Press Release

公益財団法人
日本自然保護協会
THE NATURE CONSERVATION SOCIETY OF JAPAN

Revised (Aug15)

New Facts which Came to Light after the Henoko Environmental Impact Assessment

To provide a replacement facility for the Marine Corps Air Station Futenma, onshore construction began at Henoko and Oura Bay on July 1, and a drilling survey is to start in late July. As detailed below, however, new facts have come to light since the environmental impact assessment, and the Nature Conservation Society of Japan (NACS-J) asks that land reclamation be halted and that Henoko and Oura Bay be preserved.

Introduction

Among the items to be presented here are: (1) We have received the results of a survey by 'Team Zan of the Association to Protect Northernmost Dugong '(below, "Team Zan"), and examined them in combination with NACS-J findings, which include results from our own studies conducted since the early 2000s. (2) We received photographs from crustacean researcher Mr. Yoshihisa Fujita (University of the Ryukyus, Marine Learning Center), showed them to Dr. Kensaku Urata (who specializes in karst systems and speleology, and is vice-president of the Speleological Society of Japan) and Dr. Ryuji Asami (University of the Ryukyus, Department of Physics and Earth Sciences, Geoscience Section), and received comments on them. (3)We received materials prepared and information gathered by Diving Team Snack Snufkin, and combined them with studies conducted and information gathered by NACS-J. (4) NACS-J conducted an analysis based on Application for Okinawa prefectural government's Land Reclamation Permit Approval submitted to Okinawa Prefecture by the Okinawa Defense Bureau. We decided to release these four items because they all have a connection to the rich diversity of Henoko and Oura Bay, which are jeopardized by the project to build a replacement facility for Futenma Air Station.

1) In just two months, at least 150 new dugong feeding trails were found.

After 2005 there few dugong feeding trails were recorded in Henoko and Oura Bay, and for that reason the EIA predicted little dugong use of this marine area. But since 2009 dugongs have started using this area again, with the frequency of use rising dramatically in three years. This year at least 150 feeding trails were found within the planned reclamation zone by surveys in just two months.

2) Japan's first stalactites with coral gravel have been discovered.

A cave on Nagashima, an island offshore from Henoko where local people go for recreation, has been found to be a limestone cave of very great scientific value. This is the first report in Japan of stalactites that have grown with coral gravel adhering to them.

3) There are continuing discoveries of new species, and the first recorded findings of certain species in Japan.

Although we know from the EIA study conducted by the implementer that this marine area is rich in biodiversity and is habitat for many endangered species, even after EIA completion, research in multiple fields has continued to discover new species, and to find the first appearance of certain species in Japan.

4) Environmental impacts by this project which became known after EIA completion.

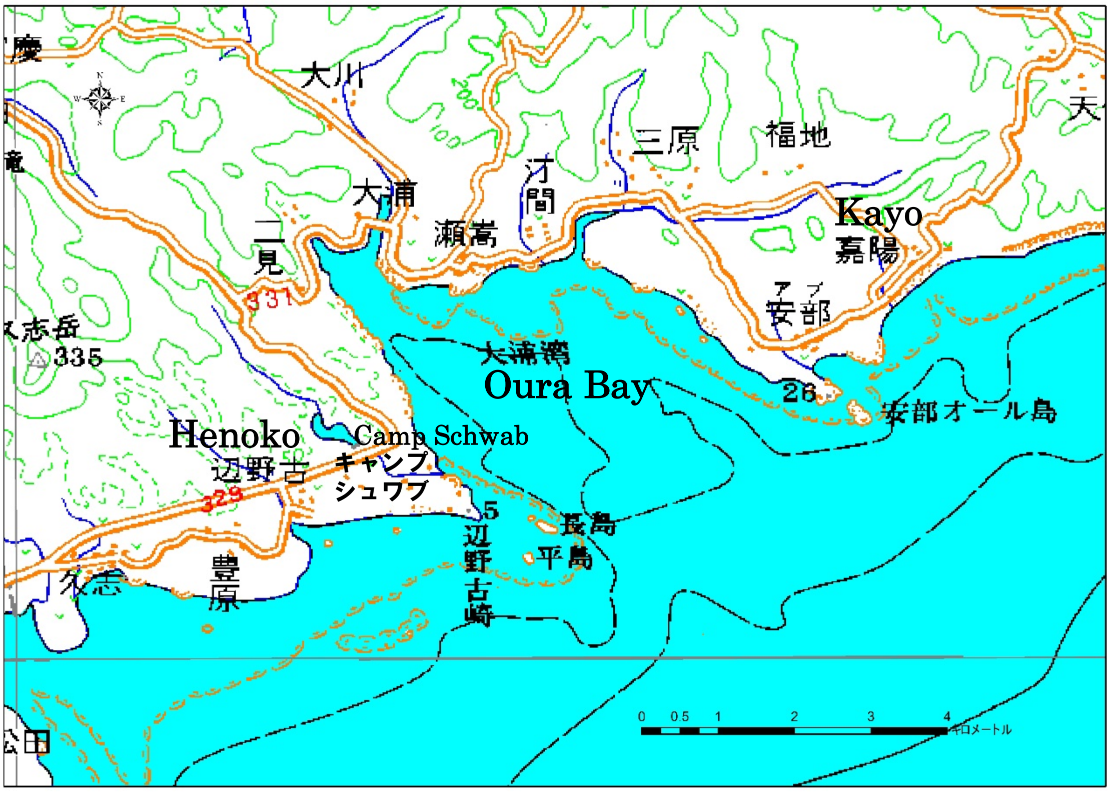
There were many instances of information concealment and delayed disclosure in the EIA process, and it was found that in the public waters reclamation procedures as well, there were some possible environment-altering changes not anticipated or assessed, such as the considerable enlargement of structures.

(press release presenter)
Dr Akira Kameyama, Director, NACS-J
Dr Mariko Abe, chief, Conservation unit, Conservation and Research division,

For more info:
The Nature Conservation Society of Japan Conservation and Research division
http://www.nacsj.or.jp/english/index.html
E-mail:abe@nacsj.or.jp
Tel:81-3-3553-4103,fax:81-3-3553-0139

The Nature Conservation Society of Japan (NACS-J) was established in 1951, and have 21,000 supporters. The aims of our activities are to survey theprinciple of Nature and to explore a strategic perspective how to prevent the wildlife crisis and to ensure the sustainability of natural resources. We have been very much interested in promoting the conservation movement.
Our recent outcomIt focuses on three main programs, which include promoting scientific study of the environment, providing scientific knowledge to public with emphasis on the importance of the conservation concept, and presenting recommendations to the relevant sectors to establish the healthy relation between people and nature.

Locations of Nago City and Oura Bay on Okinawa Island



Locations of Nago City east coast, Henoko, Oura Bay, and Kayo

1） In just two months, at least 150 new dugong feeding trails were recorded.

(1) State of Past Use by Dugongs of Oura Bay at Henoko (Feeding Trails)

Results of studies on visual dugong sitings and feeding trail discoveries in the 1990s indicate many visual sitings on the east coast (Figure1). Dugongs are herbivores and feed on seagrass. So-called "dugong trenches," ditch-like depressions 1–3 m long, remain where dugongs feed (Figure 2).

Prior to the 2004 EIA drilling survey for the Futenma Air Station Replacement Facility Construction Project, dugong feeding trails were regularly discovered in this marine area on the south side of Cape Henoko (Figure 3). The "Jangusa Watch" (seagrass survey) conducted by NACS-J several times a year has also found feeding trails, and there are records of their discovery in the "Wide-Area Survey of Dugongs and Seagrass Meadows" (2001–2005) conducted by the Environment Ministry, and in the EIA and other environmental surveys conducted by the implementer (Okinawa Defense Bureau, which was formerly the Naha Defense Facilities Administration Agency) from the second half of the 1990s through 2013.

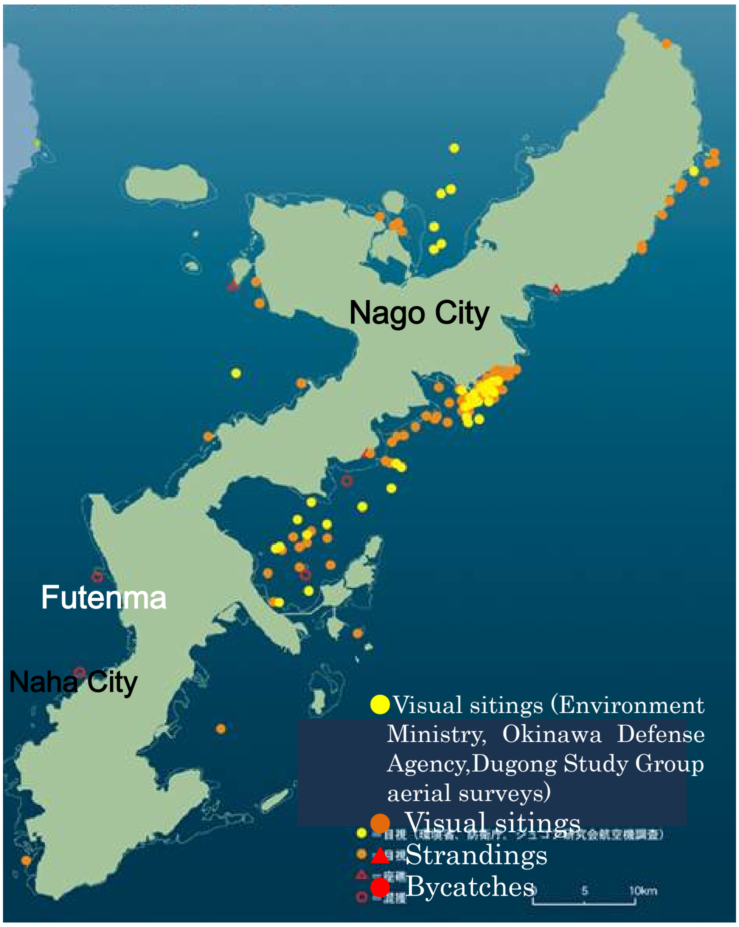


Figure 1. Compilation of dugong visual sitings (1990s).
Prepared by Dugong Network Okinawa.

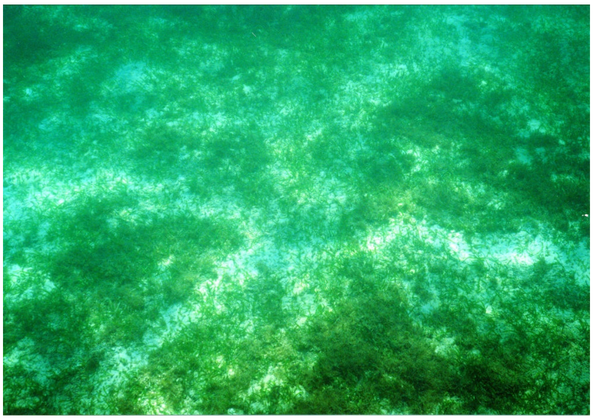


Figure 2. Dugong feeding trails.
Places where dugongs have fed appear as whitish trench-like depressions (1998 photograph by Taro Hosokawa.

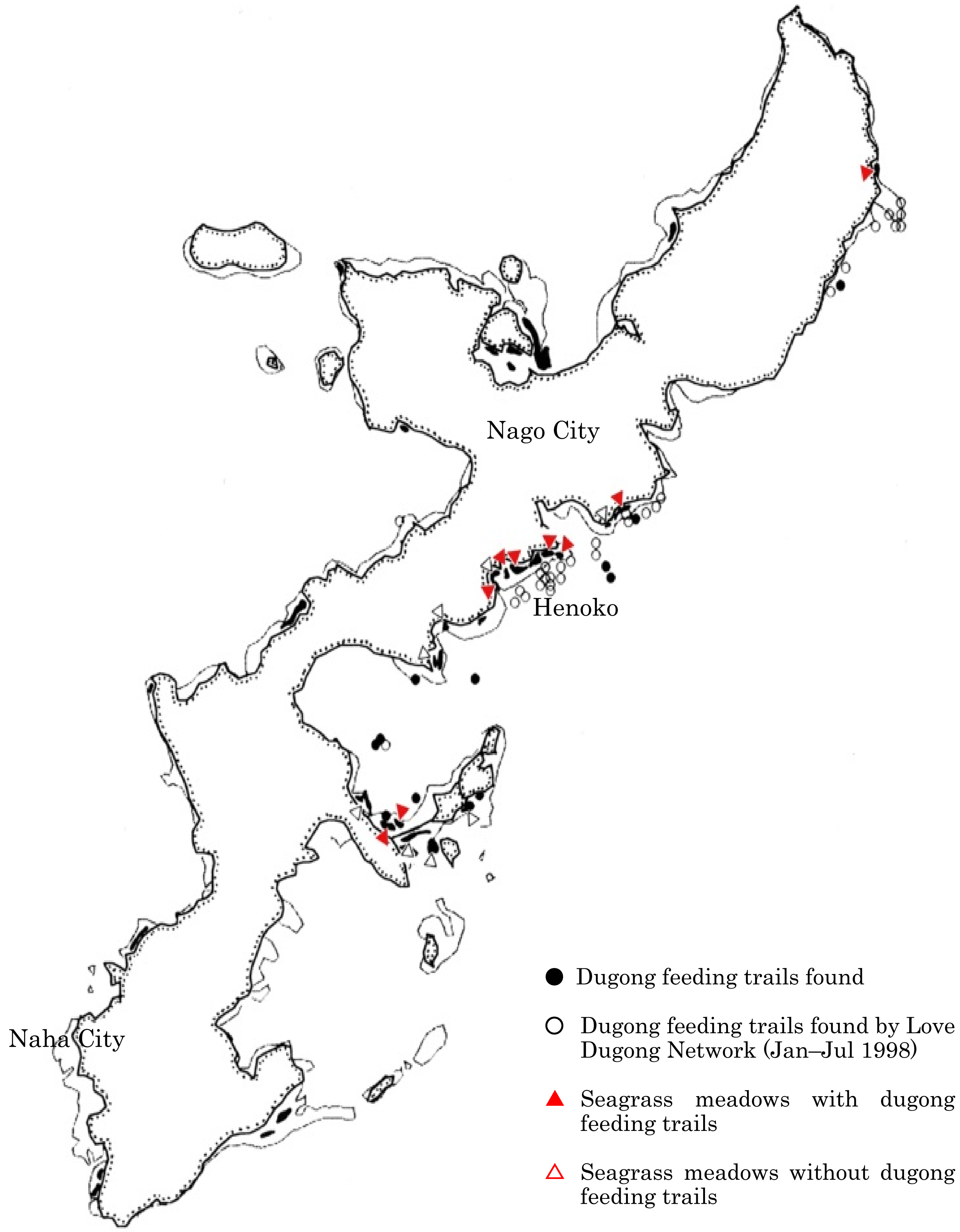


Figure 3. Places where feeding trails were found (1999).

Dugong Study Group (altered version of "Figure 4. Relationships of seagrass meadows, feeding trails, and daytime dugong distribution," from the Report on Achievements under the 8th Term Pro Natura Fund Grant, 1999).

Prior to 2004, dugong feeding trails were regularly found in this area south of Camp Schwab, but as seen in Table 1, they were not found from 2005 through 2008. This is perhaps due to environmental disturbances such as the environmental studies performed for the Futenma Replacement Facility (coastal plan), and the preliminary survey and EIA study started in 2006 for the Futenma Replacement Facility (V plan).

Records show that in this marine area dugongs used the inner recess of Oura Bay and the Camp Schwab side of Oura Bay in 2009, and in 2011 and thereafter the dugongs started frequenting Oura Bay and Henoko (Camp Schwab side of Oura Bay). Use has been frequent especially since 2012. These facts have become apparent from an independent survey by the Okinawa Defense Bureau (Survey of Organisms in the Camp Schwab Marine Area) and discoveries by citizens.

The EIA (December 2012, revised final document) predicted on the basis of survey results up to 2012 that dugongs would make little use of this area.

Table 1. History of dugong feeding trails found in the Oura Bay marine area of Henoko (up to and including 2013).

Year	Feeding trails?	Survey implementers, number of surveys, and other pertinent facts
Up to and incl. 2004	Yes	Many feeding trails found south of Camp Schwab (sources include Environment Ministry, Naha Defense Facilities Administration Agency, Dugong Network Okinawa, Dugong Study Group, and NACS-J). (Geological and drilling surveys for Futenma replacement facility construction started in September 2003. In April 2004 the Naha Defense Facilities Administration Agency started geological and oceanographic phenomena studies in the Henoko marine area.)
2005	No	
2006	No	
2007	No	(2007–2013, including Survey of Organisms in the Camp Schwab Marine Area, and preliminary survey for EIA study)
2008	No	(EIA study for Futenma replacement facility construction project, March 2008 to March 2009)
2009	Yes	Okinawa Defense Bureau records on Camp Schwab side of Oura Bay (western part of the bay).
2010	No	
2011	Yes	May. Okinawa Defense Bureau records on Camp Schwab side of Oura Bay (western part of the bay) and inner recess of bay. June. Records of feeding trails by citizens.
2012	Yes	Records of feeding trails at Henoko side of Oura Bay: 4 in April and 5 in May (Okinawa Defense Bureau survey).
2013	Yes	March. Citizen record of feeding trails in Oura Bay (at the great depth of 19.6 m, near a blue coral community in a place called “Chiribishi”). According to the Okinawa Defense Bureau, there were discoveries of 5 feeding trails in March, 12 in May, and 2 in November.

(2) Dugong Use in May–July 2014 (Feeding Trails)

A discovery this May greatly changed the perception prevailing until then: Team Zan of the Association to Protect Northernmost Dugong (below, "Team Zan") found dugong feeding trails at the locations shown below during the brief period from May 16 through July 14, 2014.

Most notable is the use of this marine area by dugongs in 2014. Although use by dugongs tended to increase also in the years through 2013, in the approximately two-month survey of 2014, there were so many feeding trails that a survey by a citizens' group with its limited days and manpower could not accurately count them all. This stands in contrast to the previous rate of a single discovery and several to a dozen or so trails in several months (Table 2).

What is more, dugongs are using a broad area ranging from the inner recess of Oura Bay to Sedake, near land (Oura Bay), to the Camp Schwab side of the bay. In terms of water depth, dugongs seem to have formerly used only shallow zones but this survey found they are also using seagrass meadows in a deep zone of 19.6 m.

In sum, in particular the Camp Schwab side of Oura Bay, in other words the area to be directly reclaimed when building the Futenma replacement facility, is most used by dugongs.

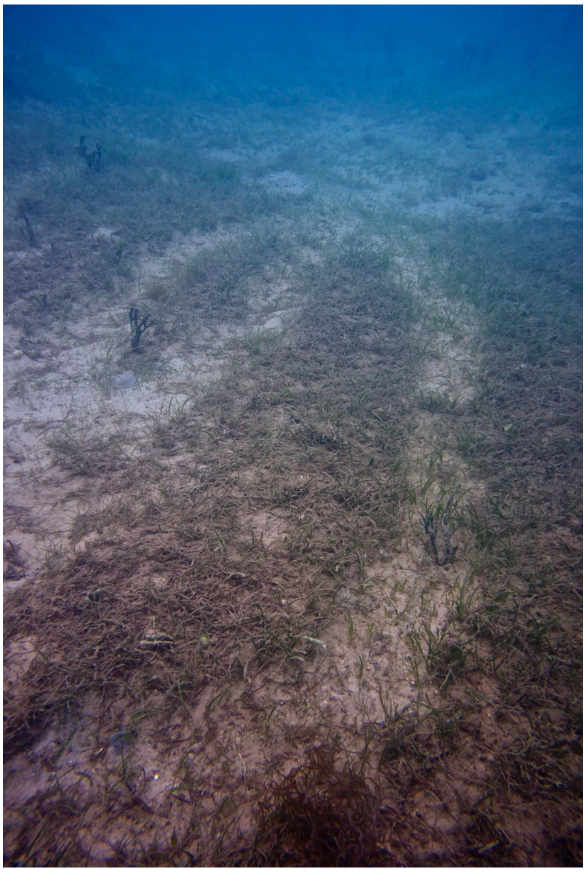


Figure 4. Feeding trails found in 2014.
Places where dugongs fed on seagrass are whitish and trench-like.
June 18, 2014, Camp Schwab side of Oura Bay (mouth of Mija River)
Photo courtesy of Team Zan.

Table 2. Record of dugong use of Oura Bay at Henoko in 2014 (Team Zan).

Survey date	Location	No. of trails	Discovered by
June 3	closed off section of Oura Bay	7	Team Zan
July 1	closed off section of Oura Bay	9	Team Zan
June 3	Sedake	Discovered only	Shigeru Fukusato
June 5	Sedake	8	Team Zan
May 16	Schwab side of Oura Bay (mouth of Mija River)	About 30	Team Zan
May 21	Schwab side of Oura Bay (inside the V)	About 30	Team Zan
June 1	Schwab side of Oura Bay (mouth of Mija River)	3	Team Zan, NACS-J, and others
June 3	closed off section of Oura Bay	7	Team Zan
June 18	Schwab side of Oura Bay (mouth of Mija River)	About 50	Team Zan
June 22	Schwab side of Oura Bay (mouth of Mija River)	Not counted	Team Zan , QAB, Okinawa Times
July 5	Schwab side of Oura Bay (mouth of Mija River)	About 30	Team Zan
July 14	Schwab side of Oura Bay (mouth of Mija River)	8	Team Zan, NACS-J

Figure 5. Locations where dugong feeding trails were found (May 16 to August 22).

Figure 6. Detail from Figure 5 of Oura Bay inner recess, no. 1

Figure 7. Detail from Figure 5 of Oura Bay inner recess, no. 2.

Figure 8. Detail from Figure 5 of Camp Schwab.

Figure 9. Detail from Figure 8 of Mija River mouth, July 5, 2014.

Currently it is confirmed that three dugongs live near Okinawa Island, and they have been named Individual A, Individual B, and Individual C (Okinawa Defense Bureau, 2009). It is known that individuals A and C regularly use the seagrass meadow at Kayo, in the northern part of Henoko waters, and that Individual C occasionally goes to Henoko's Oura Bay (Okinawa Defense Bureau, 2009).

The "Revised Environmental Impact Statement for the Project to Build a Futenma Air Station Replacement Facility" states, "Individual C likely has a broad activity range, mainly using the seagrass meadow in the Kayo area; presumably the possibility is small that it uses the seagrass meadow offshore from the Henoko area." However, these recent survey results show that dugongs are obviously using the marine area frequently.

Although Kayo also has a seagrass meadow, owing to its small 8-ha size, it is likely that the young Individual C has expanded its habitat to this marine area in search of a larger meadow. Henoko's seagrass meadow is the largest of those around Okinawa Island, with a size of 173 ha.

The ecology of Okinawa's dugongs is still not understood. Dugong conservation is impossible with the environmental conservation provisions to be implemented for this project. The project should be immediately cancelled, and the dugong, which is a natural monument of Japan and an endangered species of type IA (CR, or critically endangered, according to the Ministry of Environment Red List), should be protected.

Excerpts from the "Revised Environmental Impact Statement for the Project to Build a Futenma Air Station Replacement Facility"

Item	Text (underlining by NACS-J)
6-16-200 b) Possibility that dugongs will use the Henoko area seagrass meadow in the future	Judging from past surveys, Individual A, which is always offshore from Kayo, will likely continue feeding there, with no possibility that it will use the meadow facing Henoko, absent any significant change in the Kayo area seagrass meadow. Since 2004 Individual B has consistently used the waters off Kouri Island as its main habitat. From this it is anticipated that it will continue feeding at the seagrass meadow there. Meanwhile, in 2009 Individual C came to be observed only along the east coast of Okinawa Island, mainly in the Kayo area, and therefore the feeding trails found in seagrass meadows in the Henoko area (west part of Oura Bay) and in the bay's inner part in 2009 are likely those of Individual C. Although Individual C's activity range is likely broad, it seems that it mainly uses the Kayo seagrass meadow, and it is seen as highly unlikely that it will use the meadow facing Henoko.
6-16-209 All individuals (see Fig. 6.16.1.86) Individual C (see Fig. 6.16.1.89)	• Large differences were found in the frequency and distribution of dugong use of the marine area around the project zone. Dugongs frequently use the Abu-Kayo offshore area, which comprises mainly the range from 1.5 km SSE of Cape Abu to 2 km E of Cape Gimi. It was shown that overall, dugongs mainly use the marine area facing Kayo. • The area around Kouri Island closely coincides with the area used by Individual B. • In the marine area for base construction, dugongs have been observed swimming along the outer edge of the reef about 1 km offshore in the range extending from northeast of Cape Ban (Cape Teniya) through Cape Abu and to the east side of Oura Bay. • The area used by the unknown individual within the marine area for base construction (see Figure 6.16.1.90) coincides roughly with the location of Individual C.
6-16-259 (3) Prediction 1) Loss of Sea Area (a) Reduction of Dugong Habitat	Field surveys show that Individual A, which inhabits the marine area for base construction, is almost always offshore from Kayo, and has not been found in the construction area. One of the two dugongs seen near Kouri Island (Individual C) has been sighted in Kayo waters and Oura Bay since 2008, but its activity range extends to the eastern part of Oura Bay, and therefore it is expected that loss of sea area due to base facilities will hardly reduce dugong habitat.
6-16-259 (b) Reduction of Feeding Grounds	The feeding site of Individual A, which is always in the project area vicinity, is thought to be the seagrass meadow off Kayo, east of Cape Gimi. Judging by the feeding trails found, Individual C seems to be using mainly the seagrass meadow off Kayo when inhabiting Kayo waters, but because Individual C has a broad activity range, feeding trails found in Oura Bay seagrass meadows are thought to be those of Individual C. As such, it is conceivable that seagrass meadow reduction due to base facilities could lead to reduced dugong feeding grounds. To mitigate this impact as much as possible, environmental conservation measures will be taken to expand the seagrass meadow growth range. Feeding trails were found in the seagrass meadow off Henoko in the past, but judging by the present activity range and use of feeding grounds in the project area vicinity, it seems there is little possibility that dugongs will go to feed at the seagrass meadow off Henoko.
6-16-259 2) Changes in Currents, Waves, and Water Quality	Predicted changes in waves, currents, and water quality are that such changes occurring because of base facilities will be observed in the replacement facility vicinity, but that changes will not occur within the distribution range of the seagrass meadow off Kayo, which dugongs use as a feeding ground. Therefore it is thought that changes in waves, currents, and water quality due to the facilities will hardly change the growth environment for the seagrass meadows that feed the dugongs, or affect the dugongs' habitat.
3) Appearance of Marine Structures	Individual A, which is always in the project area vicinity, has not been found to live in the place where the reclaimed land, approach lights, and fuel jetty are to be located. But Individual C has a broad activity range, and in the project area vicinity it has been sighted in a range extending from the Cape Teniya area to the east part of Oura Bay. It is thought that feeding trails found in Oura Bay seagrass meadows are possibly those of Individual C. Based on the sighted locations of Individual C in Oura Bay according to habitat surveys, it seems

	possible that Individual C uses the east part of Oura Bay as its main migration route, but because feeding trails believed to be those of Individual C have been found in the bay's west part, a follow-up survey will be conducted to look for changes in Individual C's activity range by the reclaimed land and installation of approach lights and fuel jetty, and necessary measures will be taken in accordance with the results.
6-16-264 (c) Impacts of aircraft noise on dugongs	Part of the dugongs' habitat range, that from Abu to offshore Kayo, where Individual A is frequently sighted, is outside the flight path. There is thus likely to be little aircraft noise impact on Individual A's daytime activity range, and little impact on dugong travel to and from the coastal zone. But when aircraft land and take off using runway B, they would pass over the seagrass meadow in the shallow area off Kayo, where Individual A feeds. Surveys to date suggest that the feeding ground of the seagrass meadow off Kayo is used mainly at night, but judging by the state of operations at Futenma Air Station, the number of night flights [at the replacement facility] will be few in comparison to such facilities in general.
6-16-268 (b) Impact of low-frequency aircraft sound on dugongs	Because the range where dugongs are frequently sighted in the Kayo offshore area is not in the flight path (see Figure 6.16.2.2.5), it is reasoned that there will be little impact on daytime dugong activity by low-frequency aircraft sound. However, the seagrass meadow in the shallow area off Kayo, which is believed to be used by dugongs at night to feed, would be in the flight path of aircraft using runway B to take off and land. Because night flights are likely to be comparatively few, and because, in view of aircraft speed, the noise will exceed the impact level for only a few seconds, there is only a small possibility that low-frequency aircraft sound will affect dugongs, but because there is no knowledge concerning low-frequency noise impacts on dugongs, a follow-up study will be performed after the facility starts operating to investigate whether there are changes in dugong habitation or how seagrass meadows are used, and necessary measures taken on the basis of findings.
6-16-271 6) Effluent from airfield facilities	According to a simulation of changes in water quality occurring in conjunction with facility operations, it is predicted that effluent-induced water quality changes will occur only near effluent outlets, and likely there will be hardly any water quality change in the seagrass meadow off Kayo, where dugongs feed. Also, feeding trails were found in the seagrass meadow off Henoko in the past, but currently it is thought that there is little possibility that dugongs sighted in the project area vicinity feed in the seagrass meadow off Henoko. It is also predicted that effluent from the facility would have little effect on the seagrass growth environment off Henoko. Accordingly, effluent from the facility would likely have hardly any impact on seagrass meadows where dugongs feed.
6-16-271 7) Nighttime illumination	Individual A, which is always in the project area vicinity, very likely stays in the marine area offshore from Kayo at night. Effects on the Kayo offshore area by light from nighttime facility illumination would conceivably be small in view of topographical conditions, and therefore nighttime facility illumination would presumably bring hardly any change to the habitat of Individual A, which is always in the project area vicinity. On the other hand, Individual C, which has been sighted off Kayo and in Oura Bay since 2008, has a comparatively broad activity range, and in a follow-up survey was observed moving through eastern Oura Bay in the evening, making it conceivable that it would be attracted by the facility's nighttime illumination, and undergoing change in its behavioral ecology. For this reason, a follow-up study will be performed after facility operations start to investigate any changes in dugong habitation and use of seagrass meadows, and necessary measures would be taken based on the findings.
6-16-272 8) Ship traffic	Prediction involved establishing five evaluation points within the range of confirmed dugong habitation, and then predicting the chronological change in underwater acoustic pressure level at each evaluation point when a vessel approaches land. As shown in Figure 6.16.2.2.8, the underwater acoustic pressure level rises as a ship approaches the facility, but is estimated to reach a maximum of 103 dB. Therefore the possibility is small that underwater sounds from ships during facility operation would affect dugongs.
6-16-274 9) Impacts on maintaining dugong individuals and	Since 2005 the lowest confirmed number of dugong individuals discovered in the waters of Okinawa Island has remained at three. The major conceivable reason that the number has dropped this far is dugong catches in the Meiji and Taisho periods, with additional reasons including catches to relieve the postwar food shortage, and subsequent bycatches in gill nets

population	and other fishing nets. Therefore to conserve the dugongs, whose number has decreased to this level, it is deemed important to conserve the seagrass meadows on which they feed, and to conserve their habitat. About 78 ha of seagrass meadow will be lost due to construction of the replacement facility. We performed a population viability analysis (PVA) to examine whether this loss will shrink the dugongs' feeding ground and decrease environmental carrying capacity, thereby affecting dugong population maintenance. Table 6.16.2.2.3 shows the PVA results in detail. Calculations were performed for two situations in which habitat is limited to Okinawa Island waters, and in which habitat is all of Okinawa Prefecture, including the Sakishima Islands. There were several cases, with variables being the initial number of females and the reproduction rate. In all cases, the analysis found no significant differences between the extinction risk when environmental carrying capacity was decreased by loss of seagrass meadows due to replacement facility construction, and the extinction risk when the replacement facility is not built. It is therefore likely that seagrass meadow loss due to construction of the replacement facility will have little impact on dugong population maintenance, but because dugong feeding trails have been discovered in the Oura Bay west-side meadow, which will be lost, the utmost care will be taken for dugong conservation; conservation measures will be taken to transplant seagrasses (seeds, seedlings, etc.), and to enlarge seagrass meadows by improving their growth foundation. These measures will be mainly implemented in the parts of seagrass meadows with low coverage near the altered area, and the calm areas formed by construction of the replacement facility.
9-21 Chapter 9: Comprehensive Evaluation 9.16 Overview of EIA results concerning dugongs (1)	Survey results ○ State of seagrass meadow use: Dugong feeding trails were often found in Kayo seagrass meadows, but were not found off Henoko. Prediction results ○ Impacts of turbidity during construction: It was predicted that turbidity during construction will hardly spread to the Kayo offshore area, where dugong habitation has been frequently confirmed. ○ Impacts of noise and vibration during construction: During the height of construction activity when pile driving and riprap work are conducted at the same time, noise could surpass the level which would impact part of the dugongs' habitat. In the event that dugongs come near the construction area, this could change dugong behavior, and in marine areas where gill nets have been placed, it is possible that dugongs would get caught in the nets when taking action to avoid underwater sounds. Vibration: It is likely that construction-work vibration will be limited to the vicinity of the construction site, and that it will not induce change in dugong behavior. ○ Impacts of workboat movements: Because plans call for workboats to avoid dugong habitat, it is expected that workboat movements will have hardly any impacts such as inducing change in dugong behavior. ○ Impacts on maintenance of individuals and population: When performing construction work, efforts will be made to maintain the dugong individuals and population by choosing construction methods which mitigate impacts on dugongs to the maximum extent, and by taking measures such as monitoring the whereabouts of dugongs and setting about construction tasks while making sure that they are not near the construction area.

2) Japan's first stalactites with coral gravel have been discovered.

Nagashima Island near Henoko is a place where local people go for recreation. A cave on this island has been found to be a limestone cave of very great scientific value. As Figure 3 shows, the cave entrance is about 50 cm high, and it extends straight back for 10-odd meters, leading to a vertical hole. Following is the opinion of two specialists based on photographs from the party providing the information.

Kensaku Urata, Vice-President, Speleological Society of Japan

It is unusual to find stalactites under which stalagmites have grown with coral gravel attached to them. There are no such previous reports in Japan. It is comparatively rare to find the formation of a "beach rock"with calcareous seashore sediment cemented to it in a coastal cave. Those found in the Nagashima cave are very new and still in formation. A detailed study should be performed because we would get a clear picture of how they form.

Development process as seen from the Nagashima cave photographs

① 1 Cave formation period

Because the cave is flat with solution cavities in the ceiling, it appears to be a type called Frank Margin Cave, which was enlarged by dissolution along the former underground water level. It was formerly farther inland than now, and perhaps completely submerged in either fresh or brackish water (saturation zone). For that reason it would seem that the seawater level was relatively high compared to the present, and the cave had no opening at ground level.

② 2 Stalactites formation period

It is likely that the island's groundwater level declined, putting the cave into the air (vadose zone), upon which the formation of stalactites began. Because the stalactites' form indicates they were formed in the dark zone, at that time the cave still had no entrance. The decline of the groundwater level was probably caused by the relative decline of the seawater level.

③3 Period of coral gravel inflow and formation of milk stone with coral gravel

Coastal erosion created the present entrance, and waves caused the inflow and accumulation of coral gravel in the cave. Because the coral gravel that became attached to the stalactites was higher than floor level, it is possible that after the start of stalactite formation (period 2), the seawater level rose slightly for a time, and then fell to its current level.

Although this assessment is based only on photographs, it is possible that a detailed study of this cave would reveal the natural history of the Nagashima/Henoko region in connection with sea-level fluctuation during the past several tens of thousands of years to well over 100,000 years. To determine the years of each period, it is highly advisable to determine the ages of the stalactites and the coral gravel affixed to them.

Kensaku Urata, Dr.Science (geography)
Specializing in karst systems and speleology
Visiting professor, Osaka University of Economics and Law, Regional Research Institute
Vice-president of the Speleological Society of Japan
Contact : 7-7 Motomiya-machi, Tobata-ku, Kitakyushu-shi, Fukuoka-ken, Japan 804-0072
Telephone/fax: 093-861-3612 Mobile: 080-5272-3612

Ryuji Asami, University of the Ryukyus

If a cave is on the coast and close to sea level, and additionally is in a coral reef zone where it is supplied with coral gravel in the shallows, it is not strange scientifically that such stalagmites coated with gravel were formed.

However, many of the limestone caves found along the coasts of Ryukyu islands often have drop-offs that face deep water, thereby not admitting coral gravel, and likely there are hardly any stalagmites like those on Nagashima. Gravel-coated stalagmites such as these are thought to be rare. It is no doubt unusual from the topographical and geological perspectives of the cave's formation process and changes in sea level.

Ryuji Asami, University of the Ryukyus, Department of Physics and Earth Sciences, Geoscience Section
1 Senbaru, Nishihara-cho, Nakagami-gun, Okinawa-ken, Japan 903-0213
Telephone/fax: 098-895-8831/-8552

Figure 1. Location of Nagashima.

Figure 2. Location of Nagashima cave.

Figure 3. Entrance to Nagashima limestone cave.

Figure 4. Interior of Nagashima limestone cave.

Figure 5. Interior of Nagashima limestone cave.

Figure 6. Stalactite (stalagmite) with coral gravel in the Nagashima limestone cave.

Figure 7. Stalactite with coral gravel in the Nagashima limestone cave.

Cave photographs courtesy of Yoshihisa Fujita (University of the Ryukyus, representative director of the Marine Learning Center.

As these two specialists have explained, this cave has scientific value and must undergo a detailed study. Because such caves are dark inside, it is known that they harbor organisms adapted to special environments (for example, troglobites and troglophiles). Because their distributions are geologically isolated, it is highly possible that they have become endemic species living only in those caves. It is therefore necessary to quickly study the cave and determine what species live there.

3) Many discoveries of new species, and first recorded appearances in Japan

The EIA study by the project implementer also reveals that this marine area has high biodiversity, and is habitat for many endangered species. Even recently, around the time of EIA completion, surveys and research involving multiple disciplines continue to discover new species, and to find the first appearances of certain species in Japan. Following are the main discoveries.

Crustaceans: a mere 10-day survey (2008–2009) found 496 species of decapod crustaceans in 61 families and 241 genera, including at least 36 undescribed species and 25 species found in Japan for the first time (Fujita et al., 2009). The same survey also discovered three undescribed mantis shrimp species, and four found in Japan for the first time (Fujita et al., 2009). Subsequent research discovered four new species including Uruma ourana and Processa filipes (Komai & Fujita), 2014, and four species found in Japan for the first time, including Processa affinis (Hayashi, 1975) and Periclimenes incertus, which were announced in academic papers (Komai and Fujita, 2014, and others). With respect to crustaceans alone, this marine area is rich in biodiversity.

Shellfish: There are records of 150 species on the Oura Bay tidal flat, and over 815 species in the total Henoko-Oura Bay area (Kurozumi et al., 2003, 2007, and others). Subsequent further discoveries by multiple experts have found diverse shellfish including Semelangulus lacrimadugongi, a small (7–8 mm), white bivalve that lives in seagrass meadows, and Hypermastus ryukyuensis, a small (about 1 cm high) univalve which lives as a parasite on a flat sand dollar called Echinodiscus tenuissimus (Matsuda, H. et al.).

Fish: The mudskipper Scartelaos histophorus, whose distribution was Nakagusuku Bay at its northern extreme, has been found inhabiting Oura Bay as well (Kon, T. et al., 2003), and at least four sea cucumber species have been confirmed in Japan for the first time (Obuchi, 2011).

Seagrasses: Oba et al. (2010) confirmed the presence of 182 species, of which four were found to be new species.

Coral: Recently discovered is Goniopora stokesi, which is unusual among stony corals because it does not attach itself to rocks, instead living on mud in dividing colonies, thereby making it possible to live on muddy bottoms (Kitano et al., 2013).

Also of great value is Okinawa Island's largest seagrass meadow, which comprises seven species of seagrasses listed as near threatened species in the Environment Ministry's Red Data Book.

Table 4. Scientific literature on species discovered in Oura Bay (provided courtesy of Diving Team Snack Snufkin).

The table does not include all academic society presentations or reports.

		Species	Category	Source
1	Cnidarian, Zoanthidea	*Microzoanthus kagerou*	New family, genus, species	Fujii, T. & J. D. Reimer, 2011. Phylogeny of the highly divergent zoanthid family Microzoanthidae (Anthozoa, Hexacorallia) from the Pacific. Zoologica Scripta, 40:418–431.
2	Mollusk, bivalve	*Semelangulus lacrimadugongi*	New species	Kato, M. & K. Osuga, 2007. A new Tellinoidean bivalve in seagrass beds in the Ryukyu Archipelago. Venus, 65:291–297.
3	Mollusk, univalve	*Hypermastus ryukyuensis*	New species	Matsuda, H., D. Ueno & K. Nagasawa, 2010. A new species of Hypermastus (Prosobranchia: Eulimidae) associated with Echinodiscus tenuissimus (Echinoidea: Astriclypeidae) from off Okinawa, Japan. VENUS, 69: 17–23.
4	Arthropod, crab	*Uruma ourana* (Naruse,Fujita & Ng, 2009)	New genus, species	Naruse, T., Y. Fujita, Y. & P. Ng, 2009. A new genus and new species of symbiotic crab (Crustacea: Brachyura: Pinnotheroidea) from Okinawa, Japan. Zootaxa, 68: 59–68.
5	Arthropod, shrimp	*Cuapetes lacertae* (Bruce,1992)	First discovery in Japan	Okuno, J. & Y. Fujita, 2011. Record of a pontoniine shrimp, Caupetes lacertae (Bruce,1992) (Crustacea: Decapoda: Palaemonidae) from the Ryukyu Islands, Japan, with notes on its brachial formula and intraspecific morphological variation. Biogeography, 3: 19-23.
6	Arthropod, shrimp	*Periclimenes incertus* (Borradaile, 1915)	First discovery in Japan	Okuno, J., T. Yanagisawa, T. Seko and Y. Fujita, 2012. First record in Japan of *Periclimenes incertus Borradaile*, 1915. Natural History Museum and Institute, Chiba, Natural History Research, 12: 27-31.
7	Arthropod, hermit crab	*Albunea* sp.	New species	Osawa, M. & Y. Fujita, 2012. New records of Albuneidae (Decapoda, Anomura) from Japan, with description of a new species of Paralbunea, pp. 245-262. In Komatsu, H., J. Okuno and K. Fukuoka (eds.), Studies on Eumalacostraca: a homage to Masatsune Takeda. Crustacean Monographs 17, Brill, Leiden.
8	Arthropod, Gammaridea	*Leucothoe obuchii*	New species	White, K. N. & J. D. Reimer, 2012. Commensal Leucothoidae (Crustacea, Amphipoda) of the Ryukyu Archipelago, Japan. Part I: ascidian-dwellers. ZooKeys, 55: 13–55.
9	Arthropod, crab	*Arcania novemspinosa* (Lichtenstein, 1816)	First discovery in Japan	Fujii, T. and T. Naruse, 2013. First finding in Japan of Arcania novemspinosa (Crustacea: Decapoda: Leucosiidae), from the coast of Okinawa Island. Fauna Ryukyuana, 3: 1-6.
10	Arthropod, Copepod	*Cardiodectes shini* (Uyeno, 2013)	New species	Uyeno, D., 2013. Two new species of Cardiodectes Wilson, 1917 (Copepoda: Siphonostomatoida: Pennellidae) from gobiid fishes (Actinopterygii: Perciformes) in the western Pacific Ocean. Zootaxa, 3664: 301-311.
11	Arthropod, shrimp (Mediterranean mud shrimp)	*Paratrypaea maldivensis* (Borradaile, 1904)	First discovery in Japan	Komai, T. & Y. Fujita, 2014. New record of a callianassid ghost shrimp Paratrypaea maldivensis (Borradaile, 1904) (Crustacea: Decapoda: Axiidea) from subtidal flats in Okinawa-jima Island, Ryukyu Islands, Japan. Fauna Ryukyuana, 8: 1-7.
12	Arthropod, shrimp	*Processa affinis* (Hayashi, 1975)	First discovery in Japan	Komai, T. & Y. Fujita, 2014. New records of the caridean shrimp genus Processa Leach, 1814 (Crustacea: Decapoda: Processidae) from Japan, with descriptions of two new species. Zootaxa, 3794: 263-278.
13	Arthropod, shrimp	*Processa hayashii* (Komai & Fujita, 2014)	New species	Komai, T. & Y. Fujita, 2014. New records of the caridean shrimp genus Processa Leach, 1814 (Crustacea: Decapoda: Processidae) from Japan, with descriptions of two new species. Zootaxa, 3794: 263-278.
14	Fish, goby	*Gnatholepis yoshinoi*	New species	Suzuki, T. & J. E. Randall, 2009. Gnatholepis yoshinoi, a New Gobiid Fish from Okinawa. Bulletin of the National Museum of

				Nature and Science. Series A, Zoology, 35: 83–88.
15	Arthropod, shrimp	*Precessa affinis Hayashi, 1975*	discovery in Japan	Hayashi,K.(1975) The Indo-West Pacific Processidae(Crustacea, Decapoda, Caridea). Journal of the Shimonoseki University of Fisheries, 24, 47-145
16	Arthropod, shrimp	*Precessa filipes Komai & Fujita, 2014*	New species	Komai, T.& Y.Fujita, 2014. New records of the caridean shrimp genus Processa Leach, 1815(Crustacea: Decapoda: Processidae) from Japan, with descriptions of two new species

Announced at Academic Conventions (An "undescribed species" is one that has yet to be formally described taxonomically in academic journals or other writings. It is more or less the same as "new species.")

		Species	Category	Source
1	Cnidarian	*Heliopora coerulea*		Yasuda,N.,M. Abe, T. Takino, M. Kimura, C. Lian, S.Nagai, Y. Nakano & K. Nagaoka.2012.Large-scale mono-clonal structure in the north peripheral population of blue coral, *Heliopora coerulea*. Marine Genomics, 7: 33–35.
2	Cnidarian	*Goniopora stokesi*		Kitano, Y., M. Obuchi, D. Uyeno, K. Miyazaki & H. Fukami,2013.Phylogenetic and taxonomic status of the coral Goniopora stokesi and related species (Scleractinia:Poritidae) in Japan based on molecular and morphological data. Zoological Studies, 52: 25.
3	Fish	*Scartelaos histophorus*		Kon, T., Y. Sakurai and N. Takei, 2003. The Gobioidei mudskipper *Scartelaos histophorus* found offshore from Suku in Nago City, Okinawa Prefecture. Journal of the Biological Society of Okinawa, 41: 25–32.

Taxonomic Group Deserving Special Note

1	Bryozoa Moss animal	*Lanceopora* sp.		Hirose, M. and M. Obuchi, 2011. An undescribed species of genus Lanceopora, an erect moss animal obtained on the sandy mud bottom of Oura Bay, and its reproductive mode using buds. Japanese Society of Systematic Zoology, 47th Congress,Okinawa.
2	Echinoderm Sea cucumber	Holothurian Two undescribed species, five species first recorded in Japan	Undescribed species First recorded in Japan	Obuchi, M. and F. Michonneau, 2012. A large sea cucumber obtained from a coral reef enclosed bay area in the Ryukyu Islands. Japanese Coral Reef Society, 14th Congress, Okinawa.
3	Seagrass	Seagrasses Four undescribed species	Undescribed species	Oba, H., N. Miyamoto and S. Matsuda, 2010. Seagrass vegetation and singularity of coral topography along the east coast of Okinawa Island. Japanese Coral Reef Society, 13th Congress, Tokyo.

These discoveries extend across the entirety of Henoko and Oura Bay, and biodiversity is very high. As experts (Kurozumi, 2003 and Fujita et al., 2009) say, this suggests the great possibility that more new species, and organisms with unusual life histories will be discovered.

Figure 1. Seabed topography and survey transects in the reclamation zone.

"Effects of Topography and Sediment in the Reclamation Zone of the Project to Build a Replacement Facility for Futenma Air Station," Nakai and Kobayashi, 2007.

Figure 2. Seabed topography and bottom sediment sampling locations in reclamation zone.

"Shellfish in the Oura Bay-Side Reclamation Zone of the Project to Build a Replacement Facility for Futenma Air Station," Kurozumi, 2007.

This marine area is unusual owing to its biodiversity and its topography and sediments, especially the deep, mud-bottom places in the reclamation zone. One conceivable reason for this is the connection with the unusual topography. Just north of the reef flat offshore from Cape Henoko is Oura Bay, which is rather deep, and for that reason the coral reef itself is not well developed. The north edge of that reef flat is a steep slope ranging in depth from 2–3 m to several tens of meters. Most Okinawan coral reefs are fringe reefs (reefs that develop like fringes around islands), and have steeply inclined reef slopes on the ocean-facing sides, which are subject to strong waves. But in Oura Bay the reef faces the bay instead of the ocean, and is steeply sloped down to a depth exceeding several tens of meters.

Additionally, studies of places other than this marine area have revealed that other Okinawan coral reefs do not have such diverse sedimentary environments (Nakai and Kobayashi, 2007).

A second reason is that this marine area combines different ecosystems, from the Oura River mangrove forest tidal flats, sandy bottom, muddy bottom, seagrass meadows, and coral communities. Its coral reef is rare for Okinawa because of its depth, and several different ecotones come together here. This supports the richness of this area's biodiversity.

Reconsideration is needed as to whether it is all right to destroy — without sufficient study and without considering conservation measures — a place where many dugong feeding trails are found, and where new species are discovered and the first recorded sightings of species have been made.

Reclaiming land and building structures that will become barriers in the bay mouth will not only have direct impacts due to habitat loss, but also form a seabed environment different from that now existing due to changed tidal flows and the accumulation and outflow of mud. It is highly possible this will have impacts on the present environment (for example, Nature Conservation Society of Japan, 2013).

Regarding these discoveries, it is necessary to reveal each organism's ecology, and then, having taken the findings into consideration, consider concrete environmental conservation measures. EIAs tend to focus exclusively on listing the name of species of organisms, but there should also be consideration from the perspective of topographic alteration (irrevocable alteration occurring in conjunction with reclamation). Reclamation should be suspended, and time provided to conduct a scientific study.

4) Environmental Impacts of This Project which Came to Light after Completion of the EIA

Various information was concealed or disclosed after the EIA process, and many of the facts were found, such as the considerable enlargement of structures, in the public waters where reclamation is planned. This reveals possible environment-altering changes which were not anticipated or assessed.

(1) Change in seawall size

In the EIA the seawall with mooring capability in Figure 1 was to be 200 m long, but the Application for the Permit for Reclamation of the waters submitted to Okinawa Prefecture by the implementer in June 2013 specifies a length of 271 m, leading to the discovery that the size had grown larger. Changes in structure size affect simulations of tidal current changes. The very fact that there had been a structure size change at the time of the EIA is a problem. If the seawall size is changed, the tidal current simulation must be done over.

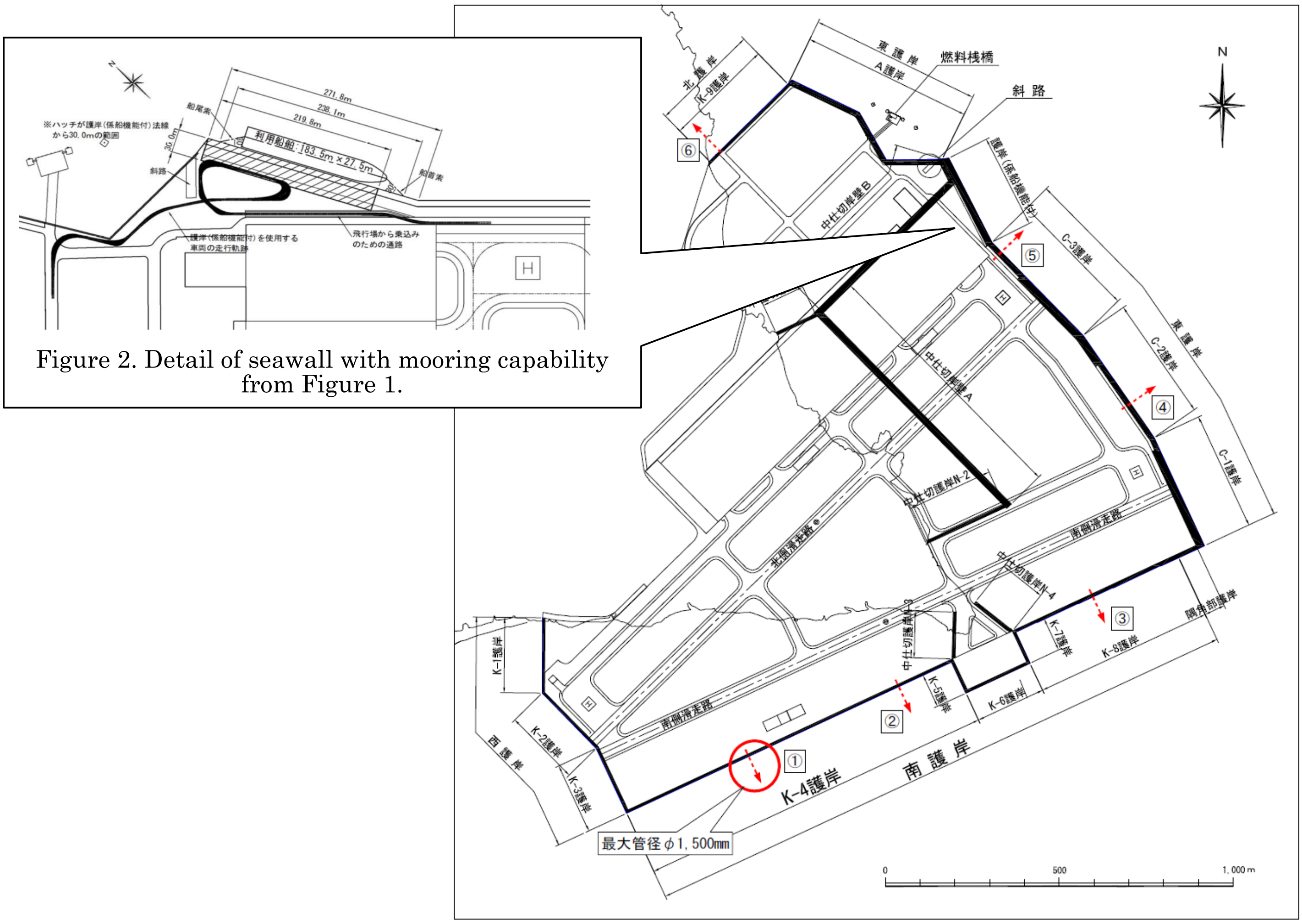


Figure 2. Detail of seawall with mooring capability from Figure 1.

Figure 1. Seawall with mooring capability.
Application for the Permit for Reclamation of the waters in Conjunction with the Project to Build a Replacement Facility for Futenma Air Station.

(2) Problems regard with reclamation fill material

The specific sources of soil for reclamation became known only when the procedure for public water reclamation started. Reclaiming 160 ha will require 21 million cubic meters of fill material, which is equal to at least 3 million 10-t truckloads. Four problems are discussed below: a) Environmental impacts on fill material supply locations, b) the possibility of collisions between fill transport vessels and dugongs, c) the possibility of impacts on the Kayo seagrass meadow by sea sand extraction, and d) importing of invasive species to the reclamation zone via fill material.

a) Environmental impacts on fill material supply locations

Fill material extraction locations given in the Application for the Permit for Reclamation of the waters include the Seto Inland Sea, the Amakusa Islands, Amami Oshima Island, and Tokunoshima Island. The EIAs for the operations associated with the project should also assess the environmental impacts of fill material extraction in these places.

b) Routes of fill material transport vessels coincide with dugong migratory routes

When fill material is extracted from Motobu Town and Kunigami Village on Okinawa Island, transport ships are to pass around the northern end of Okinawa Island on their way to Oura Bay, which is revealed in the Application for the Permit for Reclamation of the waters. As Figure 4 shows, ship routes coincide with dugong migratory routes. Considering the effects of the noise on dugongs, and the fact that dugongs have previously suffered harm including collisions with vessels, these ship routes would have a severe impact on Okinawa's dugong population.

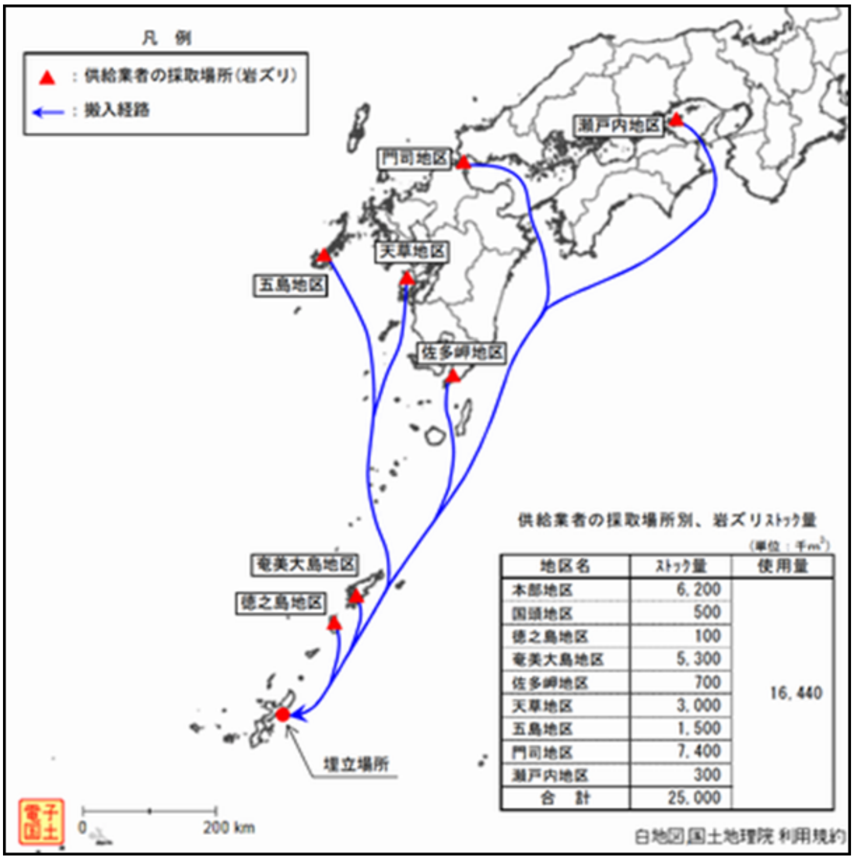
c) Environmental impacts of sea sand extraction on the surrounding area including seagrass meadows

Topographical change due to seabed drilling, changes in bottom sediment particle size composition due to changes in benthic biota (Matsuda, 1999), and changes in flow regime caused by changes in seabed topography (Takahashi et al., 2002) have been pointed out. Additionally, the impacts of turbid water dispersion on the marine environment will decrease water transparency (Kadoya and Hari, 2000), leading to an attendant decrease in seagrass meadows (Takahashi et al., 2005). This shows that, if this project is implemented as now planned, there will be impacts on the seagrass meadows not only Henoko and Oura Bay, but also at Kayo. If the Okinawa Defense Bureau reasons, as stated in the revised final EIA, that "there is a low probability that dugongs will continue using the seagrass meadows at Henoko, and they are using the Kayo seagrass meadow," then at least the conservation of the Kayo seagrass meadow should be guaranteed. This indicates that the rationale advanced by the implementer itself is no longer valid.

The life of each of Japan's remaining dugongs is precious, making it necessary to take every means to eliminate actions which cause collisions with ships, habitat deterioration, or other such problems.

d) Possibility of exotic species introduction via fill material

Seventeen million m3 of the total 21 million m3 of reclamation fill material will be sourced from several places in mainland Japan. Bringing large amounts of sand and soil from different climate zones and geographical areas will surely lead to the introduction and dispersion of invasive species in Okinawa, and the impacts will be incalculable. Special concerns are the impacts of Aspergillus and *Serratia marcescens* on Okinawan corals, and the impacts of other terrestrial organisms on marine organisms, and there are concerns about the invasion of Okinawa Island by the Argentine ant, *Linepithema humile* ,which has such a great environmental impact that it is among the world's worst 100 invasive exotic species (IUCN, 2000) and is designated as an invasive alien species in Japan. The Argentine ant has been found, and is a serious problem, in several of the places where fill material for this project is to be extracted. On this matter we are conferring with the Invasive Species Specialist Group of the International Union for Conservation of Nature's (IUCN) Species Survival Commission (SSC).



地区名	ｽﾄｯｸ量	使用量
本部地区	6, 200	16, 440
国頭地区	500	
徳之島地区	100	
奄美大島地区	5, 300	
佐多岬地区	700	
天草地区	3, 000	
五島地区	1, 500	
門司地区	7, 400	
瀬戸内地区	300	
合　計	25, 000	

Figure 2. Land reclamation fill material extraction sites routes taken by fill transport vessels, 1.
Application for Approval to Reclaim a Public Water Body in Conjunction with the Project to Build a Replacement Facility for Futenma Air Station

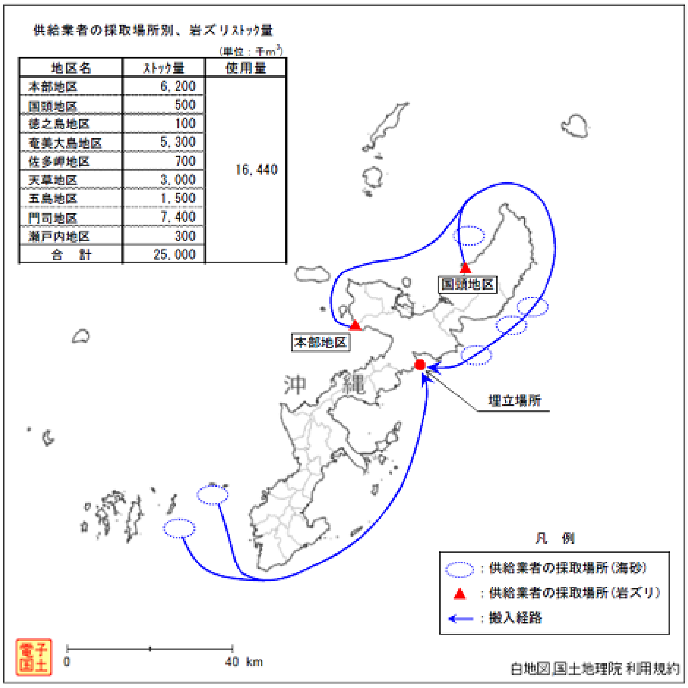


Figure 3. Land reclamation fill material extraction sites routes taken by fill transport vessels, 2. Okinawa Prefecture, crushed rock and sea sand.

Application for the Permit for Reclamation of the waters with the Project to Build a Replacement Facility for Futenma Air Station

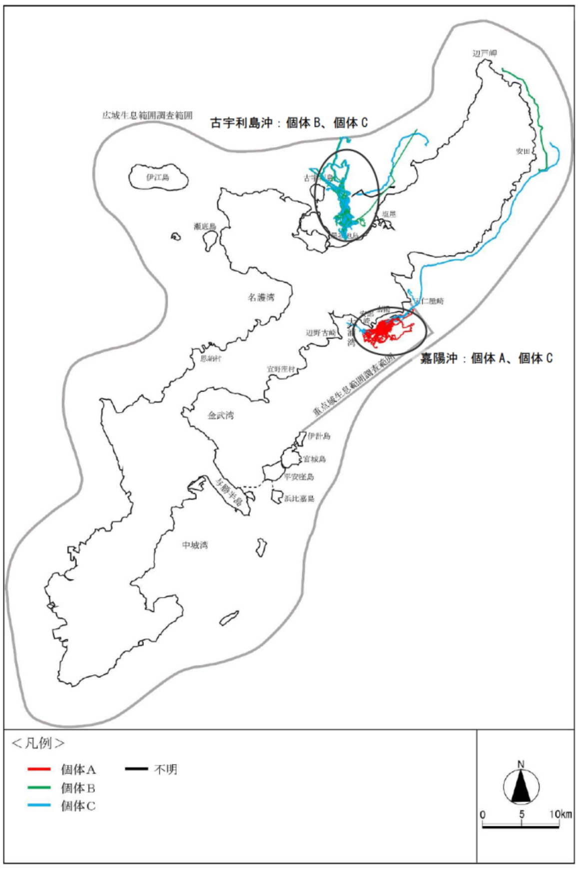


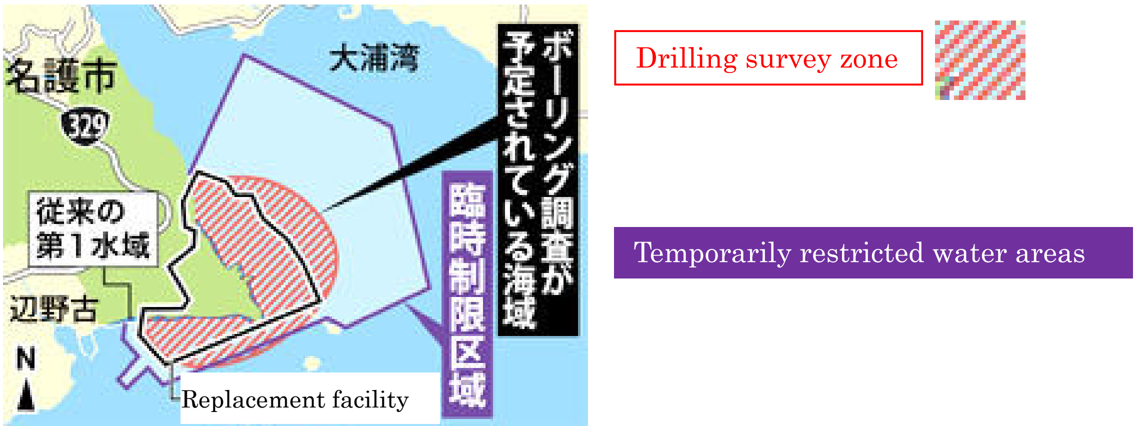
Figure 4. Migration routes of Okinawa Island dugongs.

Application for the Permit for Reclamation of the waters

Summation

The EIA for this project involved many problems as it had no regard for the two primary elements of EIAs, namely that they should be both scientific and democratic. As Okinawa Prefecture governor Hirokazu Nakaima said in February 2012, "I believe it is impossible to provide for the conservation of the living environment and natural environment in the project zone with the environmental conservation measures set forth in the environmental impact statement" (NACS-J, 2013 and others). And in the process leading to approval to reclaim a public water body, Department of Environmental and Community Affairs of the Okinawa Prefecture issued an opinion stating that it could not allay its concerns about environmental conservation in view of the environmental conservation measures proposed by the implementer. This too disagrees with the environmental impact statement.. If, as in this project, the entity determining that environmental conservation is deemed impossible at the time of the EIA, but issues the exact opposite result in the procedures for approval to reclaim a public water body, then there are problems with Japan's environment-related laws themselves. Additionally, the matter of environmental damage caused by sourcing reclamation fill material is a problem with the EIA system that needs to be addressed. It stands to reason that if a certain mountain will be razed to reclaim a marine area, that should be seen as a sequence of environmental destruction. When performing an EIA, the fill material source locations should be specified, and the environmental impact of sourcing should be taken into consideration.

At a conference held in Okinawa in June this year, "Expert Conference on Development of Island's Sustainable Societies," experts from abroad joined the other participants in reaffirming the importance of coral reef conservation. The twelfth meeting of the Conference of the Parties to the Convention on Biological Diversity will be held this autumn. It is internationally unacceptable to proceed with a project that cannot abide by Aichi Biodiversity Targets 10, "conservation of vulnerable ecosystems," and 12, "preventing the extinction and decline of endangered species," which were adopted in 2010 at the conference hosted by Japan.



Ryukyu Shimpo, July 3, 2014 (Special restricted zone)

Reference: Temporarily restricted water areas Special restricted zone to be established at Henoko and Oura Bay. Access prohibited until construction is finished.