

Thirty-two of the 46 test excavations contained terrestrial faunal remains; T-116-121, 124-126, 129-134, 136-139, 141-143, 145, 146, 148-153.

Test excavations within West Kaka'ako contained both pre-Contact and post-Contact species: *Sus scrofa*, *Canis lupus familiaris*, *Equus ferus caballus*, *Bos taurus*, *Felis catus*, and *Gallus gallus*. There was evidence of historic butchering with metal saw blades. There were also species with no evidence of cultural modification. The pre-Contact species were in association with post-Contact species and therefore are determined to be historic in origin. In some instances, the cultural context was inconclusive when the species were unidentified medium mammal and Aves or unmodified and not in association with post-Contact species.

## 5.10 Faunal Analysis for Kewalo (Test Excavations 162-178)

### T-162

Two bulk sediment samples were collected from Test Excavation 162, Strata II and III, at a depth of 1.38-1.55 mbs and 1.55-1.89 mbs, respectively. Faunal analysis of Stratum II identified naturally-deposited limpets (0.1 g), *Echinometra mathaei* (0.1 g), and Crustacea (0.1 g). Faunal analysis of Stratum III identified naturally-deposited *Echinometra mathaei* (0.1 g) and Crustacea (0.3 g).

### T-163

Three bulk sediment samples were collected from Test Excavation 163 from Stratum IIa (1.64 mbs), Stratum IIb (1.7 mbs), and Stratum IIc (1.81 mbs). Faunal analysis of Stratum II identified naturally-deposited gastropods (0.1 g). No faunal material was identified within Stratum IIb. Faunal analysis of Stratum IIc identified naturally-deposited Crustacea (0.3 g), *Echinometra mathaei* (0.1 g), limpets/gastropods (2.4 g), *Brachidontes crebristriatus* (0.2 g), and *Crepidula aculeate* (0.1 g).

### T-164

Two bulk sediment samples were collected from Test Excavation 164, Strata II and III, at a depth of 1.73-1.83 mbs and 1.92-1.98 mbs, respectively. Faunal analysis of Stratum II identified burned Crustacea (0.1 g). Faunal analysis of Stratum III identified Crustacea (0.7 g), *Echinometra mathaei* (0.1 g) and miscellaneous marine mollusk shell (4.4 g).

### T-165

One bulk sediment sample was collected from Test Excavation 165, Stratum III, at a depth of 1.86-2.04 mbs. Faunal analysis of Stratum III identified naturally-deposited marine fauna from a shallow marine or estuary deposit: Crustacea (2.2 g), *Brachidontes crebristriatus* (0.9 g), Ostreidae (0.7 g), *Turbo* sp. (0.1 g), and *Tellina* spp. (0.1 g).

### T-166

One bulk sediment sample was collected from Test Excavation 166, Stratum II, at a depth of 1.44-2.07 mbs. Faunal analysis of Stratum II identified naturally-deposited Crustacea and marine mollusk shell (0.5 g).

**SIHP # 50-8-14-7429 (Test Excavations 167, 168, 168A, 168B, 169, 170, 170A)**

Test Excavations comprising SIHP #-7429 contained invertebrate and vertebrate faunal material expressing a strong midden signature. This strong midden content was identified within the buried A-horizon (Stratum II) and associated features (Features 1-7). All midden within this stratum and associated features is tabulated for each individual trench (Table 236, Table 238 to Table 240, and Table 242) below. The marine mollusk faunal material identified as naturally-deposited shell or as juvenile in size is not included in the midden table. Any vertebrate faunal material collected individually from various strata is also discussed within each test excavation discussion.

**T-167**

A midden table of marine and terrestrial faunal material identified within bulk sediment samples within Test Excavation 167, cultural resource SIHP #-7429, is provided in Table 236 below. A midden table of marine and terrestrial faunal material documented within Test Excavation 141, cultural resource SIHP #-5820, is provided in Table 236 below. The invertebrate species most represented within the midden signature consists of *Nerita picea*. The invertebrate species identified within the midden content are naturally found within a near-shore environment: on rocks and rock shelves within intertidal zones, tide-pools, and shallow marine waters. The vertebrate species identified consisted of medium mammal and fish.

In addition to the midden analysis tabulated within Table 236, faunal analysis was conducted of bulk sediment samples collected from the interface of Strata IIa/IIb at a depth of 1.45-1.5 mbs and Stratum IIb at a depth of 1.6-1.84 mbs. Faunal analysis of the interface of Strata IIa/IIb identified marine mollusk midden consisting of *Nerita picea* (0.7 g). Faunal analysis of Stratum IIb also identified potential midden consisting of *Nerita picea* (3.4 g), Crustacea (5.2 g), and Echinoidea *mathaei* (2.2 g).

Terrestrial faunal remains were collected individually during excavation from three discrete features (of SIHP # 50-80-14-7429) within Stratum II, a culturally enriched buried A-horizon. Feature 1 (1.41-1.45 mbs) contained a single fragmentary medium mammal skeletal element; Feature 2 (1.41-1.49 mbs) contained irregular bone fragments of a medium mammal; and Feature 3 (1.4-1.45 mbs) contained both medium mammal and *Sus scrofa* skeletal elements. The medium mammal fragments from Features 2 and 3 were burned; the medium mammal fragment from Feature 1 showed no evidence of cultural modification. The *Sus scrofa* rib from Feature 3 was butchered with a metal saw blade, indicating an historic origin not traditional Hawaiian (Table 237).

Table 236. Invertebrate and Vertebrate Midden Identified Within Bulk Sediment Samples from Test Excavation 167, SIHP # -7429

Test Excavation	167	167	167	167	Weight (g)	Total %
Stratum	II	II	II	II		
Feature	-	1	2	3		
<b>Invertebrate Midden</b>						
Conidae <i>Conus</i> sp. (burned)				0.9	<b>0.9</b>	<b>3.3%</b>
Isognomidae				1.2	<b>1.2</b>	<b>4.4%</b>

Isognomidae <i>Isognomon</i> sp.				0.3	<b>0.3</b>	<b>1.1%</b>
Mitridae				0.3	<b>0.3</b>	<b>1.1%</b>
Mytilidae <i>Brachidontes crebristriatus</i>				1.3	<b>1.3</b>	<b>4.8%</b>
Neritidae <i>Nerita picea</i>	4.1	1.9		4.7	<b>10.7</b>	<b>39.6%</b>
Strombidae <i>Strombus</i> sp.				0.3	<b>0.3</b>	<b>1.1%</b>
Crustacea	5.2			2.2	<b>7.4</b>	<b>27.4%</b>
Crustacea (burned)		0.7			<b>0.7</b>	<b>2.6%</b>
Echinoidea spp.				1.7	<b>1.7</b>	<b>6.3%</b>
Echinoidea <i>mathaei</i> sp.	2.2				<b>2.2</b>	<b>8.1%</b>
<b>Total Invertebrate Midden</b>	<b>11.5</b>	<b>2.6</b>	<b>0</b>	<b>12.9</b>	<b>27</b>	<b>100.0%</b>
<b>Vertebrate Midden</b>						
Medium mammal				0.3	<b>0.3</b>	<b>60.0%</b>
Osteichthyes (fish)			0.1	0.1	<b>0.2</b>	<b>40.0%</b>
<b>Total Vertebrate Midden</b>		<b>0</b>	<b>0.1</b>	<b>0.4</b>	<b>0.5</b>	<b>100.0%</b>

Table 237. Terrestrial Faunal Material Collected Individually During Test Excavation 167

Acc. #	Stratum	Depth (cmbs)	Feature	Family/Class	Species	Element	Description	Modification
167-F-1	Ia	140-145	7429-3	Suidae (pig)	<i>Sus scrofa</i>	Rib; Irregular bones	Fragments	Rib butchered (cut with metal)
167-F-2	Ia	140-145	7429-3	Mammalia	Medium mammal	Diaphysis section; Irregular bones	Fragments	Diaphysis section burned
167-F-3	Ia	141-145	7429-1	Mammalia	Medium mammal	Diaphysis section	Fragment	None

### T-168

A midden table of marine and terrestrial faunal material identified within bulk sediment samples within Test Excavation 167, cultural resource SIHP # -7429, is provided in Table 238 below. A midden table of marine and terrestrial faunal material documented within Test Excavation 141, cultural resource SIHP # -5820, is provided in Table 223 below. The invertebrate families or species most represented within the midden signature consist of Neritidae and *Turbo sandwicensis*. The invertebrate species identified within the midden content are naturally found within a near-shore environment: on rocks and rock shelves within intertidal zones, tide-pools, and shallow marine waters. The vertebrate species identified consisted of medium mammal and fish.

Table 238. Invertebrate and Vertebrate Midden Identified Within Bulk Sediment Samples from Test Excavation 168, SIHP # -7429

Test Excavation	168	Weight	Total %
Stratum	II		

Feature	-	(g)	
<b>Invertebrate Midden</b>			
Isognomidae <i>Isognomon</i> sp.	0.1	<b>0.1</b>	<b>0.9%</b>
Neritidae	2.4	<b>2.4</b>	<b>20.5%</b>
Neritidae <i>Nerita picea</i>	2.4	<b>2.4</b>	<b>20.5%</b>
Strombidae <i>Strombus</i> sp.	0.3	<b>0.3</b>	<b>2.6%</b>
Tellinidae <i>Tellina palatam</i>	0.4	<b>0.4</b>	<b>3.4%</b>
Turbinidae <i>Turbo sandwicensis</i>	1.3	<b>1.3</b>	<b>11.1%</b>
Burned Shell	1	<b>1</b>	<b>8.5%</b>
Crustacean	0.8	<b>0.8</b>	<b>6.8%</b>
Echinoidea	0.5	<b>0.5</b>	<b>4.3%</b>
Echinoidea <i>mathaei</i> sp. and <i>diadema</i> sp.	2.5	<b>2.5</b>	<b>21.4%</b>
<b>Total Invertebrate Midden</b>	<b>11.7</b>	<b>11.7</b>	<b>100.0%</b>
<b>Vertebrate Midden</b>			
Medium mammal	1.7	<b>1.7</b>	<b>81.0%</b>
Osteichthyes (fish)	0.4	<b>0.4</b>	<b>19.0%</b>
<b>Total Vertebrate Midden</b>	<b>2.1</b>	<b>2.1</b>	<b>100.0%</b>

### T-168A

Faunal analysis was conducted of bulk sediment samples collected from the interface of Strata IIa/IIb at a depth of 1.49-1.58 mbs. Faunal analysis of this interface identified naturally-deposited *Echinometra mathaei* (0.1 g) and gastropod/limpets (0.2 g).

### T-168B

A midden table of marine and terrestrial faunal material identified within bulk sediment samples within Test Excavation 167, cultural resource SIHP # -7429, is provided in Table 239 below. The invertebrate species most represented within the midden signature consists of *Nerita picea*, although a variety of invertebrate species in small amounts is also represented. The invertebrate species identified within the midden content are naturally found within a near-shore environment: on rocks and rock shelves within intertidal zones, tide-pools, and shallow marine waters. The vertebrate species identified consisted of medium mammal, dog, rat, and fish, as well as the historically introduced bovine.

In addition to the midden collected within Stratum II and its associated feature, a single *Casmaria erinaceus kalosmodix* was hand-collected from Stratum III.

The terrestrial faunal remains collected individually during excavation from Stratum II (1.40-1.45 mbs) consisted of *Sus scrofa* and *Bos taurus* skeletal elements. A *Bos taurus* rib was butchered with a metal saw blade, *Bos taurus* is a post-Contact species, therefore both species are considered historic in origin not traditional Hawaiian. These remains are part of the culturally enriched A-horizon component (Stratum II) of SIHP# 50-80-14-7429.

Table 239. Invertebrate and Vertebrate Midden Identified Within Bulk Sediment Samples from Test Excavation 168B, SIHP # -7429

Test Excavation	168B	168B		
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Stratum	II	II/III	Weight (g)	Total %
Feature	-	1		
<b>Invertebrate Midden</b>				
Burned gastropod cf. Strombidae	1.4		1.4	6.9%
Isognomidae <i>Isognomon</i> sp.		1.4	1.4	6.9%
Lucinidae <i>Ctena bella</i>		0.1	0.1	0.5%
Mytilidae <i>Brachidontes crebristriatus</i>	0.1	0.1	0.2	1.0%
Neritidae <i>Nerita picea</i>	9.6	1.5	11.1	54.4%
Strombidae <i>Strombus</i> sp.	1.1	0.5	1.6	7.8%
Tellinidae <i>Tellina palatam</i>	0.1		0.1	0.5%
Trochidae <i>Trochus</i> sp.	0.1		0.1	0.5%
Turbinidae <i>Turbo</i> sp., operculum	0.8		0.8	3.9%
Crustacean	0.9	1.6	2.5	12.3%
Crustacean (burned)	0.5		0.5	2.5%
Echinodermata		0.1	0.1	0.5%
Echinodermata <i>mathaei</i> sp.	0.4	0.1	0.5	2.5%
<b>Total Invertebrate Midden</b>	<b>15</b>	<b>5.4</b>	<b>20.4</b>	<b>100.0%</b>
<b>Vertebrate Midden</b>				
Medium mammal	0.2		0.2	1.4%
Bovine (medium mammal) possible rib cut, marks present with metal blade	13.1		13.1	94.2%
<i>Canis lupus familiaris</i> (dog)	0.1		0.1	0.7%
<i>Rattus</i> sp. (rat)		0.1	0.1	0.7%
Fish	0.4		0.4	2.9%
<b>Total Vertebrate Midden</b>	<b>13.8</b>	<b>0.1</b>	<b>13.9</b>	<b>100.0%</b>

## T-169

A midden table of marine and terrestrial faunal material identified within bulk sediment samples within Test Excavation 167, cultural resource SIHP # -7429, is provided in Table 240 below. The invertebrate species most represented within the midden signature consists of *Nerita picea*, although a variety of invertebrate species in small amounts is also represented. The invertebrate species identified within the midden content are naturally found within a near-shore environment: on rocks and rock shelves within intertidal zones, tide-pools, and shallow marine waters. The vertebrate species identified within bulk samples were consistent with pre-Contact terrestrial and marine species, including: medium mammal, rat, bird, and fish. However, hand-collected terrestrial faunal remains included historically introduced species (see below).

Terrestrial faunal remains were collected individually during excavation within Stratum II (1.44 mbs) and include *Bos taurus*, medium mammal (possible *Ovis aries*), and *Canis lupus familiaris*. Medium mammal, (possible *Felis catus* or *Canis lupus familiaris*) and *Canis lupus familiaris* was collected between (1.44 and 1.54 mbs). The *Bos taurus* fragment had been butchered with a metal saw blade, indicating an historic origin not traditional Hawaiian; however, the other bones showed no evidence of cultural modification. The culturally unmodified species are from a pre-and post-Contact contexts making the cultural origin inconclusive. However, all species are part of the culturally enriched A-horizon component (Stratum II) of SIHP #50-80-14-7429 (Table 241).

Table 240. Invertebrate and Vertebrate Midden Identified Within Bulk Sediment Samples from Test Excavation 169, SIHP # -7429

Test Excavation	169	Weight (g)	Total %
Stratum	II		
Feature	-		
<b>Invertebrate Midden</b>			
Cypraeidae <i>Cypraea caputserpentis</i>	0.3	0.3	3.0%
Nacellidae <i>Cellana sandwicensis</i>	0.4	0.4	4.0%
Neritidae <i>Nerita picea</i>	3.7	3.7	37.0%
Tellinidae <i>Tellina palatam</i>	0.5	0.5	5.0%
Crustacea	0.3	0.3	3.0%
Echinoidea <i>mathaei</i> sp./ <i>diadema</i> sp.	4.8	4.8	48.0%
<b>Total Invertebrate Midden</b>	<b>10</b>	<b>10</b>	<b>100.0%</b>
<b>Vertebrate Midden</b>			
Medium mammal	1.8	1.8	85.7%
Rattus sp. (rat)	0.1	0.1	4.8%
Aves (bird)	0.1	0.1	4.8%
Fish	0.1	0.1	4.8%
<b>Total Vertebrate Midden</b>	<b>2.1</b>	<b>2.1</b>	<b>100.0%</b>

Table 241. Terrestrial Faunal Material Collected Individually During Test Excavation 169

Acc. #	Stratum	Depth (cmbs)	Feature	Family/Class	Species	Element	Description	Modification
169-F-1	II	144	-	Bovidae	<i>Bos taurus</i>	Tibia diaphysis section	Fragment	Butchered (cut with metal saw blade)
169-F-2	II	144	-	Mammalia	Medium mammal (possible <i>Ovis aries</i> )	Vertebra; Tibia (distal portion); Epiphysis; Irregular bone fragments	Fragments	None
169-F-3	II	144	-	Canidae (dog)	<i>Canis lupus familiaris</i>	Vertebra	Fragment	None
169-F-4	II	144-154	-	Mammalia	Medium mammal (possible <i>Felis catus</i> or <i>Canis lupus familiaris</i> )	Metatarsus (possible, pieces mend)	Fragment	None
169-F-5	II	144-145	-	Canidae (dog)	<i>Canis lupus familiaris</i>	Cervical vertebra; Ulna; Irregular bones	Fragments	None

**T-170A**

A midden table of marine and terrestrial faunal material identified within bulk sediment samples within Test Excavation 167, cultural resource SIHP # -7429, is provided in

Table 242 below. The invertebrate species most represented within the midden signature consists of *Nerita picea* and *Strombus* sp. The invertebrate species identified within the midden content are naturally found within a near-shore environment: on rocks and rock shelves within intertidal zones, tide-pools, and shallow marine waters. The vertebrate species identified consisted of medium mammal and fish.

Terrestrial faunal remains were collected individually during excavation from Stratum II (0.56-0.6 mbs) of T-170A. These consisted of a single *Canis lupus familiaris* proximal phalanx; diaphysis sections from a *Rattus* sp.; and a vertebra and irregular bone from a medium mammal. The medium mammal vertebra had been butchered with a metal saw blade, indicating an historic origin not traditional Hawaiian; the other bones showed no evidence of cultural modification. *Canis lupus familiaris* and *Rattus* sp are both associated with pre-and post-Contact contexts therefore, the origin is inconclusive. These remains are part of the culturally enriched A-horizon component (Stratum II) of SIHP # 50-80-14-7429.

Table 242. Invertebrate and Vertebrate Midden Identified Within Bulk Sediment Samples from Test Excavation 170A, SIHP # -7429

Test Excavation	170A	170A	Weight (g)	Total %
Stratum	II	II		
Feature		7		
<b>Invertebrate Midden</b>				
Isognomidae <i>Isognomon</i> sp.		0.1	<b>0.1</b>	<b>0.6%</b>
Naticidae <i>Natica</i> sp. (burned)		2	<b>2</b>	<b>11.4%</b>
Neritidae <i>Nerita picea</i>	3.8	2.6	<b>6.4</b>	<b>36.6%</b>
Strombidae <i>Strombus</i> sp.		8.5	<b>8.5</b>	<b>48.6%</b>
Crustacea (burned)		0.3	<b>0.3</b>	<b>1.7%</b>
Echinoidea <i>mathaei</i> sp./ <i>diadema</i> sp.	0.2		<b>0.2</b>	<b>1.1%</b>
<b>Total Invertebrate Midden</b>	<b>4</b>	<b>13.5</b>	<b>17.5</b>	<b>100.0%</b>
<b>Vertebrate Midden</b>				
Medium mammal	0.2		<b>0.2</b>	<b>28.6%</b>
Osteichthyes (fish)	0.4	0.1	<b>0.5</b>	<b>71.4%</b>
<b>Total Vertebrate Midden</b>	<b>0.6</b>	<b>0.1</b>	<b>0.7</b>	<b>100.0%</b>

**T-171**

A single *Bos taurus* (possible) distal tibia fragment was collected individually during excavation from Stratum II (at 0.85 mbs). The bone was butchered with a metal saw blade indicating an historic origin not traditional Hawaiian.

**T-172**

Two bulk sediment samples were wet-screened from Test Excavation 172, Strata II and III (0.84-0.86 mbs and 1.0-1.1 mbs) respectively. Faunal analysis of Stratum II identified midden material consisting of burned unidentified medium mammal (0.2 g), burned Osteichthyes (0.2 g), and *Nerita picea* (0.2 g), indicating some cultural-enrichment to Stratum II. Faunal analysis of Stratum III identified naturally-deposited marine fauna consisting of Crustacea (0.6 g), Echinoidea *mathaei* (0.1 g), and limpets/gastropods (1.7 g).

**T-174**

One bulk sediment sample was collected from Test Excavation 174, Strata II (1.0 mbs). No marine fauna was identified.

A single *Sus scrofa* (possible) rib fragment was collected individually during excavation from Stratum Ie (0.67-1.03 mbs). This bone showed no evidence of cultural modification and *Sus scrofa* is a Polynesian introduction common in both pre- and post-Contact contexts, therefore origin is inconclusive.

**T-174A**

A single *Bos taurus* proximal phalanx was collected individually during excavation from Stratum Id (at 0.75 mbs). This bone showed no evidence of cultural modification, but the presence of *Bos taurus* (an introduced species) indicates a post-Contact origin.

**T-175**

Two bulk sediment samples were collected from Test Excavation 175, Strata II and III, at a depth of 0.54-0.6 mbs and 0.65-0.72 mbs, respectively. Faunal analysis of Stratum II identified naturally-deposited marine mollusk shell (2.2 g), Crustacea (1.4 g), and *Echinothrix diadema* and *Echinometra mathaei* (0.2 g). Faunal analysis of Stratum III identified naturally-deposited Crustacea (1.0 g) and *Brachidontes crebristriatus* (0.1 g).

**T-175A**

Three bulk sediment samples were collected from Test Excavation 175A, Strata II and III, at a depth of 0.6-0.68 mbs and 0.66 mbs (Stratum II) and 0.8-0.9 mbs (Stratum III). Faunal analysis of Stratum II identified midden material, indicating some cultural-enrichment to Stratum II. A midden table for Stratum II is provided below (Table 243). In addition to the midden content, naturally-deposited marine mollusk shell, Crustacea and Echinoidea were also documented (7.8 g). Faunal analysis of Stratum III identified naturally-deposited marine fauna consisting of Crustacea (0.2 g), *Brachidontes crebristriatus* (0.2 g), and limpets/gastropods (0.1 g).

Table 243. Stratum II Faunal Material Collected from Test Excavation 175A

Faunal Material	Weight (g)
Conidae <i>Conus</i> sp.	3.0
Cypraeidae <i>Cypraea</i> sp.	0.3
Mytilidae <i>Brachidontes crebristriatus</i>	0.5
Tellinidae <i>Tellina</i> sp.	0.1
Trochidae <i>Trochus</i> sp.	0.7

Turbinidae <i>Turbo</i> sp.	2.7
Crustacea	2.2
<b>Total</b>	<b>9.5</b>

### T-176

One bulk sediment sample was collected from Test Excavation 176, Strata II, at a depth of 0.39-0.7 mbs. Faunal analysis identified a small amount of possible marine mollusk midden consisting of *Barbatia* sp. (4.5 g).

### T-177

Four bulk sediment samples were collected from Test Excavation 177, Strata II and III, at a depth of 0.9-1.05 mbs and 0.96-1.04 mbs (Stratum II) and 0.97-1.53 mbs and 1.15-1.25 mbs (Stratum III). Faunal analysis of Stratum II identified midden material, indicating some cultural-enrichment to Stratum II. A midden table for Stratum II is provided below (

Table 244). In addition to the midden content, naturally-deposited marine mollusk shell, Crustacea and Echinoidea, as well as juvenile shell of the marine mollusk midden were also documented (9.4 g). Faunal analysis of Stratum III also identified a small midden signature consisting of similar marine mollusk families and species: *Turbo sandwicensis* (0.7 g), *Ctena bella* (0.1 g), *Brachidontes crebristriatus* (0.1 g), *Strombus* sp. (0.1 g), and Crustacea (0.2 g).

Table 244. Stratum II Faunal Material Collected from Test Excavation 177

Faunal Material	Weight (g)
Lucinidae <i>Ctena bella</i>	0.5
Mytilidae <i>Brachidontes crebristriatus</i>	1.1
Naticidae <i>Natica</i> sp.	0.2
Neritidae <i>Nerita picea</i>	42.7
Pteriidae <i>Pinctada radiata</i>	1.2
Strombidae <i>Strombus maculatus</i>	3.8
Turbinidae <i>Turbo sandwicensis</i>	0.9
Crustacea	0.2
<b>Total</b>	<b>50.6</b>

### Summary of Faunal Assemblage from Kewalo

The faunal material collected within bulk sediment samples within Kewalo indicated a wetland environment continuing from West Kaka'ako (T-153 to T-161) through the western edge of Kewalo, including T-162 to T-166. The eastern portion of Kewalo showed a distinct marine and terrestrial material midden signature with the sand A-horizon, including T-167 to T-170A and a slight midden presence also within the sand deposits of T-172 to T-177. The marine and terrestrial midden material indicate a discrete area of cultural activity.

Eight of the 11 test excavations contained terrestrial faunal material: T-167, 168B, 169, 170A, 171, 172, 174, 174A. Test Excavation 167 had remains from three discrete features (of SIHP # 50-80-14-7429) within Stratum IIa; Feature 1 contained a single fragmentary medium mammal

skeletal element; Feature 2 contained irregular bone fragments of a medium mammal; and Feature 3 contained both medium mammal and *Sus scrofa* skeletal elements. The medium mammal fragments from Features 2 and 3 were burned; the medium mammal fragment from Feature 1 showed no evidence of cultural modification. The *Sus scrofa* rib from Feature 3 was butchered with a metal saw blade, indicating an historic origin not traditional Hawaiian.

Test Excavation 168B consisted of *Sus scrofa* and *Bos taurus* skeletal elements from Stratum II. A *Bos taurus* rib was butchered with a metal saw blade, *Bos taurus* is a post-Contact species, therefore both species are considered historic in origin not traditional Hawaiian. These remains are part of SIHP # 50-80-14-7429.

Test Excavation 169 remains collected from Stratum II include *Bos taurus*, medium mammal (possible *Ovis aries*), and *Canis lupus familiaris*. In addition, medium mammal, (possible *Felis catus* or *Canis lupus familiaris*) and *Canis lupus familiaris* were also collected. The *Bos taurus* fragment had been butchered with a metal saw blade, indicating an historic origin not traditional Hawaiian; however, the other bones showed no evidence of cultural modification. The culturally unmodified species are from a pre-and post-Contact contexts making the cultural origin inconclusive. All species are part of SIHP# 50-80-14-7429.

Test Excavation 170A remains collected from Stratum II consisted of a single *Canis lupus familiaris* proximal phalanx; a diaphysis sections from a *Rattus sp.*; and a vertebra and irregular bone fragments from a medium mammal. The medium mammal vertebra had been butchered with a metal saw blade, indicating an historic origin not traditional Hawaiian; the other bones showed no evidence of cultural modification. *Canis lupus familiaris* and *Rattus sp* are both associated with pre-and post-Contact contexts therefore, the origin is inconclusive. These remains are part of SIHP # 50-80-14-7429.

Test Excavation 171, 174, and 174A all contained single elements from either *Bos taurus* or *Sus scrofa*. T-171 contained a single *Bos taurus* (possible) distal tibia fragment from Stratum II. The bone was butchered with a metal saw blade indicating an historic origin not traditional Hawaiian. T-174 contained a single *Sus scrofa* (possible) rib fragment from Stratum Ie. This bone was not culturally modified. *Sus scrofa* is a Polynesian introduced species and common in both pre- and post-Contact contexts, therefore origin is inconclusive. T-174 contained a single *Bos taurus* proximal phalanx from Stratum Id. This bone was not culturally modified. *Bos taurus* (an introduced species) indicates a post-Contact origin.

## 5.11 Faunal Analysis for East Kaka'ako (Test Excavations 179-197)

### T-179

One bulk sediment sample was collected from Test Excavation 179, Stratum II, at a depth of 1.05-1.15 mbs. Faunal analysis identified naturally occurring marine faunal material, including: limpets and unidentified gastropods (3.6 g), Crustacea (1.6 g), *Brachidontes crebristriatus* (1.1 g), *Nerita sp.* (0.1 g), and *Echinothrix diadema* and *Echinometra mathaei* (0.1 g). These taxa are consistent with a marine environment.

### T-181

One bulk sediment sample was collected from Test Excavation 181, Stratum Id, at a depth of 0.8-1.0 mbs. Faunal analysis identified naturally occurring mollusk shells, including water-worn limpets, bivalves, and micro shells. These taxa are consistent with a marine environment.

#### **T-182**

One bulk sediment sample was collected from Test Excavation 182, Stratum II, at a depth of 1.36-1.46 mbs. Faunal analysis identified naturally occurring, unidentified mixed shell fragments (2.0 g).

#### **T-184**

Two bulk sediment samples were collected from Test Excavation 184, Strata Id and II, at a depth of 0.86-1.06 mbs and 1.39-1.47 mbs, respectively. Faunal analysis of Stratum Id, identified as hydraulic fill, identified Aves (0.3 g), fresh or brackish water gastropods (snails) (2.9 g), *Echinothrix diadema* and *Echinometra mathaei* (0.1 g), unidentified gastropods (5.1 g), *Theodoxus neglectus* (2.8 g) and Crustacea (0.5 g). Faunal analysis of Stratum II identified naturally-deposited marine faunal material, including: bivalves, limpets, and unidentified gastropods (3.1 g), *Nerita picea* (0.4 g), and Crustacea (<0.1 g); and naturally occurring snails (not weighed). These taxa are consistent with a wetland/estuary environment.

#### **T-186**

Three bulk sediment samples were collected from Test Excavation 186, Strata Id, IIa/IIb, and III, at a depth of 1.1 mbs (Id), 1.24-1.37 mbs (IIa/IIb), and 1.35-1.45 mbs, respectively. Faunal analysis of Stratum Id identified a single naturally occurring marine shell, *Cypraea tigris*. Faunal analysis of IIa/IIb identified fresh or brackish water gastropods (snails), Crustacea (0.2 g), *Echinometra mathaei* (0.2 g), and naturally-deposited marine mollusk shell, including an operculum (1.1 g), bivalves, limpets, and unidentified gastropods (0.8 g). Faunal analysis of Stratum III identified fresh or brackish water gastropods (snails) (3.7 g), Crustacea (5.2 g), *Echinometra mathaei* (0.3 g), limpets, unidentified gastropods, and bivalves (36.1 g). These taxa are consistent with coastal and permanent fresh- or brackish water locations (see Section 6).

#### **T-187**

One bulk sediment sample was collected from Test Excavation 187, Stratum IIb, at a depth of 1.18-1.36 mbs. Faunal analysis identified fresh or brackish water gastropods (snails) (25.7 g), an indeterminate mammal osseous fragment (<0.1 g), and naturally occurring marine faunal material, consisting of: *Nerita picea* and *Theodoxus neglectus* (1.7 g), unidentified gastropods and bivalves (1.2 g), and *Echinometra mathaei* (<0.1 g). These taxa are consistent with a wetland/estuary environment.

#### **T-188**

Two bulk sediment samples were collected from Test Excavation 188, Strata Id, IIa and IIIa, at a depth of 1.15-1.39 mbs (Id), 1.18-1.36 mbs (IIa), and 1.5-1.6 mbs (IIb), respectively. No faunal material was identified within Stratum Id. Faunal analysis of Stratum IIa identified fresh or brackish water gastropods (snails) (11.2 g), Crustacea (<0.1 g), and limpets and bivalves (0.3 g). Faunal analysis of Stratum IIb identified fresh or brackish water gastropods (snails) (183.0 g),

*Echinometra mathaei* (0.3 g), *Nerita picea* (0.2 g), and limpets, unidentified gastropods, and bivalves (3.4 g). These taxa are consistent with a wetland/estuary environment.

### **T-189**

Three bulk sediment samples were collected from Test Excavation 189, Strata Id, II and III, at a depth of 1.27-1.38 mbs (Id), 1.38-1.42 mbs (II), and 1.42-1.51 mbs (III), respectively. No faunal material was identified within Stratum Id. Faunal analysis of Stratum II identified fresh or brackish water gastropods (snails) (not weighed) and marine limpets, unidentified gastropods, and bivalves (1.3 g). Faunal analysis of Stratum III identified fresh or brackish water gastropods (snails) (272.6 g), *Theodoxus neglectus* (1.5 g), and limpets, unidentified gastropods, and bivalves (11.7 g). These taxa are consistent with coastal and permanent fresh- or brackish water locations (see Section 6).

### **T-191**

Two bulk sediment samples were collected from Test Excavation 191, Strata IIa and IIb, at a depth of 0.87-0.95 mbs and 1.2-1.26 mbs, respectively. Faunal analysis of Stratum IIa identified miscellaneous marine shell (8.6 g) and fresh or brackish water gastropods (snails) (77.5 g). Faunal analysis of Stratum IIb identified naturally-deposited marine mollusk shell consisting of: *Brachidontes crebristriatus* (1.4 g), limpets (1.0 g), Thaididae (0.7 g), *Nerita picea* (0.4 g), *Ctena bella* (0.1 g), and *Melampus sp.* (0.1 g). These taxa are consistent with a wetland/estuary environment.

### **T-192**

One bulk sediment sample was collected from Test Excavation 192, Stratum II, at a depth of 1.75-1.83 mbs. Faunal analysis identified fresh or brackish water gastropods (snails) (17.8 g), Crustacea (<0.1 g), *Hipponix sp.* (<0.1 g), and limpets (<0.1 g). These taxa are consistent with a wetland/estuary environment.

### **T-193**

Two bulk sediment samples were collected from Test Excavation 193, Strata IIa and IIb, at a depth of 1.53-1.56 mbs and 2.2-2.25 mbs, respectively. Faunal analysis of Stratum IIa identified fresh or brackish water gastropods (snails) (142.1 g), *Echinometra mathaei* (<0.1 g), and limpets, gastropods, and bivalve fragments (1.2 g). Faunal analysis of Stratum IIb identified fresh or brackish water gastropods (snails) (0.9 g), Crustacea (2.0 g), and marine mollusk shell consisting of: Fascioliidae (4.5 g), *Brachidontes crebristriatus* (3.5 g), Turbinidae (2.4 g), *Natica sp.* (1.8 g), limpets (1.4 g), unidentified micro gastropods (1.4 g), and Tellinidae (0.2 g). These taxa are consistent with a wetland/estuary environment.

### **T-195**

One bulk sediment sample was collected from Test Excavation 195, Stratum II, at a depth of 1.37-1.46 mbs. Faunal analysis of Stratum II identified fresh or brackish water gastropods (snails) (26.9 g), Osteichthyes (<0.1 g), Crustacea (<0.1 g), *Echinometra mathaei* (<0.1 g), and limpets and unidentified gastropods (0.8 g). These taxa are consistent with a wetland/estuary environment.

### **T-196**

Two bulk sediment samples were collected from Test Excavation 196, Strata IIa and IIb, at a depth of 1.5-1.55 mbs and 1.56-1.7 mbs, respectively. Faunal analysis of Stratum IIa identified fresh or brackish water gastropods (snails) and marine mollusk shell consisting of *Theodoxus neglectus* (0.4 g), *Tellina palatam* (0.4 g), Fascioliidae (0.1 g), and *Brachidontes crebristriatus* (0.1 g). Faunal analysis of Stratum IIb identified fresh or brackish water gastropods (snails) (172.9 g), Crustacea (0.1 g), and limpets, unidentified gastropods, and bivalve fragments (12.0 g). These taxa are consistent with a wetland/estuary environment.

### **Summary of Faunal Assemblage from the East Kaka'ako Zone**

The taxa collected throughout the East Kaka'ako Zone consisted mainly of naturally occurring marine faunal material, largely comprised of mollusks. Only one instance of mammal osseous remains (T-187), one instance of Aves remains (T-184), and one instance of unidentified Osteichthyes remains (T-195) were documented throughout the East Kaka'ako zone. The faunal material indicates that much of the zone was located within a wetland/estuary environment and was not extensively culturally modified.

## **5.12 Faunal Analysis for Kālia (Test Excavations 198-225)**

### **T-198**

One bulk sediment sample was collected from Test Excavation 198, Stratum III, at a depth of 1.85-1.90 mbs. Faunal analysis of Stratum III identified fresh or brackish water gastropods (snails) (10.7 g), Crustacea and Echinoidea (0.5 g), and limpets, bivalves, and unidentified gastropod fragments (10.7 g). These taxa are consistent with a wetland/estuary environment.

### **T-199**

One bulk sediment sample was collected from Test Excavation 199, Stratum II, at a depth of 1.5-1.6 mbs. Faunal analysis of Stratum II identified fresh or brackish water gastropods (snails) (168.5 g) and naturally-deposited marine bivalves and limpets (1.4 g). These taxa are consistent with a wetland/estuary environment.

### **T-200**

Three bulk sediment samples were collected from Test Excavation 200, Strata IIa, IIa/IIb, and IIb, at a depth of 1.45-1.55 mbs (IIa), 1.55-1.65 mbs (IIa/IIb), and 1.65-1.73 mbs (IIb). Faunal analysis of Stratum IIa identified fresh or brackish water gastropods (snails) (>500.0 g), bivalve fragments (0.4 g), Neritidae (0.4 g), and Crustacea (<0.1 g). Faunal analysis of Stratum IIa/IIb identified fresh or brackish water gastropods (snails) (>500.0 g), Osteichthyes (<0.1 g), Crustacea (3.0 g), and bivalves, limpets, unidentified gastropods. Faunal analysis of Stratum IIb identified fresh or brackish water gastropods (snails) 14.1 g), Crustacea (6.8 g), Echinoidea (0.9 g), Osteichthyes (0.1 g), and marine mollusk shell consisting of limpets and unidentified gastropods (19.3 g), Melampidae (4.2 g), *Brachidontes crebristriatus* (2.4 g), and Naticidae (1.1 g). Additionally, *Sus scrofa* remains were recovered from Stratum IIb at 1.55 mbs. These taxa are consistent with a wetland/estuary environment.

### **T-202**

Two bulk sediment samples were collected from Test Excavation 202, Stratum II and the fill of a historic privy, at a depth of 1.36-1.5 mbs and 1.2-1.7 mbs, respectively. Faunal analysis of

the privy fill identified *Canis lupus familiaris* (0.2 g), Osteichthyes (0.1 g), Echinoidea, Melampidae, limpets and gastropods. Faunal analysis of Stratum II identified a small amount of gastropods, limpets, and Crustacea (6.2 g). Additionally, remains of *Bos taurus* and unidentified medium mammal were recovered by hand from Stratum Ie (a fill layer) from 1.2-1.5 mbs. The taxa from Stratum II are consistent with a wetland/estuary environment, which has been disturbed by a historic-era privy containing historic refuse/midden (SIHP # 50-80-14-07430). The mammal remains from Stratum Ie were recovered from a fill layer and are considered food remnants/midden.

### **T-202A**

One bulk sediment sample was collected from Test Excavation 202A, Stratum Ie, at a depth of 1.2-1.5 mbs. Faunal analysis of Stratum Ie identified *Bos taurus*, medium mammal, and Osteichthyes. These remains were recovered from a fill layer and are considered food remnants/midden.

### **T-205**

One bulk sediment sample was collected from Test Excavation 205, Stratum II, at a depth of 1.25-1.3 mbs. Faunal analysis of Stratum II identified a large amount of fresh or brackish water gastropod (snails), Osteichthyes (2.3 g), Crustacea (0.2 g), and limpets, unidentified gastropods, and bivalves (2.5 g). These taxa are consistent with a wetland/estuary environment.

### **T-207**

One bulk sediment sample was collected from Test Excavation 207, Stratum IIa, at a depth of 0.73-1.35 mbs. Faunal analysis of Stratum IIa identified fresh or brackish water gastropod (snails) (3.2 g), Crustacea (0.9), limpets (0.7 g), *Echinometra mathaei* (0.1 g), Melampidae (0.1 g), and various unidentified shells (2.6 g). These taxa are consistent with coastal and permanent fresh- or brackish water locations (see Section 6).

### **T-208**

Two bulk sediment samples were collected from Test Excavation 208, Strata IIa and IIb, at a depth of 1.4-1.48 mbs and 1.52-1.58 mbs, respectively. Faunal analysis of Stratum IIa identified fresh or brackish water gastropod (snails) (5.1 g). Faunal analysis of Stratum IIb identified fresh or brackish water gastropod (snails) (not weighed), Crustacea (0.2 g), Echinoidea *mathaei* (<0.1 g), and limpets, unidentified gastropods, and bivalve fragments (2.5 g). These taxa are consistent with a wetland/estuary environment.

### **T-212**

Two bulk sediment samples were collected from Test Excavation 212, Stratum IIb, at a depth of 1.6-1.7 mbs and 1.65-1.8 mbs. Faunal analysis of Stratum IIb identified Crustacea, Melampidae, limpets and gastropods. These taxa are consistent with a wetland/estuary environment.

### **T-219**

Two bulk sediment samples were collected from Test Excavation 219, Strata IIa and IIb, at a depth of 1.1-1.75 mbs and 1.4-1.75 mbs, respectively. Faunal analysis of Stratum IIa identified fresh or brackish water gastropods (snails) (47.7 g), Crustacea (<0.1 g), and limpet and bivalve

fragments (0.4 g). Faunal analysis of Stratum IIb identified fresh or brackish water gastropods (snails) (150.8 g), Crustacea (<0.1 g), and limpets, unidentified gastropods, and bivalve fragments (4.5 g). These taxa are consistent with a wetland/estuary environment (see Section 6).

### T-221

One bulk sediment sample was collected from Test Excavation 221, Stratum II, at a depth of 1.2-1.5 mbs. Faunal analysis of Stratum II identified fresh or brackish water gastropods (snails) (0.6 g), Osteichthyes (0.2 g) and various unidentified shells (2.5 g). These taxa are consistent with a wetland/estuary environment.

### Summary of Faunal Assemblage from the Kālia Zone

The taxa collected throughout the Kālia Zone consisted mainly of naturally occurring marine faunal material, largely comprised of mollusks, with snails predominantly represented. There was little variety in the type of marine faunal material documented. Two test excavations (T-202, and T-202A) contained midden material, which was comprised of both marine and terrestrial species. In T-202, some of the midden was recovered from a historic-era privy (SIHP # 50-80-14-07430), while in T-202A the midden was found within a historic fill deposit. One test excavation (T-219) contained historically introduced snail species that are consistent with mid-to late-nineteenth century (or later) rice cultivation. A significant number of test excavations (13 of 24 excavated trenches) contained no faunal remains. The faunal remains as a whole indicate that the Kālia Zone was located within a wetland/estuary environment and was not extensively culturally modified.

Test Excavation 202A contained terrestrial and marine faunal were collected from Stratum Ie. This includes *Bos taurus*, unidentified medium mammal, and unidentified fish remains. The presence of *Bos taurus*, a post-Contact species provides a historic origin not traditional Hawaiian.

## 5.13 Faunal Analysis for Kaka‘ako Makai (Test Excavations 226-232A)

### SIHP #50-8-14-2918 (Test Excavations 226A, 226B, 226C, 226D, 227, 227A)

Test Excavations comprising SIHP # -2918 contained invertebrate and vertebrate faunal material expressing a strong midden signature. This strong midden content was identified within the buried A-horizon (Stratum II) and associated features (Features 1-27). All midden within this stratum and associated features is tabulated for each individual trench (Table 245, Table 247, Table 250, Table 252, and Table 253) below. The marine mollusk faunal material identified as naturally-deposited shell or as juvenile in size is not included in the midden table. Any vertebrate faunal material collected individually from various strata is also discussed within each test excavation discussion.

### T-226A

A midden table of marine and terrestrial faunal material identified within bulk sediment samples within Test Excavation 226A, cultural resource SIHP # -2918, is provided in Table 245 below. The invertebrate species most represented within the midden signature consists of *Conus* sp., *Cypraea caputserpentis*, *Brachidontes crebristriatus*, *Nerita picea*, *Strombus* sp., *Tellina*

*palatam*, and *Trochus* sp. In addition, a wide variety of other invertebrate species is represented in lesser amounts. The invertebrate species identified within the midden content are naturally found within a near-shore environment: on rocks and rock shelves within intertidal zones, tide-pools, and shallow marine waters. The vertebrate species identified consisted of small and medium mammal, pig, dog, fish, and shark.

In addition to the midden analysis tabulated within Table 245, faunal analysis was conducted of bulk sediment samples collected from Stratum Ic (0.58 mbs), Strata Ic/II (1.49-1.58 mbs), Stratum III (1.1-1.4 mbs), and Stratum V (1.3-1.47 mbs). Faunal analysis of Stratum Ic, identified as fill, marine mollusk midden consisting of *Tellina palatam* (8.2 g), *Conus* sp. (4.0 g), and *Gouldia cookei* (0.6 g). The midden material was previously removed from its cultural context. The interface of Strata Ic/II similarly expressed a small midden signature consisting of *Conus* sp. (3.2 g) and *Nerita picea* (1.2 g). Faunal analysis of Stratum III, Jaucas sand, also contained a small midden signature consisting of *Brachidontes crebristriatus* (1.3 g), Cymatiidae (0.9 g), *Strombus* sp. (0.1 g), *Tellina* sp. (0.1 g), and Crustacea (1.3 g). Faunal analysis of Stratum V identified naturally-deposited marine mollusk shell consistent with a shallow marine deposit, including: *Brachidontes crebristriatus* (10.2 g), limpets/gastropods (3.3 g), *Tellina* spp. (1.2 g), *Natica* sp. (0.8 g), Crustacea (0.1 g), and Echinoidea (0.1 g).

Terrestrial faunal remains were collected individually during excavation from the interface of Stratum Ib/Ic (0.4-0.64 mbs), the interface of Stratum Ic/II (0.7 mbs), Stratum II (0.97-1 mbs), Stratum III (0.75-1.27 mbs), and Stratum IV (1.12-1.36 mbs). Faunal remains from the interface of Stratum Ib/Ic (0.4-0.64 mbs) consisted of an unmodified *Canis lupus familiaris* distal metacarpus fragment, and *Bos taurus* skeletal elements, some of which had been butchered by a metal saw blade (indicating an historic origin, not traditional Hawaiian). In addition to the mammalian remains recovered, there were also Osteichthyes (fish) fragments recovered from the Ib/Ic interface (see Appendix A).

Terrestrial faunal remains from the interface of Stratum Ic/II (0.7 mbs) consisted of unmodified *Bos taurus*, *Sus scrofa*, small and medium mammal skeletal elements. The presence of *Bos taurus* (an introduced species) indicates a post-Contact origin for this sample area.

Diaphysis sections from a *Rattus* sp. and an unidentified medium mammal were recovered from Stratum II, (a culturally enriched A-horizon) within Feature 3 (0.97-1 mbs) of SIHP# 50-80-14-2918. None of these bones showed any evidence of cultural modification.

A collection of *Sus scrofa* skeletal elements was recovered from Stratum III (0.75-1.27 mbs), none of which showed any evidence of cultural modification, and *Sus scrofa* is a Polynesian introduction common in both pre- and post-Contact contexts. Finally, a single unmodified medium mammal diaphysis fragment was collected from Stratum IV (1.12-1.36 mbs) (Table 246).

Table 245. Invertebrate and Vertebrate Midden Identified Within Bulk Sediment Samples from Test Excavation 226A, SIHP # -2918

Test Excavation	226A	226A	226A	226A	Weight	Total
Stratum	II	II	II	II		

Feature	-	1	2	3	(g)	%
<b>Invertebrate Midden</b>						
Conidae			1.4		1.4	0.6%
Conidae <i>Conus</i> sp.	22.6			4.5	27.1	11.4%
Cymatiidae		0.1			0.1	0.0%
Cymatiidae <i>Cymatium</i> sp.	0.4		3.2	1.9	5.5	2.3%
Cypraeidae	0.2				0.2	0.1%
Cypraeidae <i>Cypraea caputserpentis</i>	10.9	0.7		1	12.6	5.3%
Gastropod (burned)	1.4				1.4	0.6%
Isognomidae <i>Isognomon</i> sp.	1	0.6		0.2	1.8	0.8%
Mytilidae <i>Brachidontes crebristriatus</i>	28.6	3.7	3.7	9.5	45.5	19.1%
Nassariidae	0.5				0.5	0.2%
Nassariidae <i>Nassarius hirtus</i>	3		1.4		4.4	1.8%
Naticidae			0.3		0.3	0.1%
Naticidae <i>Natica gualteriana</i>	2				2	0.8%
Neritidae <i>Nerita picea</i>	30.9	7.5	3.7	2.5	44.6	18.7%
Neritidae <i>Nerita polita</i>	0.4				0.4	0.2%
Pteriidae <i>Pinctada radiata</i>	0.1				0.1	0.0%
Pyramidellidae <i>Pyramidella dolabrata</i>	0.8				0.8	0.3%
Strombidae <i>Strombus</i> sp.	5.6	4.6		2.2	12.4	5.2%
Strombidae <i>Strombus</i> sp. (burned)	0.3				0.3	0.1%
Tellinidae	0.6		0.1		0.7	0.3%
Tellinidae <i>Tellina palatam</i>	10.2	1.6	0.5		12.3	5.2%
Tellinidae <i>Tellina</i> sp.				2.5	2.5	1.0%
Tellinidae <i>Tellina</i> spp.	7.9		0.1		8	3.4%
Trochidae			4.7		4.7	2.0%
Trochidae <i>Trochus</i> sp.	3.6	0.3	3.9	1.8	9.6	4.0%
Trochidae <i>Trochus</i> spp.	0.8				0.8	0.3%
Turbinidae <i>Turbo sandwicensis</i>	1.1	0.7	0.6		2.4	1.0%
Turbinidae <i>Turbo</i> sp. Opercula	2.3				2.3	1.0%
Burned shell	10.6	4	1.1	5.3	21	8.8%
Crustacea	1.5	0.3	0.2		2	0.8%
Crustacea (burned)	1.2			0.1	1.3	0.5%
Echinoidea <i>diadema</i> sp.	0.1				0.1	0.0%
Echinoidea <i>Heterocentrotus mammillatus</i>	5.1				5.1	2.1%
Echinoidea <i>mathaei</i> sp.				0.1	0.1	0.0%
Echinoidea <i>mathaei</i> sp./ <i>diadema</i> sp.	1.5	0.8	0.4		2.7	1.1%
Echinoidea <i>mathaei</i> sp./ <i>diadema</i> sp., <i>Heterocentrotus mammillatus</i>	1.7				1.7	0.7%
<b>Total Invertebrate Midden</b>	<b>156.9</b>	<b>24.9</b>	<b>25.3</b>	<b>31.6</b>	<b>238.7</b>	<b>1</b>
<b>Vertebrate Midden</b>						
Medium mammal	1.7		0.8	0.1	2.6	42.6%
Small mammal	0.2				0.2	3.3%

Test Excavation	226A	226A	226A	226A	Weight (g)	Total %
Stratum	II	II	II	II		
Feature	-	1	2	3		
<i>Sus scrofa</i> (pig)	0.6		0.1		<b>0.7</b>	<b>11.5%</b>
<i>Canis lupus familiaris</i> (dog)	0.3				<b>0.3</b>	<b>4.9%</b>
Osteichthyes (fish)	1.9		0.2	0.1	<b>2.2</b>	<b>36.1%</b>
Chondrichthyes (shark tooth)	0.1				<b>0.1</b>	<b>1.6%</b>
<b>Total Vertebrate Midden</b>	<b>4.8</b>	<b>0</b>	<b>1.1</b>	<b>0.2</b>	<b>6.1</b>	

Table 246. Terrestrial Faunal Material Collected Individually During Test Excavation 226A

Acc. #	Stratum	Depth (cmbs)	Feature	Family/ Class	Species	Element	Description	Modification
226A-F-1	Ib/Ic	40-64	-	Bovidae (cow)	<i>Bos taurus</i>	Ribs; Diaphysis section	Fragments	Ribs butchered (with metal saw blade)
226A-F-2	Ib/Ic	40-64	-	Canidae (dog)	<i>Canis lupus familiaris</i>	Metacarpus (distal portion)	Fragments	None
226A-F-3	Ic/II	70	-	Bovidae (cow)	<i>Bos taurus</i>	Rib (pieces mend)	Fragments	None
226A-F-4	Ic/II	70	-	Suidae (pig)	<i>Sus scrofa</i>	Femur (proximal portion) (Juvenile); Incisor tooth; Vertebra (spinous process)	Fragments	None
226A-F-5	Ic/II	70	-	Mammalia	Medium mammal	Diaphysis section; Cranial; Irregular bone	Fragments	None
226A-F-6	Ic/II	70	-	Mammalia	Small mammal	Femur diaphysis section (distal portion)	Fragment	None
226A-F-7	II	97-100	2918-3	Mammalia	Medium mammal	Diaphysis sections	Fragments	None
226A-F-8	II	97-100	2918-3	Muridae (rat)	<i>Rattus</i> sp.	Diaphysis section	Fragment	None
226A-F-9	III	75-127	-	Suidae (pig)	<i>Sus scrofa</i>	Scapula (spinous process portion); ulna (distal shaft	Fragment	None

Acc. #	Stratum	Depth (cmbs)	Feature	Family/ Class	Species	Element	Description	Modification
						portion); vertebra (epiphysis section); and tubercle fragment		
226A-F-10	IV	112-136	-	Mammalia	Medium mammal	Diaphysis section	Fragment	None

### T-226B

A midden table of marine and terrestrial faunal material identified within bulk sediment samples within Test Excavation 226B, cultural resource SIHP # -2918, is provided in Table 247 below. The invertebrate species most represented within the midden signature consists of *Conus* sp., *Brachidontes crebristriatus*, *Nerita picea*, and *Turbo sandwicensis*. In addition, a wide variety of other invertebrate species is represented in lesser amounts. The invertebrate species identified within the midden content are naturally found within a near-shore environment: on rocks and rock shelves within intertidal zones, tide-pools, and shallow marine waters. The vertebrate species identified consisted of small and medium mammal, dog, rat, fish, and shark. However, hand-collected terrestrial faunal remains within SIHP #-2918 also included historically introduced species (see below).

Terrestrial faunal remains were collected individually during excavation from two depths within Stratum II (0.53-0.76 and 0.9 mbs) which is a culturally enriched A-horizon and a component of SIHP # 50-80-14-2918. Faunal remains from the 0.53-0.76 mbs collection consisted of *Bos taurus* and *Sus scrofa* skeletal elements. The *Bos taurus* fragments had been butchered with a metal saw blade, indicating an historic origin, not traditional Hawaiian.

The remains from (0.9 mbs) consisted of *Canis lupus familiaris* skeletal elements, most of which originated from the articulated *Canis lupus familiaris* (small dog) found within Feature 11 of SIHP # 50-80-14-2918. There was also a complete right calcaneus from a *Canis lupus familiaris* collected separately, (but at the same depth as the Feature 11 remains) which may articulate with the Feature 11 remains. *Canis lupus familiaris* is a Polynesian introduction common in both pre- and post-Contact contexts (Table 248).

Table 247. Invertebrate and Vertebrate Midden Identified Within Bulk Sediment Samples from Test Excavation 226B, SIHP # -2918

Test Excavation	226B	Weight (g)	Total %									
Stratum	II											
Feature	-	4	5	6	7	8	9	10	11			
<b>Invertebrate Midden</b>												
Conidae <i>Conus</i> sp.	75.8					0.2			13.2	<b>89.2</b>	<b>27.9%</b>	
Cymatiidae	0.9									<b>0.9</b>	<b>0.3%</b>	
Cymatiidae <i>Cymatium muricinum</i>	9.6									<b>9.6</b>	<b>3.0%</b>	
Cymatiidae <i>Cymatium gutturnium</i>				1.5						<b>1.5</b>	<b>0.5%</b>	
Cymatiidae <i>Cymatium</i> sp.						0.9				<b>0.9</b>	<b>0.3%</b>	
Cypraeidae <i>Cypraea caputserpentis</i>	5.9									<b>5.9</b>	<b>1.8%</b>	
Cypraeidae <i>Cypraea cernica</i>	1.7									<b>1.7</b>	<b>0.5%</b>	
Gastropod		0.1								<b>0.1</b>	<b>0.0%</b>	
Isognomidae <i>Isognomon</i> sp.	5.5	0.1							0.3	<b>5.9</b>	<b>1.8%</b>	
Lucinidae <i>Ctena bella</i>						0.1				<b>0.1</b>	<b>0.0%</b>	
Mytilidae <i>Brachidontes crebristriatus</i>	8.1	13.6	5.1	15.3	4.4	20.2	1.8	2.5	10.6	<b>81.6</b>	<b>25.5%</b>	
Naticidae <i>Natica gualteriana</i>							1.7			<b>1.7</b>	<b>0.5%</b>	
Naticidae <i>Natica</i> sp.	0.7			1.3		1.1				<b>3.1</b>	<b>1.0%</b>	
Neritidae <i>Nerita picea</i>	10.9	1	1.7	3.8	0.9	2.2	0.9	0.7	4.1	<b>26.2</b>	<b>8.2%</b>	
Neritidae <i>Nerita polita</i>	0.2									<b>0.2</b>	<b>0.1%</b>	
Neritidae <i>Theodoxus neglectus</i>				3.9					0.6	<b>4.5</b>	<b>1.4%</b>	
Strombidae		0.1								<b>0.1</b>	<b>0.0%</b>	
Strombidae <i>Strombus mutabilis ostergaardi</i>	5.2									<b>5.2</b>	<b>1.6%</b>	
Strombidae <i>Strombus</i> sp.	3			0.3	1.9				0.7	<b>5.9</b>	<b>1.8%</b>	
Tellinidae	0.3	0.2							0.1	<b>0.6</b>	<b>0.2%</b>	
Tellinidae <i>Tellina palatam</i>	2.3	1	0.2			7.4	2.3	0.7	5.1	<b>19</b>	<b>5.9%</b>	
Tellinidae <i>Tellina</i> spp.	2.1				1.7					<b>3.8</b>	<b>1.2%</b>	
Trochidae									0.2	<b>0.2</b>	<b>0.1%</b>	
Trochidae <i>Trochus intextus</i>				6.6						<b>6.6</b>	<b>2.1%</b>	

Test Excavation	226B	226B	226B	226B	226B	226B	226B	226B	226B	226B	Weight (g)	Total %
Stratum	II	II	II	II	II	II	II	II	II	II		
Feature	-	4	5	6	7	8	9	10	11			
Trochidae <i>Trochus</i> sp.	0.5				0.2	0.9	1.4	0.1	0.4		<b>3.5</b>	<b>1.1%</b>
Trochidae <i>Trochus</i> sp. (burned)			0.9								<b>0.9</b>	<b>0.3%</b>
Turbinidae <i>Turbo sandwicensis</i>	14.7	2.2		3.5					0.2		<b>20.6</b>	<b>6.4%</b>
Burned shell	2.9					1.4		0.5	2.7		<b>7.5</b>	<b>2.3%</b>
Crustacea	0.5			0.1		1			0.1		<b>1.7</b>	<b>0.5%</b>
Crustacea (burned)			0.1		0.4			0.1			<b>0.6</b>	<b>0.2%</b>
Echinoidea									0.1		<b>0.1</b>	<b>0.0%</b>
Echinoidea <i>diadema</i> sp.	1.1										<b>1.1</b>	<b>0.3%</b>
Echinoidea <i>mathaei</i> sp.									1		<b>1</b>	<b>0.3%</b>
Echinoidea <i>mathaei</i> sp./ <i>diadema</i> sp.	1.7	0.5	0.6	1.8	0.9	2.2	0.2	0.1			<b>8</b>	<b>2.5%</b>
<b>Total Invertebrate Midden</b>	<b>153.6</b>	<b>18.8</b>	<b>8.6</b>	<b>38.1</b>	<b>10.4</b>	<b>37.6</b>	<b>8.3</b>	<b>4.7</b>	<b>39.4</b>		<b>319.5</b>	<b>100.0%</b>
<b>Vertebrate Midden</b>												
Medium mammal	0.8							0.1			<b>0.9</b>	<b>25.0%</b>
Small/medium mammal						0.5					<b>0.5</b>	<b>13.9%</b>
Small mammal	0.3		0.1								<b>0.4</b>	<b>11.1%</b>
<i>Canis lupus familiaris</i> (dog)				0.3							<b>0.3</b>	<b>8.3%</b>
<i>Rattus</i> sp. (rat)		0.1						0.1			<b>0.2</b>	<b>5.6%</b>
Osteichthyes (fish)	0.5	0.1				0.4			0.2		<b>1.2</b>	<b>33.3%</b>
Chondrichthyes (shark tooth)		0.1									<b>0.1</b>	<b>2.8%</b>
<b>Total Vertebrate Midden</b>	<b>1.6</b>	<b>0.3</b>	<b>0.1</b>	<b>0.3</b>	<b>0</b>	<b>0.9</b>	<b>0</b>	<b>0.2</b>	<b>0.2</b>		<b>3.6</b>	<b>100.0%</b>

Table 248. Terrestrial Faunal Material Collected Individually During Test Excavation 226B

Acc. #	Stratum	Depth (cmbs)	Feature	Family/ Class	Species	Element	Description	Modification
226B -F-1	II	53-76	-	Bovidae (cow)	<i>Bos taurus</i>	Diaphysis section (possible humerus); Diaphysis section	Fragments	Butchered (cut with metal saw blade)
226B -F-2	II	53-76	-	Suidae (pig)	<i>Sus scrofa</i>	Cranial; Mandible; Vertebra; Ribs; Molar; Premolar (pieces mend); Canine	Fragments	None
226B -F-3	II	90	-	Canidae (dog)	<i>Canis lupus familiaris</i> (small dog)	Right Calcaneus (might articulate with <i>Canis lupus familiaris</i> from II_90cmbs_Fe. 8 sample 23)	Complete	None
226B -F-4	II	90	2918-11	Canidae (dog)	<i>Canis lupus familiaris</i> (small dog)	Articulated	Fragments/ complete	None

### T-226C

Test Excavation 226C contained very little faunal midden material within SIHP # -2918. A bulk sample from Feature 29 identified Crustacea (1.3 g) and burned medium mammal (0.1 g), while a bulk sample from Feature 12 identified Osteichthyes (0.1 g). An additional bulk sediment sample was collected from Stratum Id. The faunal material identified within Stratum Id included water-worn gastropods, Crustacean, Echinoidea (6.9 g), and Osteichthyes (fish) (0.1 g).

Terrestrial faunal remains were collected individually during excavation from Stratum Id (0.73 to 1.15 mbs). These remains consisted of *Bos taurus*, *Canis lupus familiaris*, *Gallus gallus*, and *Sus scrofa* skeletal elements. The *Bos taurus* elements showed evidence of butchering with a metal saw blade, indicating an historic origin, not traditional Hawaiian. This test excavation is associated with SIHP # 50-80-14-2918, however the faunal remains collected originated in the fill layers and are therefore not associated with the cultural resource (Table 249).

Table 249. Terrestrial Faunal Material Collected Individually During Test Excavation 226C

Acc. #	Stratum	Depth (cmbs)	Feature	Family/ Class	Species	Element	Description	Modification
226C -F-1	Id	72-97	-	Bovidae (cow)	<i>Bos taurus</i>	Scapula; Scapula; Rib; Humerus; Tibia; Vertebra	Fragments	Butchered (cut with metal saw blade)
226C -F-2	Id	72-97	-	Canidae (dog)	<i>Canis lupus familiaris</i>	Left 1st molar (root apex open) (Juvenile); Right humerus (proximal portion) fragment (Juvenile); Right radius (proximal portion) (Juvenile); Left ulna styloid process; Left innominate fragment; Ala/acetabulum fragment; Right innominate; Left femur (proximal portion); Left tibia epiphysis	Fragments	None
226C -F-3	Id	72-97	-	Suidae (pig)	<i>Sus scrofa</i>	large tusk	Fragment	None
226C -F-4	Id	72-97	-	Aves (chicken)	<i>Gallus gallus</i>	Left innominate; Cranial (possible); tarsometatarsus (possible)	Fragments	None

**T-226D**

A midden table of marine and terrestrial faunal material identified within bulk sediment samples within Test Excavation 226D, cultural resource SIHP # -2918, is provided in Table 250 below. Very few invertebrate species were identified within the bulk samples, consisting of *Brachidontes crebristriatus*, Crustacea, and Echinoidea. The invertebrate species identified within the midden content are naturally found within a near-shore environment: on rocks and

rock shelves within intertidal zones, tide-pools, and shallow marine waters. The vertebrate species identified consisted of pig and fish.

In addition to the midden analysis tabulated within Table 250 faunal analysis was conducted of a bulk sediment sample collected from Stratum III, at a depth of 1.2 mbs. Faunal analysis of Stratum III identified naturally-deposited marine mollusk shell consistent with a marine deposit, including: *Brachidontes crebristriatus* (1.1 g), Tellinidae (0.7 g), *Natica* sp. (juvenile) (0.3 g), *Hipponix* sp. (0.1 g), and gastropods (1.3 g), as well as Crustacea (0.2 g) and *Echinometra mathaei* (0.2 g).

Terrestrial faunal remains were collected individually during excavation from strata Ib (0.35-0.8 and 0.65 mbs), Ic (0.8-1.1 mbs) and Id (1.12 mbs). The remains from Stratum Ib between 0.35 and 0.8 consisted of *Bos taurus* and *Sus scrofa* skeletal elements. The *Bos taurus* vertebra had been butchered with a metal saw blade, indicating an historic origin, not traditional Hawaiian. In addition to the mammalian remains Osteichthyes (fish) fragments were also recovered from this area (see Appendix A). The remains from Stratum Ib at 0.65 mbs consisted of a single unmodified *Bos taurus* vertebra.

The remains from Stratum Ic consisted of *Bos taurus*, *Sus scrofa*, and *Gallus gallus* skeletal elements. Both the *Bos taurus* and *Sus scrofa* were burned and showed evidence of having been butchered using a metal saw blade, indicating an historic origin, not traditional Hawaiian. In addition to the mammalian and Aves remains Osteichthyes (fish) fragments were also recovered from this area (see Appendix A). The remains from Stratum Id consisted of *Bos taurus* skeletal elements, one of which (a rib) had been butchered using a metal saw blade, indicating an historic origin, not traditional Hawaiian. This test excavation is associated with SIHP # 50-80-14-2918, however the faunal remains originated from a non-feature, fill layer (Table 251).

Table 250. Invertebrate and Vertebrate Midden Identified Within Bulk Sediment Samples from Test Excavation 226D, SIHP # -2918

Test Excavation	226D	Weight (g)	Total %
Stratum	II		
Feature	-		
<b>Invertebrate Midden</b>			
Mytilidae <i>Brachidontes crebristriatus</i>	2.7	2.7	42.2%
Crustacea	1.8	1.8	28.1%
Echinoidea <i>mathaei</i> sp./ <i>diadema</i> sp.	1.9	1.9	29.7%
<b>Total Invertebrate Midden</b>	<b>6.4</b>	<b>6.4</b>	<b>100.0%</b>
<b>Vertebrate Midden</b>			
<i>Sus scrofa</i> (pig)	8.1	8.1	84.4%
Osteichthyes (fish)	1.5	1.5	15.6%
<b>Total Vertebrate Midden</b>	<b>9.6</b>	<b>9.6</b>	<b>100.0%</b>

Table 251. Terrestrial Faunal Material Collected Individually During Test Excavation 226D

Acc. #	Stratum	Depth (cmts)	Feature	Family/ Class	Species	Element	Description	Modification
226D-F-1	Ib	35-80	-	Bovidae (cow)	<i>Bos taurus</i>	Vertebra; Ribs	Fragments	Vertebra butchered (cut with metal saw blade)
226D-F-2	Ib	35-80	-	Suidae (pig)	<i>Sus scrofa</i>	Diaphysis section; Left ulna (proximal portion); Right tibiotarsus; Right lunate	Fragments	None
226D-F-3	Ib	65	-	Bovidae (cow)	<i>Bos taurus</i>	Vertebra	Complete	None
226D-F-4	Ic	80-110	-	Bovidae (cow)	<i>Bos taurus</i>	Ribs; Lumbar vertebra; Tibia; Diaphysis section	Fragments	Ribs; Tibia; Diaphysis section (very burned) Butchered (cut with metal saw blade)
226D-F-5	Ic	80-110	-	Suidae (pig)	<i>Sus scrofa</i>	Canine; Diaphysis section; Carpal (unidentified)	Fragments	Diaphysis section butchered (cut with metal saw blade)
226D-F-6	Ic	80-110	-	Aves (chicken)	<i>Gallus gallus</i> (possible)	Thoracic vertebra	Fragment	None
226D-F-7	Id	112	-	Bovidae (cow)	<i>Bos taurus</i>	Rib; Diaphysis section	Fragments	Rib butchered (cut with metal saw blade)

**T-227**

A midden table of marine and terrestrial faunal material identified within bulk sediment samples within Test Excavation 227, cultural resource SIHP # -2918, is provided in Table 252 below. The invertebrate species most represented within the midden signature include: *Brachidontes crebristriatus*, *Tellina palatam*, and *Turbo sandwicensis*. These species are naturally found within a near-shore environment: on rocks and rock shelves within intertidal zones, tide-pools, and shallow marine waters. The vertebrate species identified consisted of

medium mammal and fish. However, hand-collected terrestrial faunal remains within SIHP # -2918 also included historically introduced species (see below).

Terrestrial faunal remains were collected individually during excavation from Stratum II: a general collection from 0.49 to 1.12 mbs, as well as feature specific collections at features 14 (0.9-1.07 mbs), 16 (1-1.07 mbs), and 17 (1.05-1.16 mbs) of SIHP # 50-80-14-2918. The general collection from Stratum II contained *Bos taurus* and *Sus scrofa* skeletal elements, the majority of which had been butchered with a metal saw blade, indicating an historic origin, not traditional Hawaiian. Feature 14 contained a single *Bos taurus* rib that had been butchered with a metal saw blade, indicating an historic origin, not traditional Hawaiian. Feature 16 contained an unmodified medium mammal diaphysis fragment, and Feature 17 contained unmodified *Sus scrofa* molar fragments (that mend). *Sus scrofa* is a Polynesian introduction common in both pre- and post-Contact contexts.

Table 252. Invertebrate and Vertebrate Midden Identified Within Bulk Sediment Samples from Test Excavation 227, SIHP # -2918

Test Excavation	227	227	227	227	227	Weight (g)	Total %
Stratum	II	II	II	II	II		
Feature	14	17	18	19	21		
<b>Invertebrate Midden</b>							
Mytilidae <i>Brachidontes crebristriatus</i>		1.2			0.5	<b>1.7</b>	<b>19.3%</b>
Planaxidae <i>Planaxis ponderosa</i>				0.5		<b>0.5</b>	<b>5.7</b>
Tellinidae <i>Tellina palatam</i>		1.7			1.3	<b>3.0</b>	<b>34.1</b>
Tellinidae <i>Tellina</i> sp.		0.1				<b>0.1</b>	<b>1.1</b>
Turbinidae <i>Turbo sandwicensis</i>				1.7	0.4	<b>2.1</b>	<b>23.9</b>
Crustacea					0.2	<b>0.2</b>	<b>2.3</b>
Echinoidea <i>mathaei</i> sp.				0.7		<b>0.7</b>	<b>8.0</b>
Echinoidea <i>diadema</i> sp. / <i>mathaei</i> sp.		0.3			0.2	<b>0.5</b>	<b>5.7</b>
<b>Total Invertebrate Midden</b>	<b>0.0</b>	<b>3.3</b>	<b>0.0</b>	<b>2.9</b>	<b>2.6</b>	<b>8.8</b>	<b>100.0%</b>
<b>Vertebrate Midden</b>							
Medium mammal		0.5				<b>0.5</b>	<b>62.5%</b>
Osteichthyes (fish)	0.1	0.1	0.1			<b>0.3</b>	<b>37.5%</b>
<b>Total Vertebrate Midden</b>	<b>0.1</b>	<b>0.6</b>	<b>0.1</b>	<b>0.0</b>	<b>0.0</b>	<b>0.8</b>	<b>100.0%</b>

### T-227A

A midden table of marine and terrestrial faunal material identified within bulk sediment samples within Test Excavation 227A, cultural resource SIHP # -2918, is provided in Table 253 below. The invertebrate species most represented within the midden signature include: *Theodoxus neglectus*, *Brachidontes crebristriatus*, *Cypraea caputserpentis*, *Conus* sp., *Strombus maculates*, *Tellina palatam*, and *Turbo sandwicensis*. These species are naturally found within a near-shore environment: on rocks and rock shelves within intertidal zones, tide-pools, and shallow marine waters. The vertebrate species identified are consistent with pre-Contact

terrestrial and marine species, including: medium mammal, pig, god, fish, and shark. However, hand-collected terrestrial faunal remains within SIHP # -7428 also included historically introduced species (see below).

Terrestrial faunal remains were collected individually during excavation from Stratum Id (at 0.63 mbs) and Stratum II (0.68-1.08 and 0.8-0.9 mbs) and Stratum III (1 mbs). The remains from Stratum Id consisted of *Bos taurus* and *Sus scrofa* skeletal elements which had been butchered with a metal saw blade, indicating an historic origin, not traditional Hawaiian. In addition to the mammalian remains from Id, Osteichthyes (fish) skeletal elements were also recovered (see Appendix A).

The terrestrial faunal remains from Stratum II between 0.68 and 1.08 mbs consisted of *Capra aegagrus hircus* and unidentified medium mammal skeletal elements. None of these showed any evidence of cultural modification. The remains from Stratum II between 0.8 and 0.9 mbs consisted of unmodified *Canis lupus familiaris* skeletal elements. While *Canis lupus familiaris* is a Polynesian introduction common in both pre- and post-Contact contexts, *Capra aegagrus hircus* is an introduced species indicative of the post-Contact period.

The terrestrial faunal remains from Stratum III consisted of an unmodified *Sus scrofa* canine fragment and unmodified medium mammal diaphysis fragments. Both Stratum II (culturally enriched A-horizon) and Stratum III are associated with SIHP #50-80-14-2918 (Table 254).

Table 253. Invertebrate and Vertebrate Midden Identified Within Bulk Sediment Samples from Test Excavation 227A, SIHP # -2918

Test Excavation	227A	227A	227A	227A	227A	227A	Weight (g)	Total %
Stratum	II	II	II	II	II	II		
Feature	-	22	23	24	25	26		
<b>Invertebrate Midden</b>								
Conidae <i>Conus</i> sp.	26		2.5				28.5	15.4%
Cymatiidae	0.5						0.5	0.3%
Cymatiidae <i>Cymatium nicobarium</i>	7.6						7.6	4.1%
Cypraeidae <i>Cypraea caputserpentis</i>	10.3						10.3	5.6%
Cypraeidae <i>Cypraea erosa</i>	3.7						3.7	2.0%
Gastropod			0.2				0.2	0.1%
Isognomidae <i>Isognomon</i> sp.	2.7						2.7	1.5%
Mytilidae <i>Brachidontes crebristriatus</i>	29.9	0.2	0.8	1.2			32.1	17.4%
Nassariidae	1						1	0.5%
Naticidae <i>Natica</i> sp.	0.5						0.5	0.3%
Neritidae <i>Nerita picea</i>	7.3					0.8	8.1	4.4%
Neritidae <i>Theodoxus neglectus</i>	22		0.6				22.6	12.2%
Pteriidae <i>Pinctada radiata</i>	1.1						1.1	0.6%
Strombidae <i>Strombus maculatus</i>	10.8						10.8	5.9%
Strombidae <i>Strombus</i> sp.	8.4			0.9			9.3	5.0%
Tellinidae <i>Tellina palatam</i>	19.1	0.4					19.5	10.6%
Thaididae <i>Drupa</i> sp.	1.2						1.2	0.7%
Trochidae <i>Trochus</i> sp.	2.7						2.7	1.5%
Turbinidae <i>Turbo sandwicensis</i>	14.1		0.4	1.4			15.9	8.6%
Turbinidae <i>Turbo</i> sp. Opercula	1.9	1.1	1.2				4.2	2.3%

Test Excavation	227A	227A	227A	227A	227A	227A	Weight (g)	Total %
Stratum	II	II	II	II	II	II		
Feature	-	22	23	24	25	26		
Crustacea	0.8			0.1			<b>0.9</b>	<b>0.5%</b>
Echinoidea <i>diadema</i> sp.	0.9						<b>0.9</b>	<b>0.5%</b>
Echinoidea <i>diadema</i> sp./ <i>mathaei</i> sp.				0.2			<b>0.2</b>	<b>0.1%</b>
<b>Total Invertebrate Midden</b>	<b>172.5</b>	<b>1.7</b>	<b>5.7</b>	<b>3.8</b>	<b>0.0</b>	<b>0.8</b>	<b>184.5</b>	<b>100.0%</b>
<b>Vertebrate Midden</b>								
Medium mammal	1.2			0.1		0.5	<b>1.8</b>	<b>23.4%</b>
<i>Sus scrofa</i> (pig)							<b>0</b>	<b>0.0%</b>
<i>Canis lupus familiaris</i> (dog)	0.4						<b>0.4</b>	<b>5.2%</b>
Osteichthyes (fish)	4.9	0.4			0.1		<b>5.4</b>	<b>70.1%</b>
Chondrichthyes (shark tooth)				0.1			<b>0.1</b>	<b>1.3%</b>
<b>Total Vertebrate Midden</b>	<b>6.5</b>	<b>0.4</b>	<b>0.0</b>	<b>0.2</b>	<b>0.1</b>	<b>0.5</b>	<b>7.7</b>	<b>100.0%</b>

Table 254. Terrestrial Faunal Material Collected Individually During Test Excavation 227A

Acc. #	Stratum	Depth (cmbs)	Feature	Family/ Class	Species	Element	Description	Modification
227A-F-1	Id	63	-	Bovidae (cow)	<i>Bos taurus</i>	Ribs; Innominate	Fragments	Butchered (cut with metal saw blade)
227A-F-2	Id	63	-	Suidae (pig)	<i>Sus scrofa</i>	Ulna; Diaphysis section; Rib; Incisors; Vertebra; Vertebra with facets	Fragments	Diaphysis section butchered (cut with metal saw blade)
227A-F-3	II	68-108	-	Bovidae (goat)	<i>Capra aegagrus hircus</i>	Cranial; Vertebral facets; Proximal phalanx	Fragments	None
227A-F-4	II	68-108	-	Mammalia	Medium mammal	Diaphysis sections	Fragments	None
227A-F-5	II	80-90	-	Canidae (dog)	<i>Canis lupus familiaris</i>	Cranial; Molar; Canine; Vertebral facets; Ulna; Diaphysis section; Metacarpal	Fragments	None
227A-F-6	III	100	-	Suidae (pig)	<i>Sus scrofa</i>	Canine	Fragment	None
227A-F-7	III	100	-	Mammalia	Medium mammal	Diaphysis sections	Fragments	None

**T-227B**

One bulk sediment sample was collected from Test Excavation 227B, Stratum II, at a depth of 1.3-1.4 mbs. Faunal analysis of Stratum II identified naturally-deposited marine fauna consistent with a shallow marine or estuary deposit, including: Osteichthyes (0.1 g), *Brachidontes crebristriatus* (7.8 g), Tellinidae (2.3 g), *Tellina palatam* (1.3 g), *Natica* sp. (0.5 g), *Hipponix* spp. (0.2 g), *Fragum mundum* (0.1 g), gastropod (0.6 g), Crustacea (0.1 g), and *Echinometra mathaei* sp. (0.3 g).

Terrestrial faunal remains were collected individually during excavation from Stratum Ie (0.6-1.2 mbs) consisted of *Bos taurus*, *Sus scrofa* (Young adult), and *Gallus gallus* skeletal elements. Neither the *Sus scrofa* nor *Gallus gallus* fragments showed any evidence of cultural modification, however, the *Bos taurus* had been butchered with a metal saw blade, indicating an historic origin, not traditional Hawaiian.

**T-228A**

No terrestrial faunal remains were collected from this test excavation, however, a large unmodified irregular bone fragment from an unidentified Osteichthyes (fish) was collected from Stratum Ig (1.25 mbs) (see Appendix A).

**T-229**

One bulk sediment sample was collected from Test Excavation 229, Stratum III, at a depth of 1.19-1.31 mbs. Faunal analysis of Stratum III identified naturally-deposited marine fauna consistent with a shallow marine or estuary deposit, including: Osteichthyes (0.1 g), *Brachidontes crebristriatus* (2.8 g), *Nerita picea* (0.4 g), *Trochus* sp. (0.8 g), Nassariidae (0.8 g), *Natica* sp. (0.3 g), *Melampus castaneus* (3.2 g), gastropods (0.3 g), Crustacea (0.2 g), and *Echinometra mathaei*.

**T-230**

One bulk sediment sample was collected from Test Excavation 230, Stratum II, at a depth of 1.2-1.4 mbs. Faunal analysis of Stratum II identified naturally-deposited marine fauna consisting of limpets/gastropods (2.5 g), and Crustacea (0.3 g).

**T-231A**

Three bulk sediment samples were collected from Test Excavation 231A, Strata Ig, III, and IV, at a depth of 0.9-1.1 mbs, 1.5-1.68 mbs, and 1.68-1.85 mbs, respectively. Faunal analysis of Stratum Ig, identified as a burned trash layer (SIHP #-7189), identified medium mammal cut with a metal saw blade (5.9 g), medium mammal (0.5 g), Osteichthyes (0.2 g), small mammal (0.1 g), and various marine fauna species and families (1.7 g). Faunal analysis of Stratum III identified naturally-deposited marine fauna consistent with a shallow marine or estuary deposit, including: *Brachidontes crebristriatus* (0.9 g), Tellinidae (0.7 g), Carditidae (0.1 g), gastropods (0.9 g), limpets (0.9 g), Crustacea (0.7 g), and *Echinothrix diadema* and *Echinometra mathaei* (0.3 g). Faunal analysis of the Stratum IV samples identified naturally-deposited bivalves and gastropods (9.4 g) and Crustacea (2.3 g).

Terrestrial faunal remains were collected individually during excavation from Stratum Ic (0.54 mbs). These remains consisted of *Bos taurus* and *Sus scrofa* skeletal elements. Some of the

*Bos taurus* bones had been butchered with a metal saw blade, indicating an historic origin, not traditional Hawaiian. The *Sus scrofa* elements were unmodified, and associated with the *Bos taurus* are also from a historic origin.

### T-232A

Two bulk sediment samples and various hand-collected marine shells were collected from Stratum Ie between (0.65-1.0 mbs). A bulk sediment sample was also collected from Stratum If at a depth of 0.94-1.1 mbs. Faunal analysis of Stratum Ie, identified as a burned trash layer (SIHP # -7189), identified a large amount of invertebrate and vertebrate faunal material. All faunal material identified within Stratum Ie is tabulated below (Table 255). Faunal analysis of Stratum If identified a small amount of marine fauna consisting of *Brachidontes crebristriatus* (0.4 g) and Melampidae (0.3 g).

Terrestrial faunal remains were collected individually during excavation from Stratum Ib (0.2 mbs), Stratum Id (0.65 mbs), and Stratum Ie (0.81 and 0.81-0.96 mbs). The remains from Stratum Ib consisted of *Bos taurus* and unmodified *Canis lupus familiaris* skeletal elements. The *Bos taurus* bones showed evidence of being butchered with a metal saw blade, indicating an historic origin not traditional Hawaiian.

The remains from Stratum Id consisted of *Bos Taurus*, *Canis lupus familiaris*, *Gallus gallus*, *Rattus norvegicus*, *Sus scrofa*, and other small mammal skeletal elements. None of these bones show any indication of cultural modification, but both *Bos Taurus* and *Rattus norvegicus* are introduced species, indicative of a post-Contact context.

The remains from Stratum Ie at 0.81 mbs consisted of *Bos taurus*, *Gallus gallus* and *Sus scrofa* skeletal elements. The *Bos taurus* bones showed evidence of being butchered with a metal saw blade, indicating an historic origin, not traditional Hawaiian. The remains from Stratum Ie between 0.81 and 0.96 mbs consisted of *Gallus gallus* and unidentified medium mammal skeletal elements. The medium mammal ribs had been butchered with a metal saw blade, indicating an historic origin, not traditional Hawaiian (Table 256).

Table 255. Stratum Ie Faunal Material Collected from Test Excavation 232A

Faunal Material	Weight (g)
Conidae <i>Conus</i> sp. (large)	22.3
Cypraeidae <i>Cypraea caputserpentis</i>	7.3
Isognomidae <i>Isognomon</i> sp.	0.4
Nacellidae <i>Cellana exarata</i>	23.9
Neritidae <i>Nerita picea</i>	2.8
Ostreidae	0.7
Ostreidae (large)	75.3
Tellinidae <i>Tellina palatam</i>	22.5
Tellinidae <i>Tellina</i> sp.	0.4
Turbinidae <i>Turbo</i> sp. opercula	0.3
Bivalve fragments	1.5
Crustacea	2.9
Snail (large)	5.9
Land snails	0.1

Faunal Material	Weight (g)
<i>Sus scrofa</i> (pig)	0.2
<i>Gallus gallus</i> (chicken)	0.1
<i>Rattus</i> sp. (rat)	0.1
Osteichthyes (fish)	2.1
<b>Total</b>	<b>168.8</b>

Table 256. Terrestrial Faunal Material Collected Individually During Test Excavation 232A

Acc. #	Stratum	Depth (cmbs)	Feature	Family/ Class	Species	Element	Description	Modification
232A -F-1	Ib	20	-	Bovidae (cow)	<i>Bos taurus</i>	Left humerus distal portion; Diaphysis section	Fragments	Butchered (cut with metal saw blade)
232A -F-2	Ib	20	-	Canidae (dog)	<i>Canis lupus familiaris</i>	Scapula (glenoid fossa portion)	Fragment	None
232A -F-3	Id	65	-	Bovidae (cow)	<i>Bos Taurus</i>	Rib fragments; Scapula fragment (two pieces mend); Diaphysis section (two pieces mend); Diaphysis sections; Metacarpus (proximal) fragment	Fragments	Rib, Scapula and Diaphysis sections Butchered (cut with metal saw blade)
232A -F-4	Id	65	-	Canidae (dog)	<i>Canis lupus familiaris</i>	Proximal rib fragment; Diaphysis sections	Fragments	None
232A -F-5	Id	65	-	Aves (chicken)	<i>Gallus gallus</i>	Tibiotarsal fragment; Left scapula; Right humerus	Fragment/ Complete	None
232A -F-6	Id	65	-	Muridae (rat)	<i>Rattus norvegicus</i>	Left femur fragment	Fragment	None
232A -F-7	Id	65	-	Suidae (pig)	<i>Sus scrofa</i> (Juvenile)	Left scapula fragment; Humerus (Proximal portion) fragment	Fragments	None

Acc. #	Stratum	Depth (cmbs)	Feature	Family/ Class	Species	Element	Description	Modification
232A-F-8	Id	65	-	Suidae (pig)	<i>Sus scrofa</i>	Proximal rib fragments; Left mandible fragment (with 3 <sup>rd</sup> molar); Molar fragment; Premolar; Right scapula fragment (proximal portion); Cranial fragment (supra orbital arch margin); Proximal phalanx; Vertebral spinous process fragments	Fragments/ Complete	None
232A-F-9	Id	65	-	Mammalia	Small mammal	Tibiofibula (four pieces mend)	Fragments	None
232A-F-10	Ie	81	-	Bovidae (cow)	<i>Bos taurus</i>	Rib fragment; Irregular fragments	Fragments	Butchered (cut with metal saw blade)
232A-F-11	Ie	81	-	Aves (chicken)	<i>Gallus gallus</i>	Diaphysis section fragment	Fragment	None
232A-F-12	Ie	81	-	Suidae (pig)	<i>Sus scrofa</i>	Proximal rib fragment; Irregular fragments/ diaphysis section	Fragments	None
232A-F-13	Ie	81-96	-	Aves (chicken)	<i>Gallus gallus</i>	Tibiotarsal (shaft)	Fragment	None
232A-F-14	Ie	81-96	-	Mammalia	Medium mammal	Vertebra fragments; Rib fragments	Fragments	Ribs butchered (cut with metal saw blade)

## Summary of Faunal Assemblage from Kaka'ako Makai

The faunal material collected within bulk sediment samples within Kaka'ako Makai showed a similar pattern to that seen within West Kaka'ako and Kewalo. The area of Jaucas sand deposits (T-226A to T-227A) contained a strong marine and terrestrial material midden signature within the A-horizon and associated features, evidencing cultural activity. In contrast, the nearby wetlands (T-227B to T-230) contained marine faunal material consistent with a shallow marine or estuary environment. Cultural activity within these wetlands was not evidenced in the faunal material. Test Excavations T-231A and T-232A contained a burned trash layer over natural marine deposits. The burned trash layers showed a mix of historic faunal material (such as saw-cut medium mammal) and marine and terrestrial faunal material that may relate to more traditional-style midden or to natural marine species mixed into the fill.

Terrestrial faunal remains were collected from 10 test excavation in this geographical zone: 226A-D, 227-227B, 228A, 231A and 232A.

Test excavations within Kaka'ako Makai contained both pre-Contact and post-Contact species: *Bos taurus*, *Capra aegagrus hircus*, *Canis lupus familiaris*, *Sus scrofa*, *Rattus* sp., *Rattus norvegicus*, and *Gallus gallus*. There was evidence of historic butchering with metal saw blades, and there were also species with no evidence of cultural modification. None of the pre-Contact species showed any evidence of cultural modification, however, the *Canis lupus familiaris* remains from T-226B (SIHP # 50-80-14-2918, Feature 11) appear to have been an articulated burial. In some instances, the cultural context was inconclusive when the species were unidentified small and medium mammal or unmodified and not found in association with post-Contact species.

## 5.14 Faunal Analysis Conclusion

The faunal assemblage collected during the AIS for the City Center portion of the HHCTCP documented archaeological resources within the narrow but continuous transect through O'ahu's densely populated coastal south shore. Areas of previous wetlands or shallow marine environments and areas of cultural activity were identified. Areas of cultural activities were evident from distinct and consistent midden signatures within the City Center portion.

Terrestrial vertebrate and marine midden signatures consistent with traditional Hawaiian cultural consumption activities were documented in subsurface A-horizons and/or features in Jaucas sand throughout Kaka'ako and Kewalo, and within the Chinatown waterfront area. Carbon-14 dates documented within the City Center portion of this project support the fauna midden signature analysis.

The overall faunal midden signature contained common and uncommon marine fauna. Common marine mollusks identified included, but were not limited to: *Turbo sandwicensis*, *Strombus* sp., Conidae, Tellinidae, *Brachidontes crebristriatus*, *Nerita picea*, *Theodoxus neglectus*, *Theodoxus vespertinus*, *Cellana* sp., and various Cypraeidae. *Turbo sandwicensis* and *Strombus* sp. were a type of food source harvested from the shallow sandy portions of the coast protected from the surf. Conidae exist on benches fringing the shorelines. Tellinidae and *Brachidontes crebristriatus* thrive on rocks and rock shelves within intertidal zones. Rocky substrates and tide-pools provide shelter for *Nerita picea*, *Theodoxus neglectus*, *Theodoxus*

*vespertinus* (which migrate between freshwater and saltwater), *Cellana* sp., various Cypraeidae, and *Cypraea caputserpentis* (Hammatt et al. 2000; Kay 1979). Echinoidea such as *Echinometra mathaei*, *Echinothrix diadema*, and *Heterocentrotus mamillatus* and Crustacea (not identified further) were also present in the midden signature. Both of these Classes live on rocks near the coast.

Chelonioidea *Chelonia mydas* was represented only once in the whole assemblage by a cranial fragment (0.7g) from Test Excavation 124. It is not known as to why turtles are so uncommon in Hawaiian midden assemblages considering the abundance of the species. Dr. Ziegler, referenced in (Hammatt et al. 2000:158-59) states that "...the essential absence of this type of large marine reptile...seems strange. Possibly, such turtles were commonly taken but...the large heavy individuals were always cooked at a particular spot along the shore...and little if any bone material was carried along with the cooked meat for consumption...."

Of the many Osteichthyes (fish) remains collected during the project, eight species were positively identified. The identified species were collected from seven test excavations: T-119A, T-120, T-120B, T-124, T-151, T-226B, and T-227A, all within subsurface A-horizons. It is inconclusive as to whether the species identified were harvested from fishponds or from the ocean.

The 'ō'ili'uwī'uwī (*Pervagor spilosoma* or Fantail Filefish) were found in five out of seven test excavations containing identified fish species, with the 'ō'ili'uwī'uwī being the most commonly identified species. The habitat of this species is in the deeper waters on the outer edge of the reef (Tinker 1978:480). Titcomb quotes Kepelino as evidence that these fish were eaten, either raw or broiled after the skin had been removed (Titcomb 1972:119).

The *uhu* (*Scarus* sp. or Parrotfish) and a sub-species of *uhu* (*Scarus perspicillatus* or Spectacled Parrotfish) are part of the Scaridae family which contains about 80 species that inhabit shallow tropical seas (Tinker 1978:308). The *uhu* were a favorite fish with the Hawaiians, often eaten dried, broiled, or raw (Titcomb 1972: 148).

The *kōkala* (*Diodon holocanthus* or Balloonfish/Spiny Porcupinefish) lives in shallow shoreline and reef areas (Tinker 1978:500). Diodontids are poor swimmers can be caught at the surface with hand nets (Froese and Pauly 2011).

The 'a'awa (*Bodianus bilunulatus albotaeniatus* or Hawaiian Hogfish) is a subspecies not endemic to the Hawaiian Islands. Wrasses are speedy, sleek swimmers living near the shoreline in the coral reef. The white meat of the 'a'awa is often broiled or dried (Titcomb 1972:57). Wrasses (*hinālea*) could be kept on hand and would remain healthy if kept in small pools.

The *kāhala* (*Seriola* cf. *dumerili* or Amberjack) are large predators that are often found in the deep seaward reefs, but are also known to come inshore to feed on schooling reef fishes. According to Titcomb, *kāhala* are often cooked whole in an *imu*, but can also be salted or wrapped in *ti* leaves and baked. They are a deep sea fish that often required many hooks on one line (Titcomb 1972:82).

The two species of *lau-hau*, *lau-wiliwili* (*Chaetodon miliaris* or Milletseed Butterflyfish) were identified. The Milletseed Butterflyfish inhabits shallow waters and is not a common food source (Randall 1996:101; Titcomb 1972: 98; Hoover 1993:27, 30).

The *kikākapu* (*Chaetodon tinker* or Tinker's Butterflyfish) are considered endemic to Hawai'i (Randall 1996:104; Hoover 1993:32). Tinker's Butterflyfish are found in calm deep reef edges (below 100 ft) (Tinker 1978:252). These fish were not often eaten due to the small amount of flesh (Titcomb 1972:88).

Terrestrial fauna vertebrate material was collected from post-Contact fill layers and from pre-Contact and early post-Contact subsurface A-horizon midden features. The common terrestrial Family/species identified in the subsurface features were Canidae, Suidae, and Muridae (possibly the Polynesian Rat *Rattus exulans*) (*Rattus* sp. designation was used for all rat bones that belong to the smaller sized rat genera), and Osteichthyes (fish). Felidae, Bovidae (cow, sheep, and goat), Equidae, and *Rattus norvegicus*, Aves (unidentified bird), Duck (*Anas platyrhynchos domesticus*), and Red Jungle fowl/chicken (*Gallus gallus*) were also identified.

Graphs showing both terrestrial and marine faunal material collected from individual cultural resources are shown in Figure 38 through Figure 44. In all graphs, the invertebrate marine midden constitutes a high percentage of the total faunal material collected. Large vertebrates, such as horse and cow, also show a high percentage of total weight; however, the large size of these individual animals and their higher bone density does skew consumption weights. In addition, some of the larger animals were collected from in situ burials, and therefore do not represent food consumption. They are included in the graph as they are a part of the cultural resource.

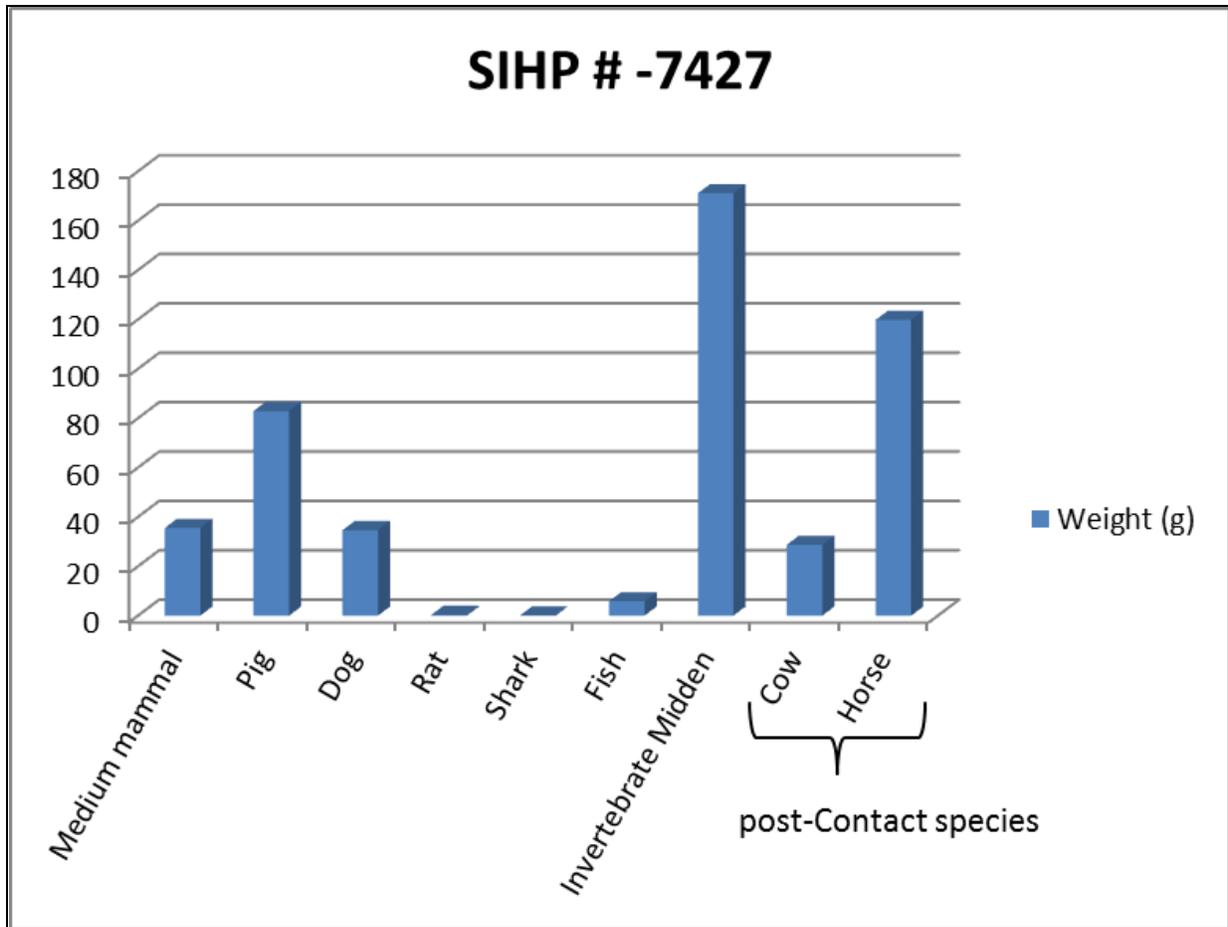


Figure 38. Graph showing all faunal material collected from SIHP # -7427, which consisted of two culturally-enriched deposits

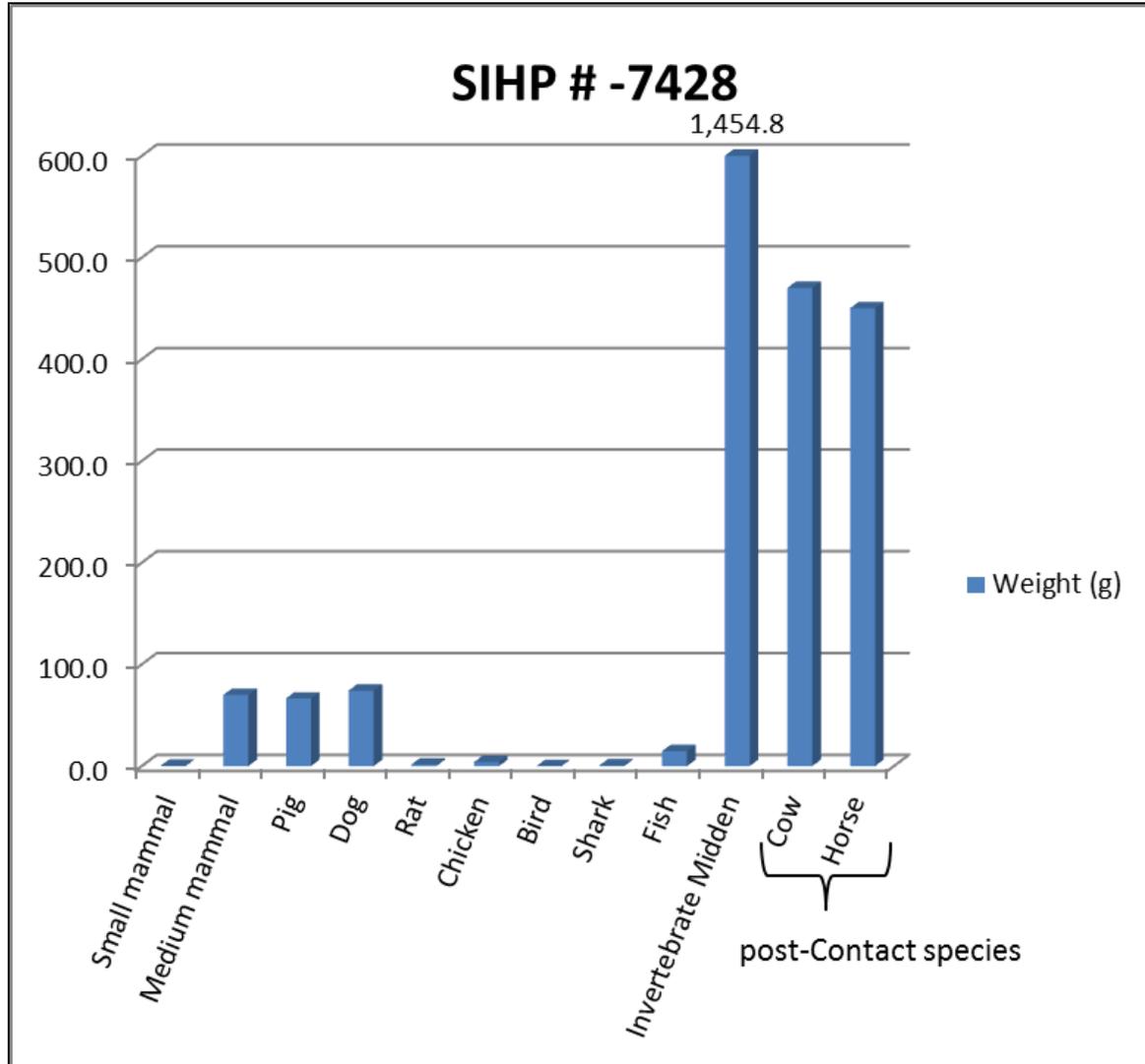


Figure 39. Graph showing all faunal material collected from SIHP # -7428. The cow and horse skeletal remains were documented within the A-horizon, rather than within discrete features.

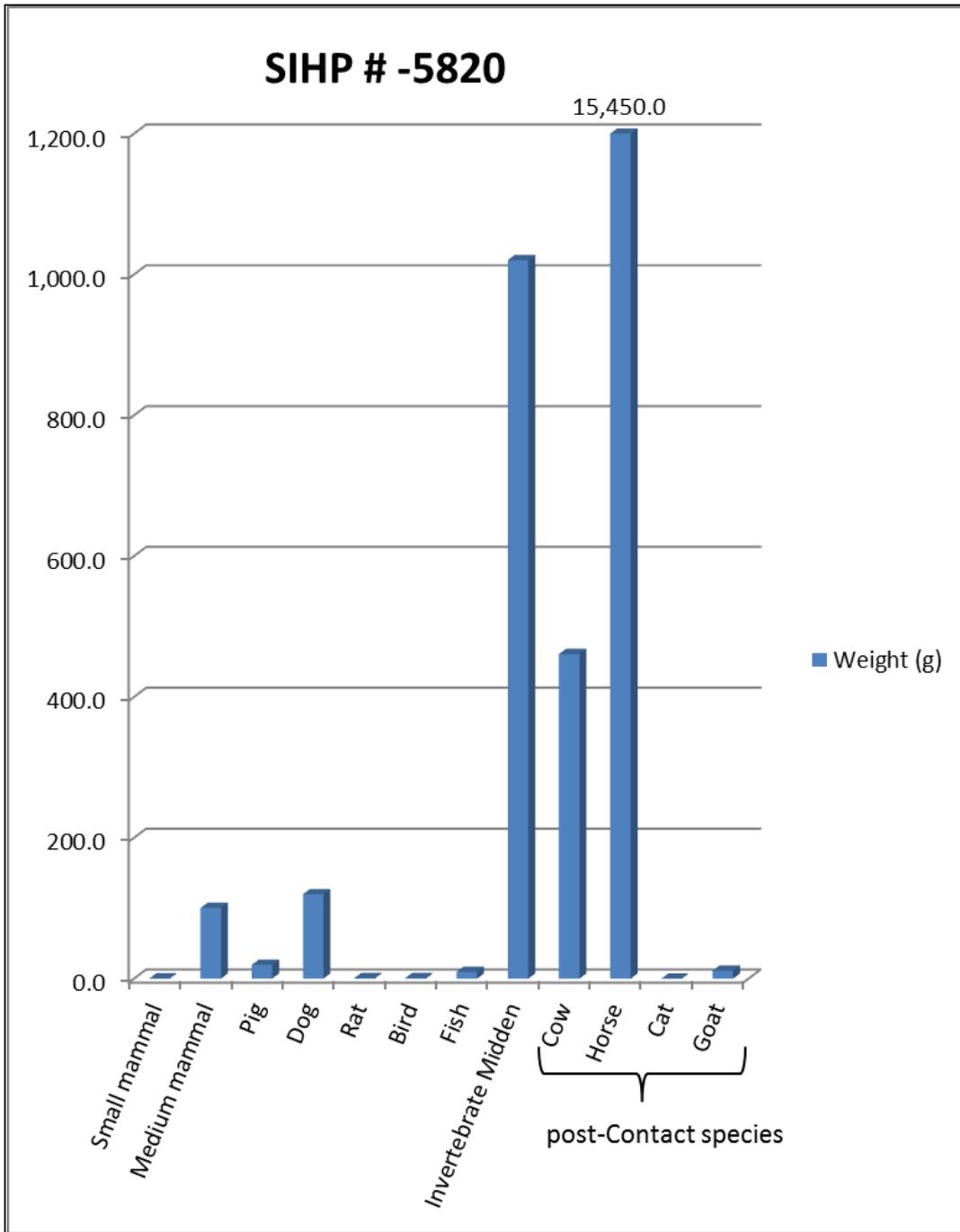


Figure 40. Graph showing all faunal material collected from SIHP # -5820 [Note: The large amount of horse remains indicated in the graph is due to the identification of an in situ horse burial]

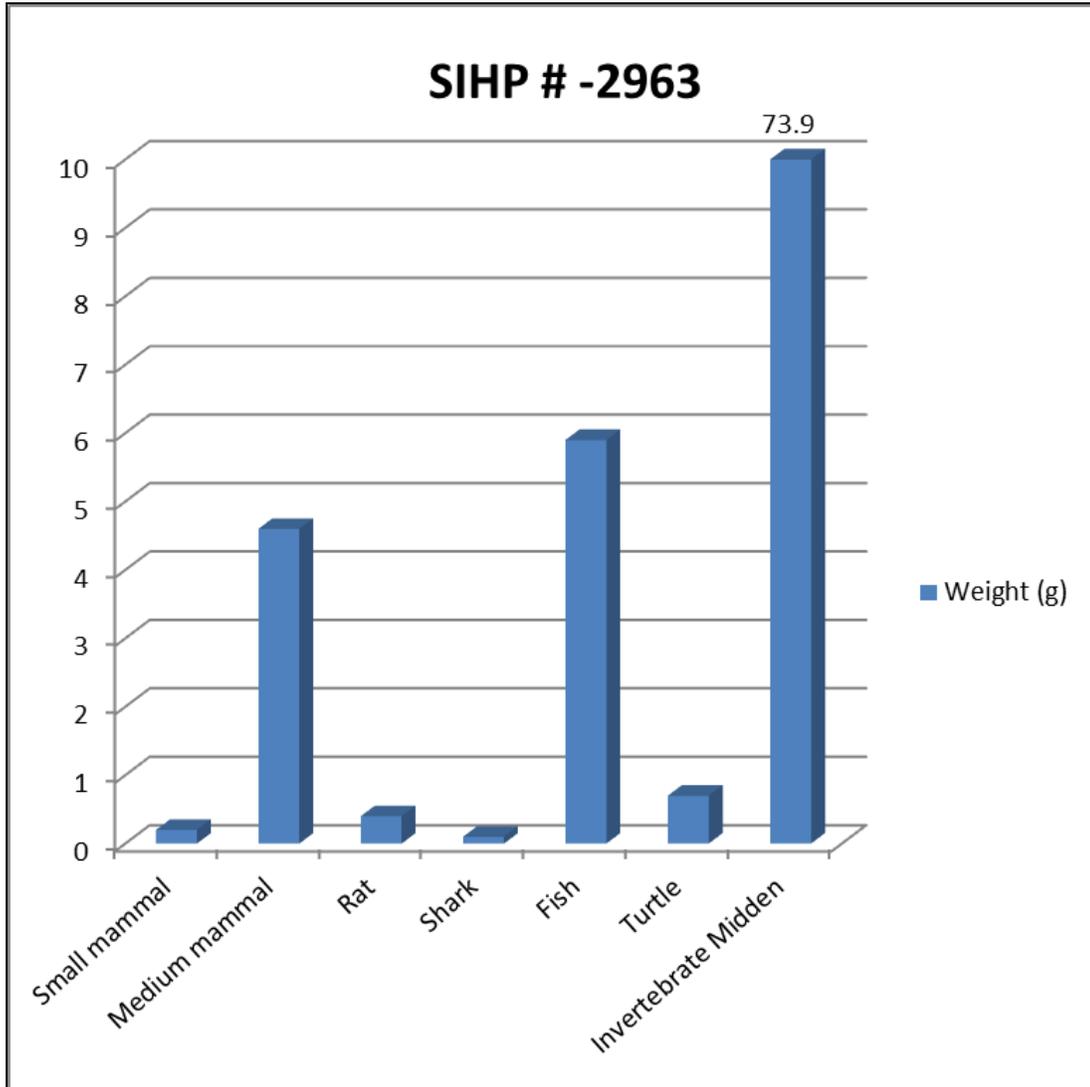


Figure 41. Graph showing all faunal material collected from SIHP # -2963. The graph represents material collected from five features associated with an A-horizon. [Note the absence of post-Contact introduced species]

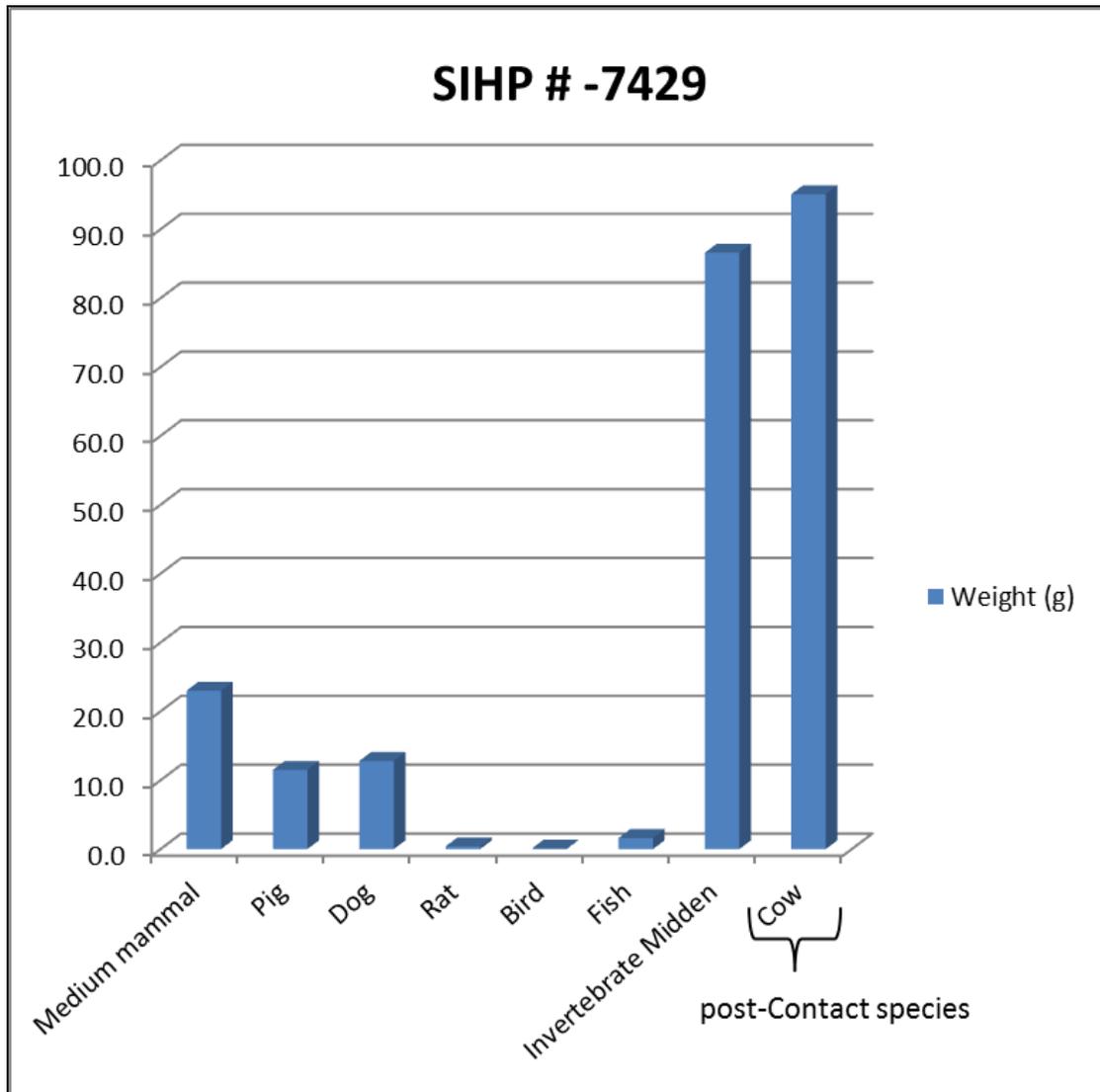


Figure 42. Graph showing all faunal material collected from SIHP # -7429

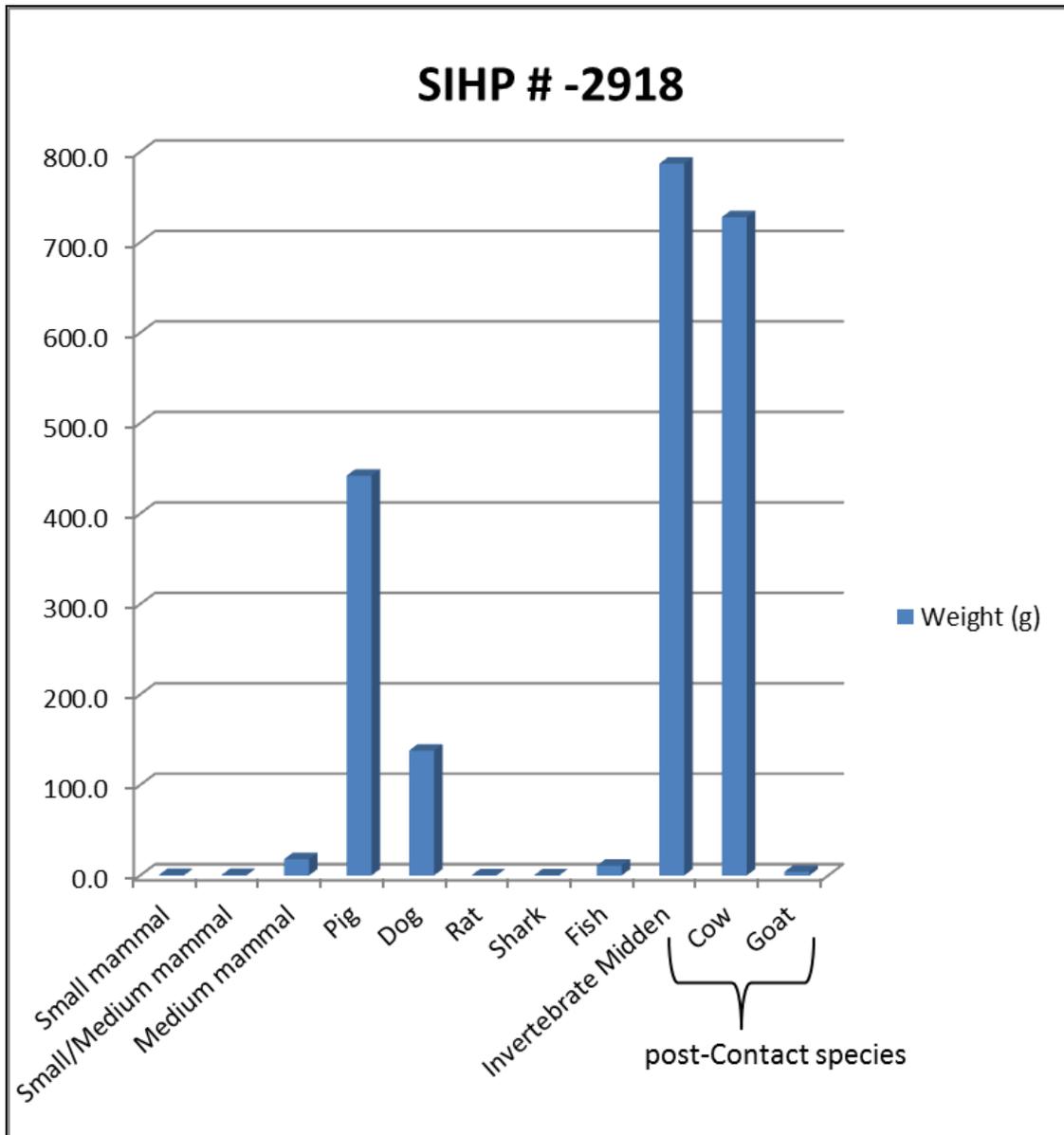


Figure 43. Graph showing all faunal material collected from SIHP # -2918. A strong invertebrate midden signature was identified throughout the A-horizon and associated features.

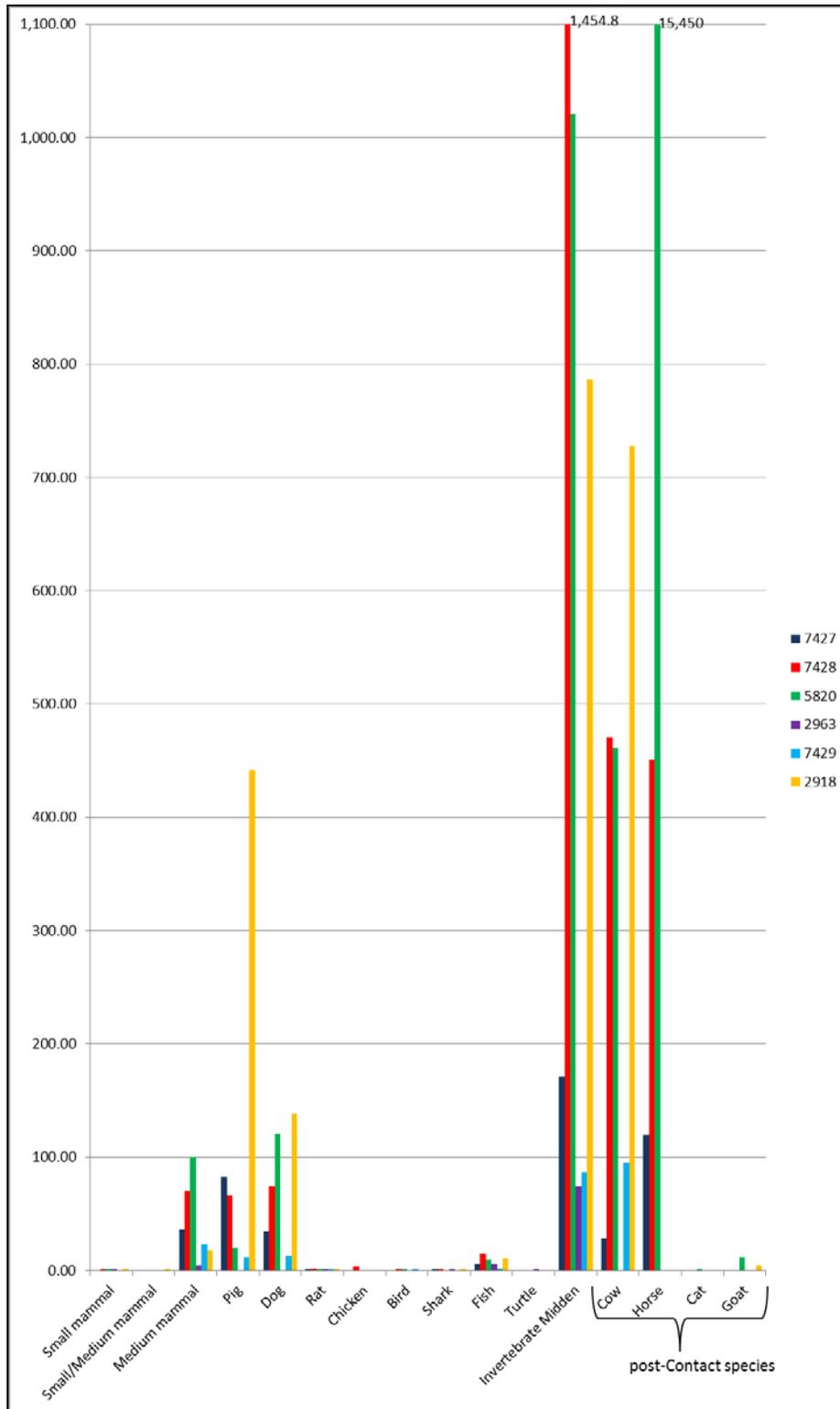


Figure 44. Graph comparing all faunal material collected from the six previously discussed cultural resources

The oldest C14 dates were documented in five of the test excavations: T-124, T-142, T-145, T-146A, and, T-151 (Figure 45). Test Excavation 124 was the only trench to contain exclusively pre-Contact vertebrate/invertebrate species along with an identified traditional Hawaiian artifact. However, the C14 dates for Test Excavation 146A indicate both a pre-Contact and a transitional cusp timeline incorporating traditional Hawaiian consumption species with introduced vertebrate species. C14 dates indicating a cusp of Contact date range were found in T-146A, T-150, and T-227A (Figure 46).

C14 dates for Test Excavation 142 and 151 both indicate a broad timeline incorporating a range of consumption patterns. T-142 contained pre-Contact vertebrate/invertebrate species and traditional Hawaiian artifacts. Introduced vertebrate species were also consumed and found in association with historic artifacts. Test Excavation 151 contained a range of vertebrate species from pre-Contact and historic times and traditional Hawaiian artifacts were also identified within T-151. Test Excavation 145 (Feature 9) contained charcoal indicating a broad timeline of pre-Contact to post-Contact consumption activities within this area, however only invertebrate material was documented within the feature.

Test excavation T-150 contained C14 dates that indicate a transitional cusp moving away from traditional Hawaiian consumption species to incorporating introduced species into dietary habitats. T-227A (Feature 23) contained charcoal indicating a cusp of contact date range, however only invertebrate material was documented.

SIHP # -5820 produced eight C14 dated features, four of which fell into the pre-Contact range and four in the cusp range. The comparison of the relative distributions is illustrated in Figure 47.

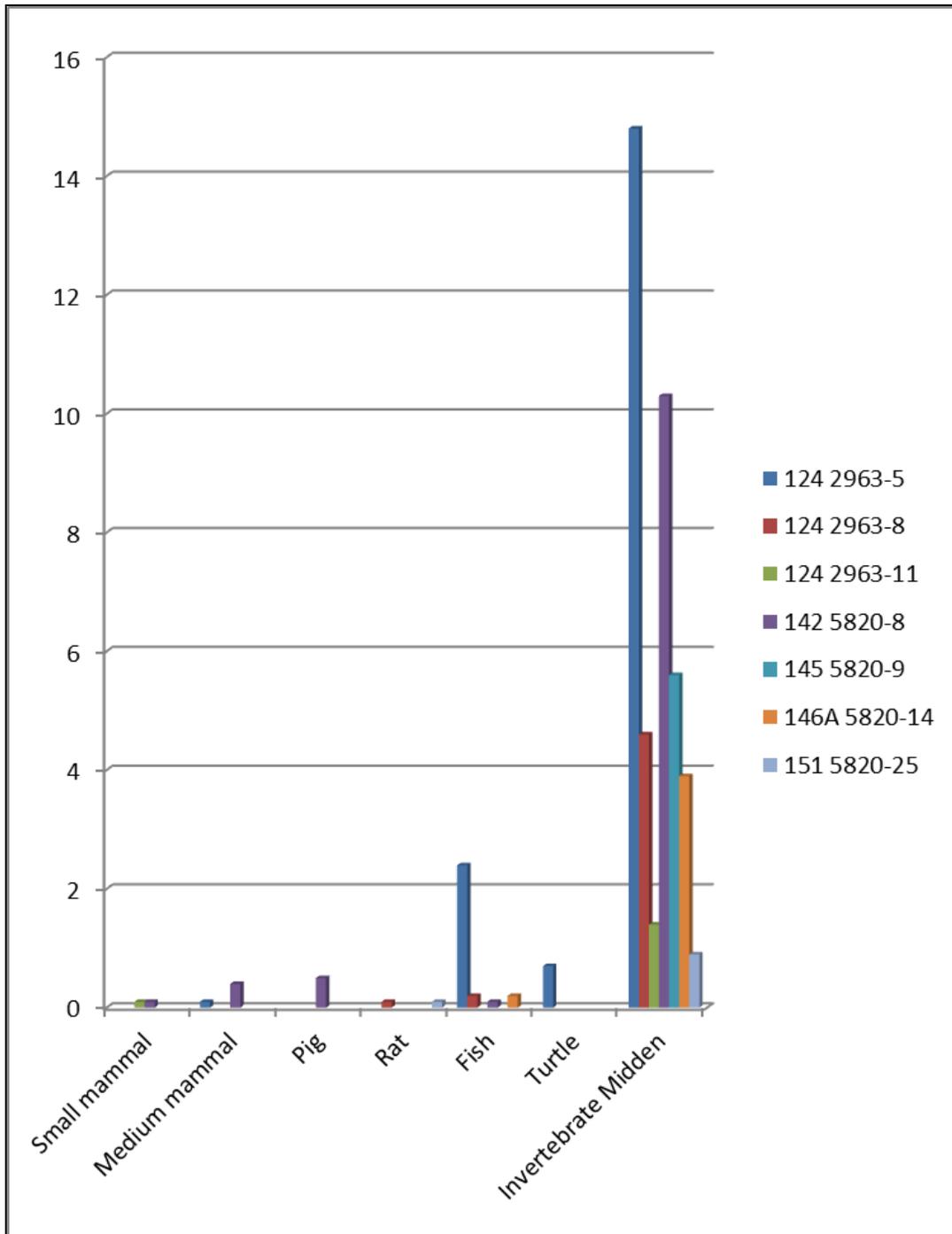


Figure 45. Graph comparing all faunal material collected from the seven features (shown by test excavation number, SIHP number and Feature number) with pre-Contact C14 dates (1400s-1600s). Marine species represents the highest weight, indicating that marine resources were consumed in greater quantity than terrestrial species.

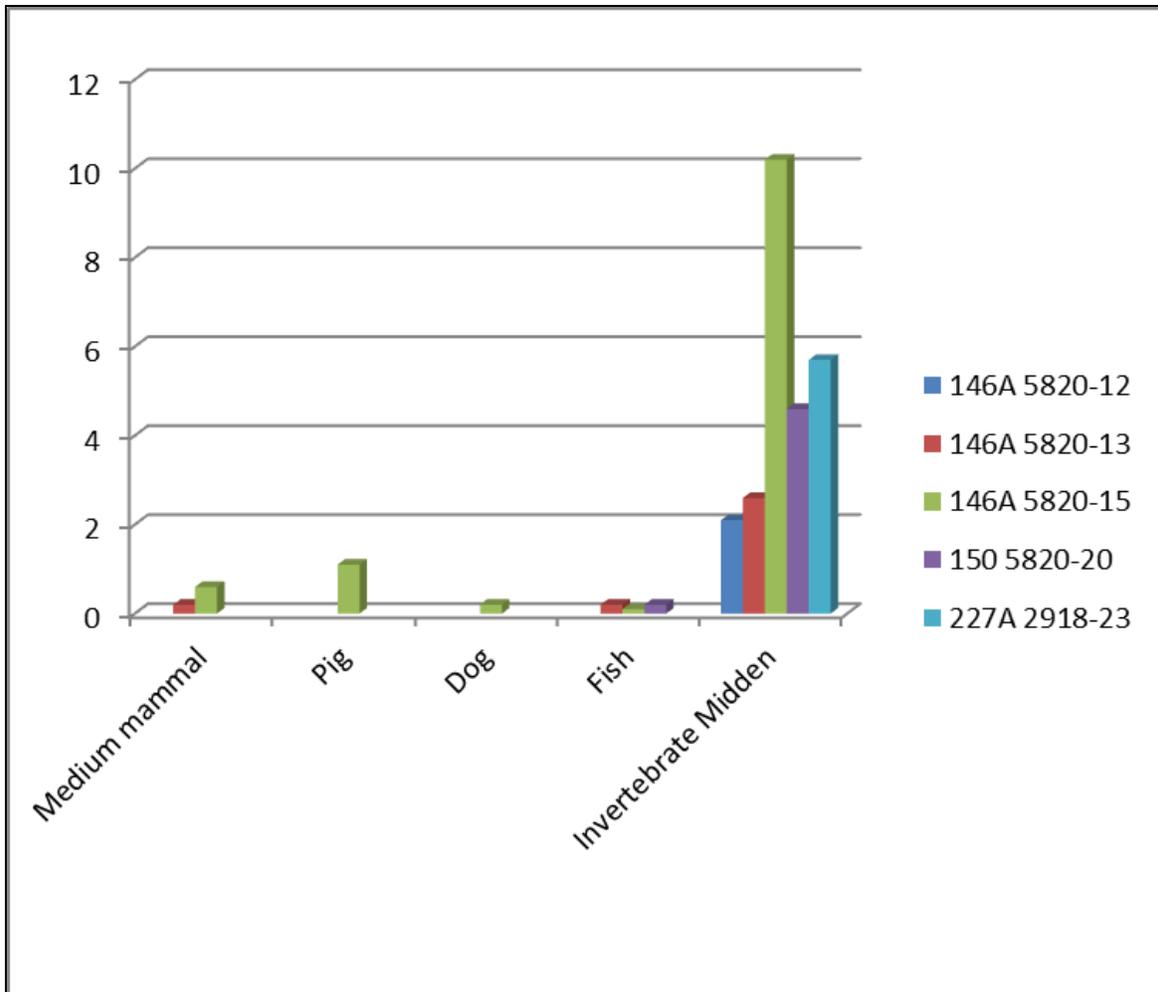


Figure 46. Graph comparing all faunal material collected from the five features (shown by test excavation number, SIHP number and Feature number) with cusp of Contact C14 dates (1720-1820). The overall midden signature is very similar to that shown within the earlier pre-Contact features in Figure 45.

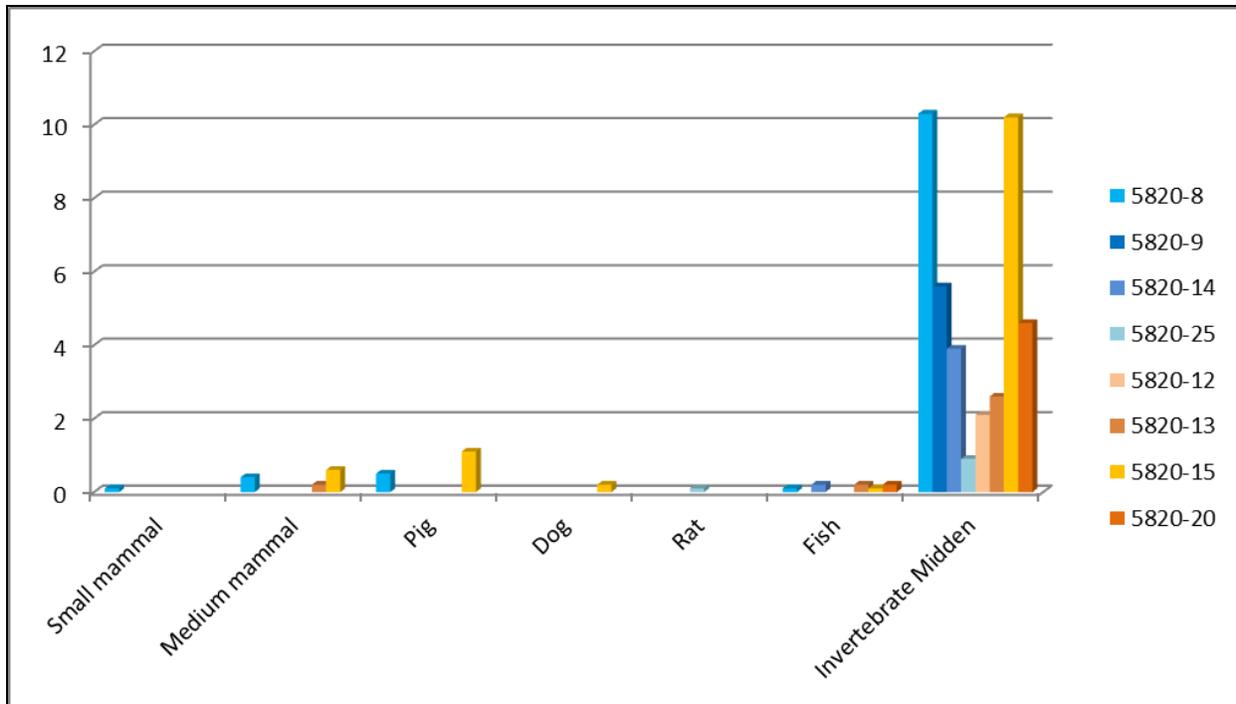


Figure 47. Graph comparing all faunal material collected from the eight features of SIHP # -5820 (shown by SIHP number and Feature number) with pre-Contact (1400s-1600s) and cusp of Contact (1720-1820) C14 dates; blue tones represent pre-Contact features and orange tones represent cusp of Contact features.

The terrestrial faunal midden assemblage collected provides evidence of pre-Contact and early post-Contact food scrap deposition, the latter represented by the large percentage of *Bos taurus* and other large species.

Faunal remains were collected individually during excavation from 70 test excavation units. These remains consisted of a variety of both Polynesian and post-Contact introduced species, which were examined for any evidence of cultural modification such as burning and butchering. The butchering marks observed were found to fall into two categories: those created by a metal saw blade (butcher’s saw) cutting through the bone, and those created by hand tools (of various materials) scraping the bone. The implication being that metal saw blade marks are consistent with post-Contact/historic food consumption practices, particularly the meat products purchased from a butcher shop; whereas the scraping type of butcher marks are consistent with traditional Hawaiian food processing methods. The most interesting aspect of the assemblage of butchered (scraping) faunal material is that most of the bones displaying evidence of this presumably traditional method (Table 257) were *Bos taurus* (cow), a species not introduced until the post-Contact period. A *Sus scrofa* (pig – a Polynesian introduced species) femur was observed to have these traditional style butcher marks; however, this traditionally butchered bone of a Polynesian introduced species, was found in the same context (T-096, SIHP # 50-80-14-7427, Feature 3, 1.33 mbs) as *Bos taurus* rib fragments that had been butchered by a metal saw blade. It seems likely that the traditionally butchered bones represent early post-Contact traditional Hawaiian

utilization of recently introduced species, prior to the wide scale adoption of immigrant food processing techniques. The faunal bones with evidence of butchering (with either a metal saw blade or traditional methods) originated from a transitional early post-Contact context. The only possibly pre-Contact faunal material with traditional butchering evidence was a *Canis lupus familiaris* diaphysis section. The diaphysis section showed evidence of spiral fracturing indicative of hand modification to long bones.

Table 257. All Individually Collected Faunal Material Showing Traditional Style Butcher Marks, as well as the Other Faunal Found in the Same Context

Test Exc.	Stratum	Depth (cmbs)	SIHP #/ Feature	Family/ Class	Species	Element	Description	Modification
034	Ib	70-83		Bovidae (cow)	<i>Bos taurus</i>	Femur; Ribs; Possible scapula; Vertebra	Fragments	Butchered, possible carnivore gnawing on vertebra
037	Ib	70		Bovidae (cow)	<i>Bos taurus</i>	Ribs; Long bones; Possible vertebrae	Fragments	Butchered
067	Ib	63-100		Bovidae (cow)	<i>Bos taurus</i>	Femur head (unfused); Rib	Complete	Butchered rib, metallic rust staining
067	Ib	63-100		Felidae (cat)	<i>Felis catus</i> (possible)	Diaphysis section	Fragments	Metallic rust staining
067	Ib	63-100		Aves (bird)	Unidentified	Tibia	Fragment	Copper and rust staining
096	Ii	133	7427-3	Bovidae (cow)	<i>Bos taurus</i>	Ribs	Fragments	Butchered (cut with metal saw blade)
096	Ii	133	7427-3	Suidae (pig)	<i>Sus scrofa</i>	Femur; Left supra orbital margin; Proximal end of rib; Diaphysis section (possible pig)	Fragments	Butcher marks on femur
097	Ie	104	-	Bovidae (cow)	<i>Bos taurus</i> (possible)	Diaphysis sections (Mostly thin cortical bone)	Fragments	Butcher marks on cortical bone
100	If/Ik	85		Bovidae (cow)	<i>Bos taurus</i>	Diaphysis section (possible femur)	Fragment	Striations on one end (possible taphonomic); cut marks along exterior
142	Iia	69	-	Canidae (dog)	<i>Canis lupus familiaris</i>	Diaphysis section	Fragment	Perimortem fractures; burned (traditional methods)

## 5.15 Cultural and Environmental Osteichthyes Discussion

### 5.15.1 Traditional Fishing Practices

One of the most varied and extensive occupations, fishing required various tools and methods. The fisherman required the knowledge to know the character of the reef, ocean, seasons, and weather; the concealment of excellent fishing grounds; and work time needed to make or expenses incurred from purchasing goods such as a canoe, fishing nets, line, sinkers, and hooks. The principal fishing god was Ku'ula, who was deemed one of the best fishermen during ancient times. Other notable fishermen include Hinahale, owner of all 'ōhua (young) fish; Kānemakua, a form of Kāne; Kapukapu; Kinilau; Kānekoa; and Kalamainu'u, the goddess of trap makers. Fishing shrines known as *ko'a* were located near shorelines. Fishermen often left an offering consisting of a stone or a fishhook prior to fishing. On returning from a successful fishing trip, offerings of fish were also made on the *ko'a* (Buck 1964:286-287).

Various kinds of fish required different methods of fishing. Methods of fishing include catching by hand or groping (*haha*); spearing ('*oi'a*); noosing (primarily used to catch sharks); nets ('*upena*) or netting was the most diversified and profitable method of catching fish; fish traps; and fishhooks (*makau*). Spears, nets, fish traps, and fishhooks varied in terms of what a fisherman desired to catch; materials utilized to create the medium; types; variations; and terminology. Accessories such as stone sinkers, hook-and-line containers, bait, mortars, pestles, and bait sticks also helped aid fishermen hone their skills. These tools and methods were utilized both in the near shore reefs and open ocean, as well as in the constructed fishponds along the coast.

Fishponds were one of the most important traditional resources for the Hawaiian community. Historic maps and images depict the locations of numerous *loko i'a* (fishponds) near Waikīkī and historic documents describe “several hundred” and “innumerable” artificial freshwater fishponds extending a mile inland from the shore (Bloxam 1925:35–36; McAllister 1933:76). These ponds were considered part of the land, rather than sea, and were therefore not *kapu* during the spawning seasons of certain species. This made the fishponds a consistent source of food year round (Wyban 1992:96).

### 5.15.2 Identified Fish Species

Of the many Osteichthyes (fish) remains collected during the project, eight species were positively identified: 'ō'ili'uwī'uwī (*Pervagor spilosoma* or Fantail Filefish); *uhu* (*Scarus* sp. or Parrotfish) and a sub-species of *uhu* (*Scarus perspicillatus* or Spectacled Parrotfish); *kōkala* (*Diodon holocanthus* or Balloonfish/Spiny Porcupinefish); 'a'awa (*Bodianus bilunulatus albotaeniatus* or Hawaiian Hogfish); *kāhala* (*Seriola* cf. *dumerili* or Amberjack); and two species of *lau-hau*, *lau-wiliwili* (*Chaetodon miliaris* or Milletseed Butterflyfish) and *kikākapu* (*Chaetodon tinkeri* or Tinker's Butterflyfish). These identified species were collected from seven test excavations; the distribution of these species by test excavation is shown in Table 258.

Table 258. Distribution of Identified Fish Species by Test Excavation Unit, Stratum and Feature Number

<b>Fish Type</b>	<b>T-119a</b>	<b>T-120</b>	<b>T-120B</b>	<b>T-124</b>	<b>T-151</b>	<b>T-226B</b>	<b>T-227A</b>
<b><i>‘ō‘ili‘uwī‘uwī</i></b> ( <i>Pervagor spilosoma</i> or Fantail Filefish)	Strata Id and IIa	Stratum II/ 7428-4, 5, 6, 7, 8 (5 fish)	Stratum II	Stratum IIa/ 2963-1	Stratum IIb/ 5820-24		
<b><i>uhu</i></b> ( <i>Scarus</i> sp. or Parrotfish)		Stratum II/ 7428-8					
<b><i>uhu</i></b> ( <i>Scarus perspicillatus</i> or Spectacled Parrotfish)		Stratum II/ 7428-5					
<b><i>lau-wiliwili</i></b> ( <i>Chaetodon miliaris</i> or Milletseed Butterflyfish)		Stratum II					
( <i>Chaetodon tinkeri</i> or Tinker's Butterflyfish)						Stratum II/ 2918-11	
<b><i>kōkala</i></b> ( <i>Diodon holocanthus</i> or Balloonfish/Spiny Porcupinefish)		Stratum II					
<b><i>‘a‘awa</i></b> ( <i>Bodianus bilunulatus albotaeniatus</i> or Hawaiian Hogfish)		Stratum II/ 7428-7					Stratum II
<b><i>kāhala</i></b> ( <i>Seriola</i> cf. <i>dumerili</i> or Amberjack)				Stratum IIb/ 2963-5			

**Fantail Filefish (*Pervagor spilosoma* or 'ō'ili'uwī'uwī)**

Family: Monacanthidae

Species: *Pervagor spilosoma*

Common name: Fantail Filefish

Hawaiian name: 'ō'ili'uwī'uwī (Hoover 1993:57; Pukui and Elbert 1986)

The Fantail Filefish (*Pervagor spilosoma*; Figure 48) ranges from 2 to 3 inches up to 24 inches in length and can be identified by its yellow body with black dots, dark brown diagonal stripes on its head, an orange tail, and pale yellow ventral and dorsal fins (Hoover 1993:59; Randall 1996:192; Titcomb 1972:118; and Tinker 1978:480). They often make a small squealing noise if removed from water, which accounts for part of their name: “'uwī'uwī” means “to squeal” (Hoover 1993:59).

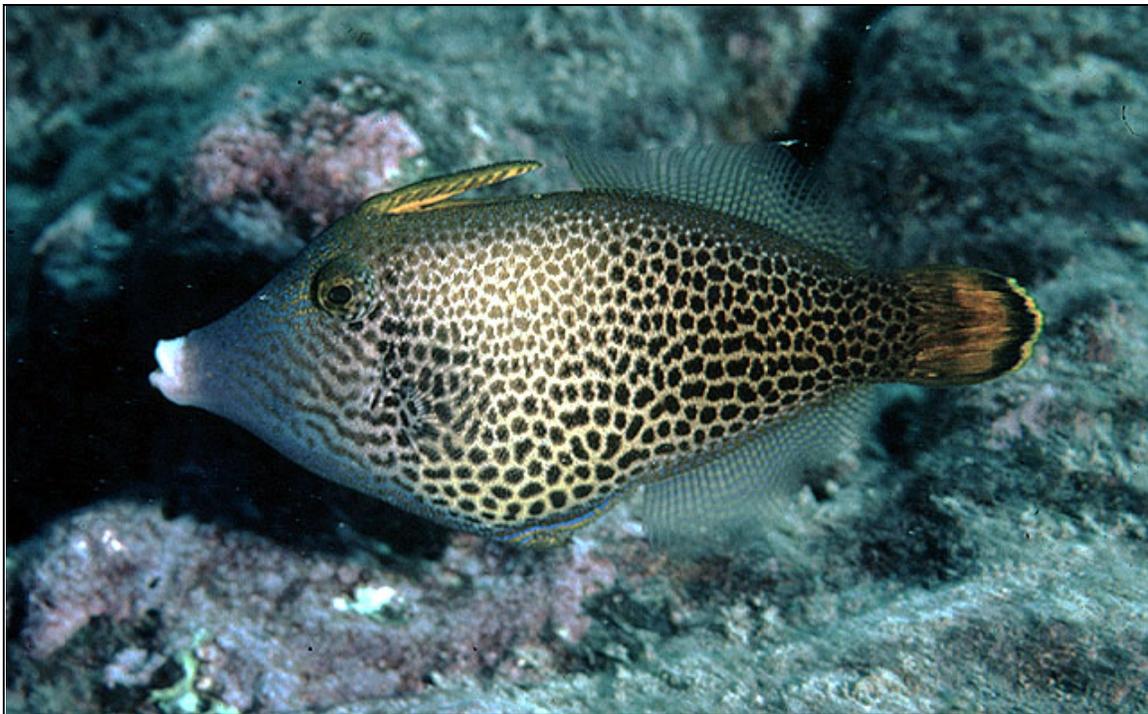


Figure 48. Fantail Filefish (Photo by John E. Randall 2011c)

The habitat of this species is in the deeper waters on the outer edge of the reef. Periodically, usually in the early spring months, the Fantail Filefish appears in shallow water in large numbers, and is sometimes found dead and dry on the beach in great numbers (Tinker 1978:480). There is a Hawaiian saying: “*He i'a pae wale no ka 'uwī'uwī*” which literally translated means: “The 'uwī'uwī is a fish that washes ashore,” which Pukui tells us (1983:70, n. 615) was “said of a ne'er-do-well who goes from house to house and depends on others for his livelihood.” Titcomb states that “the natives believe its [the 'ō'ili'uwī'uwī] appearances to prophesy the demise of some great personage, such as a king or a chief.” (Titcomb 1972:119)

In the spring of 1944, they were observed in great numbers, millions of them all along the beaches of southeastern Oahu. They seemed to be already dead when they floated ashore and piled up on the beaches. This continued for weeks. (Titcomb 1972:119)

Titcomb quotes Kepelino as evidence that these fish were eaten, either raw or broiled after the skin had been removed; and Mrs. Pukui suggested that on Hawai'i island the dry carcasses were collected and used for fuel rather than food (Titcomb 1972:119). The remains of this fish were found in 5 out of 7 test excavations containing identified fish species, and 'ō'ili'uwī'uwī was the most commonly identified species.

**Parrotfish (*Scarus sp. or uhu*)**

Family: Scaridae

Species: *Scarus sp.*

Common name: Parrotfish

Hawaiian name: *uhu* (Hoover 1993:92-93)



Figure 49. Bullethead Parrotfish, a member of the Scaridae family (Directory of Kauai 2013)

The Parrotfish (*Scarus sp.*; Figure 49) ranges in size (depending on species) from 12 to 25 inches in length and their bodies are covered with large scales. Their coloration varies depending on their sex and whether they are in “initial” or “terminal” phase (Hoover 1993:92; Titcomb 1972:148; Tinker 1978:308). Although coloration varies by species, common colors for adult male Parrotfish are orange to purplish on the upper part of the body and green to blue below, and

adult female Parrotfish are purplish red or dark brownish red in color (Tinker 1978: 309). The Scaridae family contains about 80 species that inhabit shallow tropical seas and are principally herbivorous, feeding mostly on marine algae, coral, and other living forms (Tinker 1978:308). In Hawaii, Parrotfish are known as *uhu*, and are a favorite fish with the Hawaiians, often eaten dried, broiled, or raw (Titcomb 1972: 148). The Parrotfish has a prominent place in many Hawaiian legends and was the most telltale of all fish amongst fishermen, as it was said to reveal what sort of behavior was going on at a fisherman's home (Titcomb 1972: 148).

**Spectacled Parrotfish** (*Scarus perspicillatus* or *uhu*)

Family: Scaridae

Species: *Scarus perspicillatus*

Common name: Spectacled Parrotfish

Hawaiian name: *uhu* 'ahu'ula (initial phase); *uhu uliuli* (terminal phase) (Hoover 1993:94)

The Spectacled Parrotfish (*Scarus perspicillatus*; Figure 50) can grow to 24 inches in length. In initial phase, the Spectacled Parrotfish has a grayish-brown body, with red fins and a red tail with a white band across it. In the terminal phase, it has a blue-green body and fins, with a dark band across its snout (Hoover 1993:95; Randall 1996:146).



Figure 50. Spectacled Parrotfish (Vasconcellos 2009)

**Butterflyfish (*Chaetodon* spp.)**

Two species of Butterfly fish were collected from test excavations, both of the Family Chaetodontidae.

**Milletseed Butterflyfish (*Chaetodon miliaris* or *lau-wiliwili*)**

Species: *Chaetodon miliaris*

Common name: Milletseed Butterflyfish

Hawaiian name: *lau wiliwili* (“leaf of the *wiliwili* tree”) (Hoover 1993:27, 30)



Figure 51. Milletseed Butterflyfish (Photo by John E. Randall 2011b)

The Milletseed Butterflyfish (*Chaetodon miliaris*; Figure 51) ranges from 1 to 6 inches in length and can be identified by its pale yellow body, which is marked by many, small, round, dark spots in vertical rows, with a black band across both the caudal peduncle and around the eye (Tinker 1978:249; Titcomb 1972: 98). In Hawaii, the Milletseed Butterflyfish is known as *lau wiliwili* because it resembles the leaves of the indigenous *wiliwili* tree (Hoover 1993:27, 30). The Milletseed Butterflyfish inhabits shallow waters and is not a common food source (Randall 1996:101; Titcomb 1972: 98; Hoover 1993:27, 30).

**Tinker's Butterflyfish (*Chaetodon tinkeri*)**

Species: *Chaetodon tinkeri*

Common name: Tinker's Butterflyfish

Hawaiian name: NONE (Hoover 1993:32)

The Tinker's Butterflyfish (Figure 52) is an uncommon species of reef fish named after Spencer Wilkie Tinker (Tinker 1978:252). They were considered endemic to Hawaii, but have been seen in the Marshall Islands (Randall 1996:104; Hoover 1993:32). Tinker's Butterflyfish are found in calm deep reef edges (below 100 ft) and feed on small invertebrates, plankton, and coral. They are characterized by a white body with a black upper posterior portion and a yellow band through its eye and on its caudal fin (Tinker 1978:252).

Hawaiians had several general names for other types of Butterflyfishes. Some were called *kikākapu* ("strongly prohibited") while others were called *lau-hau* ("leaf of the hau tree") or *lau-wiliwili* ("leaf of the wiliwili tree") (Hoover 1993:26-27). These fish were not often eaten due to the small amount of flesh (Titcomb 1972:88).



Figure 52. Tinker's Butterflyfish (Photo by Hiroyuki Tanaka 2011)

**Balloonfish/Spiny Porcupinefish (*Diodon holocanthus* or *kōkala*)**

Family: Diodontidae

Species: *Diodon holocanthus*

Common name: Balloonfish/Spiny Porcupinefish

Hawaiian name: *kōkala* (Hoover 1993:103)

The Balloonfish/Spiny Porcupinefish (*Diodon holocanthus*; Figure 53), known by its Hawaiian name *kōkala*, is identified by a light tan body marked with several large dark blotches and bars on its back and sides. The *Diodon holocanthus* has very long spines on the top of its head, which helps to distinguish it from other species of Balloonfish (Hoover 1993:103). *Diodon holocanthus* lives in shallow shoreline and reef areas (Tinker 1978:500). Diodontids are generally nocturnal fish that feed on bottom dwellers like sea urchins, mollusks, hermit crabs, and crabs (Tinker 1978: 500; Randall 1996:200-201). When threatened or excited, the *Diodon holocanthus* will inflate with water (or air if removed from the water) to a large, spiny ball (Hoover 1993:99). Diodontids are poor swimmers can be caught at the surface with hand nets (Froese and Pauly 2011).

According to Titcomb (1972), the spines of *kōkala* were regarded as poisonous by some Hawaiians, but the flesh may not have been considered poisonous. One sea god, Kane ko kala, was said to take this form, and those who had Kane ko kala as an 'aumakua (guardian spirit) threw the fish back if it was caught (Titcomb 1972: 91).



Figure 53. *Diodon holocanthus* (Photo by Robert A. Patzner 2011)

**Hawaiian Hogfish (*Bodianus bilunulatus alboteniatus* or 'a'awa )**

Family: Labridae

Species: *Bodianus bilunulatus*

Sub-Species: *albotaeniatus*

Common name: Hawaiian Hogfish

Hawaiian name: 'a'awa

The Hawaiian Hogfish (*Bodianus bilunulatus albotaeniatus*; Figure 54) is a subspecies not endemic to the Hawaiian Islands. Hawaiian Hogfish belong to the Wrasse (Labridae) family (Hoover 1993:146). Wrasses are speedy, sleek swimmers living near the shoreline in the coral reef. Most wrasses feed on small hard shell invertebrates like crab, sea urchin, hermit crabs, and mollusks (Randall 1996:122). The general Hawaiian name for most wrasses is *hinālea*, but the Hawaiian Hogfish (*Bodianus bilunulatus albotaeniatus*) is called 'a'awa (Hoover 1993:142-143, 146; Randall 1996:125). The species name (*bilunulatus*) means "two crescents," and the subspecies name (*albotaeniatus*) means "white line" (Hoover 1993:146) The 'a'awa are distinguished differently based on their age and sex. Juvenile 'a'awa are mostly black with yellow on top of their heads and backs. Adult female 'a'awa have light-colored bodies with dark streaks on their heads and fine lines. Terminal males are blotchy purplish gray and are not usually seen in depths less than 50 ft (Hoover 1993:146).

The white meat of the 'a'awa is often broiled or dried. Sometimes it is eaten as a *pupu* after drinking 'awa as an aftertaste (Titcomb 1972:57). Wrasses (*hinālea*) could be kept on hand and would remain healthy if kept in small pools. They could be caught with small nets when the 'awa was ready to be poured. *Hinālea* were also used as offering to the gods (Titcomb 1972:77). Partially decomposed wrasses were an ingredient in a Hawaiian condiment mixed with *kukui* nuts and chili pepper. People who had bad breath were referred to as "a dish of *hinālea* sauce" (Hoover 1993:143).



Figure 54. Adult female 'a'awa (Photo by John E. Randall 2011a)

**Amberjack (*Seriola cf. dumerili* or *kāhala*)**

Family: Carangidae

Species: *Seriola cf. dumerili*

Common name: Amberjack

Hawaiian name: *kāhala* (Hoover 1993:85)

The Amberjack (Figure 55), known by its Hawaiian name *kāhala*, is the largest member of the Jack family (Carangidae). Jacks are large predators that are often found in the deep seaward reefs, but are also know to come inshore to feed on schooling reef fishes. The *kāhala* are silvery fish distinguished with a dark diagonal bar through their eye and a yellow stripe along their side. *Kāhala* may work together to heard their prey. They tend to hunt in the early morning and late afternoon (Hoover 1993:82-85).

According to Titcomb, *kāhala* are often cooked whole in an *imu*, but can also be salted or wrapped in *ti* leaves and baked. They are a deep-sea fish that often required many hooks on one line. There was a proverb reflecting the appreciation for the *kāhala*: “*Poloei a’e la no a ka waha o kāhala*,” meaning, “It went straight to the high chief” (Titcomb 1972:82).



Figure 55. *Seriola dumerili* (Photo by Peter Wirtz 2011)

Table 259. Commercial Fishing Yields (lbs) for Select Species, as Reported by Jordan and Evermann (1903:761-765)

	<i>uhu</i>	<i>lau-hau</i>	<i>'a'awa</i>	<i>kāhala</i>	All Commercial Fish
Hawai'i	809	3,331	900	40,776	1,304,311
Lana'i	-	-	180	5,300	212,628
Maui	875	2,008	1,516	9,686	1,159,117
Moloka'i	5,674	2,065	1,205	2,148	376,255
O'ahu	10,505	110	5,921	3,915	2,737,198
Total All Islands	17,863	7,514	9,722	61,825	6,222,455

### 5.15.3 Marine Resource Exploitation Patterns

Jordan and Evermann (1903) reported on the commercial fisheries of the Hawaiian Islands, and included tables detailing the yield of the fisheries in 1900, by island and species. They included over 100 species of fish and other marine resources and reported the yield by both weight (lbs) and value (U.S. dollars).

The identified species collected from test excavations originated from buried cultural layers and discrete features, and occurred in small amounts. All of the identified species are fish that can be found in the inshore-reef zone almost exclusively (with the exception of the Amberjack, which occasionally frequents the reef zone to hunt). This assemblage seemed to indicate small scale subsistence level exploitation of the local marine resources.

As a rough comparative exercise, those species collected and identified by the project were extracted from the Jordan and Evermann (1903:761-765) tables (Table 259 and Figure 56), and compared to the species distribution encountered by the current project. This comparison was achieved by converting weights (lbs) of the commercial yields, and counts of the number of instances of species finds, to percentages of the total (Figure 57). As expected, the distributions are contradictory, supporting the hypothesis that the assemblage collected by the project represents small scale subsistence level exploitation of the local marine resources, rather than participation in the historically documented commercial fishing industry.

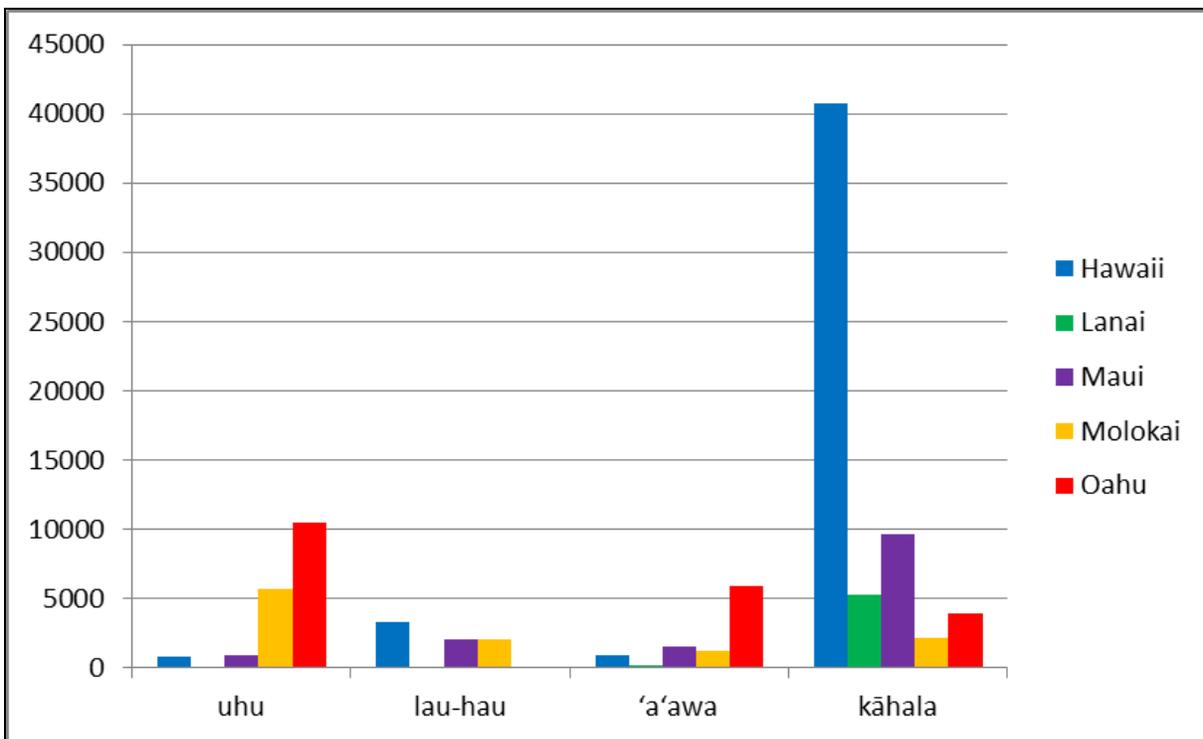


Figure 56. Yields (lbs) of four select species, by Island, as reported by Jordan and Evermann (1903:761-765)

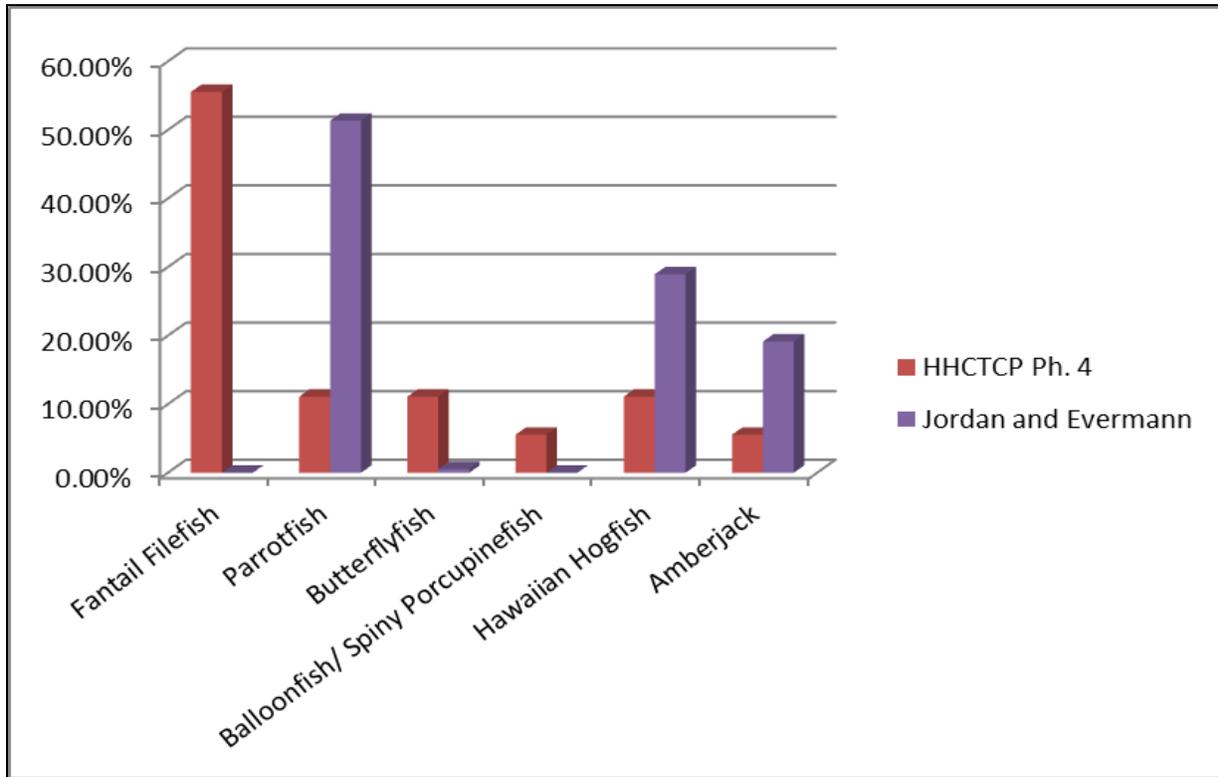


Figure 57. Percent of finds compared\* to percent of yields

\* Project Parrotfish species were counted together and compared to *uhu*; Project Butterflyfish species were counted together and compared to *lau-hau* (the only listed species of Butterflyfish); and Jordan and Evermann (1903) do not list Fantail Filefish (*‘ō‘ili‘uwī‘uwī*) or Balloonfish/ Spiny Porcupinefish (*kōkala*) as commercially exploited species.