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Under a Cloud of Secrecy: The French Nuclear Tests in the Southeastern Pacific

BY BENGT DANIELSSON

The use of the Pacific as a testing ground for nuclear weapons is perhaps one of the darkest chapters in the history of the entire Region. Before the Partial Test Ban Treaty went into effect in 1963, the US had tested at least 103 nuclear bombs in the Region. After 1963, however, the Americans, British and Soviets moved their nuclear testing programs out of the Pacific permanently. Today, only the French insist on testing their nuclear bombs in the Pacific, on two Polynesian islands: Moruroa and Fangataufa. Since 1966 the French have exploded at least 105 bombs. The devastation caused by this testing is a continuing source of controversy in the South Pacific. But relevant fallout data from all the tests have never been made public by the French government and the actual extent of the contamination of French Polynesia and its neighbors from radioactive fallout remains unknown.

Two Pacific islands have become infamous throughout the world: Bikini and Eniwetok. Between 1946 and 1958, 66 atomic bombs (including at least ten H-bombs) were detonated on these two islands, leading to the irradiation of hundreds of Micronesians. But less known are the nuclear tests made at two other locations: Johnston Island and Christmas Island. Both are located in uninhabited areas of the Pacific. At Johnston Island, 1100 kilometers southwest of Hawaii, US Air Force planes dropped two H-bombs in 1958, and then another ten A- and H-bombs in 1962. On Christmas Island, the British detonated their first home-made H-bomb in May 1957, and during the next fifteen months tested six more H-bombs and two "ordinary" A-bombs (see Figure 1).

Then in 1962 the British "loaned" Christmas Island to the Americans, who were then (like the Soviets) rushing to make the maximum number of atmospheric tests during the last year of grace before the 1963 PTB (Partial Test Ban) treaty came into effect. The "nuclear fireworks" which shook this atoll from April through July 1962, proved to be the most concentrated series of tests ever carried out, for not less than 25 bombs, of which at least three were H-bombs in the ten megaton range, were detonated (1).

By this time, France had detonated six nuclear bombs in the Sahara Desert and was already looking for a new site, since Algerian independence was impending. Unavoidably, France followed the American example and decided to establish a new nuclear test base in the Pacific. From a political standpoint the choice seemed even safer than the American decision to test in the Micronesian Trust Territory—theoretically under the jurisdiction of the UN—because France had several colonial-type possessions there. Among these included the 80 Tuamotuan atolls in French Polynesia.

THE BOMBS FALL

The islands eventually chosen were the two small, uninhabited atolls of Moruroa and Fangataufa, located in the southeast corner of the Tuamotu archipelago (Figure 2). No nuclear arms nation had ever tried the technically very difficult and therefore costly and dangerous task of making underground tests in the narrow base of a porous coral island, and the French technicians sent out to Polynesia in 1962 totally excluded this option in favor of atmospheric tests. There was one serious inconvenience, however; Moruroa and Fangataufa were surrounded to the west, north and east by inhabited islands.

Most political, church and civic leaders in French Polynesia immediately voiced strong fears that any nuclear tests made in the Tuamotus might, as the American tests did in Micronesia, adversely affect the health of the 7 000 people living there. These fears were played down by French cabinet ministers, admirals and generals, who swore that the French bombs were to be exploded only when the wind was blowing from the north, towards the empty ocean between Polynesia and Antarctica (2).

By the beginning of July 1966, after three years of intense preparations, the Moruroa testing base was operational. The first bomb was placed on a barge anchored in the lagoon and detonated. The result was a catastrophe—all the water contained in the shallow reef basin was sucked up into the air and then rained down, covering all islets with heaps of irradiated fish and clams, whose slowly rotting flesh continued to stink for weeks (3).

The next bomb was therefore dropped from an airplane at an altitude of 16 000 meters, one hundred kilometers south of Moruroa, over the empty ocean. Since there was nobody there to make any scientific records of the experiment, the whole exercise was totally worthless. Two days later, an untriggered bomb was exposed to a "security test" on the ground, which was

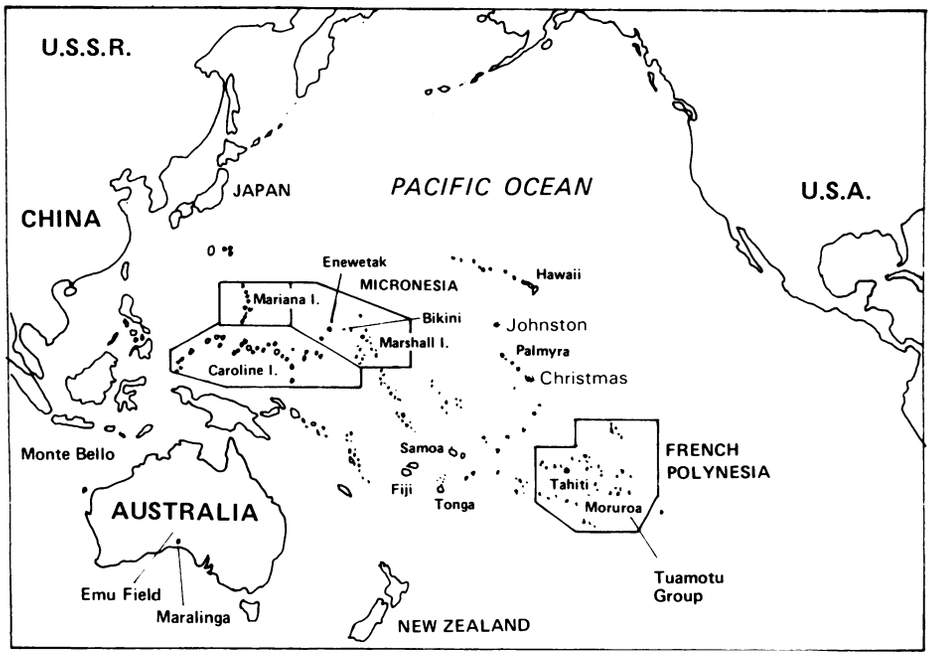

Figure 1. Map of South Pacific showing locations of major test sites for nuclear weapons.

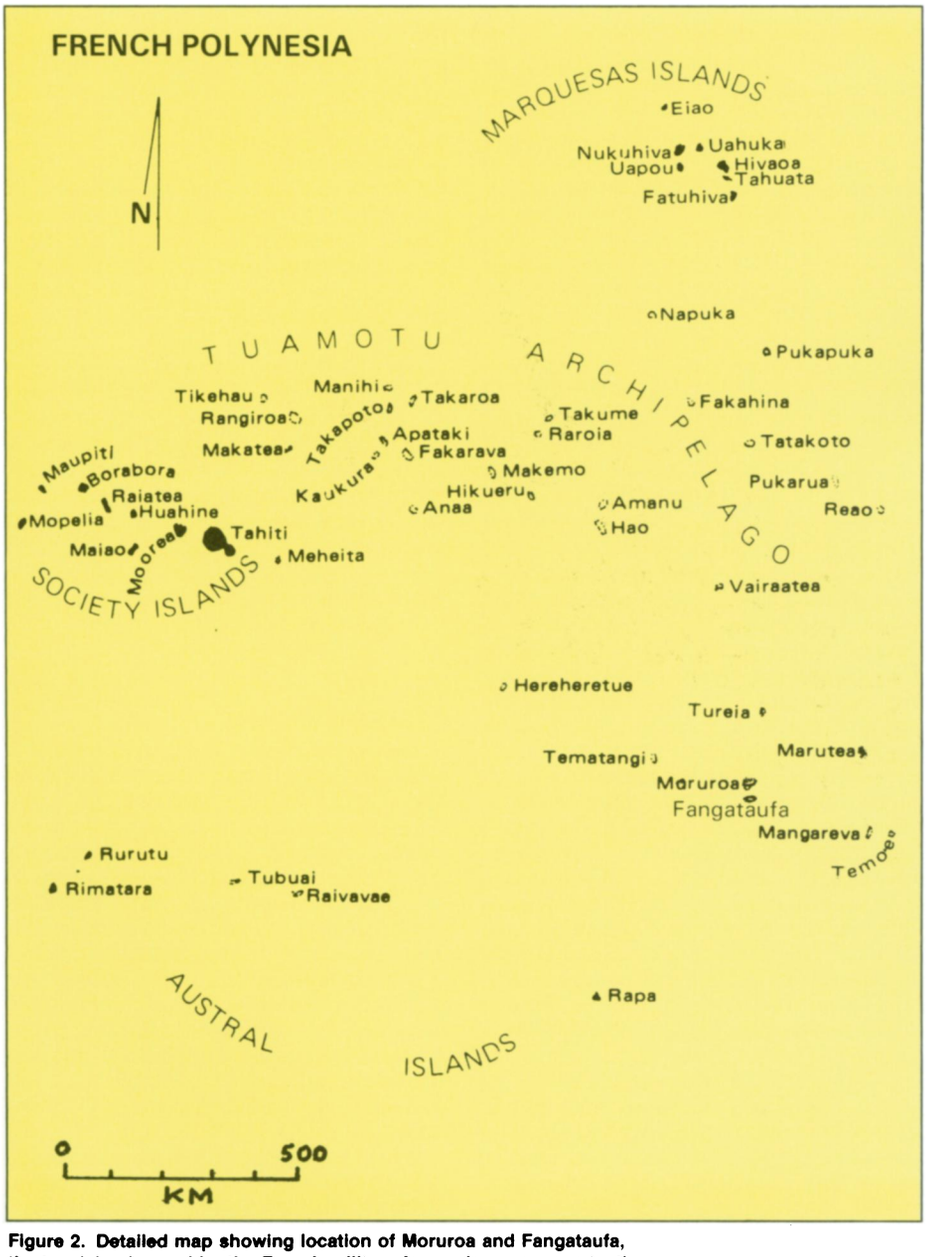

Figure 2. Detailed map showing location of Moruroa and Fangataufa, the two islands used by the French military for nuclear weapons testing.

successful in as much as it did not go off. But on the other hand, the case broke and its plutonium contents spilled out over the reef. In the sanguine hope of containing the radiation substances, the contaminated area was covered over with bitumen.

All these bizarre experiments were simply rehearsals for the grand opening bang of the new *Centre d'Experimentation du Pacifique* (CEP for short) which was to be performed on September 10, 1966, in the presence of the godfather of the French nuclear striking force, President-General Charles de Gaulle himself. As during previous tests, all technicians and troops were evacuated to another island, while on the appointed day de Gaulle embarked on a warship, especially equipped with protective iron shields and sprinklers for washing away radioactive dust, which remained close enough to Moruroa to allow him to watch the glorious event from the bridge. This time the bomb, or rather the box containing the 120 kiloton charge, was suspended 600 meters above the lagoon, from a blimp, anchored to the reef.

General Charles de Gaulle visited Tahiti in 1966 on his way to watch a nuclear explosion on Moruroa.

Unfortunately, the sky was completely overcast and the wind easterly. There was nothing else to do but postpone the bang. The following day, however, the weather was even worse. And so was the temper of the President-General who was in a great hurry to return to Paris where important affairs of State awaited him. The boxlike nuclear charge (which revealed how far the French technicians still were from their goal to produce a sleek operational bomb) was therefore exploded.

The monitoring stations which the New Zealand National Radiation Laboratory had taken the precaution of setting up in the Cook Islands, Niue, Samoa, Tonga, Fiji and Tuvalu—to the west of French Polynesia—immediately registered heavy radioactive fallout. For instance, in Apia, Western Samoa, the concentration of fission products in the rain water amounted to 135 000 picocuries per liter (4). The authorities never announced how severe the fallout was on the eighty or so inhabited islands in French Polynesia.

Two years and eight bombs later (some of which were again exploded on barges), the French technicians succeeded at long last in copying the exploit realized by the

Americans in 1952, the Russians in 1953 and the British in 1957—they detonated their first thermonuclear bomb, which had a yield of 2.5 megatons. The place chosen was Fangataufa, 40 kilometers south of Moruroa, where, up to then, only a 150-kiloton A-bomb had been tested. After this big thermonuclear blast in 1968, Fangataufa was so heavily contaminated that it was declared off-limits for all human beings, and remained so for the next six years. Consequently, the next H-bomb of the 1968 test series had to be detonated at Moruroa—which thereafter was abandoned for more than one year.

As for the fifty inhabited atolls in the Tuamotus, shelters had to be built in a great hurry on three of the easternmost ones. Each time a test was made in 1968 the hapless islanders were locked up in these shelters for a day or two and each time their homes also had to be "decontaminated" by spraying them with sea water. Quite exceptionally, the 60 inhabitants of Tureia, 125 kilometers north of Moruroa, were also evacuated to Tahiti on one occasion (5).

HEALTH EFFECTS

The 30 elected representatives of the Polynesian people, who form the local parliament called the Territorial Assembly, began to wonder aloud about the ill-effects all these accidents and high-yield blasts might have on the health, not only of the Tuamotu islanders, but of the population of French Polynesia as a whole. From 1963–65 a team of scientists from the prestigious Museum of Natural History in Paris, on the invitation of the Ministry for Defense, carried out an inventory of the fauna and flora of the Tuamotu islands. At the request of their sponsor, they had also listed the marine animals best suited for tracing radioactive fallout, due to their propensity to bioaccumulate low radiation doses. These turned out to be the tridacna clams, the turbo shells and the squids, of which the islanders consume huge quantities (6).

American specialists, who had undertaken similar field work in the Micronesian islands, had already discovered that both coconuts and coconut crabs regularly eaten there (like in the Tuamotu archipelago) easily become contaminated. Another universal source of contamination in all atolls is the rain water, because the drops drag down to earth radioactive particles injected into the air by nuclear explosions. Worst of all, the rainwater on which the atoll dwellers depend entirely is stored in concrete tanks, which results in a rapid evaporation and subsequent high concentration of radionuclides.

INADEQUATE SAFEGUARDS

At the time when these French surveys were made in the Tuamotus, the CEP high command had told the assemblymen that as soon as the tests began, inspectors were to circulate among the islands to check radiation levels. If by any chance they discovered food items which represented the slightest health hazard, a ban on eating them was to be imposed immediately. No such inspectors had ever been spotted, and even more surprising, the French National Radiation Laboratory was forbidden to send any experts to French Polynesia, where all radiation studies were entrusted to French army doctors in the pay of the CEP who refused to divulge the facts and figures on which they based their frequent bland assurances that the tests were perfectly harmless.

In fact, the only published studies of any relevance to the radiation problem emanated from Japanese scientists working for the World Health Organization, who collected data on ciguatera fish poisoning in French Polynesia in the 1970s. Up to then, the CEP doctors had always taken great pains to point out that this type of fish poisoning, resulting in vomiting, headache, fever, trembling and paralyses: 1) existed already in the days of Captain Cook, and 2) fish become toxic not because they are irradiated, but because they ingest micro-organisms which grow on broken and damaged corals. Consequently their conclusion was that the ciguatera type of fish poisoning could not be blamed on the nuclear tests (7).

The impartial studies made by the Japanese toxicologists and ichthyologists clearly demonstrated, however: 1) that ciguatera had become a serious problem in French Polynesia only after the nuclear tests had begun, and 2) that the annual number of reported cases—between 700 and 800—was higher than in all the remaining islands south of the Equator taken together. Even more revealing was the geographical distribution *within* French Polynesia, for ciguatera epidemics occurred above all in the islands where the French army had dredged and deposited garbage and where French warships regularly had been cleaned after radiation exposure. In other words, although the army doctors had been right in maintaining that ciguatera fish poisoning was not *directly* linked to the tests, the destruction of the environment by the CEP outfits was *indirectly* responsible for it (8, 9).

It may also be of some interest to quote what the highest French authority, the minister for Public Health, had to say in the eighth year of the nuclear testing program about the health risks in French Polynesia. Here is the complete text of the written question submitted by the Deputy for French Polynesia, Francis Sanford, along with the minister's reply:

"Question number 1711, May 25, 1973: Mr Sanford asks the minister for Public Health and Social Security: (1) if he is able to indicate the exact number of deaths due to cancer that have occurred in French Polynesia during the past ten years, and (2) if he can undertake an evaluation of the amount of radioactive contamination existing in the following three French Polynesian islands: Hao, Tureia and Mangareva.

"Reply, dated September 15, 1973: Mr Poniatowski, minister for Public Health and Social Security, informs the honorable member of parliament that he has no direct responsibility for the territory of Polynesia. He is nevertheless able to state: (1) that the frequency of cancer and leukemia has remained unchanged in Polynesia during the past ten years, and (2) that the radioactivity in the islands of Polynesia, taken as a whole, has stayed within the limits of the fluctuations of the natural radioactivity."

As all readers will certainly agree, these were extremely vague answers to questions which the deputy had never asked.

An attempt by Francis Sanford to enlist the support of French politicians and church leaders was only slightly more successful. Thanks to the active help (including some financing) of the leader of the small radical socialist party, Jean-Jaques Servan-Schreiber, half a dozen deputies, ministers and priests flew out to Tahiti at the end of June 1973, to participate in an anti-nuclear meeting attended by 5000 Polynesians. However, the protests went almost unnoticed and certainly unheeded in France.

All the while, the New Zealand and Australian radiation laboratories had continued to register a steady increase of strontium and cesium fallout—especially in the milk—in their national territories and throughout the Pacific islands. By 1971 the figures had reached the same level as in 1963, when the full effect was felt from the frenzied test program launched just before the deadline imposed by the PTB (10). More and more civic associations, ecological groups, church bodies, trade unions and political parties in these countries voiced protests. These were followed by nationwide boycotts of French goods, airlines and shipping companies. The mail service to and from France was also halted by Australian and New Zealand postal workers. Unavoidably, some protests took a violent form, as for instance when the French consulates in Sydney and Auckland were bombed. Little by little, the protests and boycotts spread to other countries, both in South America and Southeast Asia. Both the UN Conference on the Human Environment, held in Stockholm in June 1972, and the UN General Assembly (meeting later that year) condemned the French tests. At the latter occasion not less than 105 nations voted against France, whose only allies were Portugal, China and Albania.

PROTESTS MOUNT

Carried by this protest wave, the governments of Australia and New Zealand on May 9, 1973, instituted proceedings in the International Court of Justice (ICJ) in the Hague against France, on the grounds that the fallout from the French tests at Moruroa had polluted their national territories (11). France countered by refusing to recognize the competence of the ICJ in defense matters. The court decided that radioactive pollution across international boundaries was not a defense but a health matter and issued on June 22 an interim injunction ordering France to cease all nuclear testing, until the case was closed (12).

When it became obvious that the French government was going to disregard this injunction, the new Prime Minister of New Zealand, Norman Kirk, took the unprecedented step of sending a warship to

The protest vessel *Fri* was seized by French commandos in July 1973 in international waters as it tried to stop further testing by continuing to linger in the area.

Moruroa with a cabinet minister and a group of pressmen on board. This was an excellent way of keeping the issue alive. But more annoying to the French bombers was no doubt the presence, since early June, of three civilian protest vessels, cruising off Moruroa just outside French territorial waters. For contrary to the crews of the New Zealand warships, the young men and women on board these three small yachts had no protection whatsoever against radioactive fallout. They acted, of course, on the assumption that the CEP bombers would hesitate on humanitarian grounds to detonate their bombs.

This turned out to be correct, for after having postponed the tests for six weeks for this very reason, the French military authorities in the end saw no other way out of this dilemma but to order a commando unit (including frogmen armed with knives) to board and seize the protest vessels and imprison the crews, who had committed no offense, since they had been very careful to patrol solely in international waters. Short of opening fire there was nothing the New Zealand frigate could do to prevent the "piratical seizure" (13). Before the end of the year, the French comportment was roundly denounced by the WHO, the ILO and the Twenty-Eighth UN General Assembly.

These world-wide protests, involving many useful trading partners, could not be as easily waved aside by the French government as the ten-year-long protests of the Polynesian people, which had never received any international attention. After President Pompidou died in April 1974, the long overdue decision to cease testing in the atmosphere was made by his successor Giscard d'Estaing. But not until another eight atomic bombs had been detonated at Moruroa or dropped from airplanes over the ocean, between July and September, 1974. Incidentally, these farewell fireworks surpassed all the previous ones. For exemple, in Papeete, the only locality in French Polynesia for which a figure is available, the total Beta activity in the air was 1460 mBq/m^3, as against 3 in Auckland, New Zealand (14).

Bikini and Eniwetok, where the Americans tested in the atmosphere between 1946 and 1958, are atolls of exactly the same type as Moruroa and Fangataufa, and therefore equally unsuitable for underground testing. This is why the US Micronesian task force moved lock, stock and barrel to the Nevada desert. The British government, which also in 1957–58 used a Pacific atoll for atmospheric testing, likewise estimated that Christmas Island could not support any underground testing, because of the porous character of the coral, and gratefully accepted the American offer to share its testing facilities in Nevada.

The most sensible solution open to President Giscard d'Estaing in the summer of 1974 would have been to recall the Moruroa team to France to start drilling, after the American and Soviet example, in the solid ground of some uninhabited region. But this obvious choice was not made, mainly because of political reasons—most Frenchmen would not have approved the idea.

For this reason, the desperate French army engineers had to attempt, from 1975 on, the delicate task of erecting oil rigs on the narrow coral reef of Moruroa and drilling down 800–1000 meters to the underlying basalt rock. Then after having lowered a bomb to the bottom of the shaft, they had to plug it with a concrete fill, so as to prevent venting of gaseous fission products like krypton and xenon.

Right from the beginning, the army engineers claimed that *all* radioactive substances released during a blast would be trapped and sealed in the cavity created when the surrounding rocks were melted by the enormous heat generated. On the contrary, critics were convinced that cracks and faults were bound to appear, permitting radioactive substances to leak out into the ocean or rise to the surface.

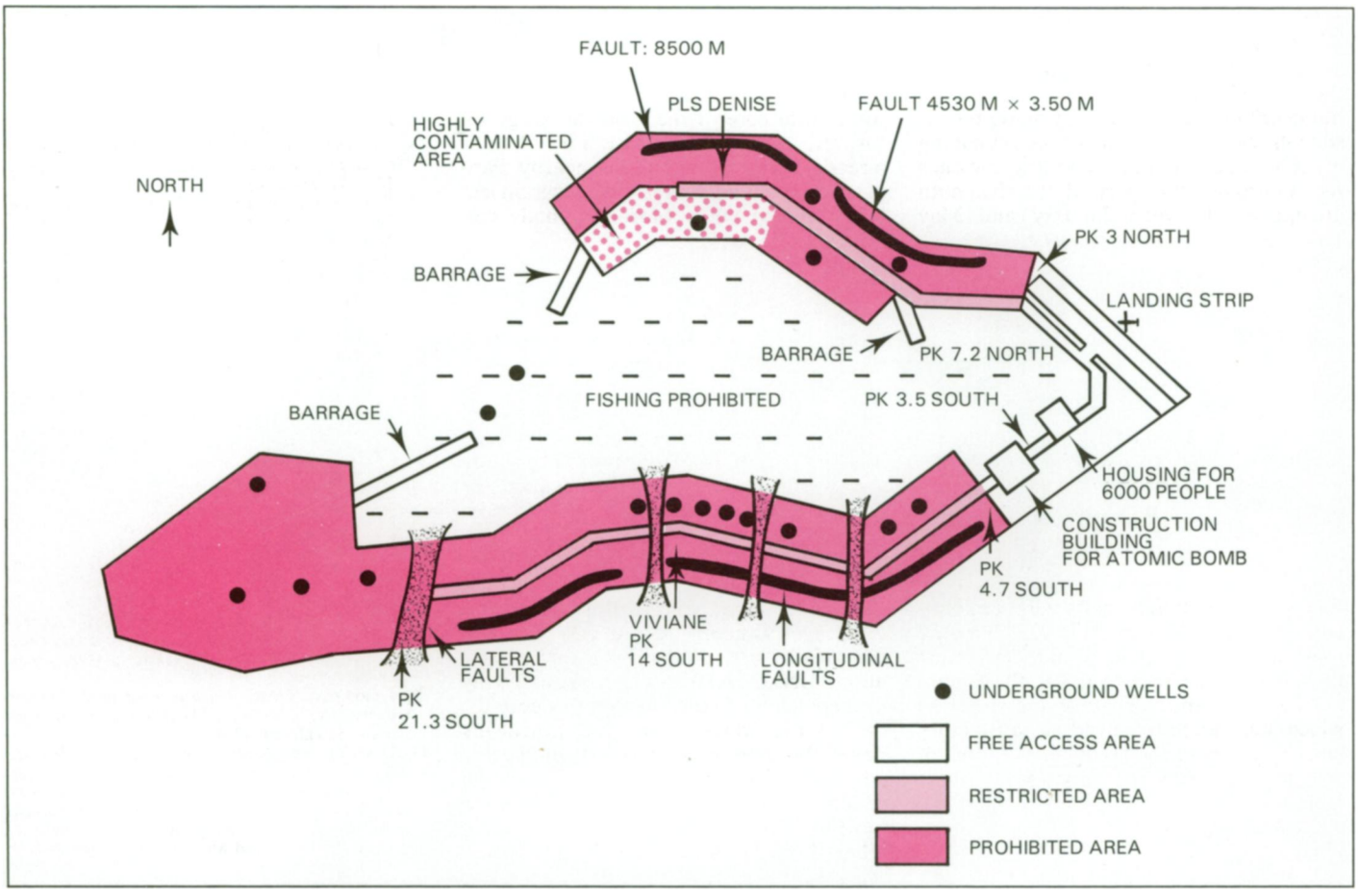

Figure 3. This official CEP map from 1980 shows the fearful extent to which Moruroa has been damaged and contaminated by the nuclear weapons tests. The black dots mark the areas where 63 underground tests have been made since 1976. The intervals between the test pits rarely exceed 500 meters. The area marked "highly contaminated" on the north coast refers to the portion of the reef impregnated with about 20 kilograms of plutonium (which has a half-life of 24 400 years). The thick black lines show the faults (fissures) caused by the tests. The hatched areas are off limits to all employees (except for the restricted corridor).

CONTINUING DISASTERS

Available reports by a few French and foreign scientists who have been allowed to visit Moruroa briefly in 1982 and 1983 (15, 14), although very sketchy, contain enough data to show that the skeptics, unfortunately, were right. For not only have the tests regularly been accompanied by venting, leakage and seepage, but several ugly accidents have also occurred, during which enormous chunks of the outer wall of the atoll were torn out. The volume of coral and rock pried loose by a 150 kiloton bomb detonated on July 25, 1979, for instance, was estimated at one million cubic meters by Tazieff (15). Of course, on each occasion, huge quantities of radionuclides escaped through the gaping hole into the ocean, where they were absorbed by fish and plankton. Even worse, the underwater landslides sometimes generated tidal waves which raced through the Tuamotu Islands, destroying buildings and wharfs. After the 1979 accident, instead of ordering a retreat to metropolitan France, the military high command erected 23 refuge platforms, 4.5 meters high, on the reef near the living quarters, which moreover were then surrounded by a two-meter-high, protective concrete wall.

As if all this were not enough, there occurred from 1980 on, a series of unforeseen, natural disasters, due to the unexpected weather changes in the Southern Hemisphere. Up to that year, cyclones had been an extremely rare phenomenon in French Polynesia. The last full-scale one occurred in 1906. The French army engineers had therefore completely disregarded this risk when they selected Moruroa in 1962, which, like most atolls, is elevated only a few meters above sea level.

It was therefore a most disagreeable surprise for the 3000 servicemen stationed on Moruroa to hear over the radio at the end of November 1980 that a cyclone had formed near the Equator and was heading in their direction. The waves stirred up by this cyclone were six to eight meters high and it was only because the "islanders" could take refuge on the providentially-built platforms that no lives were lost.

They had barely gathered their wits and scattered belongings, when another cyclone hit Moruroa even more squarely, during the night between March 11 and 12, 1981. The havoc wrought on this occasion was particularly serious on the north coast and led to several startling revelations about the criminally negligent way in which nuclear waste had been dumped there for years.

Those who squealed loudest were the French technicians employed at Moruroa, who belonged to the socialist CFDT trade union. They therefore harbored the illusion that the new minister for Defense in the socialist government which came to power in May 1981, would be more willing to clean up the mess than his predecessors. When several months later, the minister had still taken no action, the union bosses asked the independent French newspaper *Libération* to take up their cause, which it did (16, 17). The most chilling revelations in their extremely well substantiated accusation, reproduced by leading newspapers around the world, were the following:

Right from the beginning, all sorts of radioactive waste, like scrap metal, timber, tools and clothes, sometimes sealed in plastic bags or metal drums, had simply been dumped on the reef on the north side of the atoll. (The area is marked *zone très dangereuse* on the accompanying French army map). This dump eventually covered an area of 30 000 square meters.

The amount of plutonium spilled over the reef in the same area during the "security tests" in the late 1960s and early 1970s, and fixed in the roughest possible fashion by a layer of bitumen, amounted to almost twenty kilograms, enough to exterminate the whole population of French Polynesia.

Incredibly enough, the CEP high brass had considered this open air storage perfectly safe until the 1980 and 1981 cyclones

ripped off a huge portion of the plutonium-impregnated bitumen layer and swept the pieces, together with much of the other "ordinary" nuclear waste, into the ocean. Before another, less reprehensible method of disposing of the remaining waste had been found, five more cyclones raced through this part of the Tuamotu archipelago between January and May 1983, and presumably completed the job (18).

MORE WASTE

There is still another serious waste disposal problem at Moruroa, about which the army engineers and technicians have had less to say, because they have not been as directly affected themselves. This waste consists of the crushed corals and rocks taken up from the holes drilled in the reef, at the bottom of which the bombs are detonated. The amount is about 1500 metric tons per hole, and up to June 1984 more than sixty such bomb shafts had been drilled. This means that roughly 90 000 metric tons of partially polluted material must have been dumped into either the lagoon or the sea. Another intriguing question which has never received a satisfactory answer, is where the technicians found all the sand needed for mixing the huge amounts of cement required to plug the shafts. Could it have been dredged up in adjacent atolls?

More or less at the time when the first cyclone hit Moruroa, another limit had also been reached: the base of the atoll had been so badly damaged by all these tests made at the periphery that the army engineers jokingly likened it to a Swiss cheese. The size of the cavities hollowed out in the basalt foundation by the explosions was, of course, proportionate to the yield of each bomb. According to the most reliable estimates (19) a 10 kiloton bomb creates a cavity, or rather a chimney, which is 20 meters wide and 90 meters high, and the rock around it is fractured within a 150 meter radius. The corresponding figures for a 150 kiloton bomb are 55 by 220 and 400 meters (Figure 3).

Then we must remember the diminutive size of Moruroa, and the fact that the northern half of it was covered with buildings and an airstrip, leaving only a 25 kilometer long stretch of the south coast for underground testing. The shafts sunk into the reef there had to be very closely spaced—with at most 500 meter intervals —which explains why the island was so thoroughly perforated within the short period of four years. By 1980 some of the destruction was reflected on the surface by vast depressions and faults several miles long (see Figure 3).

It was thus high time to give up Moruroa, and, if more tests were on the books, to make them henceforth in the Massif Central in France. Instead the CEP high command chose to install a derrick on a platform in the middle of the 40 meter deep lagoon and started drilling there. Since this new phase of the venture was initiated in 1981, more than ten bombs have been detonated under the lagoon, at depths varying between 800 and 1000 meters. Most of these explosions have been in the 50–70 kiloton range, but at least half a dozen have been small prototypes of neutron bombs. Obviously, the lagoon area too is of such limited size that these tests in the central core of the atoll cannot go on forever. As a matter of fact, a new base is already being prepared on nearby Fangataufa so the endless testing program can be continued when Moruroa finally collapses for good.

NO END IN SIGHT

In conclusion, there can be no doubt that the nuclear fallout engendered by the 41 atmospheric tests, made at Moruroa and Fangataufa between 1966 and 1974, is still with us (mostly absorbed into our bodies), and that the 63 underground tests made since 1975, instead of diminishing the health hazards, have added several new sources of radioactive pollution.

The only reports on radiation problems in Polynesia which the French government has made public during this period are those sent annually to the UN Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) —which show mostly *average* fallout figures for ten day periods, or for the whole year, and practically never the amounts measured on specific dates. Equally unsatisfactory is the way in which the samples of the flora and fauna have been taken, for these as a rule come from the islands located farthest away from Moruroa and instead of a precise date, only the trimester is indicated! This is why the UNSCEAR members have regularly complained about the paucity of the data in these reports, which prevents them from drawing any scientifically valid conclusions.

This is nothing, however, compared to *the total absence* from these UNSCEAR reports of any statistics showing the state of health of the 166 000 inhabitants of French Polynesia, who have been exposed to all this radioactive fallout over a period of eighteen years. Under heavy pressure from WHO, the territorial health department (which is also run by French army doctors) eventually published in 1983, some figures purporting to show that such radiation-induced diseases as leukemia and thyroid cancer are practically non-existent in Polynesia. These statistics were reassuring only because they were woefully incomplete and in some respects even faked (20, 21).

In order to find out the truth, the Territorial Assembly has repeatedly tried to set up a commission of inquiry, composed of civilian doctors, French and foreign, to whom would be entrusted the task of making a thorough health survey of the population as a whole. All these attempts, however, have always been vetoed or blocked by the French government. The elected representatives of the Polynesian people are certainly justified in thinking, as they do, that the terrible secret the CEP bombers are trying to hide at any price is simply that their nuclear tests at Moruroa, like those of their American colleagues in Micronesia and their British counterparts in Australia, have been greatly detrimental to the population and the environment in French Polynesia.

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