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NORTH KOREAN PROTECTIVE MINE WARFARE:
AN ANALYSIS OF THE NAVAL MINEFIELDS AT WONSAN,
CHINNAMPO AND HUNGNAM DURING THE KOREAN WAR

by

Jason D. Menarchik, LCDR, USN

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Advisor: Dr Michael Allsep

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Abstract

The Russian-directed protective minefields laid at Chinnampo, Hungnam and Wonsan during the Korean War reflect the further development and lethality of Russian protective mine warfare doctrine and capability. This development is the continuation in the sophistication of protective mine warfare begun in 1854 during the Crimean War. Russian minelaying developed from simple geographic barriers to a sophisticated, integrated, shaping defense. With the addition of modern technology, to include aircraft, missiles, and the increasing sophistication of mines themselves, mine warfare will increasingly become a cheap and more lethal defense to our modern, conventional navy. Continued American ignorance and lack of appreciation for mine warfare and for how its opponents could lay mines will someday cost her dearly.

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North Korean Protective Mine Warfare

An Analysis of the Naval Minefields at Wonsan, Chinnampo and Hungnam during the
Korean War

“We have lost control of the seas to a nation without a Navy, using pre-World War I weapons, laid by vessels that were utilized at the time of the birth of Christ.” – Admiral Allan E. Smith¹

Mine warfare historically has had low prestige inside the United States Navy and the general military history community as well. As a result, studies involving mine warfare have been neglected. In military history, mine warfare has been used to flavor naval campaign stories, but only from the perspective of the minesweeper (or striker), not from the minelayer. David Farragut and his famous “Damn the torpedoes” moment during the Civil War is illustrative of this attitude. Mining is usually mentioned only casually in historical campaign accounts, most often with references that expand little beyond the fact that mines were present for that particular campaign. The Navy, lulled into a sense of complacency, has neglected mine warfare studies. Naval Intelligence has made little attempt to understand how adversaries would lay mines, with the information available limited to ‘guesstimates’ and random speculation.

An additional byproduct (or cause) of this neglect is a lack of respect by the Navy and Naval Intelligence for the potential of an extensive mining campaign against US forces, an attitude encouraged by the fact that the US Navy has not faced an extensive mining campaign against it. The American Navy’s first significant naval encounter with

mines occurred during the Civil War, where, at the Battle of Mobile Bay, Admiral Farragut famously ignored the mineline there to destroy the Confederate fleet nearby. While extensive mining also occurred during World War One, the United States did not encounter it, as the focus of the Central Powers mining campaigns occurred in the North, Baltic, Black and Mediterranean Seas, well away from the American sea lines of communications in the Atlantic and along the French coast. The Second World War also saw extensive mining; however, the Americans laid most of the mines and were infrequently the victim of them. The Navy did encounter mines during the Korean War, where three large ports were cleared to advance UN sea lines of communications. These minefields, however, were hastily planted as the Communists rushed to forestall additional amphibious assaults after the surprise Inchon landing, or limited by the North Koreans' lack of resources. Additionally, while the minefields in Korea were extensive at the three large ports swept, only approximately 1,000 mines were swept there. Hundreds of additional mines were encountered throughout the war, but only in piecemeal fashion as part of a harassment campaign, and not as a part of an integrated coastal defense. By comparison, in the narrow waters of the Gulf of Finland, Russians laid 19,000 mines during the First World War to counter a feared German invasion. Later, during World War Two, the Germans laid 14,000 mines there. Major powers have used mine warfare in the recent past. The US has limited experience combating it, but may face a major mine warfare threat in the near future. No interest and no experience with extensive mine warfare puts the US in danger.

This paper intends to correct these deficiencies in the historical record and in current understanding of potential threats by analyzing the most recent complex

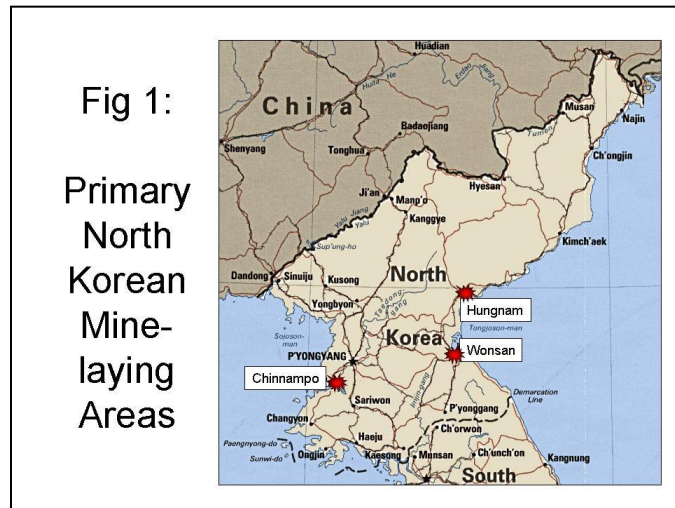
minefields laid, those directed by the Russians during the Korean War, and deriving from that experience aspects of Russian minelaying doctrine. Understanding the minefield at Wonsan, in particular, is not immediately intuitive, and has caused some befuddlement in understanding the minelaying thought process. To achieve this understanding, this paper will use a three-part approach. The first part describes the three large minefields at Wonsan, Hungnam and Chinnampo, using original research. The second part will analyze these minefields in the context of Russian minelaying history, in particular the minelaying that occurred in the Gulf of Finland during the Crimean War and World War One, as well as post-World War One mine warfare planning. The third part will apply this minelaying doctrine to real areas to better understand how protective minelaying has developed, using current knowledge of modern mines and techniques to extrapolate from the Korean War how a modern minefield might be laid.

THE KOREAN WAR

Mine warfare figured prominently during the Korean War. When war broke out in the summer of 1950, the North Koreans did not plan any significant naval activity, instead focusing on the fast-moving land campaign to drive the United Nations off the Korean peninsula. This attitude collapsed with MacArthur's surprise landing at Inchon (a landing that was opposed by only one mineline, a mineline meant to interdict naval ships operating along the coast and not to prevent an amphibious assault).² Immediately afterwards, with the North Korean forces in full retreat following the UN counterstroke, the North Koreans initiated mining to prevent further UN landings, which threatened to cut off the North Korean retreat, and destroy their army entirely. Almost all of the North

Korean ports were subsequently mined, with at least a single mineline covering the larger ports. Particular emphasis was placed, however, on the port facilities at Wonsan, Hungnam and Chinnampo (see Fig.1), where complex minefields were laid. The next UN amphibious landing occurred at Wonsan as US troops were shifted to the east coast to maintain pressure on the North Koreans. The minefield there caused the UN

difficulties, sinking four ships (including three minesweepers) and delaying the Marine landing by two weeks. As the UN advanced to the north, other ports were swept. Hungnam and Chinnampo were given particular



attention as these ports were large and by possessing them, the UN would shorten their lines of communications.

The Korean War featured another abrupt turn-of-events, when the Chinese launched a surprise counter-attack on 25-26 November 1950. The Chinese drove the UN forces back down the Korean peninsula, apparently negating the minesweeping efforts of the UN naval forces. Minesweeping did continue, however, as minesweepers kept Wonsan, Hungnam and Chinnampo open for as long as UN forces occupied them. It was particularly critical that Wonsan and Hungnam were kept open to facilitate the evacuation of troops trapped by the initial Chinese counteroffensive. When UN forces were finally able to stabilize the battlefield along the 38th parallel, where it remained throughout the war, minesweeping continued at the major ports and acted as feints to keep the Chinese

and North Koreans thinking about another amphibious assault on their flanks. Mining by the Communists continued throughout the war; however, no new large, complex minefields were laid. Mines were instead laid in small numbers as patrolling UN naval vessels and aircraft maintained UN naval superiority and prevented any large-scale minelaying effort. In fact, most mines found toward the end of the war were floating mines, which had probably been released from shore or near shore. A novel addition to this practice used late in the war was the use of water-soluble hooks that held the mine canister together as it was set afloat, only to dissolve later and allow the mine to deploy out at sea. While this sounds interesting, the lack of navigational control probably limited the effectiveness of these mines.

THE RUSSIAN ROLE

The North Korean mine warfare campaign is a well-documented example of Russian/Soviet protective mine warfare doctrine in a third-world setting. Russian mine warfare doctrine is one of the most advanced minelaying doctrines and likely profited from German mine experts captured during the Second World War. The minelaying effort during the Korean War, particularly during the Wonsan campaign, showed extensive planning, and used simplicity, geography and military experience. Mines were laid near easily identifiable landmarks, and used geography to help defend key naval areas. North Korean minetypes were not inter-mixed, presumably for loading and deployment simplicity. Mine defenses were also integrated into a greater coastal defense scheme; a particular focus of mine defenses was to decrease an opponent's naval gunfire effectiveness. Russian advisors, reported in North Korea as early as 16 July 1950, were

prominent in the mining effort, training North Korean minelayers and overseeing minelaying in strategic areas. All of the mines used were of Russian manufacture. Since many of the US' current enemies have Russian mines and may have received Russian training, an understanding of Russian doctrine becomes essential to understanding the global mine threat. Since North Korea is still a foreign policy threat, and lacks the resources to update her weaponry, understanding this campaign is vital. Many of the characteristics and conditions of the Korean War remain true today on the Korean Peninsula above the 38th parallel. North Korea is suffering economically, and may rely on dated systems and weaponry, using dated weapons to fight a modern adversary who has forgotten how to fight against them.

PART I: THE MINEFIELDS

THE MINES

The North Koreans laid only 4 different types of mines (all of Russian manufacture), three of which were moored contact mines, which are floating mines anchored to the ocean floor and activated by direct contact with an enemy ship, and one type was a magnetic bottom influence mine, which lies on the ocean floor and is activated by detecting the magnetic signature of a passing ship. The three moored contact mines were the MKB, M-26, and the Myam. The magnetic mine was an R1A, likely another name for the Russian KMD mines.

The moored mines were varied and numerous. The most prominent mine in the early minelaying campaign was the MKB. This mine was a heavy, deep-water mine, which meant it targeted larger ships with its larger explosive capability. Its size, however, made the MKB difficult to lay, and thus, cranes or special rollers were needed for deployment. Because of this requirement, the MKB could not be laid inconspicuously using smaller non-naval boats, and was used less extensively after the North Koreans lost control of their territorial waters. A less often used mine was the M-26, a lighter, shallow-water mine. This mine saw some use early in the war, but was not as prominent as the MKB. The MKB's smaller size gave the North Koreans more deployment flexibility; however, the mine was still too heavy to be laid en masse without special handling equipment. Most of the M-26 minelines were only 5-10 mines long. The final contact mine was a Myam, which was a small anti-boat mine. This mine was light enough to be laid by small craft, however, the Myam was developed too late (it was first used in 1952), to be significant for our study.

The only influence mine was the R1A. This magnetic mine saw little activity throughout the war (less than 30 were laid), but were significant nonetheless. Having an influence mine laid amongst the moored mines complicated the minesweeping problem. Minesweepers used different sweeping gear for magnetic and contact mines, as minesweepers use expansive wire structures fitted with cutters to cut the cables of the moored mines, but must special gear that simulates the magnetic field of a passing ship to trigger the magnetic mines. Because this mine had to sink a ship while being deep in the water, a large explosive had to be used. This extra weight, as in the case of the MKB, made this mine difficult to lay once the North Koreans lost control of their coastal seas.

Floating mines were not employed in the initial defense. While numerous floating mines were reported throughout the war, we have no record of any substantive number of floating mines being encountered by the minesweepers during their approach in 1950, and only 15 floating mines were encountered during the May-December 1951 sweeping of Wonsan. This number is particularly surprising since May through September experienced some of the busiest time-periods for Wonsan minesweeping.

THE MINELAYERS

Due to the hurried nature of the minelaying effort and the lack of a substantive North Korean navy, any vessel the North Koreans could get was used to lay mines. During the initial mining effort, when the North Koreans were relatively secure in their own waters, mines were loaded on barges and towed to the minefield by tugs. These barges were built originally for coastal and river transportation, but were fitted with three pairs of 1.5” rails, arranged parallel to the centerline, to hold mines. Each barge was

stated to have a capacity for 10-15 mines. The tugs were navigated by trusted North Korean personnel, and the mines were deployed at timed intervals, reported as 1-1.5 minutes. The Russians were reported to be directly involved in laying the magnetic mines; otherwise all minelaying was conducted by the North Koreans.³

Later, as the UN naval forces asserted themselves and achieved naval superiority, the North Koreans could not conduct extensive minelaying. As a result, with fewer naval vessels available, they conducted minelaying by more commonplace, non-naval platforms. Reports indicate the North Koreans used sailing junks, powered junks, barges, tugs and fishing sampans. Sampans used “heavy timbers” laid athwartship (across the ship) that could carry four M-26 mines.⁴ Mining operations were typically conducted at night by these vessels to conceal their mission. The capture of the crew of a minelaying junk in 1952 reveals how the North Koreans laid mines at this stage of the war. Interrogations revealed that they positioned the mines by navigating from a set reference point, by eye, without instruments in the dark, and the mines were spaced by assuming a boat speed of one knot. The captured boat carried two magnetic mines, and was rowed by 4-6 enlisted men chosen for that purpose.⁵

CHINNAMPO

For the Chinnampo sweep, the UN forces had a lot of information; unfortunately, that information was not preserved. Little data exists to evaluate these mine defenses; only the Interim Evaluation Report of that time period survives. No other records of any substantive value appear could be found. Chinnampo is the port facility that services Pyongyang, the North Korean capital (see Fig. 2). The Taedong River heads

south from Pyongyang, and then turns west, where it opens into the Yellow Sea at Chinnampo. The entry into the port is covered by two islands, Cho and Sok, and is protected by very shallow waters around the channel. Sweeping at Chinnampo occurred from 29 October 1950 to 03 December 1950. According to the First Interim Evaluation Report, 80 moored mines and 4 magnetic mines were swept. In the appendix timeline appears the ominous phrase "Moored and magnetic mines remained unswept."⁶ Referring back to the IER, 217 moored and 25 magnetic mines were reported.⁷ Looking at the Chinnampo sweeping campaign map in the IER (see Fig. 3), one gets a good look at where these swept mines were located, and where the reported mines were believed to be located. Five minelines were believed to have been swept; one of them was a magnetic mineline. The US Navy had received exact intelligence on where mines were located and was thus able to avoid any casualties during the minesweeping. The North Koreans were very systematic in their defense of Chinnampo. They used geography to place minelines across sea-lanes and provided redundant coverage of these channels. In all, 12 minelines (see Figs. 3, 4) were reported, none of which was more than 12 miles from shore. Almost all of the minelines were near a geographic landmark; these locations, presumably, facilitated night-time navigation, or navigation without proper instruments.⁸ By placing mines near strategic islands, the North Koreans made these islands off-limits as bases for providing cover for UN ships from North Korean shore defenses. The outer defenses began with two minelines in the vicinity of Cho Island (see Fig. 5). Both of these minefields blocked the outer access into Chinnampo. One line was a north-south mineline, the southern point of which was approximately 10 miles from Cho Island. This line blocked the western approaches, and was approximately 7 miles

long. No information exists on how many mines were in this line. Of note was the curious lack of mine defenses to the north and east of this mineline. If one looks closely at a chart, however, the reason becomes evident. From the northern coast of the North Korean peninsula, several 'fingers' (see Fig. 6) of shallow depth extended south, complicating the northern approach. These 'fingers' were as shallow as 1-2 meters. The minesweepers were aware of this, as they had to modify their approach to navigate into the Chinnampo sea-lane. The farthest point of the mineline from land (Cho Island) was approximately 12 miles, the distance of the horizon at sea. Presumably, the line was laid to hamper the initial approach of an invading force, and to extend the length of the approach time in the face of coastal artillery. The second line extended two miles northeast from Cho Island, near So Island, a small landmark for the primary entrance into the Chinnampo sea-lane. A lighthouse marks the entrance to the sea-lane today. There is no indication of how many mines were in this line. Neither of the Cho Island lines was ever swept. This mineline directly cuts the primary approach route into Chinnampo. Curiously, however, a north-south line would have better cut the access to the channel, bridging the gap between Cho Island and the 'finger' that began to the north. This mineline probably had another purpose: to prevent naval gun-fire support ships, or others, from using Cho Island for cover from mainland coastal defenses, or for an anchorage.

The interior defenses of Chinnampo focused almost solely on the sea-lanes into the port, where ships round the northern side of Sok Island. This is the primary access into the port facility. After passing the initial outer mineline near So Island, 4 minelines crossed this primary access route. It is important to note, again, that all four minelines were near geographic landmarks. The outermost line, near Sok Island, used the Chamae

Island (a lighthouse is currently on this island). This mineline was approximately 1 mile long and may have had a double purpose. A quick-look at a nautical chart shows how this line blocked not only the access lane into Chinnampo, but also a modern waiting area for incoming vessels. This mineline was most likely the magnetic line, as such a mine was found here during the 2-3rd IER period (see Fig. 7). This mineline was not listed as being swept in the 1st IER, but this omission may reflect a partial sweeping of the area, as allied minesweepers probed westward. The other four magnetic mines may also have been part of this line. The other three minelines used landmarks to defend the channel as well. Two minelines again used Sok Island as a starting point. The first line headed due north from the northern tip; the second headed northeast. These minelines may also have been placed to keep allied ships from loitering around the island to avoid coastal gunfire. The last mineline originated from the Am peninsula near Sohae-ri. The mineline headed north-northeast to a point near the Chiri Island.

Secondary approaches were defended as well. A mineline was laid south of the Sok Island. This mineline blocked the deepest channel available outside of the primary access route (see Fig. 4). Two other minelines protected a shallow-water entrance to the north of the primary access channel. These parallel lines laid across the only other deep-water access into Chinnampo, and effectively sealed off the city. One of these minelines was also a candidate to be a magnetic mineline (most likely the interior line). These minelines may have been countermined by air-dropped depth charges on 27-28 November. Minesweeping Force WESTPAC war diaries mentioned that 48 depth charges were dropped on a mineline 'northwest' of Chinnampo, destroying 4 mines.

Since only one mineline was mentioned, this mineline was more probably the one below Sok Island.⁹

Other areas were defended as well. Two different minelines covered areas other than the main channels. The outermost of these lines was located about 10 miles north of Cho Island. This mineline appears to have been laid in the middle of nowhere; however, a check of the nautical chart shows that this line crossed the innermost channel between two of the above-mentioned 'fingers' of shallow water. This mineline was also almost exactly 10-12 miles from Cho Island and the North Korean coast. A ship that would travel south of the mineline would head toward Cho Island. A ship north of the mineline would be drawn closer to the North Korean coast by the route of the channel. Because of this layout, the purpose of this mineline was to block a channel that could be used for naval gunnery support or as an anchorage. The other mineline lay across a sheltered area between Sohae-ri and the Am peninsula.

A notable gap existed in the Chinnampo defenses. There was a channel exists north of the Changsan peninsula. Another access route was available south of Cho Island (the intervening space was blocked by another shallow-water 'finger' that ran parallel to the coastline). A ship using this channel could approach almost 10 miles closer to Chinnampo before being forced to cross a mineline near Sok Island. This channel could have been easily cut with two minelines: one at the Changsan peninsula heading north; and another one at Cho Island, heading south. Other secondary sources mentioned that a North Korean minelayer was sunk nearby that may have been intended to cover this area.¹⁰

After the minesweepers cleared Chinnampo on 03 December 1950, interior probing of the Taedong River stopped. Chinnampo was evacuated two days later under pressure of the Chinese counterattack. The approaches to Chinnampo continued to be swept, usually as part of a feint, faking an amphibious landing. Most of the minesweeping attention shifted to the East Coast.

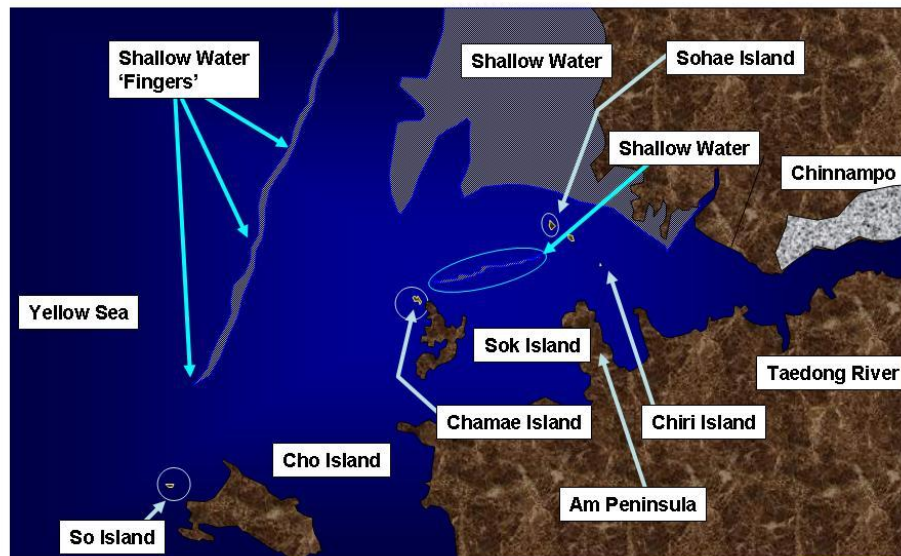


Fig 2: Prominent Chinnampo Landmarks

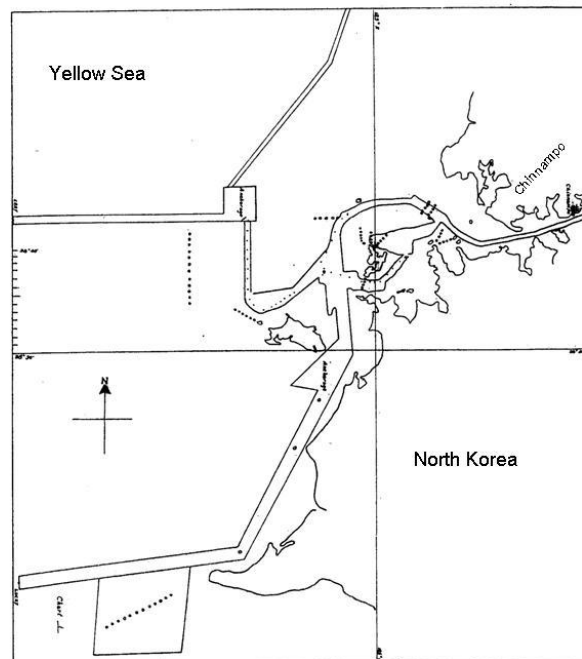


Fig 3: Chinnampo Minesweeping Areas and Reported Minelines. Sweeping occurred from 29 October 1950 to 03 December 1950.

IER 1: Appendix 4, Enclosure 3, pg 1132, Courtesy Naval Historical Archives

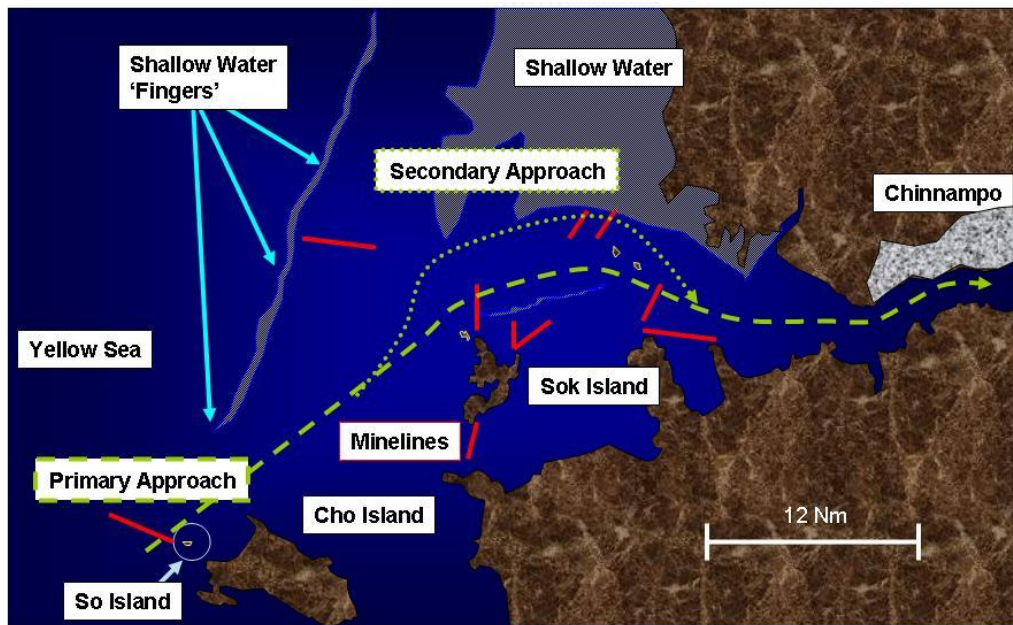


Fig 4: Primary and Secondary Approaches to Chinnampo and Reported Minelines. Map shows mineline coverage of Chinnampo's approaches.

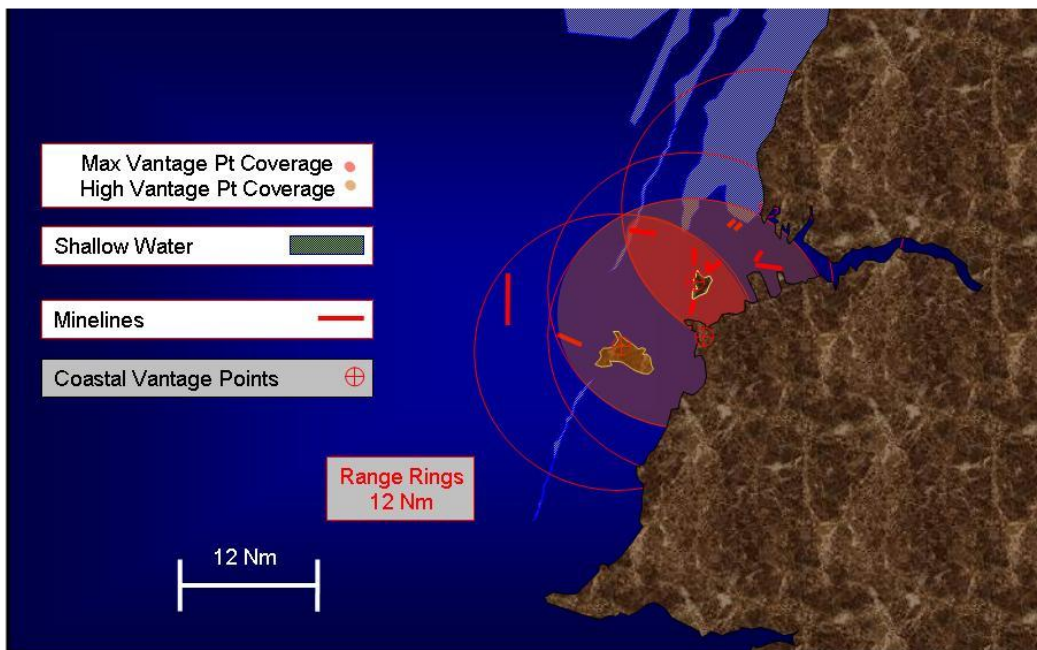
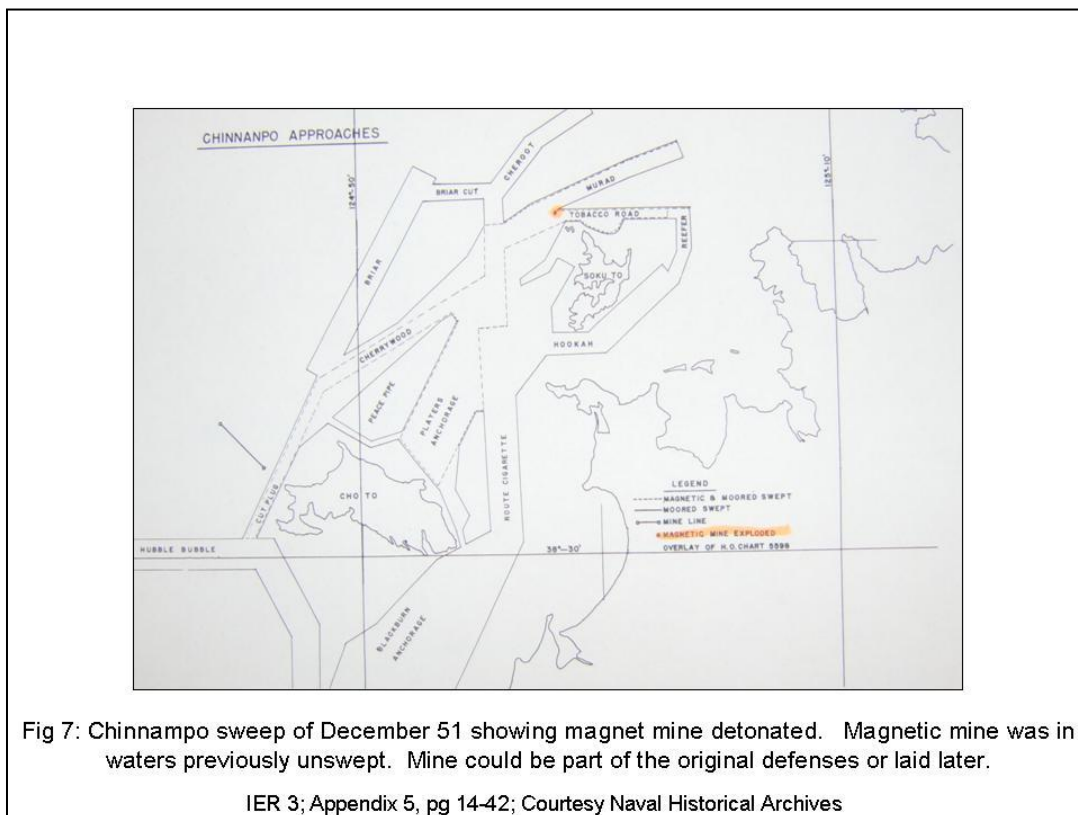
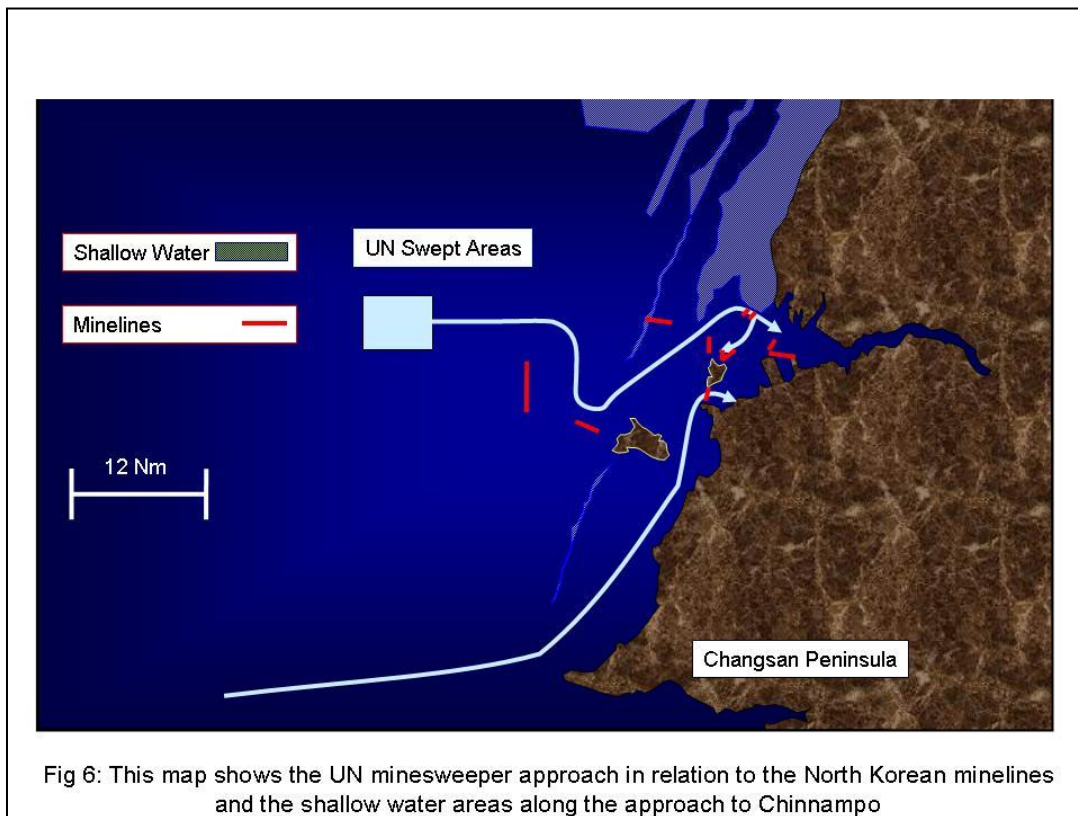


Fig 5: Outer Defenses of Chinnampo. Range rings from coastal vantage points demonstrate artillery coverage over entire mine defenses. Highlighted areas show redundant coverage.



HUNGNAME

Sources for the Hungnam minelaying campaign are somewhat scarce, although more information exists about this campaign than did for Chinnampo. IERs, COMNAVFE (Commander, Naval Forces Far East) daily reports and monthly summaries provide good information as does the intelligence report from the captured captain of one of the minelaying vessels. During the course of the first two years, Hungnam was thoroughly swept. The first sweep, in which six mines were swept, was from 29 October to 14 November 1950 as part of the UN advance north after MacArthur's counterattack at Inchon. On 4-18 December of the same year, Hungnam was swept again, with the majority of the mines swept at Hungnam being swept during this operation. This city was the first major port to be evacuated by the UN after the Chinese invasion. Similar to Chinnampo, Hungnam was swept repeatedly after the UN withdrawal as an amphibious feint, with major sweeping occurring in September-October 1951.

Hungnam's port facility made it a natural draw for minelaying (see Fig. 8). The body of water that services the Hungnam port facility is the Hamhung-Man (or bay). The bay is shaped like the letter 'C', with Hungnam to the north, on the upper edge. The little islands of Hyongje-am lay at the center of the bay. The mine defenses of Hungnam (see Fig. 9) featured three minelines guarding the primary route into Hungnam, and two other minelines cutting the primary access into the bay. The minelines were clearly oriented to defend against an attack from the east. The UN was able to get extensive intelligence and advanced warning on where the lines were laid; as a result, they were able to sweep a path along the northern shore and bypass the mines defenses.

The intelligence for the Hungnam sweep was excellent, and featured the capture of a captain of a North Korean minelayer.¹¹ During his debrief, the captain mentioned two minelines: the first line was laid on August 17, by two ships, carrying 18 mines each. These ships used the Chakto-ri lighthouse at Hungnam, to the east of the city, as a reference point. They headed south from the lighthouse and began laying their mines, stopping at a point three miles east of the Hyongje-am Islands. The North Koreans laid a second line on August 22 by three ships, carrying 18, 18 and 20 mines respectively. The ships headed east from Hyongje-am and began minelaying. The report cryptically mentions that the last of 56 mines was laid three miles east-southeast from the lighthouse, not mentioning an apparent turn to the north. Looking at a chart may fill in gaps in the minelayer's story. All of the reported mines began near the same point, at the Chakto-ri lighthouse; they also ended at nearly the same point, near the eastern side of the Hyongje-am Islands. Presumably, the minelayers arrived at the eastern side of Hyongje-am and proceeded north, to the lighthouse.

Looking at the first mineline reported by the North Korean captain, the minesweeper's report mentioned that a line of 19 mines was spotted, starting one mile from the lighthouse and heading south at 185 degrees.¹² During the initial sweep, six other mines were reported swept in this area during the initial sweep in November.¹³ Later, a total of 38 mines were picked up in two different sweeps in September 1951.¹⁴ This number is roughly equivalent to that reported by the North Korean captain. The minesweeper's chart (see Figs. 10, 11) shows several north-south minelines in this area. If the November 1950 and the September 1951 sweeps are separated out, then the 38-mineline was probably the first mineline mentioned by the captured North Korean

captain. The 6-mineline may have been another mineline, or an extension of the 38-mineline. The 38-mineline served two purposes: the first was to block the southern approaches to the port facility; the second was to prevent the allied ships from loitering to the east of the Hyongje-am Islands. The first purpose was accomplished by bridging the gap between the Chakto-Ri lighthouse and the Hyongje-am Islands. The second was accomplished by merely placing the mines near the islands.

The second group of mines that the North Korean captain reported is covered as well, although not as clearly (see Fig. 9). The allied minesweepers' mentioned several other lines in their reports. Two north-south lines, consisting of a total of 41 mines, were swept east of the above-mentioned mineline. To the south of the above-mentioned two lines lay another north-south mineline consisting of 23 mines. These minelines were probably the second lines reported by the North Korean captain.

Other minelines were laid in Hungnam Bay as well. To the north of the two above-mentioned minelines, the North Koreans laid two 8-minelines on a northwest/southeast axis, which were aligned to defend against an approach toward the Chakto-ri lighthouse. Two minelines that were reported as improbable were located south of the Hyongje-am Islands. This place was logical to lay mines, as the Hyongje-am Islands were a good geographic landmark to the north. The chart, however, (see Fig. 11) shows that a lane to the south was swept during the second sweeping, and no mines were found. Later, in September 1951, 23 M-26s were swept in this area. Presumably, these mines were laying on a similar axis as those reported earlier. This line, oriented away from Hamhung, probably served to cut-off the southern route, and to keep ships away from the islands.

One question remains about the Hamhung fields: why were gaps left along the coastlines? The above-mentioned line off of the Hyongje-am Islands left a mile-wide gap along the mainland coastline. The minelines that defended against the approach from the east also left a mile-wide gap. The allies used the northern gap during their initial approach in November 1950. Closing these gaps would have been an easy affair and would have achieved a complete defense of the harbor area. This was accomplished at Wonsan. Perhaps the North Koreans did not believe that the allies would reach Hamhung, and wanted a way to get ships in and out of the bay. More likely, the gaps were to allow minelayers access into and out of the bay, as they came to the bay from other ports, or the North Koreans simply focused on the primary access route into Hamhung.

Doing the math, every reported mine is accounted for. In total, 112 mines were initially reported in the Hungnam area, as mentioned in the 1st IER.¹⁵ The intelligence report accounted for 92, and 20 other mines were apparently found or reported beyond this reporting. Six mines were actually swept in this period. No mines were reported as having been swept, despite the widened channel, in the second IER. In the third IER, 186 mines were reported as having been swept. Of these, 24 were newer MKBs or M-26s; 25 did not reference age markings; and 137 were listed as old MKBs. These numbers (137 old MKBs of the 3rd IER plus the six swept during the 1st IER) would indicate that at least 143 mines were found at Hungnam. The total reported mines add up to 135 (the originally reported 112 mines, plus the 23 found near Hyongje-am), providing a slight overlap, but near complete numerical coverage.

To sum up, based on the above reports, the defenses of Hungnam were very stout. The primary access route, from the east, was guarded by three minelines. The secondary approaches, from the south, were guarded by one mineline on either side of the Hyongje-am Islands. A mile-wide gap was left on the extreme northern and southern ends, of the defenses. The Hyongje-am Islands were prevented from being a hiding spot for any loitering ships. The Chakto-ri lighthouse and the Hyongje-am Islands figured prominently as reference landmarks.

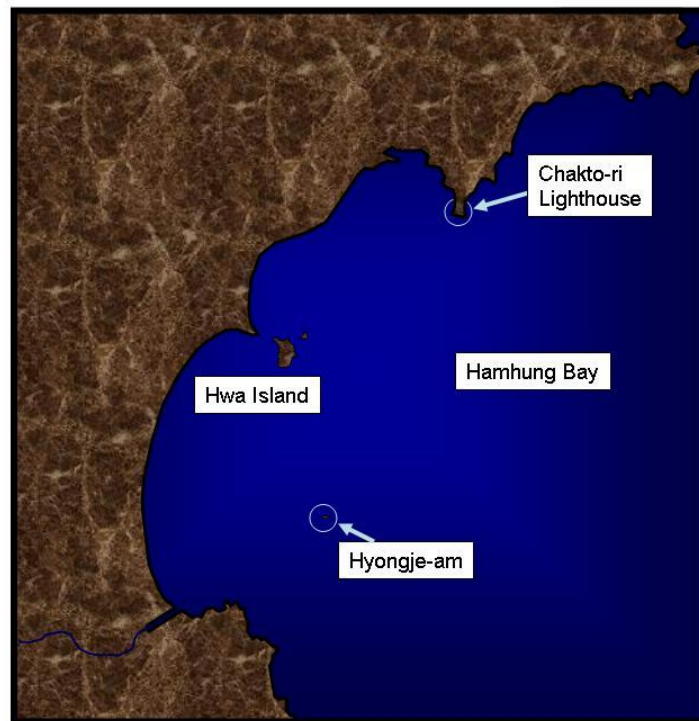


Fig 8: Hungnam Landmarks

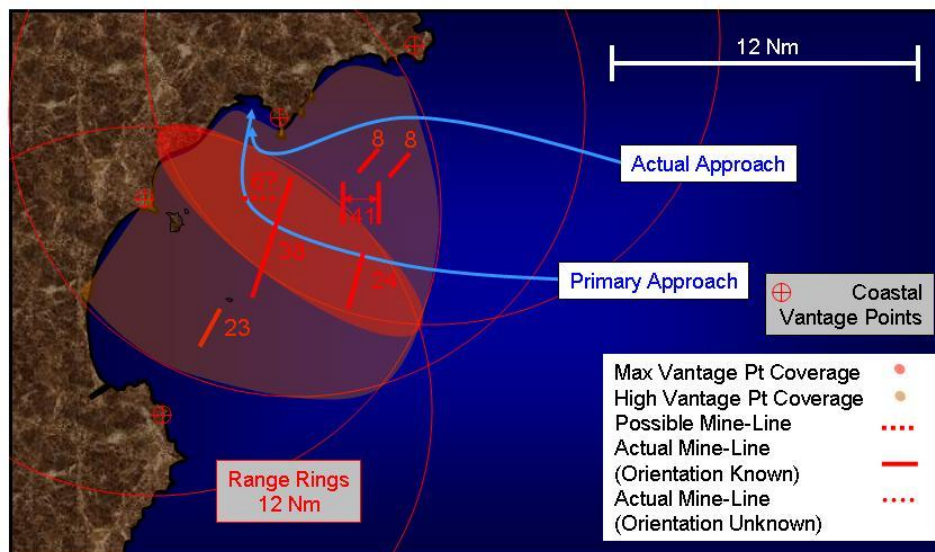
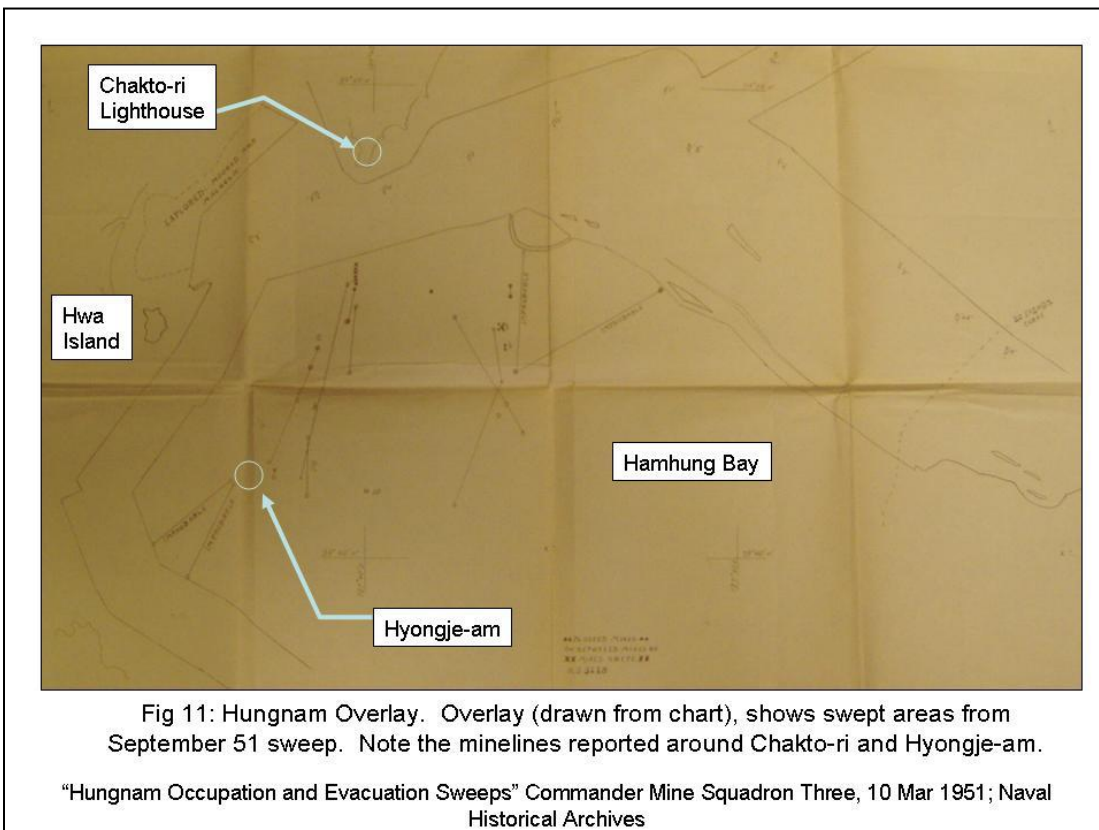
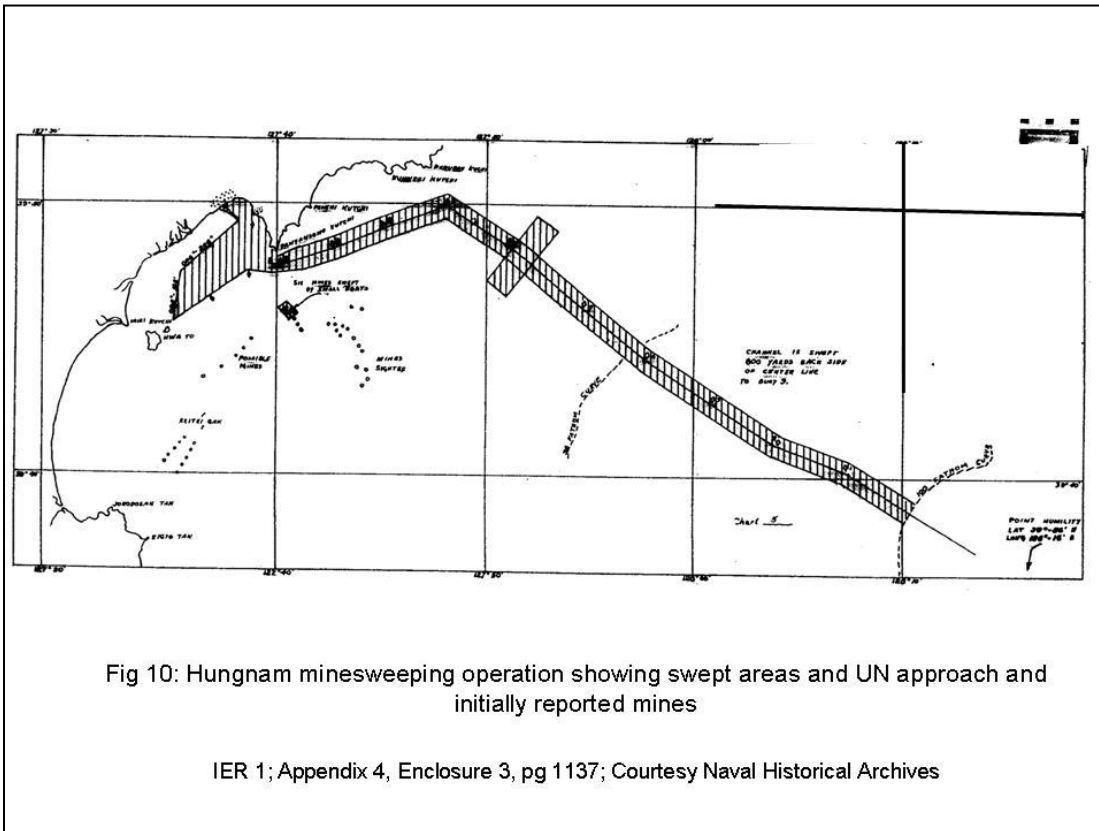


Fig 9: Hungnam minelines. Range rings from coastal vantage points demonstrate artillery coverage over entire mine defenses. Highlighted areas show redundant coverage



WONSAN

“Wonsan ...taught us that we can be denied freedom of movement to an enemy objective through the intelligent use of mines by an alert foe.” -- Admiral Turner Joy¹⁶

Of all the operations, Wonsan provides the most records, but with the least detail. Our sources range from the IERs, to COMNAVFE's monthly summaries and daily reports, to several detailed minesweepers' reports. Unfortunately, the information is often too general or too piecemeal to create a definite picture of the minefield.

Analysis is very important.

With its huge protected bay area, Wonsan was an important port facility. The coastline (see Fig. 12) in this area 'stepped' up from the south to the Amyon-Kutchi point to the Irari Point further west. The coastline headed north to the Kalma Peninsula, which was the key geographic feature of Wonsan. This peninsula protected the inner harbor, and was also home to Wonsan's airport. The hills on the peninsula dominated the interior bay area. Wonsan itself was located just west of the peninsula. The coastline then headed north before curling south again at the Ho Peninsula, which dominated the northern part of the bay, or Eiko Wan. The middle region of the Eiko Wan was dominated by island groups, the most prominent of which was Yo Island, the largest and most easterly of all the islands. Oceanographically, another feature was prominent: a triangular area of deep water, at the 200-fathom depth, jugged westward from the Sea of Japan, toward the Eiko Wan. This area was significant as it is the deepest water (deeper than the lengths of a mine's cable) that was close to the North Korean shore.

Wonsan was the most heavily mined of all the port facilities. This fact became painfully evident when the allies attempted to land there in early October 1950. Due to the unexpectedly high number of mines reported, the original minesweeping plan had to be altered. This alarming discovery also forced the planned landing to be delayed for 14 days. Up to 4,000 mines are typically reported to have been laid here alone. This number would appear to be too high, however, and is probably a misinterpretation based on the reported numbers of mines that were shipped to the area. Actually, the small number of mines, and/or the limited time to lay them, drove the creation of the mine defenses at Wonsan. According to reports, the minelaying campaign here began sometime in early August.¹⁷ Wonsan was consistently reseeded throughout the war; however, due to the constant mining, the waters of Wonsan were swept repeatedly.

The first sweeping (see Fig. 13), during the first IER period, was to clear the waters for the above-mentioned amphibious assault. This sweeping occurred from 08 October to 20 October. A channel was swept from the western bulge in the 200-fathom curve on a line west-southwest to a point south of the Yo Island, and then west to the Kalma peninsula. This route, however, was reported to be heavily mined very early in the operation, so the plan was altered to the north. The new plan called for a path to be cut from the 200-fathom curve and to head due west. A path would be cleared to a point north of Yo Island. After reaching this point, the minesweepers would head south and clear the area around the Kalma peninsula, south of the Sin Island grouping.

Numerous mines were swept in this period. 104 moored mines and six magnetic mines were reported cleared by minesweepers.¹⁸ A further few mines were destroyed by dropping hydrostatically fused bombs to help clear a path for the

minesweepers.¹⁹ Also mentioned, but not factored into the above numbers, were the mines swept during the initial approach. A mission report by the squadron commander mentions that all mines encountered were swept on the first day.²⁰ He does not, however, plot any of these mines on his chart, nor mentions them later in his final mine tally. In a daily report for that same day, the minesweepers mentioned that 22 mines were swept.²¹ COMINERON 3 war diaries mention that 18 mines were cut on October 10.²² The IER map shows the corner of an east-west and a north-south mineline may have been swept.

The second IER period began after Wonsan was abandoned in December. Minesweeping continued not only as an amphibious feint, but also to keep open the possibility of real future operations. The same channel was kept cleared, and widened, from the 200-fathom curve to a point north of Yo Island (see Fig. 14). The path then turned south to the limit of the 20-fathom curve, east and south of Sin Island. Minesweeping also occurred in the area southwest of Yo Island, where a mineline had been found in the initial sweep. Twenty-nine mines were reported swept in this period: fifteen mines were specifically mentioned as new M-26s that were swept at the end of March.²³ Of the remainder, six were M-26s, likely not original mines; five were MKBs; three were unknown contact/ moored. Four of these mines were known to be original mines.

The third IER period saw the most active minesweeping activity. Wonsan was swept repeatedly throughout this period, presumably check-sweeps (sweeping previously cleared waters to check for re-mining) and feint operations. The main approach channel area was kept clear with an additional magnetic sweep conducted. In May 51, the moored sweeping widened the eastern approach to Yo Island. In mid-June of that same

year, the minesweeping effort focused on sweeping in northwest-southeast lines, from deeper water, heading progressively toward shore. In July, the minesweepers headed north from the swept approach channel, sweeping in east-west lines. Also, additional sweeping cleared an area north of Sin Island that extended west to a point north of the Kalma peninsula.

Minesweepers reported 325 mines swept in this period, including 317 moored mines and eight magnetic mines.²⁴ Of these mines, 197 were found to be original minelines; a further 16 M-26s may also have been an original mineline.²⁵ Of the remaining 104 mines, 10 were floaters; 86 were identified as new or newly laid; the remaining 8 were undetermined. All newly swept magnetic mines were planted after 1950, as they were found in previously swept areas.

In the fourth IER period, the Wonsan minesweeping campaign shifted north, above the continuous check-sweeping (see Fig. 15). Sweeping for this IER period began in earnest in March 1952. The bulk of this month was spent sweeping the interior Eiko Wan, west of the Kalma Peninsula. This area was new territory; however, the minesweepers found no old mines. All mines found were Myams, new mines not seen before this period. A path was swept to the north of the Taedari, Sodari and Mo Islands and an area to the west of the islands as well.

In this time period, minesweepers found 141 mines at Wonsan.²⁶ Taking away the 61 Myams (all Myams were found at Wonsan)²⁷ leaves a possible 80 mines from the original minefield. Of the remaining 80 mines, 24 were floaters and 39 were moored. The remainders are unknown, but the majority were probably floaters. We can account for all 39 moored mines; of these, 16 were found to be original mines.

In the fifth IER period, the North Korean minelaying effort continued to taper off. Over 104 mines were swept or destroyed in this period, with at least 78 of these being floaters. Many of these were picked up after Typhoon Karen swept through the area in August 1952. The authors of the mine summary believe that many of these mines were broken loose by the typhoon. Only 20 of these were in the Wonsan area and were old enough to be original mines.²⁸ Of the swept mines (from all Korean waters), 6 were magnetic and 19 were Myam mines. In the 6th and final period, 93 total mines were found. Of these 80 were floaters.²⁹ During both of these last two periods, the minesweeping consisted of check-sweeping previously cleared areas.

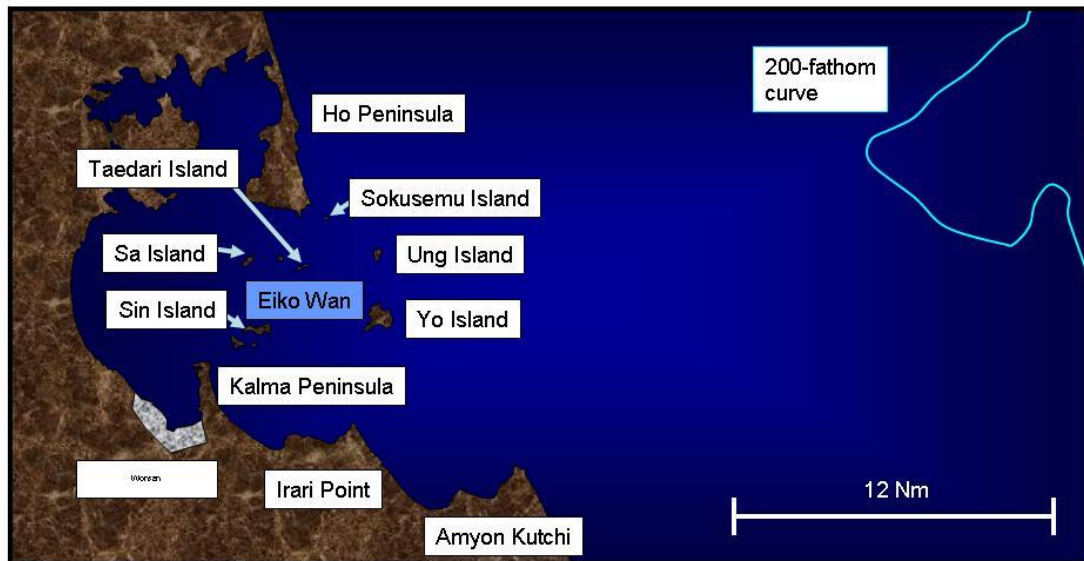


Fig 12: Wonsan Landmarks

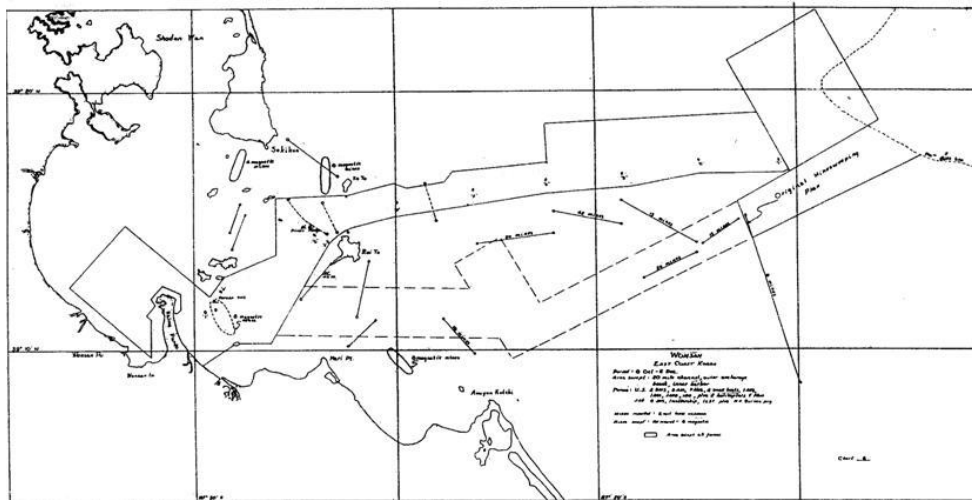


Fig 13: 1st Minesweeping of Wonsan in October, 1950. Map shows original southern approach. Dotted lines show full initial planned approach. Northern approach past Yo Island into Wonsan crossed over four minelines.

IER 1; Appendix 4, Enclosure 3, pg 1136; Courtesy Naval Historical Archives

ACTUAL FINDS IN THE EIKO WAN

A review of the sources from the first IER period reveals that five minelines were detected and swept in the initial effort (see Figs. 16,17).³⁰ The first intersected the revised route approximately five miles east of Yo Island. This mineline consisted of approximately 42 mines.³¹ Further in, between Yo and Ung Islands stretched a mineline consisting of at least 21 MKBs.³² Behind this line, a third mineline was laid. These mines sank the Pledge and the Pirate, two of Wonsan's minesweeping casualties (see Fig. 16). This line stretched from Yo Island to a point northwest toward Taedari Island. This line consisted of at least 37 MKBs.³³ A fourth line covered the shallow area to the southwest of Yo Island consisting of 4 or more mines.³⁴ This line sank a UN minesweeper. The final line was a line of magnetic mines that covered the eastern approaches to the Kalma Peninsula. This line sank a Korean minesweeper. This area was swept and a mineline consisting of 6 mines were found (see Fig. 16).

Other minelines were found among the islands around Wonsan. One mineline blocked interior access through the Sin-Mo Island gap. During the 3rd IER period, minesweeping was conducted through this gap and into the Eiko Wan (interior bay) area. A July report previously mentioned that 23 mines were reported between the Sin and Mo Islands.³⁵ A UDT (Underwater Demolition Team) destroyed 5 of these mines; the remaining 18 mines were swept later, in August.³⁶ This mineline was noted in the original overlays of 1950. This fact, along with a larger number of mines, attests to the fact it was an original mineline. During the 4th IER period, the minesweepers swept an area southeast of Yo Island, and found another string of eight MKBs in this area.³⁷ These mines were probably originals, as this line was marked on charts from the first IER

period. In April and May of 1952, a lane was cut that passed north of Ung and Sa Islands into the interior. This route represents a third approach into the interior Eiko Wan that had not been swept previously. Relatively few mines were found here; however, two mine groups were swept. The first, and most extensive, was the mineline between Ung Island and Sokusemu Island, in which the sweepers found 13 MKBs.³⁸ A second mineline, consisting of 7 mines, ran from Sokusemu Island to the Ho Peninsula, completely cutting off the northern route.³⁹ A third possible mineline was laid north of Sa Island. The minesweepers' overlay shows a possible mineline in this region, as does the first IER map (see Figs. 13,16). Seven mines were reported found 800yds southwest of Ho Peninsula in March 1952; 2 mines were reported later cut here; 2 other mines were cut later in August.⁴⁰ The previously marked magnetic mines in this area were either not found, or were avoided.

Other minelines were reported in areas that were not swept. In the minesweeper's overlay, a mineline extends from Amyon-Kuchi to the northwest, and consists of 18 contact and 8 magnetic mines (see Fig. 17). This report must be based on intelligence since magnetic mines would not be spotted from the air. The IER provides a more likely scenario, by showing ten contact mines in this same area, and 8 magnetic mines further west, covering the Irari Point coastline (see Fig. 13). Further west, the overlay shows several minelines that appear to cover the Irari Point. The 27-mine line and the 'Irregular Mineline' that extends north are corroborated by the IER, and correlate to the 8-mine line mentioned above.⁴¹ The two probable minelines were not reported in the IER. One of these lines is probably an originally swept mineline that was laid southwest of Yo Island. No other mines were found, indicating just the one line existed.



Fig 16: Minesweeping overlay from Oct, 1950 showing swept areas in the Eiko Wan. North-south line east of Kalma peninsula were the magnetic mines. Note the reported mineline between Sa and Sin Islands

Overlay for Minesweeping Report for Wonsan Assault Sweep", COMINERON Three, Serial 0121; 10 Mar 1951; Naval Historical Archives

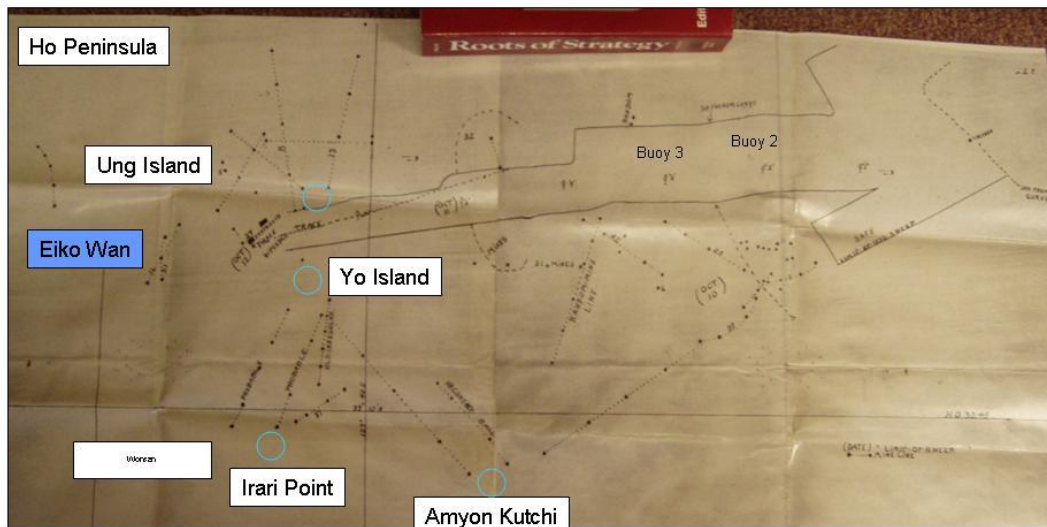


Fig 17: Minesweeping overlay from the Oct, 1950 showing cleared areas and minelines outside of the Eiko Wan. Note the minelines south of Buoys 2 and 3, and around Yo Islands.

Overlay for Minesweeping Report for Wonsan Assault Sweep", COMINERON Three, Serial 0121; 10 Mar 1951; Naval Historical Archives

ACTUAL FINDS: BEYOND THE EIKO WAN

Determining where the minelines were laid outside of the Eiko-Wan is very difficult. None of the sources give explicit locations of these minelines. The original minesweepers' reports and charts (in October 1950) list many minefields, but only one was swept. While minesweeping in this area began in earnest in May 1951, some records from this period survive; however, none have definitive detail. Most of the existing information comes from the 3rd IER, with collaboration from sporadic minesweepers' reports.

The minesweeping of the 3rd IER period revealed how extensively the outer approaches had been mined (see Fig. 14). All of the mines swept were found to the east of Yo Island. The May and June sweeps of 1951 focused on the area south of the previously swept channel; in July, the minesweeping effort shifted to the north of the same channel. The main effort focused on the area directly east of Yo Island. Helicopter and intelligence reports from the initial sweep in 1950 suggested that extensive mining occurred in this area. The minesweepers reported numerous mines; many of these are corroborated in the IER (see Fig. 13). For example, the minelines of 20 and 42 mines are clearly marked on both the IER and overlay (see Figs. 16, 17). The 15-mine line located south of buoys 2 and 3 on the IER is represented by 25 mines on the minesweepers' overlay. The two axial minelines of 20 and 15 mines are represented by a 39-mineline that extends almost entirely to the Amyon-Kuchi coastline.

Actual mines swept corroborate many of the depicted minelines. An important clue in deciphering the mine reports comes from a line from the June mine summary, which mentions that "no new minelines were found", thus establishing these older

minelines as the only minelines swept.⁴² The first mineline swept was the 20-mineline nearest to shore. A total of 21 mines were swept in this area. Two mines were swept during channel-widening in March; two more were swept in April; the rest were swept in May. The minesweepers swept 13 mines on 16 May; an additional four were swept on the 14th.⁴³ The 2nd mineline swept was the 42-mineline. This line may have been started off by the sweeping of two mines on 22 May (although they may also be part of the previous mineline as the only location data given was in relation to the nearest buoy).⁴⁴ Sweeping continued in June with 10 mines swept on the 8th, 36 swept on the 14th, and 14 swept on the 17th.⁴⁵ These numbers corroborate the reported numbers with 10 extra mines for either this line, or for the first one. The 3rd mineline was the 15-mine line. Also in this area were the 39 (or 15)-mineline and the 15 (or 22)-mine line that ran perpendicular to the coast line, along the originally planned approach lane (see Fig. 13). These numbers would mean that as few as 45 mines account for all 3 minelines. Unfortunately, only 32 mines were swept in this area.⁴⁶ To this tally, however, we must add 24 mines swept in October 1950.⁴⁷ These mines would presumably be added to the 22 or 15-mineline mentioned as a trap field. Two mines were reported swept when a minesweeper had to divert south of the channel to avoid other traffic.⁴⁸ The 22 reported swept on 10 October, 1950 are more perplexing. Since the originally planned channel was reported to have 39 and 22 minelines by a patrolling helicopter, and 22 mines are reported swept on the 10th, one of these minelines was probably swept before this approach was called off the next day. This reasoning would mean, of course, that minesweepers went further west than previously reported. Since the only source for how the minesweepers actually swept is based on the minesweepers' reports themselves, and

since the IER appears to follow these reports, then we can assume that the charts are mistaken, or do not note the full extent of the sweeping accomplished in this area. The charts may indicate only those waters established as swept, and not incomplete efforts.

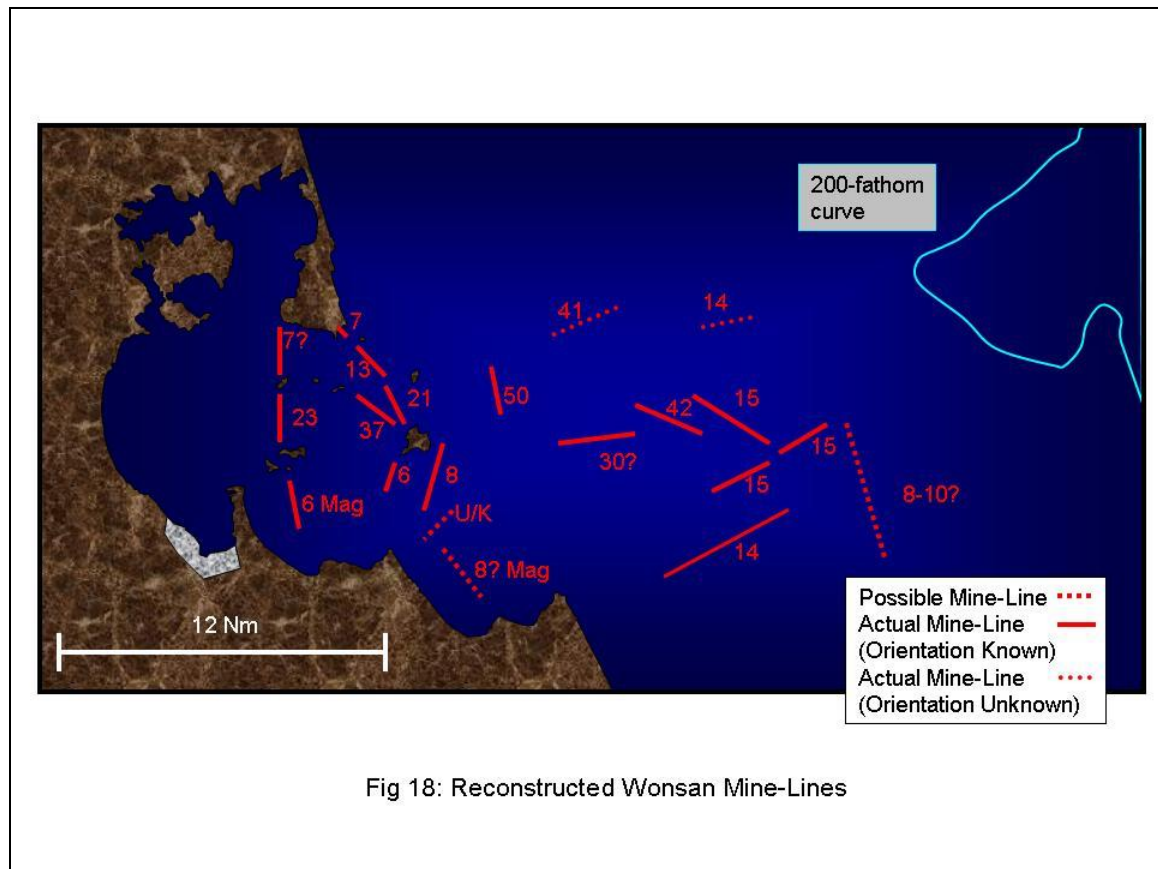
The 1st IER indicates an extensive mineline that consists of only 8 mines covering several miles (see Fig. 13) laid along a north-south axis; the minesweeper's overlay does not show this line. No mines were found that specifically indicate such an extensive mineline was laid. Such spacing is not practical for stopping an invasion, or inhibiting naval gun-fire support. Minesweeping at the end of June 51, however, may have swept up some of these mines, as this time period saw the beginning of the northwest-southeast axis minesweeping, which swept from the sea to shore, as mentioned above in the 3rd IER discussion. Some of these mines may have been swept up also during the 10 October 50 sweeping, as the IER indicates (see Fig 13). Most likely, however, this mineline did not exist.

The vast area south of the swept channel may also have had mine defenses. The southern limit of this area extended approximately 10mi north of Amyon Kutchi, and extended out roughly 12 miles from this point. Along the southern limit, 16 mines were reported: two lines along a northeast-southwest axis, consisting of five and nine M-26s, straddling a horizontal line 10mi north of Amyon Kutchi, and two M-26s further east.⁴⁹

⁵⁰ Identifying these mines is difficult. The small numbers of the mines, as well as the fact that these mines were mostly M-26s may indicate that these were laid after the initial minesweeping in October 1950. They may, however, coincide with the long northeast-southwest line stretching from Amyon-Kutchi to the 39-mineline in the minesweeper's overlay (see Fig.17). On the other hand, in the minesweeper's after-action report, it

mentions that “those (mines) in the southeast (Eiko) Wan were undoubtedly buoys or jellyfish”.⁵¹ Since the closest the UN minesweepers ever approached Amyon-Kutchi was about two miles away, and since these mines were reported on a northeast-southwest axis, they were probably an original line.

While the area north of the swept channel was not as heavily defended, significant mining, however, did occur. In fact, UN minesweepers found two clusters of 77 mines there (see Fig. 18). A 13-mineline, presumably on an east-west axis (the minesweepers were sweeping east to west at this point, and were not advancing that far north), was swept north of buoy 2.⁵² The rest were further west, around buoy 5. The area north of buoy 5 featured numerous mines. Seven mines were swept on 17 July, north of buoy 5. Also in this area, minesweepers found 16 mines that were swept previously in May, during the widening of the original channel.⁵³ These mines were probably the northern extension of the 42-mineline swept in October 50, east of Yo Island. Another 30 mines were swept the next day to the north of the previously swept 7-mineline.⁵⁴ A further 11 mines were swept the following day to the northeast of the 30-mineline.⁵⁵ These minelines may have been part of the 30-mineline, on a northeast-southwest axis. These mines were presumably laid to intercept naval gun-fire ships, as well as provide some defense against an approach from the east, through the Yo-Ung Islands gap. No further information is given, however, so we may never know for sure.



WONSAN OVERVIEW

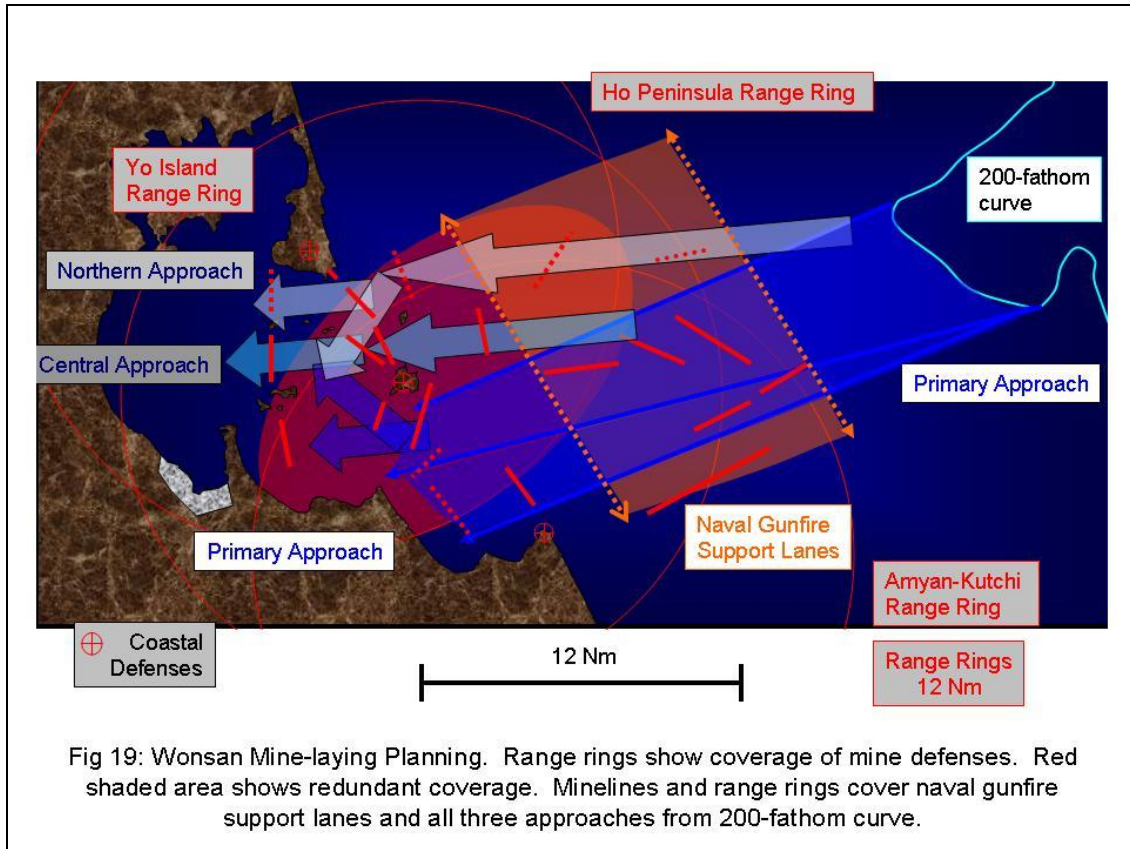
Over 400 old or unaccounted for mines were reported swept in Wonsan waters. This number comes from the IER-reported number of mines swept. Reporting indicates 168 mines were swept south of the channel. An additional 77 were swept north of the channel, for a total of 245. Also to be included are the eight mines southwest of Yo Island, giving a new total of 253 mines. Counting inside the Eiko Wan, 20 mines were swept in the Eiko Wan (around Ung Island), increasing the total to 273 mines. If the Sin-Mo Island mineline of 23 mines is added, the new total is 296 mines. If the 107 mines swept in the initial approach are added, the mine count increases to 403 mines. We are left with one old mine in May; and one mine in June; five in September; and one in November with no information. Even with these mines, the mine total is far short of the 3,000-4,000 reported in other write-ups. This number is somewhat corroborated by the Russians in an article that states that 500 mines were laid there.⁵⁶ Additional mines could remain in waters unswept by the UN.

As described above, Wonsan was very heavily defended in a mine warfare capacity. Minelines were laid out to visual range (12 miles). Mines were used to defend against an approach from the 200-fathom-curve bulge to the opening of the Eiko Wan, south of Yo Island. As mentioned in the minesweeper's report, the North Koreans laid mines here to prevent this open area from being a staging ground for an amphibious assault. Mines were also laid perpendicular to the coastline to prevent naval gunfire support. As an opposing ship approached from the north-east from the 200-fathom bulge, it found numerous mines (see Fig. 19). Its route to the open area south of Yo Island would have been entirely blocked off by the extensive minelines running east-west and

northwest/southeast. These minelines, due to their perpendicularity to the coastline, served a particular purpose: they inhibited gun-ships patrolling along the coastline.

These minelines may have been augmented by harassment lines laid further south along a horizontal line 10mi north of Amyon Kutchi. If this ship successfully passed through these lines and attempted to penetrate into the Eiko Wan, presumably heading south of Yo Island, it would have found two more lines south of Yo Island. The first was a north-south line just east of the island; the second was the mineline southwest of Yo Island that sank a Korean minesweeper. Any ship attempting to avoid coastal defenses would not be able to hide behind Yo Island, as the numerous minelines forced ships away from the island.

The northern and central approaches were also well defended. If a ship chose to approach Wonsan from a more northerly route, it would have found two minelines blocking its approaches. Successful penetration of these two lines would have brought the ship into the 13-mineline between Ung Island and Ho Peninsula, or the 7-mineline between Sokusemu Island and the Ho Peninsula. If a ship chose to run from the 200-fathom bulge to the center route between Yo and Ung Islands, as the minesweepers did, they would have found three minelines, as mentioned above. Further travel on this route between Sin and Sa Islands would have found a final 23-mineline between these last two islands. The long coastline along the Kalma Peninsula, where the initial landing was accomplished, was defended by a line of 6 magnetic mines. The Amyon-Kutchi coastline may have been similarly defended.



Part II: North Korean Minelaying Analysis:

“War demands sacrifices in untold numbers and in various ways. Combat, notwithstanding all these terrors, usually includes something that borders on the sublime, the magnificent; yet mine warfare, be it on sea or land, embraces an element of ghastliness and fiendishness” – Lieutenant General von Tschischwitz⁵⁷

A look at the minefields above, particularly Wonsan, reveals a complexity to the minefields. To understand why mines were laid where they were, one must appreciate the history of Russian/Soviet protective minelaying and the development of minelaying doctrine. The Russians normally fought in a state of naval weakness, so they appreciated naval mine warfare. As a result of their planning and experience, minelaying developed from simple geographic/oceanographic isolation, to gunfire support interdiction, to an integrated coastal defense. The hallmark of this integration was the mine-artillery position, which became institutionalized in Russian/Soviet naval doctrine. Initially, the mine-artillery relationship was dominated by the mine, with artillery used in support. The doctrine progressed by using mines to support artillery. The Russians accomplished this progression by moving mine defenses away from the coastline. This movement forced gun-fire support ships further away from shore, reducing their effectiveness by making them fire at longer ranges, or far enough that their guns could not reach the shore, but placing them in danger of long-range coastal artillery. Minefields were always within range of the artillery, as this allowed for protected reseeding should

minefields be swept by the enemy, thus completing the symbiotic connection between artillery and mines.

Russian protective minelaying began very early, during the Crimean War in 1854, when the Russians mined the Gulf of Finland in order to prevent Allied (British/French) operations in the vicinity of the Russian capital, St. Petersburg. The Russians laid both electric command-activated mines and contact mines at the entrances to the major port facilities along the Gulf of Finland (Russia owned Finland at that time), to include the major ports of Sveaborg (994 mines) and Kronstadt (1,865 mines).⁵⁸ The minelines laid here simply stretched across the harbor entrances.⁵⁹ The major ports did have artillery present. Two British ships were damaged by the mines, causing the British to maneuver ineffectually through the rest of the campaign, thus removing the threat to Saint Petersburg.

The next major instance of Russian protective mining occurred during the Russo-Japanese War. The war began in 1904 with Japanese surprise attacks throughout Asia. The early action became focused around the area of Port Arthur, a natural harbor on the Kuan Tung Peninsula (see Fig.20) in modern northeastern China. The Russians owned the port, but the Japanese wanted it to control the Yellow Sea and the Bohai Gulf, as well as to extend their power inside China. Port Arthur was defended by approximately 20 artillery batteries along the coast and along Tiger Island that ranged up to seven miles out to sea.

The fighting at Port Arthur began on the 9th of February when the Japanese fleet conducted a night attack, firing torpedoes at the Russian fleet arrayed defensively at the mouth of Port Arthur, under the protection of the coastal batteries. The main action

occurred the next day when the main fleet conducted a pass approximately two miles in front of the Russian fleet. After suffering some hits from the Russian artillery, the Japanese fleet returned to their anchorage on the Korean coast. Following this attack, the Russians began their first protective mining effort. As the Russians feared an amphibious assault, they began mining many of the bays around the Kuan Tang peninsula; the three bays around Dalien (to the north of Port Arthur) and Eight Ships Bay received the initial attention (see Fig.20). These minelines were laid parallel to the coast, or using oceanography or geography to isolate the bays from Japanese assault. Eight hundred mines were laid.⁶⁰

The Japanese had determined, however, to conduct an overland assault on Port Arthur, and focused their naval efforts on blocking the harbor entrance by sinking a ship there, and to thus trap the still potent Russian Navy inside. Three 'blocking' expeditions were conducted. The first failed due to difficulties navigating at night and under the glare of Russian searchlights, as well as due to the heavy gunfire from shore. The Japanese later, on the 25th of February, conducted a long-range bombardment of Port Arthur, from approximately 4-5 nautical miles away. Due to the effect of Russian coastal batteries, the Japanese conducted their second bombardment from the south, six miles away, covered by the hills of a peninsula, Lao-Tieh (see Fig.20), to the south. As a result, the next Russian mining effort focused on the southern portion of the peninsula, where 25 mines were laid to obstruct future Japanese bombardments, on the 25th of March.⁶¹ A gun was placed on the Lao-Tieh in support. A second attempt was made to block the harbor, and it too was unsuccessful. The first mining successes of the war were scored, although it was the Japanese who were successful. They laid mines outside the harbor

where the Russians had habitually traveled and, as a result, one battleship was sunk and another was severely damaged. As a result of the continued attempts to block the harbor, the Russians laid 135 mines outside the harbor entrance in mid-April. The mines were laid in two groups, with three lines extending east from the shoreline southwest of Port Arthur, and another three minelines extending southwest from the shoreline east of Port Arthur and then bending due west.⁶² These minefields had the additional benefit of being electrically controlled by the shore. They were laid to no affect, as the third blocking effort by the Japanese was conducted unsuccessfully. The mines laid, while perhaps adding stress for the Japanese, did not make a significant impact on their attack.⁶³ The Russians minelayers were not without success, however, as they later noticed the Japanese traveled a particular route to the south, which they mined with 50 mines. The results were spectacular; three Japanese battleships were struck. This disaster killed the Japanese naval offensive options, and increased the danger to the Japanese fleet with the approach of the Russian Baltic Fleet, making its journey to Asia. The Russians were not able to follow-up this success, and their fleet remained inside Port Arthur.

The defenses there were strengthened, as additional electric-detonated mines were laid to supplement the existing fields.⁶⁴ Additionally, 45 mines were laid at the approaches to Taho Bay, just east of Port Arthur.⁶⁵ Minelaying continued through the summer by both sides, as the Japanese stopped attempting to block the entrances of Port Arthur with blockships. Other than a Russian sally in July, the siege settled into a blockade, with neither side making any further moves. On 10 August, the Russians made an attempt to break out their navy, so that they could reunite later with the rest of the Russian fleet to challenge the Japanese. The Russians lost the subsequent Battle of the

Yellow Sea and retreated back to Port Arthur, where they remained until they were destroyed in the port by Japanese land artillery, as the Japanese closed before they finally took the city in January in 1905.

While most of the mining conducted in this conflict by the Russians was either to defend against amphibious assaults that did not happen or were part of a harbor defense against the Japanese blocking efforts, the significant mining development was the use of mines to interdict ships transiting and conducting coastal bombardments. Many mines were laid; the most effective were the minelines off the Lao-Tieh Peninsula and the single mineline laid that struck the three Japanese ships in May.⁶⁶ This type of minelaying is the first instance of mines being laid that were not used to block a direct amphibious assault, but to interdict naval activity away from the coastline. A second aspect of the Port Arthur minelaying is the relationship between coastal artillery and mines. The concept of the mine-artillery position had not been fully formed, although it may have received impetus by the use of mines at Lao-Tieh Peninsula to cover a gap in coastal artillery defenses, specifically, to deny the Japanese a naval bombardment vantage point hidden from view of the Russian guns. Mines were yet to be laid, however, to take full advantage of coastal artillery.

The First World War was another opportunity for the Russians to develop their minelaying doctrine. As tensions in Europe rose, Russian naval defense focus shifted back to the Gulf of Finland. Russia, in the face of German naval strength, and fearing Swedish collusion, planned for a defense to stall an attack for 14 days, to allow the mobilization of a defense around the capital at St. Petersburg.⁶⁷ The initial plan was to set a line of mines both north and south of the Gogland Islands (see Fig. 21). The main

naval base would be Kronstadt, with an advance base at Sveaborg (Helsinki, Helsingfors).⁶⁸ The Russian fleet, still reeling from the severe losses suffered against the Japanese, kept its fleet in a purely defensive posture, not risking further losses.

This policy did not sit well with the Russian admiral in charge of the Baltic fleet. Admiral Essen, placed in command in 1908, sought a more aggressive stance, believing that despite their naval superiority, the Germans would be focused on the British, and that the Baltic would be a secondary theater for them.⁶⁹ Essen sought a more offensive posture, to include offensive mining of Swedish and German ports, and a naval demonstration to deter the Swedes.⁷⁰ The Russian naval leadership did not accept Essen's plan, but agreed to establish a more forward line of defense at the Nargen-Porkkala-Udd line, designated as the "Central Position", which lay to the west, allowing Essen a first line of defense further out in the Gulf.⁷¹ Moon Sound, to the south, would also be mined. Despite this concession, the Russians' Baltic stance remained defensive. In the face of an attack, the Russian fleet would retreat behind the Central Position, which was covered by heavy artillery on the Finnish coastline.⁷² The main fleet would be based at Revel (modern Tallinn), which was not completely equipped, so Helsingfors (modern Helsinki) would serve until Revel was complete.⁷³

At the outset of the war, the Russians immediately began to establish the Central Position, laying 2,124 mines in 4.5 hours⁷⁴, with additional mines along the Finnish coast.⁷⁵ Mines were laid approximately 200-400 feet apart, in complimentary lines so that a second line will fill the gaps of the first.⁷⁶ Mines were laid 4-6 feet deep in shallow water, and 15-20 feet deep in deeper water.⁷⁷ By 1917, the number of mines in this line had been increased to 11,000 mines.⁷⁸ Despite being aided by Swedish

neutrality, the Russians did not assume the offense; the Germans did. They shelled Libau (in modern Latvia), which, unbeknownst to them, had been evacuated, as planned by the Russians. The Germans, contrary to Russian fears, had committed fewer forces to the Baltic. The Russians, detecting the German weakness, began to push westward, stationing some destroyers at Lapvik; lighter forces were moved to the Aland Islands, and a forward base was planned at the Moon Island.⁷⁹ The Russians, on 27 August, even conducted a naval raid against the German-Swedish line of communications, although with no effect. Later, offensive mining against the Germans was conducted against their ports of Memel, Pillau, Bornholm, Danzig and the island of Rugen.

As 1915 opened and progressed, the Russians became more comfortable with the notion that the Germans were not going to force the Gulf of Finland. As a result, that began to develop a “Forward Position”, laying mines between Hango and Dago Island. By 1917, the Forward Position would have 8,000 mines.⁸⁰ They also began to mine the Irben Strait, to the south, with 2,179 mines.⁸¹ In support of this effort, they also began fortifying the Moon and Aland Islands. The real threat to the region began to materialize as the German ground forces moved into the Courland region (modern Latvia). As they advanced, the Gulf of Riga grew in importance for the Germans, as it was as a flank for their Army. As a result, the German navy decided to sweep the Russian mines in the Irben Strait and to mine the Moon Sound. The Russians reacted by skirmishing with the Germans, and reseeded the minefields. The Germans were able to sweep the Irben Strait, but were unable to mine Moon Sound. After losing 2 destroyers and a minesweeper to mines and submarines, the Germans withdrew.⁸² After the Germans left, the Russians reseeded fully the mines that had been swept.

In 1916, the Russians continued to develop their defenses. They renewed their minefields in the Central and Forward positions, as well as the Irben Strait and Moon Sound. To augment the minefields, the Russians built batteries at Zerel on the Sworbe Peninsula, which dominated the Irben minefields, and at Cape Tachkona, on the northern tip of Dago Island, dominating the southern flank of the advanced position. The only significant action of this year featured a German raid against Russian shipping in the western Gulf of Finland, behind the Forward Position. Underestimating the Russian defenses, the Germans advanced into the Gulf, immediately losing two destroyers to mines. After concluding the raid, which achieved very little, the Germans lost an additional five on the return, also to mines, leaving only four destroyers to survive the mission.

In 1917, the Russian Revolution occurred. As a result of this, the Baltic Fleet ceased to be a factor, distracted by the political situation. The Germans, seeking to take advantage of the situation, launched their largest Baltic naval operation, the seizure of Osel and the Moon Islands. The Germans launched over 300 ships in support of this operation, but were lacking in minesweepers. The German operation began with an attack on the northwestern coast of Osel (see Fig.22). The German assault force penetrated past a weak minefield and artillery defense to Tagga Bay. German battleships neutralized the nearby artillery batteries at Hundsvort and Ninnast. The Germans were running behind schedule, however, and braved the minefields protecting Tagga Bay. Despite suffering damage to two battleships and a transport sunk due to minestrikes, the Germans successfully landed at Tagga Bay on 12 October. A second landing occurred at Pamerort, further north on the island, after the Germans neutralized the battery at Toffri

village, in the southern coast of Dago Island.⁸³ A second group of Germans began the penetration of the Irben Strait by engaging the batteries at Sworbe, the southern tip of Osel. The minefields and the long-range of the Sworbe guns kept the Germans from coming close and neutralizing the battery there. The first group, after completing the landing at Tagga Bay and Pamerort, planned to force the shallow waters of Soela Sound, between Osel and Dago Island, and support the army's passage from Osel to Moon Island. This naval movement also would block Russian naval access into Moon Sound and trap the Russian naval forces reacting to the Germans penetrating the Irben Strait. The German attempt to force the Soela Sound was initially unsuccessful as shallow water and a minefield prevented the larger German ships from supporting the minesweepers, which received fire from Russian ships nearby.⁸⁴ The Germans were ultimately able to sweep the area, and tow a battleship near enough to provide support, allowing the Germans to control the Sound. The Russians retreated and established a new defensive line by laying a minefield in the inlet of Kassar Bay, north of Cape Pawasterort, which resulted in the sinking of two German destroyers.

The German land advance on Osel allowed the naval action to shift toward the Irben Strait. The long-range battery and the minefield made the German advance difficult. The odd shape of the minefield took advantage of the shoals near Zerel and forced the Germans to travel through 10 miles of mined water to enter the Gulf of Riga. The northeastern leg of the minefield was designed to keep the Germans from further penetration of the Gulf of Riga. The effort to sweep this area progressed slowly as the battery at Zerel prevented the Germans from sweeping the Strait.⁸⁵ The German troops advancing from Tagga Bay silenced the battery, allowing the sweeping to succeed. After

gaining entrance into the Gulf of Riga, the Germans were again held up at the southern entrance of the Moon Sound; the Russians had positioned their battleships in the Sound. These ships, as well as the batteries at Woi and Werder, held up not only the minesweepers sweeping the many mines there, but also the battleships and destroyers supporting them. The minesweepers were sent to a portion of the minefield where Russians had been seen transiting and began to sweep there. After a while, German battleships were brought forward and chased off their Russian counterparts. Once the ships had left, the Germans silenced the batteries at Woi and Werder. As they retreated, the Russians sank three of their own ships to block the Sound and laid more mines to slow the German advance.⁸⁶ With the Germans controlling the island by land, and the minesweeping effort finally succeeding to clear the Moon and Soele Sounds, the Russians retreated. Their minefields, however, continued to exact a toll, with a battleship damaged and a destroyer sunk and another destroyer damaged.⁸⁷ These continuing losses made the Germans wary of pursuing the Russians, preventing them from accomplishing their goal of trapping the Russian Navy.⁸⁸ With the conclusion of this fight, the Baltic campaign was over. The Germans, having sampled Russian naval defenses in the Baltic, did not want to try the stronger defenses in the Gulf of Finland, opting to let the land forces threaten the Russian capital. The new communist government signed an armistice with the Germans, and the war ended for the Russians.

Despite their lack of success in defending their Baltic Islands, the Russian defenses were very well planned. As the Russians had been anticipating fighting in the Gulf of Finland, extensive planning went into their defenses. As a result, they fully used the 35,000 mines laid in the Gulf of Finland⁸⁹; the first incidence of Russian full force

coordination of naval vessels and submarines with mine-artillery positions occurred here,⁹⁰ and this coordination was another development of the doctrinal “mine-artillery positions” that would dominate Soviet/Russian coastal defense doctrine for the next 50 years. These mine-artillery positions caused considerable difficulties for the Germans, and only due to overland success and Russian political instability caused by the Revolution were the defenses overcome. A weakness did exist in these defenses. A gap in the mine defenses existed between Osel and Dago Islands. As a result, the artillery positions there were able to be destroyed singularly. The damage caused by this lack of mine coverage was made apparent during the landings that occurred on Osel, which were not very well opposed. This lack of minelaying was likely caused by German minelaying in the area, which the Germans had to sweep themselves to launch their assault. The Russian artillery positions at Ninast and Hundsort were destroyed piecemeal by German battleships that did not have to worry about minefields. The Germans were then able to maneuver up to Tagga Bay and Pamererort virtually unopposed. The mine defenses there were weak and easily penetrated.

Despite this weakness, the mine defenses demonstrated how effective mines could be as a cheap, effective way of countering a large, modern naval force. During the Battle of Jutland in 1917, the major force-on-force battle of the First World War, the British destroyed one German battleship, one battle cruiser, four light cruisers and five torpedo boats. In comparison, during the entire 1917 Baltic operation two German battleships were damaged for the duration of the war, and a third was taken out of the war for a month; two small battle cruisers, three destroyers, ten minesweepers and one transport were sunk. While no battleships were sunk, the results of the mine campaign

were very comparable to what the British fleet accomplished at Jutland, with much fewer assets than the British used.

The new Soviet government remained concerned with the Gulf of Finland, and planning continued for its defense that led into the Second World War. As the Soviets struggled to gain control and the Germans withdrew from the Baltic, the British intervened to support the independence movements of the Baltic states, which the Soviets were attempting to retake. Fearing intervention, the Soviets began minelaying in the vicinity of Stirsudden and Shepelev on 10 August.⁹¹ The minelayers laid 438 mines at a depth of 15 feet, 150 feet apart in 4 lines (see Fig. 23).⁹² The British arrived in the Gulf, entering Revel on 12 December. The British later advanced toward Kronstadt, but were deterred by the Russian defenses. Driving off two Soviet sorties, the British conducted several raids into Kronstadt. Because of the mines, the British had to use torpedo boats that were of shallow draft to carry them over the mines. Despite inflicting losses on the Soviets, the British were unable to penetrate the mine-artillery defenses, and ultimately departed the Gulf, allowing the Soviets to defeat the counter-revolutionaries.

Despite the change in government, the new Soviet government maintained an emphasis on mine warfare. This emphasis mostly was due to necessity, as the arrival of the British fleet in 1919 in the Baltic, combined with the shortage of naval assets, made mine warfare an attractive defensive option. The vacillating role of the Navy in the politics of the revolution, however, made the new Soviet government wary of the Navy. Although home to the Russian Revolution, Kronstadt fell out of favor after a counter-revolt in 1921.⁹³ In the general atmosphere of upheaval, several mutinies occurred as well; most notable in the mine warfare community was the mutiny on the Pripyat, the

minelayer responsible for mining the Soela Sound in 1917. The crew had to be replaced, but the delay allowed the Germans to penetrate the Sound, endangering the rest of the fleet.⁹⁴ As a result, political officers were placed on Soviet ships to ensure party loyalty. This loyalty was institutionalized by the Great Terror, when all suspected sailors, guilty or otherwise, were dismissed and/or executed, and replaced by newer sailors who were raised in party loyalty. This purge, while ensuring party loyalty, also calcified initiative at the lower echelons, ensuring the disaster that would occur in 1941.

As a result of the Russian Revolution and the independence of the Baltic States, the Soviets' options for the defense of the Gulf of Finland were severely limited. Due to the loss of territory in Finland and the Baltics, as well as a shortage of mines, the Soviets initially believed they would be limited to a defensive area just west of Kronstadt, along the Stirsudden-Shepelev perimeter, which could be covered by the Kronstadt batteries. The lack of mines and minelayers limited the Soviets initially to lay 2,500 mines within 2 weeks – a capacity that compares unfavorably to the 2,100 mines laid in the Baltic within 5 hours in 1917.⁹⁵ In order to meet their defensive needs, the Russians considered two plans. The first consisted of a single defense zone about 7-9 miles from the fort at Krasnoya Gorka (see Fig.24), to be defended mostly by surface ships; the second consisted of two mine zones, protected by coastal artillery. The latter option was chosen. It consisted of 1,300-1,400 mines in a forward defense zone located 9-11 miles from the Krasnoya Gorka, whose guns had a range 13 miles.⁹⁶ Seven miles behind the first mineline the fall-back defense zone would be created, with only 240 mines, so the Soviet warships could maneuver to counter the enemy or support ground forces. The rear zone would be covered by the Soviets' only battleship and the batteries of Fort

Krasnoarmeysky and Fort Rif, on the Kronstadt Island. As the principal landing sites for an attack on Petrograd were not covered by Kronstadt's batteries, additional minefields would be laid there, supported by torpedo boats and aircraft.

A naval exercise in 1923 revealed that this defense was too shallow, and that the Soviets would have to extend their defense further west. The updated version of the plan moved the defense back to the Gogland and Seiskari Islands (where the Russians had planned for it before World War One), and since they lacked the land area to place coastal artillery, they moved their battleships forward, behind this line. After further exercises and planning, the Soviets increased the offensive capability of their battleships, where they engaged a hypothetical enemy in a protracted fight, before retreating behind the minefield.⁹⁷ The offensive role of these ships was quashed by fear of hostile land defenses (principally, the Finnish battery at Bjorko, just outside Stirsudden-Shepelev line), and the Soviet Navy remained in a defensive posture, only moving forward when ground forces had secured the land flanks.⁹⁸ By 1928, the Soviet mine inventory had increased enough to allow for 3,444 mines at the Stirsudden-Shepelev line, augmented by 610 sweeping obstacles, devices meant to foul minesweeping gear.

As planning continued in 1935, Soviet theory remained defensive. The Navy, still anticipating a British attack, believed that they would attack in two waves.⁹⁹ The first wave would consist of cruisers and minesweepers, which would clear a path to the northern shore. The second wave would consist of battleships that would engage the coastal artillery and the Soviet Navy until a path was cleared and a landing was secured. To counter this perceived threat, the Soviets sought to engage in a skirmish with the hostile fleet, then fall back behind their forward defense position.¹⁰⁰ They would then

engage the first wave with torpedo boats, submarines and coastal artillery.¹⁰¹ Once the enemy's plans had been determined, the Soviets would launch their counterattack, using battleships, long-range coastal artillery and cruisers to attack the second wave. Aircraft and additional torpedo boats would be a mobile reserve force.¹⁰² This defense would include 550 mines and 50 sweeping obstacles in the forward defense zone, and 2,381 mines and 902 sweeping obstacles in the rear defense zone.¹⁰³

A change in leadership in 1938 brought about another review of the Baltic defenses though the Soviet posture remained essentially unchanged. Their mine inventory had increased, and, as a result, the mines defenses increased in strength. The Soviets now had 4,754 mines and 1,926 sweeping obstacles, a third of which was to be deployed at the Shepelev-Stirsudden line within 72 hours.¹⁰⁴ The forward position at Gogland remained. In the event of an attack, aircraft, submarines and destroyers would reconnoiter around Tallinn, Helsinki and the mouth of the Gulf. If the enemy were present before mine defenses had been established, they would be engaged. Troops would then be landed on the Seiskari and Lavensari Islands and 6" guns would be established there to stiffen the forward defense zone. As the enemy fleet entered the Gulf, the Soviets would engage it at the forward defense zone, with submarines and torpedo boats; the battleships would be held in the rear. Soviet naval options increased significantly, however, in the late 1930s. With the Soviets seizing the Baltic states in an agreement with Germany that included dividing Poland, as well as the capture of several Finnish islands during the Finnish War and, more significantly, the Hango position that covered the entrance to the Gulf of Finland, the Soviet Navy could plan again to defend the entire Gulf of Finland.

This new plan was soon to be executed. In June of 1941, the Germans launched their invasion of the Soviet Union, taking the Soviets by complete surprise. Despite the surprise, the Russian Navy took initial actions to defend the Gulf. On 22-24 June, 3,000 mines and 500 sweeping obstacles were laid.¹⁰⁵ The mines were not laid at the Stirsudden-Shepelev line, but were at the mouth of the Gulf, taking advantage of the Soviet territorial acquisitions at Hango and Dago Island.¹⁰⁶ Offensive mining also was conducted by air-drops against Finnish ports.¹⁰⁷ Mine-artillery positions were begun to defend the Irben Strait and the Gulf of Finland. The Gulf of Finland position was to have three mine barriers. The first two barriers were laid against large naval ships. Each of these barriers consisted of two rows of mines and a row of anti-sweep mines. The third barrier was laid against submarines, and consisted of two rows of mines set at different depths. To screen the entire field, it was planned to lay eight one-row minelines to the west, and two each on the flanks. The minefields were to be supported by artillery at Hango and Osmus Saar Island, just off the Estonian coast. Reality set in, however, as the Soviet mine inventory would not support such an extensive operation. Instead, the plan was modified to lay two and half rows of mines¹⁰⁸, supported by two rows of antisweep mines and two rows laid against submarines.¹⁰⁹ A Central Position was also laid, supported by 3,059 moored contact mines and 498 anti-sweep mines. Mines were also laid here against submarines, in two rows, at depths of 75 feet and 120 feet.¹¹⁰ These lines were noted to be ineffective against submarines, as the Gulf could get as deep as 270 feet, suggesting a third row at a lower depth was necessary.¹¹¹ Mines were also not laid against shallow draft vessels or minesweepers. The proportion of anti-sweep mines also was noted to be insufficient.¹¹² The Irben Strait also was planned to be extensively

mined, with 1,647 mines and 500 anti-sweep mines in ten lines covering 20 miles. Four minelines were to be laid against large surface ships, four against small ships, and two against submarines. Because of the weather and German army success, the Soviet minelaying effort here was limited to only two lines: a field of 60 mines was laid near the Mikhailovsky Shoals (off Zerel), and 120 mines were laid in the Shoals and the rest of the Irben Strait.¹¹³ A total of 1,178 mines and 40 anti-sweep mines were laid in the Irben Strait and in the Gulf of Riga, including a mineline from Abruksa Island to Kurassare peninsula.¹¹⁴ This effort resulted in the Gulf being denied to the Germans, with three German minesweepers sunk as a result,¹¹⁵ allowing the Soviet Navy to hover on the flank of the German Army, now in Latvia. With Finland entering the war, the artillery flanks of the Forward and Central Positions were exposed. The Soviets reacted by mining the old Gogland line, with minelines running along the Gogland-Bol'shoy Tyuters Island-Kunda Bay, with its development in depth to the line at Sommers (Mayak) Island-Lavensari- Kurgal'skiy Peninsula.¹¹⁶ To support these minefields, coastal batteries were set up at Gogland, Bol'shoy Tyuters and Lavensari.¹¹⁷ As the German Army advanced, another position was prepared near Narva, Lavensari, the Kurgal'skiy Reef and Shepelev.¹¹⁸ A total of 5,657 mines and 1,480 anti-sweep mines were laid in these two positions.¹¹⁹ At least five lines were laid against minesweepers in the rear position.¹²⁰

In spite of this effort, it was the Germans who had the most success in mine warfare. In the Gulf, German and Finnish minelayers began mining throughout the Gulf of Finland immediately once war was declared. Of note were the minefields near Juminda, where 2,400 mines had been laid. These minefields, combined with Soviet inaction allowed the Germans to maintain control of the Gulf. This control produced

catastrophic results when retreating soldiers and party officials, trapped by the rapid German advance, decided on a naval evacuation from the Estonian city of Tallinn. An initial attempt to sweep the path to Kronstadt was made, but four minesweepers and a destroyer were sunk by mines, and another destroyer and steamer were sunk by aircraft. Later, four groups of ships, including 128 warships and 67 cargo ships attempted to escape. Weather prevented a daytime transit, so the Juminda minefield was crossed at night. The results were disastrous. Due to minestrikes, dive-bomber, torpedo boats and coastal artillery, 25 of 29 cargo ships, 9 of 38 minor cargo ships, 5 destroyers, 3 patrol ships, 2 submarines and several mine ships were sunk. Estimates of personnel losses are usually given at 10,000 to 14,000.¹²¹ Another evacuation occurred from the coastal artillery position at Hango, where 23,000 men were evacuated, having to transit through the same minefields. Three destroyers, three minesweepers and a patrol ship were sunk. Most of the 5,000 killed in this operation were on board the passenger ship Iosef Stalin, which was hit carrying 5,500 troops.¹²² While this mine warfare campaign was not conducted by the Russians, the combined effect of mines, coastal artillery, aircraft and surface ships illustrates what the Russians could have achieved in the Gulf, as well as the maximum damage a coordinated mine-based defense could provide, particularly in a constricted sea space.

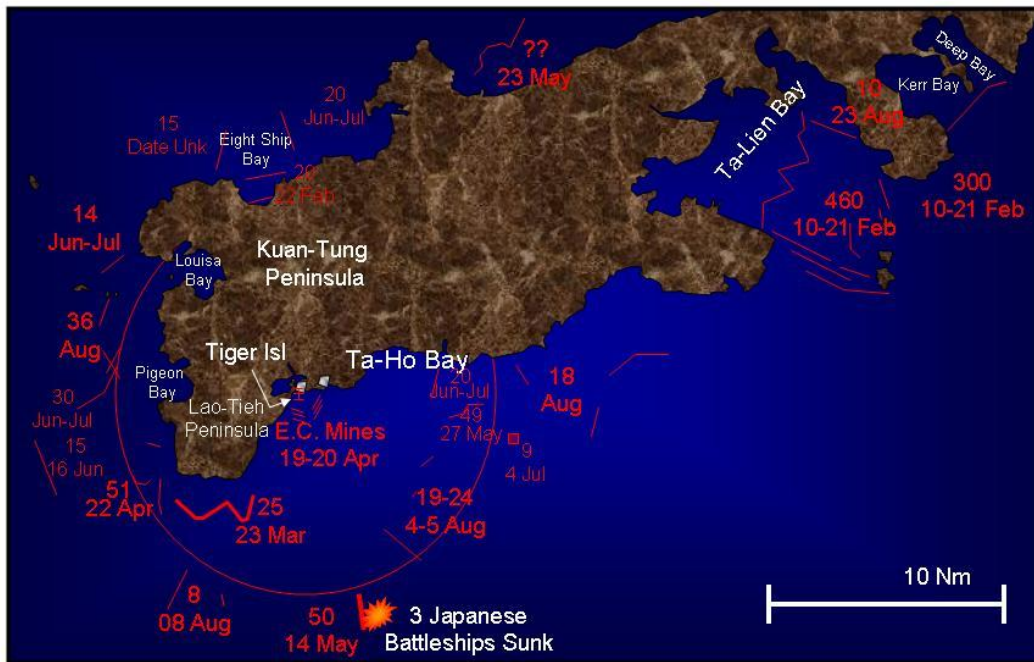


Fig.20: Port Arthur, 1904. Note the minelines laid on 23 March and 14 May. 23 March mines covered Japanese firing position; 14 May mines (explosion) intercepted Japanese transit route, sinking 3 Japanese battleships.

"Official History of the Russo-Japanese War", "Plan 4: Russian Minefields, Feb-Aug, 1904"



Fig 21: First World War, 1917 Minefields. Minefields focused blocking entrance into Gulf of Finland and the approaches to St Petersburg. Minefields laid to maximize artillery coverage

Russian Defenses

- Coastal Artillery
- Osel
 - Tagga Bay protected by four 15.2cm guns at Hundsort and four 15.2cm guns at Cape Ninnast.
 - The battery at Cape Zerel featured four 30.5cm guns which could dominate the entire Irben Straits.
- Dago
 - Battery at Toffri with 4x12cm guns
 - Cape Tachkona with two batteries.
- Moon Island
 - Heavy battery at Woi consisting of 5-25cm guns and 4-15cm guns
 - Verder defended by a battery of 4-15cm guns.
- Mines
 - Dense minefields in the Irben Straits
 - Russians laid over 10,000 mines there
 - Southern Moon Sound protected by 1300 mines.

Barrett, pg.63,70

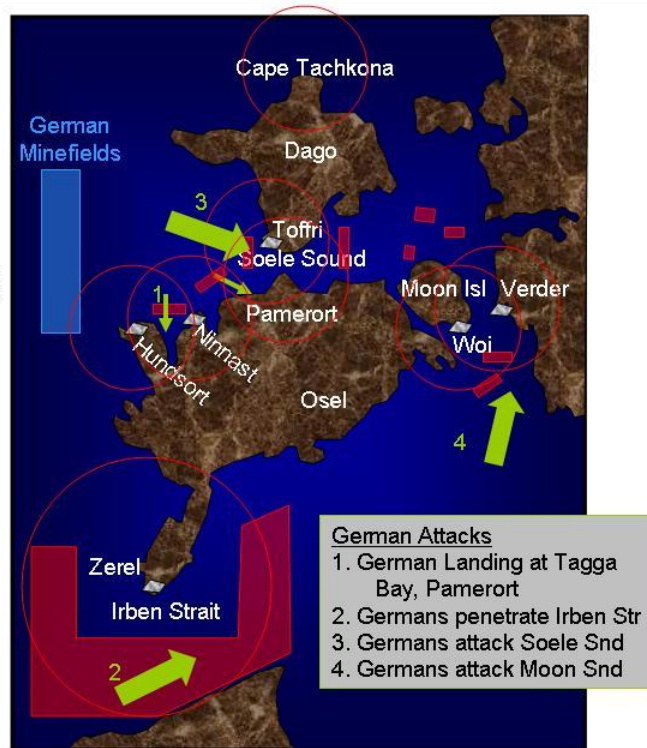


Fig 22: German Island Attacks and Russian Defenses, 1917

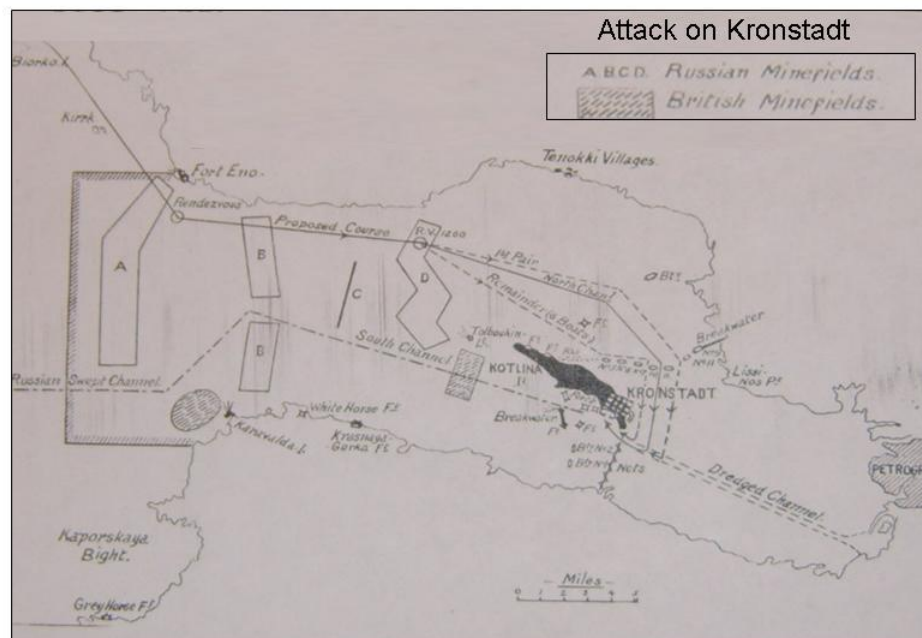


Fig 23: British operations near Kronstadt in 1919. Note Russian minefields blocking approaches to the Island. Lines to the north denote the path of the British torpedo boats.

Agar, CDR A.W.S., "Naval Operations in the Baltic", Journal of the Royal United Service Institution, Vol. 73, Nov 1928, No.492, pg. 675



Fig 24: World War II, 1941 minefields. The Soviets reused many of the positions from WWI. The surprise attack and sparse resources limited the Soviet effort. Note the German minefield near Tallinn, which block the Soviet evacuations from Hango, Tallinn.

The minefields laid in Korea reflect the coastal defense doctrine, highlighted by the mine-artillery position that the Russians/Soviets had developed since the Crimean War. The minefields here could not be fully developed, as minelayers were hindered by the limited resources of the Koreans, most specifically, the lack of minelaying force,¹²³ and the compressed timeline forced by the changing situation on the ground brought about by the landing in Inchon. Despite these shortcomings, the minefields reflect the Soviet appreciation of the mine-artillery relationship. The shortcomings manifested themselves in the violation of the minelayers first rule: quantity, quantity, quantity. All of the areas mined cover a 30-mile span; the most mines laid were at Wonsan with over 500. In the Gulf of Finland, a similar distance was mined, when the Russians laid 11,000 mines there in the First World War, in one position. As a result, the defenses were not as thorough as previously seen. For example, fewer lines were seen in Korea, with less depth. The novelty of these minefields was the first use by the Russians of influence mines in addition to the moored mines commonly used, and the use of the diagonal mineline as a dual purpose/area denial mineline.

Two types of mine-artillery position arrangements were used by the Soviets in Korea. The first, utilized at Chinnampo and Hungnam, focused on covering a limited area with multiple minelines, covered by multiple vantage points. This arrangement was likely due to the more limited number of mines at these two cities (242 reported at Chinnampo; 135 were swept at Hungnam). Referring back to figures 5 and 9, both of these areas featured mines concentrated in areas likely to be covered multiple times by

artillery placed across the coastline. Few minelines existed outside these areas. Attention was focused on the primary approach while lesser areas were ignored. This focus may account for the gaps noted at both Hungnam and Chinnampo. Fig. 25 depicts this arrangement in a more generic setting. The second arrangement, utilized at Wonsan, utilized more mines to channel approaching vessels into areas covered by more vantage points. At Wonsan, the most likely approach was to come from the east and to head west-southwest through the open area north of Amyon Kutchi and Irari Point. The numerous minelines that covered this area forced an opponent north. A more northern approach was channeled south by the minelines north-northeast of Yo Island. Thus, as happened in 1950, an opponent was funneled into the approach north of Yo Island, which could be covered by numerous positions throughout the area. Fig. 26 depicts this second arrangement in a more generic setting.

As mentioned above, the Korean minefields were manifestations of the mine-artillery positions of Russian doctrine. Wonsan, in particular, illustrated this. All minelines lay within the 12-mile radius that coastal guns could cover, allowing for reseeded, if possible.¹²⁴ These minelines also forced gunfire supports outside the 12-mile radius of the guns like the minelines at Moon Sound and the Irben Strait in 1917. Additionally, the minelines denied coverage in the outlying islands where ships could find cover from the gunfire, similar to how the Russians denied the Japanese a cover point at the Lao-Tieh peninsula in 1904. While not as extensive, similar planning was observed at Chinnampo. Two gunfire support lines were denied with the two minelines west of Cho Island and within the shallow water fingers to the north. The Cho Island mineline also denied an enemy the use of that island as a vantage point. Hungnam did

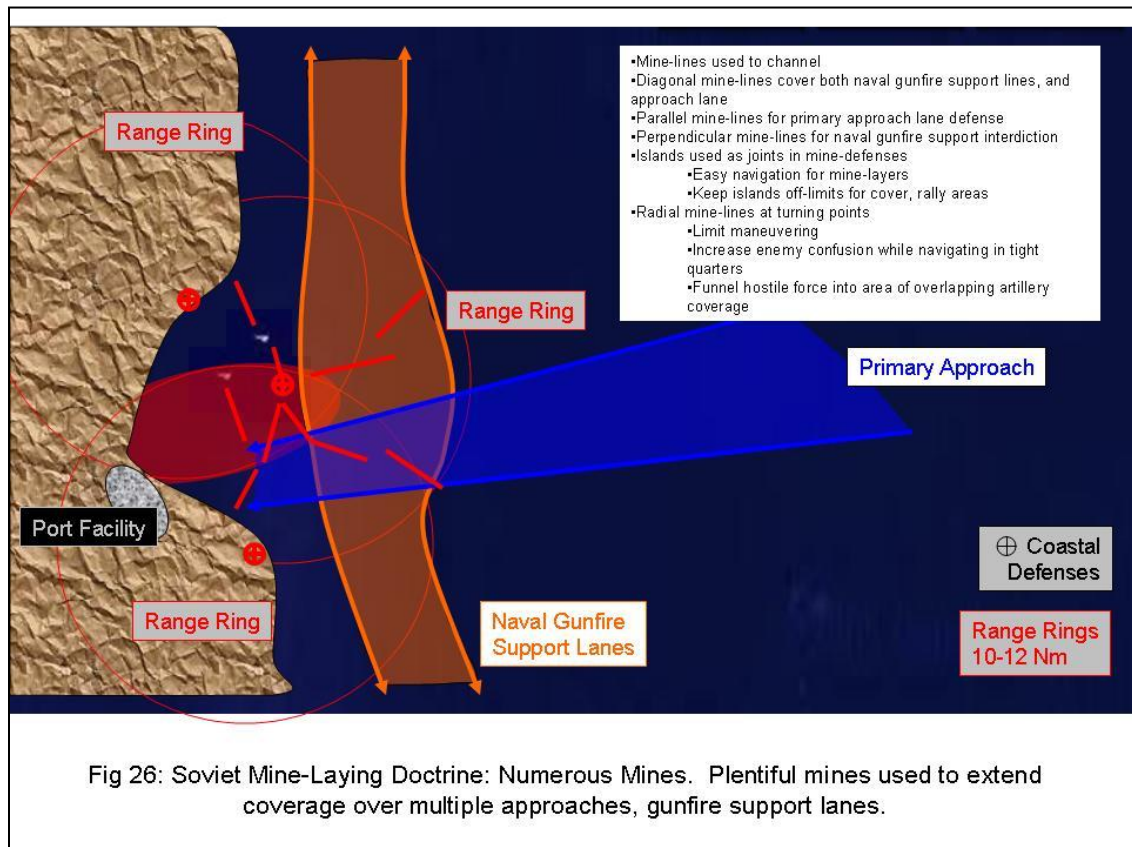
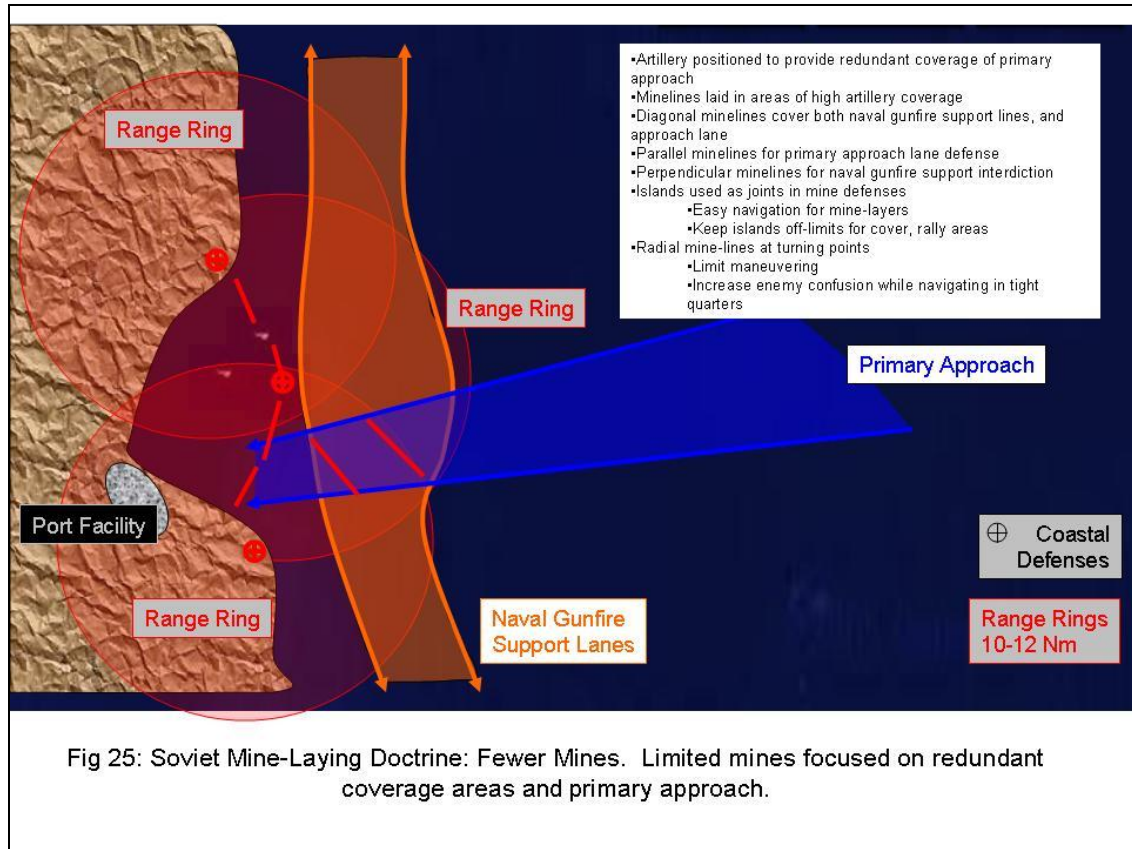
not feature the denial of gunfire support lanes although the southernmost mineline denied the safety of the Hyongje-am islands as a vantage point.

The Korean minefields featured two innovations: the influence magnetic mine, and the diagonal mineline. The magnetic influence mines were first used by the Germans during the Second World War, and account for some of the damage inflicted on the Soviets, who were not prepared for them, during their retreat from Tallinn and Hango. Their use at Wonsan and Chinnampo were the first time that they were used by the Soviets. These mines were also equipped with ship counters, an internal mechanism that counts the passes of a ship before it detonates. These mines were the last line of defense for a hostile landing. This positioning was mostly due to the requirement to be used in shallow water; however, it should be noted that these mines were not integrated with the other mine-types, i.e. influence mines were laid in their own rows and moored mines were laid in their own rows. At Wonsan, these mines were used in 36-50 feet of water. At Chinnampo, with only one mine position given, this minetype likely was laid in a line placed among lines with moored mines to complicate the sweeping in the vicinity of Sok Island, similar to the mix of mines found in the Gulf of Finland during the Second World War, when antisweeping mines were laid separately from the large surface ship lines, and those were separate from the anti-submarine lines.

The other innovation was the diagonal mineline. This innovation was observed primarily at Wonsan, beyond the islands that surrounded the harbor. Due to the lack of mines or minelayers, the Soviets used an economy of mines to accomplish two missions with one mineline. In some areas, approach lanes and naval gunfire lanes overlapped. In these areas, diagonal minelines were used. These minelines would thus cut both lanes in

an economic fashion. This concept was used outside of Wonsan, and may have been used at Hungnam, near the Hyongje-am Islands.

Other observations can be made about how the Soviets planned to lay mines. The approaches to a harbor were usually geographically cut off. Particular attention was paid to primary approach lanes. Islands or other natural barriers were used as references and hinges in a mineline defense. Minelines also were placed in close proximity to each other, particularly in tight areas, or where turning was required for navigating a channel. At Wonsan, the minesweepers, which had cut one mineline successfully, lost 2 ships in a second mineline while making the turn around Yo Island. This tactic may have been attempted at Chinnampo near Sok Island, where 3 minelines were laid in close proximity.



Part III: Extrapolating from the North Korean Minelaying Effort:

“No means, no expenses for the development of mine affairs can be considered excessive. In my opinion, mines are destined to play an enormous role in future wars.”

- Admiral S. O. Makarov (Defender of Port Arthur and naval innovator)¹²⁵

The first step in extrapolating from the Korean War is to look at what changed since the minelaying campaign occurred in 1950. With the Koreans and Russians only using moored contact mines and magnetic bottom influence mines, their inventory was severely limited by modern standards. Additionally, other military technology has been developed and improved, most notably coastal defense missiles. Air power has also improved, and, as demonstrated by the Germans in World War II, must be factored into a coordinated coastal defense. Taking these concepts and building upon the mine-artillery coordination of the Mine-Artillery Position, one can create a realistic estimation of a future mine defense.

Russian mine development has been significant since the First World War. As a key element of their naval defense, the effort to complicate hostile minesweeping efforts became an imperative. In addition to the magnetic mines used in Korea, the Russians have developed pressure, acoustic, electric potential and seismic sensors. The pressure sensor initially consisted of a compartment with a flexible top that has a plate inside that separates two internal regions. As a ship passes over the sensor, the flexible top is sucked upward by the drop in pressure caused by the Bernoulli Effect. This suction pulls the plate up as well allowing an electrical current to pass, activating the mine.¹²⁶ Acoustic sensors detect specific sound waves for activation (similar to a torpedo) and

seismic sensors detect the vibrations caused by a moving vessel. The electric potential sensor detects the electricity inside of ship as it passes by. Mines have advanced in other ways as well. Mines now have ship-counters that count off a pre-determined number of sensor detections before detonation. This allows a minesweeper to conduct a sweep without triggering the explosive until later. Some mines have ship counts up to 99. The magnetic mines used at Wonsan are believed to have used sweep counts as four passes were made to sweep these mines.¹²⁷ Rising mines have also been developed that sit low on the ocean floor, complicating the minesweeping problem with the possibility of the sweeping gear passing over the mine. These mines rise upon activation, often rocket-propelled, toward the target for detonation. Anti-submarine mines have also been developed that are basically tethered torpedoes which detach and home in on the submarine upon detection. These mines reduce the need for layered minelines to combat the submarine problem. This multitude of minetypes complicates the minesweeping problem by featuring different sensor-types in different minelines in a single mine barrier, thus requiring a minesweeper to activate all of these sensors, requiring either expensive or complex minesweeping gear, or multiple passes over minefield to sweep an active minefield.

The greatest development in protective mine warfare doctrine, however, has been the dissolution of the Mine-Artillery Position. This concept, as stated in the Soviet Military Encyclopedia, has been negated by the development of cruise missiles and their supplanting of coastal artillery as the primary defensive means.¹²⁸ Two considerations must be mentioned, however, before we discard this concept entirely: artillery is still a key aspect of interior Russian coastal defense; and the concept of the integrated defense

will remain. Even if artillery has been supplanted by missiles, mines will likely be utilized in the same manner with missiles as they were with artillery, i.e. minefields will be pushed out further to account for the range of the missiles. An example of this new integration occurred at Iraq in 1991 during Operation Desert Storm. The Iraqis, using Russian mines and Chinese missiles, established minelines extending 50mi from the coast of Kuwait (see fig. 27).¹²⁹ The range of the Iraqi missiles, the CSS-C-3 “Seersucker”, is assessed to be 50mi, providing coverage of the minefield from the Kuwaiti coastline.¹³⁰ Additionally, aircraft will be a factor for both opponents. The hostile force will use helicopters to sweep for mines; for the Russians, aircraft will be integrated into the defense, and thus anti-aircraft missile ranges must also be accounted for. To maximize the minesweeping difficulties, missiles and aircraft will be used to prevent/inhibit their minesweeping, thus the need for anti-aircraft cover. The German advance at Moon Island in 1917 will be somewhat similar to how a modern enemy will have to advance – just the parameters will be different. Minesweepers, both surface ship and helicopter, will still form the advance guard of a hostile assault to clear the mines away. The effective use of mines, missiles, surface ships and aircraft are all needed to repel this advance.

The Russians possess a very capable missile development program. For the purposes of this paper, I utilized a 300nm range for coastal defense missiles, and a 150mi range for anti-aircraft missiles. Most of the known coastal defense missiles possess very short ranges (under 100mi), however, these missiles are also very old (50s/60s technology). The Russian Oscar submarine carries the SS-N-19, which has a range of 300mi.¹³¹ I assumed this range to account for new, unaccounted for developments in

coastal defense anti-ship missile capability. As for anti-aircraft missiles, the Russians are known to possess the S-400 missile, which has an advertised range of 150mi.¹³² The Russians are developing an S-500 system, which will have a 300mi range, but is not known to be in use yet.¹³³

I have chosen to analyze two prominent Russian ports. While constrained by geography, Saint Petersburg will always be the primary naval defensive concern for the Russians. Analyzing Saint Petersburg will also be useful in the light of the extensive history to see how minelaying has changed from the past, as it was the scene of so much mining previously. The approaches to Saint Petersburg are similar somewhat to the approaches to Tianjin, the naval port that services Beijing, a more likely opponent. Archangel is another prominent Russian port and could conceivably see action in a Russian conflict scenario. Archangel is also more dynamic geographically and offers a different aspect to understanding the relationship between geography and strategy. The White Sea approaches are similar to the Strait of Hormuz, a geography relevant to another more likely opponent. In both scenarios, I assume that plenty of time is available for planning, plenty of mines are available for laying, and that the laying areas are uncontested, allowing for extensive and exhaustive planning and implementation, conditions not necessarily to occur, as may have happened in North Korea in 1950.

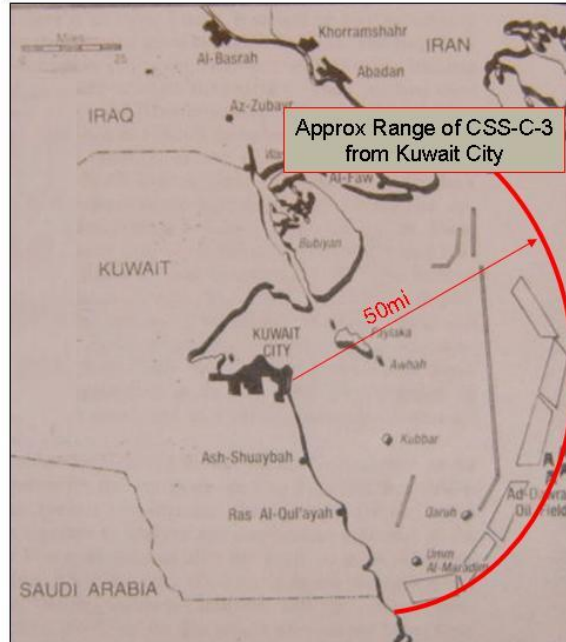


Fig 27: Iraqi minefields laid during Desert Storm, 1991. Note forward projection of minefields under coverage of potential missile positions in Kuwait.

Trainor, LTGEN Bernard, "Still Going...Amphibious Warfare", USNI Proceedings, Vol.118, Nov. 1992, pg. 32 (my range ring)

SAINT PETERSBURG

As seen in the second part of this essay, the Russians have extensively planned for the defense of this city throughout her naval history. The current Russian situation is similar to that which the Soviet Union faced prior to the Second World War: most of the shoreline of the Gulf of Finland is no longer under their direct control. The very narrow shape of the Gulf, furthermore, limits the Russians' options in planning for a mine defense. These options could be expanded if the Russians seize key vantage points as they did during the Second World War. If the Russians were to conduct these seizures, they would likely return to Hango, Osel and Moon Islands and the Aland Islands; also not to be forgotten is the Russian foothold in the Baltic at Kaliningrad. If the Russians opt for the aggressive option of seizing these positions, they could mine most of the Baltic Sea east of Denmark. As the approaches to Saint Petersburg have always been a naval priority for the Russians, and have always seen extensive mining, the Russians would most likely use the Wonsan arrangement for this effort. The first minelines could be encountered around Bornholm Island, as these minefields would be supported by a coastal defense missile system at Kaliningrad (see Fig. 28). Due to the distance from Russian naval defenses, these mines would likely be laid by submarines and, perhaps, defended by them as well, to complicate the approach. Moving into the Baltic, mining would be encountered around 150mi from Kaliningrad, to support the defense of that enclave. An advantage of placing mines this far out is that it demonstrates intent to mine throughout the Baltic, putting pressure on an opposing force to keep any aircraft carriers more than 500mi away from Saint Petersburg, reducing the sortie rate of carrier-based aircraft.¹³⁴ The outermost mineline would run from the Polish coast to the outer limit of

the coastal defense missile at Osel Island in order to force oncoming forces north inside this supporting threat ring, similar to how ships were channeled into the northern artillery positions at Wonsan. The bulk of Kaliningrad's mine defenses would be encountered within 15 miles of the city, supported by coastal artillery.

As the hostile fleet moves north, they would encounter the mine defenses running from the northern edge of Gotland Island to the Latvian coast. These defenses would be supported by the coastal missiles and anti-air missiles on Osel Island, and would constitute the outermost defense of that island. I did not include any mines west of Gotland Island, as this would antagonize the neutral Swedes, and put pressure on the hostile force to violate their waters. Sweden possesses a significant naval mining capability, and has been known to mine their own waters to prevent conflict from expanding into them, as they did during the First World War.¹³⁵ Further minelines would be found around Osel, mostly to the south. These minelines, like the minelines found at Cho Island at Chinnampo, would serve the dual purpose of blocking entrance into the Irben Strait and preventing Osel Island from masking coastal radar from supporting defenses on Dago Island. Additionally, minelines would also be used to push hostile forces to the north around Osel Island and into supporting threat rings from the Aland Islands, Dago Island and Hango. Forces moving north would encounter the defenses to the Aland Islands that, similar to Osel Island, would be used to defend the islands and to force hostile forces into supporting threat rings.

The first interior mining barrier would occur between the Aland Islands and Osel Island (see Fig.28). This mining barrier would further demonstrate Osel Island's position as the hub of the Baltic defenses. This barrier is also the western extension of

the traditional Russian defenses between Dago Island and Hango, enabled by long-range anti-air and coastal defense missiles. This barrier would likely feature multiple minelines for defending against submarines, large ships and minesweepers, similar to what the Soviets envisioned in their pre-WW2 defenses. Supporting minelines would be laid between Osel and Dago Island in order to block the Soelesund Strait, and to prevent Moon Island from being a rallying point for the enemy hiding from the supporting threat rings at Hango and the Aland Islands. An additional mineline would be placed in the traditional area in the Moon Sound between Moon Island and Estonia. A second barrier would be encountered at the traditional area between Hango and Dago Island. This barrier would be similarly arrayed as the Aland-Osel barrier. Osel and Dago Islands would essentially be treated as Yo Island at Wonsan, and Cho and Sok Islands at Chinnampo, with numerous minelines radiating out from them. As with Kaliningrad, all islands would be defended with mine defenses within 15 miles of the coast within range of any nearby artillery to prevent hostile forces from landing. The chokepoint at the narrowest part of the Gulf would also be defended, covered by positions at Hango and Dago Island, as well as Gogland Island. Another barrier, the old 'Central Position', would be laid at the narrowest point of the Gulf, taking advantage of the choke-point there, as well as missile coverage from Gogland (see Fig.29). These outer minelines would be supported by submarines, surface ships and aircraft sorties. The full array of mines would be laid here, as this chokepoint facilitates the laying of numerous mines rapidly. The main interior defense would occur where it traditionally has, in the area around Gogland Island all the way to Kronstadt. This area would be thickly laid with mines, as the fallback and final defensive positions. The numerous islands in this area

would be mined as they were at Wonsan. Minelines would link the islands, and they would remove the islands as anchorages or rally areas, hidden from radar or supporting defenses. Additionally, Vyborg, now a Russian city, would have to be defended as an alternate landing point with overland access to Saint Petersburg.

If the Russians were restricted by time or quantity of mines, they would use the fewer-mines arrangement (see Fig.30). If they controlled the Baltic Islands, concentrations of fire would occur between the Aland Islands and the Dago and Osel Islands, leading into the Gulf of Finland, south of Hango. This area would thus be heavily mined, with minelines running from Osel Island to the Alands, as well as north of Dago Island, to include a mineline running to Hango. The same positions that make this area so defensible also make the chokepoint in the Gulf of Finland defensible as well (see Fig.31). The positions at Hango and Dago Island could support the defense of a barrier there, which would also be covered by defenses from Gogland Island. This arrangement provides a relatively economical way to cover a 3-tiered defense of the approaches to the Russian capital.

In the less aggressive option, the Russians remain confined inside the Gulf of Finland. While coastal defense missile threat rings extend out of the Gulf beyond the Aland Islands, anti-air missile threat rings do not, thus the defensive area is much more confined. The defense for the many-mines arrangement for this option would be the same as the many-mines arrangement for the aggressive option, from the Hango position inward (see fig. 29). The only difference would be the lack of coverage from the Baltic. An arrangement using fewer mines would not look significantly different from the above arrangement (see fig. 31). A forward position would remain south of Hango, as well as

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the Central Position. The meat of the defense, however, would exist inward of Gogland Island, where the maze of islands could provide multiple interior firing angles against an invading opponent. This arrangement, from the Central Position inward would similarly constitute the interior aspect of the more aggressive option as well.

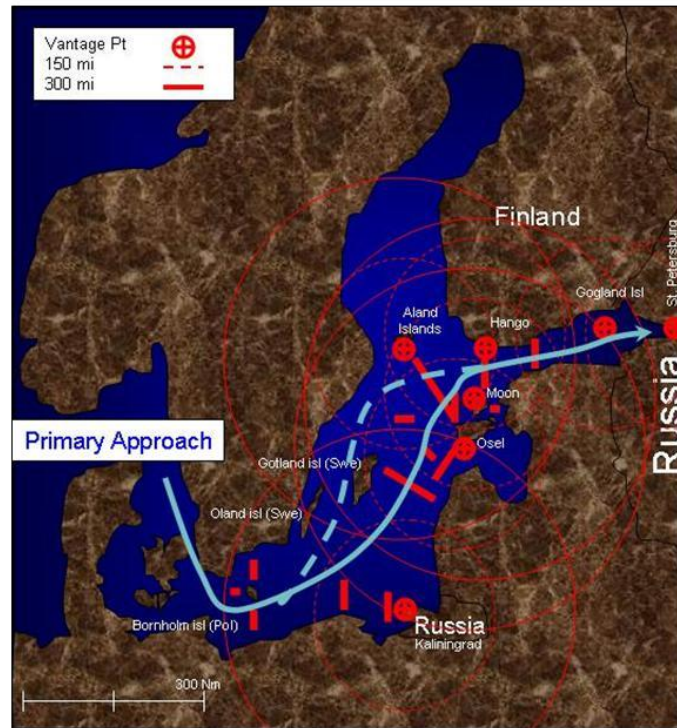


Fig. 28: Baltic Sea: Many Mines. Due to potential missile coverage, mine defenses could extend well southwest into the Baltic. Additional mines used to channel hostile forces into missile, air defenses.

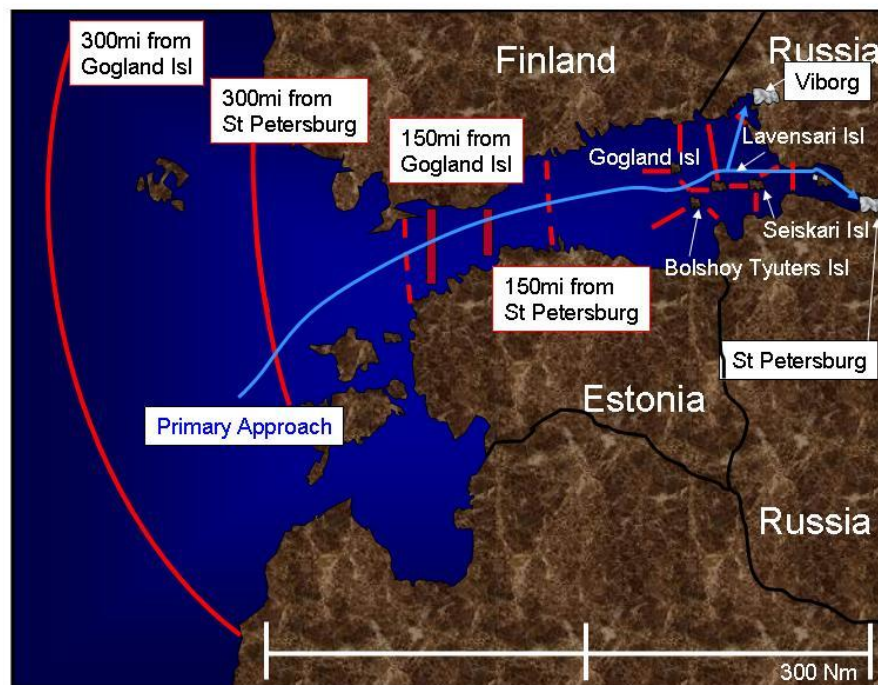


Fig 29: Gulf of Finland: Many Mines. Due to limited land defenses, minefields concentrated in air-covered area near Hango, and interior areas between Gogland and Seiskari Islands.

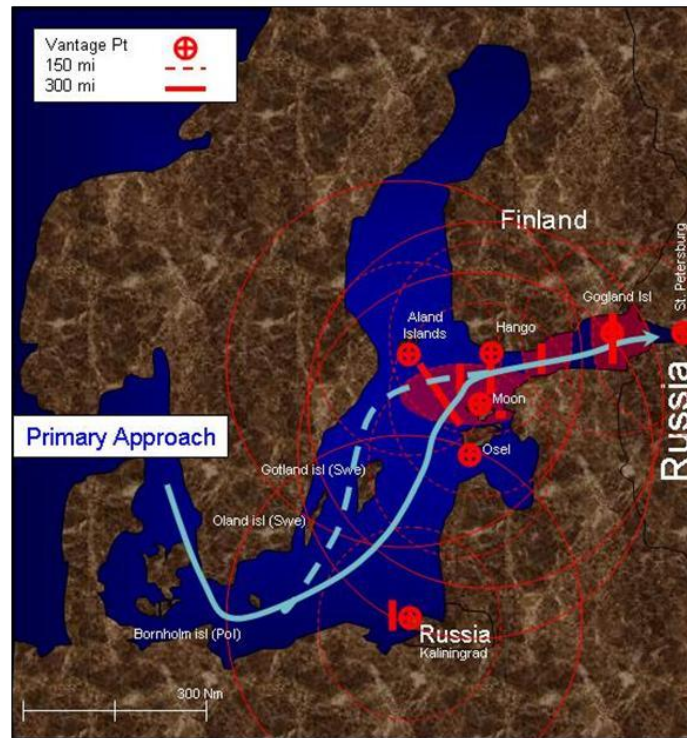


Fig. 30: Baltic Sea: Fewer Mines. Primary focus of Russian defenses would be under redundant coverage areas between Aland Islands and Osel/Dago Islands. Defenses are more restricted and focused on primary approach.

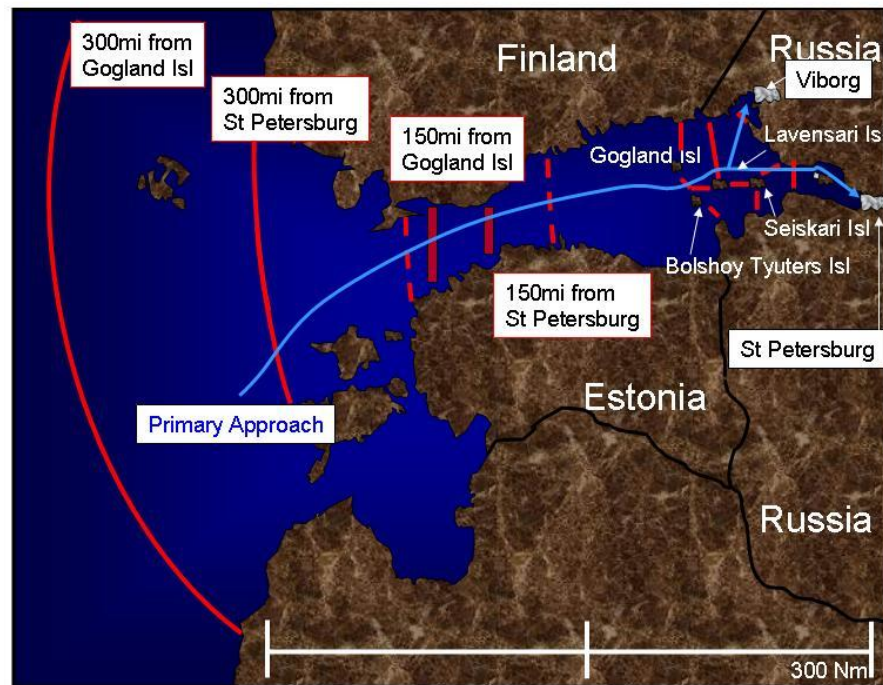


Fig 31: Gulf of Finland: Few Mines. Due to limited land defenses, minefields concentrated in air-covered area near Hango, and interior areas between Gogland and Seiskari Islands.

ARCHANGEL

Archangel has been a significant port for the Russians. It was used by both the British and the Americans during their intervention in the Russian Civil War. Archangel was also a primary resupply port for the Soviets from the West during the Second World War. The White Sea, which is where Archangel is located, was the scene of fighting (or mining) during the Crimean War, and the two World Wars. The approach to Archangel comes from the north, from the Barents Sea. A hostile fleet would have to approach from along the coast of Norway. Due to its northern location, ice is a factor in winter and early spring, with ice forming a barrier from Bear Island to the Novaya Zemlya Island in March, as well as the entire White Sea being iced over as well. In August, the ice retreats to its northernmost point, receding to the north of the Svalbard Islands to the northern tip of Novaya Zemlya Island.

If the Russians were to use a many-mines arrangement to defend Archangel, the defenses could begin as far out as Bear Island and the Svalbard island group, which are attractive option for extending the defense of Archangel, particularly in winter, when ice narrows the approach significantly into the Barents Sea (see Fig. 32). This extension would also endanger aircraft carriers up to 500mi away from Archangel. These islands are remote, however, and resupply could be difficult, particularly in the face of a superior naval enemy. This action would also antagonize Norway, who owns all of these islands. In a more standard defense of Archangel, mine defenses would begin northwest of Murmansk, outside of Norwegian territorial waters. Mine defenses that began here would threaten aircraft carriers almost 400mi from Archangel. These minelines would block the line of advance under missile coverage from Murmansk. They would also

force an advance into the supporting missile arc from Novaya Zemlya. As the hostile fleet passes these defenses, an extensive mineline would be laid to block the hostile advance, as well as to maximize the redundant coverage of the positions of Novaya Zemlya, Kalin Nos, Kalguyev Island, Ivanovka and Morzhovets Island, and defend the individual locations at the above sites from piecemeal attack. The next line is between the Kalin Peninsula and Ivanovka. This mineline takes advantage of the chokepoint at the entrance to the White Sea, which is supported by the position at Morzhovets Island. As the opposing force passes Morzhovets Island, it enters an extremely narrow chute, the entire length of which could be lined with missiles, artillery and mines to make for a particularly harrowing approach. Additionally, this area is covered by vantage points at Zhizhgen, Morzhovets Island and Kalin Nos. As the fleet passes the Kola Peninsula, its risk increases from vantage points at Kem, Zhizhgen, Ruchi and Archangel able to cover their approach. As the hostile fleet makes its final approach, it turns into Dvina Bay, upon which lies Archangel. As the fleet approaches Archangel, it would encounter mine defenses for the city itself, all of which would be covered from the rear by the Ruchi vantage point. A secondary approach could occur at Belomorsk, where a canal links the White Sea to the Baltic, a useful line of communication for an overland advance on Saint Petersburg. The approach into Onega Bay, upon which lies Belomorsk, is similarly covered by the multiple minelines and vantage points that Dvina Bay and Archangel are covered.

This natural confinement could be easily defended with much fewer mines, and could be well defended by the fewer-mines arrangement (see Fig.33). A small initial mineline could be laid in international waters supported by the position at Murmansk.

This mineline would block the initial advance and slow the approach for hostile fleet.

The main defense, however, would begin at Kanin Nos, taking advantage of the same chokepoints as the many-mines arrangement and the same minelines, duplicating the same harrowing approach into Archangel. The hostile fleet would be in grave jeopardy all the way into Dvina Bay. Similarly, the same vantage point at Ruchi would threaten the rear of the hostile force all the way to Archangel. The secondary approach to Belomorsk is similarly covered.

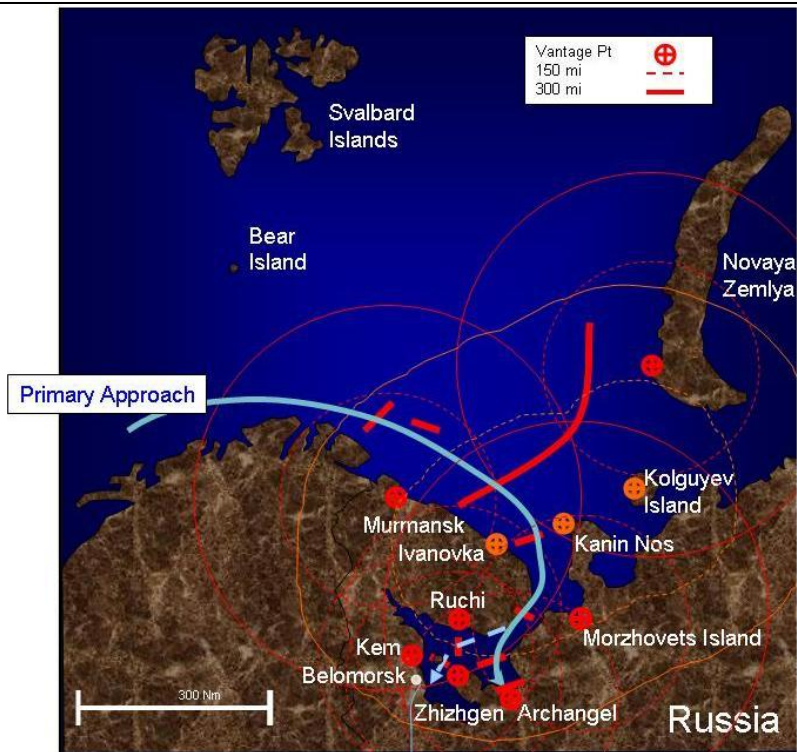


Fig 32: Archangel: Many Mines. Numerous mines extend defenses well west of Murmansk, with numerous well-defended positions guarding the approach into Archangel. Interior minelines laid at areas of redundant air and missile coverage.

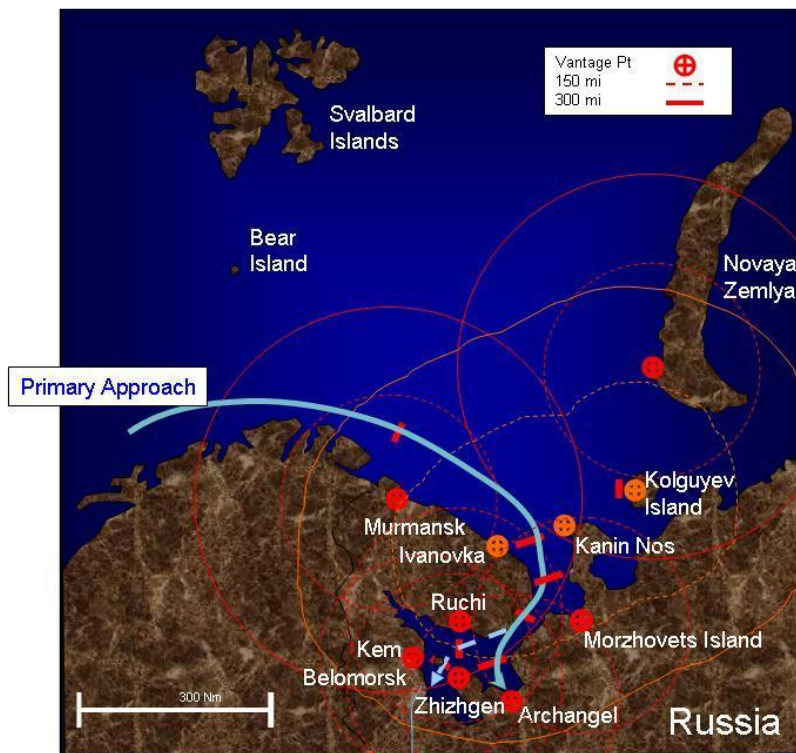


Fig 33: Archangel: Few Mines. Fewer mines focus on well-defended positions guarding the approach into Archangel. Interior minelines laid at areas of redundant air and missile coverage.

CONCLUSION

The narrow confines of the Gulf of Finland and the White Sea highlight the complications mines create for an invading force. When one adds the capacity to lay massive numbers of mines, mines with multiple sensors and different deployment depths, the problem worsens. When mines are fully integrated into a sophisticated multi-axial, complimentary coastal defense system commanded by an aggressive leader and competent defensive force, the problem is insurmountable. This problem highlights the capability of our adversaries to counter our carrier-based navy, and eliminate the threat posed by our amphibious forces by laying a sophisticated mine-based defense, a defense that represents a low-cost deterrent for our expensive, modern navy.

This capability has developed since the Russians began laying mines during the Crimean War. As mine defenses developed from the simple geographical isolation of the Crimean War, to coordinated complexity during the Russo-Japanese War and the two World Wars, to a shaping, flexible defense in the Korean War, to a coordinated naval/missile/mine defense of the modern era, their lethality increased exponentially. Unfortunately, this lethality has been augmented by the recent lack of employment since the Korean War. Isolated incidents of mining have occurred since then, however, these efforts have not been significant enough to garner naval or historical attention. This inattentiveness has caused the study of mine warfare to atrophy, to the detriment of our navy, and to a full understanding of naval history and strategy. Hopefully, the thought of the complexity and volume of mines laid in the Baltic during the First World War, arranged to the shaping complexity of Wonsan, supported by modern strike aircraft and long-range anti-ship missiles will elevate the study of minelaying.

¹ P. 76, Melia, Tamara: "Damn the Torpedoes: A Short History of the U.s. Naval Mine Countermeasures". (Washington: Naval Historical Center, 1991)

² Field, Chapter.7, pt.2; <http://www.history.navy.mil/books/field/ch7b.htm#top>

³ P. 1089, IER#1, "Participation of Russians", "Participation of Koreans".

⁴ P.1407, IER#2, para 2.a. "North Korean Mining Campaign"

⁵ P.7.49, IER#5, App.4 "North Korean Mine Laying Operations"

⁶ Ibid. p.1131, App 4, pg 2 "Summary of Minesweeping Operations in Korean Waters 25 June- 30 Nov 1950"

⁷ Ibid. p. 1132, App4, Encl 3

⁸ P. 7-49, IER #5, Appendix 4, "North Korean Mine Laying Operations" Courtesy of Naval Historical Archives

⁹ P. 10,12 Minesweeping Force West Pacific War Diaries, November 1950, November 27-28. Courtesy Navy Historical Archives

¹⁰ P. 159 "The Sea War in Korea" Malcolm Eagle, Frank Manson; US Naval Institute; Annapolis, MD 1957

¹¹ "Mining Operations Off Hamhung-Man" Commander Mine Squadron (COMINERON) Three, 3 Nov 1950, Encl 1 "Report of LT Olenciacz to Capt Spofford" Subj: 'Mining Operations Off Hamhung-Man'; report dated 26 Oct 1950; Courtesy of Naval Historical Archives

¹² P.2 "Hungnam Occupation and Evacuation Sweeps" Commander Mine Squadron Three, 10 Mar 1951; Courtesy of Naval Historical Archives

¹³ P. 1137 IER #1 App4, Encl 3; Courtesy of Naval Historical Archives

¹⁴ Intelligence Periodic Reports (IPR), COMNAVFE, 25 Sep 1957; Courtesy of Naval Historical Archives

¹⁵ P.1137, IER #1, App4, Encl 3; Naval Historical Archives

¹⁶ P.79, Melia

¹⁷ P. 1088, IER #1

¹⁸ Ibid, p.1136, App 4, Encl 3

¹⁹ Ibid

²⁰ P.2 "Minesweeping Report for Wonsan Assault Sweep" COMINERON Three, Serial 0121; 10 Mar 1951; Naval Historical Archives

²¹ P.2 "Commander Mine Division (COMINEDIV) 32 War Diary" October, 10 October 1950; Naval Historical Archives

²² P.4-5, COMINERON Three War Diary, October 1950; October 10, 11. Navy Historical Archives.

²³ P. 1420, IER #2; Naval Historical Archives

²⁴ P.14-23, IER#3

²⁵ Ibid., p. 14-19-14-22

²⁶ P. 8-39, IER#4

²⁷ Based on a review of COMNAVFE reports "Mines Reported in Korean Waters" for the months of Jan-Jun 1952. All Myams were found near Wonsan. Reports are located at the Naval Historical Archives.

²⁸ Statistics added up from "Mines Reported in Korean Waters"; July- December 1952;Naval Historical Archives; Typhoon Karen comment at the end of the August 1952 summary. The fifth IER period runs through January 1953, but the records for this month are lost. The 6th IER features a mine count summary graph for each month. Approximately 7 mines are noted for that month. Only 1-2 of these mines were moored, based on probability of the previous and following months, if that many (IER #6, p.8-57; Naval Historical Archives).

²⁹ P.8-45, IER#6

³⁰ "Minesweeping Report for Wonsan Assault Sweep". Entire article discusses these 5 minelines

³¹ Ibid, pg. 4 mentions that 40 mines were found in this line. This is a miscount or misprint. Recounting the commander's numbers show 42 mines were swept.

³² Ibid, pg.3

³³ Ibid, pg.6. Another miscount. The number on this page is 29, however, the previous page shows 36 mines, plus the mine swept on page 6 brings us to 37 mines.

³⁴ Ibid, pg 3 for the sunken ship in this line. See also IPR, Mar 51, that notes a271234 Feb report of an explosion of 2 mines that became intertwined during heavy swells. IER #2, pg. 1408 mentions another explosion in the same area. A later IPR (18 Sep) mentions a magnetic mine that was swept. This mine may have been planted after the original fields were laid.

³⁵ IPR, 31 Jul 51, p.2; 30 Jul 51, p.2. For an accurate position change CU to CJ in the MGRS system. The CU coordinate is not near Wonsan. If my coordinate manipulation is not valid, footnote 30 citation mentions that this line lies between the Sin and Mo Islands.

³⁶ Ibid; 'Mine Warfare Report No.6', COMINERON Three, Serial 0133, 31 Aug 1951

³⁷ "Mines reported in Korean Waters", 15Nov-31 December 1951 mention 4 MKBs swept; Feb 1952, 271257Z reports and 28150Z report add 4 MKBs.

³⁸ "Mines Reported in Korean Waters"; March 1952, 210015Z entry; Naval Historical Archives

³⁹ Ibid, April 1952, 91315Z report

⁴⁰ Ibid, March and August 1952; 210015Z, 221337Z March; 021400Z, 031340Z August.

⁴¹ See Fig 11. p. 1136 IER #1. See pg.11 of this paper on the mine SE of Yo Island.

⁴² P.2-39, June 1951, COMNAVFE Monthly Summary, ref COMINERON 3 War Diary. The May 1951 Monthly Summary also mentions (on p.23 of that summary) that the search for new minelines was "uneventful". The July 1951 summary mentions that minesweepers concentrated on "old mine lines" (P. 2-31 of that summary). Courtesy of Naval Historical Archives

⁴³ IPR 14,16 May; COMINEDIV 31 War Diary, March 1951, 19-23 March; Serial 012-51, 03 April 1951; Naval Historical Archives

⁴⁴ P.10, COMINERON 3 War Diary, May 1951, May 22; Naval Historical Archives

⁴⁵ COMINEDIV 32 War Diary, June 1951, 14-17 June; Naval Historical Archives

⁴⁶ Ibid. 14,17,18 June

⁴⁷ See above, footnote 15

⁴⁸ "Minesweeping Report for Wonsan Assault Sweep"; pg. 5

⁴⁹ IPR, P.2 22 Jun 1951, helicopter sights 5 mines; on 25,26 June reports, 5 M-26s were swept; 14,11 July 1951; a 10-mine line was reported on the 11th; a minesweeping report of 9 mines being swept was issued on the 14th. No proof that these reports are linked as the report on the 14th does not mention the location of the mines swept, but the helicopter reporting the minelines may have been scouting for the sweepers; P.2 29 June 1951 2 M-26s found.

⁵⁰ IPR 11,14 July 1951;

⁵¹ "Minesweeping Report for Wonsan Assault Sweep"; pg.3

⁵² P.9, COMINERON 3 War Diary, July 1951, 17 July

⁵³ Ibid, P.3, May 1951, 2-3 May; P.7, May 1951, 14 May; P.10, May 1951, 22 May.

⁵⁴ P. 10, COMINERON 3 War Diary, July 1951, 18 July

⁵⁵ Ibid., P. 10, 19 July

⁵⁶ Dotsenko, pg.18

⁵⁷ Von Tschischwitz, pg.21

⁵⁸ Morozov, Fish; pg. 22

⁵⁹ Napier, pg. 132, 162, 225, 248. These citations discuss the Russian preparations vaguely. VADM Napier's fleet seemed able to approach the two cities without problem. The citations also imply that the Kronstadt defenses may have stretched across Neva Bay, in which Kronstadt lies. ADM Dundas, Napier's successor is stated to have gotten past a "barrage" to threaten the northern part of the island.

⁶⁰ Halpern, pg.65

⁶¹ Ibid, pg.87

⁶² Ibid, pg. 102

- ⁶³ Ibid, pg. 105
⁶⁴ Ibid, pg.150
⁶⁵ Ibid, pg.168
⁶⁶ A total of 11 Japanese ships were sunk by mines. Aselius, pg. 32
⁶⁷ Halpern, pg. 180
⁶⁸ Ibid.
⁶⁹ Ibid, pg.181
⁷⁰ Ibid.
⁷¹ Ibid.
⁷² Ibid.
⁷³ Ibid.
⁷⁴ Panferov, pg.8
⁷⁵ Halpern, pg.183
⁷⁶ Barrett, pg.111
⁷⁷ Ibid.
⁷⁸ Panferov, pg.8
⁷⁹ Halpern, pg. 185
⁸⁰ Panferov, pg.8
⁸¹ Halpern, pg.191
⁸² Ibid, pg.199
⁸³ Ibid, pg. 215
⁸⁴ Ibid. pg. 216
⁸⁵ Ibid. pg. 217
⁸⁶ Ibid, pg. 219
⁸⁷ Ibid
⁸⁸ Kuvaldin, pg. 21
⁸⁹ Dotsenko, pg.40
⁹⁰ Ibid, pg. 42
⁹¹ Badeyev, pg.49
⁹² Ibid., pg.51
⁹³ Aselius, pg.4
⁹⁴ Barrett, pg.205
⁹⁵ Aselius, pg.75
⁹⁶ Ibid, pg. 76
⁹⁷ Ibid. pg.79
⁹⁸ Ibid., pg.87
⁹⁹ Ibid, pg. 129
¹⁰⁰ Ibid, pg.130
¹⁰¹ Ibid.
¹⁰² Ibid.
¹⁰³ Ibid.
¹⁰⁴ Ibid., pg. 178
¹⁰⁵ Ibid, pg. 225
¹⁰⁶ Ibid, pg.226
¹⁰⁷ Achkasov, pg.20
¹⁰⁸ No information on what a half-row of mines is.
¹⁰⁹ Ibid, pg.21
¹¹⁰ Ibid, pg.22
¹¹¹ Ibid.
¹¹² Ibid.
¹¹³ Ibid.

¹¹⁴ Ibid, pg.23

¹¹⁵ Ibid., pg.23

¹¹⁶ Ibid, pg. 23

¹¹⁷ Ibid.

¹¹⁸ Ibid.

¹¹⁹ Ibid.

¹²⁰ Ibid. pg.24

¹²¹ Aselius, pg. 229;

¹²² Ibid, pg. 230

¹²³ Dotsenko, pg.18

¹²⁴ Dotsenko, pg.18; author mentions that all minelines were within coastal artillery range.

¹²⁵ Polenin, pg.67

¹²⁶ Crowie, pg.162

¹²⁷ Pg.108, Meacham

¹²⁸ Pg.298, Kodola, SME

¹²⁹ Trainor, p. 32

¹³⁰ Militaryperiscope.com; "CSS-C-3 SeerSucker"

¹³¹ Militaryperiscope.com; "SS-N-19 Shipwreck anti-ship missile"

¹³² Janes Online; "S-400 Triumph"

¹³³ Janes Online; "S-500"

¹³⁴ The Russians believe that the Americans like to operate their carriers 150mi from shore. Pg.85, TBD

¹³⁵ The Swedes mined the entrance into the Baltic from the North Sea. Pg.211, Halpern