

A VISUAL GUIDE TO THE U.S. FLEET SUBMARINES
PART ONE: GATO CLASS
(WITH A TAMBOR/GAR CLASS POSTSCRIPT)
1941-1945

BY

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A cursory review of photographs of the U.S. fleet submarines of World War II often leaves the reader with the impression that the boats were nearly identical in appearance. Indeed, the fleet boats from the *Porpoise* class all the way to the late war *Tench* class were all similar enough in appearance that it is easy to see how this impression is justified. However, a more detailed examination of the boats will reveal a bewildering array of differences, some of them quite distinct, that allow the separation of the boats into their respective classes. Ironically, the rapidly changing configuration of the boats' appearances often makes it difficult to get down to a specific boat identification. However being familiar with all of the wartime changes will allow you to narrow down the date of the photo and when combined with other data will sometimes get you the specific name.

The *Gato* class started construction on 11 September 1940 with the *Drum* at Portsmouth and ended on 01 March 1944 with the commissioning of the *Hammerhead* at Manitowoc. With a construction period spanning a time of tremendous change within the force, these boats were subjected to several distinct modifications to their outward appearance, with these configurations being distinct enough to allow their visual separation from the earlier *Porpoise/Perch*, *Salmon/Sargo*, and *Tambor/Gar* boats, and the later *Balao* and *Tench* classes. A number of the *Gatos* underwent no fewer than four of these extreme makeovers during the war years, with most getting at least three.

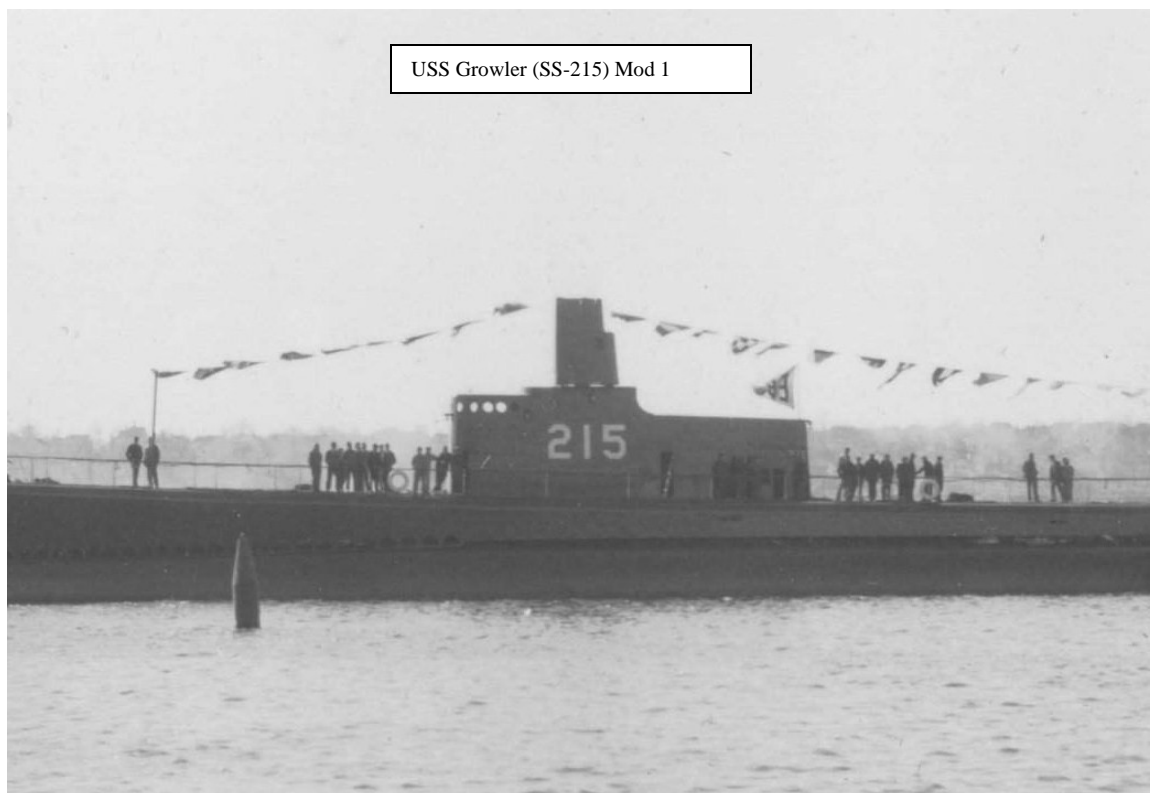
The configurations of the fairwaters changed so much for several good reasons. First, the large, bulky original configuration, optimized for peacetime cruising, was great for reducing drag while submerged, but soon after the war started it was realized that this massive structure made the boats a huge visual target on the surface. Portions of the fairwater were quickly cut away in an effort to reduce the silhouette. Secondly, the rapid advances in radar, radio direction finding, and communications technologies necessitated changes in the fairwater and shears in order to accommodate the masts and antennas for the new equipment. Third, the realization that the boats were going to spend a lot more time on the surface than was originally thought led to the desire to have a more powerful gun armament. The platforms created by reducing the silhouette of the fairwater made excellent mounting points for .50 caliber machine guns and the more powerful 20 and 40 mm automatic cannons.

These modifications, even though many were simple enough to be accomplished between patrols by a tender, had all been reviewed and approved by the ongoing Submarine Officers Conference and authorized by the Navy's General Board for design. Curiously, they did not take the form of official Ship Control Board (SCB) modifications. The changes simply were made to the construction plans and were incorporated into the boats on the building ways. The changes were also rapidly disseminated to the fleet and were made to commissioned boats during refit or overhaul. Goaded by anxious boat crews, some of these changes were probably done by tender and refit crews ahead of the official authorization and were completed on the fly.

For the purposes of uniformity a couple of nomenclature conventions will be adhered to in this article. The term “fairwater” refers to the support structure and plating attached to the main deck that encloses a free flooding area around the horizontal cylinder of the “conning tower”, a separate pressure vessel directly above and exterior to the control room of the submarine. Other authors have used the term conning tower to refer to the combined conning tower and fairwater structure and while this may be a simple convention for the layman, it is technically incorrect and the two terms will be separated here. “Shears” or “periscope shears” will be used to describe the structures above the conning tower and the fairwater that provide a hydrodynamic fairing and structural support to the periscopes and masts. The names of the Modifications (Mods) that I describe below are entirely of my own creation and do not reflect any official U.S. Navy nomenclature. I created the terms to make sense of what I discovered while doing research for this article.

MOD 1

In the summer of 1940, the U.S. Navy, noting with alarm the deteriorating situation in both Europe and the Pacific, was eager to greatly ramp up the rate of shipbuilding. The Submarine Force was quite satisfied with the latest fleet boat design, the *Gato* class, and “froze” the design to facilitate mass production. The Bureau of Ships had developed the Government design from the preceding *Tambor/Gar* class and incorporated all the lessons learned. The Navy Yards at Portsmouth, New Hampshire (actually Kittery, Maine) and Mare Island, California began promptly laying keels for the *Gatos*. The Electric Boat Company (EB) of Groton, CT. was the only civilian shipyard at the time with a submarine design and construction capability and their excellent work in the past and their large yard along the Thames River led the Navy to award EB a huge construction contract for *Gato* boats. In order to accommodate EB’s unique construction methods and techniques, and desirous of incorporating EB’s vast knowledge base into the *Gato* design, the Navy allowed EB to make numerous, but relatively minor changes to the construction blueprints. One of these changes involved the look of the fairwater.



USS Growler (SS-215) Mod 1

The photo above of *Growler*, taken on her launch day of 22 November 1941, shows the Mod 1 EB design. At the forward upper end are a series of circular windows that let into a sheltered area for the bridge crew during surface transits, a much-appreciated feature during rough weather. It also housed an auxiliary steering station for the helmsman. Directly abaft, and raised slightly higher (just above the number 2) is the open-air bridge which was protected from strong ocean breezes along its forward edge by a wind venturi. The vertical stepped rectangle above the 15 is the shears that house the periscopes. The rest of the fairwater curves gracefully downward for a short distance directly aft of the shears, then heads aft in a level fashion for quite a distance then straight down to the main deck. The fairwater aft of the shears actually covered two decks. The lower one housed the large main air induction valve, which allowed the prodigious amounts of air that was used by the diesels to be sucked into the engine rooms. Just aft of the number 5 is a rectangular cutout that allowed access to this lower fairwater deck. On the aft end of the conning tower was a watertight door that opened into this void area between the conning tower and the main induction valve. In a battle surface action, the deck gun crew would exit the interior of the boat through this watertight door; walk through this cutout in the fairwater and onto the main deck. They would then head aft to the normal position of the 3-inch/50 cal deck gun (not yet mounted when this photo was taken). The upper deck started just above this cutout, with the fairwater providing roughly a chest high safety rail. This area was known as the cigarette deck, as it was the area that crewmen could go to catch a smoke while the boat was surfaced. Mounted here but often obscured by the fairwater rail was a .50 caliber water-cooled machine gun, the only anti-aircraft gun in the original design.



This photo shows *Silversides* on 2 February 1942 and is indicative of the Mod 1 Government design. The main visual difference is in how the lookout platform around the shears is extended aft, providing an extra perch. The cigarette deck fairwater rail angles downward from the shears

at about a 45-degree angle, as opposed to curving down on the EB design. Notice also that the fairwater aft of the shears is shorter and slightly taller than the EB model and that the trailing edge is at a slight angle as opposed to the vertical edge of the EB design. One of the first changes made to the boats during the war was the addition of the SD series air search radar. The antennae mast was added to the shears and extended upward from the step perch just aft of the periscopes.

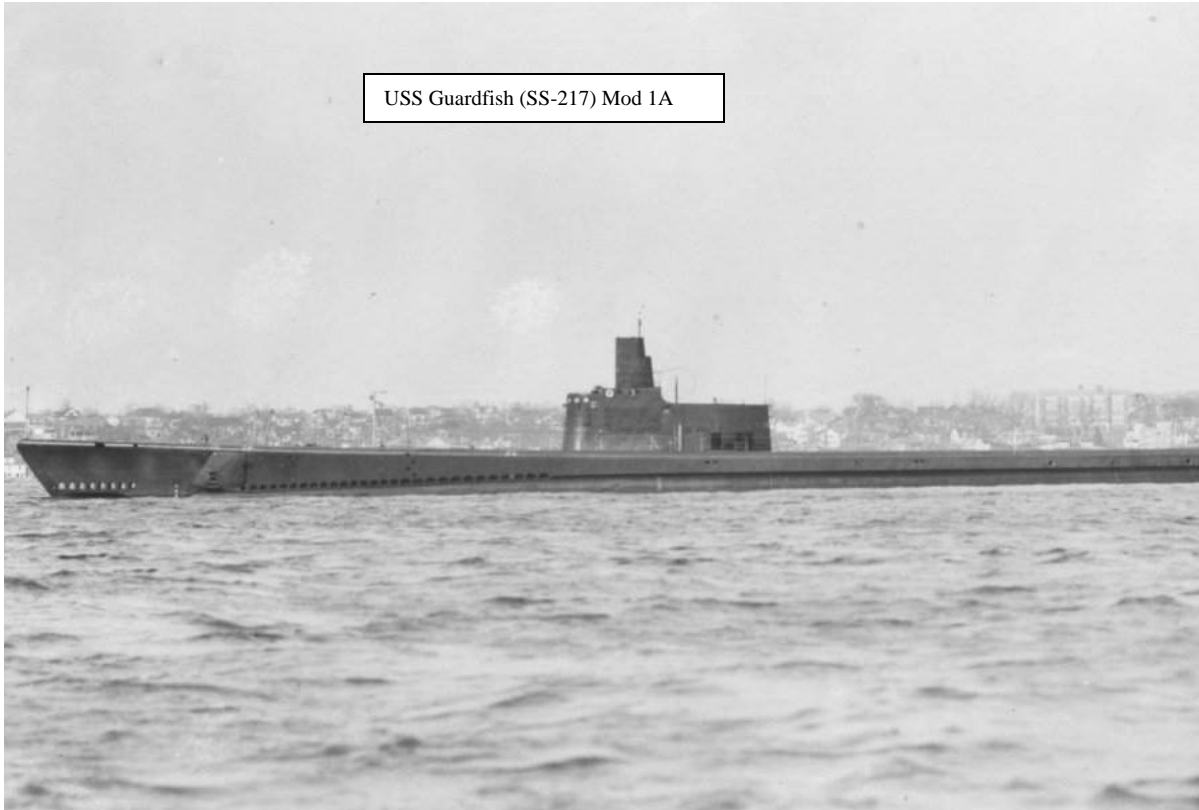


This photo of the famous *Wahoo* on 1 August 1942 shows the radar arrangement. The T-shaped antenna for the SD is shown on its mast aft of the periscopes. In the late spring of '42 the SJ series surface search radar began to be installed on the boats and its normal position was on a mast forward of the shears, extending down through the bridge and into the conning tower. Angle brackets fixed the mast to the forward edge of the shears. An SJ set on a Mod 1 boat was actually pretty rare, as most of the boats received the Mod 2 prior to getting their first SJ.

MOD 1A

Starting with *Guardfish*, EB shortened the forward to aft length of the covered navigation bridge on their boats. This change was incorporated into production several months prior to the war starting so it may have been economically driven, rather than by operational feedback from the fleet. Compare the photo below of *Guardfish* with that of *Growler* above and the difference becomes readily apparent. Shortening the navigation bridge also eliminated several of the round portholes that were used by the helmsman. Manitowoc incorporated this change in their very first boat, with construction of *Peto* starting ten weeks after that of *Guardfish*.

USS Guardfish (SS-217) Mod 1A



Portsmouth and Mare Island did not shorten the navigation bridge on the first production run of their boats (*Drum* to *Shad* and *Silversides* to *Whale*). However, starting with the 2nd production run (*Runner* to *Steelhead* and *Sunfish* to *Tunny*) the government yards incorporated a similar Mod 1A to their fairwaters, although it does not appear that they shortened them as much as EB.

MOD 2

The high silhouette of the Mod 1 and 1A fairwaters was increasingly seen as a liability in early 1942 and the desire to reduce the boat's visual profile was foremost in the mind of the submarine crews. Authorized by the General Board on 9 March 1942, the fairwater around the cigarette deck was removed. Stanchions and wire safety cables replaced it. This also gave the .50 cal machine gun mounted here a better arc of fire against low-lying targets. This was a relatively easy modification and could be done by a tender in theater. However, it was also incorporated into boats still under construction. Manitowoc starting launching boats with Mod 2's starting with *Pompon* and Mare Island completed their last two boats (*Tinosa* and *Tullibee*) with this modification. Portsmouth launched all of their boats with Mod 1 or 1A's and EB transitioned directly to the Mod 3 starting with *Bluefish* (Manitowoc transitioned to Mod 3's starting with *Raton*).

Photo # 19-N-33839 USS Wahoo at the Mare Island Navy Yard, 10 August 1942

OFFICIAL PHOTOGRAPH

NAVY YARD MARE ISLAND, CALIF

USS Wahoo (SS-238) Mod 2



These two photos show *Wahoo* at Mare Island on 10 August 1942. These are excellent shots of the early Mod 2 configuration. The periscope shears retained the plating and the SJ mast mounts are clearly visible. The cut down started right where the down angled part of the bridge fairwater ended. On the EB boats this part would have been curved.

Photo # 19-N-33840 USS Wahoo at the Mare Island Navy Yard, 10 August 1942

OFFICIAL PHOTOGRAPH

USS Wahoo (SS-238) Mod 2

TARGET BEARING TRANSMITTER MOVED FORWARD.

AFT BRIDGE DECK FAIRWATER REMOVED AND AFT BRIDGE DECK REPLACED WITH STEEL.



MOD 2A

As 1942 wore on, a further attempt was made to lessen the fairwater silhouette, leading to the simple expedient of removing the plating around the periscope shears, giving them a skeletal look. The General Board authorized this change on 26 September 1942. The photo below shows *Pogy* on builder's trials on Lake Michigan in the fall of 1942 with the shears unplated. *Pogy* is an interesting boat in that she went through four major fairwater modifications during her lifetime. She was launched by Manitowoc Shipbuilding (a follow-on yard that built boats to EB plans) on 23 June 1942 with a Mod 1A fairwater. During her fitting out phase she was converted to a Mod 2A and ran sea trials in this configuration. Prior to commissioning, she was converted to a Mod 3 and in 1944 she received a Mod 4 (see below).



This following 6 November 1942 photo of a Mod 2A *Tunny* shows a variation given to some of the *Gatos*. The plating on the shears provided a smooth hydrodynamic flow around the periscopes, but it also added a level of structural stiffening. Once the plating was removed reports came in of vibration of the scopes at certain speeds and sea states. An attempt was made to beef up the shears to eliminate this vibration, although it doesn't appear to have been applied to all of the *Gatos*, as some of them finished the war without this change. For reference purposes, I refer to this as the "thick scope" with the other as the "thin scope" This photo also shows one of the earliest mounts for a 20 mm AA gun on the cigarette deck, replacing the .50 cal. The Mk. 5 mount had a heavy enclosed base that proved to be a bit cumbersome. It was eventually replaced by the lighter, tripod style Mk. 10 mount. In both this and the *Pogy* photo the radar installations forward and aft of the periscope shears can be clearly seen.

USS Tunny (SS-282) Mod 2A with thick scopes

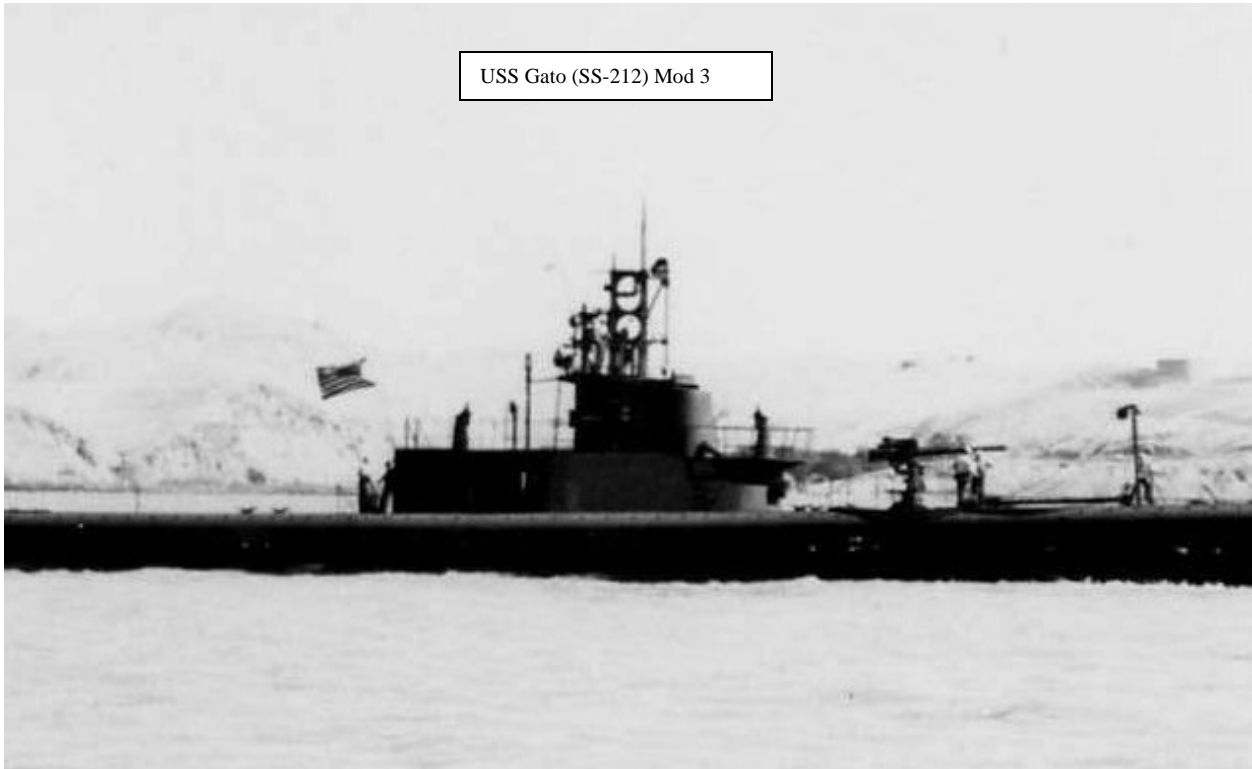


Notice also that *Tunny* started life with the shorter navigation bridge of a Mod 1A.

MOD 3

The next major step involved the removal of the fairing around the navigation bridge and the former surface steering station. Although authorized for removal at the same time as the cigarette deck portion, it seems that this cut down was not done on a widespread basis until late '42. New construction boats began to slide down the ways in early 1943 with this fairing already cut away. The reason for this delay is not clear, but it may have had to do with the desire to retain the sheltered navigation bridge for rough weather surface operations. The desire to reduce the silhouette prevailed, though and once the mod was done, the advantages became well understood. This mod also created a perfect spot for another AA gun and a 20 mm gun mount was usually placed here.

USS Gato (SS-212) Mod 3



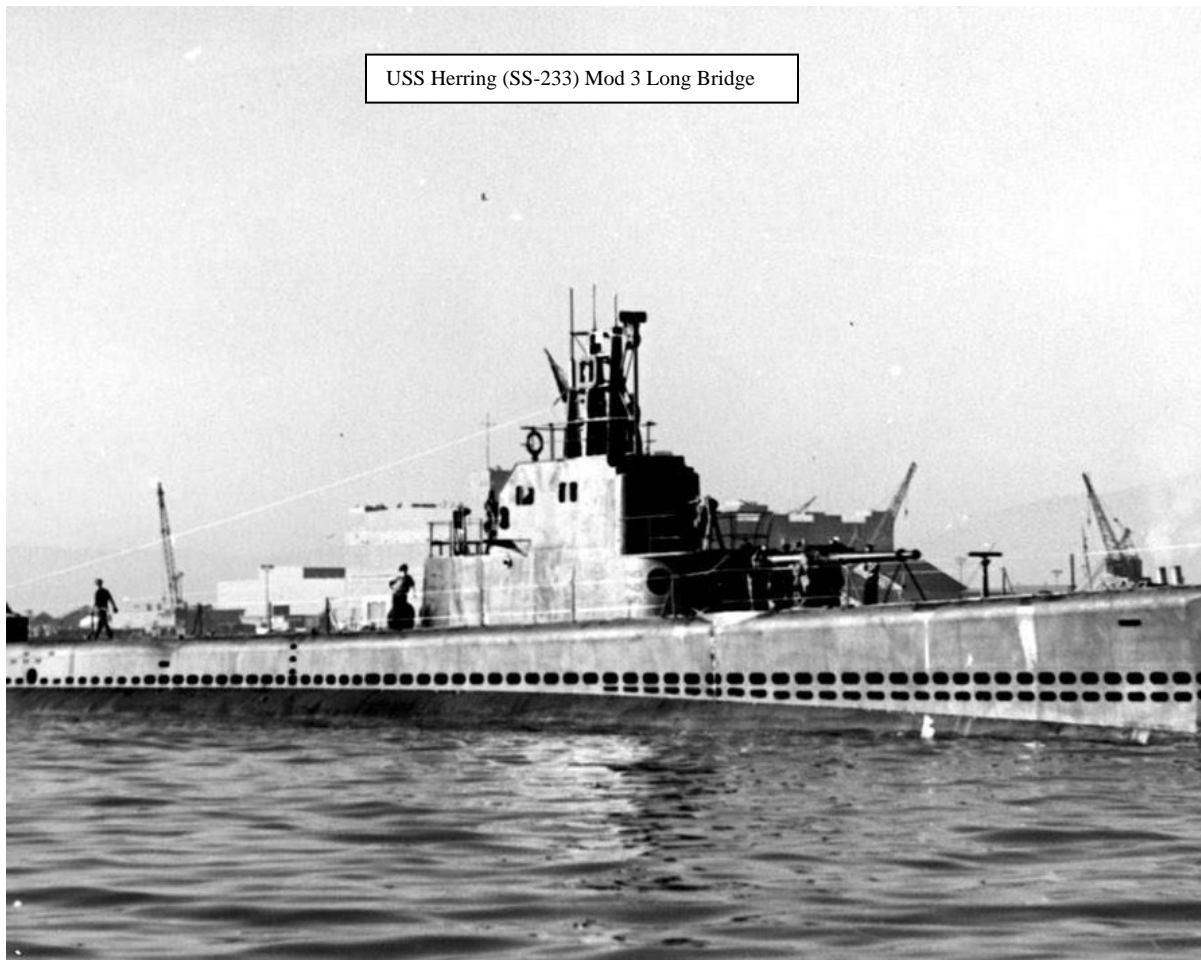
This view of the lead boat *Gato* on 6 August 1943 shows an early Mod 3 configuration. At this point in her service, *Gato* still had the thin scopes and the Mk. 5 solid mounts for the 20 mm guns. Corresponding with the Mod 3 changes, the deck gun was moved to the forward position. This provided some tactical advantages as you could fire at the target while approaching, as opposed to swinging broadside or moving away to bring the gun to bear. At the time that this shift was made, large numbers of the more powerful 4-inch/50 caliber gun became available and these were quickly fitted onto the boats. These guns came mostly from decommissioned S-boats and their popularity amongst the boat crews did lead to some short-term shortages, as evidenced by the fact that *Gato* is still carrying the 3-inch/50 caliber gun in this photo. It was actually pretty rare to see this gun in the forward spot.

USS Jack (SS-259) Mod 3



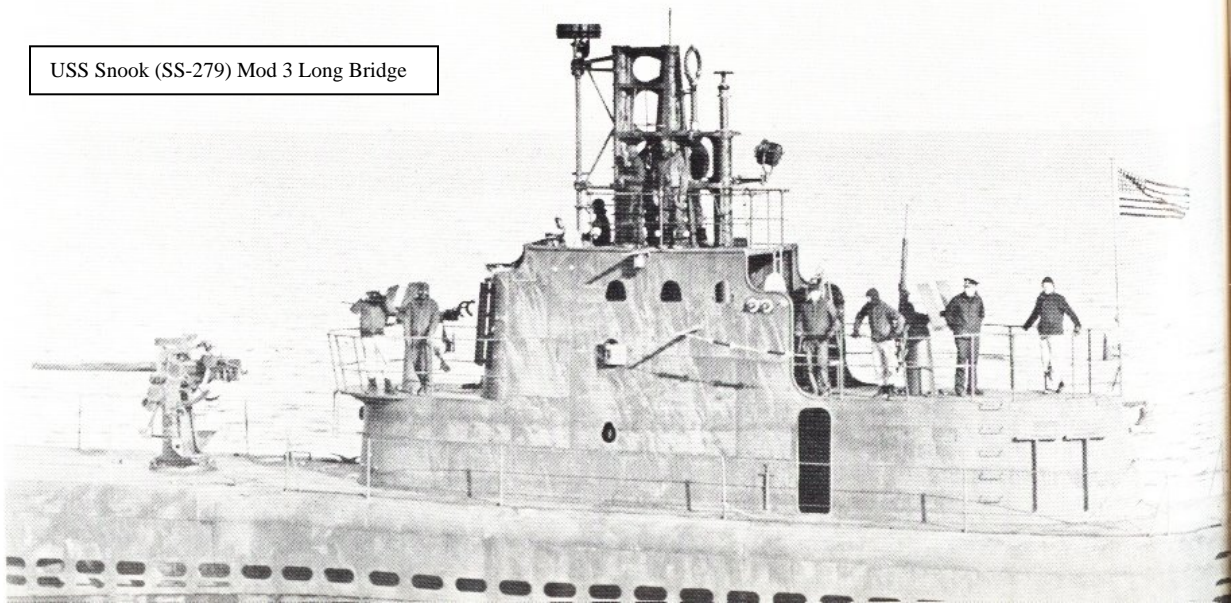
The 17 December 1943 shot of *Jack* above illustrates the classic Mod 3. With the ammo magazine located under the galley and crews mess aft of the control room, the long passing chain needed to get ammo up to the gun in the forward spot resulted in lower than desired firing rates. To alleviate this, watertight ready service ammo lockers were placed in the fairwater under the forward gun platform and these are visible in both of these photos. *Jack* also sports the lighter Mk. 10 tripod style 20 mm gun mounts. Note also how the fairwater has been cut away directly under the SD radar mast, leaving a short extension for an aft lookout platform and giving the visual impression of a shortened bridge. On a few of the boats (at least *Silversides* and maybe most of the Government boats) an approximately 18 inch long extension was added to the fairwater under the forward gun deck. This section was probably added to provide more room for the gunner to clear the bridge fairwater as he swung the gun through its' firing arc.

A variation on the Mod 3 is what I call the Mod 3 Long Bridge. Whereas the Mod 3 had the aft part of the bridge fairwater cut away under the SD radar mast, at least five boats (*Grouper*, *Herring*, *Scamp*, *Scorpion*, and *Snook*) did not have this done, resulting in this variation.



Four of the five boats were built at Portsmouth and there is some anecdotal evidence to suggest that this was a Mod 3 that was done while the boat was still under construction. The extended portion may have been cut away once the boat arrived in theater.

USS Snook (SS-279) Mod 3 Long Bridge

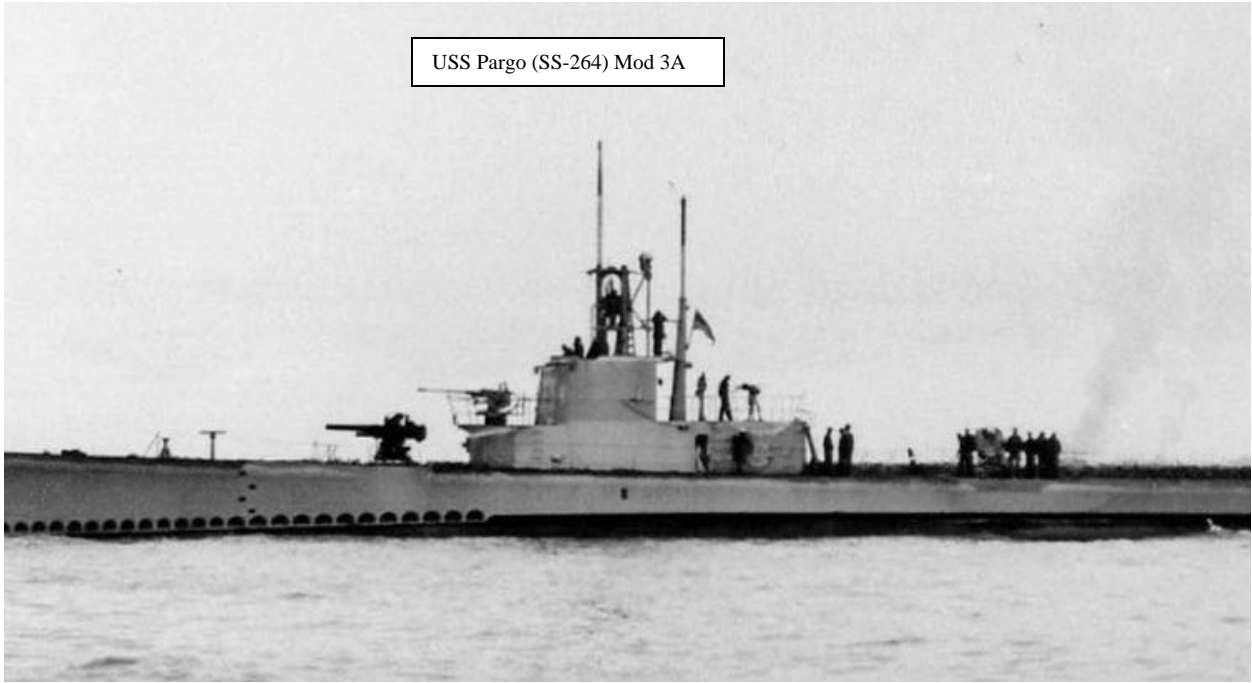


MOD 3A

As mentioned earlier, the conning tower itself was a horizontal cylinder situated above and separate from the control room and the rest of the pressure hull. The hemispherical ends were dished inward and the after end had a watertight access door for the gun crew. This door proved to be a liability as several boats had them unseated during a depth charge attack, with one boat very nearly being lost. Also, the move of the gun to the forward position resulted in this door becoming redundant. In the spring of '43 a change was initiated that eliminated this door entirely on the boats under construction, replacing the concave aft end with a new outward dished convex one. This had the welcomed side effect of increasing the available room in the crowded conning tower. This major change to the structure of the conning tower was also applied to some of the commissioned boats, but had to be accomplished during overhaul at a major shipyard. The side effect of increased room in the conning tower was short lived, however as now the gun crew had to come up through the conning tower and cross the bridge to reach the deck gun, necessitating a carefully orchestrated ballet during a battle surface scenario. This problem was rectified in the *Balao* and *Tench* classes with the addition of a gun access trunk that bypassed the conning tower and allowed direct access to the main deck forward from the control room.

The crowding of the conning tower led to other changes. The SD radar mast was moved aft and out of the conning tower altogether, with a new mast for it installed on the cigarette deck. This allowed the SJ radar mast to be moved to a more optimal position aft of the shears, getting it out of the way on the bridge. This created the Mod 3A, with this mod first appearing in late 1944. The 28 May 1945 photo of *Pargo* below shows one of the many variations of gun armament with the new and much more powerful 5-inch/25 caliber gun in the forward position (unusual, the 5 incher usually was sited aft), a 40 mm single mount on the forward gun deck, and a 20 mm on the cigarette deck.

USS Fargo (SS-264) Mod 3A



Towards the end of the war, the much more capable SV radar with its large wire mesh antenna replaced the SD radar antenna on the same mast. Many other detail changes were made as well. Additional ammo lockers, ladders down from the cigarette deck, rearranged lookout perches, and small spindle mounts for .50 cal machine guns appeared in a bewildering number of arrangements. Note also in the 23 July 1945 photo of *Gurnard* below that she has been up gunned with the addition of 40 mm single mounts on the forward and cigarette deck mounts and a 20 mm mount on the forward main deck position, with the 5-inch/25 sited aft. One other minor mod common at this time was the addition of a non-watertight door through the bridge fairwater, leading to the forward gun deck. This improved the access to the forward guns. Many of the *Gato* class boats finished the war with a Mod 3A fairwater.

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NAVY YARD MARE ISLAND, CALIF

USS Gurnard (SS-254) Mod 3A



MOD 4

Some personnel were still not happy with the size of the bridge silhouette. One additional effort was made and it was found that the height of the bridge itself could be lowered. Aft of the bridge, three I-beams rose up from the deck and curved inward to provide structural support for the periscope shears. They also provided attachment points for the fairwater plating. These beams could not be removed without compromising the strength of the shears. Besides, they provided excellent lookout platforms. The plating could simply be removed allowing light to flood through. The combination of lowering the bridge and removing this plating resulted in the Mod 4 configuration. Although quite similar to the Mod 3, this configuration developed a little later, not appearing until early 1944.



This shot is of the oft-modified *Pogy*, taken in August 1944 shows the typical Mod 4. Note the skeletal look of the thin scopes and the prominent mount for a TBT (Target Bearing Transmitter) on the cigarette deck. The SJ radar mast is still mounted forward (the late war improved SJ-1 with the bigger antenna), and the SD mast immediately aft on the shears, identical to the Mod 3 arrangement. Removing the fairwater plating and exposing the ribs gave this mod a distinctive look and is what gave rise to the *Gato* class being called the “covered wagon” boats.

It bears noting that the covered wagon ribs on the fairwater were present *only* in the design of the *Sargo*, *Tambor/Gar*, and *Gato* class boats. Due to shorter periscopes, they did not exist on the earlier *Porpoise/Perch* and *Salmon* classes, and a total redesign of the fairwater and shears on the later *Balao* and *Tench* class boats did away with them entirely.

OFFICIAL PHOTOGRAPH

NAVY YARD MARE ISLAND, CALIF

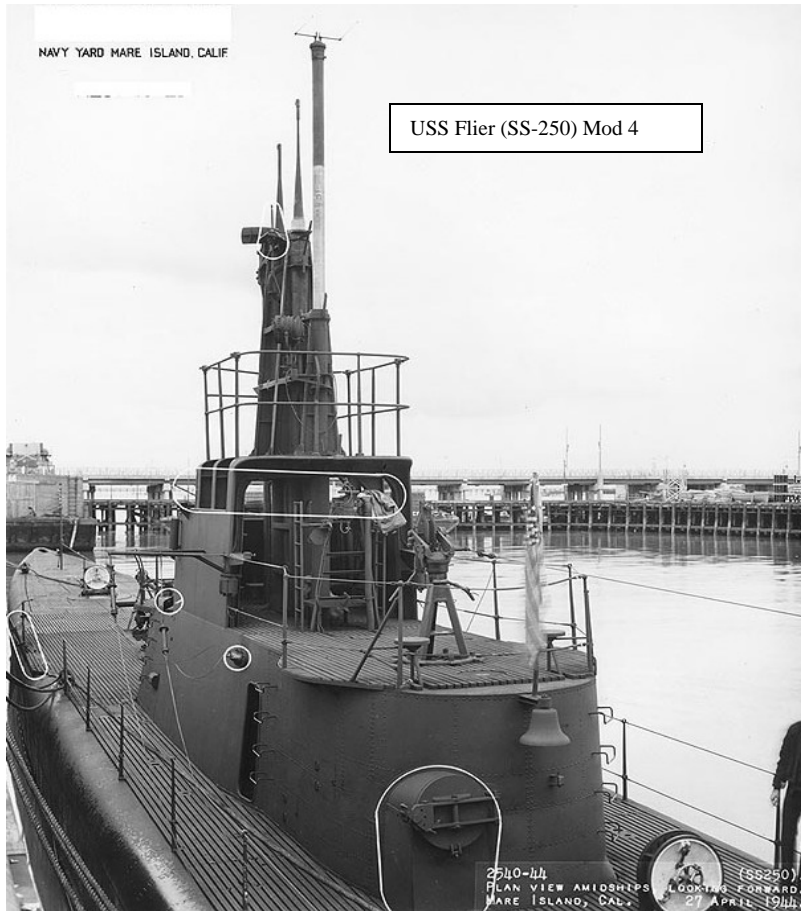
USS Flier (SS-250) Mod 4



2511-44 (SS250)
PLAN VIEW AMIDSHIPS, LOOKING FORWARD
MARE ISLAND, CAL. 27 APRIL 1944

NAVY YARD MARE ISLAND, CALIF

USS Flier (SS-250) Mod 4



2540-44 (SS250)
PLAN VIEW AMIDSHIPS, LOOKING FORWARD
MARE ISLAND, CAL. 27 APRIL 1944

These two 27 April 1944 photos of the ill-fated *Flier* are a good representation of a Mod 4. The covered wagon ribs are very prominent. Her armament at this time was a 20 mm on an open mount on the forward gun deck and cigarette deck, and a 4-inch/50 in the forward main deck position. Two ammunition-passing scuttles have been cut into the bridge fairwater, allowing the quick passing of 4" ammo from the conning tower to the forward gun crew. These photos also show *Flier* with the original SJ small dish surface search radar.

MOD 4A

Running virtually parallel with the Mod 3A, the 4A was very similar, but with the low bridge and the covered wagon ribs of the Mod 4. This was the last major modification of the *Gato* fairwaters during the war. The photos of *Cero*, *Dace*, and the museum boat *Cod* all show the classic Mod 4A. All three show the late war SJ-1 radar, but none had received the new SV radar to replace the SD when these photos were taken. The SV was just coming into service when the war ended and availability was limited. Between the thick scopes, the circular radio direction finder (DF) loop can be seen. There are numerous minor detail differences between the three boats. The smaller changes were easily done by tenders between patrols and whether they were accomplished was usually left to the preferences of the boat's commanding officer.

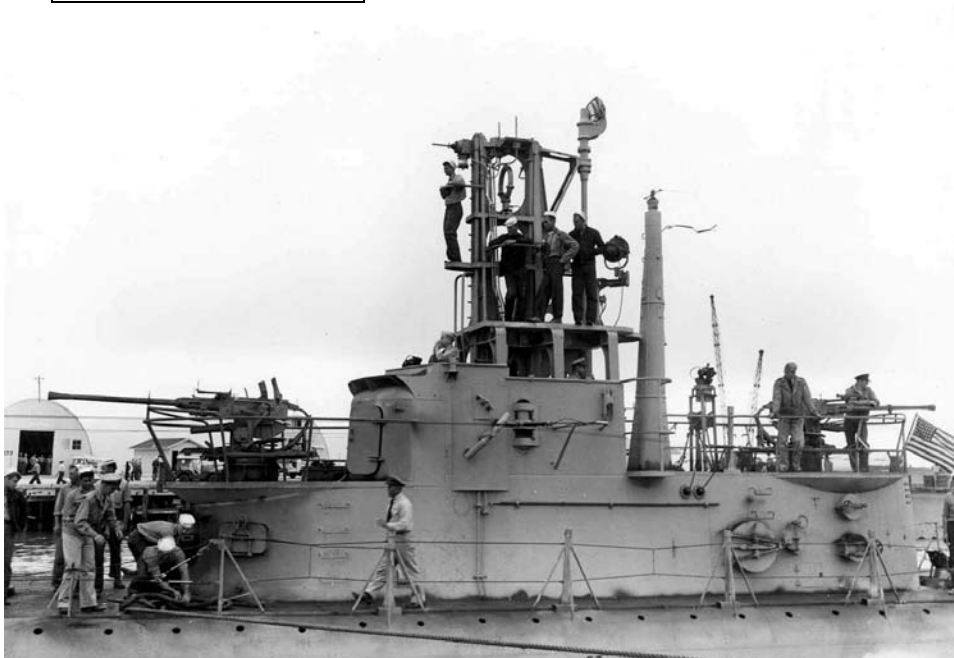


USS Cod (SS-224) Mod 4A



In the photo of the *Dace* below, note the difference in the wind venturi along the front edge of the bridge. The purpose of this device was to channel wind up and over the heads of the bridge crew. Having looked at *a lot* of photos during the course of research for this article, I found an amazing variety of modifications for this venturi. There was seemingly no rhyme or reason to the design, and apparently they reflected a lot of different ideas on how to mitigate the wind problem. This experimentation with the venturi took place throughout the war and was not specific to any particular *Gato* fairwater modification, or even to the *Gato* class itself.

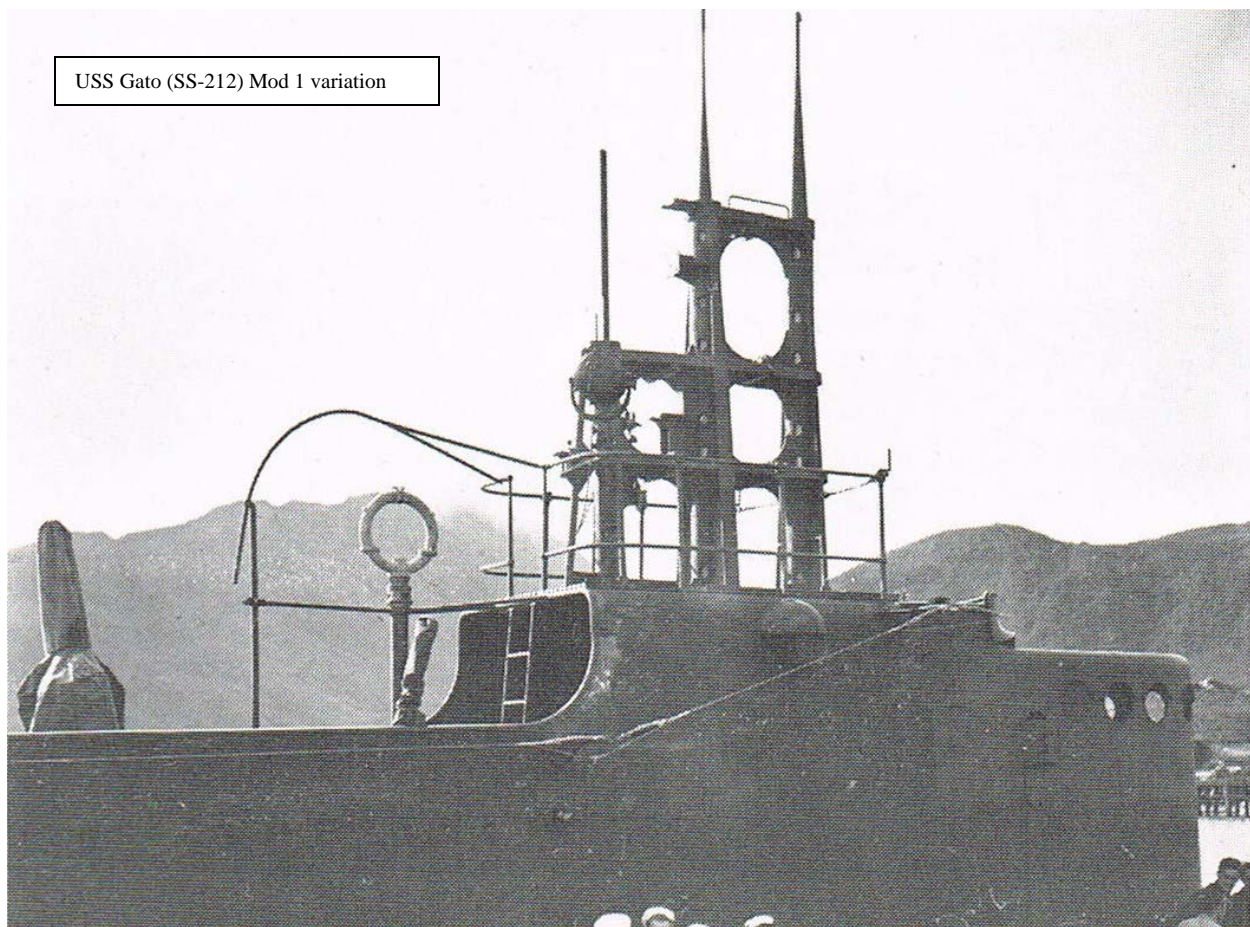
USS Dace (SS-247) Mod 4A



OTHER VARIATIONS

Along with the major modifications detailed above, there were several one-off and unique mods done to several boats. Some of these may have been short-term interim changes, but a few were permanent.

Gato is shown in the photo below with a variation on the Mod 1. This 30 August 1942 photo taken in Dutch Harbor shows her periscope shears unplated. I have yet to see any other boat with a Mod 1 or 1A with this variation. The circular DF loop is very prominent in this photo. The object aft of the loop is the water-cooled .50 caliber machine gun. It is covered with a weather proof canvas covering. This weapon would not have been left mounted topside when the boat submerged. It would have been taken below and was mounted here to provide some level of air defense while the boat was in harbor.



Robalo and *Gabilan* both sported at one time a Mod 4, but with the covered wagon ribs still plated. *Robalo* was launched with a Mod 3 and was converted to this version before her sea trials began.

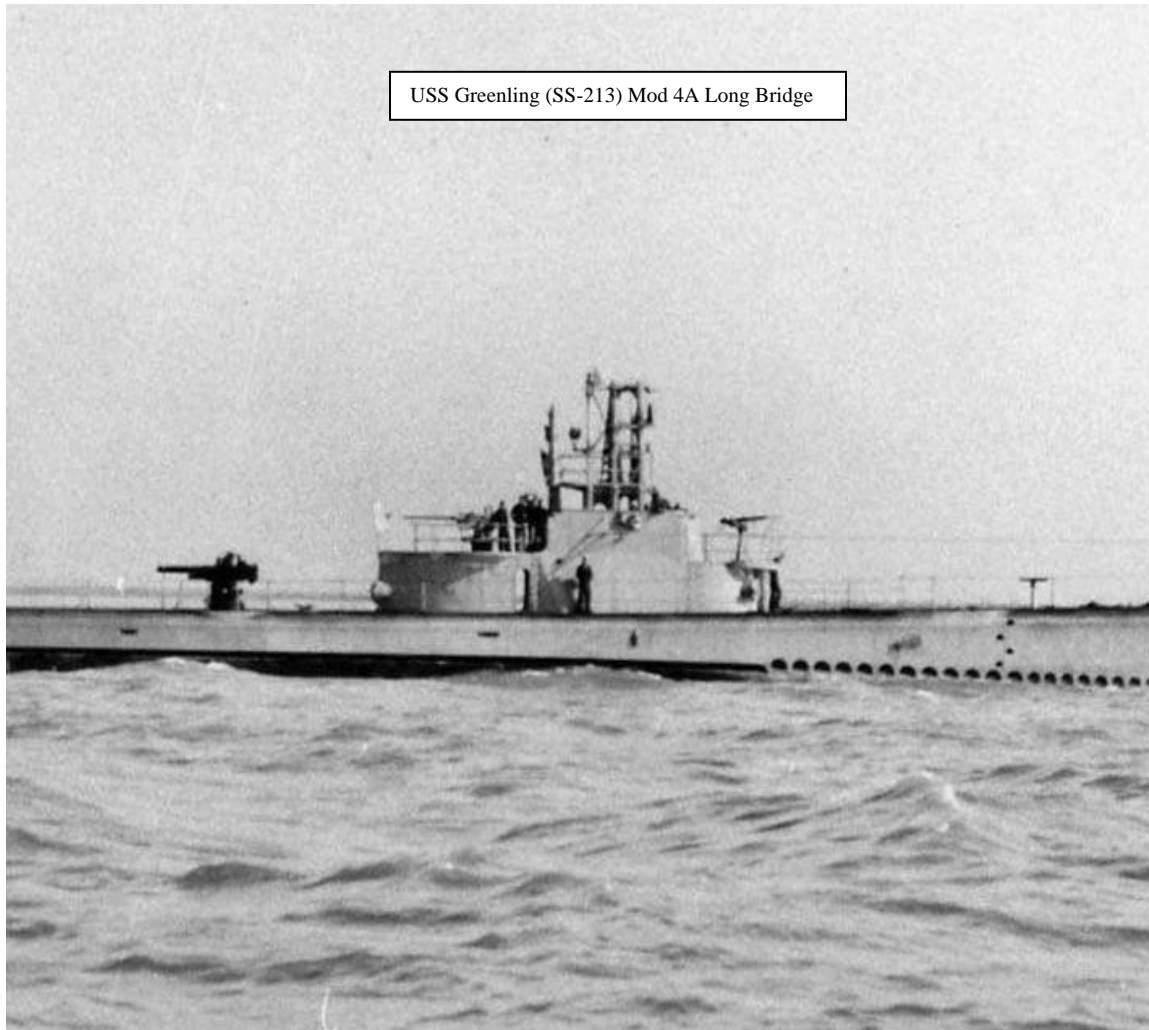
USS *Robalo* (SS-273) Mod 4 variation



USS *Gabilan* (SS-252) Mod 4 variation



Greenling is shown in the photo below on 3 May 1945 with a Mod 4A, but with a long bridge fairwater. This is the only boat with a Mod 4 or 4A to have the long bridge variation.



The next photo reportedly shows *Shad* on 21 Mar 1944 with a very unusual Mod 2 low bridge. This would have required the sheltered navigation bridge to be cut down and then rebuilt to match the level of the lowered bridge. There also would have been no point. Why lower the bridge, unplate the wagon ribs, then leave the huge bulk of the navigation bridge in place? A close look at the photo shows unmistakable evidence of censoring and alteration. The area forward of the bridge and the periscope shears have been heavily censored, the deck gun altered, and details on the main deck obscured. She is also missing her radars. Other views of *Shad* taken at the same time show her with a Mod 4 configuration, so there seems to be very little reason for the Navy to want to heavily censor this photo of *Shad*.



USS Halibut (SS-232) altered post damage photo. Originally identified as Shad (SS-235)

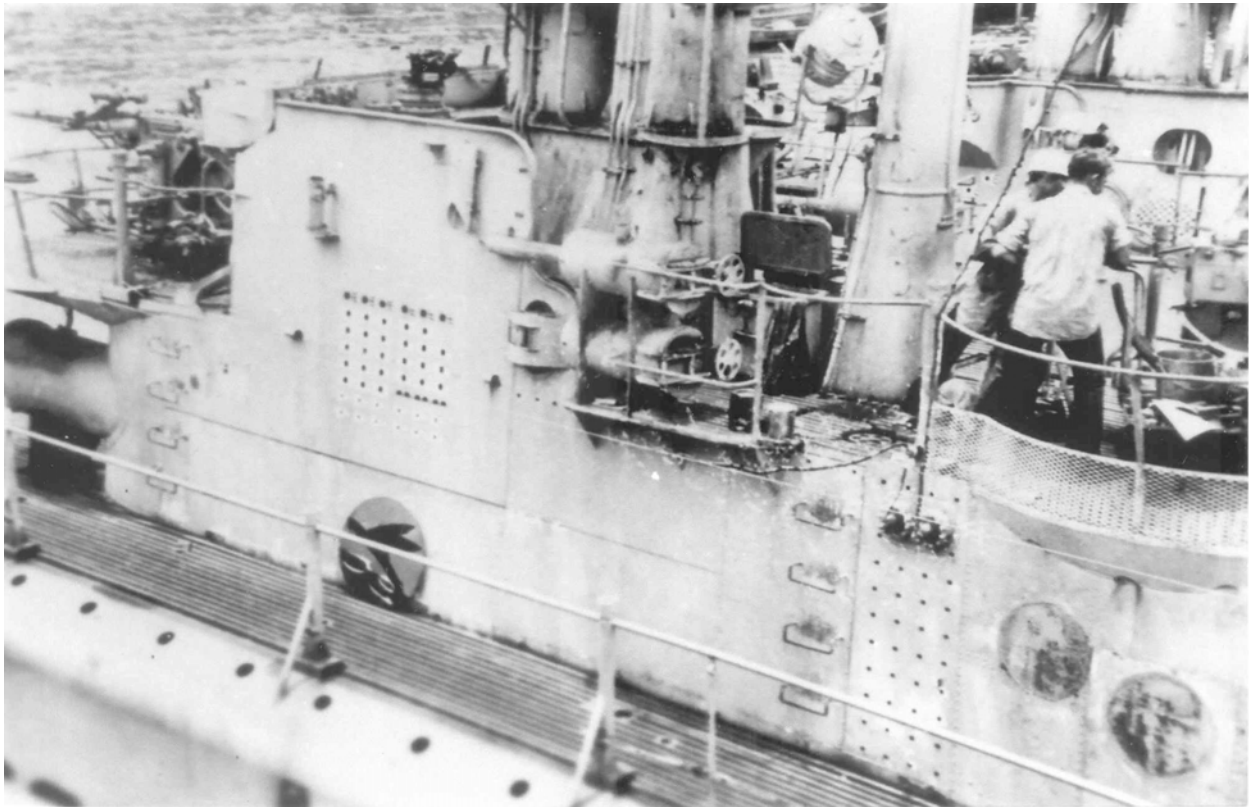
Recently, however another photo has come to my attention that I think clears up this mystery. The *Halibut* was severely damaged in an aircraft born depth charge attack on 13 November 1944. Only through heroic efforts by her crew was the terribly damaged *Halibut* able to return safely to port. Examined by engineers at Saipan, Pearl Harbor, and San Francisco she was deemed to be beyond economical repair. Temporarily patched up she sailed from San Francisco on 16 February 1945 for New London where she was decommissioned there on 18 July 1945.



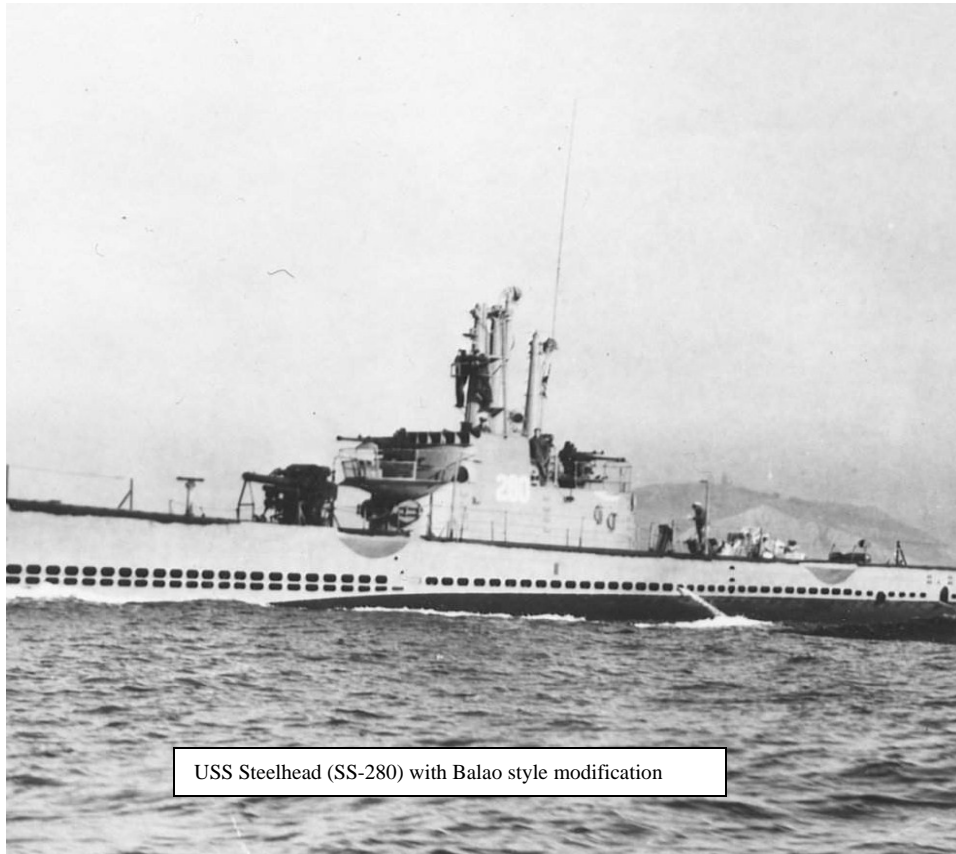
USS Halibut (SS-232) post war photo

Notice the close similarities between the purported *Shad* photo and that of the confirmed post war photo of *Halibut* above. I now believe that the first photo was an attempt to hide the fact that *Halibut* was so badly damaged that she had to be decommissioned, for all intents and purposes a war loss. The photo was probably taken during her transit between San Francisco and New London. Sometime in the intervening years the photo was mis-identified as *Shad*.

Flying Fish and *Steelhead* were unique among the *Gatos*. Both of these boats had complete rebuilds done on the fairwaters during the war. This involved the complete removal of the fairwater and periscope shears (including the distinctive covered wagon ribs) down to the main deck and the replacement of this structure with one that closely matched that of the later *Balao* class. In the case of *Flying Fish*, the reason for this radical, expensive, and time-consuming change is not yet clear. For *Steelhead*, it is known that she had a major fire in the conning tower on 01 October 1944, with the damage being extensive enough to warrant the installation of a new conning tower. Apparently the fairwater was rebuilt at this time as well.



USS Flying Fish (SS-229 with Balao style modification to periscope shears and bridge)



USS Steelhead (SS-280) with Balao style modification

Despite the visual similarity of these two boats to the *Balaos*, one major difference sets them apart. The elimination of the watertight door in the aft end of the conning tower in the *Balao* design allowed the repositioning of the main induction valve closer to the conning tower. This had the desirable effect narrowing the fairwater to a fine point at the aft end in the early *Balaos*, or of shortening the fairwater altogether in the later boats. The size of the cigarette deck gun platform had to stay the same, so the platform overhung the aft end of the fairwater, giving the *Balao* and *Tench* boats a look very distinctive from the other classes. (See the photo of the *Balao* and *Hardhead* below)



USS Balao (SS-285)

USS Hardhead (SS-365)



The *Flying Fish* and *Steelhead* did not have their main induction valves moved forward so they did not have the overhang at the aft end of the fairwater, this area remaining rounded on the end with the cigarette deck much longer when compared to the *Balaos*.

OTHER VISUAL FEATURES

As built, the EB design had a single row of semi-circular limber holes along the bottom edge of the superstructure just aft of the bow planes. This allowed the superstructure to flood faster when diving. The Government design had two rows of smaller oval shaped holes in the same area. As the war progressed, dozens of additional holes were added in an attempt to speed dive times. There was no official pattern to these additional holes and they were often times done between patrols by tender crews at the behest of the boat's Commanding Officer.

The first three boats built at EB, Portsmouth, and Mare Island all had two anchors when completed. One of these anchors (usually the port side, although this varied a little) was removed as part of the of "frivolous equipment" purge of early 1942 and the hawse hole plated over. All subsequent boats from all yards were built with only one anchor and hawsehole. The EB design standardized on a starboard side anchor and the Government design on a port side one.

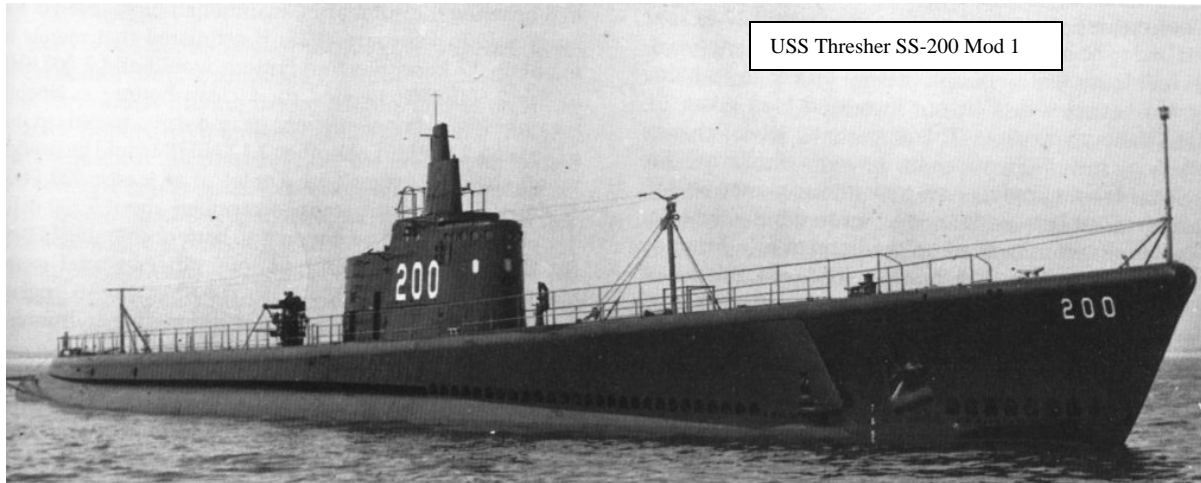
CONCLUSION

As you can see, the *Gato* class submarines went through numerous configuration changes during their wartime careers, although these changes aren't as random as they might first seem. They were driven by solid tactical experience gained the hard way and in some cases can probably be credited with the safe return of a boat from patrol. Some sense can be made of these changes and once understood, can greatly aid in the accurate identification of photographs.

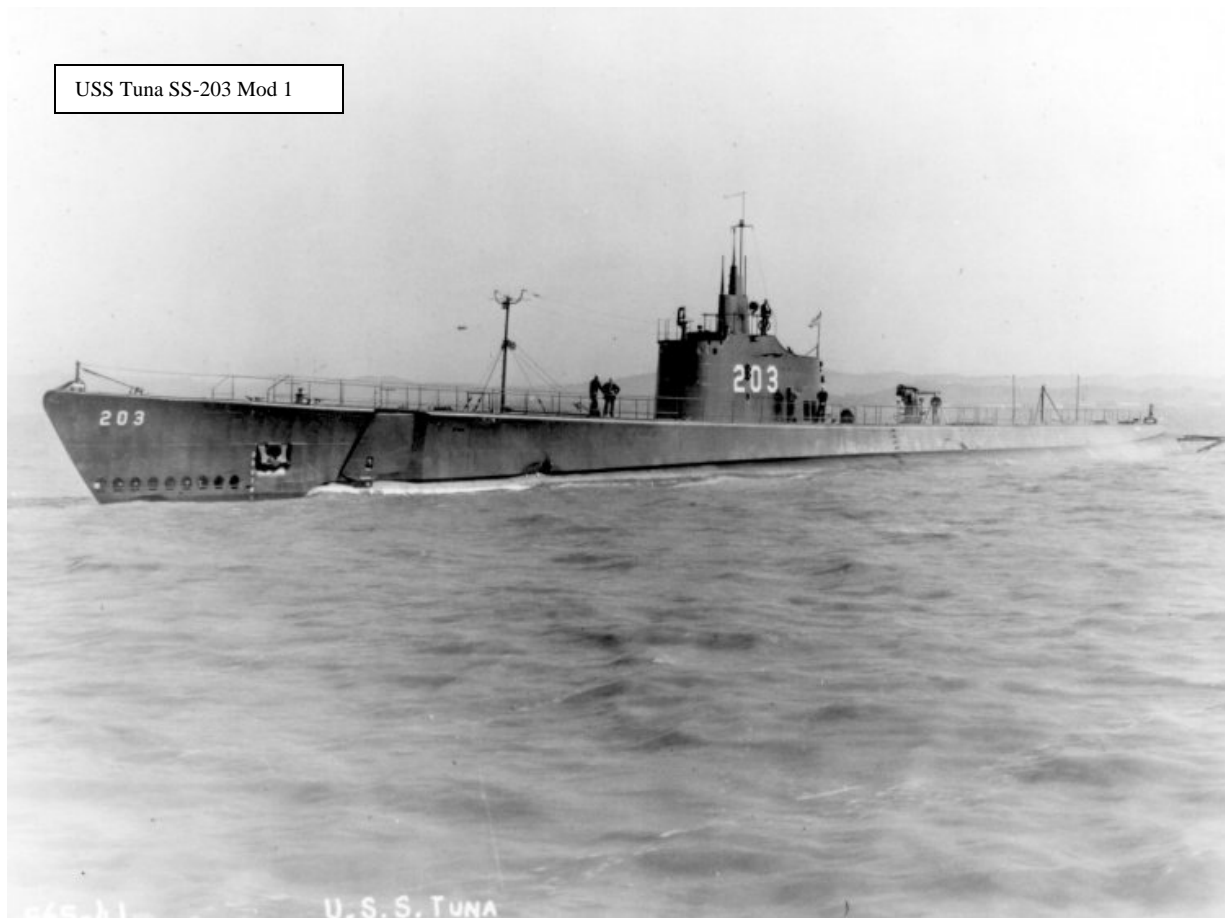
POSTSCRIPT: TAMBOR/GAR CLASS

The twelve submarines of the *Tambor*/*Gar* class were the immediate precursors to the *Gatos*. They represented the high water mark in the development of the USN fleet submarine prior to the war. All the hard earned lessons learned during the rapid development of the fleet submarine concept during the 1920's and 30's were poured into these boats. Although authorized in two different fiscal years (FY 39 & 40), the six boats each of the *Tambor* and *Gar* classes were actually identical in design with no significant differences between the two groups. They will be considered as one class in this article. Ultimately proven to be quite successful, they were used as the basis for the follow-on FY 41 boats, the war winning *Gatos*.

Outwardly, these boats were nearly indistinguishable from the *Gatos* and indeed went through many of the same wartime modifications that their later cousins received. A few features though will make these boats stand out.



These two photos show *Thresher* and *Grampus* in a classic as-built EB Mod 1 configuration. As you can see, they are nearly indistinguishable from the *Gatos*. The only readily apparent difference is in the periscope shears. All of the *Tambor/Gar* class boats had two 40-foot long periscopes, but they were the last class to retain a periscope station in the control room. This resulted in #1 scope position in the shears being shorter than the #2 position, giving the shears a stepped appearance. Later modifications eliminated the control room station and both scopes eventually let into the conning tower. The only other external difference between these boats and the later *Gatos* is that the *Tambor/Gar* class was five feet shorter. This was due to the fact that all four main engines and generators were contained in one large engine room. Concerns over flooding of this one large space led to the *Gato* class engine room being divided in two, with a watertight bulkhead between them. The *Gatos* were lengthened slightly to accommodate this bulkhead. However, this difference in length is not readily apparent in photos. Notice how EB continued the practice of fairing the bull nose into the superstructure as they did with their *Sargo* class boats. In the *Grampus* photo you can see that for the first time the superstructure aft ended short of the hull, much different from the preceding *Porpoise/Shark/Perch* and *Salmon/Sargo* classes which had the aft end faired into the rest of the hull.



The Mare Island built *Tuna* is typical of the Government design for these boats. There are few differences from the EB boats, but a two features stand out. Continuing the practice from the earlier *Salmon/Sargo* class, the six Government built *Tambor/Gars* were the last to have the above deck, ring-type bull nose. All fleet boats built after this point, whether EB or Government design had the faired-in style bull nose. Also, the EB style large semi-circular limber holes aft of the bow planes for flooding the superstructure are absent on the Government boats. There is a slight gap between the bottom edge of the superstructure and the pressure hull on the Government boats and it is here that the water floods in. This tended to slow dive times and

shortly after commissioning most of the Government *Tambor/Gars* were retrofitted with a small set of limber holes. This photo of *Tuna* is interesting in that she seems to have some damage to the superstructure along the bottom edge, just aft of the forward radio aerial mast.

As I stated above, these boats were so similar in design and capability to the later *Gatos* that they went through many of the same wartime Mods. Curiously, one that seems to be missing is the Mod 2. I have yet to see a photo of a *Tambor/Gar* with a Mod 2 fairwater, although it is likely that this mod was applied to most of the boats at some time. The most likely explanation is an incomplete photographic record due to the heavy losses suffered by this class.

The mod that appears most often for the hard fighting *Tambor/Gars* is the Mod 3. The photo below of *Thresher* on 8 October 1943 is typical of this mod.



This shows the cut away of the forward navigation bridge and the aft “cigarette” deck on the fairwater. The SJ radar mast is mounted forward of the shears and the SD mast aft of the shears. The bridge fairwater is cut away under the aft lookout platform and ready-use ammo tubs have been added on the aft edge of the fairwater near the deck. The 20 mm mounts are still the older solid base type; the lighter weight open mounts will come later. On the main deck aft of the gun mount you can see raised platforms over the engine mufflers. On older fleet boats that were re-engined, this was sometimes necessary to accommodate the larger mufflers of the new engine types. However, re-engining of the *Tambor/Gars* does not seem to have taken place as the Navy was quite satisfied with the GM/Winton 16-248 and Fairbanks-Morse 38D8 1/8 diesels that were installed in these boats. I have yet to determine the true purpose of these raised platforms in this class. The original 3”/50 caliber deck gun has been replaced with a large 5”/51 caliber Mk. 9 gun at the insistence of Admiral Charles Lockwood. Not apparent in this photo is the flared out

ponson on the port and starboard sides of the superstructure needed for the gun crew to maneuver this large gun through its full firing arc. Intended to provide more hitting power than the dinky 3"/50, this gun proved to be unwieldy in practice and its use was not repeated on the *Gatos*.



The ill-fated *Grayback* is shown here with a Mod 3 Long Bridge, a 5"/51 caliber gun, and the later open mount 20 mm anti-aircraft guns on the forward and aft gun decks. *Gudgeon* also received a similar mod prior to her loss.

All of these boats were built with two anchors (port and starboard) and two motor whaleboats stowed in the superstructure near the forward gun foundation. One of the two anchors and both boats were deleted as part of the wartime purge of unnecessary peacetime equipment.

The Navy heavily relied on the *Tambor/Gars* to lead the fight against the Japanese. Thus, seven of the twelve were lost in combat. Of the survivors, *Tambor* received a Mod 4A (the only one to receive this mod), *Tautog* a Mod 3, *Thresher* and *Tuna* a Mod 4, and *Gar* probably finished the war with a Mod 3.

OFFICIAL PHOTOGRAPH
NOT TO BE RELEASED
FOR PUBLICATION
NAVY YARD MARE ISLAND CALIF

USS Tambor SS-198 Mod 4A

RESTRICTED



Tambor alone seemed to receive the full suite of mods, with the photo above showing her with a Mod 4A, a 40 mm on the cigarette deck, open mount 20mm on the forward gun deck, and the SD radar on the separate mast. She also lost her big 5"/51 gun in favor of the smaller but easier to use 4"/50.

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www.navsource.org

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