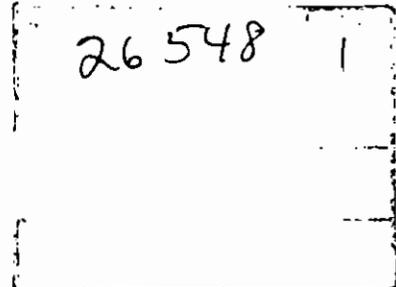


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Technical Note No. TN238
JULY 1970

ENVIROMENTAL SUPPORT OF WATER DOG
TESTS OF LATE OCTOBER 1969 (U)

by
G. B. Austin



REPORT DECLASSIFIED IN ACCORDANCE WITH
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ABSTRACT

(C) In late October 1969, environmental measurements were taken in support of several "Water Dog" tests which were conducted during the hours of darkness on the Apalachicola River near Bay City Lodge, Apalachicola, Florida. The results of the environmental measurements are contained in figures and tables of the report, and a discussion of the relationship between the environment and the detection of swimmers by trained dogs operating from small craft after dark is made. Test-results were favorable in spite of man-generated distractions. The effects of the environment were concluded propitious to swimmer detection.

ADMINISTRATIVE INFORMATION

(U) This work was funded under NRDU-V Project "Water Dog," 104-68, Work Unit PO-9-0110-5 (NOL). The field work was conducted in late October 1969 on the lower Apalachicola River. The results of the environmental measurements taken are documented in order to preserve a record of reference significance. The support and contributions of Lt. J. C. Adkins and Mr. W. H. Tolbert are acknowledged.

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INTRODUCTION

Background:

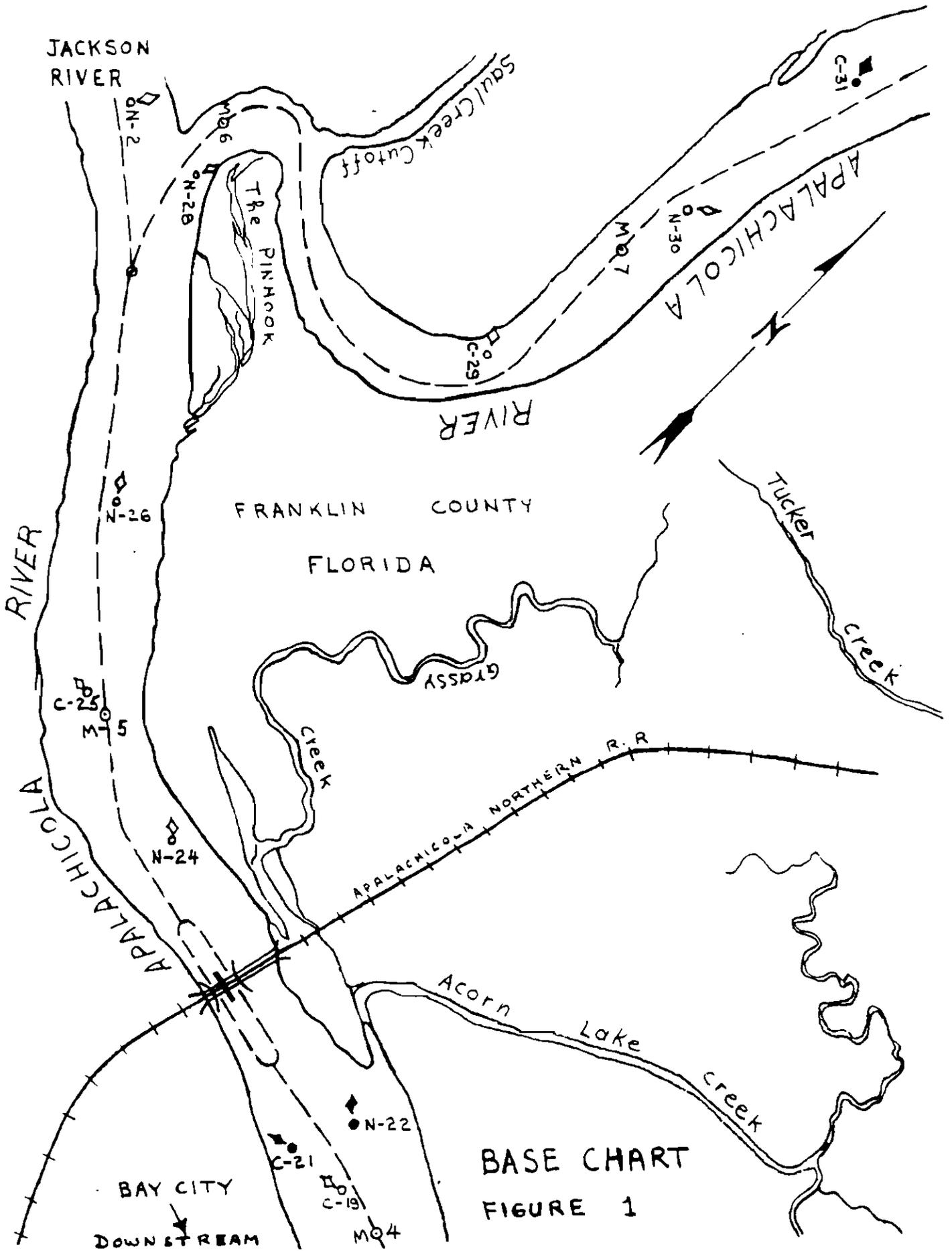
(C) Following a proposal and preliminary investigation by Mr. W. H. Tolbert, a task was implemented at the NSRDL (Panama City) in October 1969 to test the feasibility of detecting swimmers after dark, using trained dogs. The Apalachicola River was selected as a suitable test site to simulate the river environments of southeast Asia. A test utilizing U. S. Navy Swimmers, USAF military dogs and their trainers was designed and implemented which included a requirement to monitor and/or measure the test environment. This report documents the environmental measurement results which were acquired. Several small craft (Navy) were employed in the tests, including outboards. A Navy Utility Boat (U.B. 109) was the base from which swimmers, dogs, their trainers, outboards, oceanographers and other test personnel operated. This craft, approximately 50 feet in length, was usually anchored in mid-stream or moored to the river bank during tests. On a very few occasions, the U.B. 109 patrolled with dogs and trainers in attempts to detect swimmers either in the water or on the river bank. Figure 1 is a Base Chart of the test site showing reference navigation buoys and boat locations during tests, i.e., channel markers C-31 and C-21.

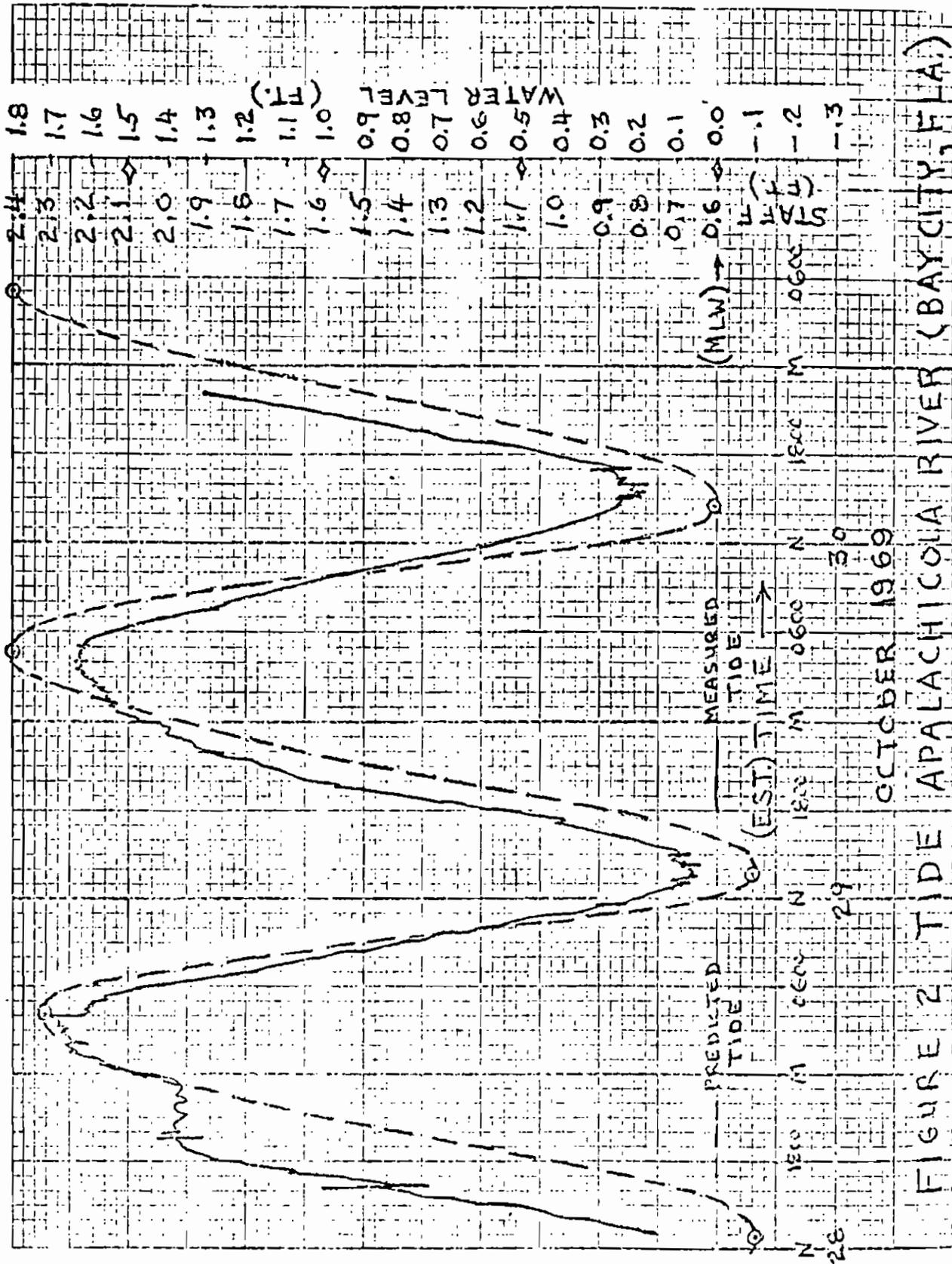
Experimental Setup and Procedures:

(U) Prior to the Water Dog tests on 28 October, a recording tide gage and rainfall meter were set up near the Bay City Lodge. There was no precipitation recorded during the period of testing, and this parameter has been deleted from the tables of environmental measurements. A record of water level changes near mile 3 on the Apalachicola is presented in Figure 2. Time of high and low water coincide fairly well with the predicted times, but the ranges of water level change are attenuated about 20% from the predicted ranges. Tides were of diurnal period. Late on 28 October a water level anomaly appears in the tide record as a step function. The river rose much more rapidly than predicted, stopped rising suddenly and got back in phase, then rose as predicted to the level expected. The cause of the anomaly is not known. It may have been due to wind set-up in Apalachicola Bay and River from the south, or due to an anomalous river discharge triggered upstream at a dam or locks. In any case, it did not appear to affect the Water Dog tests.

(U) Other environmental measurements were taken from the stern of the U.B. 109, at least hourly, while anchored and/or moored to the river bank. The parameters measured in addition to water level and precipitation, included air and water temperature, relative humidity, surface wind speed and direction, and water current speed and direction. Estimates of cloud cover and visibility interpolated from tide prediction tables. (See Table 1)

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(C) Swimmers were transported up or down stream and dropped from small Boston Whaler outboards to simulate attacks on either the U.B. 109 and/or a bridge. Military dogs, each with a trainer (USAF), were used to detect the swimmers from the U. B. or from the bow of a patrolling Boston Whaler small boat. A swimmer, upon a successful attack or upon discovery, would light a flare to show his location with respect to the target. During the simulated swimmer attacks, a dark and quiet boat environment was attempted; however, some smoking of cigarettes and/or cigars was conducted by test personnel and there was some conversation.

(U) Results of environmental measurements are presented chronologically and each set contains a REMARKS paragraph, relative to results of the tests and the measurements which were made.

(U) Instrumentation used in the test measurements included a portable hand-held anemometer, a Marine Advisors portable recording SAVONIUS rotor current meter and mercury-in-glass thermometers were used to measure air, water temperatures and humidity (Sling Psychrometer).

(U) Environmental Data:

(U) STATION "A"

Date: 28 October 1969
Time: 1945 (EST)
Location: Near Buoy 31 (Mile 7.4) Apalachicola River
Visibility: 5+ Miles. (Haze)
Sky Cover: Clear - no clouds
Wind Speed: 0.1 knot - almost calm
Wind Direction: North
Current Speed: 0.5 to 0.6 knots
Current Direction: South-southwest downstream flow (surface)
Tide: Flood Stage, but anomaly in record, slack
Water Temperature (surface): 71.0°F
Air Temperature: Dry Bulb: 66°F, Wet Bulb: 65°F
Relative Humidity: 95+%
Ambient Light: Night, dark, no moon.
Ambient Odors: Cigarette and/or Cigar Smoke, Boat Odors
Ambient Noise: Some talking - conversation

(U) STATION "B"

Date: 28 October 1969
Time: 2045 - 2115 EST
Location: Near Buoy 31 (mile 7.4) Apalachicola River
Visibility: 5+ Miles (Haze)
Sky Cover: Clear - no clouds
Wind Speed: 0.1 knot to 1 knot, gusting
Wind Direction: North, shifting to 045°
Current Speed: 0.5 knot
Current Direction: SSW, downstream flow (surface)
Tide: Flood stage, but at anomaly in record, slack

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Water Temperature (surface): 70.8°F
 Air Temperature: Dry Bulb: 66.0°F, Wet Bulb: 62.0°F
 Relative Humidity: 78%
 Ambient Light: Moon rising, light level up, but dark shadow zones along river bank
 Ambient Odors: Cigarette and/or cigar smoke, boat odors
 Ambient Noise: Some talking and conversation

(S) Remarks: U.B. 109 underway at 2115 to detect swimmer on shore. Two swimmer runs were conducted. On the first run, swimmer boat could be heard. Dogs on U.B. were alerted several times in the direction of noisy swimmer boat. Swimmer drifted downstream, and with the wind toward U.B. 109. Dogs were alerted several times during his drift and swimmer was found with a spotlight approximately 200 yards from the U.B.

(S) For the second swimmer run, the outboard was positioned behind the U.B. Dogs were alerted three or four times during the swimmer's approach to the U.B. Swimmer was not picked by spotlight until approximately 150 yards from U.B.

(S) For the third detection test, swimmer was placed on the beach (river bank) while the U.B. with dogs and trainers aboard, drifted slowly downstream. Detection of man on beach was made by dogs while approximately 150 yards away. Man on beach was actively moving when detected by dogs.

(S) For the last run of the 28th October 1969, a swimmer was placed on the beach, hidden and quiet (not moving) while the U.B. cruised slowly upstream with dogs and trainers. The man was detected from a range of approximately 50 - 75 yards by the dogs.

(U) STATION "C"

Date: 29 October 1969
 Time: 1900 - 1915 EST
 Location: Near Buoy 31 (Mile 7.4) Apalachicola River
 Visibility: 5 miles, thin haze obscuration
 Sky cover: Clear, but high thin stratus and cirro stratus clouds
 1/3 cover
 Wind Speed: 4 - 6 knots, gusty
 Wind Direction: North (000°)
 Current Speed: 0.4 knot
 Current Direction: 240° downstream flow (near surface)
 Tide: Flood Stage, rising
 Water Temperature (surface): 69.9°F
 Air Temperature: Dry Bulb: 65.1°F, Wet Bulb: 60.0°F
 Relative Humidity: 75%
 Ambient Light: Night, dark, no moon, starlight
 Ambient Odors: Cigarette and/or cigar smoke, fuel oil, boat odors.
 Ambient Noise: Much talk, dogs whining, unnecessary noise

(U)

STATION "D"

Date: 29 October 1969

Time: 1950 - 2010 EST

Location: Near Buoy 31 (Mile 7.4) Apalachicola River

Visibility: 5 miles thin haze obscuration

Sky Cover: Cloudy, thin high stratus and cirro-stratus, 1/2 cover

Wind Speed: 6 - 8 knots, gusty

Wind Direction: 030°

Current Speed: 0.3 Knot

Current Direction: 245° downstream flow

Tide: Flood Stage, rising

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(U) STATION "E"

Date: 20 October 1969
Time: 2040 - 2045 EST
Location: Near Buoy 31 (Mile 7.4) Apalachicola River
Visibility: 5 miles, thin haze, obscuration
Sky Cover: Cloudy, high thin cirros, cirro stratus, 1/2 cover
Wind Speed: 5 - 7 knots, gusty
Wind Direction: 030°
Current Speed: 0.3 knot
Current Direction: 270° downstream flow
Tide: Flood Stage, rising
Water Temperature (surface): 69.9°F
Air Temperature: Dry Bulb: 63.5°F, Wet Bulb: 58.0°
Relative Humidity: 72%
Ambient Light: Night, dark, moon rise due but not visible
Ambient Odor: Cigarette, cigar smoke, boat odors, fuel oil
Ambient Noise: Talking, people moving about, unnecessary noise

(S) Remarks: U.B. 109 anchored astern and moored bow to beach near Buoy 31. Bow was aground, stern was in approximately 6 feet of water. Although night visibility appeared good, the boat's spotlight would illuminate water-vapor obscuration. Two swimmers were taken upstream and dropped from outboard to simulate attack on anchored U.B. 109. Dogs were nervous and whining, but alert and barked twice. One swimmer was detected by dogs when approximately 20 to 25 yards from port side of U.B. in water near river bank. Swimmer walking along river bank was detected by dogs when approximately 25 yards from starboard side of U.B.

(S) Two swimmers were dropped for second test run about 2000. Dogs detected swimmer in water on starboard side of U.B. when approximately 10 to 15 yards from boat. Man on the beach was not detected by dogs until he reached the bow line of the U.B. Anchor station was secured at 2050 for a running test.

(S) For third test of 29 October 1969, swimmer was placed on the beach, lying down, quiet, motionless, U.B. with dogs and trainers patrolled slowly downstream near river bank. Swimmer on beach was detected by dogs when approximately 250 yards from the man. Tests secured at 2200 and returned to base.

(U) STATION "F"

Date: 30 October 1969
Time: 1910 - 1925 EST
Location: Near Buoy 21 (Mile 4.2) Apalachicola River
Visibility: 5+ miles, clear, no obscuration
Sky Cover: Clear, no visible clouds, stars out
Wind Speed: 5 knots, steady
Wind Direction: 000° North

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Current Speed: 0.25 knot
Current Direction: 310° NW, upstream flow
Tide: Flood Stage, rising
Water Temperature (surface): 69.4°F
Air Temperature: Dry Bulb: 64.4°F, Wet Bulb: 61.4°F
Relative Humidity: 85%
Ambient Light: Starlight, no moon visible
Ambient Odor: Cigarette and cigar, boat odors, fuel oil, etc.
Ambient Noise: People talking, moving about, dogs restless.

(U) STATION "G"

Date: 30 October 1969
Time: 2000 - 2010 EST
Location: Near Buoy 21 (Mile 4.2) Apalachicola River
Visibility: 5+ miles, clear, no obscuration
Sky Cover: Clear, no visible clouds
Wind Speed: 7 knots, steady
Wind Direction: 010° North
Current Speed: 0.35 knot
Current Direction: 315° Upstream Flow
Tide: Flood Stage, rising
Water Temperature (surface): 69.4°F
Air Temperature: Dry Bulb: 64.0°F, Wet Bulb: 61.0°F
Relative Humidity: 83%
Ambient Light: Night, dark, starlight, no visible moon
Ambient Odor: Cigarette, cigar, boat odors, fuel oil, etc.
Ambient Noise: People talking, moving about.

(U) STATION "H"

Date: 30 October 1969
Time: 2030 - 2050 EST
Location: Near Buoy 21 (Mile 4.2) Apalachicola River
Visibility: 5+ miles, clear, no obscuration
Sky Cover: Clear, no visible clouds, stars
Wind Speed: 8 Knots, gusty
Wind Direction: 030°, NE
Current Speed: 0.45 Knot
Current Direction: 300° (WNW) upstream flow
Tide: Flood stage, rising
Water Temperature (surface): 69.3°F
Air Temperature: Dry Bulb: 64.3°F. Wet Bulb: 61.0°F
Relative Humidity: 82%
Ambient Light: Night, dark, starlight, no visible moon
Ambient Odor: Cigarette, cigar, boat odors, fuel oil, etc.
Ambient Noise: People talking, moving about

(S) Remarks: The U.B. 109 was anchored from bow near Buoy 21 on west side of river, southeast of railroad bridge. The boat swung on anchor approximately 90° from downstream of anchor to upstream of anchor.

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Difficulty was experienced with current meter. Mercury battery was found corroded; cleaned contacts and swapped batteries to get meter operational again. Water depth was approximately 7 or 8 feet. Obtained current measurements from one depth of approximately 4 feet beneath surface. Swimmer detection tests were made at the railroad bridge too distant to observe effects of tests from anchored U.B. 109. Swimmers were dropped from an outboard several hundred yards from the bridge. Two outboards then picked up a dog and trainer each and returned to the bridge to patrol. Two tests believed run during night. Both swimmers detected by dogs on one run. Detection ranges reported 100 and 150 yards. Dogs detected, then tracked or homed boat to the swimmer. On a second run, one swimmer was reported detected by a dog in outboard at 300 yards and dog homed boat to swimmer. The second swimmer reported boat with dog passed within a few feet of him in the water near the river bank without detection. He made the bridge near one bank without being detected, but then proceeded to move to the center span of the bridge and was detected before reaching his goal by a dog in the boat from a range of approximately 25 to 50 yards. The major noticeable environmental difference for this night's tests was the increased wind velocity. Tests were secured at 2100 hours and personnel returned to base.

SUMMARY OF RESULTS AND CONCLUSIONS

(C) Three sets of swimmer detection tests using military dogs at night were conducted on the Apalachicola River in late October 1969. Supporting environmental measurements were made in an attempt to correlate detection performance of the dogs with changes in environmental conditions. The performance of the dogs and their trainers was considered impressive, even though the natural environmental conditions were moderate, that is favorable for detection. It was believed by the author that the noise of talking, moving about the boat and the odors of cigarette smoke could have detracted from the dogs' ability to detect a swimmer from the elevated deck of the U.B. and perhaps there was an effect? There was no test conducted to determine the effect of man-generated distractions. In any case, the dogs performed well in the tests.

(U) Environmental conditions were surprisingly uniform for the three nights of testing; so almost no comparison of these effects was possible. One noticeable exception was in wind speed which was greater on the second and third nights of tests.

(C) Too few tests were conducted to attach any confident statistical significance to the results obtained and which are reported below. "Measured" ranges of detection at night, over water were, at best, poor estimates.

(S) Swimmer detection results for the three sets of tests may be summarized as follows:

Team A - with four trials (some dissimilar)

1. Mean range of detection was 140 yards.

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2. The standard deviation from the mean was ± 57 yards.
3. A conservatively weighted probability of detection was 0.97.

Test B - With five trials (some dissimilar)

1. Mean range of detection was 65 yards.
2. The standard deviation from the mean was ± 103 yards.
3. A conservatively weighted probability of detection was 0.75.

Test C - With four trials (all similar)

1. Mean range of detection was 137 yards.
2. Standard deviation from the mean was ± 122 yards.
3. A conservatively weighted probability of detection was 0.75.

Total of all tests with 13 trials (some dissimilar)

1. Mean range of detection was 110 yards.
2. Standard deviation from the mean was ± 100 yards.
3. A conservatively weighted probability of detection was 0.82.

(C) It appeared that the dogs performed somewhat more effectively from the moving outboard than from the elevated deck of the anchored U.B. 109, e.g., see results of Test B. It is possible that noise and odors from the larger crowded boat distracted the animals, or attenuated their performance. All animals appeared to be able to perform equally well in swimmer detection. The writer had no means of determining individual animal performance; and as far as he knows, no one else kept a record during these tests. The effects of environment upon the dogs' ability to detect swimmers appeared to be minimal from these test results. However, the weather was fair for all nights of testing. Atmospheric visibilities were good, with no precipitation; the sky was clear, water motion was less than 0.5 knot and there was little wind to disturb water surface but sufficient to transport odors. The test nights were dark without moonlight, but even so, there was sufficient starlight to see on the river. In short, it is concluded that the environmental effects encountered were favorable to swimmer detection by the dogs, and that trained military dogs will effectively detect swimmers in the waters of rivers at night.

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