

Incident information sheet of TANI0 1980

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The incident

In the morning of 7 March 1980, a distress signal was sent by the Malagasy oil tanker *Tanio*, off the northern coast of Finistère. Loaded with 26,000 tonnes of heavy fuel oil (n°2) and 900 tonnes of propulsion fuel oil, the vessel was journeying from Wilhemshaven (Germany) to Civitavecchia (Italy). She was about to leave the Channel when the storm broke her in two.

Despite a force 11 north-west wind, a British tanker ship quickly located the wreck north of Batz island. The [Maritime prefecture for the Atlantic](#) immediately organised rescue operations through the French Navy's Operation Centre.

The bow of the oil tanker, which was at first folded to 45 degrees, broke off from the stern and floated vertically. The stern tipped and drifted slowly. A total of 12,500 tonnes of fuel oil started spilling in the sea.

A helicopter from the French Navy (Super Frelon) airlifted thirty one crew members at once in winds up to 50 knots. Eight crew members, including four officers, were reported missing.



Stern of the TANIO ©FRENCH NAVY

Type	N°2 IFO 380 fuel oil
Properties at 20°C	Viscous oil
Viscosity	33 cSt at 100°C 340 cSt at 50°C 15000 cSt at 20°C
Pour point	9°C
Composition	Paraffins: 30 % aromatics: 53 % resins: 12 % asphaltenes: 5 %

Pollution response

A near grounding

Immediately after receiving the *Tanio*'s SOS, the support tugs *Malabar*, *Abeille Languedoc* and *Abeille Flandre* headed to the location of the wreck. Despite low visibility (2 to 5 miles), swell, and strong winds, the tugs reached the wreck before the night. The stern of the *Tanio* kept on drifting towards the East. She did not leave a trail of pollution but was still filled with 7,500 tonnes of heavy fuel oil and getting dangerously close (2 miles) to the shallows of the Barnouic plateau. The wreck had to be towed quickly but the wind was too strong. No intervention was possible.

The wind slowed down the next day. At around 11h00, despite waves up to 7 metres and winds of 55 km/h, two men of the *Abeille Languedoc* boarded the *Tanio*. A response team of 12 men was airlifted for support. The mooring lines were successfully attached on the first try and helped avoid a grounding. The *Tanio* stopped only 1,000 metres from the breakers.

The *Abeille Languedoc* headed to the north-west while waiting for a refuge port. Following negotiations, the vessel headed towards the Seine Bay to moor in the port of Le Havre three days later.

Emptying operations at quay started on 15 March. The oil was pumped after being heated by the boiler of the *Tanio*. The pumping operations took a week: 7,500 t were unloaded without incident or pollution. The wreck, stored in a dry dock, could then be assessed. She was then towed to Santander (Spain) on 21 June to be scrapped.

A hard-to-treat oil

Scientists from CEDRE, IFP, oil companies, and the Scientific and Technical institute for maritime fishing carefully studied the oil from the *Tanio*.

The mixture of heavy fuel oils initially heated in the tanks cooled down due to the contact with water and turned into a sticky and thick emulsion. In the marine environment, it did not evaporate, showed poor and slow biodegradability (less than 10 %). It was too viscous to be pumped easily. Dispersants would be ineffective. On land, the oil slowly evolved when exposed to the sun and the air. Once the emulsion was broken down, the surface turned black and hardened, which made it particularly difficult to collect and treat. Its viscosity was heightened by the low temperatures of March 1988.

The Polmar-Sea plan

Upon declaration of the wreck, the maritime prefect for the Atlantic triggered the Polmar-Sea plan. The response at sea was delayed 48 hours due to the weather. The use of dispersants and sinking agents (test of Nautex chalk by the French Navy) would have been useless anyway: the fuel oil from the *Tanio* was too viscous. The authorities gave up on the idea of recovery at sea as they lacked appropriate equipment.

The following day, CEDRE, the Nation Weather agency and the LNH-EDF Chatou implemented prevision tools for the drift of slicks (from 7 to 20 March) as a way to better evaluate the scale of the pollution. The model from Météo-France, which integrates real-time meteorological previsions, predicted that pollution would first reach the department of Côtes d'Armor.

Aerial missions involving military and civilian aircrafts (from the Maritime Affairs, Border patrol, Civil protection and the French Navy) took turns to monitor the evolution of the pollution at sea and on the coastline.

The threat of delayed pollution

Tracking

Less than 10 hours after the incident, the bow of the *Tanio* sunk to about 80 – 90 m below the surface. A support aviso found and tagged the wreck using sonar. The wreck was then explored by the *Cybèle*, a minehunter, which tagged its exact position.

On 8 March, the maritime prefect for the Atlantic gave formal notice to the shipowner and the charterer to implement measures that would eliminate the risk of pollution. On 13 March, the insurers declared that the wreck of the *Tanio* would be analysed by the BRITISH OCEANICS company. An observation submarine on board of the *British Voyager* was used to explore the bow of the *Tanio*. Specialists noticed three cracks on tanks 4 and 5. They estimated that the wreck released between three and ten tonnes of fuel oil daily.

The sealing of the leaks started in mid-April, after the spring tides. The divers from the INTERSUB IV submarine put up formwork which they then filled with resin (11 dives in 12 days). The location of the wreck and the bad weather complicated the operations. The sealing operations were achieved in mid-April, the French Navy was then tasked by the cross-ministry mission for the Sea to find a way to definitely eliminate the contents of the tanks. The insurers refused to take responsibility of the following operations.

Realisation

The consultation commission created for the occasion favoured pumping to burying and lightering of the wreck after refloating. A process developed by the IFP was chosen to recover the oil. An emergency plan was planned to avoid incidental pollution.

The work was estimated to 50 million Francs (about 7 million Euros) and carried out by COMEX. It had to be completed before September due to the tides and storms at this time of year. Unfortunately, technical issues and a series of storms slowed the pumping operations down. They had to be put on pause during the winter and started again in the spring of 1981. The work was completed on 18 August 1981, a total of 5,100 tonnes were collected for a total cost of 250 million Francs (around 38 million Euros).

Response on land

Pollution in the Côtes d'Armor

The prefect for the Côtes d'Armor waited to trigger the Polmar-Land plan. He wanted first to assess the level of pollution. Following the weather forecast of 7 March, he decided to pool the pollution response equipment in Tréguier. The aim was to make access to resources easier and improve spending management. Indeed, a first slick, long of 4 km, was spotted off the coast of the Côtes d'Armor. Large streaks were also observed in a area of 1 to 5 km about 30 km off Batz Island.

Maritime equipment services immediately deployed floating booms from the Polmar plan. They received advice from the Technical Service for the Lighthouses and Beacons. As part of the protection programme for estuaries, the port of Perros-Guirec, The Bay of Lenn, Javoy, and Trieux were protected. A 760 m long boom was deployed on Ile Grande by a Belgian civil protection team. The command post in Lannion supported the action by organising the collection of new booms from private providers. In total, 15 km of booms were deployed in Côtes d'Armor.

The booms were completed by synthetic pads. But these "coastline carpets" have limited effectiveness in conditions of wind and hull. Strips of 6 to 8 m in length with waterproof junctions were deployed on masonry work, quays, promenades.

In the morning of 9 March, off Trégastel and the Sept-Iles, a slick of 1 km in length and 20 to 30 m in width was reported. Pushed by the North-western wind, it reached Ploumanac'h and Trégastel. Slick patches started forming in Primel bay and in the Léguer river.

The Polmar-Land plan was triggered on 10 March. Command posts were installed in Saint-Brieuc, Lannion, and Trégastel.

Between 9 and 15 March, the ongoing western winds and the tide currents pushed the oil to the east. Port-Blanc, then Plouha and the Bay of Saint-Brieuc were also polluted. This first step in the oil spill mainly impacted Trégastel and Perros-Guirec. It signalled the beginning of a week-long massive and continuous arrival of oil on the coastline of the Côtes d'Armor.

Pollution spread to north Finistère

Due to south-eastern winds, the oil on the coast was partially remobilised and drifted back into the sea. The oil spill was pushed to the shores of northern Finistère. The product weathered and was mixed with algae when it reached Roscoff on 20 March. 20 kilometres of coastline were polluted. The prefect for the Finistère triggered the Polmar-Land plan on 22 March. A fixed command post was set up in Quimper while, for the first time, an operational command post was set up in Morlaix. The following week, the oil spill kept on spreading, polluting beaches that had already been cleaned. It reached Brigognan and Guisseny.

Oil collection on land

No less than 15 work sites were set up in the first week (Plubien, Plougueil, Plougrescant, Penvenan, Ploumanac'h, Kerlavos, Pleumeur-Bodou, Louannec, Perros-Guirec). The first oil accumulation areas quickly benefited from rough but massive cleaning. Empty trucks and manure pits were used for storage during this period. Military personnel was deployed in priority in Trégastel and Perros-Guirec while

firefighters headed to the other sites. Numerous isles and islands were depolluted but there were logistical issues regarding the cleaning and removal of waste.



Aerial view of a polluted beach ©CEDRE

Oil accumulation areas on the beaches in Côtes d'Armor were quickly cleaned despite frequent arrivals. Patches in areas where vehicles could circulate were removed using shovels. Some beaches were subject to a more selective manual cleaning (waste with only 20 % sand). This slow method required considerable human resources, which is why mechanical cleaning was used as support. On the work site of Grève Blanche, public work engines collected large and homogeneous slicks. The amount of stranded oil was estimated to 400 tonnes. CEDRE launched studies on the most selective engines as a way to reduce the amount of waste. The recovery equipment used during depollution operations in 1978 following the incident of the [Amoco Cadiz](#) was adapted and improved by technicians.

In the Côtes d'Armor, the coastline (rocky shores, capes, deep bays) made cleaning operations more complicated. Manual collection in inaccessible areas was dangerous for the military personnel, firefighters, State agents, and volunteers.

In some cases, the oil from the *Tanio* which had accumulated in and under rocks was remobilised using salt-water and pressure hoses (high and low pressure). The pollutant, floating on the water, was then directed to a recovery EGMOPOL barge in Ploumanac'h, or naturally moved to a recovery area using marine currents, the tides, and the winds. Some oyster barges equipped with dredges were used as mops to collect the sticky fuel oil. Depending on their consistency (liquid, pasty, or solid), the collected pollutants were stored in pits dug on the upper parts of beaches and protected by tarp.

They were then loaded and transported to a treatment plant.

Islands, a particular case

Pollution was significant in the islands and isles of the Côtes d'Armor. The Bono and Malban islands, as well as the coastline of Saint-Gildas de Rhuys and the nearby isles all the way to Pointe du Château, were heavily impacted.

The priority was to get human resources to inhabited islands and work on the logistics regarding the material resources (namely pumping systems). On Renote island, near Ploumanac'h, neither the swell nor the chop could remobilise the oil. The use of low-pressure salt-water pumps, loaded on board of rafts, was therefore necessary.

But in these areas without access to fresh water, it wasn't always possible to use pumps adapted to salt water. Therefore, only the polluted algae were collected in bags and sent to the mainland.

Sometimes, the impacted sites were exposed enough to benefit from natural

cleaning. The rough sea cleaned up the oil, which meant the water would be polluted longer.



Booms used for confinement and recovery by empty tanks ©CEDRE



Aerial view of booms setup to protect the coastline ©France Telecom R&D

Fine cleaning of beaches and rocks



Polluted rocks in the Côtes d'Armor
©CEDRE

The finer cleaning operations for rocks and beaches started in the Côtes d'Armor on 15 April. But the daily cleaning rate on rocks was too low. CEDRE aimed to improve the technique by using high pressure hot water pumps. A series of cleaning products were tested. Ultimately, CEDRE advised cleaning the rocks using hot water. The importance of collecting the cleaned oil was highlighted. The pumping operations were carried out directly on beaches into tanks to collect large volumes. The smaller pollution spots would be cleaned up using sorbents.

For hard-to-reach areas, the use of very low dose second generation sorbents was advised.

Once the rocks had been cleaned, the finer cleaning on beaches could start. Depending on their nature (lightly impacted sand beaches, rough sand beaches retaining water during low tides, pebble beaches), multiple options were advised by CEDRE: cleaning with water and recovery using pumps, ploughing using sorbents, cleaning with sea water or with high pressure water and sorbing agents.

Waste treatment

Aside from the equipment provided by communal services and the Polmar plans, town operators also used farm equipment. In exchange for material compensation at the end of each week, all of the towns in the Côtes d'Armor had access to trailers, tractors, or manure tanks necessary for the pumping and transportation of the waste towards intermediary storage areas.

Starting on 14 March, vacuum trucks took over. They operated in priority to relieve the saturated storage areas in Trégastel and Perros-Guirec. Despite their highly powerful turbines and vacuum pumps, they had a hard time cleaning fresh, liquid, and viscous residue on the coastline. CEDRE tried to implement thinning systems to ease the pumping operations and transport the oil to storage.

The liquids with a high fuel content were treated in a deballasting station. The waste and pasty residue were first treated using quicklime in trenches near the coastline. They were then transported to Louargat where they were treated again.

Most of the waste treated this way would end up used as embankment for the construction of national road 12 in the Côtes d'Armor.

Quantitative data on the Polmar operations

The pollution, which first massively impacted the Côtes d'Armor, then Finistère, ended up spreading on 160 km of coastline. The response operations required more than 3,000 people, including 2,500 military personnel. No less than 200 work sites, spread on 38 sites were necessary to eliminate any trace of pollution in both departments. Around 54,300 tonnes of soiled waste were collected and treated for 12,500 tonnes of oil spilled.

Department	Amount of waste collected on 1 June 1980
Côtes d'Armor	2,300 t (pumped liquids)
Côtes d'Armor	33,000 t (solid waste)
North Finistère	19,000 t (solid waste)
Total	54,300 t

The impacts

Assessment of the situation

Two aerial missions (11 March and 18 March) helped draw detailed situational maps of the polluted areas. The sedimentologists on board of the aircrafts confirmed that the pollution level was high, including on the numerous isles and islands along the Côtes d'Armor.

They completed their study with field analysis. 131 stations were set up between Guissény and Saint-Brieuc to assess the impact of the pollution. Sampling was carried out for analysis on 15 of them. The samples revealed that the effects of this new oil spill were combining with those of the Amoco Cadiz, still visible at that time.

Scientists retraced the distribution of the pollution. They determined the roles played by natural elements. Using a vulnerability index which accounted for the geomorphology and sedimentology of each area, they classed the impacted sites in three main categories. On 160 kilometres of polluted coastline:

- 50 kilometres were heavily polluted: on Ile Grande and the sites of Trégastel and Ploumanac'h, the arrivals were continuous and thick.
- 35 kilometres were moderately polluted, with numerous discontinued slicks.
- 75 kilometres were lightly polluted by sparse slicks with thin films.

80 % of the polluted coastlines were rocky shores. By mid-April, almost all of the spilled oil had reached the coast.

Sediment monitoring

On land, the pollution studies on intertidal sediments lasted 16 months. They assessed the impacts of the spill, directly linked to the nature of the oil. The oil from the *Tanio* slowly degraded naturally in the sediments (compared to a light fuel oil). Along the coastline, the polluted levels were frequently interstratified. They reached up to 30 cm deep, as was the case on Renote island. These levels were discontinued and mixed with soiled algae on numerous fine sand beaches. This was the case for the beaches of Brignogan and Roscoff.

The finer sediments were less prone to permeation due to the viscosity of the product. However, on coarse sand beaches, percolation could reach 40 centimetres. The numerous beaches and pebble furrows in the area most impacted were heavily contaminated by the oil which then hardened and crusted.

Monitoring of the pollution in water

The oil from the cargo of the *Tanio* was first characterised by the team at the Ocean Centre of Brittany (CNEXO/COB). Chemical analyses were carried out on a sample from the wreck towed to le Havre. These results served as a baseline to monitor the evolution and the degradation process of the oil. Scientists from IFP also participated in the operation. They carried out fine analyses for the oil contained in the *Tanio*.

Toxicological analyses were carried out by the laboratories of the Medical university in Brest. The aim was to determine the eventual effects of the oil on people swimming in the area but these studies were limited and the results not representative.

Aside from the possibility of monitoring the evolution of the oil trapped in the sediments, as well as estimate the extend of the pollution over time, these reference

analyses helped measure the degree of contamination of the sea waters in multiple sites.

Data from four campaigns of the CNEXO boats (from March to June) confirmed that the pollution level was high off the Morlaix-Lannion area, in the Sept-Iles area, and off Le Trieux.

A fine dosage methodology implemented by CNEXO/COB made the mapping of pollution easier in the western Channel, on the coastline of the Abers, in the bays of Morlaix and Lannion and in the area between Sept-Iles and Le Trieux. This operational technique could be carried out from the boats. It gave an immediate assessment on the pollution level of an area.

The sea floor was also explored to check for contamination. From 25 to 30 March, the ship *Thalia* from CNEXO carried out the first measurement campaign. Samples were collected at various depths in a water column. The campaign of the *Pluteus* (24 to 26 March), the vessel from the Biological Station in Roscoff, ensured that there were no contamination of the deep marine sediments between Triagoz and Sept-Iles.

Overview of the impact on some populations

Impact studies were also carried out on:

- **Algae:** large algae were oiled more or less depending on the location. The pollution had no impact on photosynthesis. Cleaning operations had more consequences. High and medium level algae were only lightly impacted. Although the *Ascophyllum* were impacted in some areas, the general loss was limited. The laminaria which constitute all of the algal biomass were also only lightly impacted.
- **Plankton:** The overall impact is light since they follow a rapid cycle.
- **Dying cockles, surf clams and clams** were observed on Ile Grande.
- **Crustaceans:** lobster larvae living on the surface were impacted, but overall, crustaceans dying from oiling or asphyxia were rare. In Trégastel, young poutings were found dead, their digestive tract filled with oil. This fauna living on algae free rocks suffered the loss of 80 % of the population in Trégastel and Ploumanac'h (mid-April). Winkles (common periwinkle, gibbula, and dog whelk) living in the rock formations were impacted.
- **Sand hoppers:** the sand hoppers which eat the stranded algae survived.
- **Zooplankton:** studies on a group of copepods showed that some areas were polluted.

Ecological monitoring

The CNEXO, the ISTPM, the Institute for marine studies of the UBO, the medical university of Brest, and the biological station in Roscoff were involved in the monitoring studies commissioned by the Ministry for the Environment.

The impact of the pollution from the *Tanio* on the environment varied depending on the degree of pollution in the area, on the life environment (in sediments, on beaches, in rocks or in algae), on the amount of human intervention (used of cleaning agents, mechanical cleaning).

Arrivals of fuel, even light, on beaches can change the behaviour of animals, mainly for species using the seaweed as a food source. On a smaller scale, bacteria had apparently more trouble degrading the fuel once it started accumulating.

The institute for marine studies (UBO) was tasked with estimating the global losses in marine littoral biomass. It managed the monitoring of fauna, evaluated the mortality rate and the recolonisation process on the beaches of Plougrescant and Grève Blanche (in the commune of Trégastel). The sites were sampled before the first oil arrivals. These samples were used as reference. Researchers counted and measured the populations of localities (around 20) at various depths. The studies carried out on herbivorous mollusc survival gave an overview of the impact of pollution on all the fixed populations of the foreshore.

The first estimates regarding the mortality rate for birds were catastrophic. Birds were gone from Sept-Iles. The guardian of the reserve estimated that the auks (small penguins and guillemots) were the most impacted ones. He estimated that it was already too late to protect the Atlantic puffins which were about to arrive after migrating. 80 % of the 4,000 couples of Northern gannets from the colony in Sept-Iles were oiled. The soiled eggs had no chance of hatching.



Birds killed by the pollution ©CEDRE

The fuel from the *Tanio* killed almost 40,000 birds despite the interventions from volunteers of the Nature Conservation Society in Brittany, twice as much as the [Amoco Cadiz](#).

This level of mortality was explained by the fact that the birds lived on the surface of water in this area (the pollution area was estimated to 1,000 km²).

Moreover, the light smell of the oil from the *Tanio* did not draw the birds away.

Monitoring of the sea industry

The most impacted area spread on 45 km of coastline between Trégastel and Ploumanac'h and is made of a succession of pink granite cliffs. The variety of landscapes and the ecological richness of the region led to the development of a variety of economic activities linked to the sea. Tourism, coastal fishing, oyster farming, and fish farming largely developed there. In this region, the pollution caused major economic repercussions.

The Scientific and Technical Institute for Maritime Fisheries monitored the commercial species such as algae. From Perros-Guirec to Ile-Grande, the algae of the coastline were polluted. The oyster farms and mussel bouchots were also closely monitored. However, samples taken on board of the Pelagia vessel on scallops and flat fish did not show abnormalities (study carried out at the end of April).

Compensation

The compensation for victims

Immediately after the incident of the [Amoco Cadiz](#), the French state adhered to the compensation system created by the International Maritime Organisation through the [IOPC Funds](#). The damage from the pollution of the *Tanio* was therefore eligible for compensation by the IOPC Funds, after using the limitation funds from the ship's insurer, the United Kingdom P&I (Protection and Indemnity) Club. The shipowner was responsible up to 11.83 million Francs. The sum was provided to the tribunal in Brest as limitation funds in April 1980 and was entrusted to a liquidator, who made it grow while waiting for an agreement regarding compensation claims. There was almost a hundred of them, for a total of 527 million Francs (including a claim for 490 million Francs by the French government). This sum exceeded the available amount between the insurer's money and the IOPC Funds. Following partial payments between 1983 and 1985, the IOPC Funds reached agreements with all claiming parties in 1988, for a total of 348 million Francs, including 327 million Francs (with late fees) for the French government.

A legal dispute settled amicably

In parallel to compensation negotiations, the French government and the IOPC Funds instituted proceedings against the charterers and other stakeholders potentially responsible for the ship's failure. The State wished to complete their compensation while the IOPC Funds wanted to recover at least part of the sums it paid. Together, they filed a claim for 483 million Francs.

On 15 December 1987, an agreement between the interested parties put a stop to the judicial proceedings. The shipowner and the Club, acting in the name of all defending parties, signed a protocol for the forgiveness of any pursuit with the State and the IOPC Funds against the payment of 294 million Francs (107 for the IOPC Funds and 187 for the French State). The IOPC Funds recovered about a third of the amount they paid to victims while the State increased its compensation to a third party. To our knowledge, it was the first instance of a State reaching a compensation amount exceeding the maximum amount given by the IOPC Funds.

What changed?

The incident of the *Tanio* revealed multiple issues which turned into long-lasting debates. It led to innovation on two major points:

The issue of ports of refuge

The admission of ships in distress in a port of refuge is risky. In circumstances of force majeure, it is complicated to prevent these vessels transporting hazardous substances from entering areas where industrial activities are very developed and with a high population density. The case of the *Tanio* underlined the importance of taking a certain amount of safety measures to prevent further incidents during the presence of a vessel in distress in a port of refuge.

Controversy around the triggering of the POLMAR Plans

The incident of the *Tanio* opened a debate around the triggering of the Polmar plan: was it really appropriate to trigger it instantly? Was it necessary to preserve the marketable image of the Briton coastline as a tourist area...

Innovations:

CEDRE

The oil spill of the *Tanio* was the first large scale pollution event faced by CEDRE. The association had to take on the roles of mediator and advisor, in particular for Polmar plan managers and local authorities.

It was also heavily involved in the deployment of new response techniques and ensured good coordination between the various scientific partners involved in the response operations. CEDRE, with the support of other research teams, carefully studied the physico-chemical behaviour of the oil from the *Tanio*. It helped improve the daily cleaning rate of rock cleaning work sites. Existing equipment such as the EGMOPOL, skimmers, and viscous products pumps were suggested. Others destined for recovery were adapted.

Pumping in the wreck

The pumping of the *Tanio* was an unprecedented operation from a decisional and operational point of view. Following that, it would become unimaginable to leave the wreck of an oil tanker at the bottom of the sea without at least considering operations for the neutralisation of its cargo.

40 years on...

On 16 November 2019, the MRCC Corsen received reports of potential pollution in northern Finistère. The same day, oiled birds were found on the shoreline between the beaches of Saint-Samson and Saint-Jean-du-Doigt.

As soon as this information was confirmed, satellite, aerial, shipborne and onshore surveys were launched to detect the pollution. Despite the resources deployed, no pollution was detected.

However around forty birds, some bearing traces of oil, were found on the beaches of northern Finistère and Côtes d'Armor and were taken to the LPO Ile Grande rehabilitation centre. At the request of the Maritime Prefecture for the Atlantic, CEDRE analysed samples taken from several oiled birds. The oil analysed showed major similarities with the heavy fuel oil of the *Tanio*.

On 21 and 22 November, the French Navy sent the *Pégase* (a tripartite minehunter) to determine the precise location of the wreck of the *Tanio*, which lies off the coast of Batz Island at a depth of 80-90 metres. No pollution was detected by the *Pégase* around the wreck.

Surveys of the northern Finistère shoreline were reinforced and maritime surveillance continued.

Further investigations are scheduled to be conducted to assess the state of the wreck and to detect any possible leaks of oil remaining in the bow section of the *Tanio*.

In early December 2019, the French Navy deployed a ROV (Remote Operated Vehicle). After several investigation dives, a few minor oil leaks were detected. These leaks were coming from two drilled holes fitted with valves, due to operations conducted in 1980 to pump out part of the *Tanio*'s cargo. The valves had been torn out of the two holes.

The sealing of the leaks was carried out from 5 to 8 September 2020.

At the end of 2020, oiled birds were found on the shoreline of Finistère. Following a request from the Maritime prefecture for the Atlantic, CEDRE carried out analyses which showed that, as in November 2019, the oil shared major similarities with the heavy fuel oil from the *Tanio*. Resources were deployed at sea on 6 and 7 January 2021 to assess the state of the wreck. This new investigation showed that 3 of the 10 sheets installed in September 2020 were ripped by fishing engines and that oil was leaking from one of the holes.

The feasibility of a further operation is being studied and the maritime authorities remain vigilant on the monitoring of this wreck.