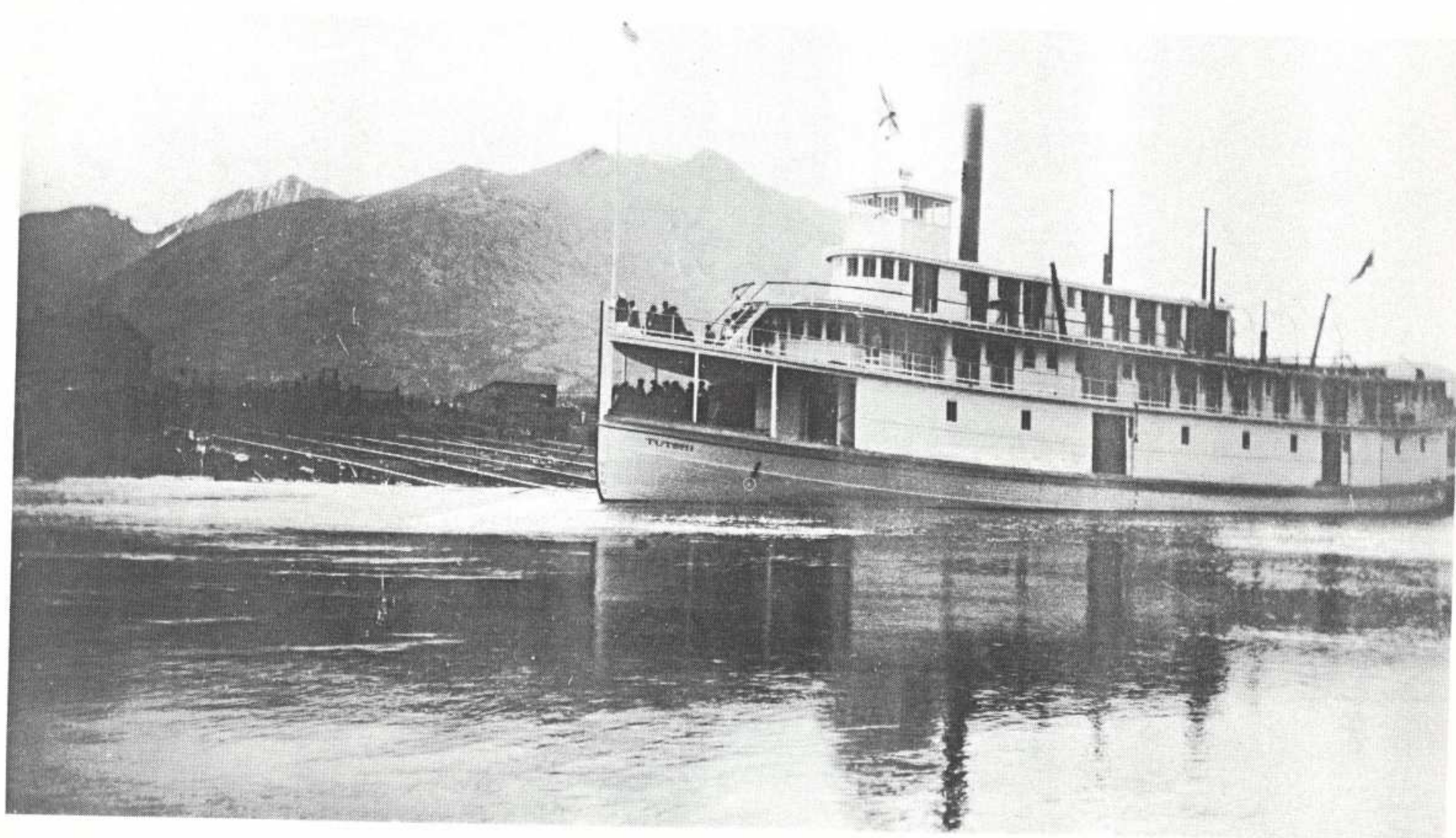


2.3 DESIGN

Design of the Tutshi was similar in general principles to the design of other BYN ships. It had been found that large Mississippi style steamboats which had been used on the Yukon River were too unwieldy, and this design was replaced by smaller and faster boats which drew less water. That the Tutshi is a sternwheeler at all is interesting, for a screw driven ship such as the Tarahne would have been more efficient for lake service. The decision to build a sternwheeler was dictated by the depth over the bar at Nares Lake, south of Carcross, possibly by water depths at Ben My Chree and Taku Landing, and perhaps by the opportunity of using recycled machinery from other stern wheelers. Even so, the Tutshi grounded on the bar at Carcross in 1918, and was left there for the winter. Although her beam to length ratio was similar to other sternwheelers (see table) the Tutshi was given finer lines at the bow in order to deal with Tagish Lake which is very exposed and can get quite rough. A critical element of sternwheeler design is in the relationship of the wheel and the aft hull configuration. The wheel must be set so that it gets adequate "bite" in the water, but not so low that it is liable to damage from underwater obstructions. A major advantage of the sternwheel as a propulsion system is its high degree of manoeuvrability compared to screws - reversing is rapid and very powerful, with good control through the main rudders which, when reversing, are located in the fast running wash from the wheel.

Construction of the Tutshi, although similar in general approach to other sternwheelers constructed by the White Pass crews, differed in some important respects. Most obvious is the extension of the saloon deck forward to the bow, a feature found also on the Tarahne. This resulted primarily from the fact that the ship, with the exception of the approach to Carcross,



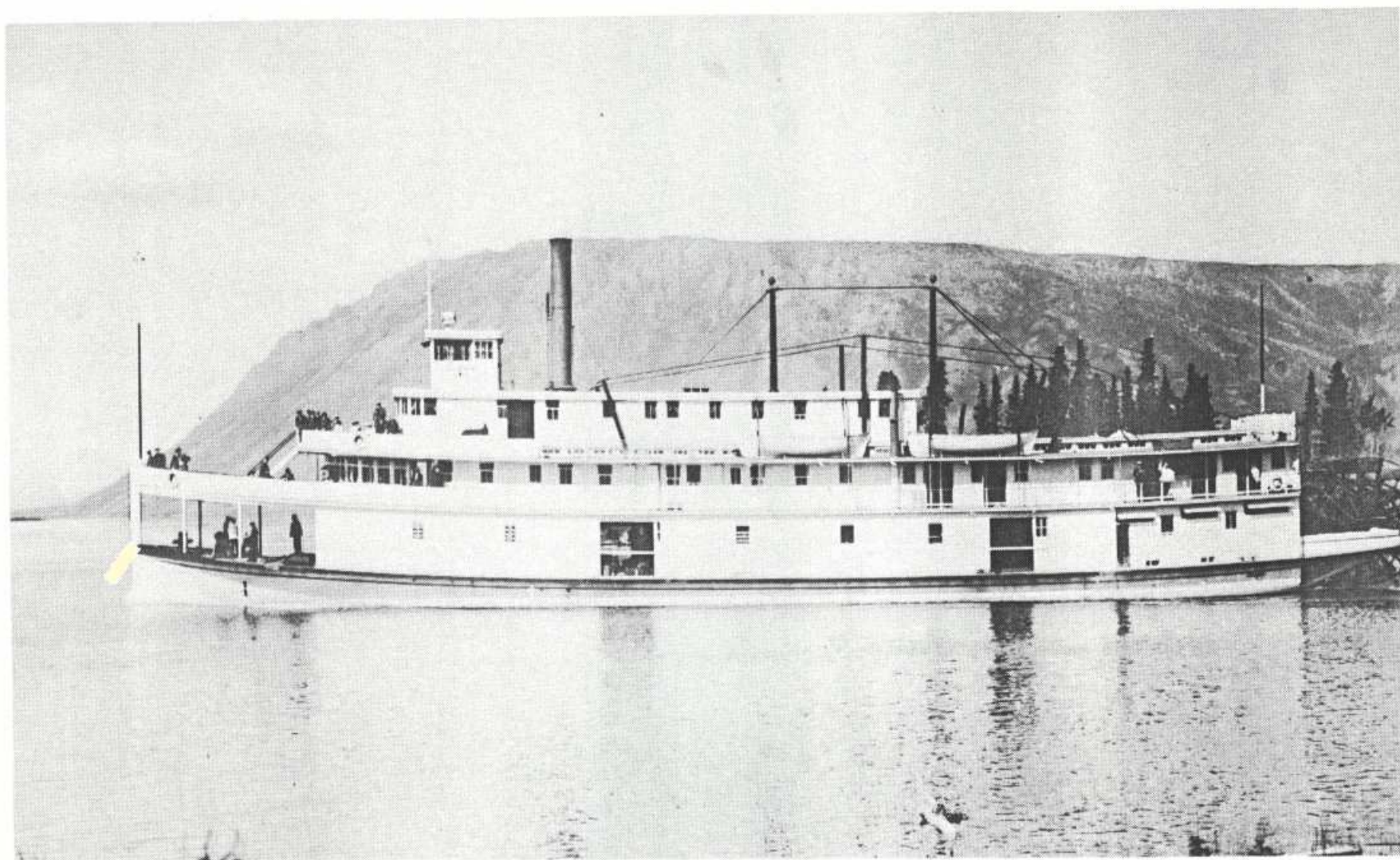
3. TUTSHI SOON AFTER LAUNCHING, 1917. a clear view of the slipway. The ship has not had her lifeboats and other gear installed YA JAMES COLL. 4340

spent its entire running time in Tagish Lake, and therefore did not need the unlimited visibility from the wheelhouse, and room for handling the spars or "grasshopper poles," of the river boats. This, combined with the limited demands for handling freight on Tagish Lake, allowed the provision of the additional deck area for tourists to view the passing scenery. This forward deck had been common as far back as 1895 on sternwheelers, such as the Kokanee and Rossland, developed for the Okanagan and Kootenay lakes regions by the CPR and other companies.

Comparison of dimensions of some Yukon sternwheelers

ship	length	beam	length/beam
Tutshi	167 ft.	35 ft	4.77
Gleaner	113 ft.	24.5 ft	4.6
Australian	115 ft.	24.6 ft.	4.6
Tarahne (as lengthened)	119.25 ft	20 ft	5.95
Klondike	210.25 ft.	42.1 ft.	5.00
Keno (as lengthened)	130.5 ft.	30 ft.	4.35
Kokanee	143 ft	25 ft.	5.72
Moyie (as lengthened)	161.7 ft.	30.1 ft.	5.37

The figures show that the Tutshi was about average in its length to beam ratio, being slightly longer because of its run being primarily on a lake, and therefore not requiring the manoeuverability necessary on the rivers. The Klondike is an exception to this rule, and presumably its beam was limited by the rapids on the Yukon River; thus the only way to obtain higher carrying capacity was to increase the length. The Keno has a very low ratio, being designed for service on the shallow Stewart River. To again compare these ships with those used on the lakes in southern British Columbia, length/beam ratios of these were generally much greater. This allowed higher speeds for a given horsepower, and the ships in use in the south were able to steam at 20 to 22 knots.

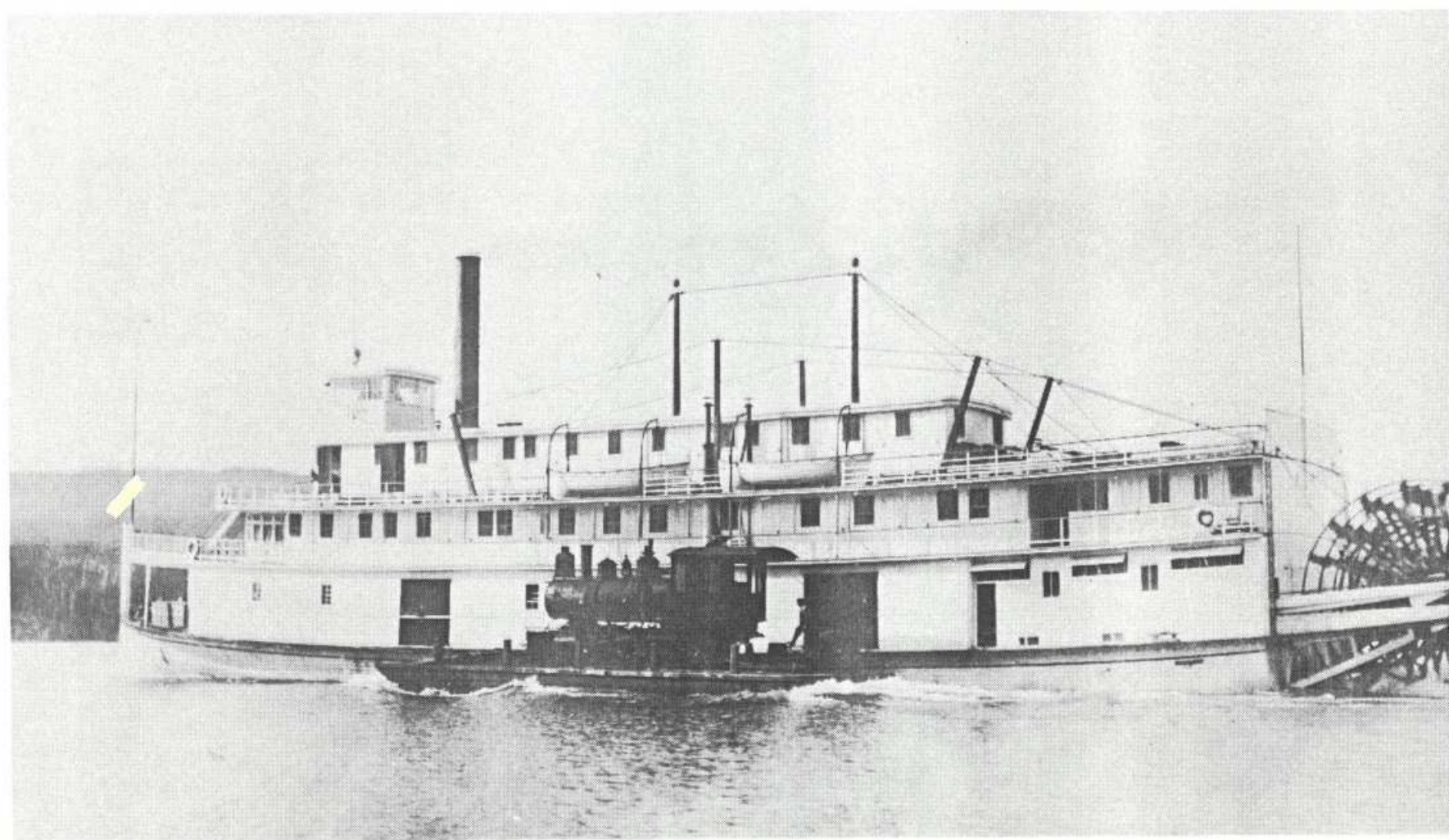


4 TUTSHI, JULY 27, 1919. The ship in her original configuration, prior to the addition of staterooms to the Texas deck. Note the canvas screens around the forward railings of the saloon and Texas decks, with liferings mounted outside. There are no covers on the lifeboats YA. ALASKA HISTORICAL LIBRARY 4305

Construction of the ships was highly developed and could proceed very quickly, generally using a permanent BYN crew augmented with shipwrights from the coast. The hull consisted of ribs fitted to longitudinal trusses which formed internal keelsons. Where there was substantial loading, for example under the boiler or at the heel of the kingposts, transverse trusses were fitted. All material with the exception of some oak ribs, including the hull planking, is high quality Douglas fir. The depth of the bilge or hull was insufficient to provide adequate rigidity over the length of the entire ship, and so adjustable hog chains were placed over posts which were mounted on the keelsons and extended up through the superstructure. This in effect turned the entire hull into the bottom chord of a truss. The general arrangement of these posts, which was followed on the Tutshi, was to have large posts on the centerline (kingposts) flanked by a smaller system on each side (queenposts); all the posts were angled to place them in compression. Major loads on the hull were concentrated at the stern, where the weight of the wheel and the forces on it were carried on an extended wood frame which was again developed into a small truss and which was as well supported by the hog chains.

Above the hull, the superstructure was kept as light as possible, using a very minimal form of stick construction, with 1 1/4" x 3" cedar "studs", sheathed with 1/2" cedar v-joint on one side.

Deck construction, stanchions, and other structural elements were all kept extremely light, and are, in strictly structural terms, likely underbuilt for the job they are to do. Framing members in the superstructure are for the most part discontinuous, and rigidity, such as there is, relies on the partitioning required for the staterooms. For the most part, the structure has held together very well, with the only obvious deflection being in the area of the clerestory windows in the dining saloon.



5 TUTSHI WITH A BARGE CARRYING Engine 51 to Taku, CA 1921.
Six staterooms have been added to the Texas deck YA R. BROOK COLL
80/49 Temp #29

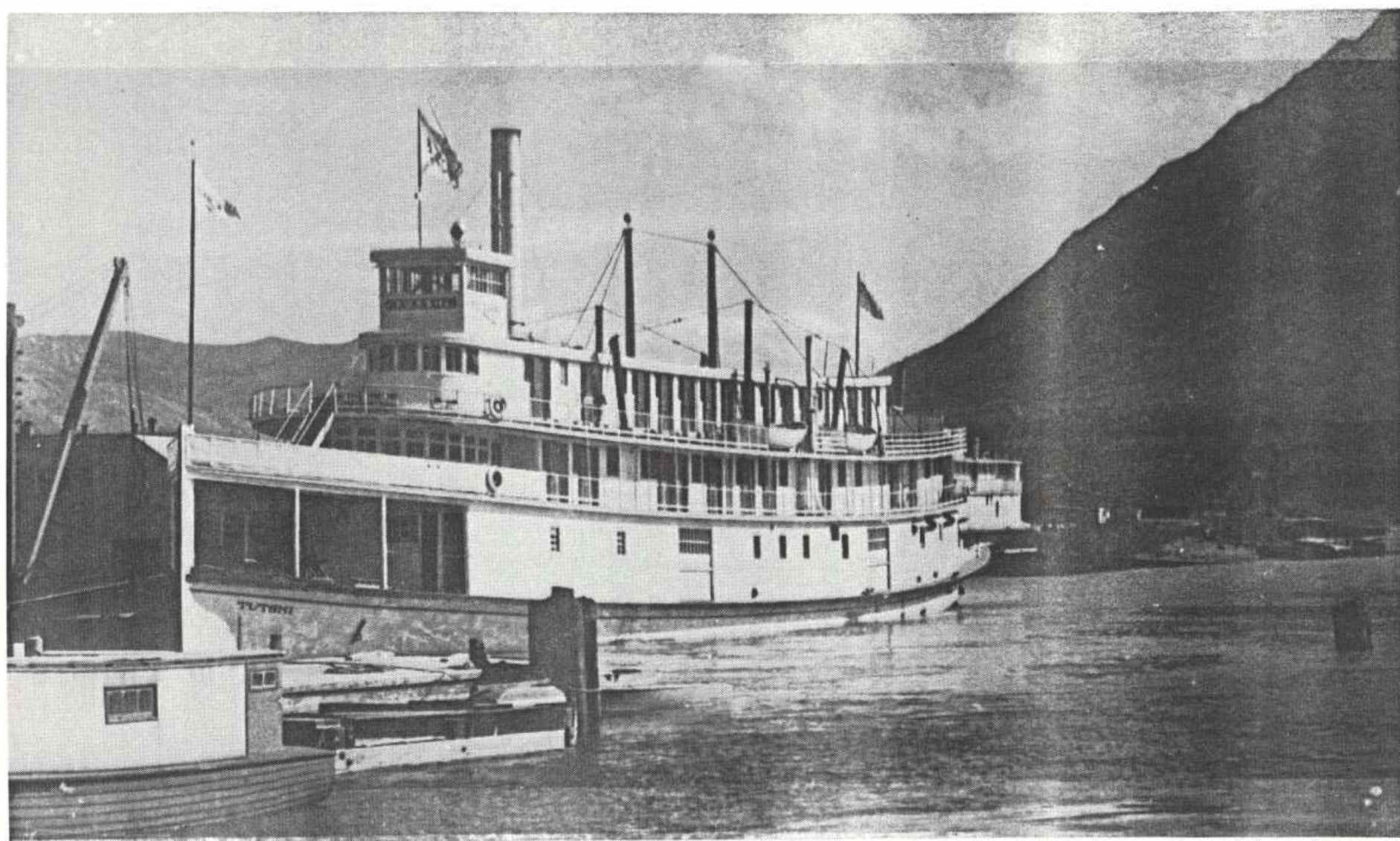
2.4 DESIGN CHANGES

Over the years, the basic design of the Tutshi proved able to accommodate the increase in traffic. Modifications to increase the passenger carrying capability and standard of service were as follows:

- 1920: addition of six staterooms to the Texas deck
- 1922: addition of ten cabins to the rear on the Texas deck and added quarters for the steward's crew on the freight deck. This raised the carrying capacity to 110 passengers
- 1926: addition of two staterooms on Texas deck, extending it the full length of the ship
- ca.1926: crews' quarters enlarged
- ca.1949: forward saloon enlarged, rail and passage around stairs altered

The career of the Tutshi was relatively trouble free. She was grounded for the winter of 1918 , as mentioned above, and in the fall of 1933 was damaged by ice. Eleven hull frames as well as one plank on the water line were broken, with some other planking damaged by the ice. Temporary repairs allowed her to finish the season, and she was then repaired in the spring of 1934. Mechanically she performed well. Repairs and upgrading over the years consisted of the following:

- 1925: Engines converted to burn oil, with two tanks (from the steamer Alaska) installed on the freight deck, and a preheater and oil burner at the firebox. The ship continued to burn wood for standby and startup power. The conversion seems to have resulted in a significant increase



6. TUTSHI AT CARCROSS DOCK, CA 1925. A good view of the canvas covering for the bow railings. Note that the stack is painted buff, without a black band at the top.

in fuel costs, from 57 cents mile in 1924 to 75 cents mile in 1925, but was done to eliminate the noise and disturbance to passengers of refueling at night, and the risks inherent in pulling up to the rocky shores of Tagish Lake to take on wood

- 1926: truss work added under oil tanks;
deck canvas replaced;
four new rudders;
shaft for stern wheel cracked; the repair required taking down and rebuilding the wheel
- 1927: new engines installed: These engines came from the Seattle #3, built in 1898, which had operated on the lower Yukon River until 1924 when it was abandoned at Dawson. The "new" engines, built by the Detroit Engine and Drydock Works effected a considerable saving in fuel costs, from 65 cents a mile in 1926 to 46 cents a mile in 1927. The date of the original engines, manufactured by the Dubuque Iron Works, Dubuque, Iowa, is unknown, but it is probable that they had come from a previous sternwheeler. One possibility is that the engines came from the Tyrell, one of the C.P.R. boats built for the Stikine River. The boiler for the Tutshi came from this vessel.
- 1928: condenser installed;
recaulked, galvanized metal sheathing applied to hull;
hog chains repaired
wheel repaired

- 1929: cylinder timbers strengthened;
toilet facilities increased on saloon deck
repainting superstructure and saloon
- 1930: further repairs to cylinder timber fastenings;
74 new tubes installed in boiler;
insulation added to steam pipes and boiler
heater added to oil pipe line on wharf (the Tutshi
burned a heavy grade of oil which does not flow
readily unless it is heated)
- 1932: king and hog chains replaced with heavier ones;
five pieces of planking replaced, painted and
caulked hull
- 1934: repairs to ways at Carcross; repairs due to
ice damage as described above

2.5 MAINTENANCE

The length of the season was of course constrained completely by the ice free period on Tagish Lake and, to a lesser extent, conditions on Atlin Lake; the ice would generally go out around the first week in June, with service starting as early as May 14 and as late as June 15. Normally, the Tutshi would start service between June 1 to 5. The last run of the season would usually be at the end of October.

At the end of the season, the method of winter storage of the ship appears to have depended on work to be done for the following year. From time to time the Tutshi was hauled up on ways below her present location, using horse drawn capstans; the