At Nakaminato, pictured above in 1842, seagoing boats unloaded Edo-bound cargo that continued to the shogun’s capital on inland waterways.

Öuchi-ke “Go-yödome,” a family’s collection of documents on shipwrecks, describes the loss of 28 metric tons of rice from a boat that drifted into rocks at Isohama on January 28, 1700. In 2004 a local historian, Satō Tsugio, compared two writings of the boat captain’s name. Öuchi Yoshikuni (left) represented the family.

THE PICTURE MAP of Nakaminato, above, was made by Watari Kizaemon in Tenpō 13 (1842) and published in Ansei 4 (1857). Map courtesy of the city office of Hitachinaka, Ibaraki Prefecture.

ÖUCHI-KE “GO-YÖDOME,” a single volume of 1,390 pages, contains writing from many hands. One hand, probably no earlier than 1735, compiled all the material on wrecks between 1700 and 1735, according to Satō Tsugio, an authority on Mito-han documents. The volume’s entire contents, along with reports on 14 other Edo-period shipwrecks, have been printed by Nakaminato Shishi Hensan I’in'kai (1993). In this modern volume the 1700 wreck is number 55, pages 81-83.

THE MAPS OPPOSITE are derived from modern sources. The middle map is from Kawana (1984, p. 6, 20) and Kaizuka and others (2000, p. 21). The lowest map is from 1:25,000-scale maps by Kokudo Chiriin (Hitachinaka sheet, dated 1999; “Isohama” 2001) except for 1885 entrance to Naka River, traced from a 1:200,000-scale map by Rikuchi Sokuryōbu, 1885 (Meiji 18).

THE RICE BOAT went aground at “Hakoiso” (photo below). Lost were all the boat’s cargo—28 metric tons of rice—and two of the boat captain’s men. Documents failed to recover any of the rice.

THE ORPHAN TSUNAMI OF 1700...
Main points

High waves on the morning of January 28, 1700, prevented a boat from entering the river-mouth port of Nakaminato. A storm that evening drove the boat to a rocky shore near Isohama village (map, lower right). Lost were all the boat’s cargo—28 metric tons of rice—and two of the crew (p. 68-69, 71).

Officials of Mito-han certified the losses in response to a petition (p. 70). The certificate and petition were copied into a family’s collection of documents about Edo-period wrecks near Nakaminato (opposite).

The morning high waves probably represent ordinary ocean swells that were opposed at the river mouth by the ebb currents of a long-lasting tsunami (p. 72-75).

Setting

The river mouth at Nakaminato afforded access to inland waterways that conveyed cargo to metropolitan Edo (p. 31, 61). The waterways followed valleys that the sea covered 6,000 years ago. A prehistoric people, the Jomon, fringed this former sea with piles of clam shells (dots, right).

To reach Nakaminato, Edo-period sailors threaded a rocky constriction north of a sand spit (lower map at right, picture map at left). Additional rocks awaited boats that drifted south toward Isohama, a name that means “rocky beach” (photo below).

Nakaminato served as the main port in Mito-han. The rice boat came from another domain, Nakamura-han (upper map). The lost rice belonged to the Nakamura daimyo. Villagers from Isohama towed the wreck for salvage but failed to recover any of the rice.

Documents

The boat captain, two local villagers, and two other men petitioned local officials to certify the accident. The petition and the resulting certificate make up “Ura shōmon no koto” (ura, port; shōmon, certificate; p. 70-71). A headnote states that 470 bails of rice were lost. Next, a narrative explains the loss in the words of headmen from Isohama village. The certificate concludes with a signed statement by representatives of the senior ministers of Mito-han.

The earliest extant copy appears in a family volume, Ōuchi-ke “Go-yōdome” (go-yō, official business; tome, records). The volume (opposite) contains documents on 131 shipwrecks near Nakaminato between 1670 and 1832.

Rocks break fair-weather surf near former Isohama.
A BOAT LADEN WITH RICE—470 bales belonging to the daimyo of Nakamura-han—approached the Mito-han port of Nakaminato around 8 a.m. (columns 1-2). High waves held the boat offshore, where the crew cast anchor (3). Still offshore that evening, the crew bailed half the rice during an evening storm (4-5). But the storm broke the anchor lines and drove the boat to a rocky shore near Isohama village (5-6). Two of the crew perished (7).

Afterwards, villagers from Isohama and Nakaminato collected and returned, to surviving crew, articles that had been scattered at sea (8).

The full document, reproduced on the next two pages.
washed ashore (8-9). Officials of Mito-han, from a district magistrate’s office, oversaw a fruitless attempt to find the rice bales (11-14) and certified the accident (14).

The full document, reproduced on the next two pages, contains this narrative as part of a certificate issued to two samurai of unstated affiliation. The narrative’s authors, all from Isohama, were a pair of boat headmen, Hei’emon and Rokus’emon; the village headman, Sakubei; and two village assistant headmen, Heisaku and Jiza’emon.

2. toryo Nakanominato—Mito-han’s Nakaminato.
4-5. oni-nami...uchini—The crew jettisoned cargo in hopes of saving the ship.
5. toson china—The boat drifted to the area of Isohama, home of the narrative’s authors and of two of the certificate’s petitioners, Kichirōemon and Gon’emon (p. 70).

1. tsumitate—The rice was loaded onto a boat.
1-2. saru nanuka ni—On the most recent 7th day before the headnote date (24th day, 12th month, Genroku 12; p. 70). Similarly, dō kokonuku in column 2 means the most recent 9th day.
2 and 4. itsutsudoki—About 8 o’clock in the morning (column 2) or evening (4); see page 46.

NOTES. Column 1, migi... o-kome—The rice mentioned previously; itemized, p. 71.
1. Sōma Danjō sama—Sōma Masatane served as 5th daimyo of Nakamura-han in 1679-1702.
1. Go-doryo Ukedo-hama—Ukedo-hama (literally, Ukedo Beach) was the southernmost of four ports in Nakamura-han (Sato, 1988, p. 167).
Like a police report on a car crash, a harbor certificate verified the shipwreck. OBLIGATIONS AWAITED the captain who lost cargo at sea while bound for the Morioka-han port of Kuwagasaki. On arrival he was to inform port officials of the loss. He would then petition them for a port certificate, ura shömon, that could absolve his crew of responsibility while clearing the way for insurance claims.

Similarly in the Mito-han port of Nakaminato, the shipwreck started by the 1700 tsunami resulted in a petition and certificate (below). The petitioners included not just the captain but also villagers from Nakaminato and Isohama, along with two men we call samurai because they have family names. They addressed their joint petition to officials of Mito-han and Isohama village. In response, village headmen affirmed the accident and han officials, having made an inspection of their own, issued the certificate.

As copied into Ōuchi-ke “Go-yōdome,” this ura shömon contains both the petition and the certificate. Each mentions the “high waves” we ascribe to the 1700 tsunami (p. 73).
The certificate begins by itemizing the loss of 470 bales of rice (right). Those bales probably looked like the ones that burly men fill, cinch, lift, and carry in the Hokusai sketches below. Each bale, with a volume of one hyō (i-ppyō), probably weighed close to 60 kilograms (130 pounds).

Two and a half bales made up one koku. A unit of volume, the koku measured such quantities as the capacity of freighters. But it also measured wealth and status—the amount of rice granted annually to a samurai (the 50-koku stipend of the former merchant, Moriai Chūzaemon, p. 53), and the officially expected agricultural yields that ranked daimyo domains (examples, below right).

Fair-weather waves 好天下の高波

The 1700 tsunami in Japan began without a storm but may have continued into one.

THE SUN WAS SHINING from Morioka to Wakayama the day before the 1700 tsunami approached Japan (the 7th day, below). On the 8th day, as the tsunami crossed the Pacific (p. 74-75), skies remained fair over Morioka and Wakayama while snow fell in Edo. Rain or snow fell widely on the 9th day, but mainly in the evening and not at Morioka or Nikkô.

Most of these weather observations come from diaries. Some are official journals—from castle towns, a shrine, a temple, and Edo mansions (p. 61). Others were kept by court aristocrats in the imperial capital, Kyoto.

Among narratives of the 1700 tsunami, only the Nakaminato rice-boat story mentions weather—a storm that arrived 12 hours after the crew first encountered “high waves” as they tried to enter port.

Weather observations

7TH DAY 8TH DAY 9TH DAY

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>DIARY AND WRITER</th>
</tr>
</thead>
<tbody>
<tr>
<td>a Morioka</td>
<td>“Morioka-han zassho” Administrators of Morioka-han (p. 44, 60).</td>
</tr>
<tr>
<td>b Nikkô</td>
<td>“Shake gobansho nikki” Officials of shrine for the grave of Tokugawa Ieyasu (shogun, p. 41).</td>
</tr>
<tr>
<td>c Edo</td>
<td>“Gokokuji nikki” Buddhist monks.</td>
</tr>
<tr>
<td>d Edo</td>
<td>“Sakakibara-ke Edo hantei nikki” Officials at an Edo mansion of the Sakakibara family, which then ruled Murakami-han. Diary started 1651, continued to 1866, 553 volumes. For map of Edo mansions of daimyo like the Sakakibara, see pages 61 and 106.</td>
</tr>
<tr>
<td>f Nagoya</td>
<td>“Ômu rôchû ki” Asahi Bunzaemon Shigeaki, floor-mat manager (tatami bugyô) of Nagoya castle. The castle was headquarters of one of the three main branches of the Tokugawa family. As the caged parrot (Ômu rôchû) in the book’s title, Asahi says he wrote exactly what he heard.</td>
</tr>
<tr>
<td>g Kyoto</td>
<td>“Kinsumi-kyô ki” Shigenoi Kinsumi, court aristocrat and scholar.</td>
</tr>
<tr>
<td>h Kyoto</td>
<td>“Kinmichi ki” Ôgimachi Kinmichi, court aristocrat and Shinto scholar.</td>
</tr>
<tr>
<td>i Kyoto</td>
<td>“Tokudaïji hînami” Tokudaïji Közen, court aristocrat.</td>
</tr>
<tr>
<td>j Kyoto</td>
<td>“Sadamoto-kyô ki” Nonomiya Sadamoto, court aristocrat and scholar.</td>
</tr>
<tr>
<td>k Wakayama</td>
<td>“Miura-ke nikki” Miura-family head serving as a karô (senior minister, p. 44) of Wakayama-han.</td>
</tr>
</tbody>
</table>

WEATHER OBSERVATIONS are lacking from Nikkô on the 7th and 8th days, and from Nagoya on the 7th day. Observations differ in Edo on the 8th day, in Kyoto on the 8th and 9th days. All were first compiled in Tsuji and others (1998, p. 8), where Ueda mislocated observation g in Ise (80 km south of Nagoya).
Waves raised by an opposing current
The morning “high waves” that held the rice boat offshore probably originated as incoming ocean swells that met river-mouth backwash of a long-lasting tsunami.

Several accounts refer to the 1700 tsunami as a tide (p. 40). The Miho headman, for instance, reports that the water came in “something like a very high tide” about seven times between dawn and about 10 a.m. (“the hour of four”). The headman further notes that the water drained “with the speed of a big river” (p. 79, columns 3-4).

Such tide-like currents impressed eyewitnesses to the 1960 tsunami at Nakaminato. They estimated incoming velocities at 7 knots (about 3.5 meters per second) and described the outflow as even faster.

Strong ebb currents heighten incoming ocean waves on river-mouth bars. An Oregon boating manual warns, “If you are trapped outside a rough bar on an ebb tide, it is wise to lay to and wait” until a rising tide produces an inflowing current.

The 1700 tsunami probably produced strong ebb currents that heightened waves at 8 a.m. off Nakaminato. Such currents should not have resulted from the astronomical tide, which was rising at that hour from Kuwagasaki to Tanabe (p. 83). But the tsunami, at Miho, was then producing intermittent, swift outflow. Similar outflow from the port of Nakaminato probably raised the “high waves” that eventually led to the rice boat’s demise.

The tsunami likely continued raising river-mouth waves through the morning and perhaps into the early evening. It disturbed seas at Miho until noon (p. 79, columns 4-5). Together with the coming storm it may explain why the rice boat stayed off Nakaminato throughout the day.

An outsize tsunami can go on for 24 hours or more. The 1960 tsunami lasted that long (marigrams below and p. 46). Similarly in a computer model, the 1700 tsunami disturbs the Pacific Ocean for an entire day (next two pages).

Duration of tsunami wave trains in 1700 and 1960

NAKAMINATO, 1700

High waves at 8 a.m.
Boat stays offshore

1 m

NAKAMINATO TIDE GAUGE, 1960

MIHO, 1700

Repeated surges
Seas calmer after noon

1 m

TIDE GAUGE NEAR MIHO, 1960

QUOTES AT LEFT from Ōuchi-ke “Go-yōdome” (p. 69, col. 3) and “Miho-mura yōji oboe” (p. 79, col. 4). MARIGRAMS traced from The Committee for Field Investigation of the Chilean Tsunami of 1960 (1961, p. 364, 371). Gauge sites plotted on p. 67 (Nakaminato) and p. 82 (Shimizu, near Miho).

COMPARABLE TIMES DURING THE TWO TSUNAMIS
Arrival of first large waves at Kuwagasaki (p. 43, 46) Six 60-minute hours

The orphan tsunami—Nakaminato
**Simulated waves 津波のシミュレーション**

In a computer model, a long-lasting 1700 tsunami engulfs the Pacific.

**TIME IN JAPAN**

(-120-minute hours; p. 43)

**TIME SINCE EARTHQUAKE**

(60-minute hours)

Hour of eight, afternoon of 8th day, 12th month, 12th year, Genroku era

Cascadia earthquake, ~9 p.m., Jan. 26, 1700

Tsunami already striking Pacific coast at Cascadia (resulting deposits, p. 18, 20)

Hour of seven, afternoon, 8th day of 12th month

Hour of five, evening, 8th day of 12th month

At Cascadia, 9 a.m. of January 27

Hour of eight, night, 8th day of 12th month

Tsunami noticed at Kuwagasaki and Ötsuchi

(p. 39, column 2; 60, col. 1)

Hour of six, dusk, 8th day of 12th month

Tsunami noticed at Miho and at Tanabe

(p. 79, col. 1; 86, col. 1)

Seas calming at Miho (p. 79, col. 5) but probably still rough at Nakaminato (p. 73)

Hour of nine, noon, 9th day of 12th month

Hour of six, dawn, 9th day of 12th month

Hour of four, night, 8th day of 12th month

About seven daylight waves noted by then at Miho (p. 79, col. 4)

Hour of eight, night, 8th day of 12th month

At Cascadia, 9 a.m. of January 27

Hour of five, morning, 9th day of 12th month

“High waves” off Nakaminato (p. 69, col. 2-3)

Hour of four; morning, 9th day of 12th month

About seven daylight waves noted by then at Miho (p. 79, col. 4)

IN THE DEEP OCEAN a tsunami’s waves have little height but great crest-to-crest length. As they enter shallow water the waves slow down and stack up. In the model above, the 1700 tsunami rarely rises more than 0.5 m as it crosses the Pacific but builds against Japanese shores to heights as great as 5 m (p. 99).
Simulated waves

In a computer model, a long-lasting 1700 tsunami engulfs the Pacific.

The model depicts the tsunami from a Cascadia earthquake of magnitude 9.0 with a fault rupture 1,100 km long (p. 98-99; Satake and others, 2003).

An animated version of the model:

THE MODEL depicts the tsunami from a Cascadia earthquake of magnitude 9.0 with a fault rupture 1,100 km long (p. 98-99; Satake and others, 2003).

ANIMATED VERSION of the model: