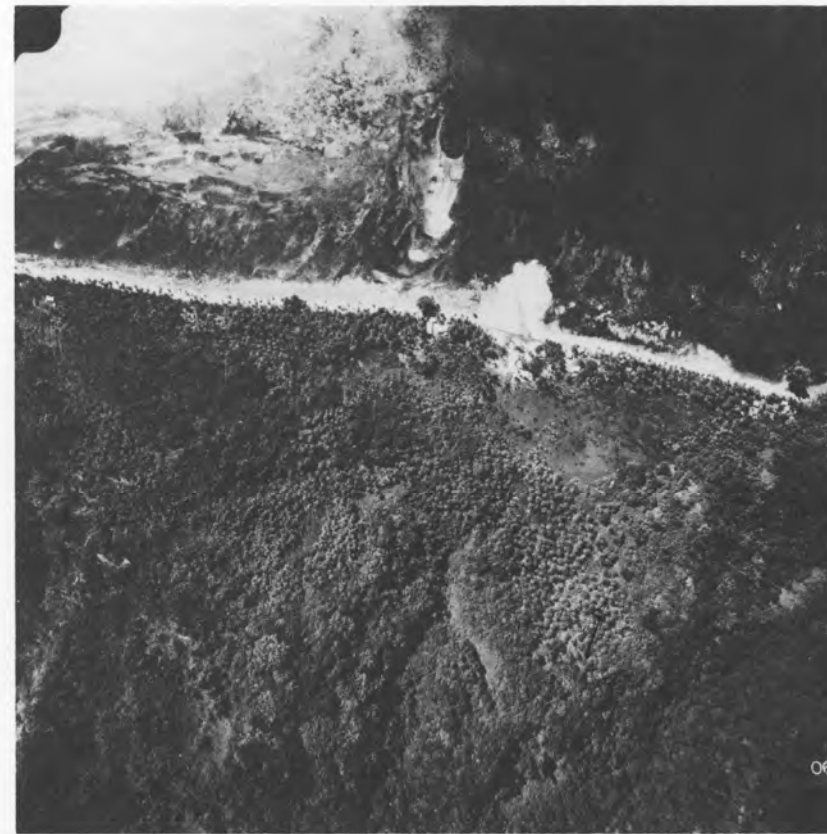




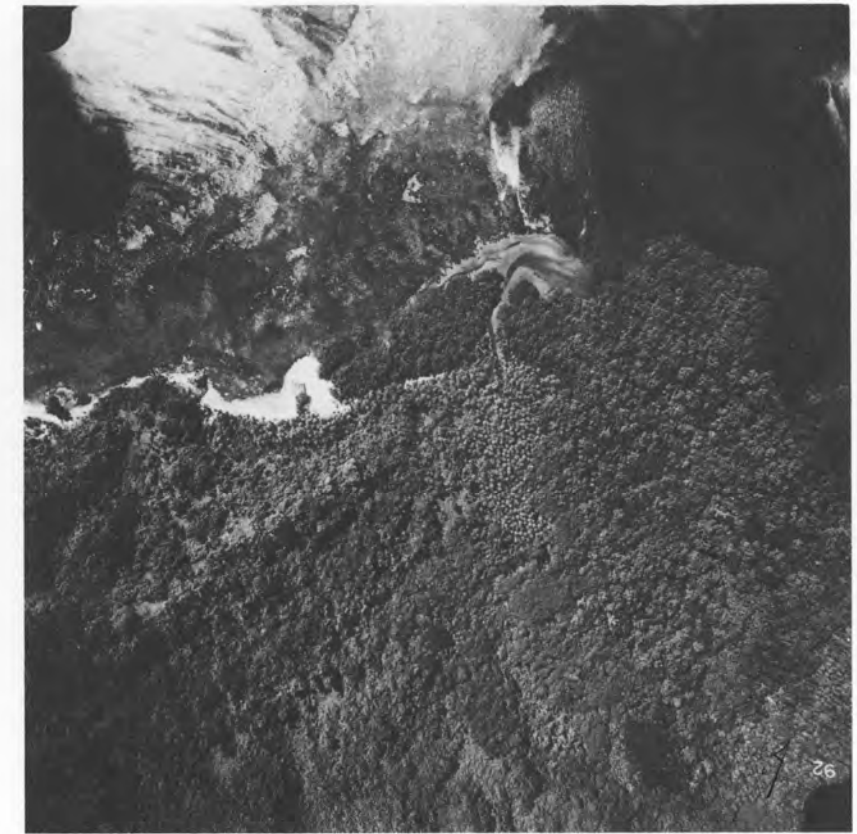
Photograph 88



Photograph 90



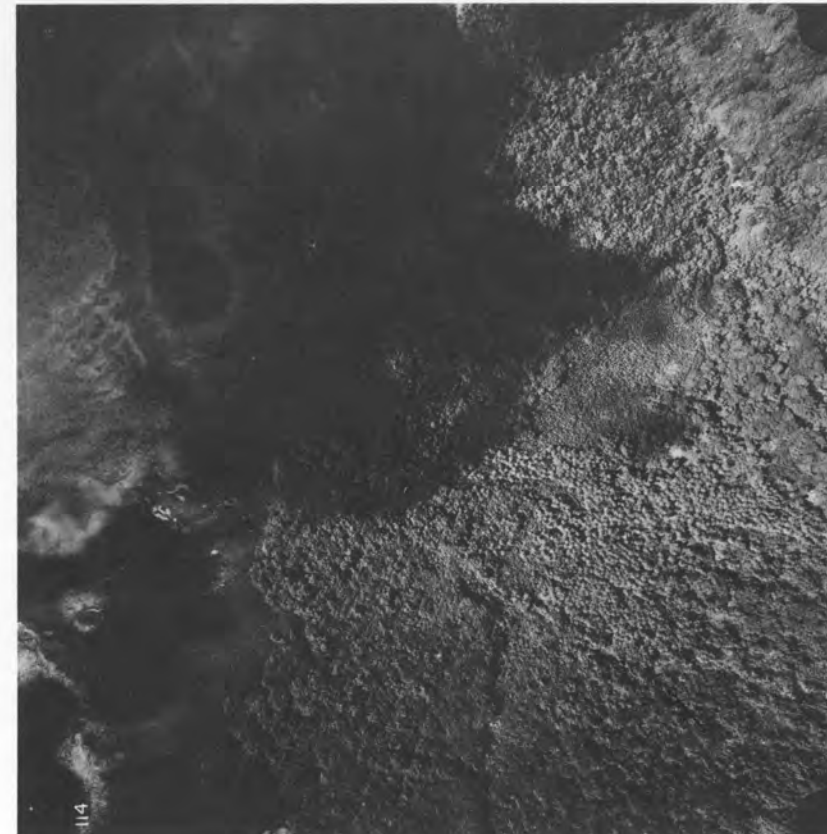
Photograph 92



Photograph 94



Photograph 114

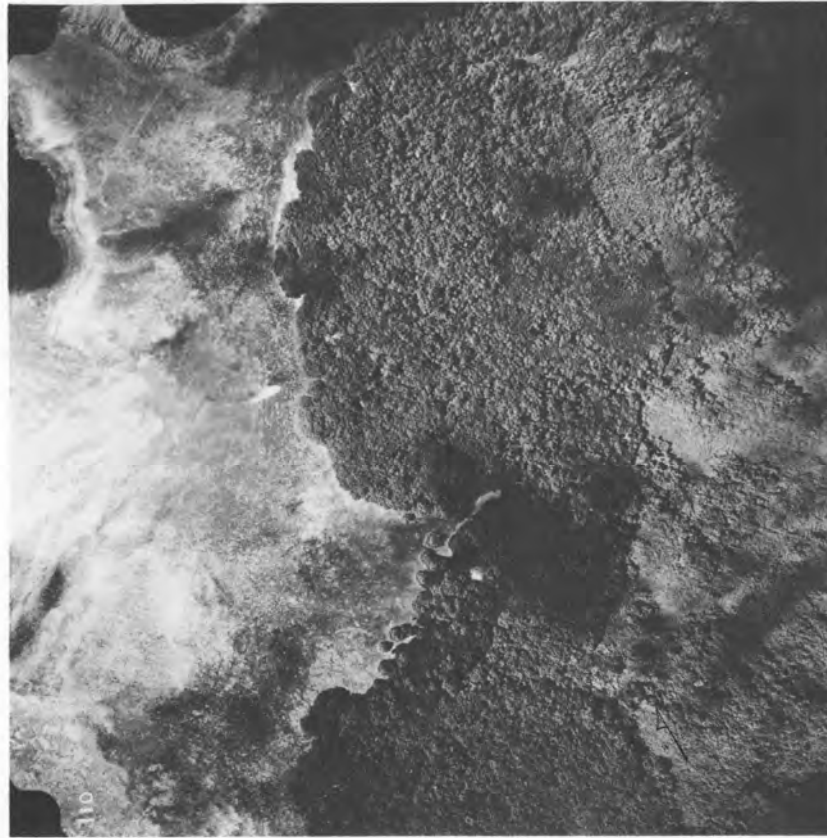


Photograph 112





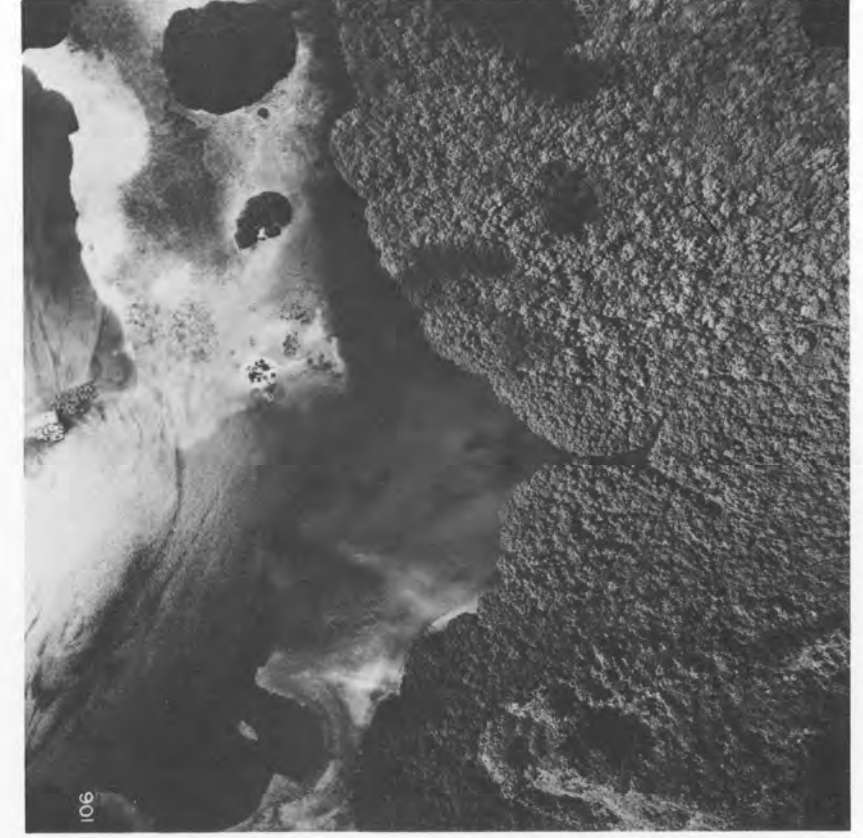
Photograph 110



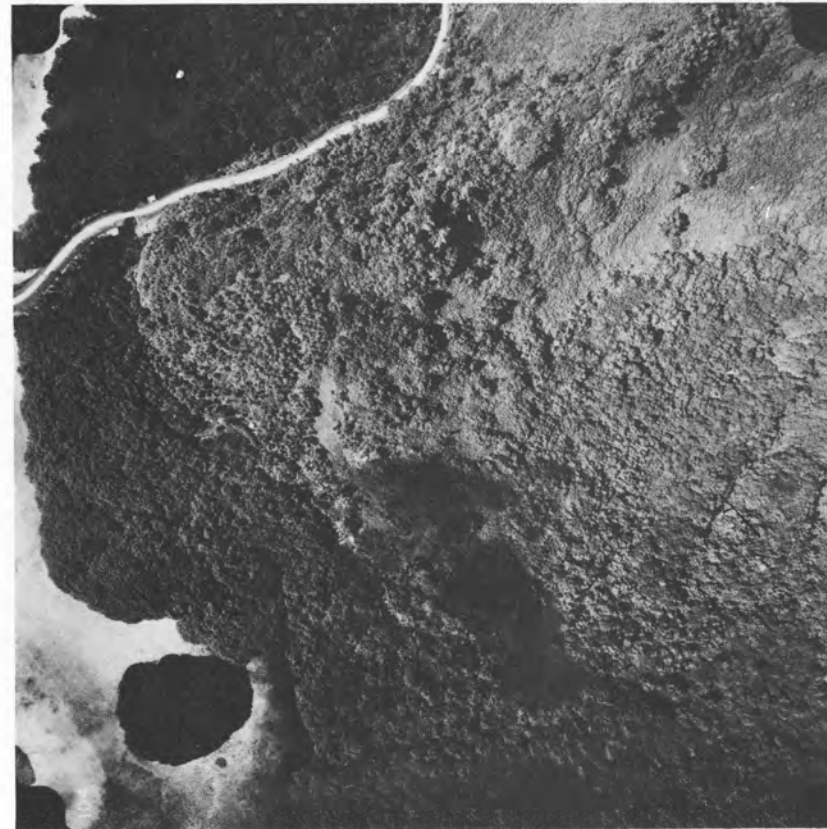
Photograph 108



Photograph 106



Photograph 104



Photograph 219

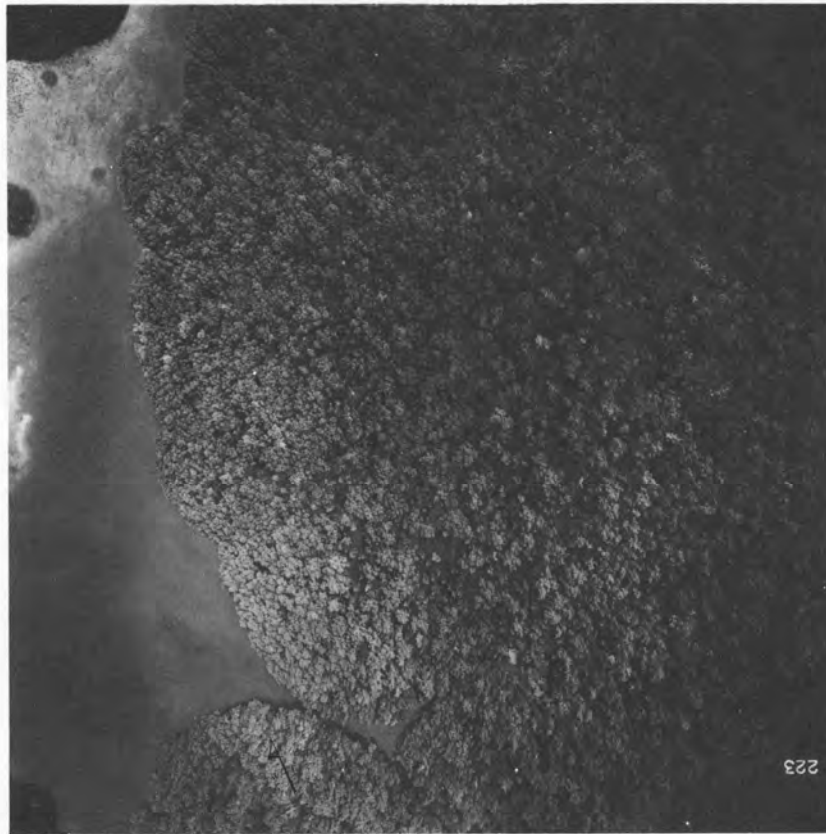


Photograph 221





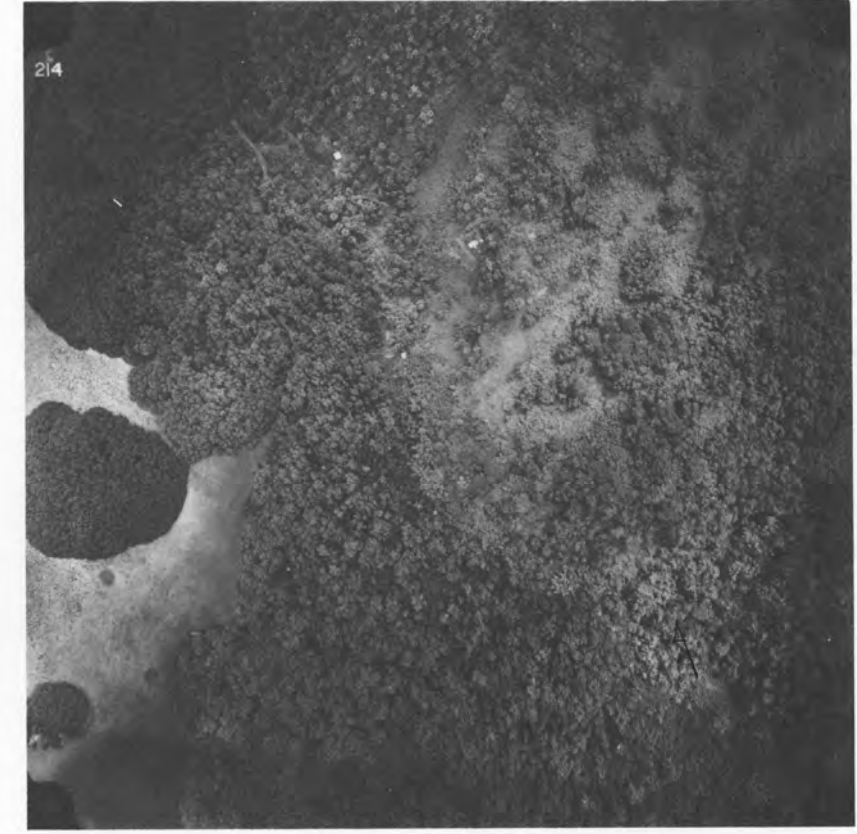
Photograph 223



Photograph 216



Photograph 214



Photograph 96



Photograph 97

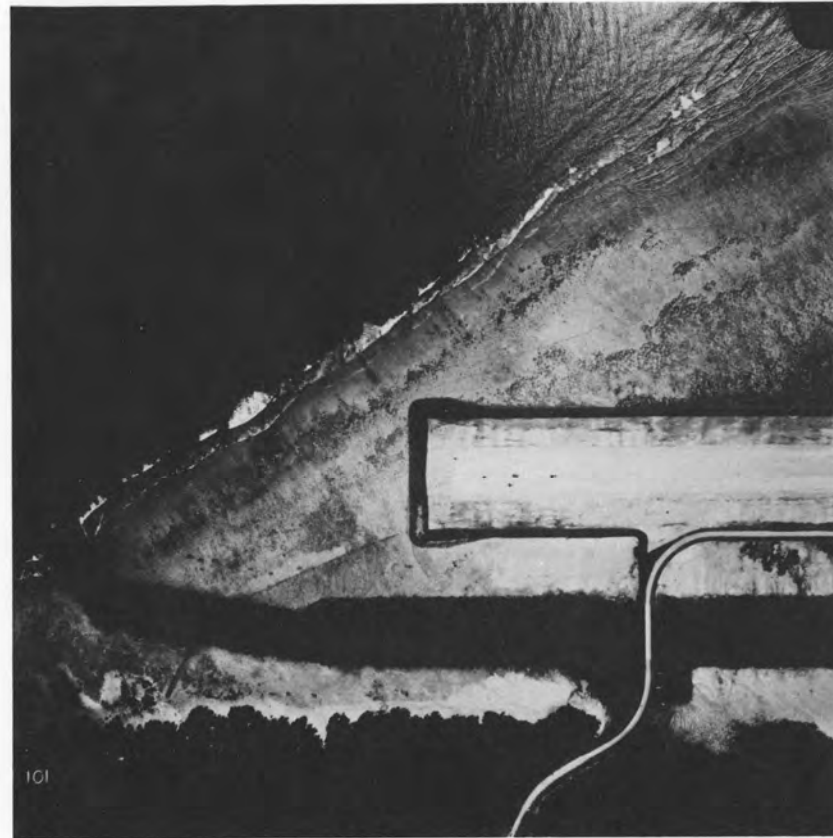


Photograph 99





Photograph 101



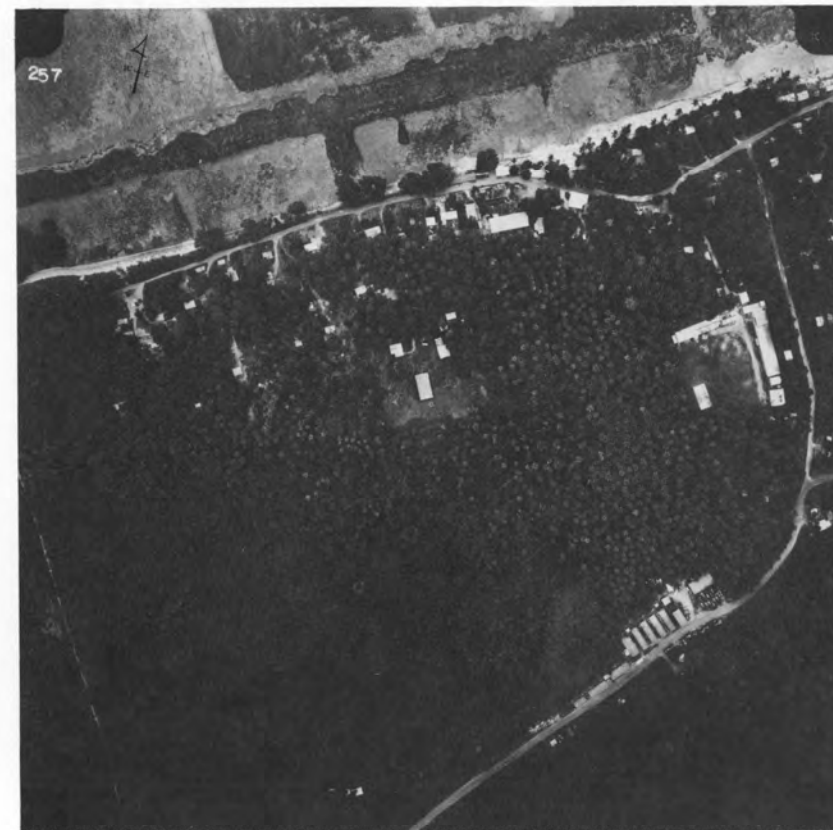
Photograph 261



Photograph 259



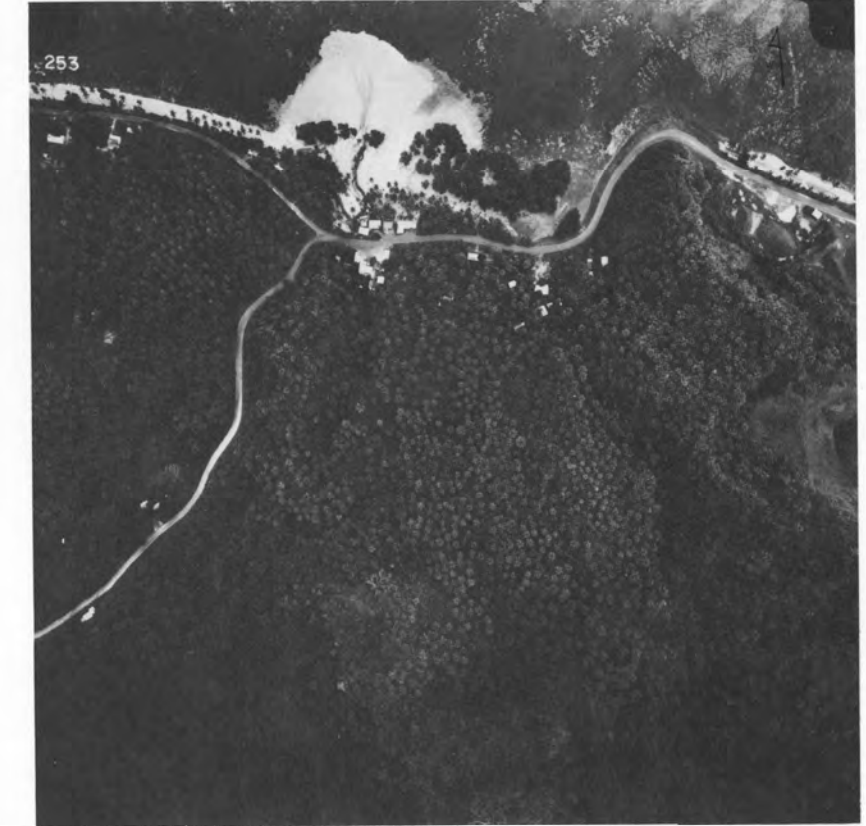
Photograph 257



Photograph 255



Photograph 253

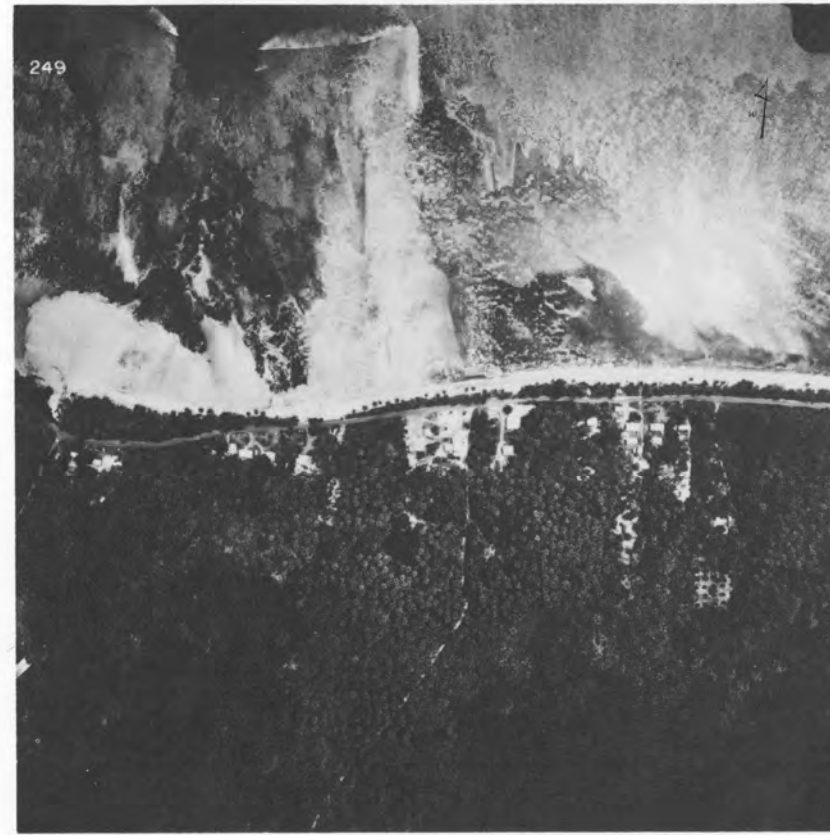




Photograph 247



Photograph 249



Photograph 251



Photograph 245





## Acknowledgments

We thank Michael White, Chief of MRD and his staff for providing essential logistical, diving, boat-and-driver, other field support, and for reviewing the draft atlas maps. Special thanks go to Rooston Abraham of MRD and to Carlos Jose Cianchini, Peace Corps Volunteer at MRD, for participating in the field work, serving as effective translators during interviews, and volunteering extra time and effort to help insure the success of this project. Michael Gawel, Chief of Marine Resources for the Federated States of Micronesia (FSM), and Michael Molina, FSM fisheries biologist, took time off from their busy schedules to participate in the field work and provide notes on many fishes and invertebrates.

We thank Kosrae's Chief Magistrates for their assistance in arranging and participating in the village meetings with the fishermen. Participants at Lelu included Clarence Alokoa, Louisa Elmer, Robson Henry, Martin Jesse, Zakias Mike, Marson Netlic, Berlin Sigras, Kun Welley, and Palikkun Wesley. Participants at Malem included Joseph Ittu, Namiko Jack, Kresma Luey, Sepe Marumo, Barton Musrasrik (Chief Magistrate), Takao Olter, Mode Shrew, Takasy Shrew, and Lambert Tally. Participants at Utwe included Joab Edmond, Bino Joseph, Justus Joseph, Atchiro Melander, Hanson Nena, Madason Nena, Marston Nena, Clanry Tilfas, Joel Tilfas, Raetul Tilfas, and Paul Wakuk. Participants and Walung included Likiak Albert, Iso Clarence, Divinson Con, Ezikiel David, Hamlet Jim, Alikisa Kioken, Shrew Luke, Merlinda, Kilafwa Mike, Corina H. Nena, Fordon Peter, Maxwell Salik, Swainfred Salik, Annie Swiny, Hashime Taulung, Johnson J. Taulung, Palikkun Taulung, Ranold Taulung, Saimon Taulung, and Sunny Taulung. Participants at Tafunsak included Alik Albert, Frederick Albert, Madison Albert, Shrew Albert, Kun S. Arriola, Lenard Benjamin, Joseph Z. George, Victor George, Webster George, Christopher Jonah, Julian Jonah, Augustine Luke, Polti Luke, Ailin Lupalik, Maxmiller A. Mongkeoya, Russel Ned, Obed Nena, Singeo Nena, Emerson Nithan, Lupalik Nithan, Alik Palsis (Chief Magistrate), Kenny Palsis, Ruly L. Palsis, Alokoa Sigras, Moses Taulung, Hideo Tolenoa, Miles Tolenoa, and Rison Tolenoa. The Corps gratefully acknowledges the essential information provided by these individuals. Information provided by other Kosrae residents at various times during the project is also acknowledged.

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