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Special Contribution

Selection of Kumejima for the Okinawa DSW Project

Results of a 1995 visit to the Natural Energy Laboratory of Hawai'i
by Okinawa Governor Masahide Ota
Prepared for presentation 29 September 2018 at the 9th Annual Ocean Energy and
Economic Development Symposium and Workshop, Kumejima[1]

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Abstract

In July, 1995, Okinawa Prefecture Governor Masahide Ota visited the Natural Energy Laboratory of Hawai'i in Kailua-Kona. In August, Gov. Ota invited the author to travel to Okinawa to help select a site for an Okinawan Deep Seawater Laboratory similar to the one in Hawai'i. The author travelled to Okinawa and, during a 4-day visit, was guided around Okinawa and Kume islands by a team of prefectural planning department officials and local officials from the sites visited. The team established criteria for site selection and, based on bathymetric and elevation data combined with evaluation of access logistics, determined that the site information, determined that the Maja site on Kumejima was the only suitable site of those evaluated for a deep seawater laboratory with adjacent low-elevation space available for Aquaculture and agriculture.

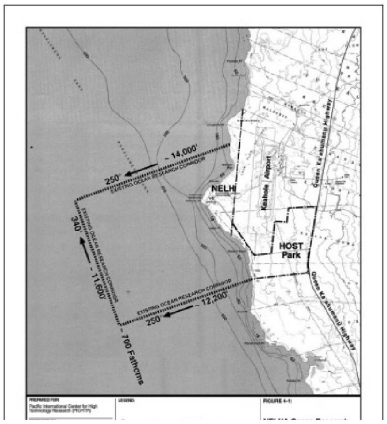
The Natural Energy Laboratory of Hawai'i Authority (NELHA) was founded as the Natural Energy Laboratory of Hawai'i in 1974 by the Hawai'i State Legislature[2].

The legislation was written by Dr. John P. Craven, deep seawater utilization visionary and marine affairs advisor to State Governor John A. Burns. The law was passed by the legislature and signed by Gov. Burns just before he died.

Initial experimentation began nearshore in 1977, when Jan War, now NELHA Operations Manager, started work as a diver/researcher at the site.

Mini-OTEC—the world's first floating OTEC net power plant—operated in the NELH Offshore Research Corridor in late 1979[3].

The access road and first buildings were completed,



and the first DSW pipeline (30 cm diameter, 600 m intake depth, HDPE) was installed in late 1981.

The new "Laboratory Director", Dr. Tom Daniel, joined NELH in Jun 1982, and the first deep seawater was

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1 The 9th OEEDSW was cancelled by the Okinawa Prefectural Government because of the approach of Super-Typhoon Trami (#24). This presentation was made instead on 26 September 2018 at the 8th International Ocean Energy Symposium at the Okinawa Institute of Science and Technology, Onna, Okinawa

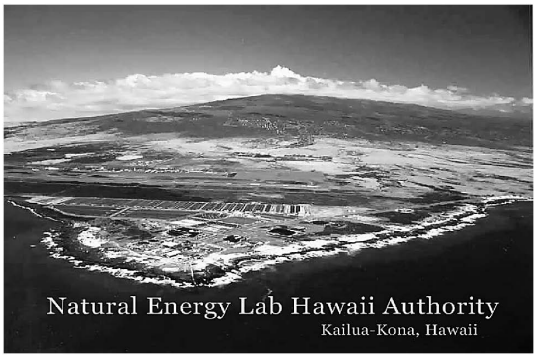
2 http://oeqc2.doh.hawaii.gov/EA_EIS_Archive/1976-08-DD-HA-DEIS-Natural-Energy-Lab-Keahole-Pt-Phase-I.pdf

3 L. Owens, William & C. Trimble, Lloyd. (1981). Mini-OTEC Operational Results. Journal of Solar Energy Engineering-transactions of The Asme—J SOL ENERGY ENG. 103. 10.1115/1.3266245.

pumped ashore in August of 1982— and had flowed continuously ever since!

New 45 cm and 1.02 m diameter pipelines were installed to 600 m depth in 1987, and the Hawai'i Ocean Science and Technology (HOST) Park (developed by the state of Hawai'i for commercial development of research begun at NELH) began installing new infrastructure in 1986.

NELH and HOST Park were combined into a new State agency, NELHA, in 1990.



Aerial View of NELHA, ～1991

NELHA and Japan

Many Japanese researchers visited NELH after Dr. Tom Daniel became Laboratory Director in 1982. Most memorable were Takayoshi (Ted) Toyota and Dr. Toshimitsu "Tommy" Nakashima from JAMSTEC, Drs. Masayuki "Mac" Takahashi, and Hisaaki Maeda, then at U. Tokyo and Prof. Uehara and Dr. Yasayuki Ikegami from Saga U.

Dr. Daniel, then Scientific/Technical Director of NELHA, along with Dr. Paul Yuen, University of Hawai'i Dean of Engineering, and leading French OTEC researcher, Mr. Michel Gauthier, visited Japan in 1990 as guests of the MITI and STA. Itinerary included the newly constructed Kochi DSW pipeline and laboratory, the Toyama Bay "Hoyo" offshore upwelling platform and multiple aquaculture facilities throughout Honshu and Shinkoku.

Hosts included friends from earlier NELHA visits, "Ted" Toyota, "Tommy" Nakashima, "Mac" Takahashi, Dr. Shigeru Arai and several others.

I have many "meishi" from these and subsequent visits to NELHA and my visits to Japan. I'm happy to share them and receive help with translations!

NELHA and Okinawa

Delegations of researchers and Industry/commerce people from Okinawa visited NELHA in Feb 1991 and in Feb, Oct and Nov 1994.

I did not recall these visits until preparing this talk and reviewing "meishi" that I had collected and dated during those years!☺

Governor Ota NELHA Visit, 1 August 1995

Dr. Daniel, the acting Executive Director of NELHA, was on the US mainland, so Governor Ota was shown around the laboratory by Operations Manager, Jan War, Public Affairs Specialist, Adrianne Greenlees and Dr. John Craven, founder of NELHA.

He was apparently very impressed, and determined that a similar facility should be established in Okinawa.

Invitation to Join Site Selection Mission to Okinawa

Dr. Daniel returned to NELHA on Friday, 4 August 1995 and, within hours of his arrival, received a phone call from Governor Ota's office inviting him to participate in an Okinawa Deep Seawater Laboratory site selection team.

He was told that tickets awaited him at Honolulu airport to fly to Naha on Sunday August 6!

Due to his recent return from travel, he asked that the trip be postponed.

Travel to Okinawa

Dr. Daniel flew from Honolulu on Sunday, 13 Aug 1995 to Naha via Osaka, arriving Naha on Monday evening, 14 Aug (JST). He was met by a delegation from the Prefectural Cabinet and taken to the August Inn, immediately across from the Prefectural Office building.

Okinawa prefectural assembly building
Photos by T. Daniel, 15 Aug 1995

Meeting with Gov. Masahide Ota, Tuesday Morning, 15 Aug 1995

Chihiro Tominaga San, was my technical host for the whole visit. He was at the Okinawa Tokyo Office, but had returned to Naha at Gov Ota's request to help guide me around. With a recent graduation from the University of Washington, I recall, he was uniquely qualified to help as translator and technical liaison. Until that meeting on 15 August, I had thought that other "experts" would be involved.

Gov. Ota said that the Site Selection team would include only Dr. Daniel and a team of prefectural officials who would accompany him on a tour of possible sites in Okinawa Prefecture:

Okinawa DSW Site Selection Team Commissioned by Gov. Ota 15–18 August 1995

- Thomas Daniel, Actg. Exec. Dir, NELHA

(From the left) Shimoji, Sunagawa, Sakiyama, Taira, Kugai

(Back, from the left) Taira, Uehara, Yonahara, Sunagawa, Daniel, Tominaga, (Front, from the left) Kugai, Shimoji

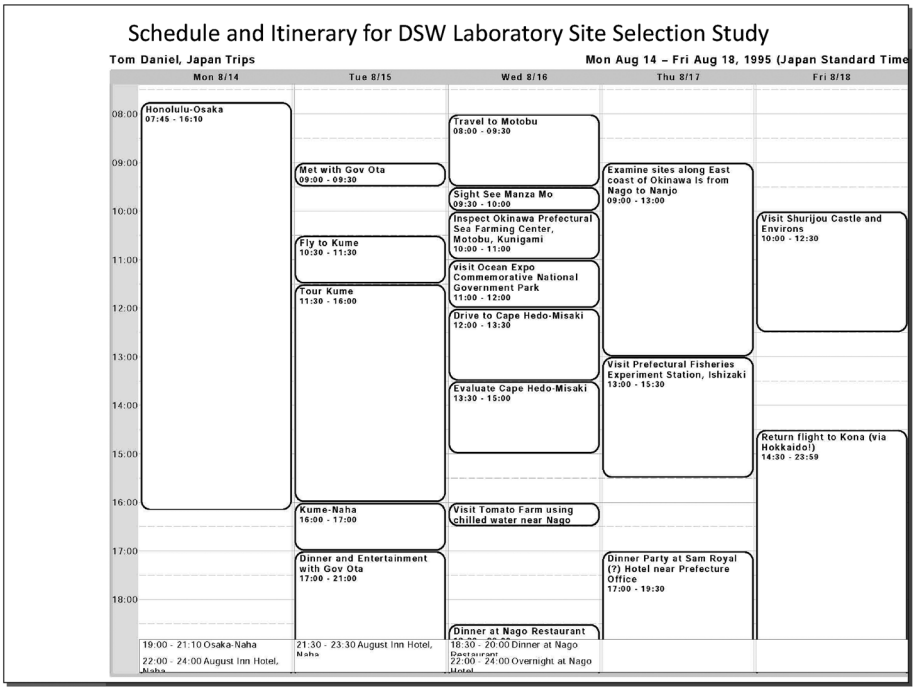
- Hisaro Yonahara, Ex. Dir. Planning Div, OPG
- Toshihiko Shimoji, Dep. Advisor, Planning Div, OPG
- Junichiro Kugai, Advisor, Planning Div, OPG
- Testu Taira, Tropical Techno Ctr.
- Chihiro Tominaga, Diet Liaison, OPG

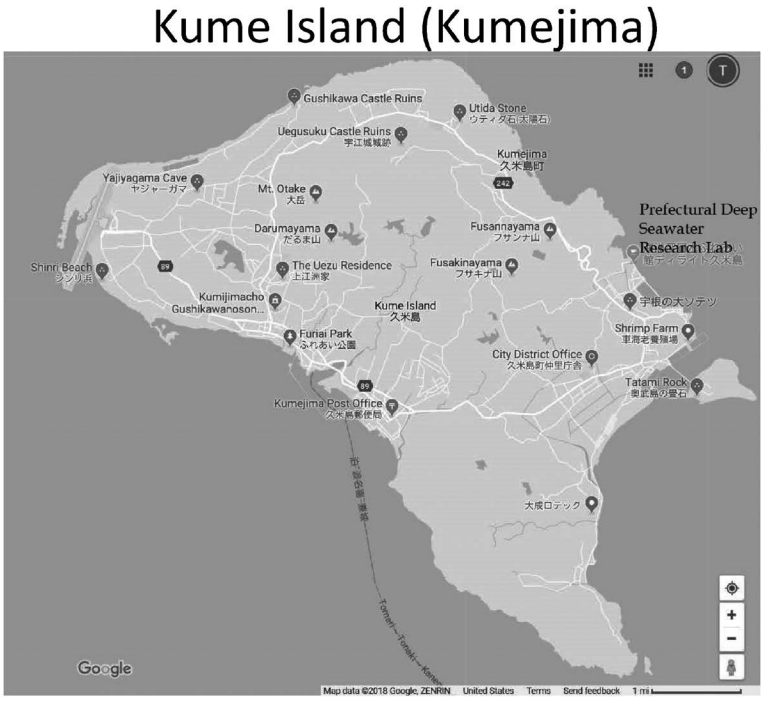
・Kunishige Sakiyama, Tropical Techno Center
・Saori Sunagawa, Fisheries Div, OPG—Translator

Deep Seawater Laboratory Site Selection Criteria —Developed at initial 15 Aug 95 meeting with Gov. Ota

・Steep offshore slope—to allow nearshore access to cold deep seawater
・Level land—at least multiple hectares - near sea level for development of aquaculture and cold water agriculture, e.g. spinach
・Well-developed transportation and access for initial construction and future growth of the facility.

These criteria had not been previously discussed, due to the hurried initiation of the site selection trip. I





learned during this meeting that one of the goals for utilizing deep ocean water resources was to grow spinach in the summertime, when scarcity drove its price very high. I don't know whether that project was ever pursued, but it was an economic incentive for seeking sea-level land.

Here is a Google Calendar summarizing the Itinerary for Dr. Daniel's 1995 Okinawa trip.

Kumejima Visit

Immediately after meeting with the Governor, we (Tominaga San, Yonahara San, Shimoji San, Kugai San, Sunagawa San and I) flew to Kumejima to begin our site inspection study there.

I did not learn the correct names for the sites on Kumejima. I've "guessed" at the site names based on current tourist maps.

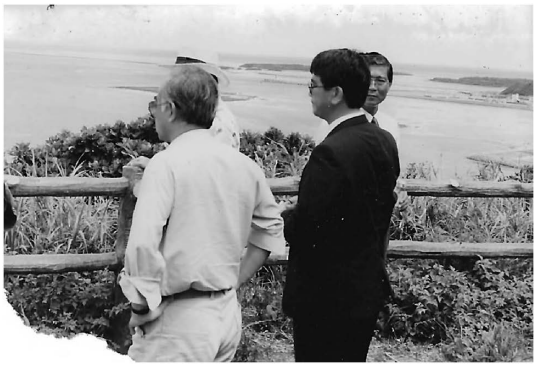
Above Site 2

Returning from Gushikawa Castle Ruin

Looking NE to Miifuga Rock from Site 2 Vantage Point

Above Hiyajo, Looking NNW

Reviewing Bathymetry Charts at Maja Site



Above Kumejima Site 4: The Selected "Maja" Site

Visit Kumejima Tourist Sites after site survey completion

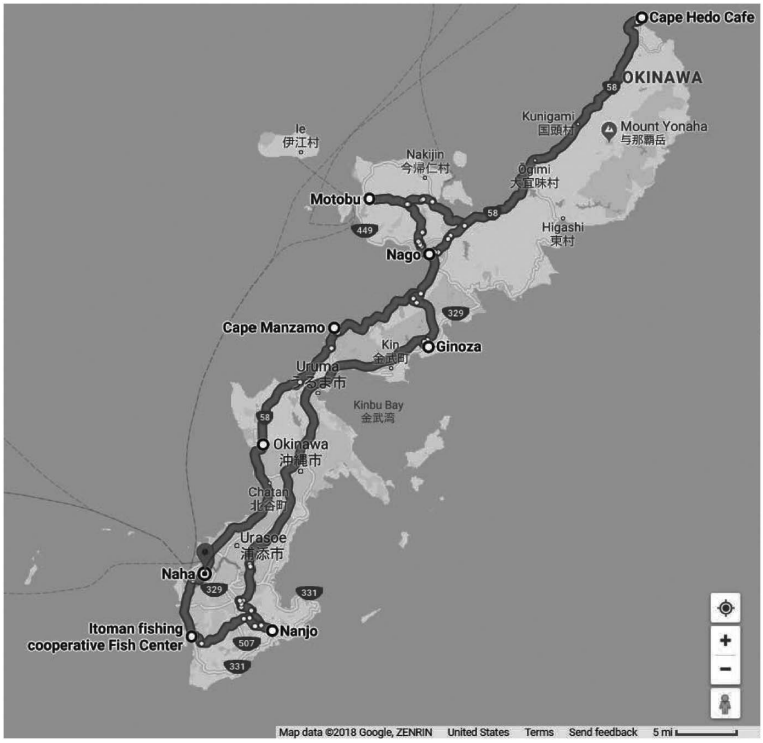
At Tatami Stones

At Goedano Matsu Pine Tree

15 Aug 1995: Dinner with Gov. Ota in Naha

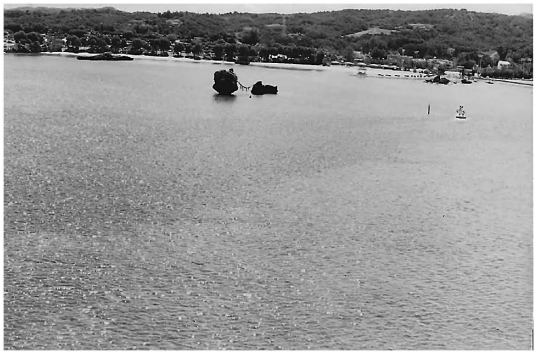
I was very honored by this presentation of music, dances and costumes which Gov. Ota was proud of having recently re-discovered from pre-Japanese Ryukyu culture. The similarities to the 1970s revival of Hawaiian culture, similarly suppressed since the overthrow of the Hawaiian Kingdom in 1893, were striking!

Following the dinner and cultural presentation, Gov. Ota insisted that I meet the lead dancer.



Route traveled by Site Selection Team: 16–17 Aug 1995. The night of 16 Aug was enjoyed at a Nago Hotel.

16 Aug 95 AM: Visit Cape Manzamo



Pref. Sea Farming Center (Motobucho)

Visit Ocean Expo Commemorative Park—Aquarium, Tropical Arboretum

Inspect Cape Hedomisaki Site

Interpreter Sunagawa San at Cape Hedo Marker

Prefecture Van at Cape Hedo Cafe

Discussing Bathymetric Charts in Cape Hedo Cafe

Visiting Chilled-Water Tomato Facility on Return to Nago

Night of 16 August at Nago Hotel

Friendly Waitresses at Nago Restaurant

Morning (17 Augurst) View from Nago Hotel Room

17 Aug. AM: Travel Down E. Coast to Pref. Fisheries Experiment Station, Itoman

Review Programs in PFESO Office

Site Selection Team with Itoman PFES Staff

17 Aug—Farewell Party at Naha Hotel

18 Aug—Shuri Castle Tour

18 Aug—Study Wrapup Meeting

And . . . Fly back to Hawai‘i

Study Conclusions

- Few sites had suitable steep slope offshore–pipeline lengths would have been excessive at all sites other than Cape Hedo and the western side of Kumejima.
- Logistical access was relatively good for all sites other than Cape Hedo and Kumejima.
- Cape Hedo has insufficient land near sea level for developing commercial agriculture or aquaculture—pumping costs would be excessive
- Though logistical access would have to be developed.

The Maja site on Kumejima was the only site reviewed that had sufficiently steep offshore bathymetry AND adequate available low-elevation developable land onshore.

Okinawa Prefecture Follow-up

- Governor Ota and his team quickly secured funding and began design and construction of the facility.
- The pipelines were installed and many projects were operational when I was invited to visit Kumejima again in 2000.
- In my opinion, this Kumejima DSW Facility is a lasting tribute to the foresight and effectiveness of Governor Masahide Ota.

References

Maps Modified from: Google Maps
Geographic names from Wikipedia and Google Earth

Photographs by: T. Daniel and Unidentified Prefectural Photographer, August 1995
Information from T. Daniel Notes, August 1995
Thanks to Mr. Chihiro Tominaga and Ms Saori Sunagawa for assistance

In Memory of Governor Masahide Ota (1925–2017)