1 Introduction: Research overview

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The mysteries of Easter Island (Rapa Nui) have gripped the imagination of explorers, scientists, and the public for more than a century. The origin of the Rapanui people and the rise and fall of their advanced prehistoric culture raise many important scientific questions. Who were the Rapanui ancestors? Did they come to this remote island as part of a single Polynesian migration or multiple ones? Were all of these early inhabitants Polynesian or were some of them of South American origin? What forces were involved in the rise, decline, and eventual collapse of this unique culture? Answers to these questions could explain much about human mobility, resourcefulness, and adaptability.

Explorations of Easter Island within the modern era began largely with archaeological investigation. Beginning with the Norwegian Expedition of 1955–56, under the direction of the world-famous explorer, Thor Heyerdahl, an international team of archaeologists began the process of scientific inquiry (Heyerdahl and Ferdon, 1965). They excavated a number of well-documented sites, and at most of them encountered well-preserved human skeletons. Thousands of additional human bones were seen by these archaeologists since they existed in open caves and partially exposed burial chambers within *ahu* platforms (i.e., the platforms that support the giant Easter Island statues, or *moai*). These men realized the importance of human skeletons to future scientific investigation, and also the risk of their loss in the not too distant future as this tiny island would most certainly, in time, begin to open up to the outside world.

The 1981 Easter Island Anthropological Expedition, which resulted in the successful recovery, protection, and initial study of these threatened human bones, and which eventually allowed for many of the studies presented in this book, was inspired and assisted in many ways by these members of the original Heyerdahl team (especially William Mulloy, Gonzalo Figueroa G-H, and Thor Heyerdahl himself). This connection will be discussed in more detail below.

Certainly the bioarchaeological and osteological studies that were an integral part of the 1981 Easter Island Anthropological Expedition (Baker and Gill, 1997; Chapman and Gill, 1997; Gill, 1981, 1986, 2000a, b; Gill *et al.*, 1997; Long and Gill, 1997; Owsley *et al.*, 1983, 1985; Seelenfreund, 2000; Shaw, 2000a) and those that were a subsequent outgrowth of it (Chapman, 1993; Chapman and Gill, 1998a;

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Clow, 1997; Furgeson, 2003; Furgeson and Gill, 2005; Harrison and Harper, 2010; Owsley *et al.*, 1994; Stefan, 1999, 2000, 2004; Stefan and Chapman, 2003) are not the first studies to have been undertaken that involved Easter Island skeletons. The many open tombs and caves on the island, mentioned above, were known from the earliest days of discovery of Easter Island by Europeans. By the late nineteenth century, systematic efforts were made to collect series of Easter Island crania from these locations. At least 15 explorers and scientists collected human remains there before our own expedition efforts in 1981. Furthermore, a number of osteological analyses emanating from these collection efforts were published (de Quatrefages and Hamy, 1882; Henckel, 1939; Heyerdahl and Ferdon, 1965; Imbelloni, 1951; Meyer and Jablonowski, 1901; Murrill, 1965, 1968; Petri, 1936; Volz, 1895; von Bonin, 1931). Even though some very useful information has come from these earlier studies, definite limitations exist as well. Most of them include skulls only, without post-cranial elements, and except for Murrill's study (Murrill, 1965, 1968) which was conducted on the small but well-documented Norwegian Expedition sample, they largely utilize materials without adequate provenience.

Expedition history

Since much of the biological anthropology research presented within this volume has its roots within the 1981 Easter Island Anthropological Expedition, a brief history of that project would seem to be appropriate here. The primary goal of that expedition was to excavate and analyze a large, well-documented sample of Easter Island skeletons in order to: (1) gain insight into the question of origins through analysis of skeletal remains, (2) collect anatomical, demographic, and paleopathological information from the bones to facilitate an understanding of Easter Island population history and adaptation, and (3) record cultural information in order to better understand burial practices and other concepts and customs of the early inhabitants (Gill, 1981, 1986, 2000a).

Our international research team was mobilized between 1978 and 1979 with the above scientific goals in mind. The inspiration and initial assistance in preparing for the project came from William Mulloy, my close colleague in anthropology at the University of Wyoming and a former member of the Norwegian Expedition team. Through team-teaching of classes and working in the field together (coastal West Mexico 1973), he and I had developed a mutual understanding and trust. Then followed numerous discussions about Polynesian research, and finally a decision was made by 1977 for us to work toward an Easter Island project, under my direction, which would focus upon human osteology research (Gill, 1988). In addition, during the following year two native archaeologists, Sergio Rapu Haoa, and his cousin Sonia Haoa, excavated 100 skeletons from the North coast site of Ahu Nau Nau, and these remains were in need of analysis. Rapu, a former undergraduate student in anthropology at the University of Wyoming, and by that time Curator of Easter Island's Sebastian Englert Museum of Anthropology, joined the effort in organizing and initiating the human osteology project on Rapa Nui. Gonzalo Figueroa G-H, another

former member of the Norwegian Expedition team and a close friend of Mulloy's since the days of the expedition, was also involved. He was a Chilean citizen deeply involved with agencies in Santiago and around the world responsible for Easter Island's administration, and for Easter Island research. In fact, at that time, he was director of the Easter Island Committee of the Fundacion del Pacifico (Pacific Foundation).

In the midst of this planning phase Mulloy contracted lung cancer and unfortunately died shortly thereafter. Enough ground work had been prepared by that time, however, that with the support of a University of Wyoming Basic Research Grant I was able to make a reconnaissance trip to Easter Island and to Santiago, Chile to meet with Gonzalo Figueroa. Figueroa also introduced me to the Chilean physical anthropologist, Juan Munizaga, and a number of Chilean government officials. During this short 1979 trip, Rapu and I excavated 20 skeletons from threatened sites, and data collection was begun on the 100 Ahu Nau Nau skeletons. Additionally, plans were laid for the 1981 project.

By January 5, 1981 the international research expedition that was the result of this planning finally began. This 6-month long field effort (5 months on Easter Island and 3 weeks in Santiago, Chile) was funded by the National Geographic Society, the Center for Field Research-Earthwatch, University of Chile, the Pacific Foundation, and the government of Chile. Gonzalo Figueroa was dispatched from Santiago to the island in order to oversee the initial organization. I was named Scientific Leader of the expedition and worked closely with two co-principal investigators: Claudio Cristino, archaeologist with the University of Chile, and Museum Curator Sergio Rapu Haoa. We were assisted by a well-trained team of archaeologists (Leslie Shaw, University of Wyoming and Andrea Seelenfreund H., University of Chile), two human osteologists (Scott J. Baker and Suzanne M. Bennett, University of Wyoming), and four teams of Earthwatch volunteers scheduled over a 4-month period (some trained in archaeology, some in photography, and some with useful medical specialties). Over the duration of the field season on Easter Island over 200 human skeletons were excavated from both caves and *ahu* from all parts of the island. These were added to the 20 skeletons excavated by Rapu and myself in 1979 and to the 100 skeletons excavated in 1978 by Rapu and his cousin Sonia Haoa.

Personnel from Cristino's University of Chile segment of the team were not available to assist in the field as much as originally planned, but their valuable survey records were made available to other expedition personnel throughout the entire field season. Sergio Rapu's assistant curator at the museum, Pelayo Tuki, did work closely with our field archaeologists, and osteologists in the laboratory, and provided a significant amount of support.

Quite early in the field season, the project was joined by Christopher M. Stevenson, who at that time was with Pennsylvania State University. He was funded independently from our project and his work was directed toward the recovery of obsidian artifacts for the purpose of obsidian hydration dating and settlement pattern analysis. A co-operative effort developed with Stevenson that consisted of collaboration on site information and obsidian recovery in exchange for obsidian hydration dates

for our important burial sites. This resulted in critically important site dates for the project, especially since airborne radioactive contamination on Easter Island (probably from post World War II hydrogen bomb tests in the Pacific) adversely affected all of our C^{14} dates from bone samples.

Coding for computer analysis of osteometric and other skeletal data was placed under the supervision of another co-investigator on the project, Douglas W. Owsley, at that time with Louisiana State University, Baton Rouge. Later on, but still within that phase of the project, Owsley transferred to his present position with the Department of Anthropology, National Museum of Natural History, Smithsonian Institution. His participation was initially supported by funds from my National Geographic Society grant and from Louisiana State University, and later by the Smithsonian Institution.

Excavations and analysis of mortuary practices

During the 5 months of field work on Rapa Nui from early January through May of 1981 a total of 16 major burial sites were excavated (see Table 1.1). These sites represent nearly all regions of the island and various burial contexts (*ahu* chambers, caves, *avanga*, *poepoe*). The map in Figure 1.1 shows the locations of these sites. Figure 1.2 shows the two most common types of burial locations on the island (caves and *ahu* chambers). In the detailed archaeology reports of these burial sites, prepared by Shaw (2000a) and Seelenfreund (2000), all sites are thoroughly described. Some of the sites possess multiple burial features. These also are well illustrated with complete site maps. One such site, for example, the West coast site of Ahu Kihi Kihi Rau Mea (site 8–374) described by Seelenfreund (2000), has 17 burial tombs within that single *ahu* structure.

The tremendous success of the 1981 Easter Island Anthropological Expedition with regard to field archaeological recovery, coupled with National Geographic Society's ability to publicize that success, led to immediate worldwide media attention following the conclusion of the 1981 field season. Major newspapers across the United States, Europe, and Latin America ran stories with photographs of our work. *Science News* (Trotter, 1981) carried a full-page article, and both *Science and Mechanics* (Hill, 1982) and *Science Digest* (Bowser and Engel, 1982; Engel, 1982) published feature articles accompanied by dramatic field photographs from inside the burial caves, on horseback in the statue quarry (Figure 1.3) and in the field laboratory (Figure 1.4). Perhaps the most significant of these media releases to me personally was one that I encountered at home back in Wyoming after work one evening. My sixth-grade son came home after school and said, "Look Dad here's a picture of you on the front page of our *Weekly Reader*!" (see Figure 1.5). Following this burst of enthusiasm by the national and international media, the granting agencies, and others, came a long and slow (but very important) period of meticulous osteological data collection. This work, so important to extracting the vital information from the skeletons, is much less well understood by the media (and public) and also by the granting agencies. So, subsequent support for the project work came not from large

Table 1.1 Major burial sites excavated by the 1981 Easter Island Expedition

*Location	Site no.	Site name	Obsidian hydration dates AD
West coast	8–374	Ahu Kihi Kihi Rau Mea	1334 ± 76 to 1628 ± 56 (total of 5 dates)
Northeast coast	31–1	Ahu Mahatua	
	31–5	Mahatua Cave 5	1037 ± 93 and 1850 ± 32
	31–6	Mahatua Cave 6	
South coast	12–468	Ana Mahiha	1273 ± 81 to 1798 ± 40 (total of 8 dates)
	12–469	Oroi Cave 469	
	12–471a	Oroi Cave 471a	1149 ± 88 to 1775 ± 43 (total of 3 dates)
	12–472a	Oroi Cave 472a	1305 ± 80 to 1763 ± 44 (total of 3 dates)
	12–472b	Oroi Cave 472b	
	12–474	Oroi Cave 474	
	13–6	Koe Hoko Cave	1422 ± 72 to 1787 ± 41 (total of 11 dates)
	+ 14–21a	Ahu One Makihi	
	+ 14–22	One Makihi Crevice	
Southwest coast	7–220	Ahu Onero	1440 ± 70 to 1867 ± 30 (total of 16 dates)
	7–148	Akahanga Karava	1554 ± 62
	Φ 7–598	Akahanga Cave	1320 ± 79 and 1577 ± 61

* All sites listed here from the West coast, Northeast coast, and Southwest coast (except one, designated Φ) are described in full within the archaeological site reports of Seelenfreund (2000). All sites from the South coast (except two, designated +) plus one additional site from the Southwest coast (designated Φ) are described in full within the archaeological site reports of Shaw (2000a). + Burial records but no published site reports exist for these two closely associated South coast sites. Φ Reported by Shaw (2000a).

granting agencies, but as will be seen below, from a series of smaller grants. There has also been much less media attention on the project since the field phase. It seems that everyone understands the importance of archaeological exploration and recovery, but few seem to understand the importance of the systematic data collection and analysis which follow.

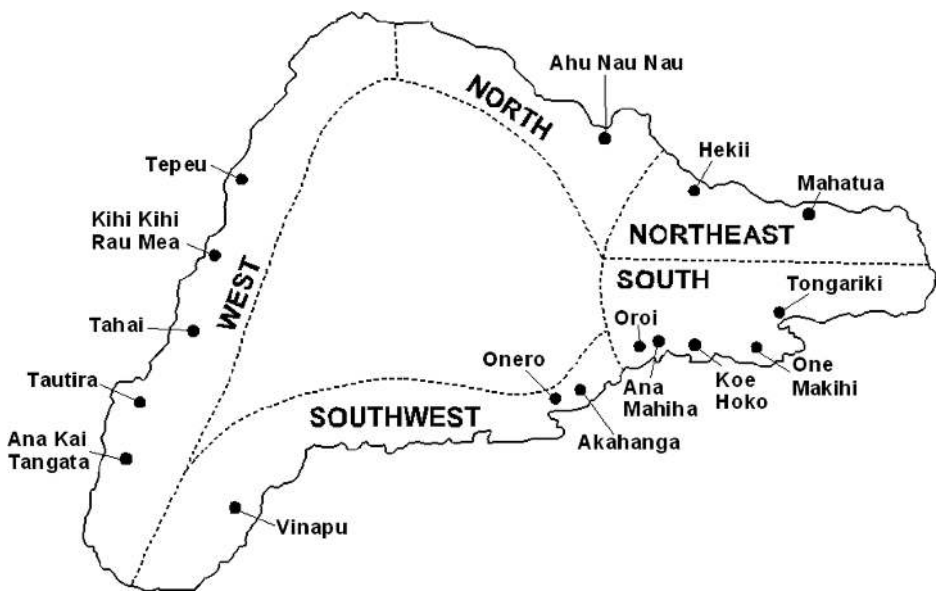

Figure 1.1 Map of Easter Island showing all major burial sites.

(a)

Figure 1.2 Burials within the coastal cave site of Koe Hoko (a), and burials within an *ahu* chamber (*avanga*) at Ahu Mahatua (b).

(b)

Figure 1.2 (*cont.*)

Additional burial sites (see Table 1.2) from the earlier work of the Norwegian Expedition and Rapu's field work, as well as post-1981 projects at Ahu Tautira and Ahu Tongariki, have provided well-documented skeletons as well. These have been added to the Human Remains Master List of the 1981 Easter Island Expedition and/or subsequent databases that have also contributed to research featured within this volume.

Skeletal biology research

The initial sample size of skeletons from the 1981 expedition was 426 individuals. These have been from the beginning of the project curated and housed on Easter

Figure 1.3 One of the popular field photographs during the "media blitz" following the 1981 field season: Gill on "Pisco" the project horse. (Photography by Chod Harris.)

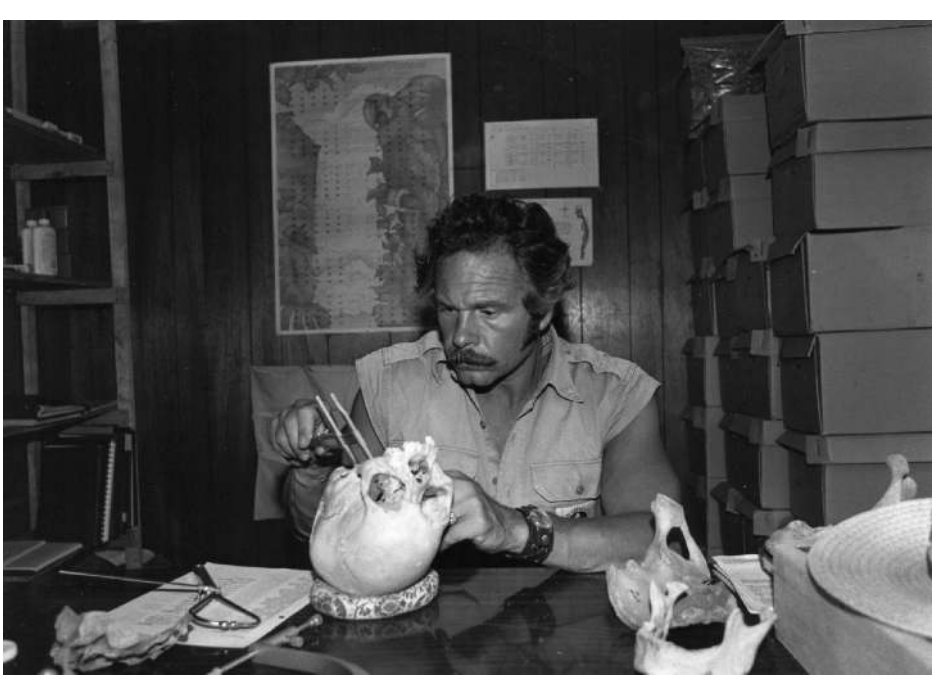

Figure 1.4 One of the few laboratory photographs utilized by the media following the 1981 field season: Gill in the field laboratory. (Photography by Chod Harris.)

Figure 1.5 This image (Gill at Koe Hoko burial cave) was taken by National Geographic Society for their worldwide news release immediately following the field season.

Island at the Sebastian Englert Museum of Anthropology (MAPSE). This arrangement was made between the three co-principal investigators of our project and Chilean officials in Santiago before the 1981 work began. This total does not include the human remains collected later from the Tongariki site restoration. They are currently maintained in a separate collection since they were recovered and curated under separate contract, but are also housed at the Sebastian Englert Museum. The total also does not include the 33 skeletons collected by the Norwegian Expedition. These are housed at the National Museum of Natural History in Santiago, Chile, and were studied there by our human osteology team (Baker and Gill) at the end of the 1981 field season. Before those data could be added to our database, however, some

Table 1.2 Additional burial sites that yielded skeletons of value to studies within this volume

*Location	Site no.	Site name	Excavation history
West coast		Ahu Tepeu	Norwegian Exp. 1955–56
		Tahai	Salvage
		Ahu Tautira	199-
North coast		Ahu Nau Nau	Rapu & Haoa 1978
Northeast coast		Ahu Hekii	Norwegian Exp. 1955–56
South coast		Ahu Tongariki	Japanese-Chilean Proj-1992–93
Southwest coast		Ahu Vinapu	Norwegian Exp. 1955–56
		Ahu Akahanga	Rapu & Gill 1979

* All sites listed here that were excavated by the Norwegian Expedition of 1955–56 have been published in full (Heyerdahl and Ferdon, 1961). Published reports on the human remains from those sites are also available in Murrill (1965, 1968). Burial records, notes, and photographs exist for the other sites but not published reports.

adjustments to Murrill's original skeletal assessments had to be made. We found Murrill's craniometrics to be quite accurate, but the sexing of six of the large females was in error. The placement of those six females within his male sample affected greatly his conclusions as to cranial size (significantly reducing the cranial dimensions for both the male and the female adult samples). This in turn also adversely affected the interpretation of relationships to other Polynesian populations. Baker and I have published corrections to these classifications (Baker and Gill, 1997) which have allowed subsequent researchers to correctly utilize the Murrill data.

A quite adequate field osteology laboratory was established on Easter Island in 1981, which ran concurrently with field recovery operations. Some curation of the skeletal remains was carried out, as well as osteometric data collection, photography, and radiographic analysis. These procedures are described in various reports (e.g., Gill, 1986; Gill and Owsley, 1993). On a return trip to Rapa Nui in 1987, Douglas Owsley and Robert Mann of the Smithsonian Institution joined the team and assisted greatly in making more detailed assessments of skeletal pathology, which were entered on forms appropriate for computerized data analysis. That field osteology effort was funded by the Smithsonian Institution and the Kon-Tiki Museum in Oslo, Norway. A small University of Wyoming team made a return trip in 1989 to carry out further curation activities such as the application of bone preservative, reboxing of specimens (due to cockroach damage), and the construction of new shelving. That work and the production of cranial casts and facial reconstructions for the museum was supported by World Monuments Fund. Sharon A. Long, facial reconstruction artist, University of Wyoming, produced the casts and "living faces" for the museum.