AN EVALUATION OF INTERACTIONS BETWEEN SEA TURTLES AND POUNDNET LEADERS IN THE CHESAPEAKE BAY, VIRGINIA

Final Report

K. L. Mansfield
E. E. Seney
M. A. Fagan
J. A. Musick
K. L. Frisch
A. E. Knowles

Virginia Institute of Marine Science
Fisheries Science Department
P.O. Box 1346
Gloucester Point, Virginia 23062
(804) 684-7313

Submitted to:

National Marine Fisheries Service
Fisheries Science Center/Northeast Region
One Blackburn Drive
Gloucester, MA 01930
Contract #: EA1330-02-SE-0075

October 2002

TABLE OF CONTENTS

I. INTRODUCTION

Every year, thousands of sea turtles seasonally utilize the Chesapeake Bay and coastal waters of Virginia as foraging grounds and developmental habitat. Sea turtles migrate north into Virginia's waters in the spring when sea temperatures warm to approximately 18° C (Coles, 1999). Since 1979, the Virginia Institute of Marine Science (VIMS) has recorded high sea turtle mortalities in the spring of the year when sea turtles first migrate into Virginia's waters. Each year, between 200 and 400 sea turtle stranding deaths are recorded within Virginia's waters. The vast majority of these strandings are juvenile loggerhead (*Caretta caretta*) and Kemp's ridley (*Lepidochelys kempii*) sea turtles. Historic stranding data show that 50.0% to 55.0% of the yearly turtle deaths occur in May and June when the turtles first enter the Bay (Lutcavage, 1981; Lutcavage and Musick, 1985; Keinath et al., 1987; Coles 1999; Mansfield et al., 2002). At the time when stranding counts are highest, mean water temperatures range between 18° and 22° C (Coles, 1999). Kemp's ridleys also have an additional peak in strandings in the fall (October and November) when temperatures begin to drop (Lutcavage and Musick, 1985; Coles, 1999).

Despite research efforts over the past 24 years, many questions still remain regarding the sources of spring mortalities. State stranding counts have risen steadily over the last ten years (Mansfield et al., 2002). This increase may in part be due to either intensified fishing interactions, an increase in the sea turtle population. To address this problem, VIMS, under contract and supplemental funding from the National Marine Fisheries Service and Virginia's Commercial Fishing Advisory Board, conducted aerial, surface and sub-surface fisheries surveys and aerial sea turtle population surveys in the Chesapeake Bay during the 2001 season. This work continued during the 2002 season with VIMS conducting a series of surveys including aerial sea turtle population assessments and side scan sonar surveys of the Bay poundnet fishery. The objectives of this study were two-fold:

- To provide NMFS with near real-time data on marine turtle interactions with poundnet leaders in the Chesapeake Bay waters of Virginia;

- To conduct side scan sonar surveys of poundnet leaders in order to collect and provide near real-time data on the presence of entangled sea turtles in Virginia's Chesapeake Bay waters.

In addition to these objectives, with NMFS support, VIMS also conducted aerial surveys in the Chesapeake Bay, Virginia to document the location of sea turtles and fishing gear deployment during the spring. The collection of these aerial data was a result of a no cost extension from the FY01 contract (Contract #: 43-EA-NF-110773).

To date, there is no sea turtle take limit established for the poundnet fisheries in Virginia and Maryland. Therefore, no takes are permitted in either state. In order to quantify the level of take occurring within the Bay poundnet fishery, real-time monitoring of sea turtle mortalities and direct assessments of fishery-induced mortalities is necessary. Poundnets typically do not target any particular species of fish. They are passive fishing devices that fish swim into and become trapped within. Sea turtles may interact with these nets in two ways: sea turtles are known to swim into these nets to feed (Lutcavage, 1981; Lutcavage and Musick, 1985) and they have been observed entangled within the larger meshed leaders (Musick et al., 1984; Bellmund et al., 1987). Once inside a pound, turtles are trapped and must be released by the fisherman. The pound itself is a bowl-shaped small meshed net similar to a live well that is open at the surface, allowing trapped turtles to surface and breathe.

Understanding sea turtle mortality due to poundnet interaction is a current priority within the National Marine Fisheries Service (NMFS) Northeast Region. Many of these larger mesh nets are set in the lower Chesapeake Bay, along the southern tip of the Eastern Shore where currents are strong. These nets may entangle turtles when they first enter the Bay in the spring. They may also trap dead, floating turtle carcasses that drift into the Bay with the tides and currents. This is a region where high numbers of sea turtle mortalities are recorded annually. At the time of the spring immigration, many of the turtles are emaciated and weak (Bellmund, 1988) and may have difficulty navigating around nets. Historically, these mortalities drop off substantially by the middle to end of June. Turtles tracked via radio telemetry in the summer and fall were able to forage around the nets with little threat (Musick et al., 1984; Byles, 1988).

In the early 1980's when VIMS was contracted to study poundnet-turtle interactions, there were over three hundred active poundnets in the Virginia mainstem of the Chesapeake Bay. Studies conducted in 1980-1981 concluded that between 3% and 33% of the sea turtle mortalities in Virginia could be attributed to poundnet leaders (Bellmund et al., 1987). This work determined that larger mesh nets (defined as >12 inch stretch) were more likely to entangle turtles than smaller mesh nets (< 12 inch stretch) (Musick et al., 1984). Subsequent work conducted in 1983-1984 examined sea turtle mortalities in relation to leader mesh size. A combined total of 211 poundnets were observed in 1983 (n=113) and 1984 (n=98) within the Western Chesapeake Bay alone (Bellmund et al., 1987). Between these years, 173 of the nets examined were large mesh nets (defined as >12 inch stretch) and 38 had string leaders (Bellmund et al., 1987). This work concluded that turtle entanglement was insignificant in smaller mesh (<12 inch stretch) leaders (Bellmund et al., 1987). The type of net that contributed most to sea turtle mortalities in the mainstem Bay were string leaders followed by large mesh (> 12 inch stretch) leaders (Bellmund et al., 1987).

Based on the 2000 and 2001 poundnet surveys, the current number of poundnet stands found in the mainstem Bay (Virginia waters) ranges between 70 and 80 stands, with even fewer active at any given time. During the 2000 and 2001 seasons, there were approximately 20 large mesh nets (> 12 in stretch) in the entire mainstem Bay—a drastically reduced number of large mesh nets compared to the 1980's. Yet, VIMS has recorded a steady increase in sea turtle mortalities in Virginia over the past eight to ten years. The surveys conducted by VIMS and NMFS during the 2001 and 2002 seasons attempt to assess current sea turtle bycatch mortalities associated with Bay poundnets.

In addition to determining bycatch mortalities, it is also imperative that the status and condition of existing sea turtle stocks be understood (TEWG, 2000). During the early 1980's, VIMS' mark-recapture population modeling indicated that approximately 3,000 sea turtles inhabited the Bay each year (Lutcavage, 1981; Lutcavage and Musick, 1985). Due to sampling size and the possibility that some assumptions associated with the population model may not have been met, this number was deemed a minimum estimate.

The VIMS Sea Turtle Research Program has used aerial surveys to determine relative abundance and seasonal distribution of sea turtles found in Chesapeake Bay and coastal waters (Byles, 1988; Keinath et al., 1987). Aerial surveys conducted between 1982-1985 and 1994 indicated that 6,500 to 9,700 and 3,000 turtles respectively are found in Virginia's lower Bay waters in any given season (Byles, 1988; Musick et al., 1984; Keinath, 1993). Turtles were recorded only if found observed at the surface or within the first meter of the water column in order to reduce biases associated with seasonal changes in water clarity or sea state (all surveys were conducted when sea states were less than Beaufort force 3) (Byles, 1988). Population estimates were based on the number of aerially observed sea turtles extrapolated to account for the entire Chesapeake Bay. Estimates were adjusted to reflect surfacing times and diving behavior. The largest numbers of sea turtles were observed during the spring of the year. This may be due to greater sea turtle abundances occurring within the spring, differences in surfacing behavior of the animals in the spring vs. summer/fall, all possibly biasing observer counts and resulting in lower estimates of the turtle population later in the season.

Sea turtle population estimates for the Chesapeake Bay have not been consistently quantified in over ten years due to lack of available funding. Surveys were reinstated during the 2001 season and the distribution of sea turtles 2001 was consistent with the distribution of sea turtles observed during VIMS turtle surveys in the 1980's. The highest number of turtles observed were within the spring months and located within the lower Bay, corresponding to the time when turtles are first migrating into Virginia's waters Mansfield et al., 2002). Minimum estimated sea turtle densities (uncorrected for diving behavior) were greatest in June (0.147 turtles/km^2 +/- 0.022 turtles/km^2 standard deviation) and declined over the course of the season within the lower Bay (Mansfield et al., 2002). Highest average densities were also observed in the upper Bay during June (0.080 turtles/km^2 +/- 0.054 turtles/km^2). The lower Bay population estimates, behaviorally corrected for densities and spatially extrapolated, ranged between 549 turtles in early October, to 5,169 turtles the second week of June (Mansfield et al., 2002). Upper Bay estimates ranged between 418 and 5,404 turtles (Mansfield et al., 2002). It is important to note that the 2001 surveys did not begin until after the stranding season had begun, due to available funding and inclement weather conditions. It is possible that we may have missed the peak week in relative turtle abundances. These data should also be considered a minimum estimate of turtles found within the Chesapeake Bay in 2001 due to biases associated with the methods used. This report, to conclude the FY01 contract (Contract #: 43-EA-NF-110773), provides current estimates of sea turtle standing stocks in the Chesapeake Bay from aerial surveys conducted during the 2002 season.

II. METHODS:

Sea Turtle Strandings:

Dead or live stranded sea turtles throughout the state are reported to VIMS or a network cooperative. All stranded turtles that network participants respond to are identified as to species and size class (adult or juvenile). Turtles are measured (carapace, plastron and head) and when possible, necropsied. Muscle tissue, Kemp's ridley flippers, and fresh heads were collected for various NMFS-related studies, and gut content samples were collected from relatively fresh carcasses for later examination by VIMS. The relative condition of each animal is also determined based on a standardized condition index established by NMFS:

0 = Alive
1 = Fresh Dead
2 = Moderately Decomposed
3 = Severely Decomposed
4 = Dried Carcass
5 = Skeleton, Bones only

Sea turtle stranding locations were divided geographically into five regions: Western Bay, Eastern Shore-Bay, Eastern Shore-Ocean, Virginia Beach-Ocean and Southern Bay (Figure 1). Bay and ocean regions are divided by the Chesapeake Bay Bridge Tunnel—regions east of the Bridge Tunnel are considered ocean, and west of the tunnel, Bay.

Side Scan Survey:

A *Marine Sonics Technology* side scan sonar system was used to scan poundnet leaders and gillnets for sub-surface sea turtle entanglements. A 900 kHz side scan sonar tow fish was used, providing high-resolution digital sonar data, with a resolution of 0.1 meter. All sonar images were processed by an on-board computer, providing real time data management and storage. The system operated on a *Microsoft Windows* based program for ease of data management while a side scan review program (Sea Scan PC Review 2.0) allowed for post-processing and viewing of all survey sites.

Beginning May 15, 2002 all poundnets in the main-stem Chesapeake Bay were scanned early in the sea turtle residency season to establish a base-line image of each net. The sonar was towed at a depth of one meter, a speed of 2.0-3.5 knots and a distance of 10 to 20 meters from the net. Gain settings varied based depth of net and sea conditions. Range settings were set at 20 meters. Depth and navigation permitting, scans were conducted along both lengths of the net—typically along the up current and down current sides of each net. Leader poles were counted during scans, and the location, indicated by pole number, of any acoustic signature similar to that of a sea turtle was recorded. Once the scan was complete, potential sea turtle signatures were verified by returning to the target's location along the net and recording any objects present at surface or at depth. Objects at depth were verified with a Sea Viewer Black and White 550 Sea-Drop underwater video system with halogen lighting.

Each net was monitored throughout the season until June 30, 2002, weather and sea conditions permitting. Subsequent scans were compared to archived base-line images of each net to determine the presence of potential acoustic targets—particularly at depth, below the level of visibility. Nets found along the southern Eastern Shore were monitored on a weekly basis beginning mid-May and continuing throughout the survey period.

Aerial Monitoring:

Aerial surveys were conducted based on the protocol established by VIMS (Byles, 1988; Keinath et al., 1987; Keinath, 1993) in the 1980's. Due to inherent biases associated with aerial surveys (glare, sea state, observer differences), in order to best compare current turtle densities and estimates to those in the 1980's we opted to replicate the older methods, reducing biases associated with changes in observer efficiency. Surveys were flown in an over-wing aircraft (Cessna XP II) at an altitude of 152 m, and at a speed of 130 km/hr. Sixty east-west transect lines were established over the Virginia portion of the Chesapeake Bay. The locations of these lines were based on the locations of the lines used in the 1980's (Keinath et al., 1987). Two sub-regions were established with thirty transects falling within the Lower Bay region and thirty within the Upper Bay region (Figure 2). All transect lines fall within suitable loggerhead sea turtle habitat: no more than five miles up a tributary and in waters deeper than three meters.

Eight lines were randomly chosen for each survey, four within the Upper Bay region and four within the Lower Bay region. These transect lines were flown with the aid of a GPS unit. Surveys were flown once a week once a week between May 1 and July 31, 2002, weather and sea state permitting. Two trained observers, one on each side of the plane, scanned the sea surface for turtles, marine mammals and fishing activity. The time was recorded at the start of each transect line. Each transect took between 12 and 20 minutes to complete. Transect lines flown were spaced far enough apart that the likelihood of a turtle swimming at higher known velocities (3.5 km/hr) counted subsequently within two adjacent transect lines is negligible (Byles, 1988). When an animal or fishing activity was sighted, the following were recorded:

- Sighting angle from the transect line;
- Time and date of observation;
- Species/Activity (and number);
- Weather, sea state; solar glare.

Time at the end of each transect was also recorded. The time that an animal or activity was observed was converted to distance along the transect line through back calculation, determining its location along the transect. The sighting angle, recorded with the use of Suunto inclinometers, was used to determine whether the animal/activity falls within the effective visual swath adjacent to the transect line, abeam of the airplane. The distance each animal/activity was from the transect line was recorded as an angle of degree. GPS units were not used to record the location of objects sighted since the airplane's electronics, located above the observer seats, often disrupted satellite signals and reliable location data were not consistently available.

Byles (1988) and Keinath (1993) estimated population densities using strip transect methodology. This method assumes that all turtles are counted within a given distance from each transect line, and that any turtles falling outside of the census area are not recorded. Both Byles (1988) and Keinath (1993) determined that the effective visual swath within which the peak sighting efficiency occurs is between 50 meters (18º) and 300 meters (63º) from the transect line (Musick et al., 1987). Over 90% of all sea turtle sightings occur within this range (Musick et al., 1984). Thus, the visual swath being surveyed (250 meters on either side of the plane) combined with transect length, allows for the calculation of minimum surface density estimates using strip transect analysis (Byles, 1988; Musick et al., 1987). Minimum sea turtle densities are determined using the following equations (Keinath, 1993):

$$\mathbf{D = N / A} \qquad \text{Eq. 1}$$

where: D = density of sea turtles observed
N = Total number of turtles observed
A = Area surveyed (km^2)

and:
$$\mathbf{A = (O \times W) \times L} \qquad \text{Eq. 2}$$

where: O = Number of observers in the plane
W = width of survey area (km) per observer
L = Length of survey transect (km)

or:
$$\mathbf{D = N / (0.5\ km \times L)} \qquad \text{Eq. 3}$$

Using radio telemetry data, Byles (1988) determined that loggerhead sea turtles spend approximately 5.3% of their time below the sea surface while resident in the Bay during the summer and fall months. Aerial survey observations only record those animals at the surface or within about one meter of the surface. The minimum density estimates must be multiplied by a correction factor in order to account for turtles below the observed sea surface. The correction factor is determined based on the ratio of time spent below the surface to time at the surface. The ratio used by VIMS for summer and fall estimates is 18.7:1 (turtles below surface to turtles at surface) (Musick et al., 1984; Byles, 1988). Thus, in order estimate the total number of turtles within the flight path, the following equation was applied:

$$\mathbf{D_{corr} = 18.7 \times D} \qquad \text{Eq. 4}$$

where: D_{corr} = Turtle density corrected for dive behavior

Densities were then determined for the lower Bay and upper Bay regions by extrapolating the corrected densities to the entire study region:

$$\mathbf{P = D_{corr} \times A_{tot}} \qquad \text{Eq. 5}$$

where: P = Estimated turtle population
A_{tot} = Total study area (km^2)

Areas for the Upper Bay and Lower Bay survey area (within the 3 meter depth contour) were calculated from distances and area recorded in ArcView 3.2 (Mercator projection).

RESULTS:

2002 Sea Turtle Strandings:

Managed by the Virginia Institute of Marine Science, the Virginia Sea Turtle Stranding Network has documented high sea turtle mortalities occurring in the spring of each of the past 24 years. In 2002, five strandings occurred during January and February, and the first stranding of the spring occurred on April 21, nearly a month earlier than in 2001 (Figures 3-6). However, the water temperature was similar to that at the time of the first strandings during other years (Coles, 1999; Mansfield et al., 2002). The mean sea surface temperature recorded at VIMS on April 21 was approximately 19^{o} C and mean temperatures had increased to over 25^{o} C by mid-June (Figure 7). From January 1 to October 19, 2002, a total of 289 sea turtle strandings were recorded in Virginia. During this same time period during 2001, 375 of the year's 395 strandings had occurred (Mansfield et al., 2002).

The strandings recorded through October 19, 2002 were comprised of 232 loggerheads, 30 Kemp's ridleys, 12 leatherbacks, 4 green turtles, and 11 unidentified turtles (Figures 5, 8a). The majority of the Kemp's ridley strandings (21) occurred during the month of May (Figure 5). None of the state's stranding regions arose as a clear "hotspot" during the spring and summer of 2002 (Figures 4, 8b). Strandings on the Oceanside of the Eastern Shore represent 23.9% (69) of the 289 strandings, while those on the Bayside of the Eastern Shore account for 22.8% (66). The Oceanside of Virginia Beach, the Western Bay, and the Southern Bay account for 28.0% (81), 13.5% (39), and 11.8% (34), respectively, of the current 2002 total (Figure 9). As seen in Figure 4, the Western and Southern Bay regions experienced in increase in strandings during mid- to late-May and a similar increase occurred along the Oceanside of Eastern Shore during the beginning of June. The majority of the strandings occurring to date in September and October were on the Oceanside of Virginia Beach (31 out of 46 turtles). Figure 6 indicates increased states of decomposition later in the stranding season, as was also seen in 2001 (Mansfield et al. 2002). A large number of fresh dead and moderately decomposed strandings along the Eastern Shore Oceanside during June 2 – 8 account for the slight departure from this trend seen during that week.

Although the majority of the strandings (236) encountered were either moderately or severely decomposed (Figure 8c), injuries and other abnormalities were noted when possible (Figure 10). Of the 289 strandings, 72.7% (210) had no obvious wounds or abnormalities or were too decomposed to examine thoroughly. Four of the five strandings from January and February were probable cold stuns and two of these turtles were later released alive. Of the remaining strandings, eight were either entangled in fishing gear or showed signs of constriction marks, six had gaff-like wounds, three had ingested anthropogenic items (hook, light stick, or fishing line and plastic), six had indications of health problems (cataracts, emaciation, dehydration, or internal infection), and 52 had wounds resembling a boat strike or crushing injury.

Three loggerheads and two Kemp's ridleys were found entangled in poundnet leaders by NMFS alternative platform observers (Mike Tork, pers. comm.). These turtles were transferred to the stranding network for examination and necropsy. Four of these turtles were fresh dead (all loggerheads and one ridley) and one was moderately decomposed (one ridley). The ridleys and two loggerheads were from the Kiptopeke area along the Eastern Shore Bay, and one loggerhead was from the New Point Comfort area along the Western Bay. Two additional loggerheads were observed to have floated into poundnet leaders post-mortem (not entangled). These turtles were examined by the stranding network and included in the stranding data. Finally, two live leatherbacks were disentangled from crab pot lines in the York River mouth and in Mobjack Bay (Western Bay).

Side Scan Sonar Survey:

Between the dates of May 15 and June 30, 2002, all poundnets with active leaders (n=63) in Virginia's main stem Chesapeake Bay, and approximately five miles up river of the major tributaries, were scanned by sonar. Due to the size of the Bay and length of time necessary to survey all gear within the Bay, individual surveys were performed in each of the stranding regions, with a concentrated effort during the peak stranding period along the Eastern Shore Bay per the request of the National Marine Fisheries Service. This region experienced higher than normal strandings along its beaches between May and early June 2001 and typically has a concentration in strandings during the first weeks of the Bay sea turtle residency season. Unless depth of water prohibited access, all nets were scanned lengthwise along both sides of the net. Survey efficiency was very high: each net took approximately four to five minutes per side to scan at a tow speed of 2.0 to 3.5 knots. With one exception, a baseline image for each active poundnet stand located within the mainstem Chesapeake Bay was recorded and digitally archived (Appendix A). One net (license 2002-187) was in very shallow water and could not be scanned by the sonar, however it was visually checked by boat. Another net (license 2002-188) was successfully scanned by sonar but the digital files were corrupted and could not be archived successfully. This net was subsequently observed by boat due to low tides at time of follow-up surveys. Both nets were located off of Fisherman's Island off the Eastern Shore. A total of 1848 images (baseline and follow-up) were archived for the remaining 61 of the 63 active poundnet leaders surveyed. For each net, between four and ten images were recorded per scan (the number of images archived varied based on length of net). Most nets were scanned at least twice (four nets were scanned only once due to their nets being pulled early in the season) with Eastern Shore Bay nets and southern Western Bay nets observed at least three to six times. Survey frequency depended upon weather, sea state and need based on stranding events, as well as boat availability. The primary research vessel was grounded for ten days in May for repairs and the average sea state for the month of May was 2-3 feet throughout most of the Bay.

Scans of Bay poundnets indicated that various species of algae, seagrass and other detritus may imitate the signature of sub-surface sea turtle entanglements. The majority of the detritus, however, was found floating along the surface of the nets and video images of targeted objects allowed for visual verification of objects at depth. No sea turtle acoustic signatures were observed via side scan or video during the baseline or follow-up surveys. One turtle was found to have floated into a string leader off Newpoint Comfort however this turtle was floating at the surface, was severely decomposed and appeared to have floated in post-mortem. Side scan images of this turtle were processed and measurements made via imaging software were within approximately two inches of the actual carapace measurements recorded. A dolphin was also found in a Lynnhaven net and reported to the Virginia Marine Science Museum (state mammal stranding coordinators). Signs of struggle and entanglement were apparent on the carcass. Other by-catch included cownose rays, juvenile sharks and pelicans.

Aerial Monitoring:

Eleven population surveys were flown between May 1 and July 31, 2002. Population surveys began the first week of May and continued weekly, weather permitting, until the end of July. Eight transect lines were flown on each survey, with the exception of the first two surveys in May and June 20 when only lower Bay transects were flown (four total) due to either the turtles not having entered Bay waters or poor weather conditions. Additionally, only six transects were flown June 11 (four lower Bay and two upper) due to deterioration in weather and sea conditions. Transect length within the 3m-depth contour ranged between 23.82 km and 45.58 km, with survey area ranging between 10.74 km^2 and 21.00 km^2 per transect. Total survey area for the lower Bay was 636.61 km^2 and 507.50 km^2 for the upper Bay, however fewer flights were flown in the upper Bay than the lower. Estimates of total area for the entire lower and upper Bay regions were determined in ArcView 3.2 to be 1,529.36 km 1,879.41 km^2 and 1,879.41 km^2 respectively (Mercator projection).

Sea turtles were not observed in the Bay until the third survey in May (May 24). The majority of turtles initially sighted in the spring of the year were located within the upper Bay region. Within the week between the second (May 15) and third (May 24) survey of May, turtles may have moved well up into the Bay. Most turtles observed were found between 50 and 300 to 350 meters from the transect line (Figure 11), and no more than 500 meters from the transect line. Turtles falling outside this range were eliminated from the analyses. Minimum estimated sea turtle densities (uncorrected for diving behavior) were greatest in the last half of May and first two weeks of June and declined over the course of the season within the upper Bay and lower Bay with the exception of the July 17 survey (Figure 12). Per lower Bay survey, average densities ranged from 0.017 turtles/km^2 (+/- 0.035 turtles/km^2) in July to 0.137 turtles/km^2 (+/- 0.099 turtles/km^2) in June (Table 1). Upper Bay densities (per complete survey) ranged from 0.013 turtles/km^2 in July to 0.229 turtles/km^2 in the first half of June (Table 1). Based on negative biases associated with strip-transect analyses and sea turtle sightability, these densities must be considered as minimum estimates.

Extrapolated population estimates factoring in area surveyed and turtle surfacing behavior were calculated for the purposes of comparison with aerial survey work from the 1980's. Variance associated with the surfacing behavior correction factor is not apparent from available literature. As part of VIMS' future research, these estimates will be recalculated to include descriptive statistics, and incorporate radio tracking data from the 2002 season including a quantification of seasonal surfacing patterns. Thus, for the purposes of this study, our extrapolated population estimates may only serve as a relative index of abundance in relation to the work presented in the 1980's. The Lower Bay population estimates, behaviorally corrected for densities and spatially extrapolated, ranged between 506 turtles in early July, to 3948 turtles the third week of July (Table 1). Upper Bay estimates, excluding June 20, ranged between 459 and 8118 turtles (Table 1). Population estimates were highest in late May and mid-July (Figure 13).

Surveys conducted by VIMS in the mid-1980's were concentrated within the lower Bay. 2002 surveys recorded a total of 33 turtles over time within an observed area of 636.61 km^2, resulting in an unadjusted average density of 0.052 turtles/km^2. With the behavioral adjustment, this is increased to an average of 0.983 turtles/km^2, resulting in an extrapolated average population estimate of 1844 turtles for May through July, 2002

(Table 2). The lower Bay area surveyed in 2001 and 2002 is larger than that surveyed in the mid-1980's by approximately 146 km^2. Mean population estimates between 1982 through 1985 and 1994 ranged between 3,068 turtles to 9,743 turtles in the lower Bay (Table 2).

Gillnet activities were minimal during the months of May through July. No more than one to five nets were observed per survey within the defined survey strip (Figure 14). Only one menhaden boat was observed and occurred in the upper Bay region. Crab pots were observed throughout the Bay, blanketing Bay shorelines out to a depth of approximately ten meters. Due to the density of crab pots within the Bay, it was not possible to record every single pot within the strip transect. Distances of crab pot densities from or to shore were back calculated from the time of observation of the last pots from shore, or first observed pots heading to shore along each transect flown (Appendix B). The distribution of crab pots in the Bay generally complied with the newly established Marine Protected Area and Corridor (MPAC) for the Bay's blue crab spawning stock, or "crab sanctuary". Recreational and commercial fishing boats were also observed throughout the Bay (Figures 15-16). Recreational fishing vessels were predominantly hook and line fishers and were often found in association with converging water masses/fronts. Commercial fishing boats, not including menhaden boats, were primarily comprised of crabbers (Appendix B, Figures 15-16) and located mostly outside the "crab sanctuary", within the 10-meter depth contour of the Bay.

Marine mammals were also observed during surveys. All mammals observed were a species of dolphin, most likely the bottlenose (*Tursiops truncatus*). Distribution of mammal sightings is provided in Appendix C. Most mammals were sighted during the first half of the summer and in highest concentrations in the lower Bay region. Mammal sightings ranged from one individual up to a group of five or more.

DISCUSSION:

The number of confirmed sea turtle strandings recorded in Virginia between January 1 and October 19, 2002 (n=289) represents a decline of 86 strandings compared to the same time period for the previous year (n=375). Annual sea turtle strandings numbered from 150 to 300 between the years 1992 and 2000 (Mansfield et al., 2001), and it is likely that the total for 2002 will also fall into this range. Although this year's strandings started earlier in the spring, the overall pattern of strandings is consistent with historical patterns. This includes a large peak occurring between mid-May and June followed by a low level of strandings for the remainder of the summer (Lutcavage, 1981; Lutcavage and Musick, 1985; Keinath et al., 1987; Coles, 1999). Increasing levels of decomposition throughout the stranding peak are similar to data from years past (1999-2001, Mansfield et al. 2002) and the mean sea surface temperatures at VIMS at the time of the first spring strandings (18^o C) are also consistent with historical stranding events (Coles, 1999). An increase in strandings outside of the Chesapeake Bay, particularly along the Oceanside of the Eastern Shore coincides roughly with York River mouth mean surface temperatures near or in excess of 25^o C (Figures 4 and 7). Shifting winds appear to be somewhat responsible for rapid changes in stranding distributions within the Chesapeake Bay, particularly during late May and early June (Figure 17).

Wounds, illnesses, or other abnormalities were noted for 27.3% (79) of the January through October 19, 2002 strandings. Of these turtles 52 (18.0% of current annual stranding total) had wounds indicative of a boat strike or other crushing injury. Only eight strandings showed indications of entanglement or constriction marks. An additional five turtles were examined that had been incidentally caught in poundnet leaders, and two live leatherbacks were freed from crab pot lines. As such, entanglements (or constriction marks) account for 2.8% (8 out of 289) of the current stranding total, and for 5.1% (15 out of 296) of all turtles (stranded and incidental) examined by the Virginia Sea Turtle Stranding Network. It should be noted that a large number of turtles were severely decomposed, reducing examiners' ability to determine probable cause of death. The stranding numbers reported here do not represent the entire 2002 stranding season. The annual stranding total is anticipated to be somewhat larger by the end of 2002. Additionally, only cursory observations are usually recorded in reference to the health of stranded turtles, and as such, health-related issues cannot be ruled out with regards to sea turtle mortalities.

Side scan sonar surveys have strong potential in assessing sub-surface entanglements of sea turtles within fixed gear fisheries. As in 2001, no sub-surface sea turtle entanglements were observed in any net surveyed. Though these surveys provide a relatively efficient way to observe for sub-surface entanglements, they are limited by weather and sea conditions. Successful surveys occurred when the sea state was relatively calm since suspended sediments (due to wave turbulence) are reflected acoustically by the sonar. Thus, monitoring frequency may be limited by weather conditions as was experienced during the month of May 2002. The size of the Bay coupled with the geographic distribution of nets also limited the frequency of monitoring particular regions. While we concentrated our efforts primarily in the lower, eastern Bay in 2002, considerable time was spend surveying geographically dispersed, small mesh nets in the Western Bay that may not pose as great a risk to turtles as other nets in the lower Bay. Thus, it is recommended that targeted areas of concern (i.e. lower Eastern Shore, bayside) be monitored with a greater concentrated effort in the future; nets with very small mesh leaders found in the upper Western Bay or northern region of the Eastern Shore (bayside) could be monitored with less frequency or, perhaps by boat or airplane. Daily sea surface patrols of poundnet leaders within targeted stranding regions should continue to be performed in order to best assess actual surface entanglement rates, particularly in the spring of the year.

Aerial strip transect method risks a negative bias in density calculations since this method assumes that all animals are seen and recorded within the survey strip. Turtles observed just outside the study swath must also be eliminated from the analysis. Thus, strip transect methods may only provide minimum density and population estimates. However, on a management level, underestimating the endangered/threatened turtle sub-population in Virginia is less detrimental than overestimating the population.

The distribution of sea turtles over time in 2002 was less consistent with the distribution of sea turtles observed during the 2001 season and previous VIMS turtle surveys. This may in part be due to poor survey conditions. Winds and sea state were higher in 2002 than 2001 and the probability of aerially observing turtles at the sea surface may have been somewhat reduced. Consistent with previous surveys, the highest number of turtles observed were within the spring months and located within the lower

Bay, corresponding to the time when turtles are first migrating into Virginia's waters. These higher numbers may be associated with a) a concentration of turtles moving into the Bay during the initial weeks of their residency period, after which they are found more evenly distributed within the upper and lower Bay; b) differences in surfacing behaviors in the spring months vs. warmer summer moths; and/or c) some turtles entering into the Bay as a stop-over place to feed along their migration route to northern summer foraging habitats. Most turtles observed during the early part of the residency season this year were found in the upper Bay, however Bay temperatures warmed rapidly this year, particularly between May 20 and 27 (Figure 7). Within the week between the second (May 15) and third (May 24) survey of May, turtles may have moved well up into the Bay. Regardless, most strandings also initially occur within the lower Bay region during this timeframe. Fishery-based management strategies should prioritize the lower Bay fisheries over upper Bay fisheries in the early spring. Adjusted estimates were higher in the early spring surveys this year compared to last year. However, we may have missed the peak of turtles last spring due to inclement weather and timing of surveys (Mansfield et al., 2002), thus potentially biasing comparisons of early spring population estimates between 2001 and 2002.

Aerial population surveys only record sea turtles visible at the surface of the water, requiring that a correction factor be applied to turtle observations in order to estimate population densities. The distribution, biology and behavior of sea turtles are strongly linked to the thermal regimes of a turtle's environment (Spotila et al., 1997). Byles' radio and sonic tracking work in the 1980's indicate that sea turtles spend approximately five percent of their time at the surface while foraging in the Bay during the summer months (Byles, 1988). However, surfacing behavior may vary with season (Keinath, 1993), particularly early in the springtime when sea temperatures are lower and waters are more stratified. To improve estimates of regional abundance from surface densities, VIMS is currently conducting radio tracking experiments to determine the amount of time turtles are visible on the sea surface throughout their residency in Virginia waters—particularly during the spring season. Determining whether sea turtles exhibit a difference in their inter-seasonal diving behaviors will help determine their vulnerability to different fishing/commercial gears, affecting incidental takes of turtles in near-shore fisheries. Past aerial correction factors for surfacing behavior were calculated only for loggerhead sea turtles—potentially biasing population estimates that would include Kemp's ridleys (previous aerial surveys did not distinguish between species). Radio tracking conducted by VIMS in the spring of 2002-2003 will help determine the correction factor necessary for turtle densities calculated seasonally and by species.

Management Strategies:

Timing is crucial for any turtle management strategy with the goal of reducing turtle-fisheries interactions in Virginia. Historic stranding data combined with sea temperature data (Coles, 1999) and carcass condition codes all indicate that the critical time for sea turtle strandings in Virginia's waters is between mid-May and mid-June. Yearly variability associated with the start of the stranding season has been related to differences in sea temperatures (Coles, 1999). Thus, gear modifications, regulations or closures—regardless of the fishery, should be implemented much sooner than mid to late June. In addition, ocean-based and offshore sources of mortality must also be identified and quantified during this timeframe. More information is needed regarding prevailing currents and transport systems in the spring of the year that may carry turtle carcasses into the southern Chesapeake Bay from points offshore.

LITERATURE CITED:

Bellmund, S.A. 1988. Environmental stress on loggerhead sea turtles in Virginia. M.A. Thesis, Virginia Institute of Marine Science, College of William and Mary, Gloucester Pt., VA. 81 pp.

Bellmund, S.A, J.A. Musick, R.E. Klinger, R.A. Byles, J.A. Keinath, and D.E. Barnard. 1987. Ecology of sea turtles in Virginia. VIMS Special Scientific Report No. 119. Virginia Inst. Mar. Sci. 48 pp.

Byles, R.A. 1988. The behavior and ecology of sea turtles in Virginia. Ph.D. Dissertation, VIMS, College of William and Mary, Gloucester Point, VA, 112 pp.

Coles, W. 1999. Aspects of the Biology of Sea Turtles in the Mid-Atlantic Bight. Dissertation, Virginia Institute of Marine Science, College of William and Mary, Gloucester Point, VA. 153 pp.

Keinath, J. A., J. A. Musick and R. A. Byles. 1987. Aspects of the biology of Virginia's sea turtles: 1979-1986. VA Jour. Sci. 38(4): 329-336.

Keinath, J.A. 1993. Movements and behavior of wild and head-started sea turtles. Ph.D. Dissertation. Virginia Inst. Mar. Sci., College of William and Mary, Gloucester Point, VA, 206 pp.

Keinath, J. A., J. A. Musick, D. E. Barnard and B. A. Bell. 1994. Final Report of Aerial surveys for sea turtles over lower Chesapeake Bay and the Chesapeake Bay Shipping Channel during 1993. Army Corps of Engineers. Waterways Experiment Station, Vicksburg, VA. 14 pp.

Lutcavage, M. 1981. The status of marine turtles in the Chesapeake Bay and Virginia coastal waters. M.A. Thesis, Virginia Institute of Marine Science, College of William and Mary, Gloucester Point, VA.

Lutcavage, M. and J. A. Musick. 1985. Aspects of the biology of sea turtles in Virginia. Copea 1985:449-456.

Mansfield, K., J. A. Musick, and R. A. Pemberton. 2001. Characterization of the Chesapeake Bay Poundnet and Whelk Pot Fisheries and their Potential Interactions with Marine Sea Turtle Species. Final Report, NMFS, Woods Hole, MA. Contract #: 43EANFO30131. 66 pp.

Mansfield, K. L., E. E. Seney, and J. A. Musick. 2002. An evaluation of sea turtle abundances, mortalities and fisheries interactions in the Chesapeake Bay, Virginia, 2002. Final Contract Report (Contract#: 43-EA-NF-110773). National Marine Fisheries Service, NEFSC, Gloucester, MA. 102 pp.

Musick, J. A., R. Byles, R. Klinger, and S. Bellmund. 1984. Mortality and behavior of sea turtles in the Chesapeake Bay. Summery Report for 1979 through 1983. National Marine Fisheries Service, NEFSC. Woods Hole, MA. Contract #: NA80FA00004. 52 pp, 2 app.

Musick, J.A., J.A. Keinath, and D.E. Barnard. 1987. Distribution and abundance of sea turtles in the proposed EMPRESS II operating sites. Final Report to the Department of the Navy, Theater of Nuclear Warfare Program. 1-19.

Spotila, J. R., M. P. O'Connor and F. Paladino. 1997. Thermal Biology. In: Lutz, P. L. and J. A. Musick (eds.). The Biology of Sea Turtles. CRC Press, Boca Raton, FL. Pp. 146.

Terwilliger K. and J. A. Musick (co-chairs), Virginia Sea Turtle and Marine Mammal Conservation Team. 1995. Management plan for sea turtles and marine mammals in Virginia, Final Report to the National Oceanic and Atmospheric Administration. 56 pp.

Turtle Expert Working Group. 2000. Assessment Update for the Kemp's Ridley and Loggerhead Sea Turtle Populations in the Western North Atlantic. U.S. Dep. Comm. NOAA Tech. Mem. NMFS-SEFSC-444, 115 pp.

TABLES

TABLE 1. **Summary of 2002 Aerial Surveys by Flight**

Date	Portion of Bay	No. of Transects	Area Observed (km^2)	Average Area per Transect (km^2)	No. of Turtles Observed	Average Turtle Density	St.Dev. of Density	Average Population Estimate
5/7/02	Lower	4	55.17	13.79	0	0.000	0.000	0.000
5/7/02	Upper	0	--	--	--	--	--	--
5/15/02	Lower	4	59.20	14.80	0	0.000	0.000	0.000
5/15/02	Upper	0	--	--	--	--	--	--
5/24/02	Lower	4	62.28	15.57	2	0.034	0.040	995.266
5/24/02	Upper	4	63.23	15.81	8	0.125	0.107	4440.790
5/29/02	Lower	4	53.60	13.40	5	0.093	0.186	2692.330
5/29/02	Upper	4	74.52	18.63	16	0.229	0.315	8117.620
6/11/02	Lower	4	58.56	14.64	6	0.103	0.041	2973.540
6/11/02	Upper	2	24.71	12.36	0	0.000	0.000	0.000
6/20/02	Lower	4	54.31	13.58	1	0.200	0.400	575.795
6/20/02	Upper	0	--	--	--	--	--	--
6/26/02	Lower	4	58.88	14.72	4	0.067	0.056	1936.410
6/26/02	Upper	4	70.88	17.72	3	0.043	0.029	1538.770
7/2/02	Lower	4	56.75	14.19	2	0.035	0.041	1024.370
7/2/02	Upper	4	68.68	17.17	4	0.054	0.043	1902.780
7/9/02	Lower	4	56.76	14.19	1	0.017	0.035	505.684
7/9/02	Upper	4	66.39	16.60	1	0.013	0.026	459.163
7/17/02	Lower	4	60.38	15.10	8	0.137	0.099	3948.160
7/17/02	Upper	4	69.47	17.37	3	0.046	0.033	1636.550
7/30/02	Lower	4	60.72	15.81	4	0.067	0.010	1940.630
7/30/02	Upper	4	69.62	17.41	2	0.027	0.032	971.706
All	Lower	44	636.61	14.240	33	0.052	0.090	1843.575
All	Upper	30	507.5	17.060	37	0.073	0.084	2192.999

TABLE 2. Lower Bay Aerial Surveys, Sea Turtle Densities and Population Estimates by Year (strip transect methodology).

Year	No. of Flights	No. of Turtles	Area Observed (km^2)	Unadjusted Density (turtles/km^2)	Behaviorally Adjusted Density	Population Estimate
1982	10	168	632	0.266	5.001	6,862
1983	12	272	721	0.377	7.088	9,743
1984	10	207	629	0.329	6.185	8,490
1985	11	176	699	0.252	4.738	6,526
1994	8	58	492	0.118	2.218	3,068
Mean	10.200	176.200	634.600	0.268	5.046	6,938
St. Dev.	1.483	77.725	89.422	0.098	1.841	2,521

Data compiled from Byles, 1988; Keinath, 1993; and Keinath et al., 1994.

Each population estimate is based on the survey area for a given year, which was 1,383 km^2 during 1982 - 1985.

FIGURES

Virginia Sea Turtle Stranding Regions

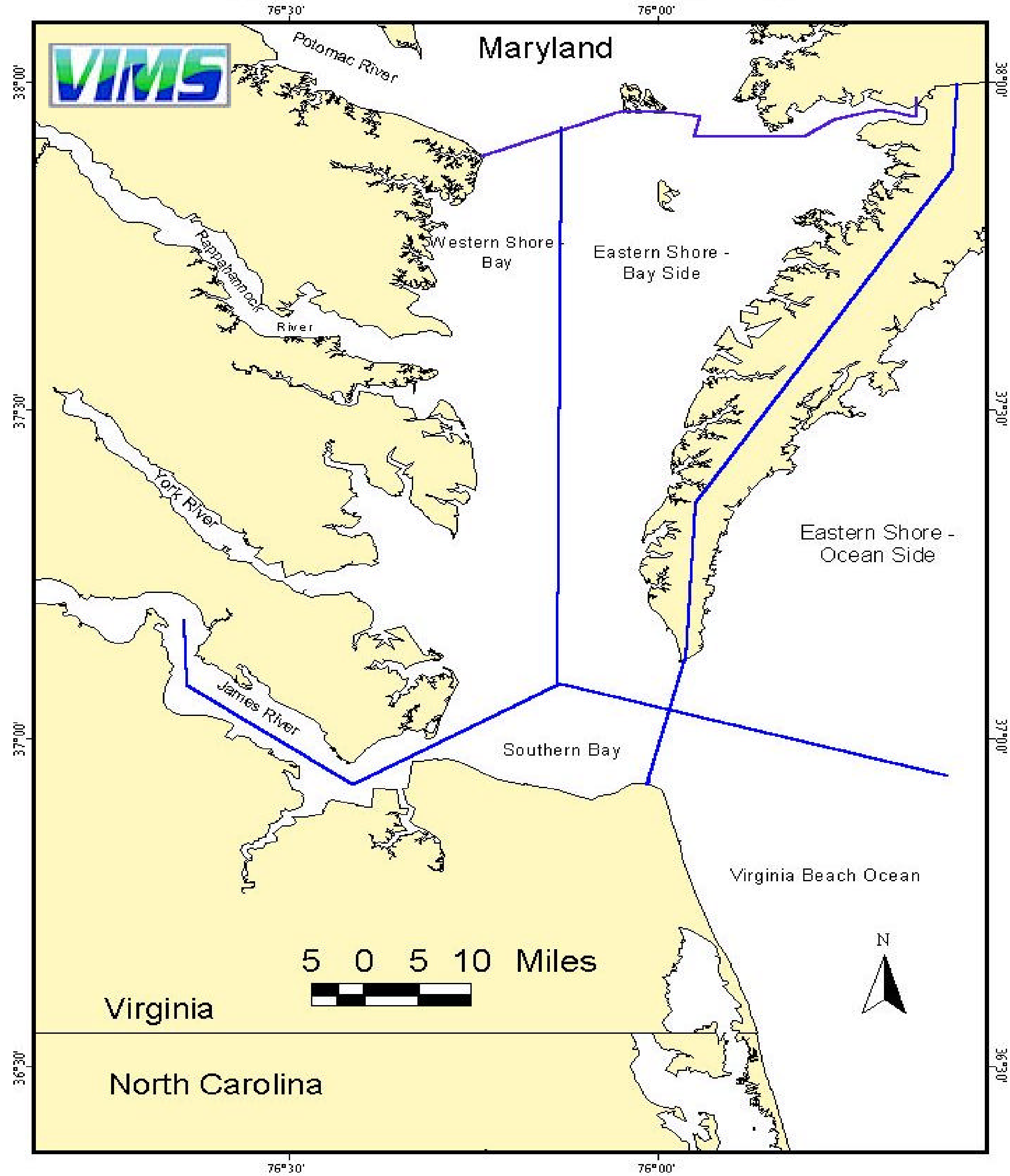


Figure 1. Sea turtle stranding regions (from Mansfield et al., 2001, 2002).

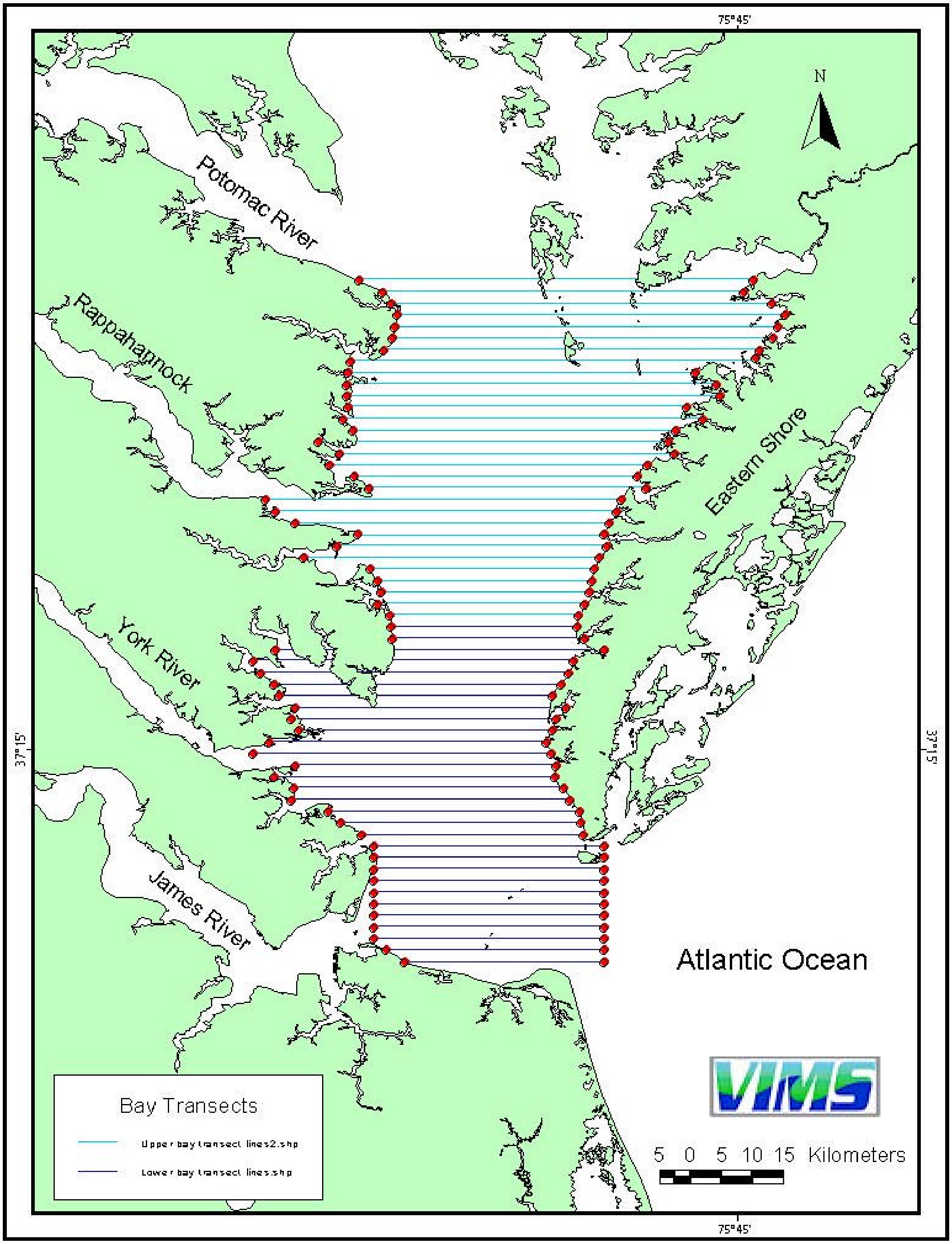


Figure 2. Transect locations (including Upper and Lower Bay survey areas) for the Chesapeake Bay aerial surveys, 2001 and 2002.

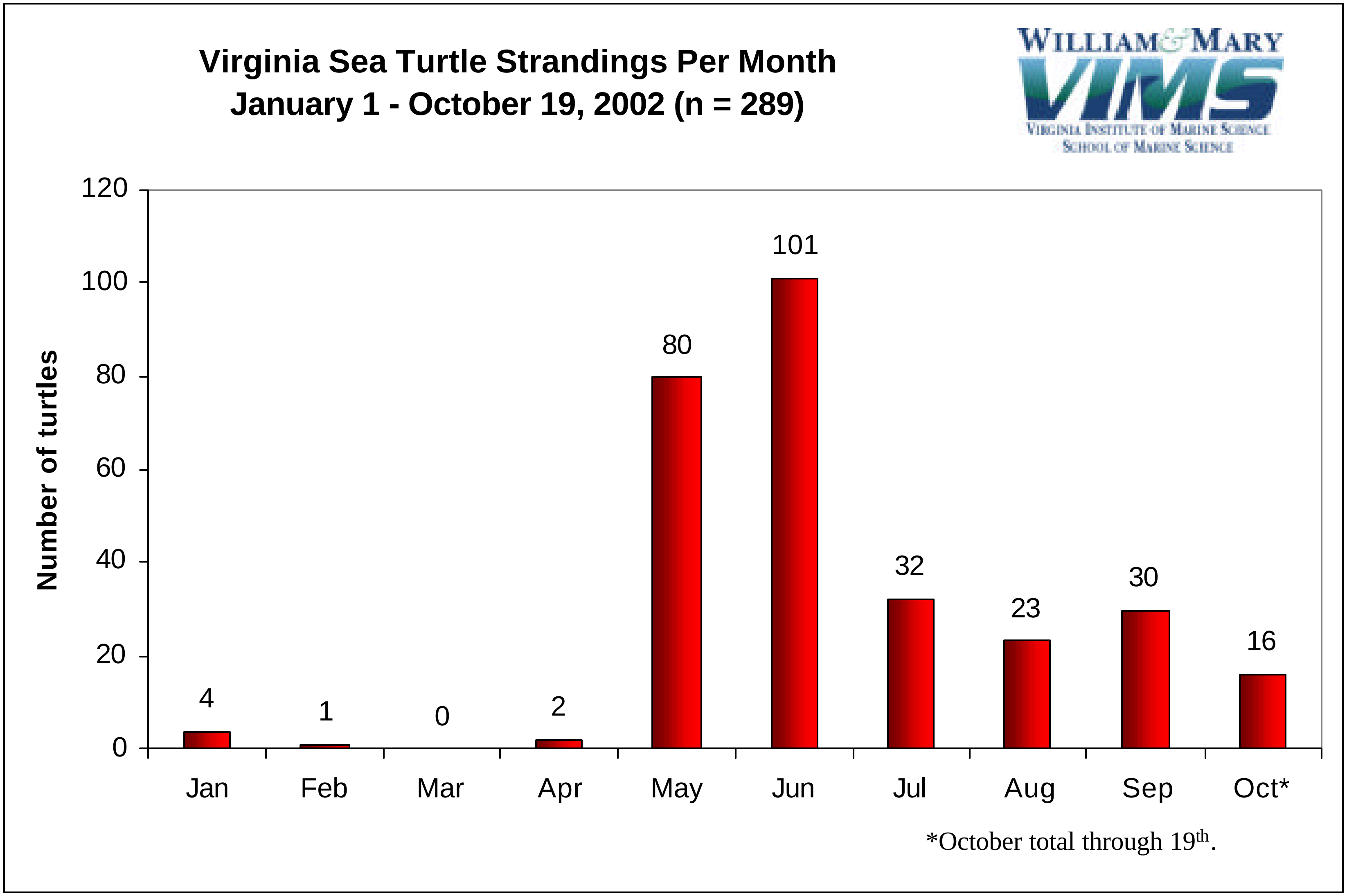


Figure 3. Number of sea turtle strandings in Virginia by month from January 1 – October 19, 2002.

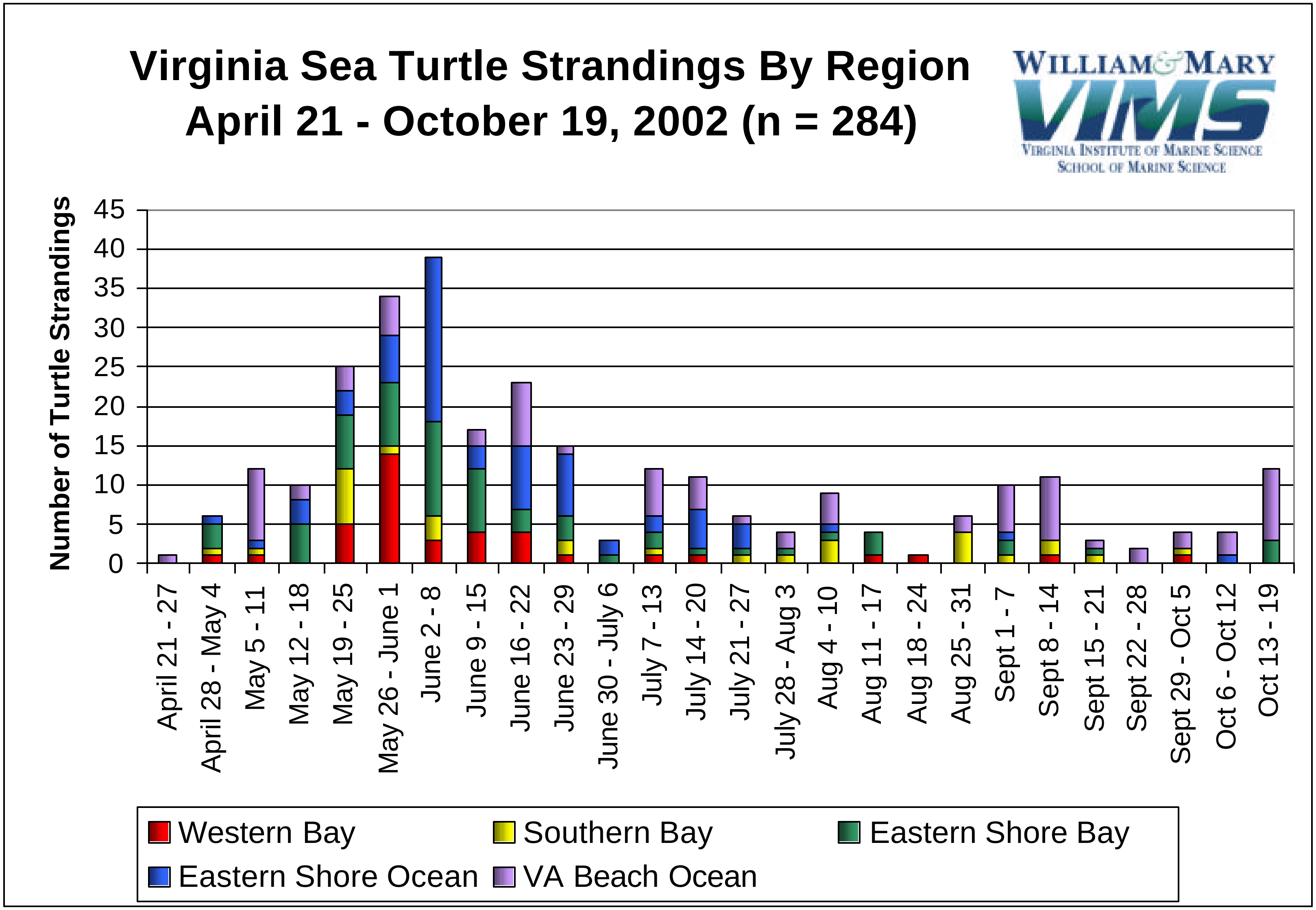


Figure 4. Number of sea turtle strandings in Virginia by week and location from April 21 – October 19, 2002.

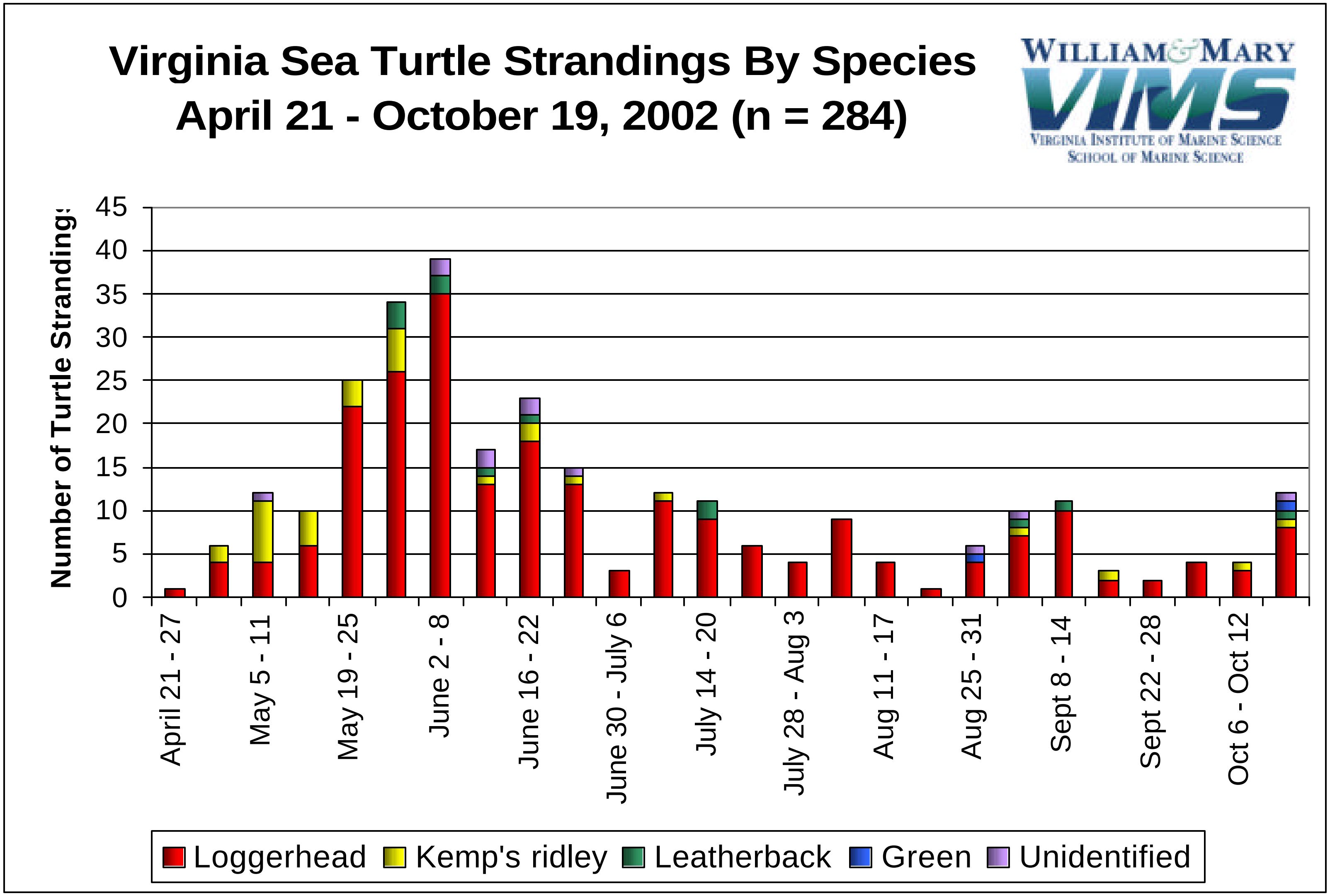


Figure 5. Number of sea turtle strandings in Virginia by species from April 21 – October 19, 2002.

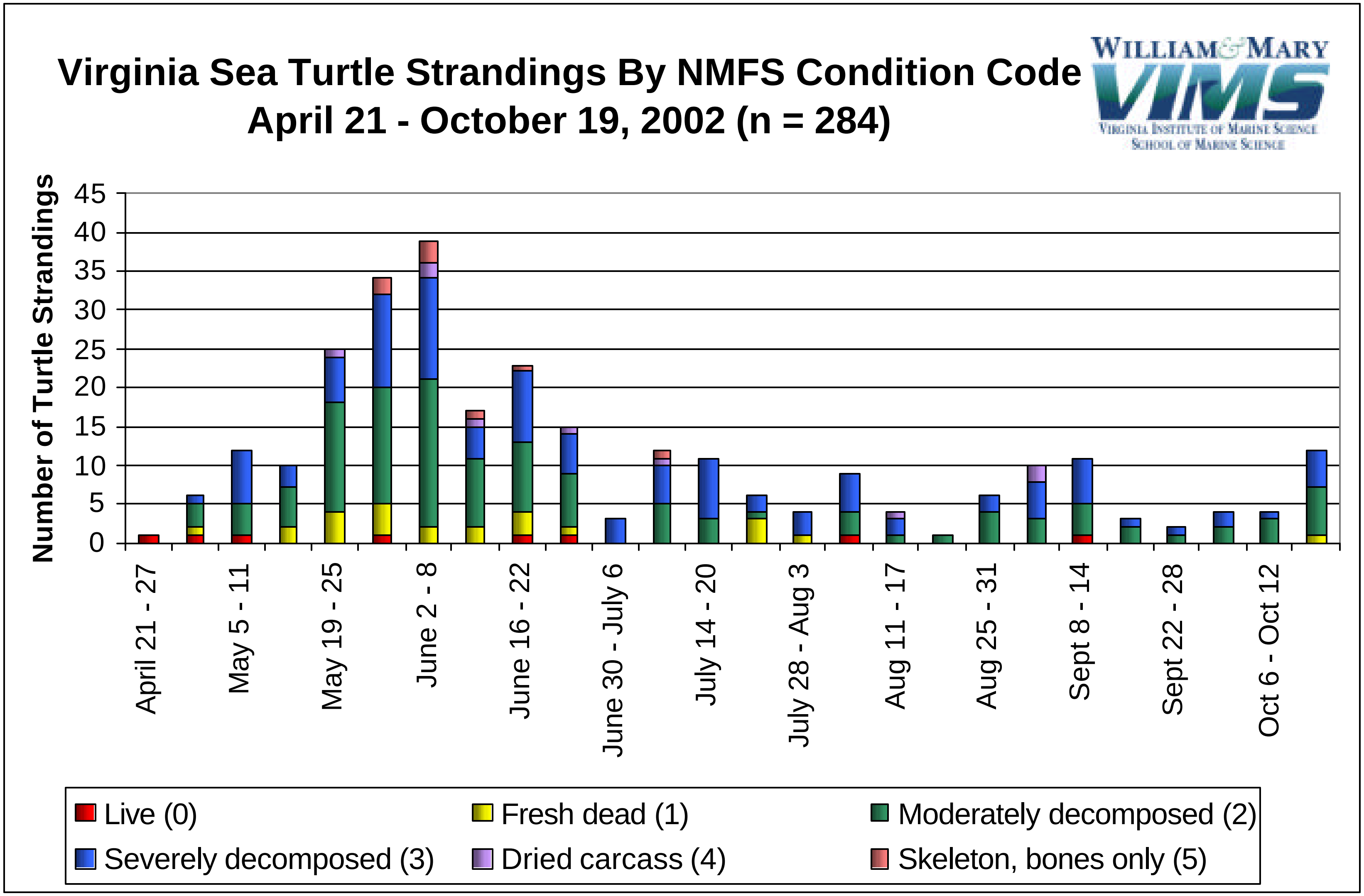


Figure 6. Number of sea turtle strandings in Virginia by NMFS condition codes from April 21 – October 19, 2002.

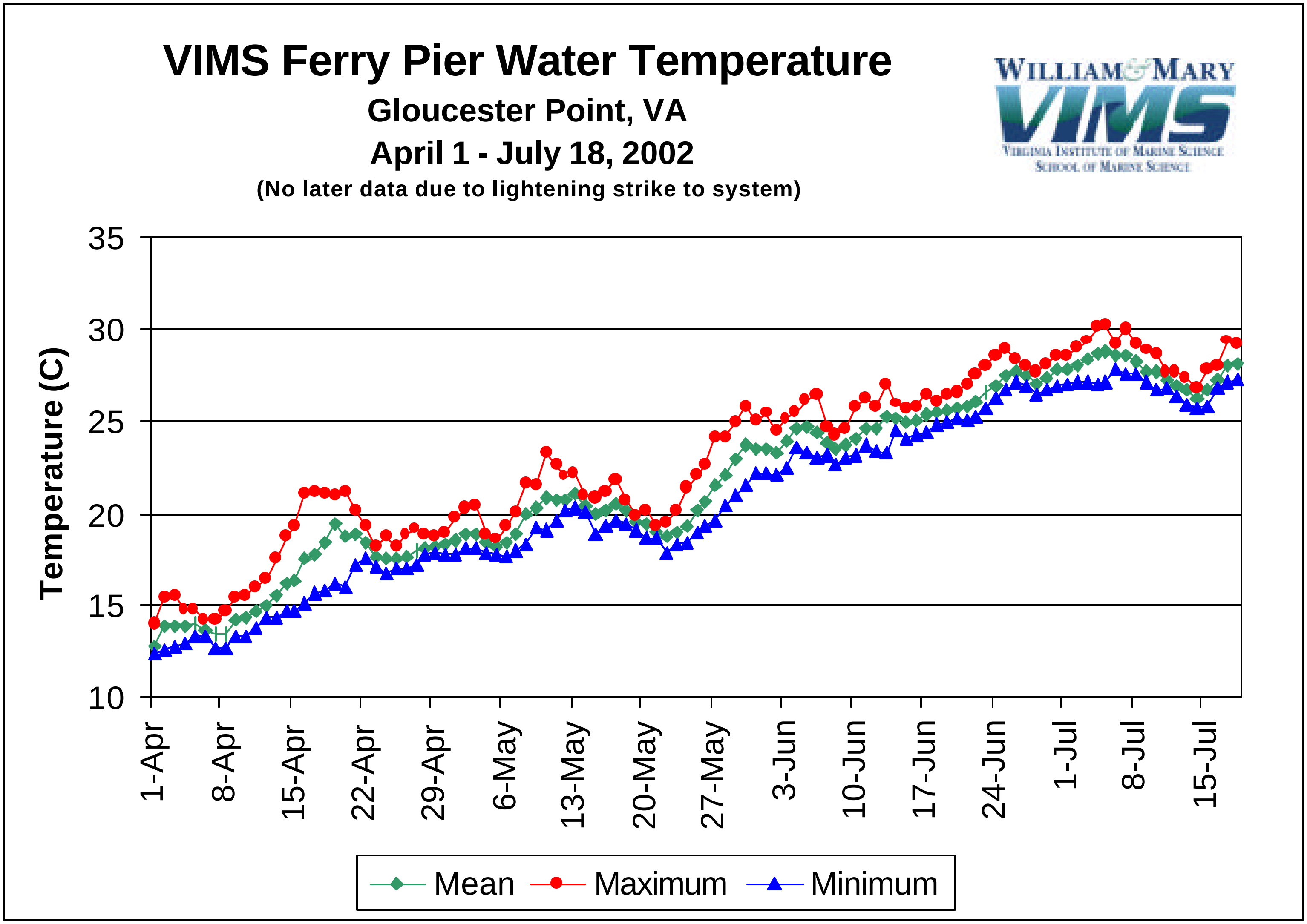


Figure 7. Gloucester Point, VA sea surface temperatures as recorded at the VIMS Ferry Pier from April 1 – July 18. Data acquired from the VIMS Meteorological and Hydrographic Online Archives at http://www.vims.edu/resources/databases.html#pier.

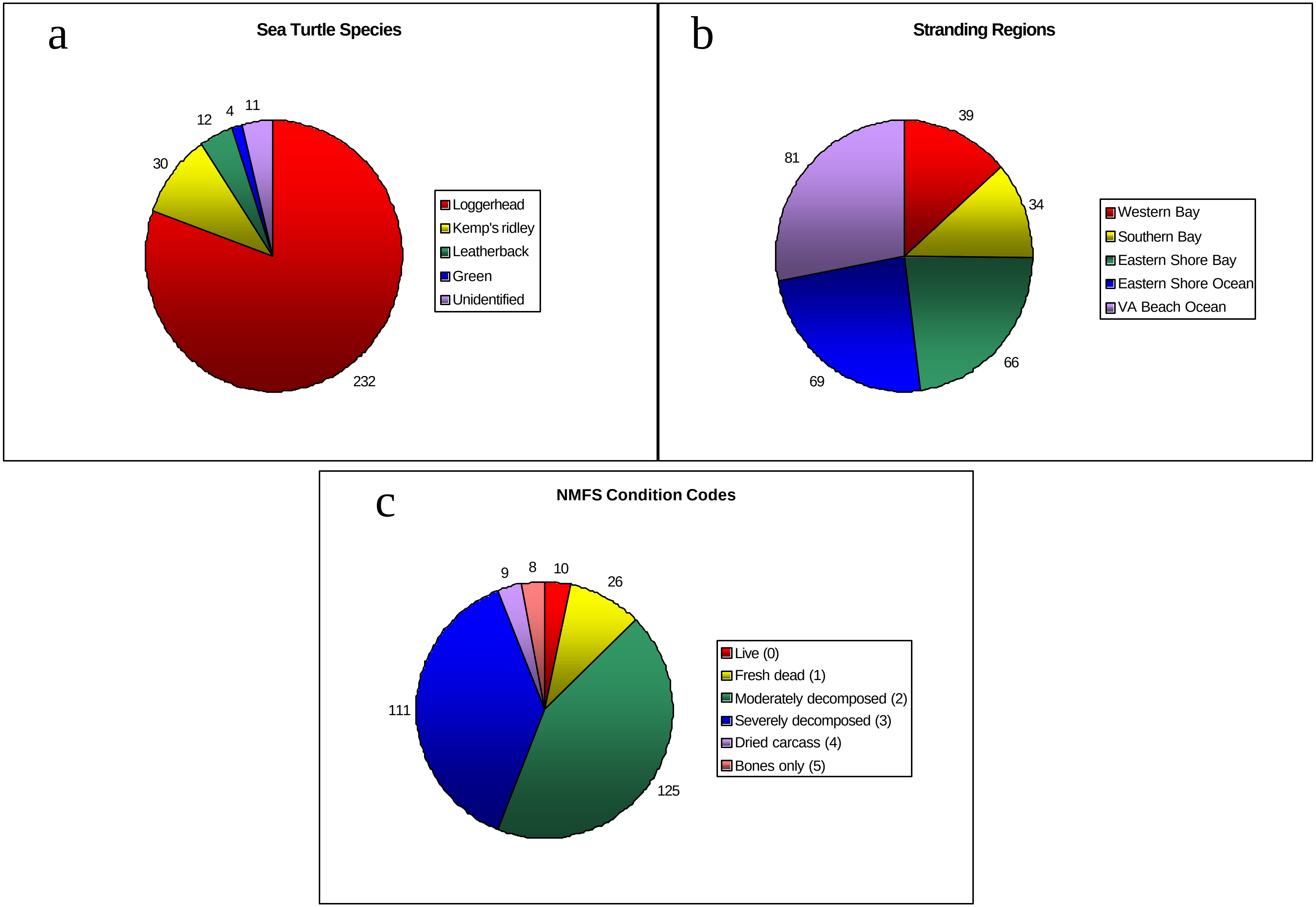


Figure 8: Composition of Virginia's sea turtle strandings occurring from January 1 – October 19 (n = 289) by (a) species, (b) stranding region, and (c) NMFS condition code.

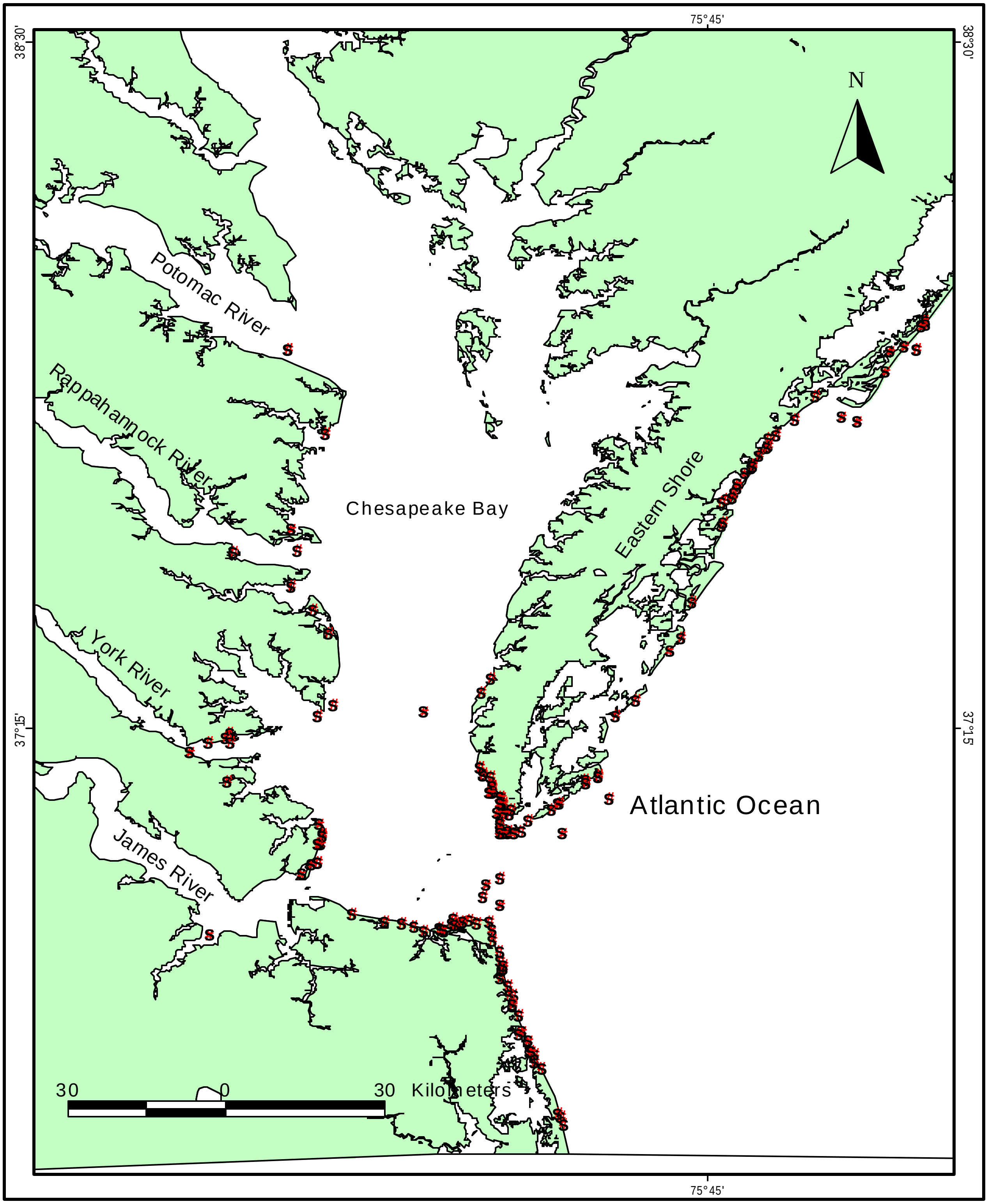


Figure 9. Locations of 2002 sea turtle strandings in Virginia, January 1-August 17, 2002.

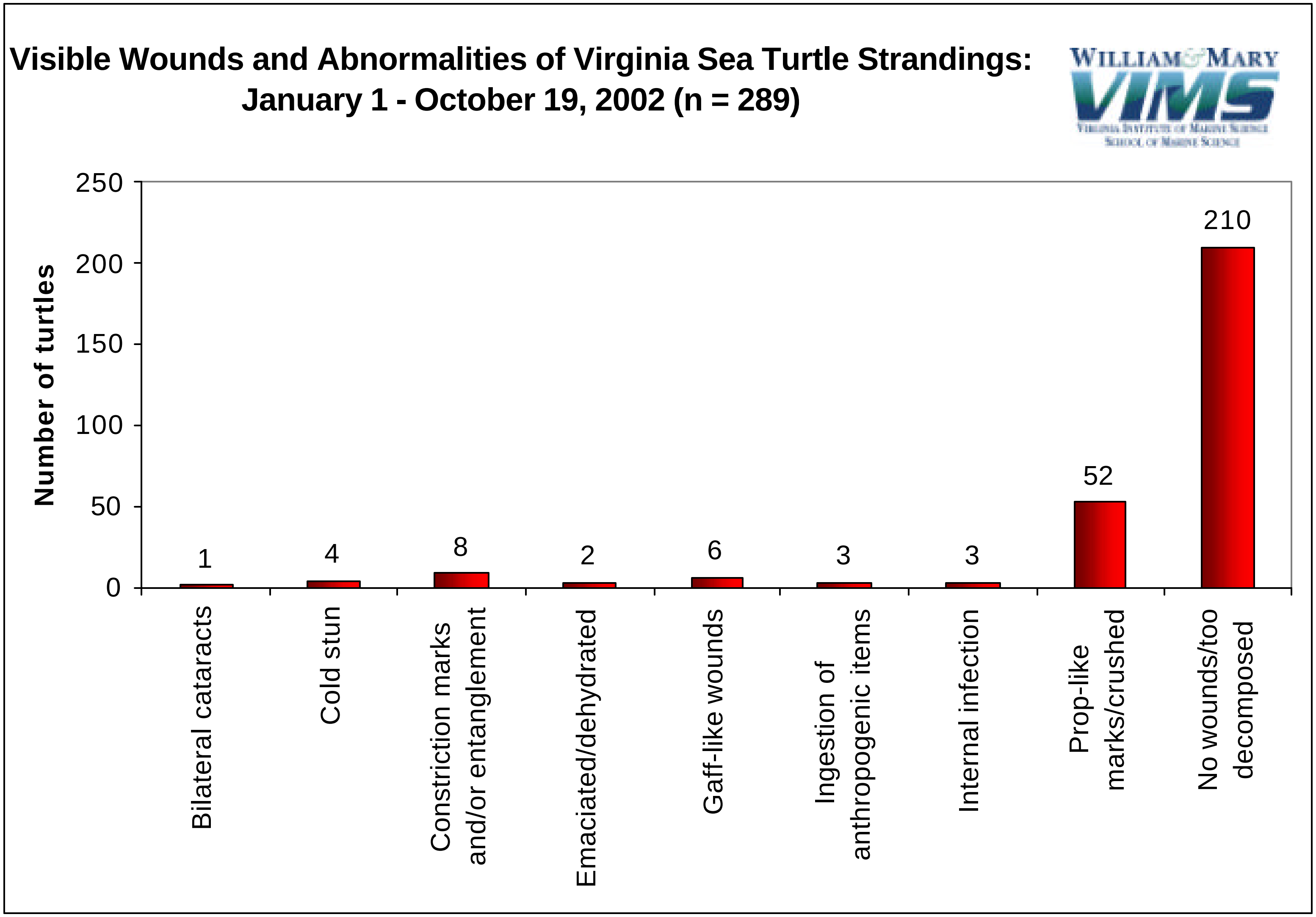


Figure 10. Visible wounds and abnormalities noted for sea turtles stranding in Virginia from January – October 19, 2002.

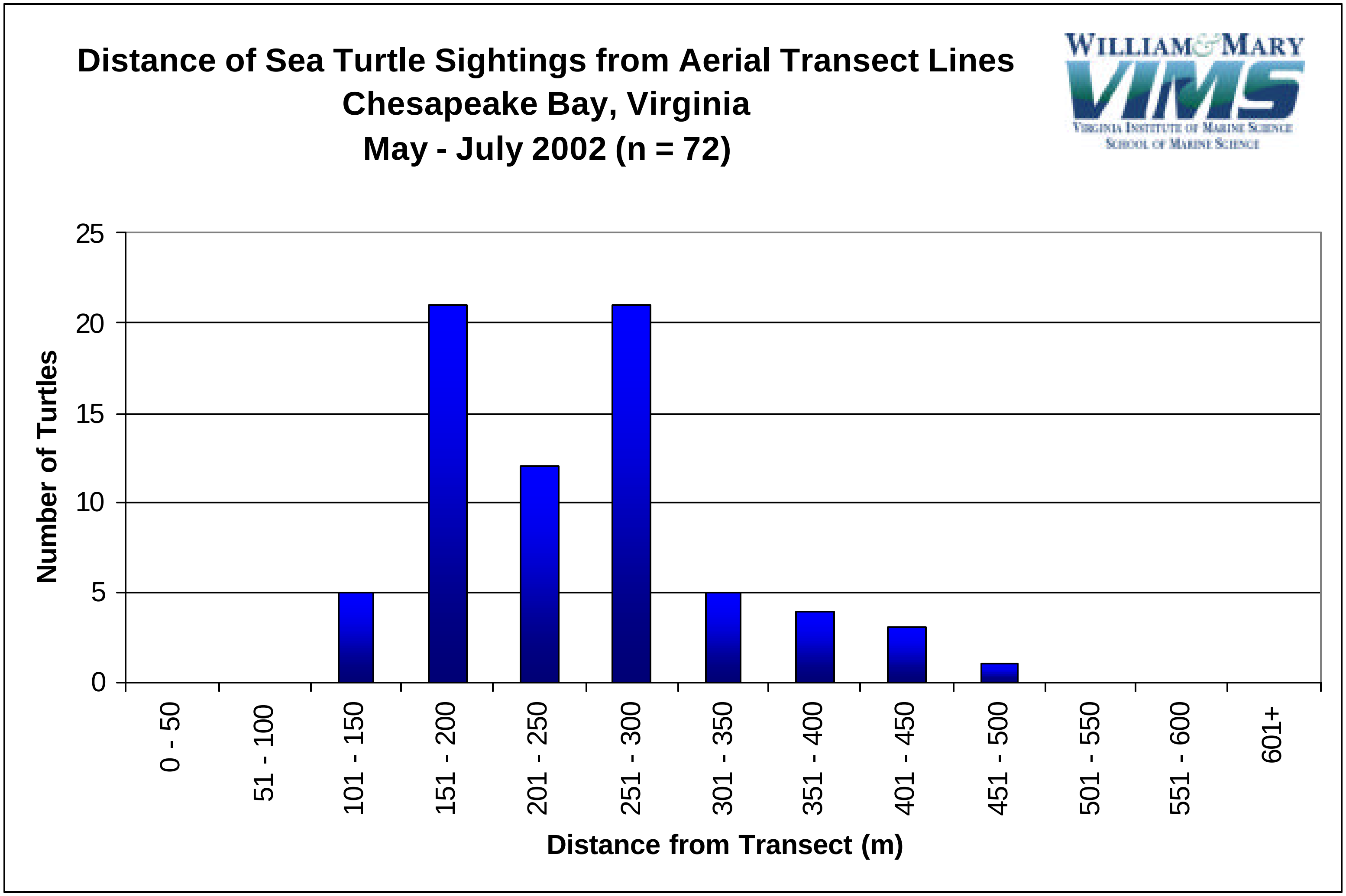


Figure 11. Distances of sea turtle sightings from aerial transect lines in the Chesapeake Bay, Virginia from May to July 2002.

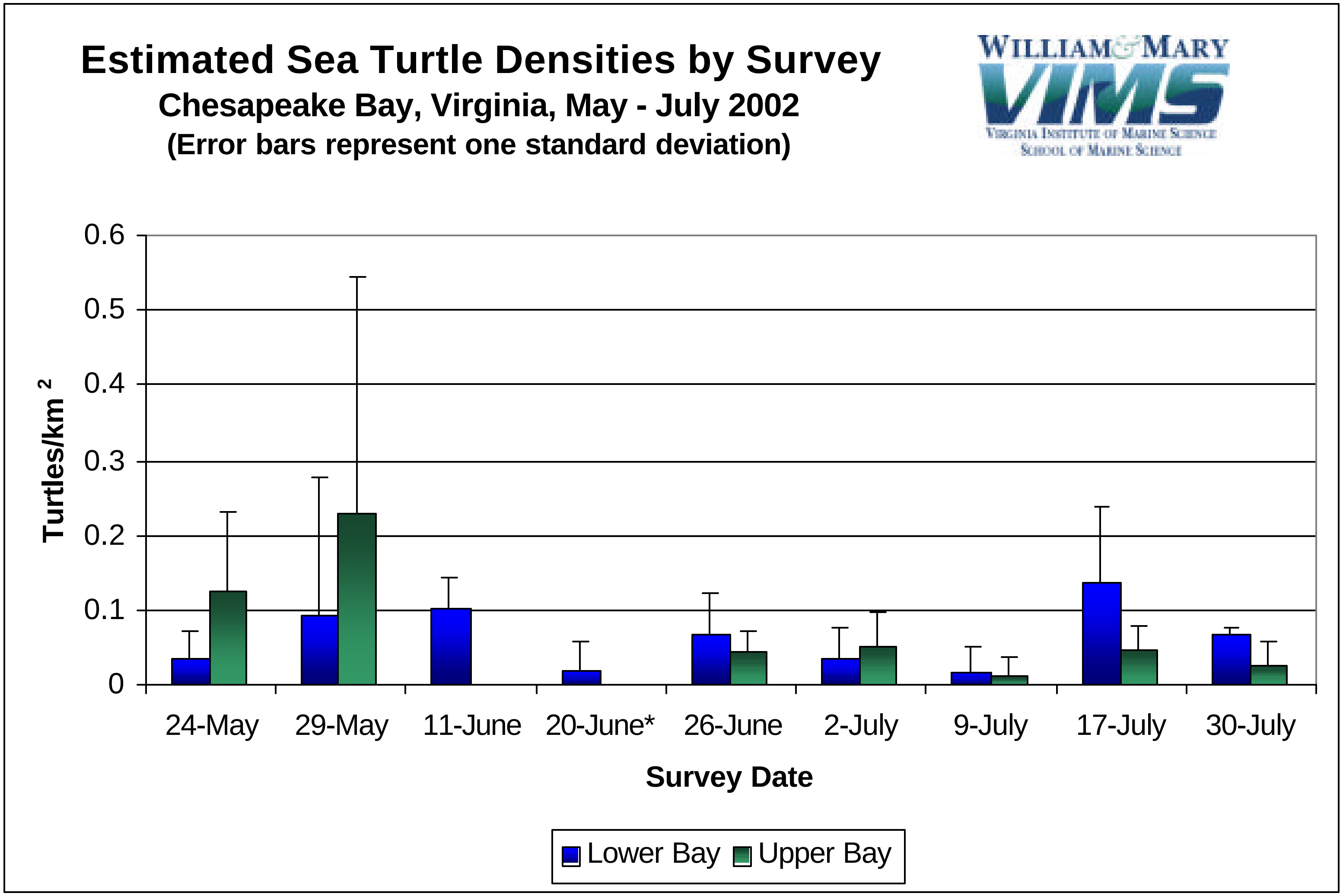


Figure 12. Uncorrected estimated sea turtle densities for Chesapeake Bay, Virginia, as observed from May to July 2002. *Note: No turtles were seen on surveys flown on May 7 and May 15, and only the Lower Bay region was flown on June 20 due to poor visibility.

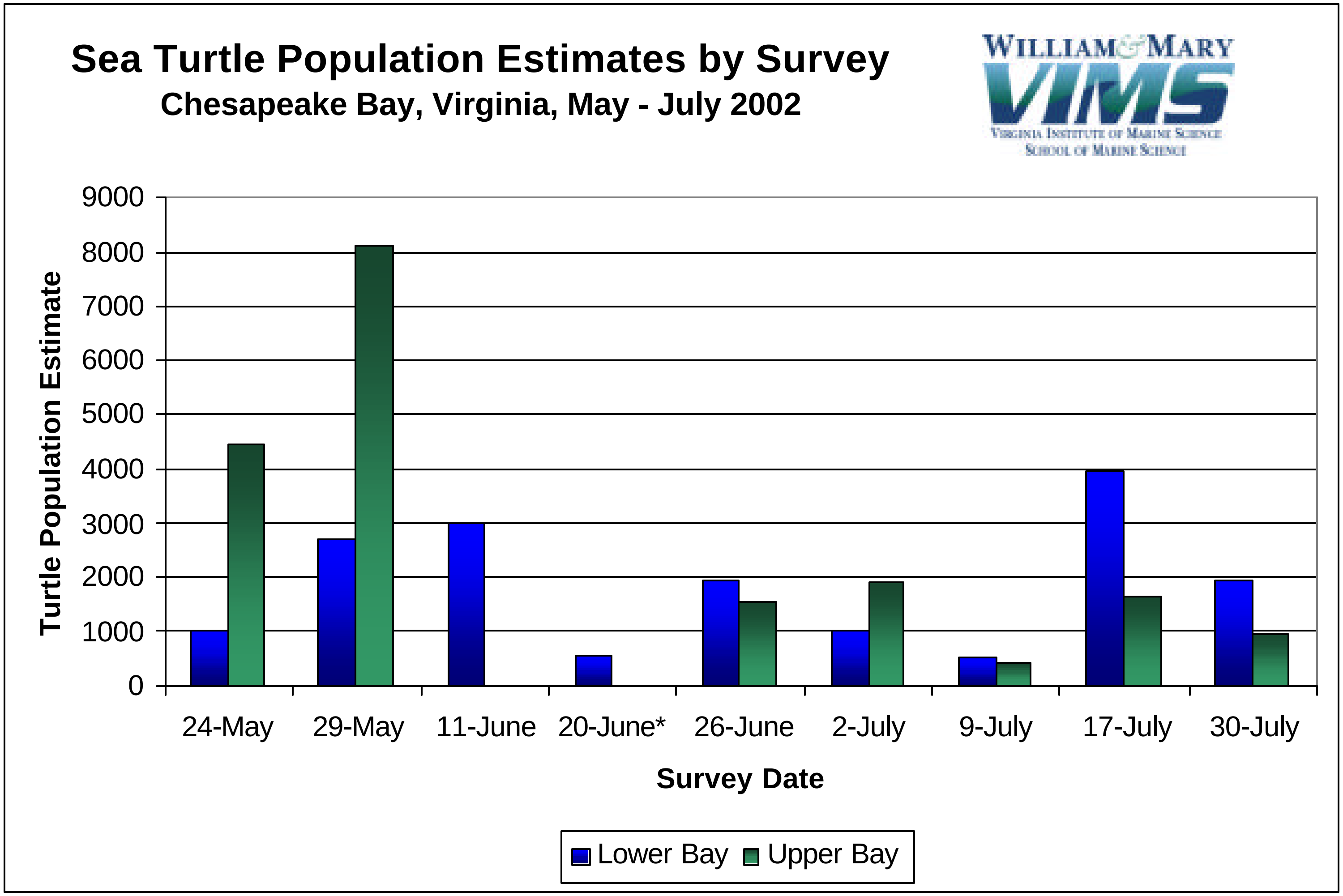


Figure 13. Sea turtle population estimates for Chesapeake Bay, Virginia, as observed from May to July 2002. *Note: No turtles were seen on surveys flown on May 7 and May 15, and only the Lower Bay region was flown on June 20 due to poor visibility.

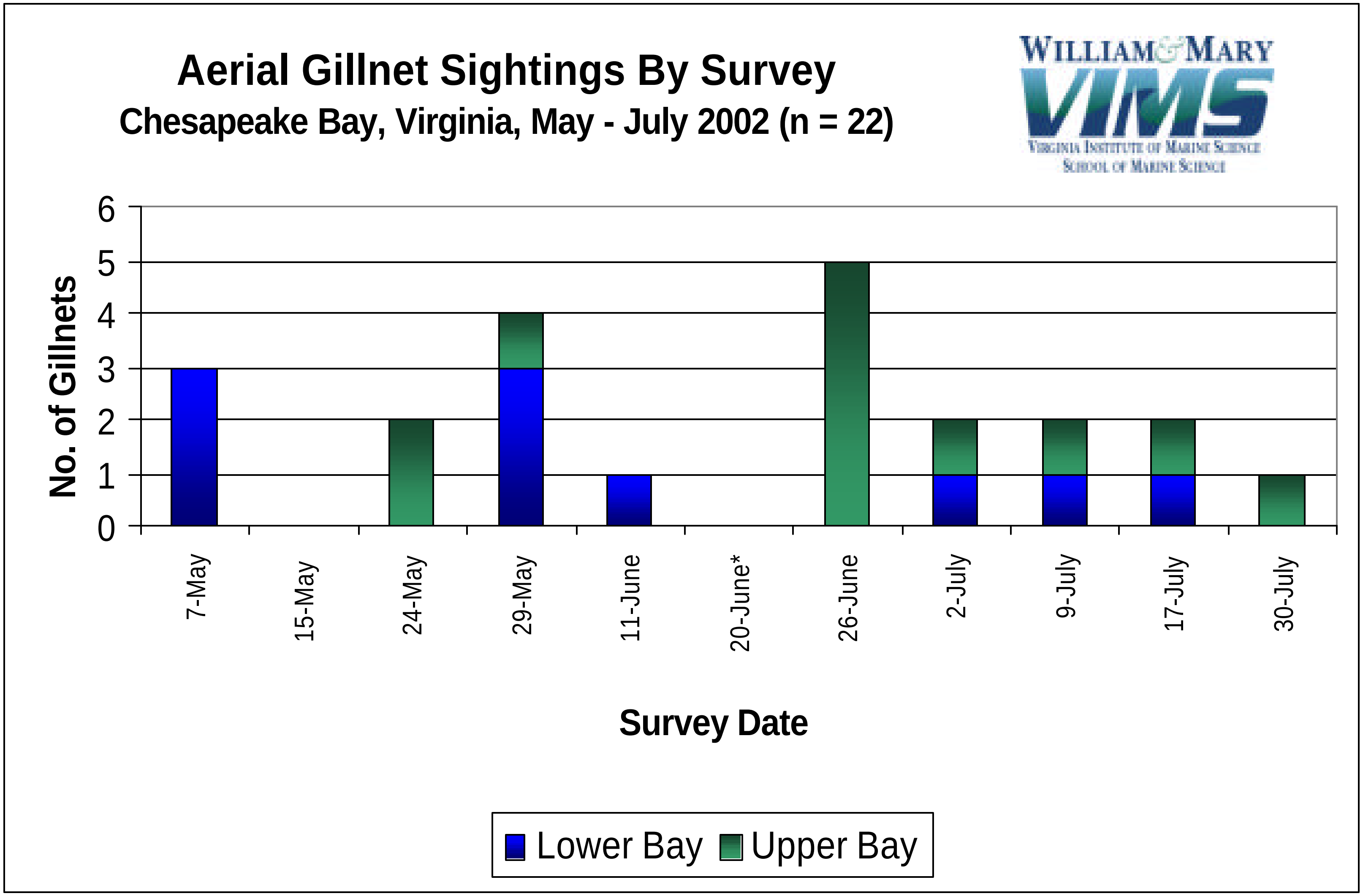


Figure14. Aerial sightings of gillnets in the Chesapeake Bay, Virginia from May to July 2002. *Note: Only the Lower Bay region was flown on June 20 due to poor visibility.

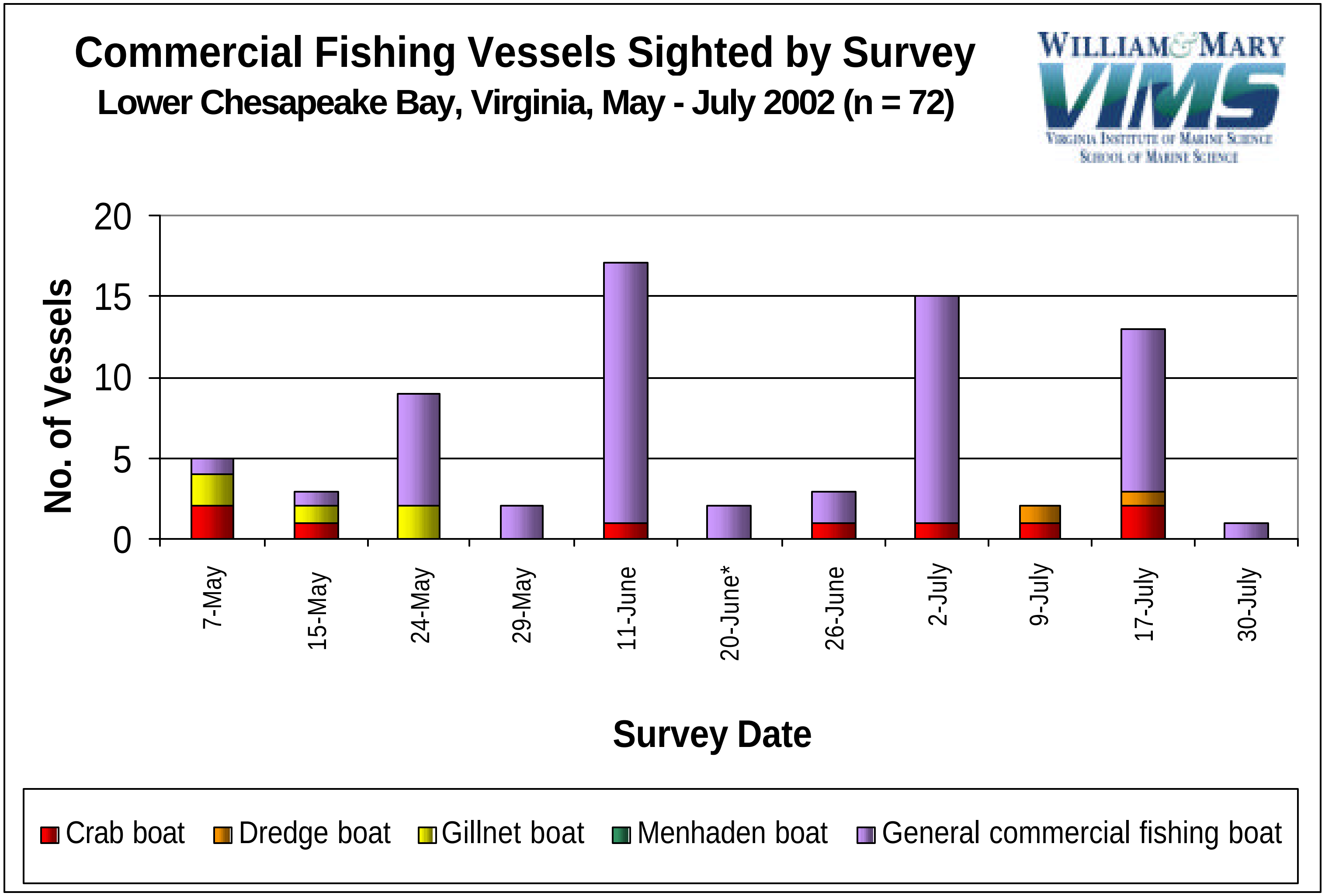


Figure 15. Aerial sightings of commercial fishing vessels in the Lower Chesapeake Bay, Virginia from May to July 2002. *Note: Only the Lower Bay region was flown on June 20 due to poor visibility.

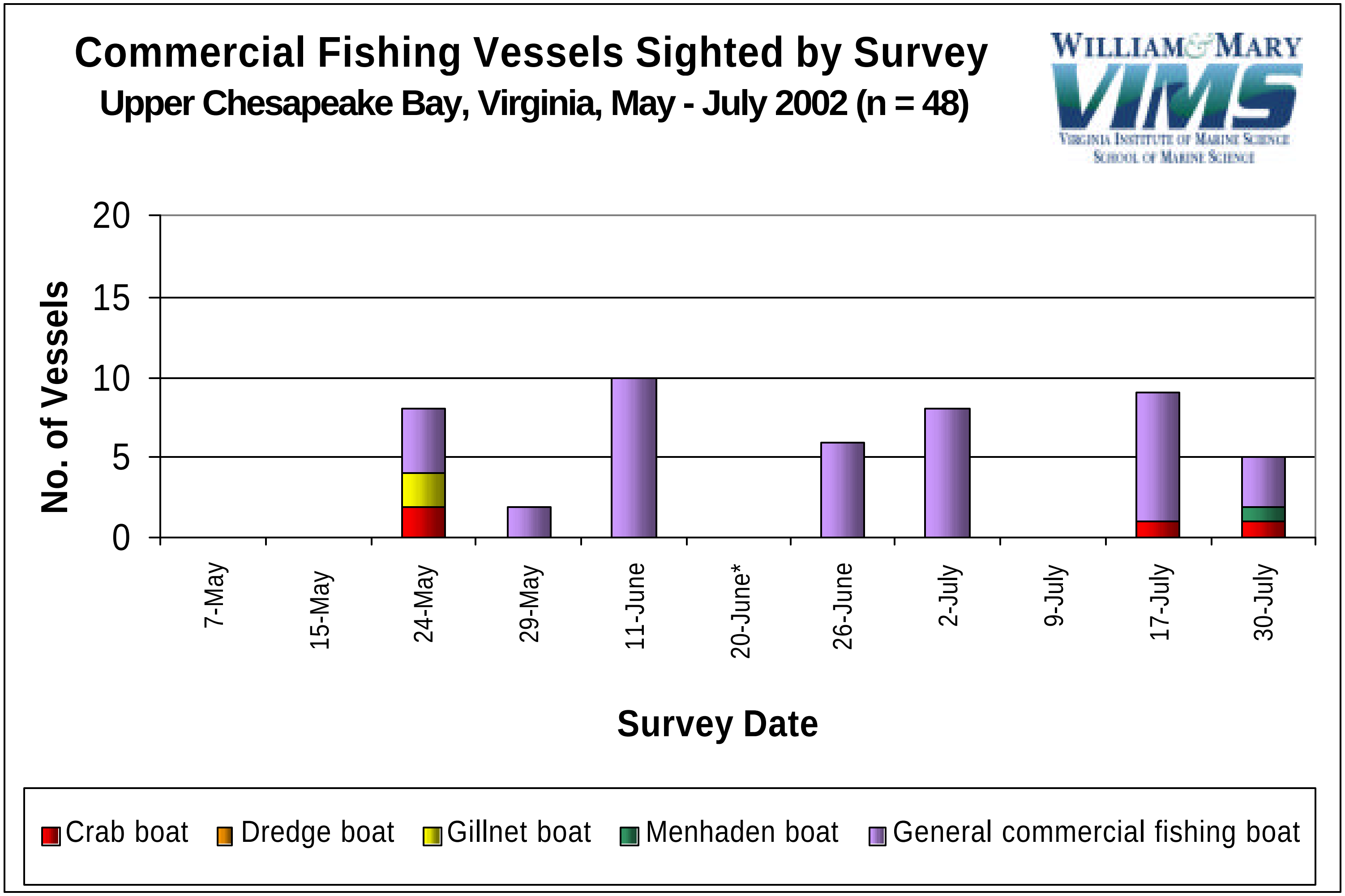


Figure 16. Aerial sightings of commercial fishing vessels in the Upper Chesapeake Bay, Virginia from May to July 2002. *Note: Only the Lower Bay region was flown on June 20 due to poor visibility.

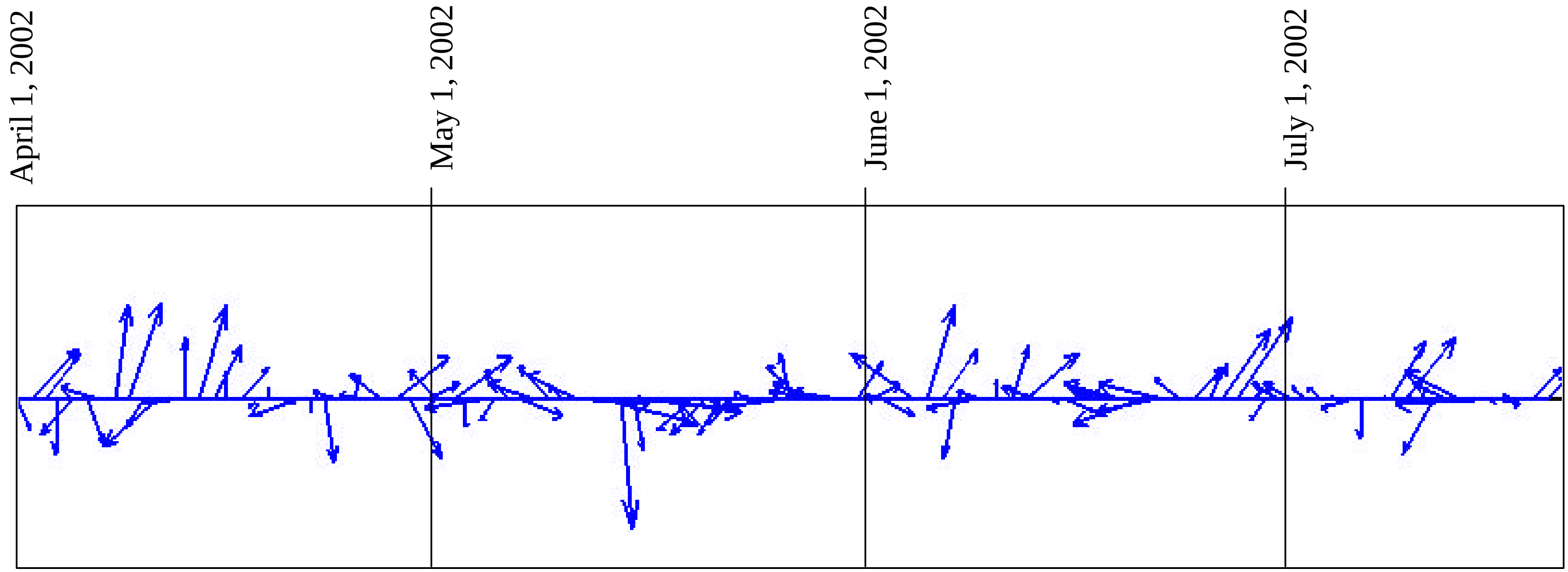
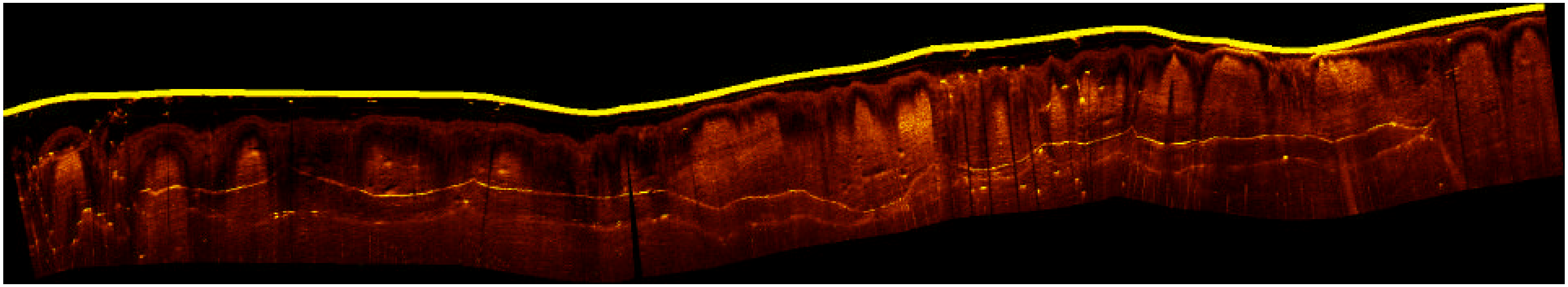


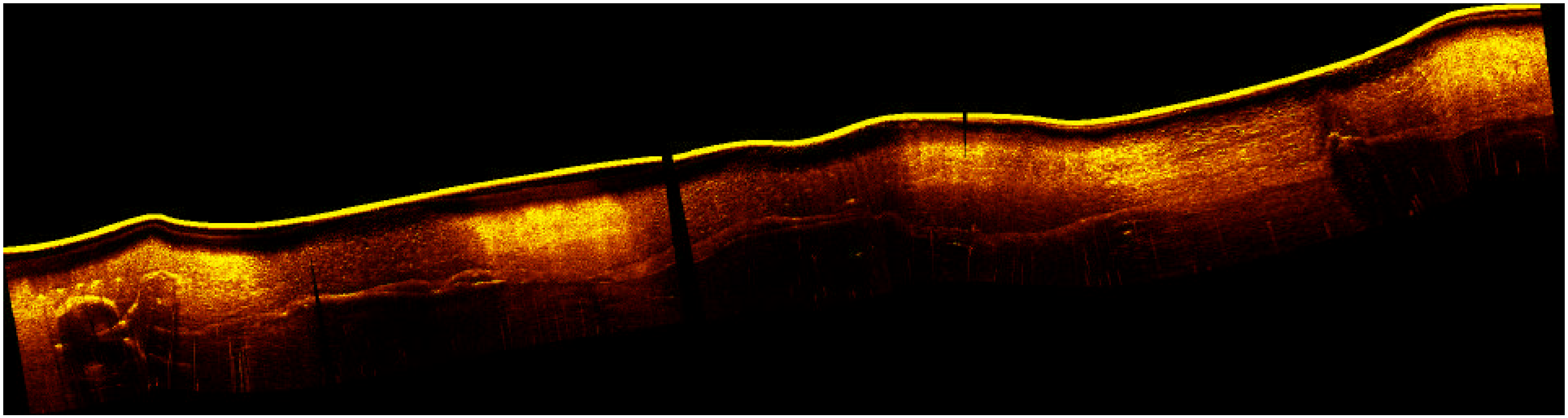
Figure 17. Wind sticks for VIMS Ferry Pier from April 1 through July 18, 2002. Each wind stick represents a daily mean wind direction (stick points in direction towards which wind was blowing) and daily mean wind speed (indicated by size of stick). Data acquired from the VIMS Meteorological and Hydrographic Online Archives at http://www.vims.edu/resources/databases.html#pier.

APPENDICES

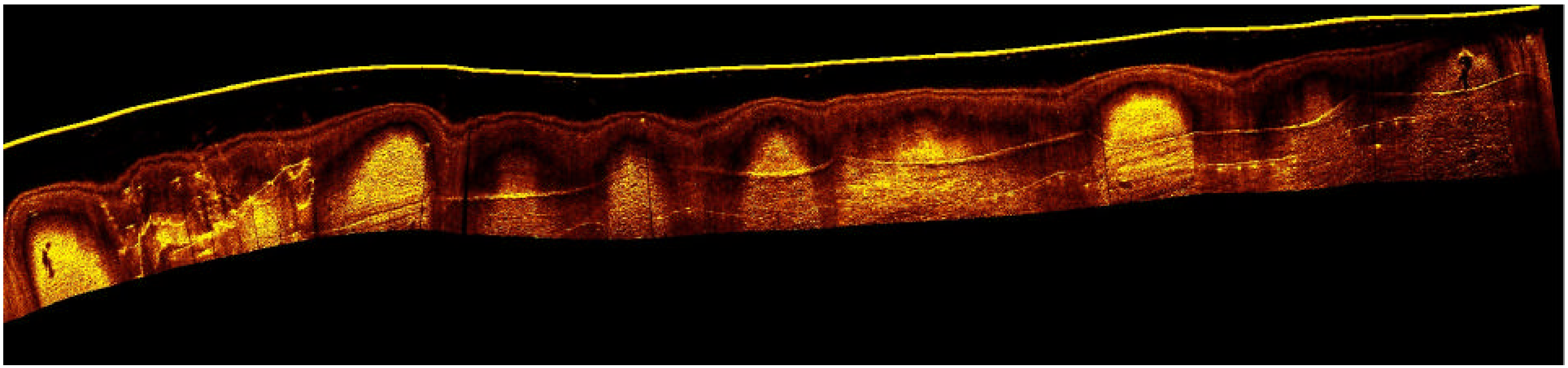
APPENDIX A. **Baseline mosaic image catalog of all Chesapeake Bay poundnet leaders, 2002. Organized by latitude and region. Yellow line indicates sonar tow path.**



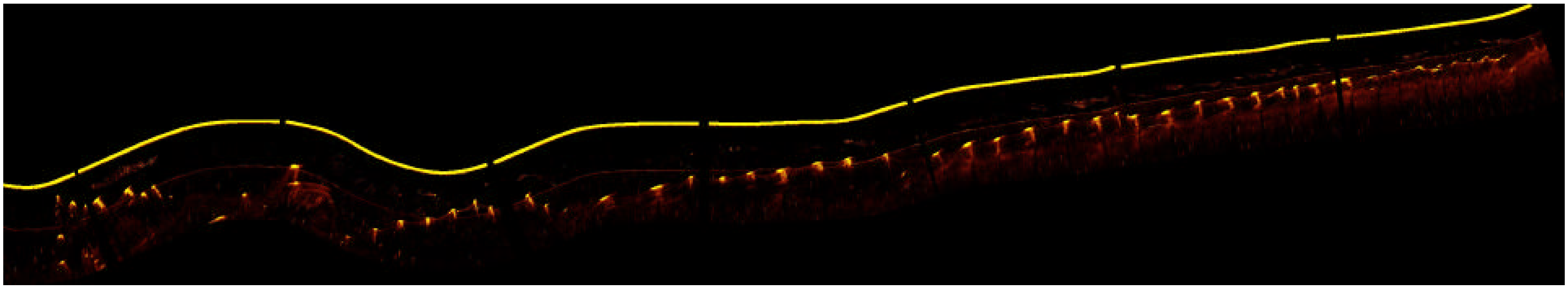
Net 2002-158 (37^0 7.50, 75^0 58.63) south of concrete ships at Kiptopeake



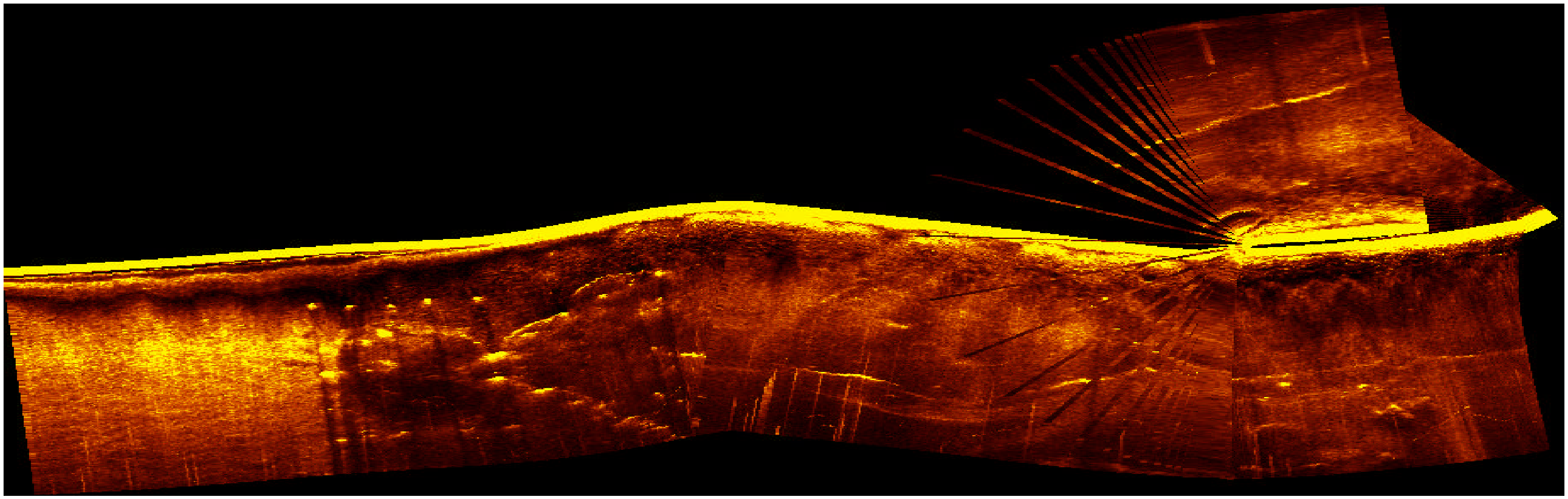
Net 2002-183 (37^{0} 8.05, 75^{0} 58.47) south of concrete ships at Kiptopeake



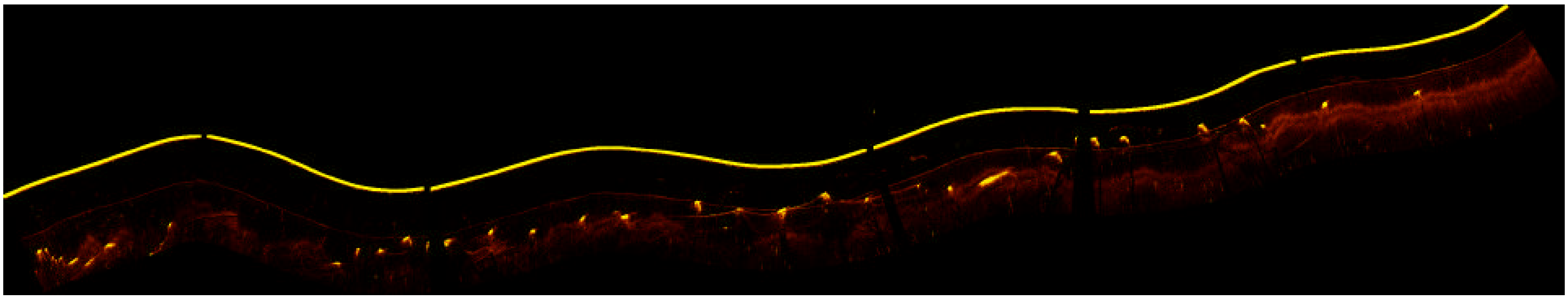
Net 2002-150 (37^0 8.28, 75^0 58.74) south of concrete ships at Kiptopeake



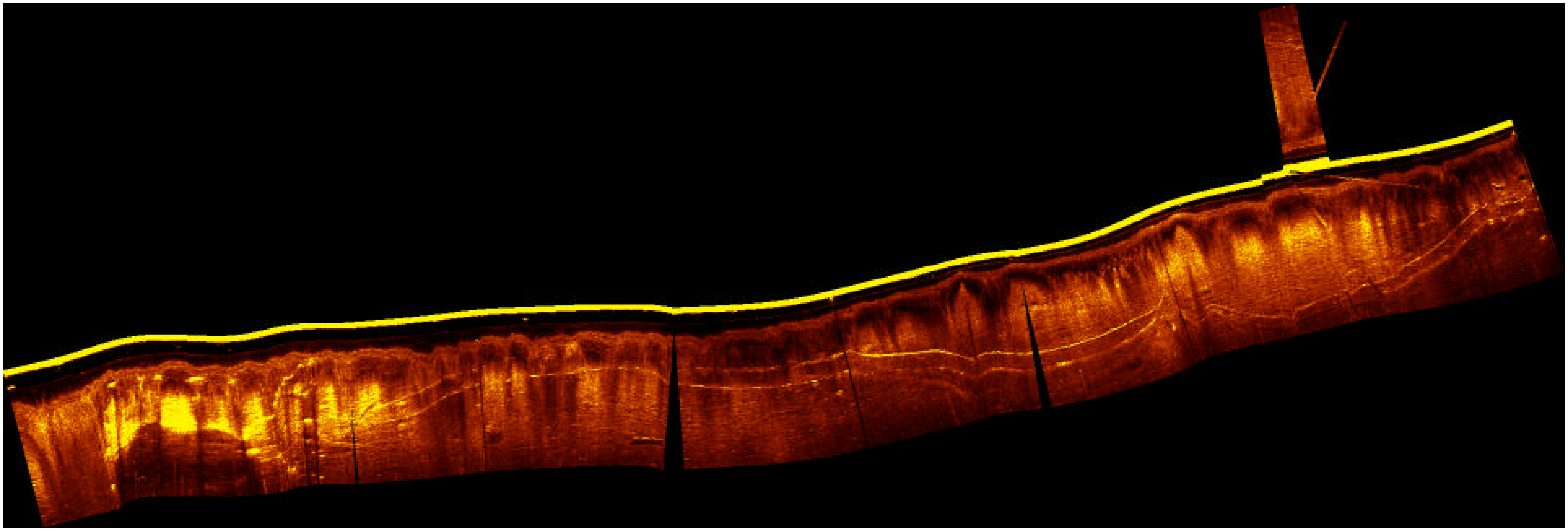
Net 2002-189 (37^0 8.31, 75^0 58.98) south of concrete ships at Kiptopeake



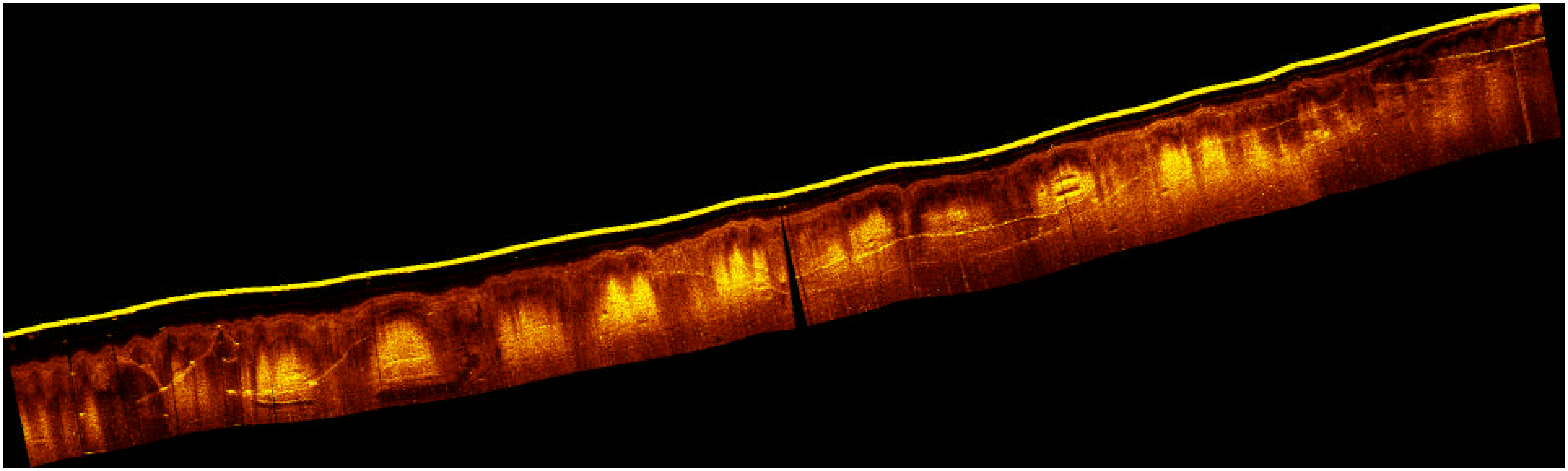
Net 2002-152 (37^0 8.34, 75^0 58.54) south of concrete ships at Kiptopeake



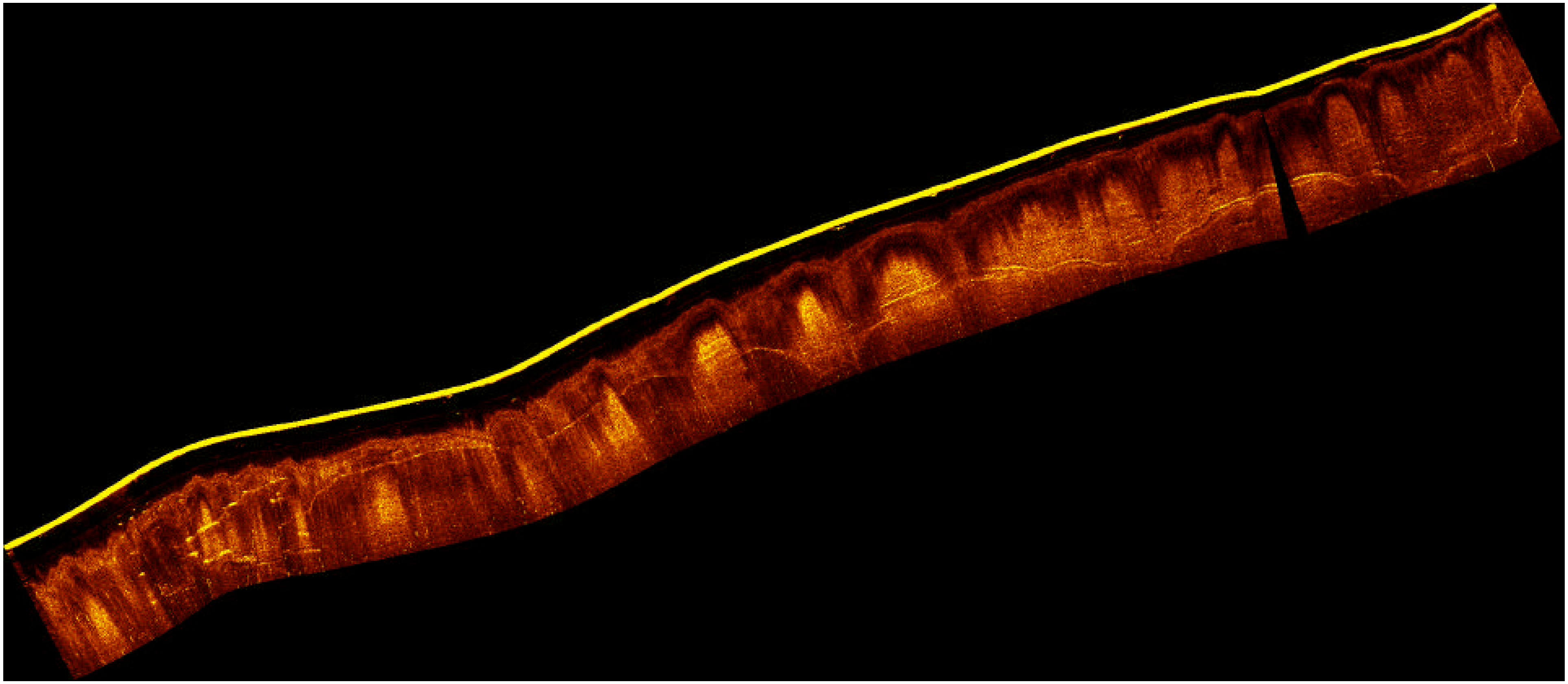
Net 2002-157 (37^0 8.62, 75^0 59.05) south of concrete ships at Kiptopeake



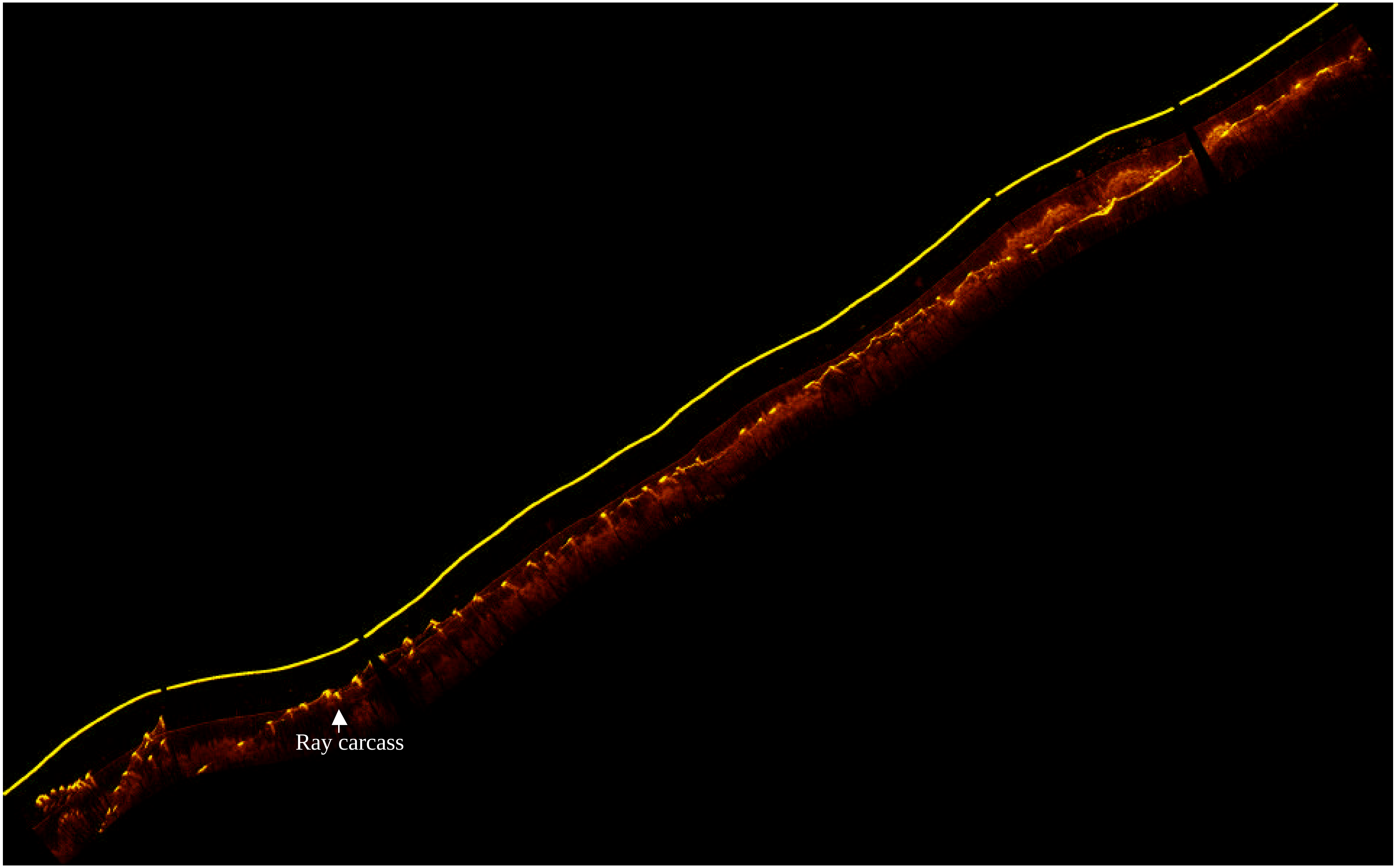
Net 2002-156 (37^0 8.76, 75^0 58.67) south of concrete ships at Kiptopeake



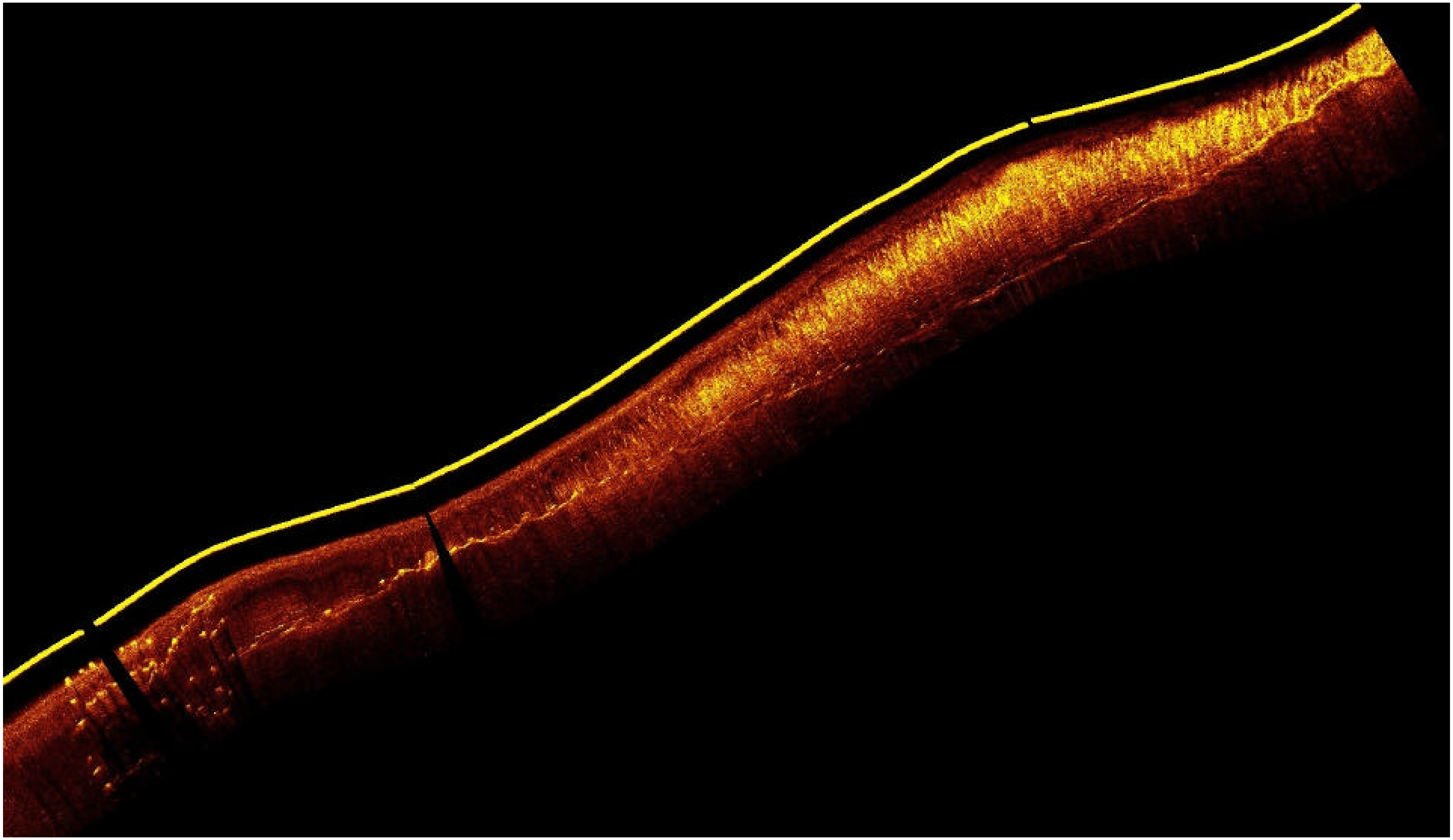
Net 2002-209 (37^0 9.03, 75^0 58.74) south of concrete ships at Kiptopeake



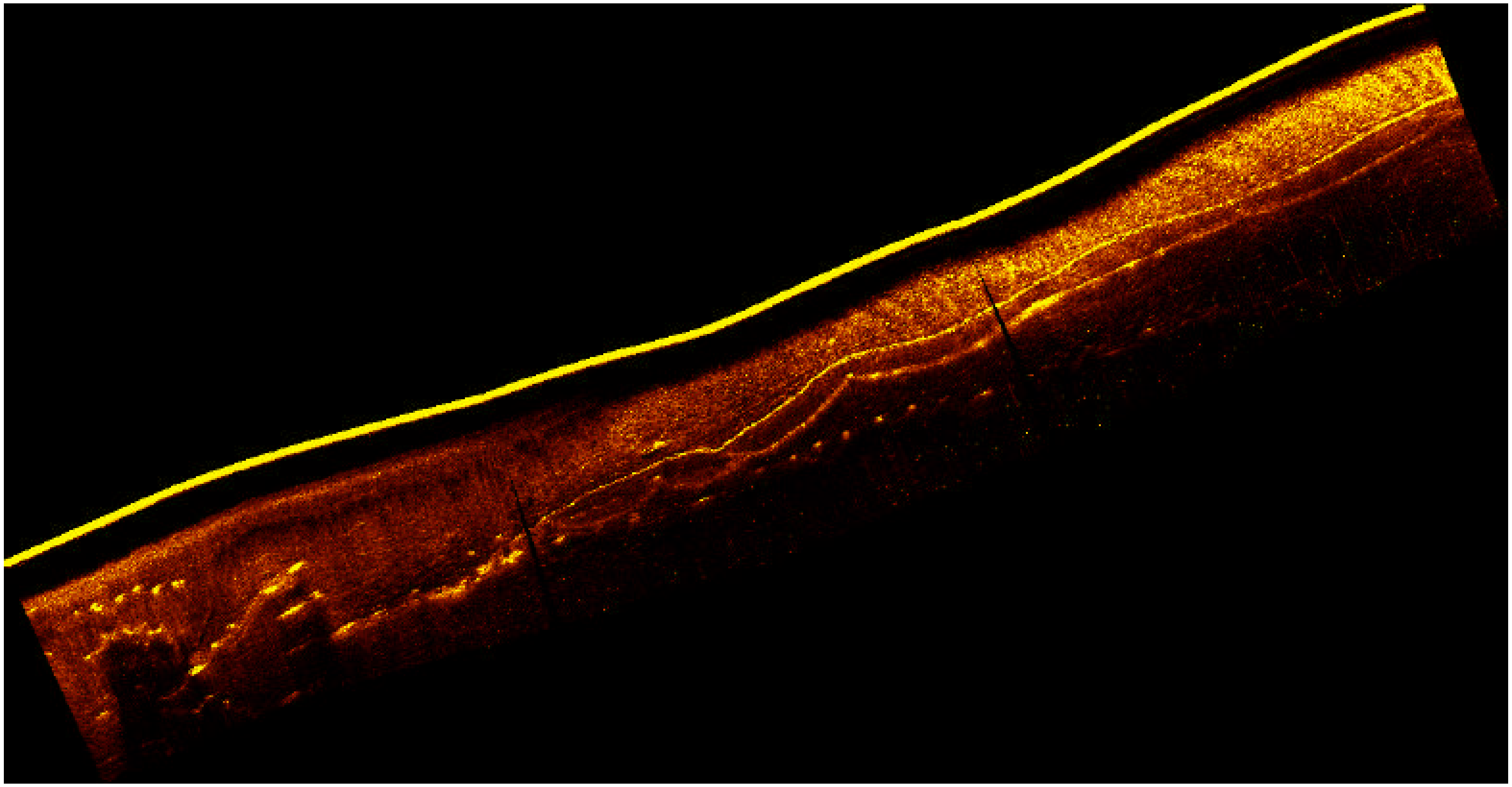
Net 2001-152 (37^{0} 9.35, 75^{0} 58.81) south of concrete ships at Kiptopeake



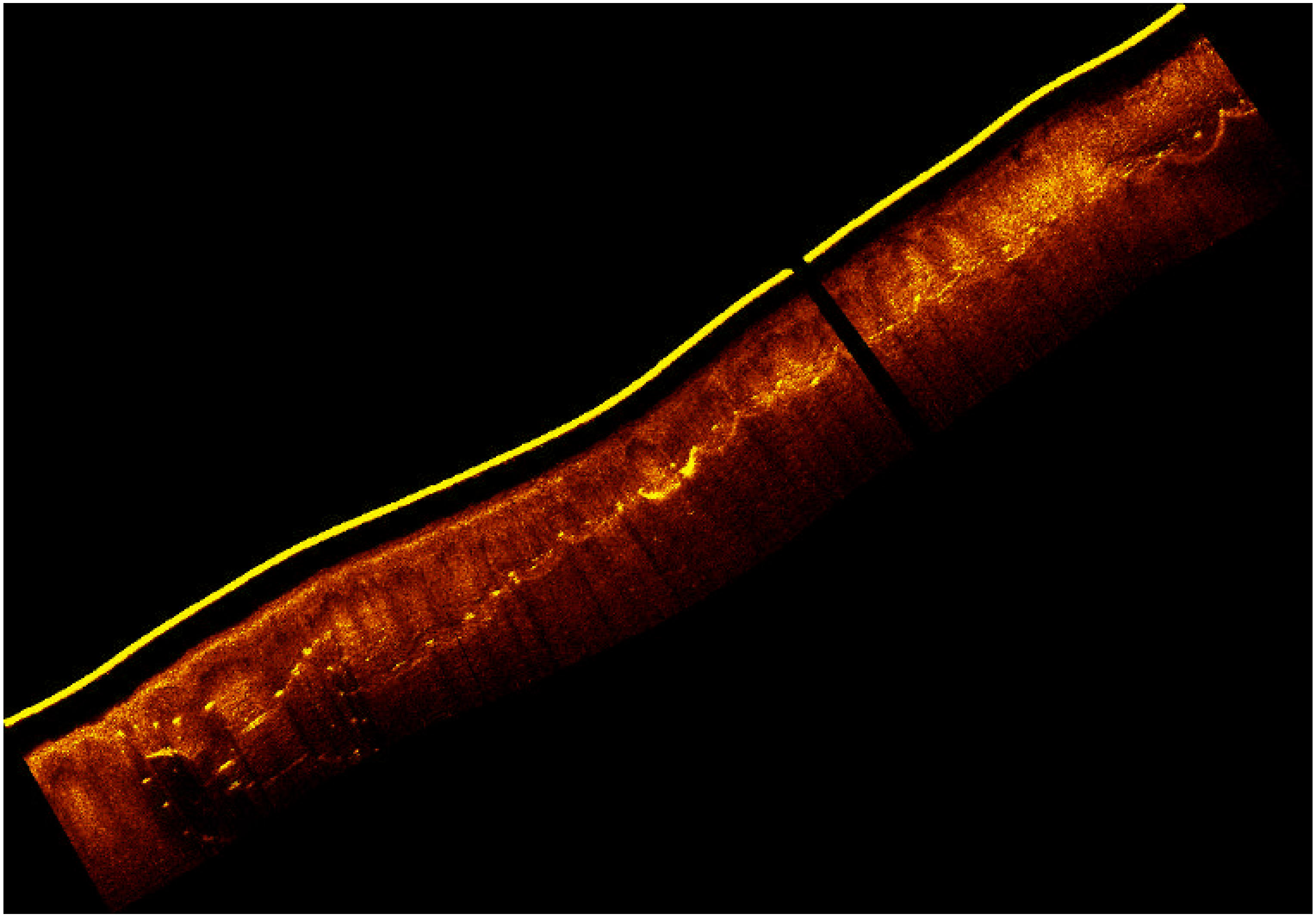
Net 2001-174 (37^0 9.57, 75^0 59.47) near concrete ships at Kiptopeake



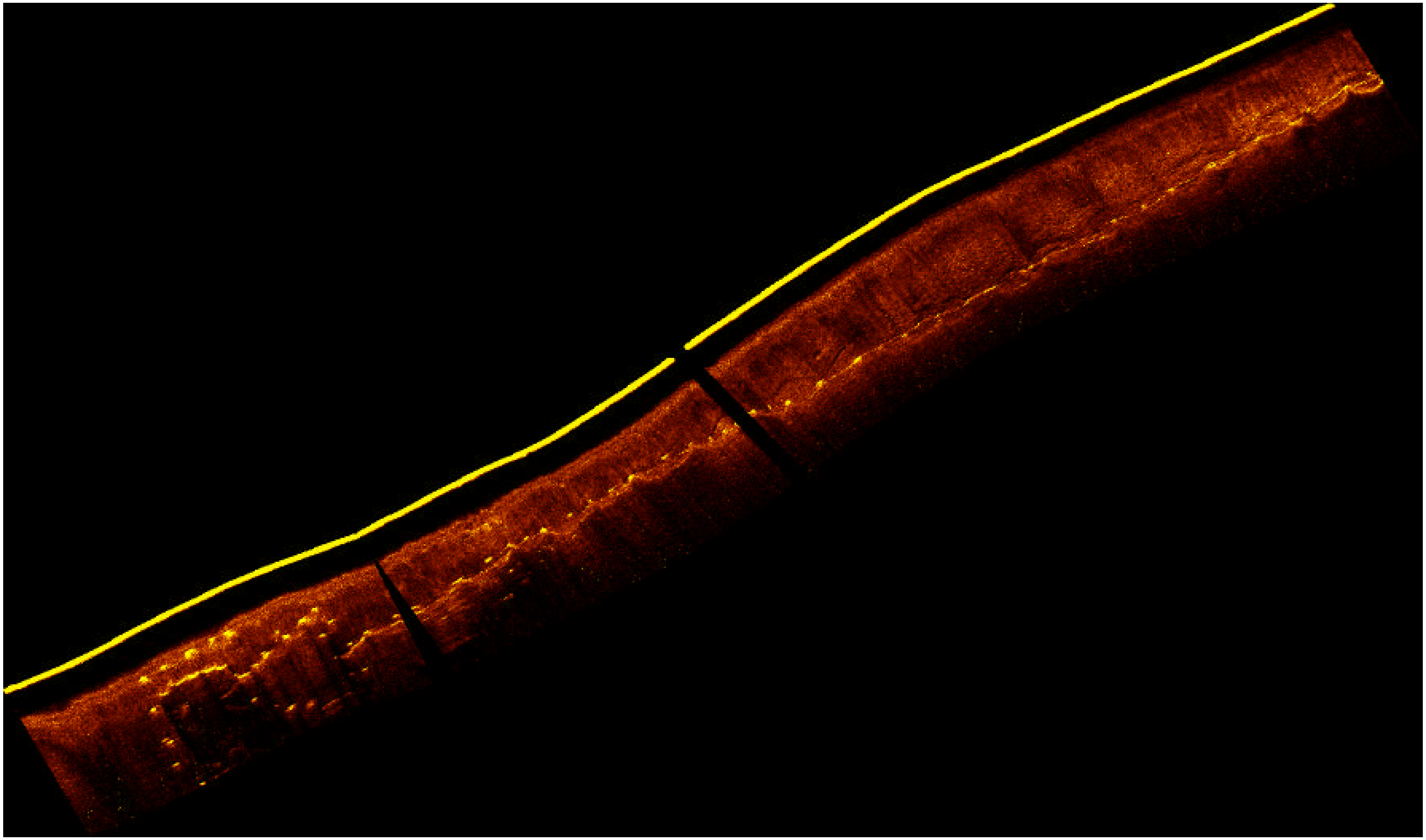
Net 2002-180 (37^0 9.60, 75^0 58.98) south of concrete ships at Kiptopeake



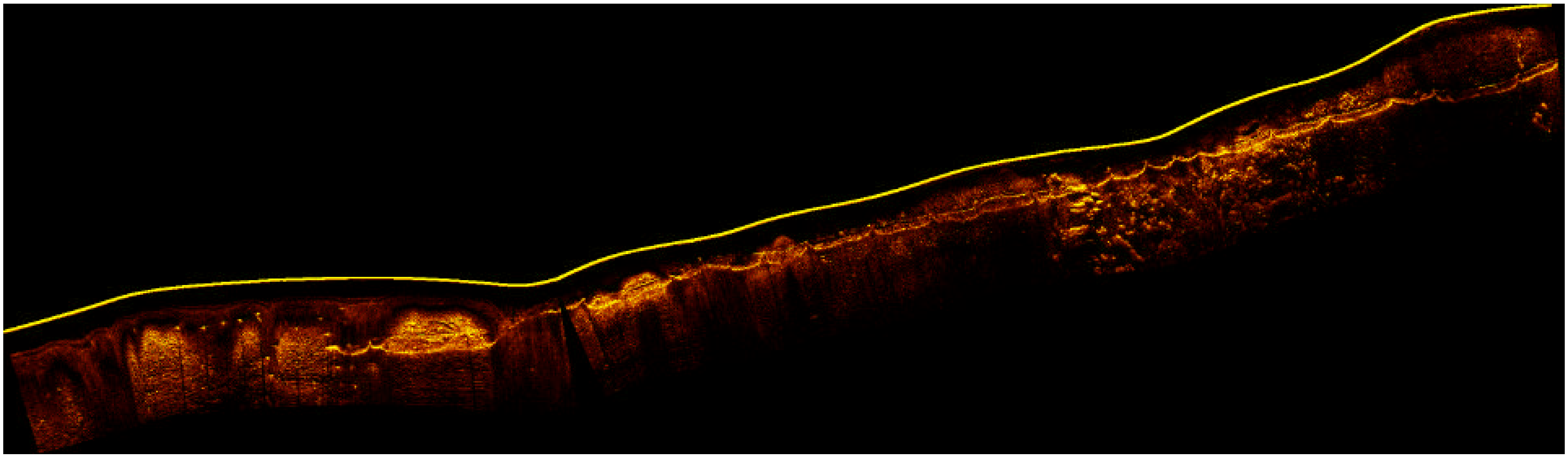
No plate near concrete ships at Kiptopeake (37^0 10.32, 75^0 59.42)



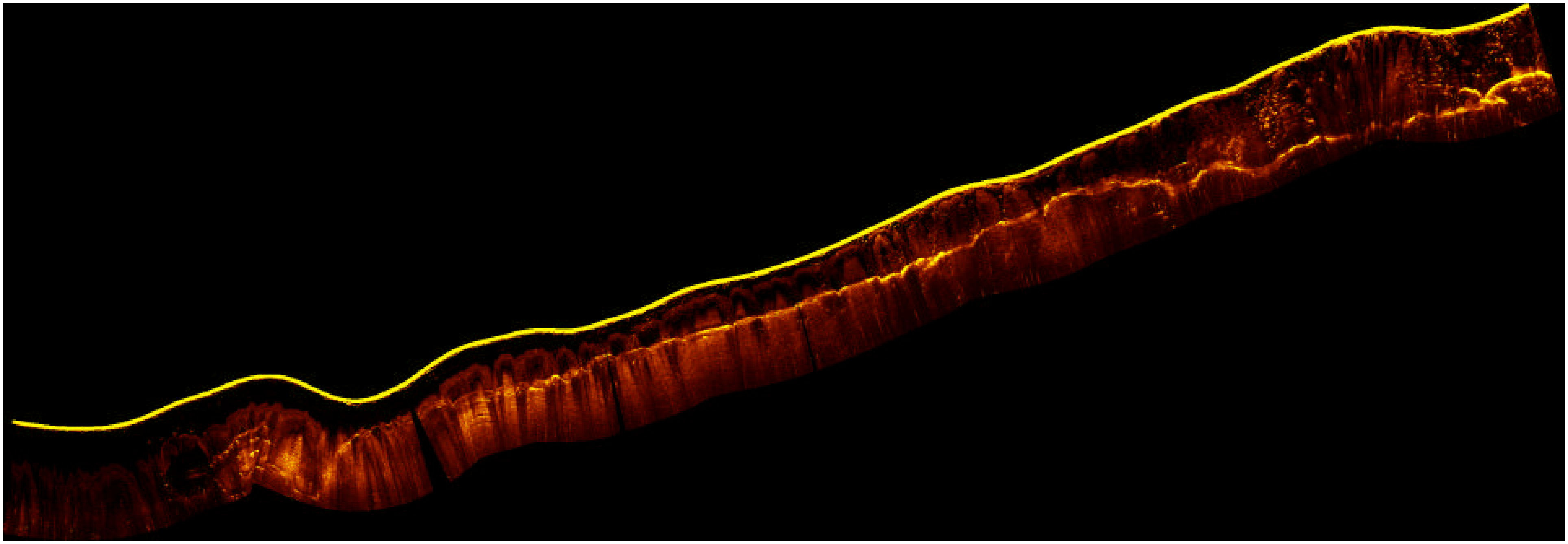
Net 2002-177 (37^0 10.54, 75^0 59.54) north of concrete ships at Kiptopeake



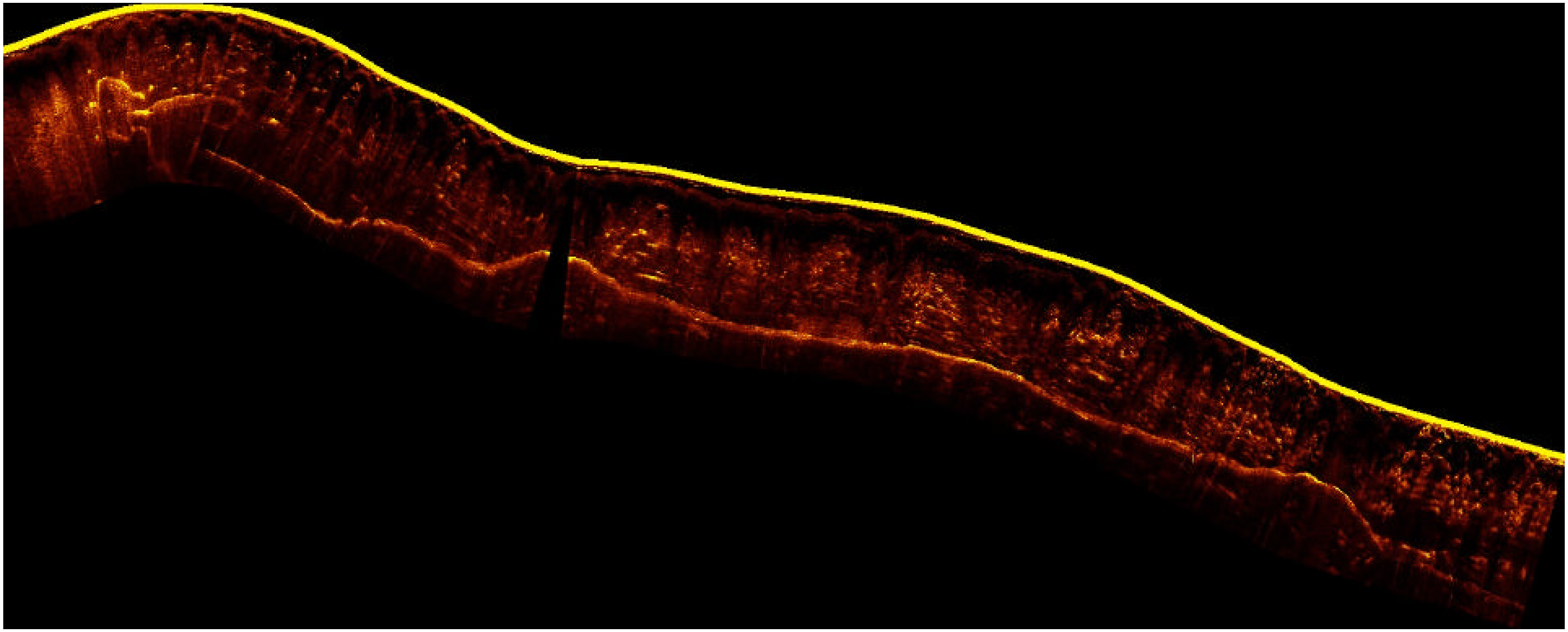
Net 2002-181 (37^0 10.8, 75^0 59.82) north of concrete ships at Kiptopeake



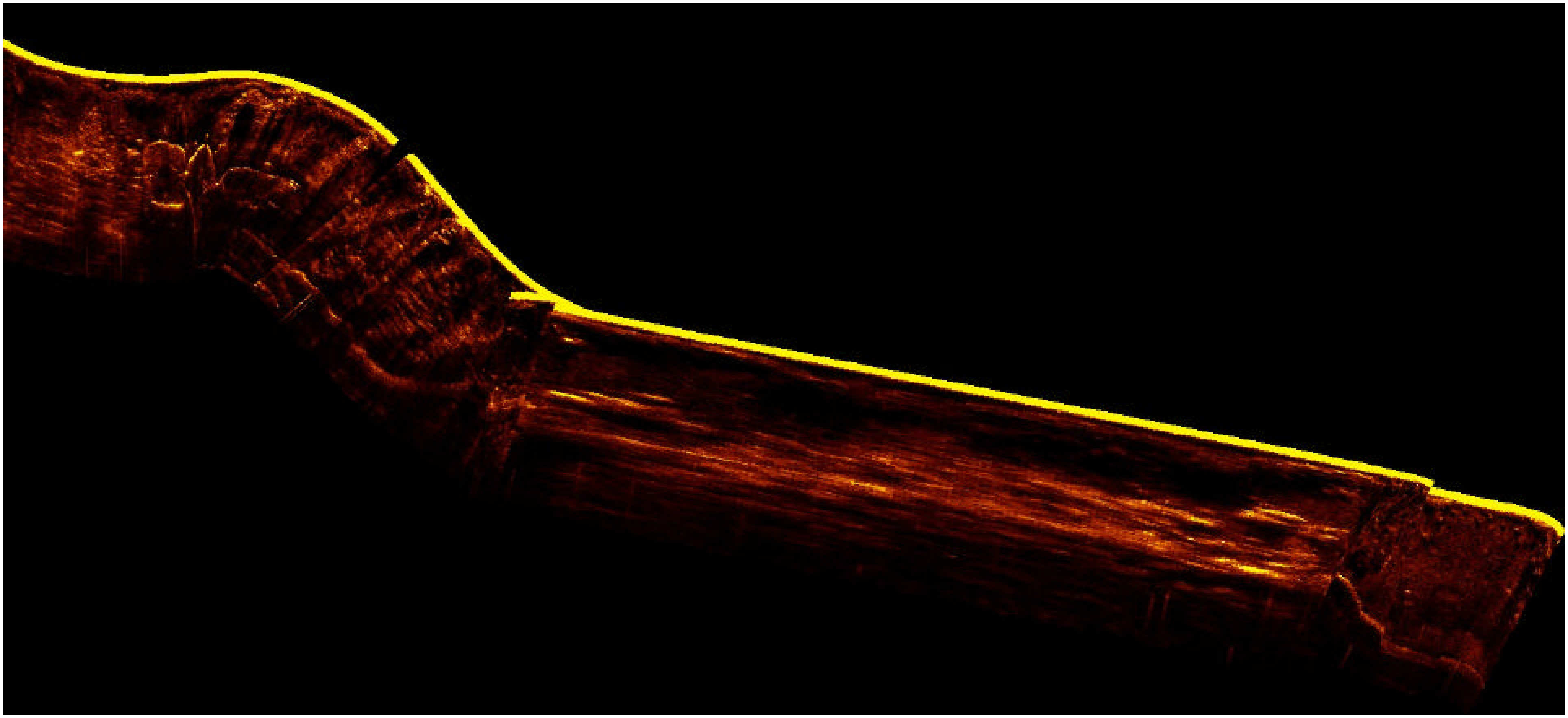
Net 2002-161 (37^0 14.74, 76^0 1.48) near Cape Charles



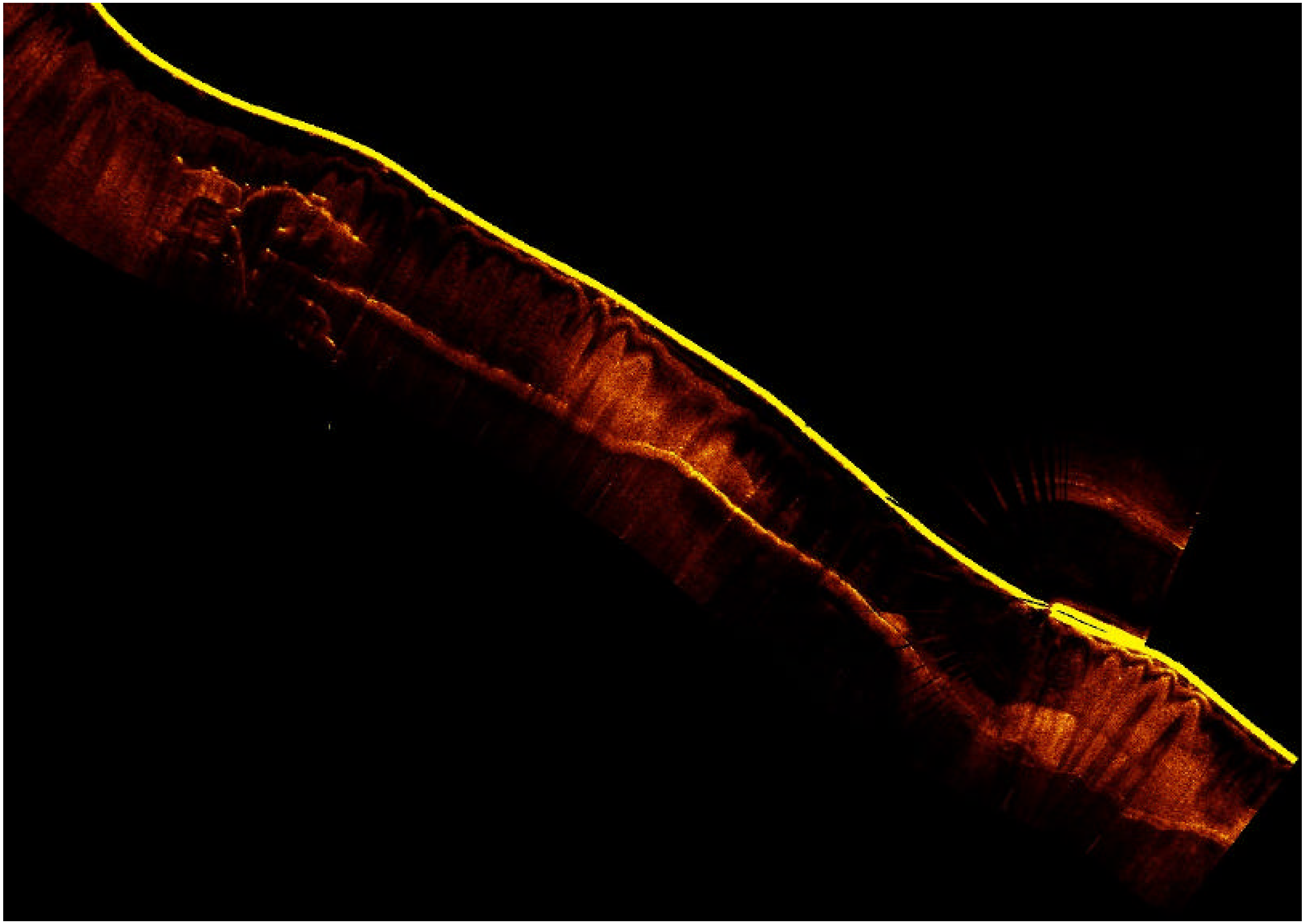
Net 2002-165 (37^0 15.12, 76^0 1.80) off Cape Charles



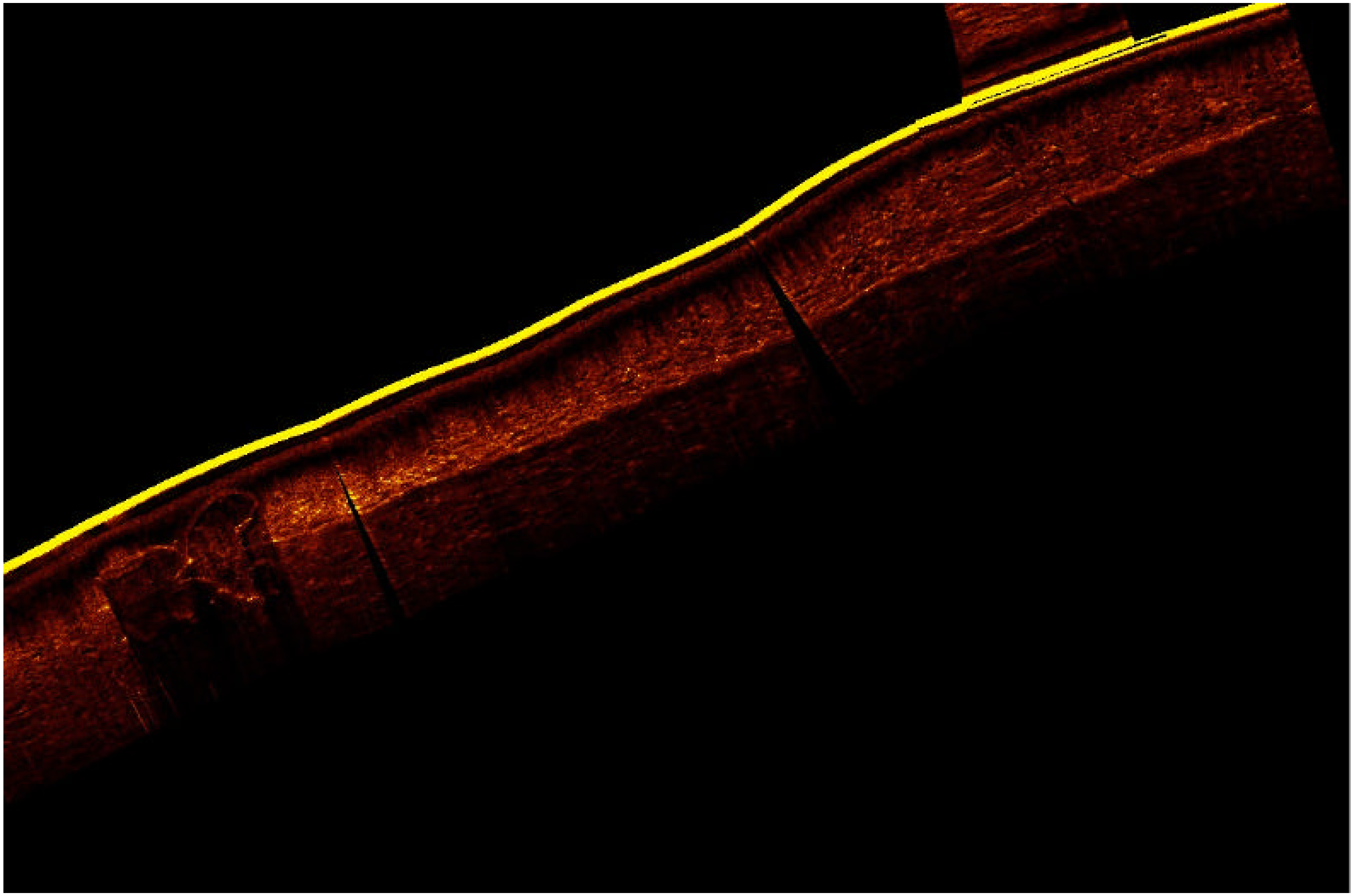
Net 2002-169 (37^0 28.72, 75^0 57.9) near Silver beach



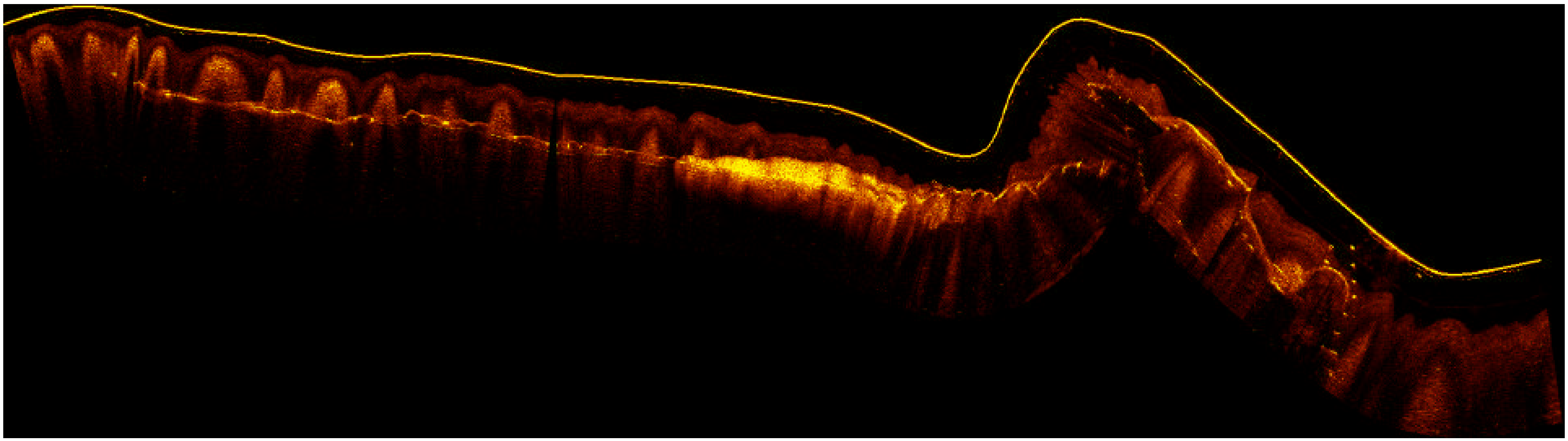
Net 2002-171 (37^0 29.55, 75^0 57.75) near Silver beach



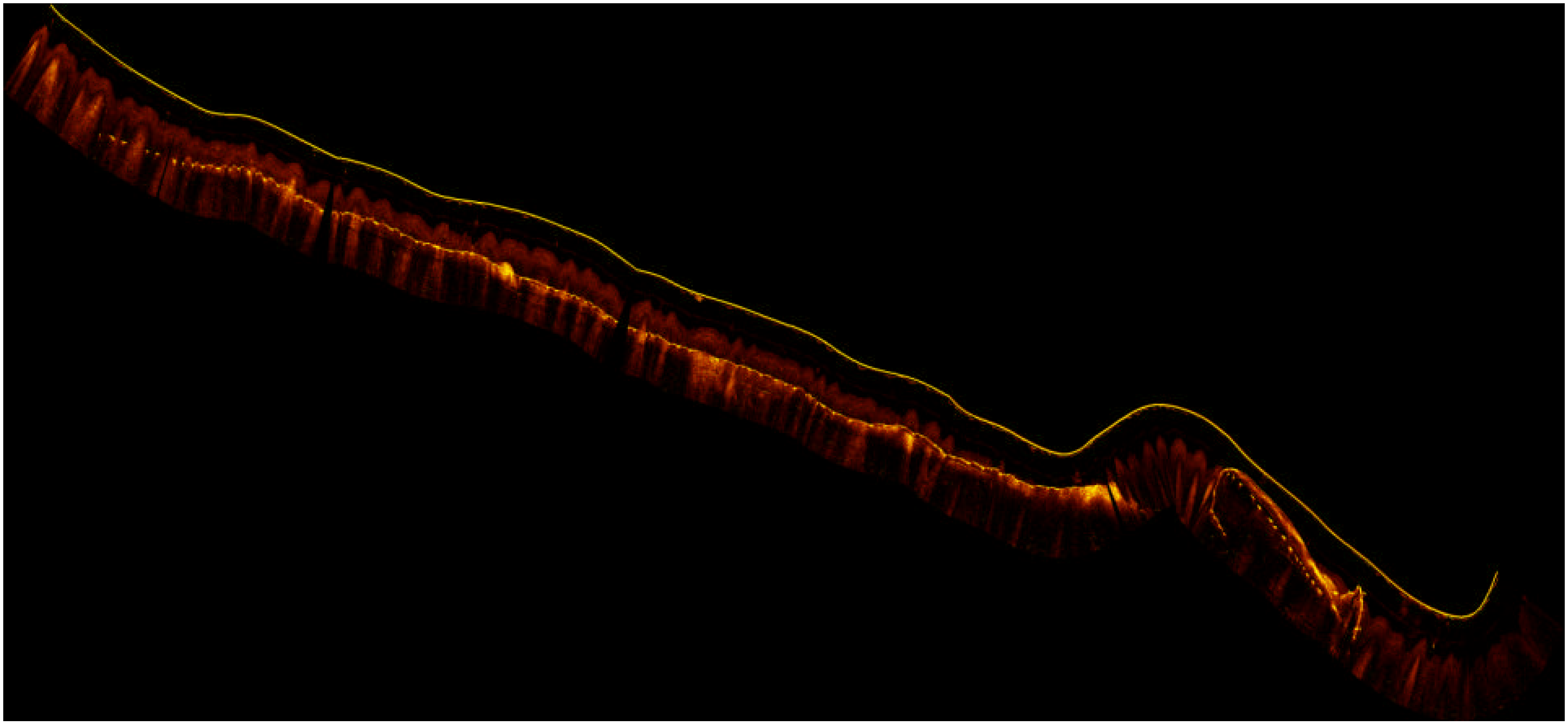
Net 2002-170 (37^0 31.33, 75^0 57.15) near Silver beach



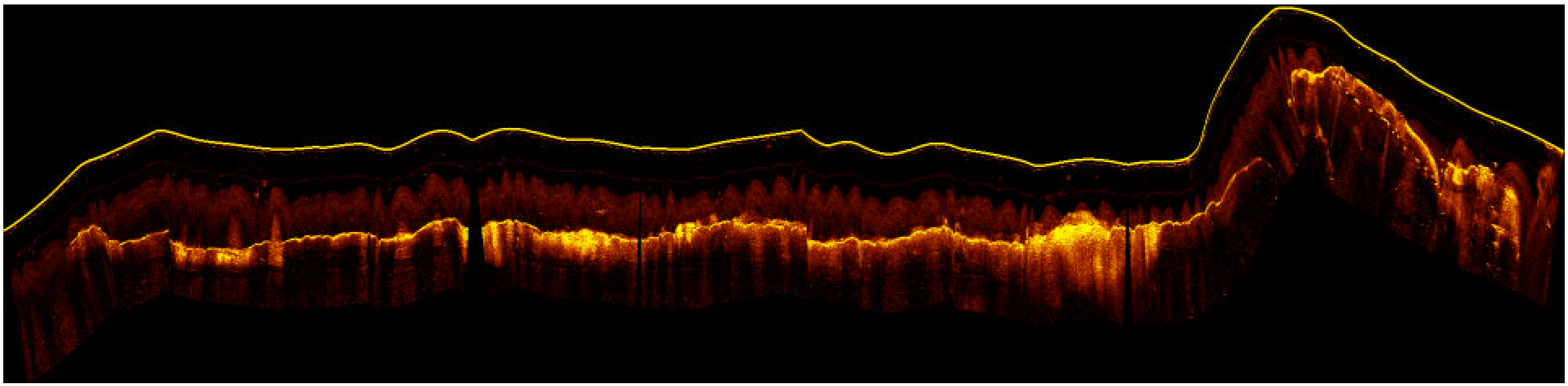
Net 2002-148 (37^0 37.58, 75^0 53.19) near Silver beach



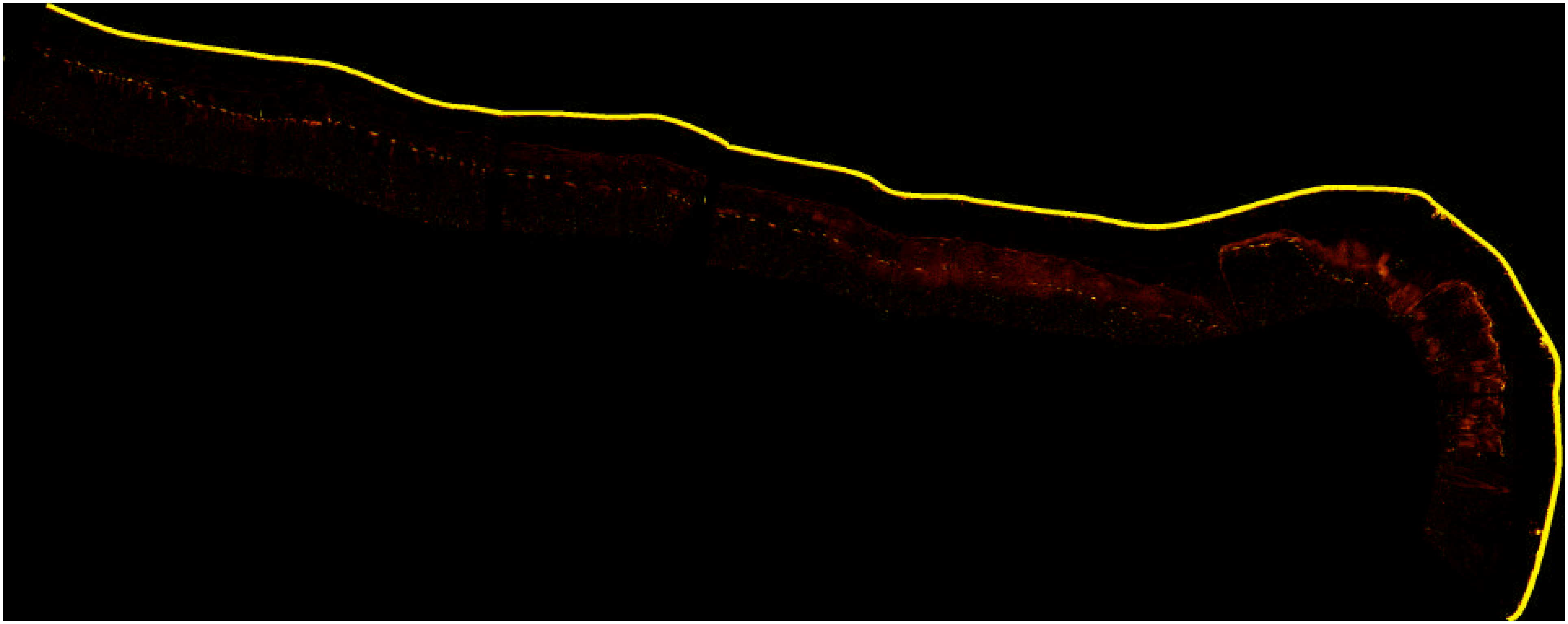
Net 2002-35 (37^0 57.543, 76^0 14.331) south of Smith Point



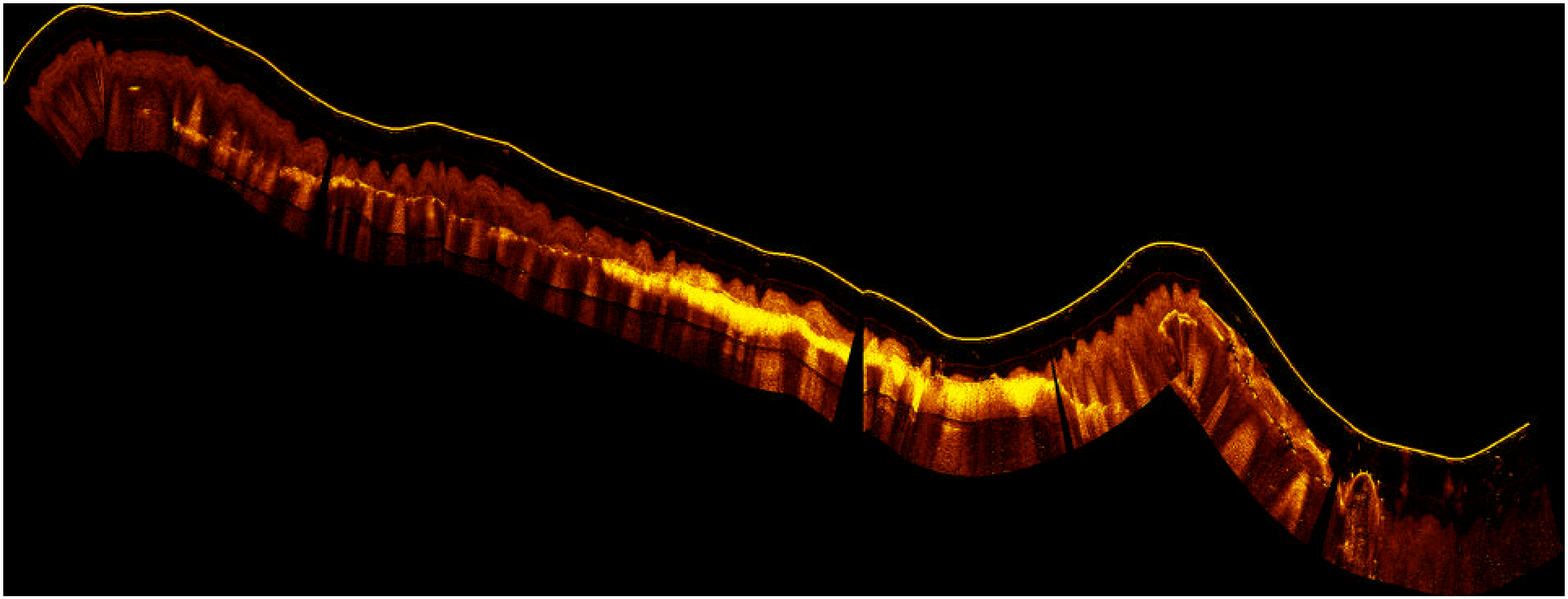
Net 2002-44 (37^0 52.737, 76^0 13.08) off Smith Point



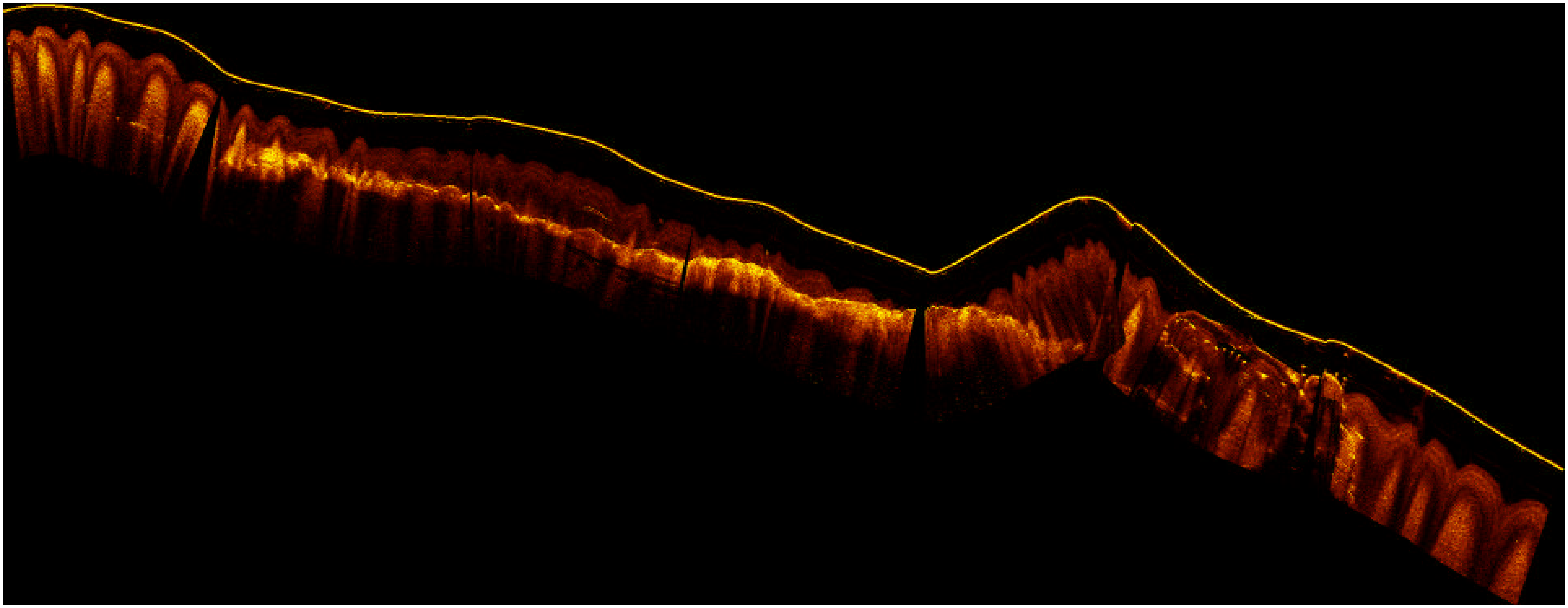
Net 2001-37 (37^0 52.72, 76^0 13.60) off Smith Point



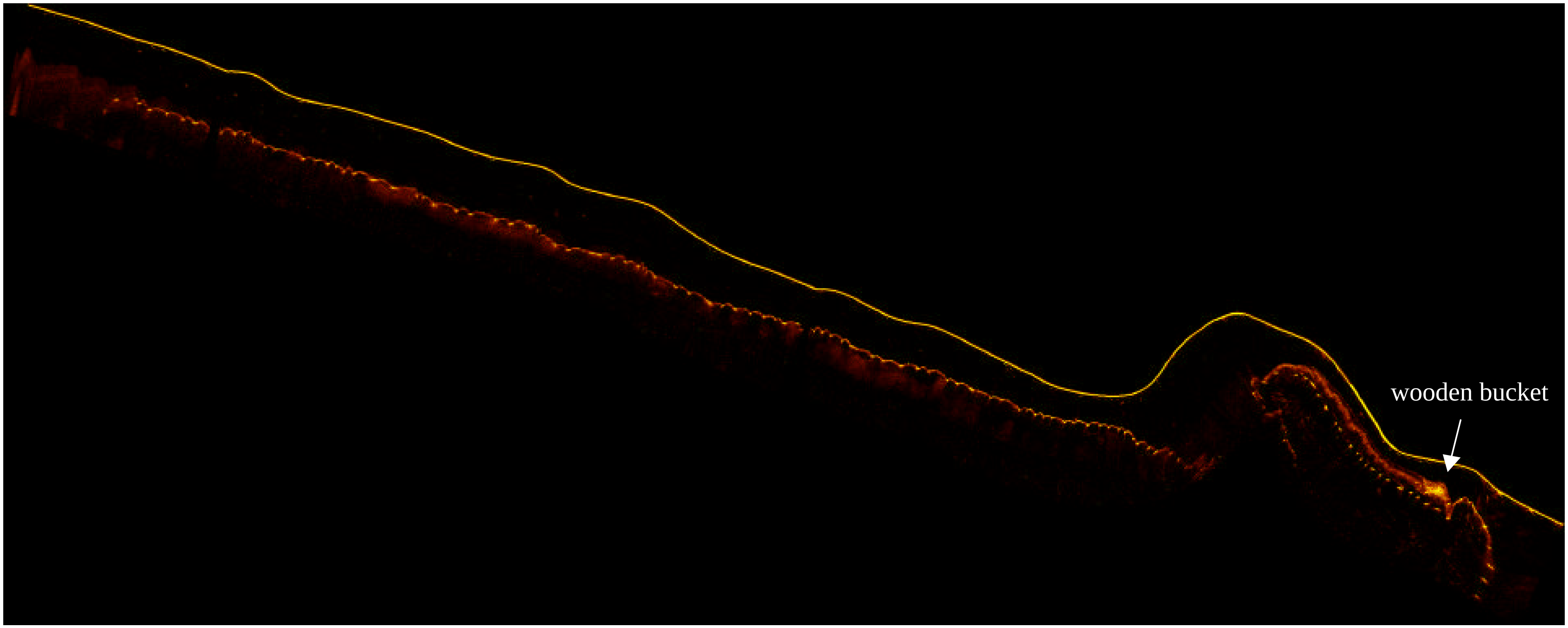
Net 2002-39 (37^0 52.41, 76^0 13.42) off Smith Point



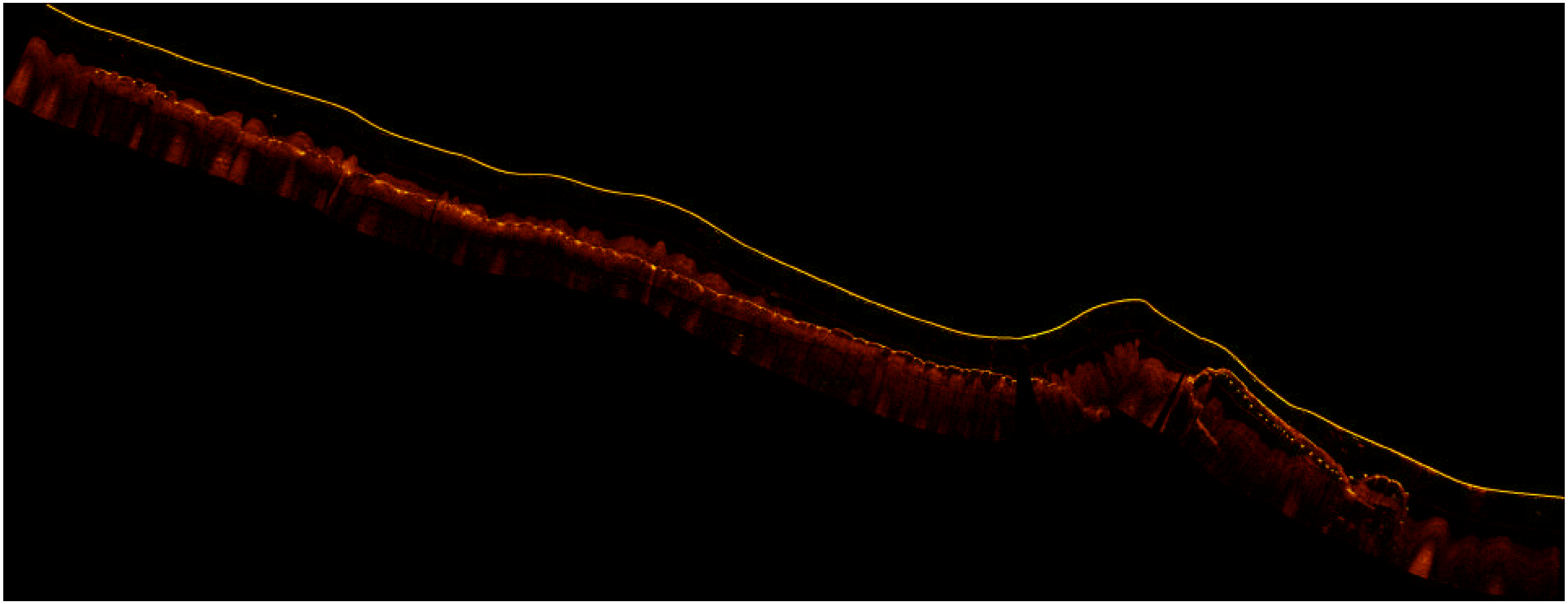
Net 2002-30 (37^0 52.188, 76^0 13.588) off Smith Point



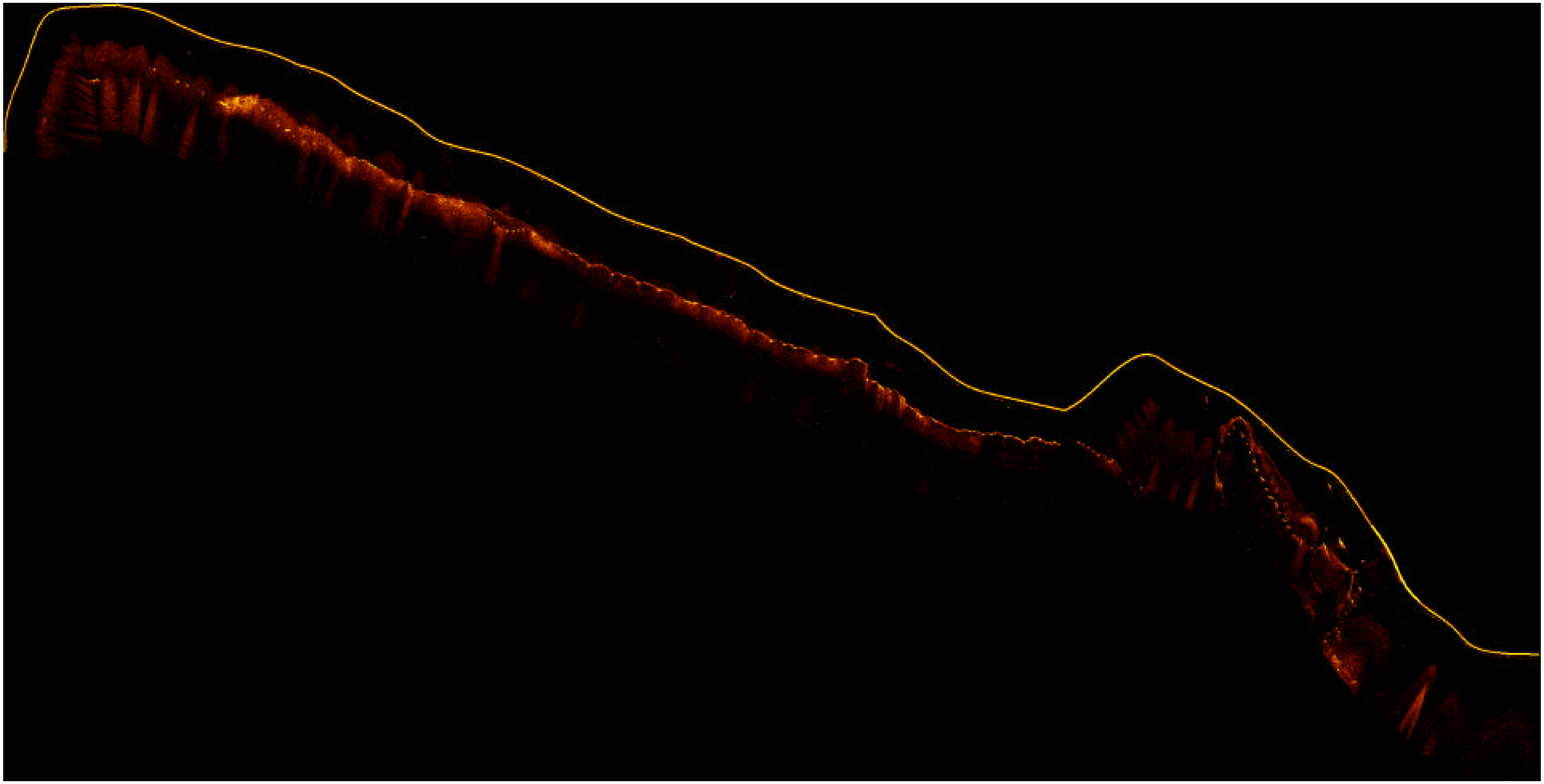
Net 2002-40 (37^0 52.12, 76^0 14.06) off Smith Point



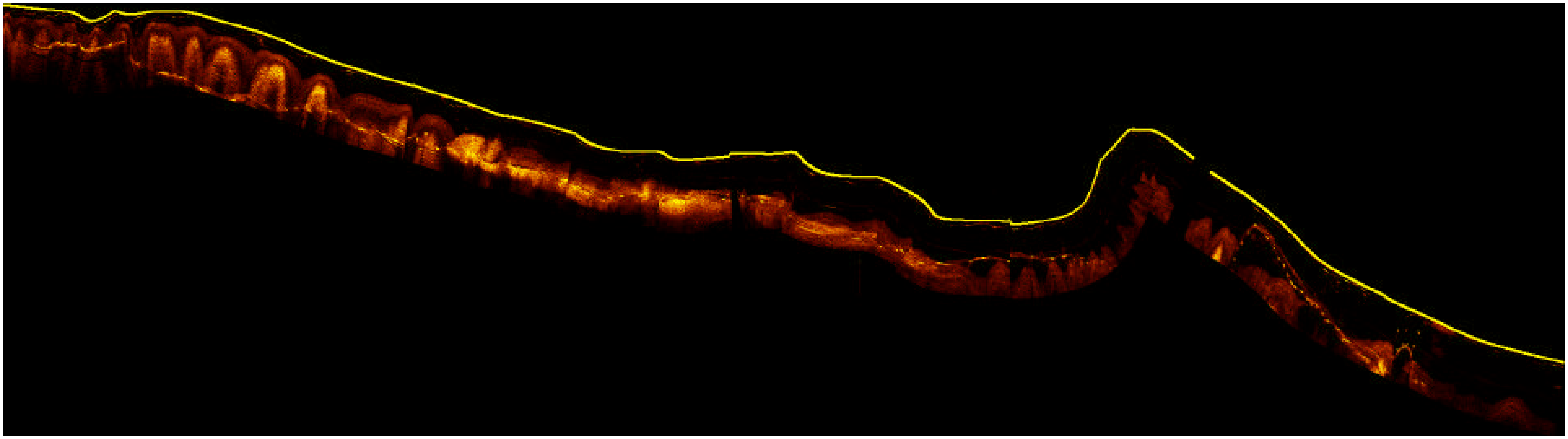
Net 2002-29 (37^0 51.76, 76^0 13.79) off Smith Point



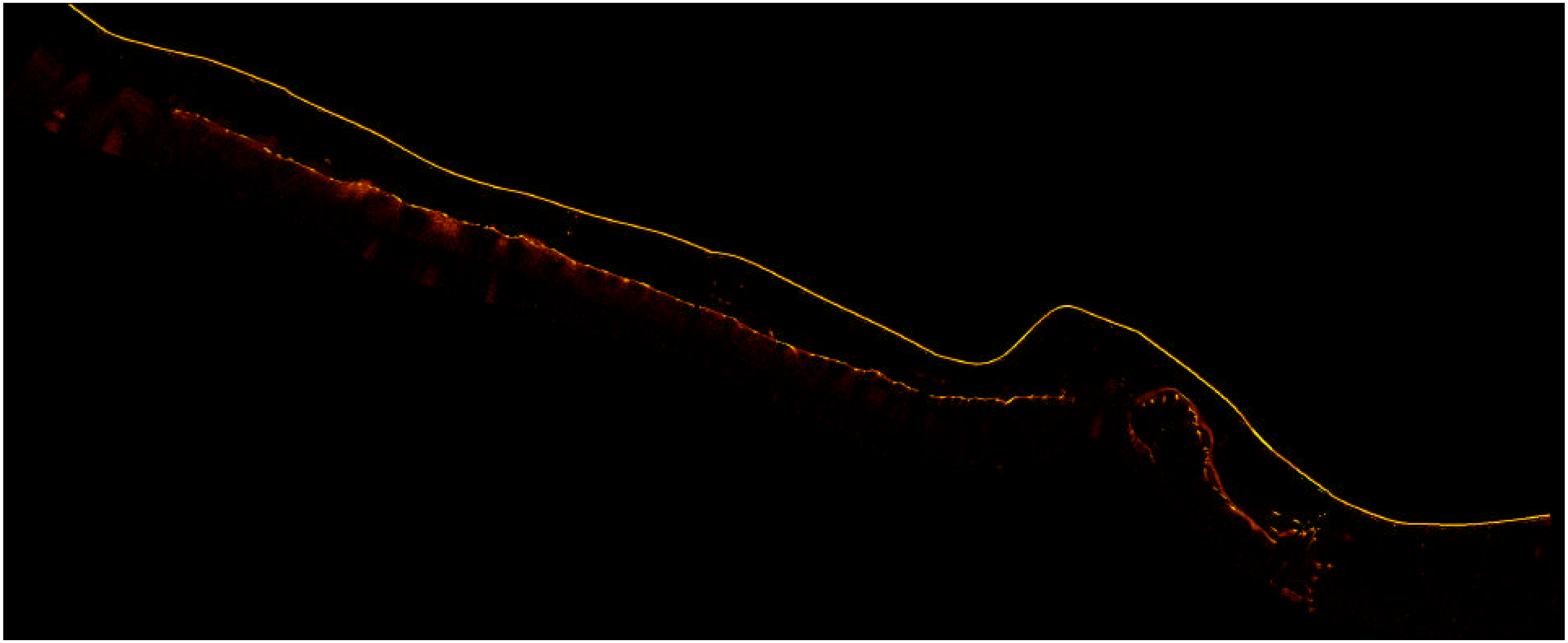
Net 2002-32 (37^0 51.481, 76^0 14.111) off Smith Point



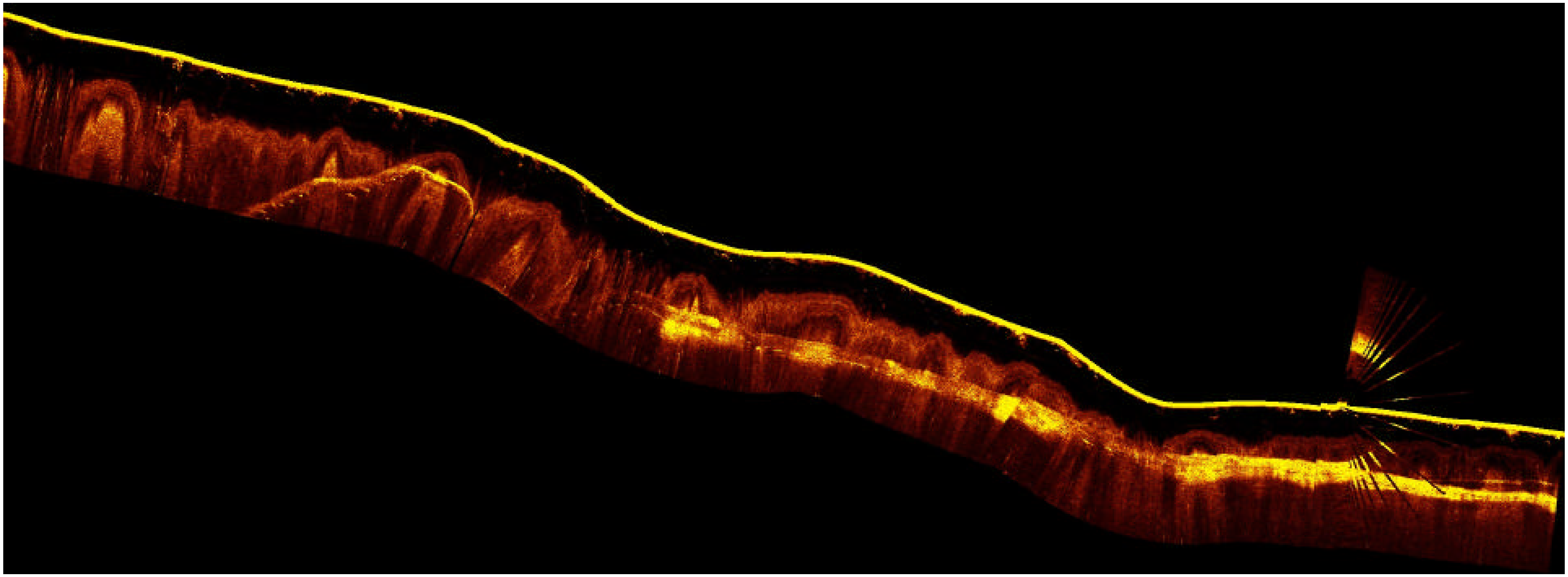
Net 2002-42 (37^0 51.148, 76^0 14.262) south of Smith Point



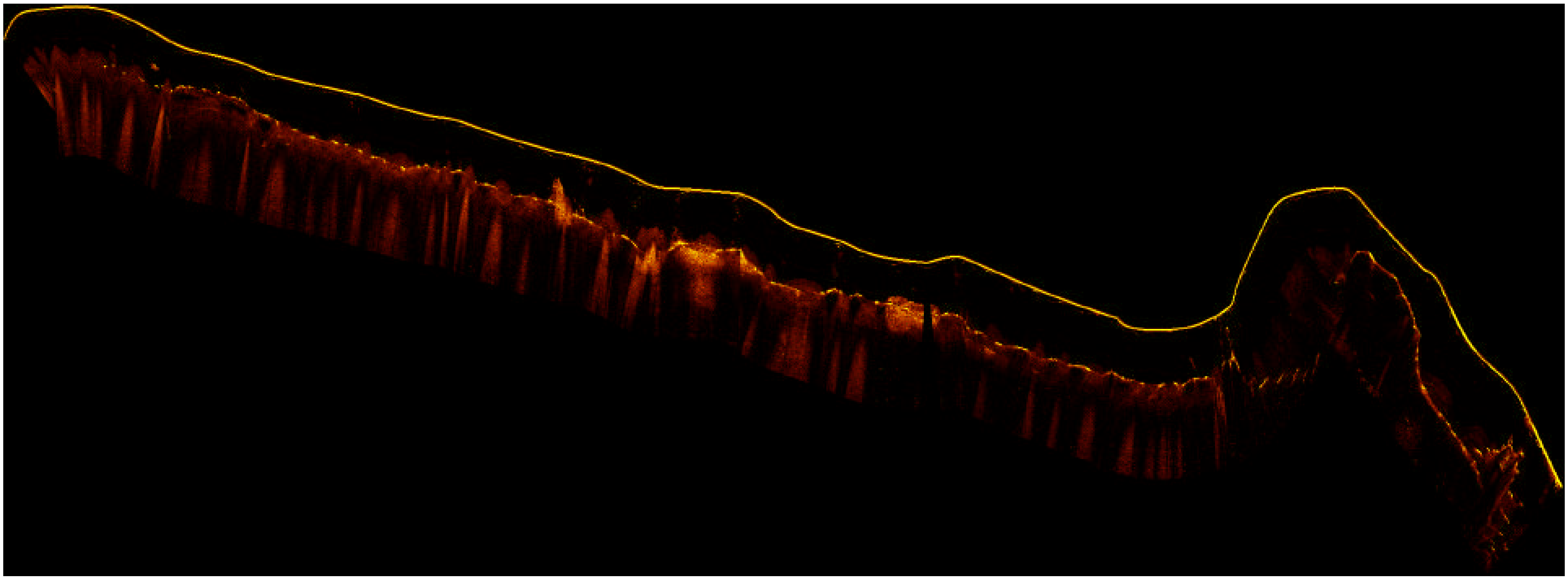
Net 2002-33 (37^0 50.896, 76^0 14.512) south of Smith Point



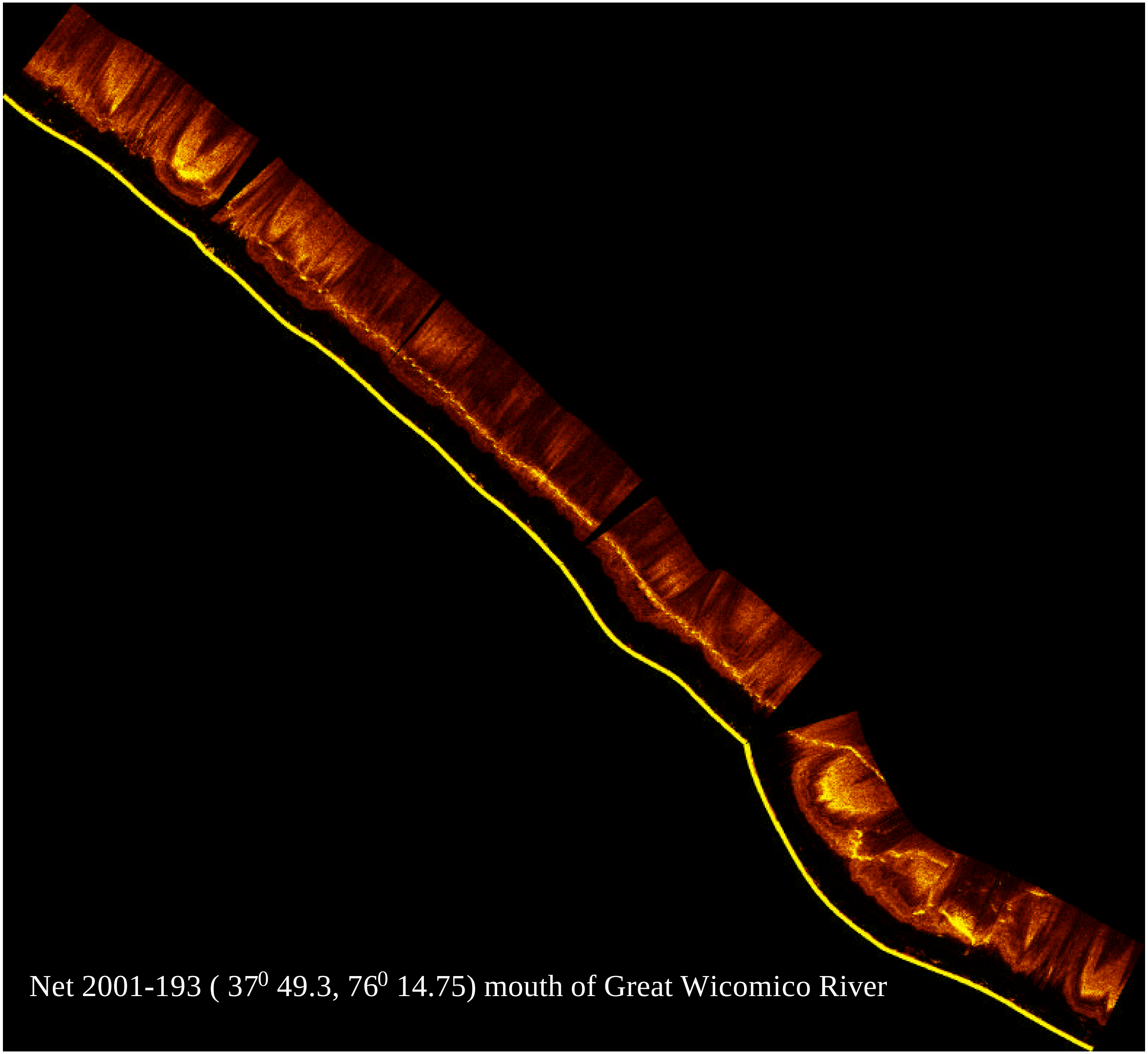
Net 2002-36 (37^0 50.764, 76^0 14.168) south of Smith Point



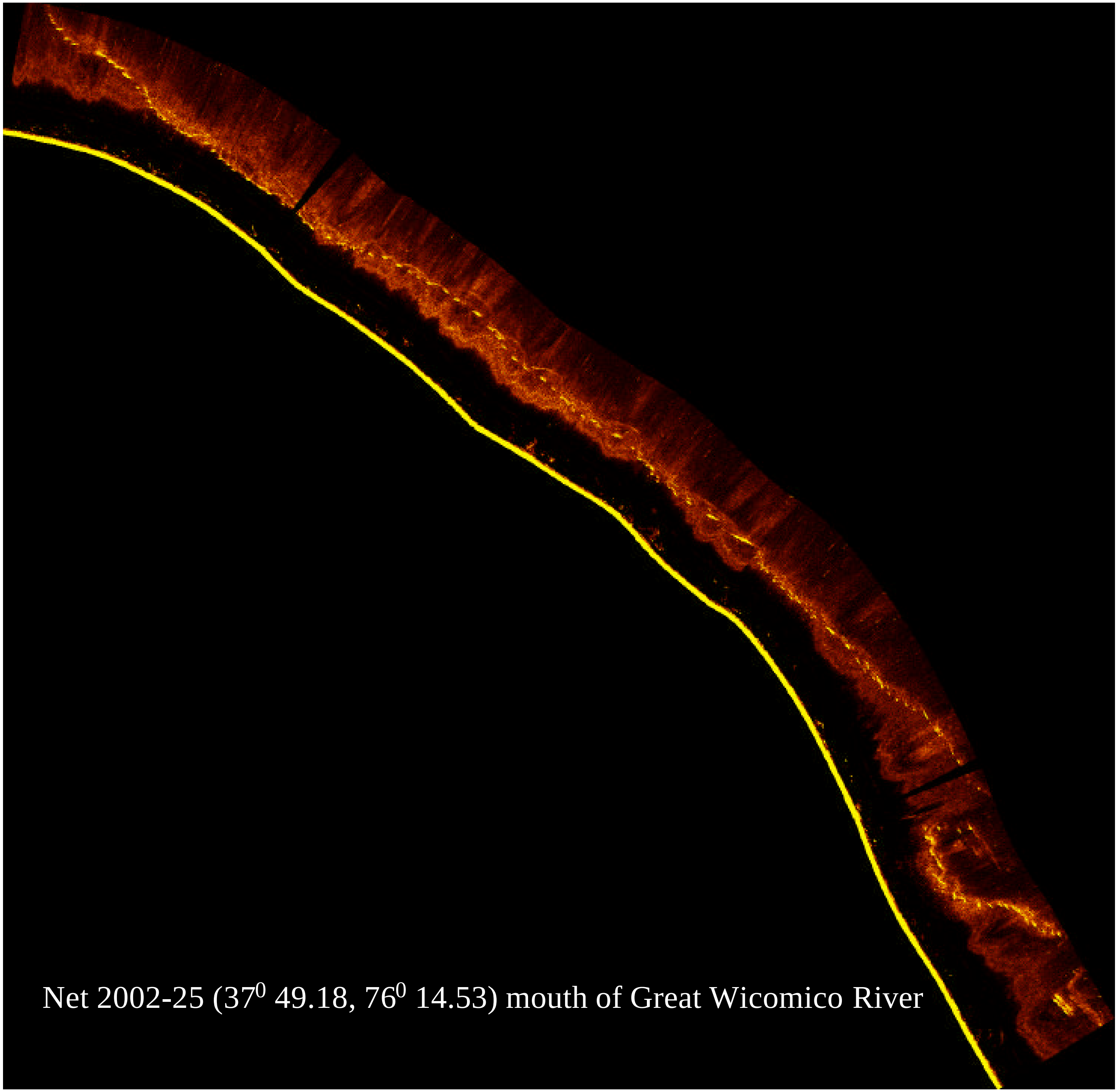
Net 2002-50 (37^0 50.54, 76^0 14.64) near Smith Point



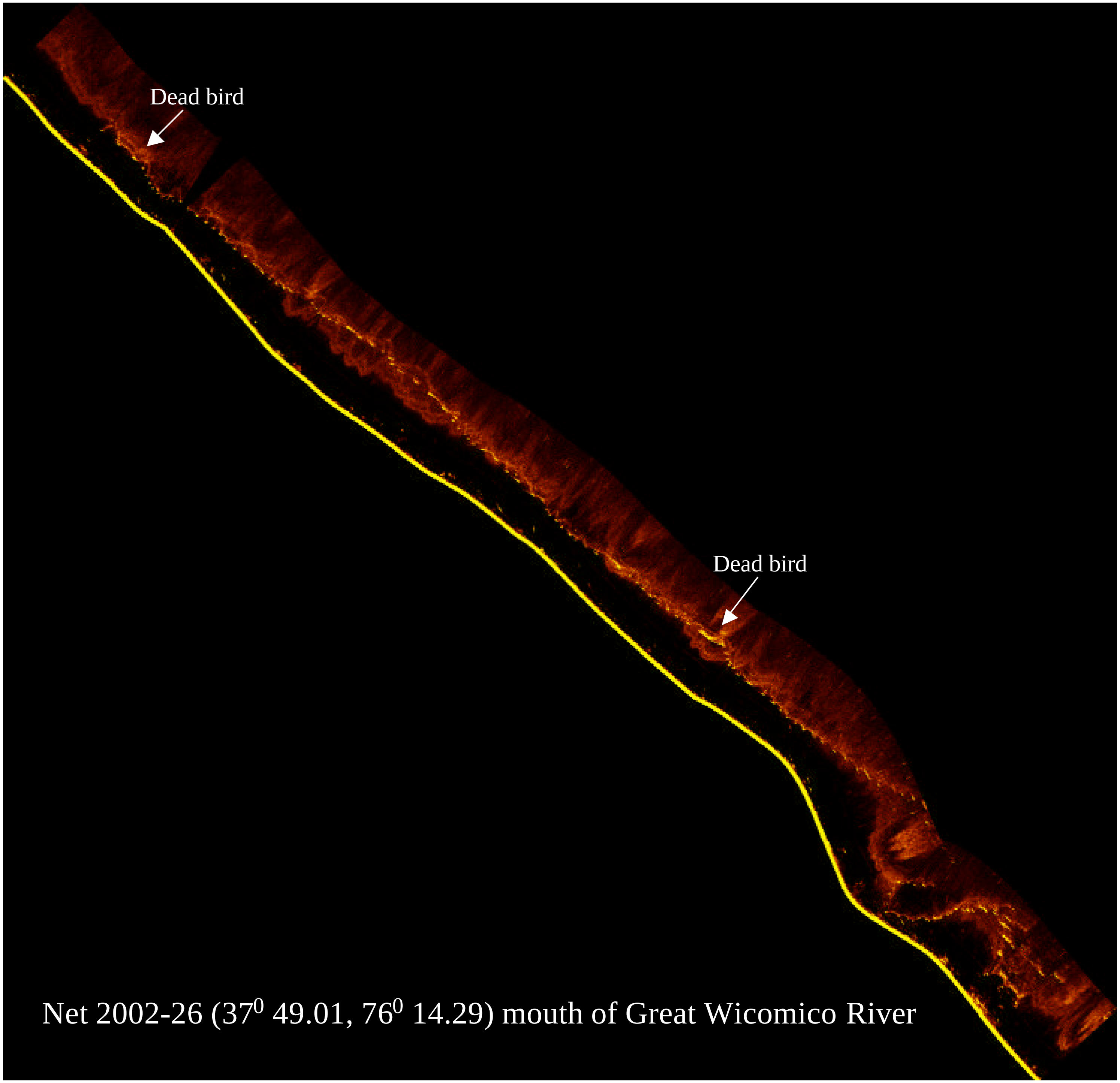
Net 2002-51 (37^0 50.52, 76^0 14.39) off Smith Point



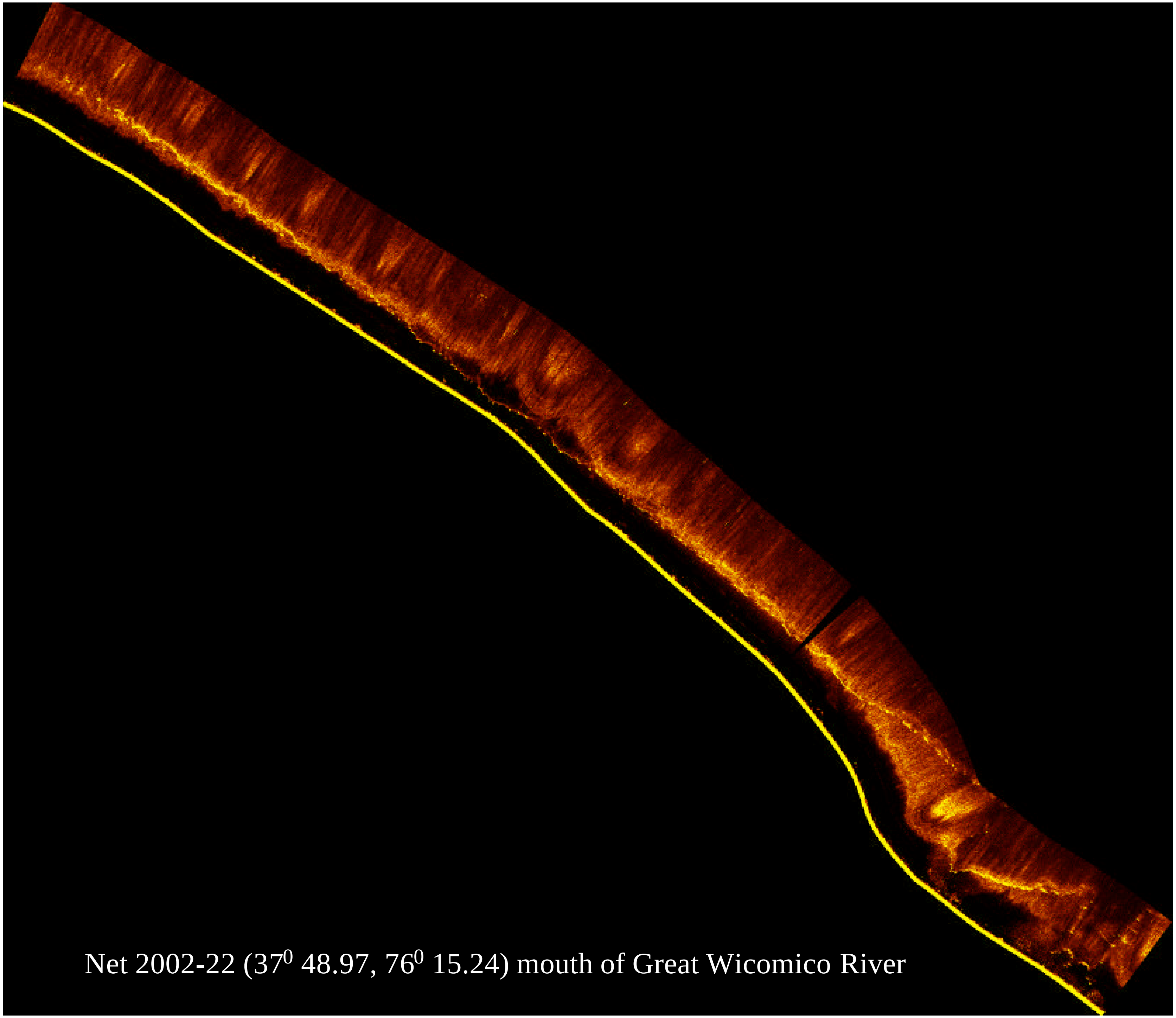
Net 2001-193 (37^0 49.3, 76^0 14.75) mouth of Great Wicomico River



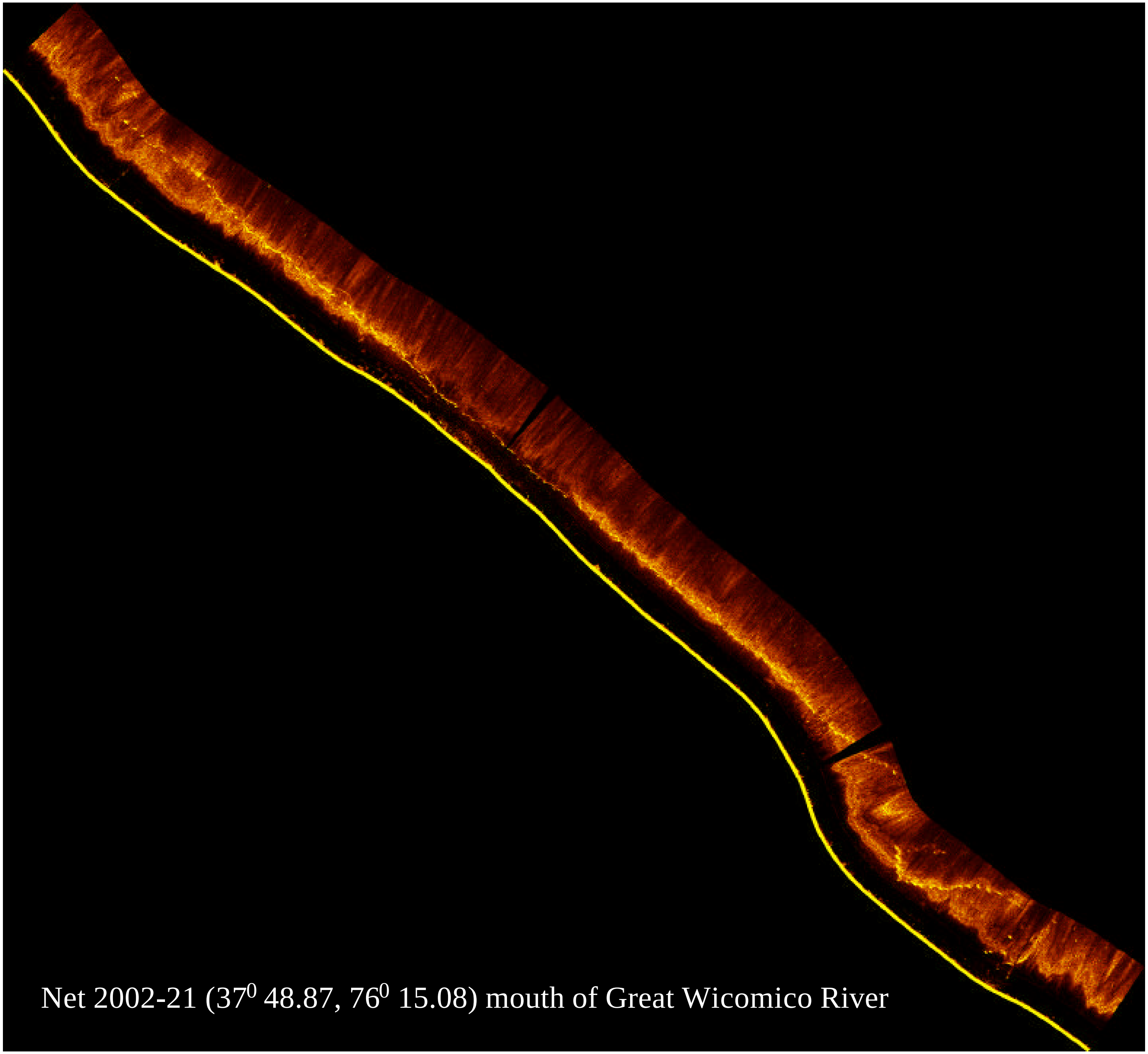
Net 2002-25 (37^0 49.18, 76^0 14.53) mouth of Great Wicomico River



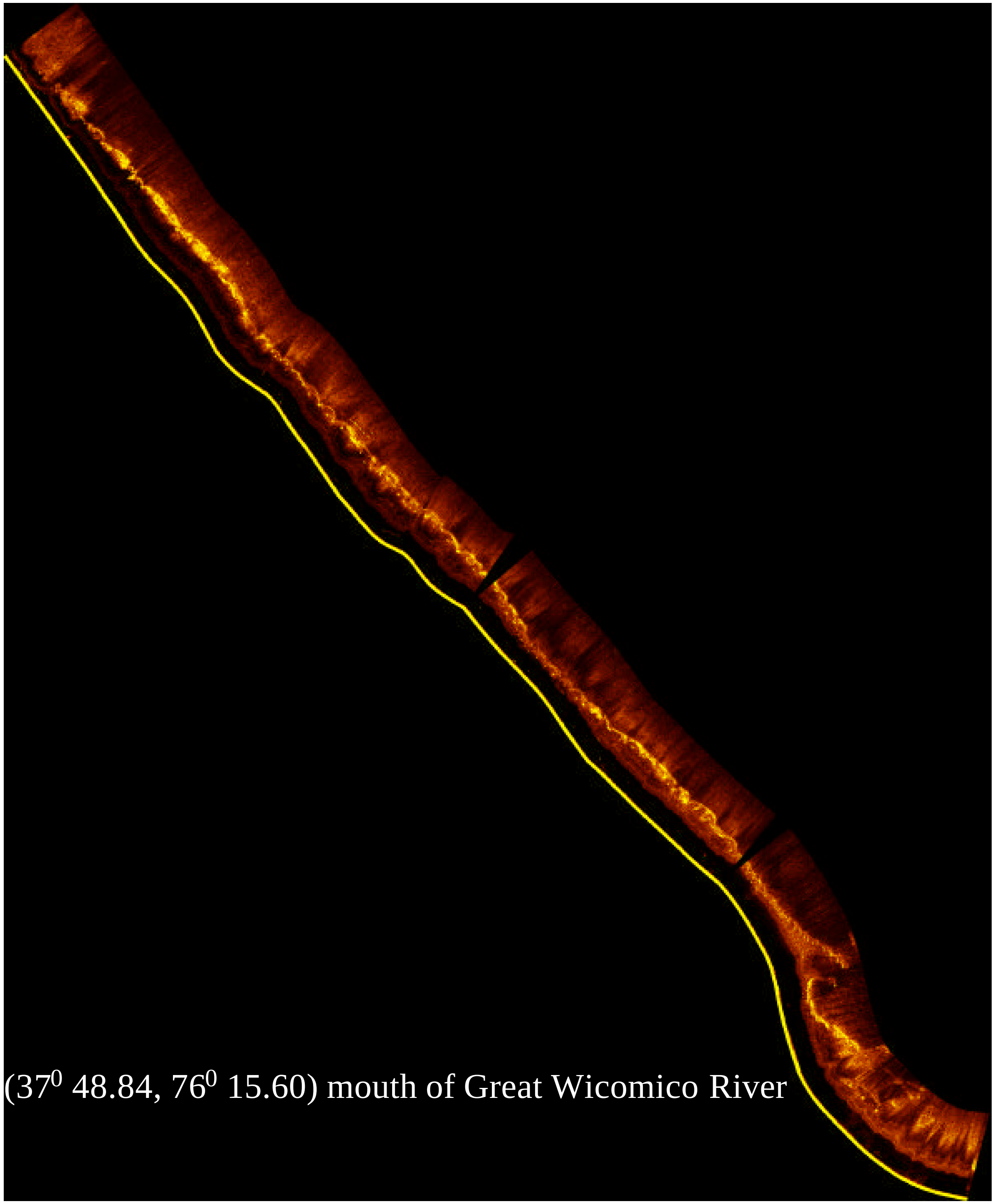
Net 2002-26 (37^0 49.01, 76^0 14.29) mouth of Great Wicomico River



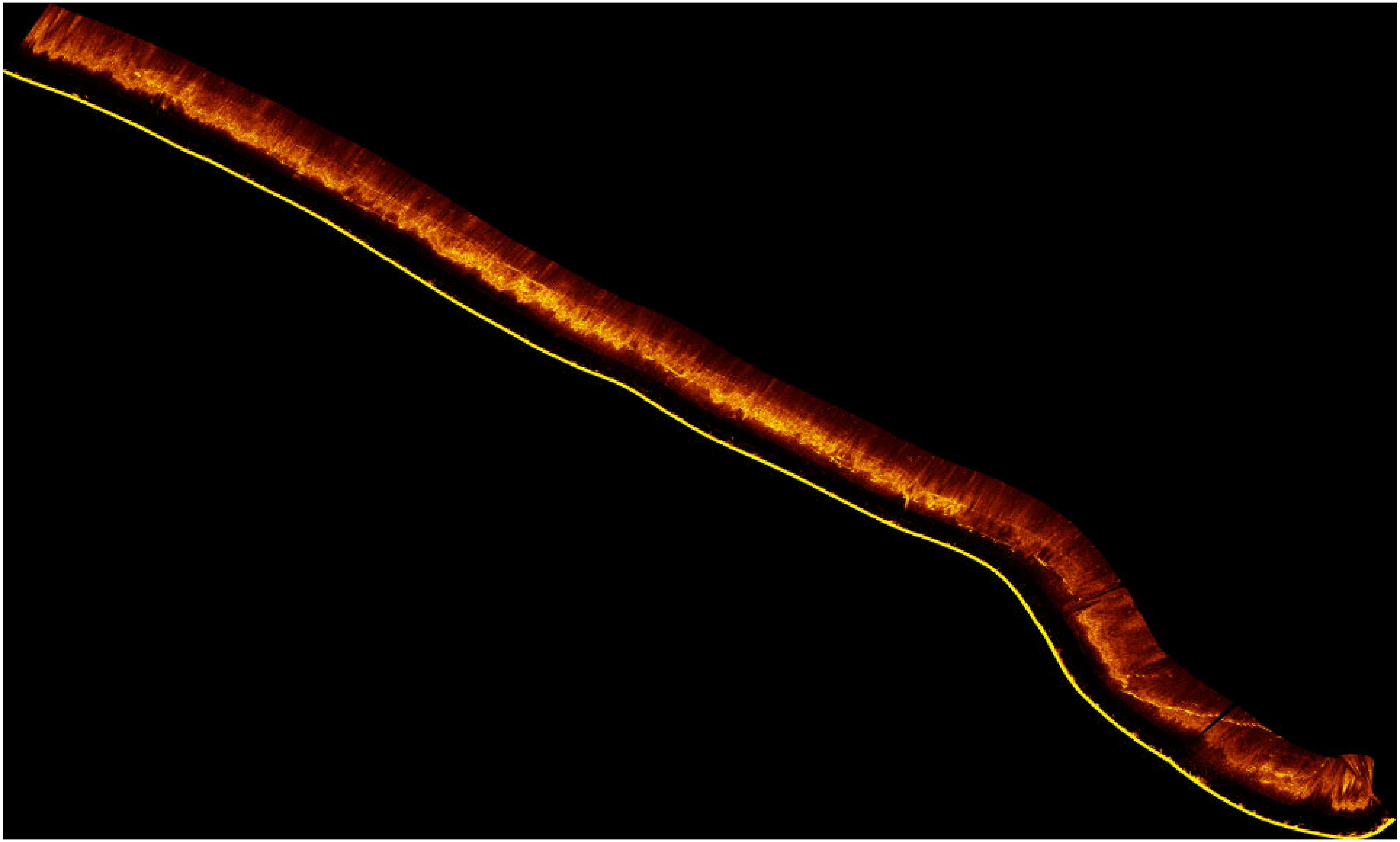
Net 2002-22 (37^0 48.97, 76^0 15.24) mouth of Great Wicomico River



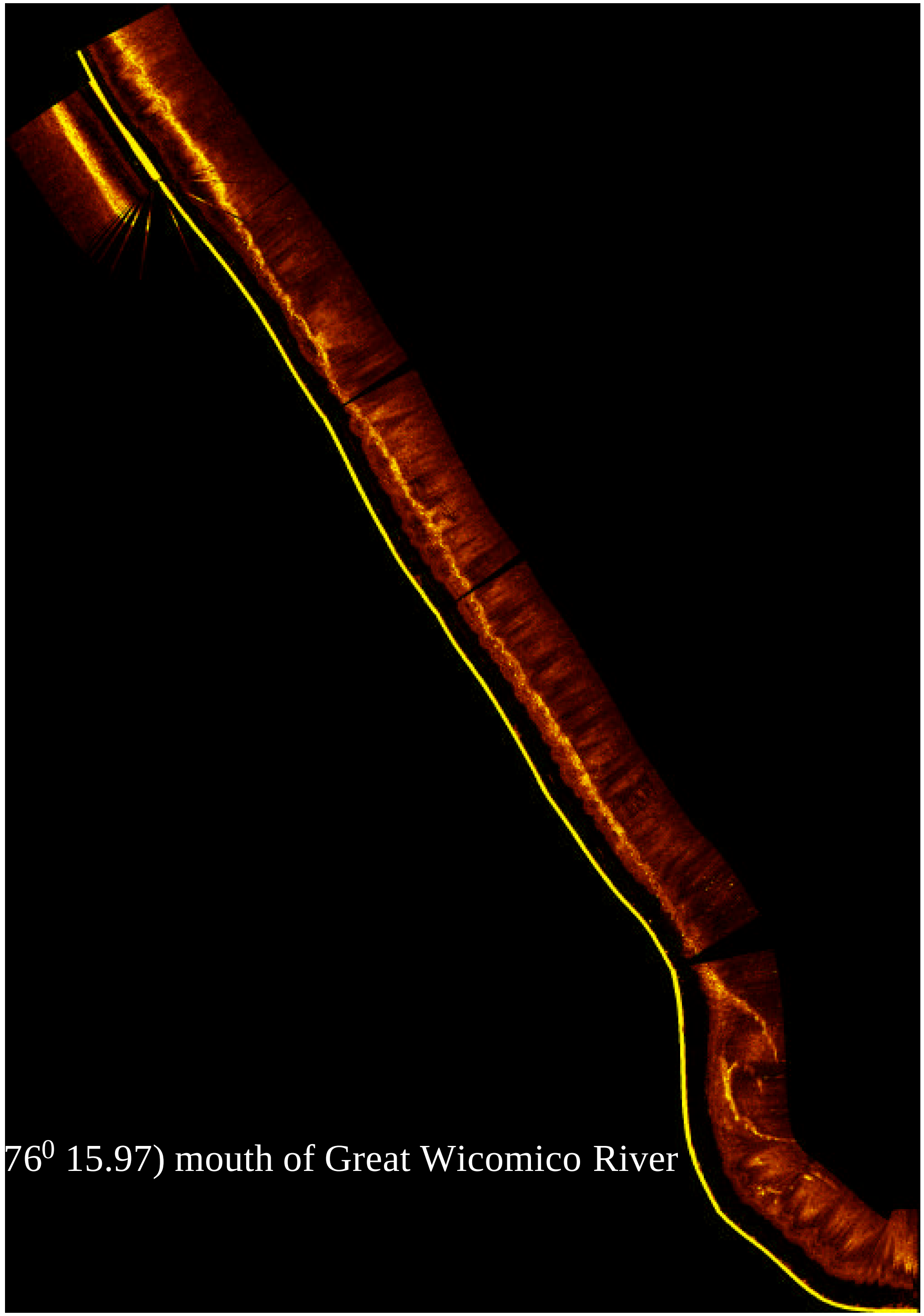
Net 2002-21 (37^0 48.87, 76^0 15.08) mouth of Great Wicomico River



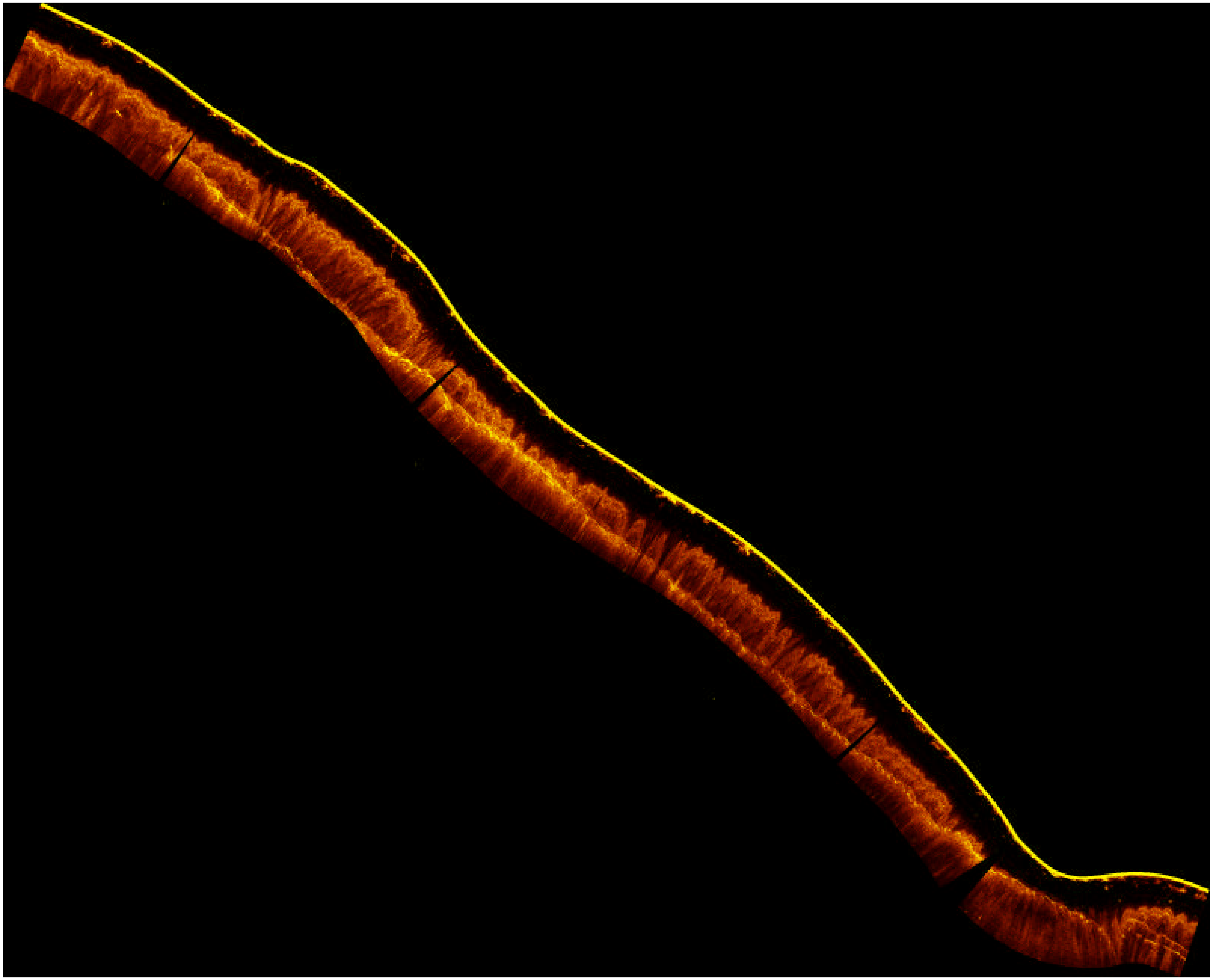
Net 2002-59 (37^0 48.84, 76^0 15.60) mouth of Great Wicomico River



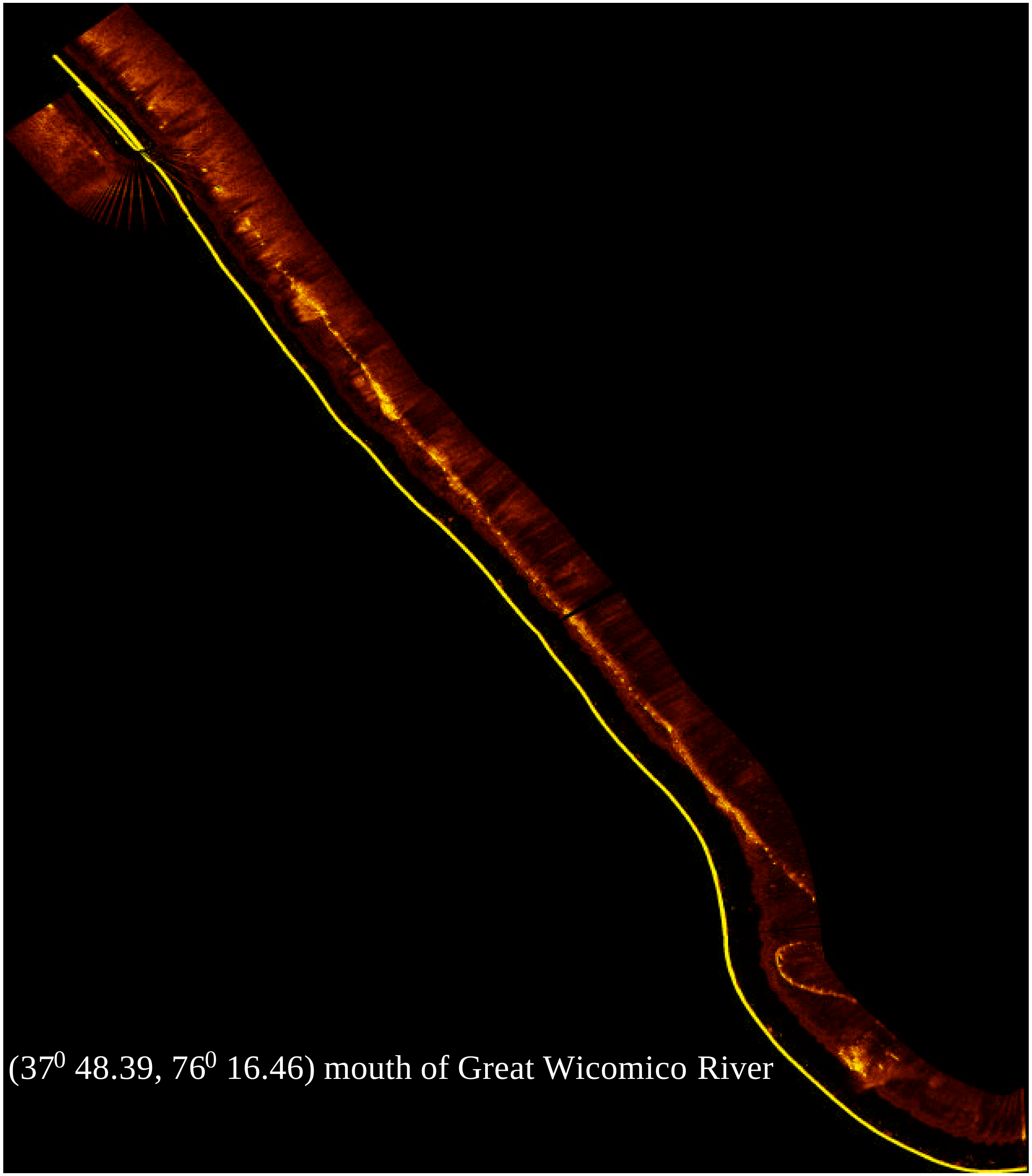
Net 2002-38 (37^0 48.74, 76^0 14.88) mouth of Great Wicomico River



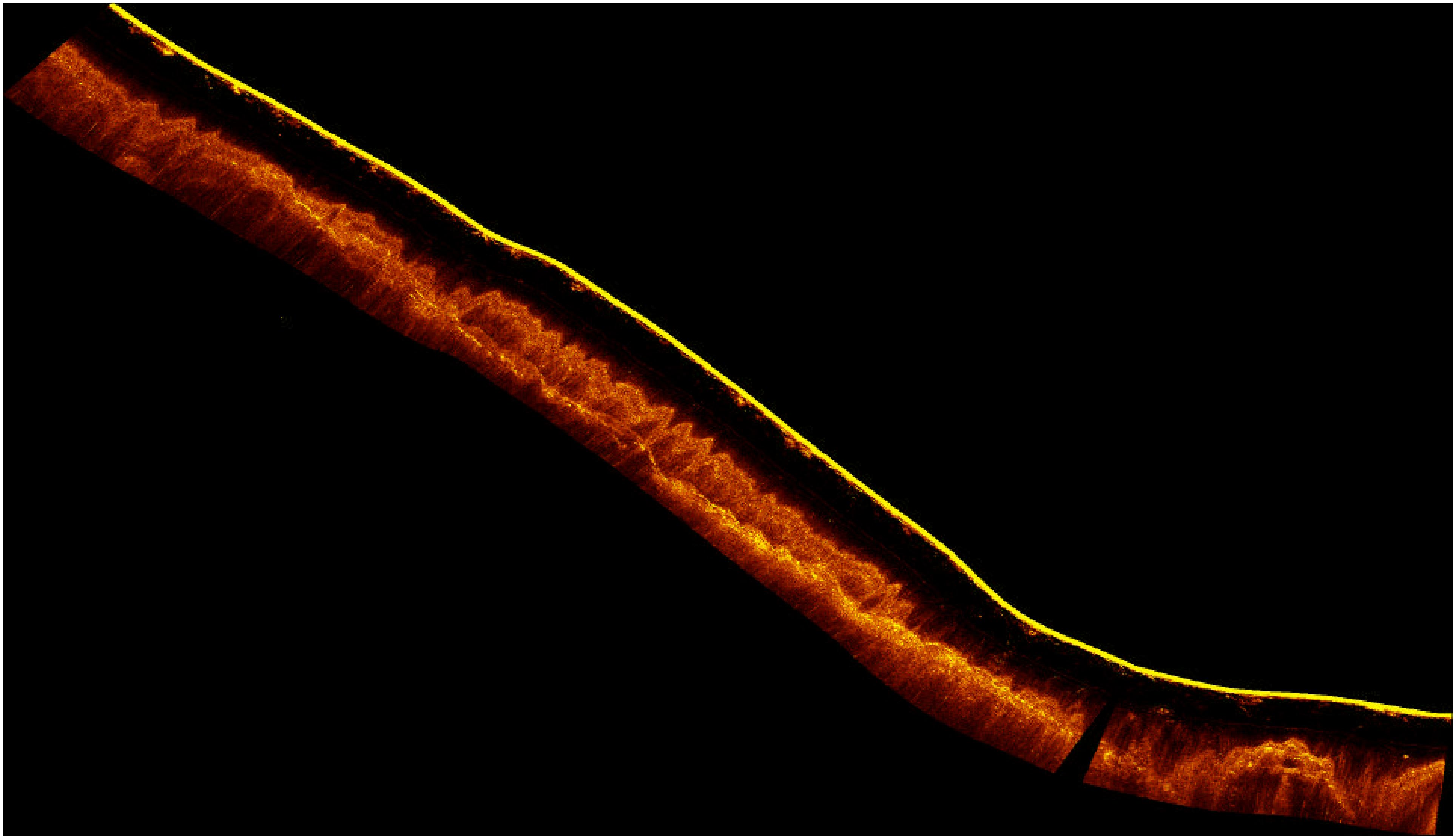
Net 2002-58 (37^0 48.67, 76^0 15.97) mouth of Great Wicomico River



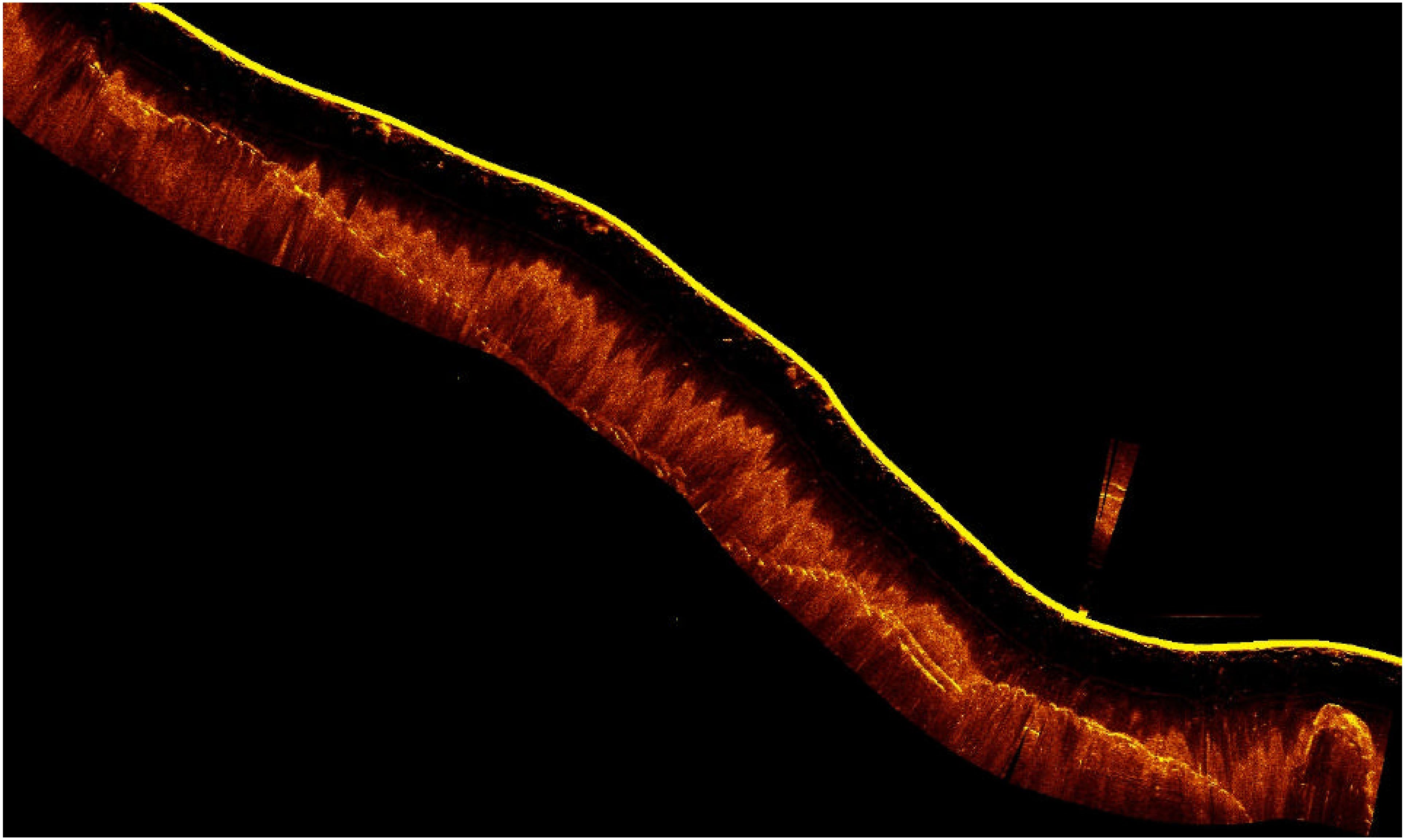
Net 2002-56 (37^0 48.44, 76^0 15.26) mouth of Great Wicomico River



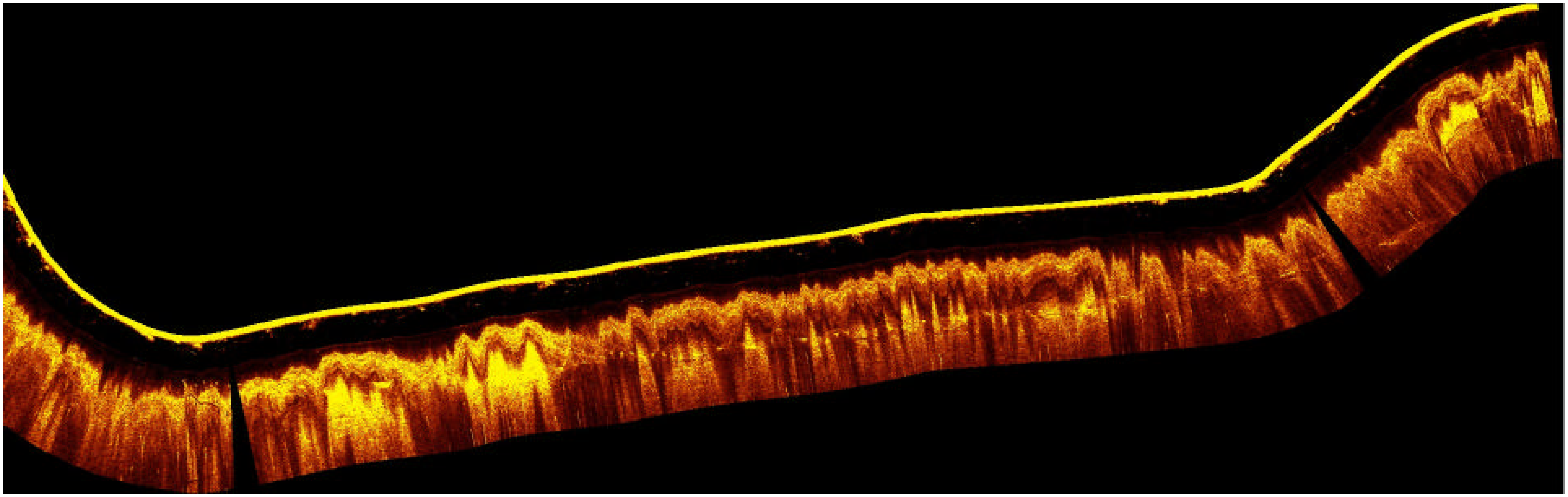
Net 2002-43 (37^0 48.39, 76^0 16.46) mouth of Great Wicomico River



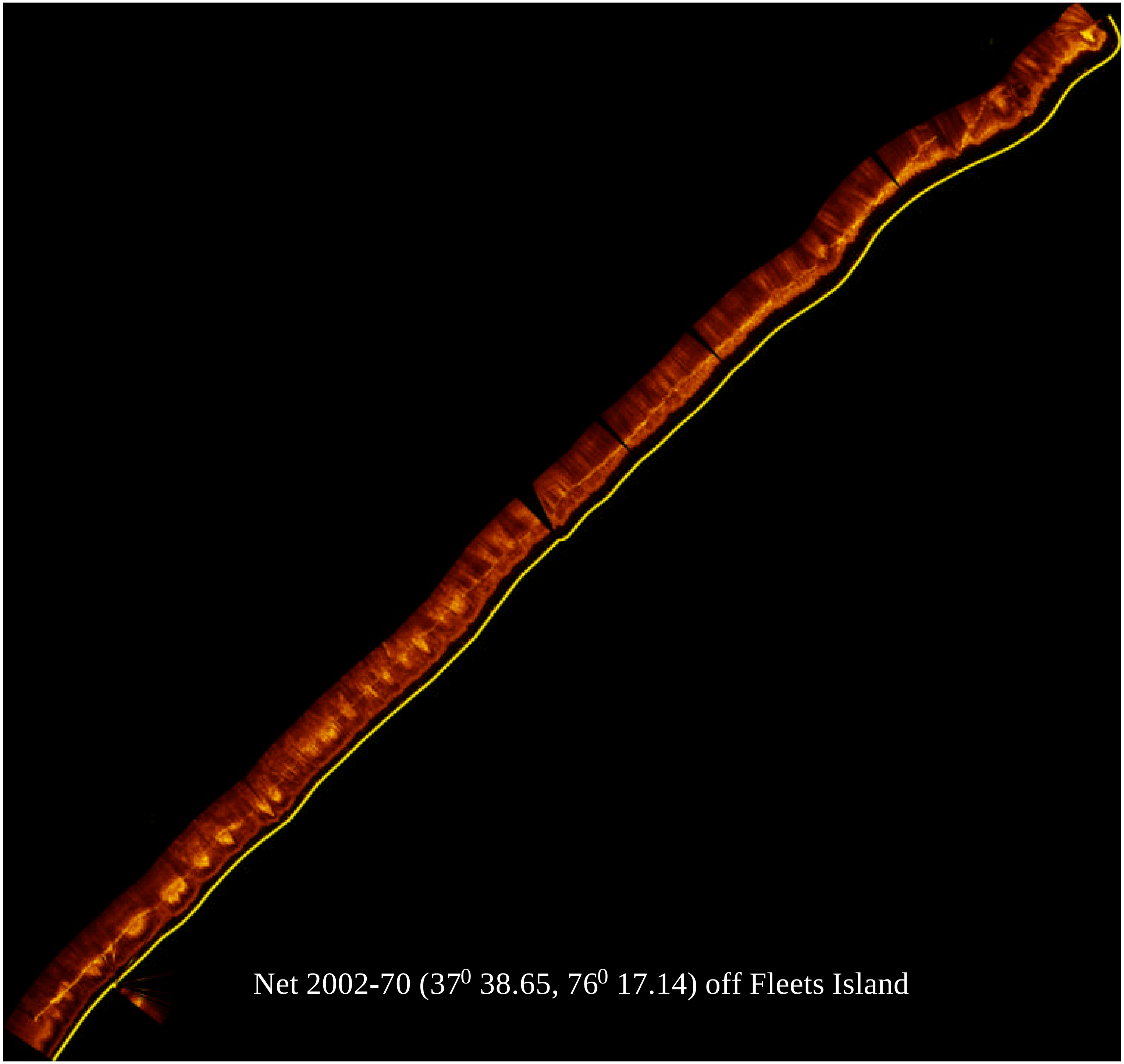
Net 2002-60 (37^0 48.35, 76^0 15.12) mouth of Great Wicomico River



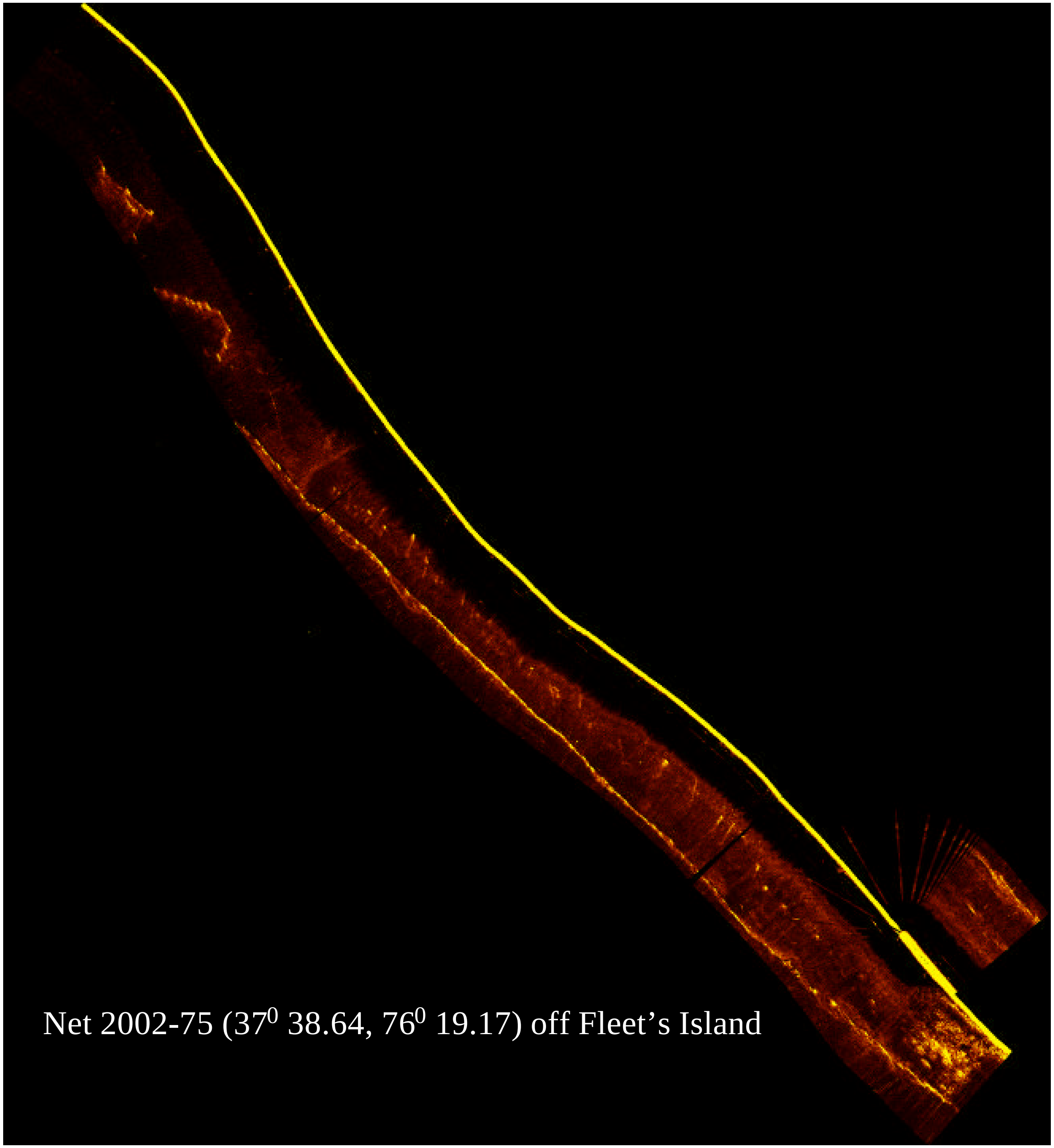
Net 2001-192 (37^0 48.33, 76^0 14.91) mouth of Great Wicomico River

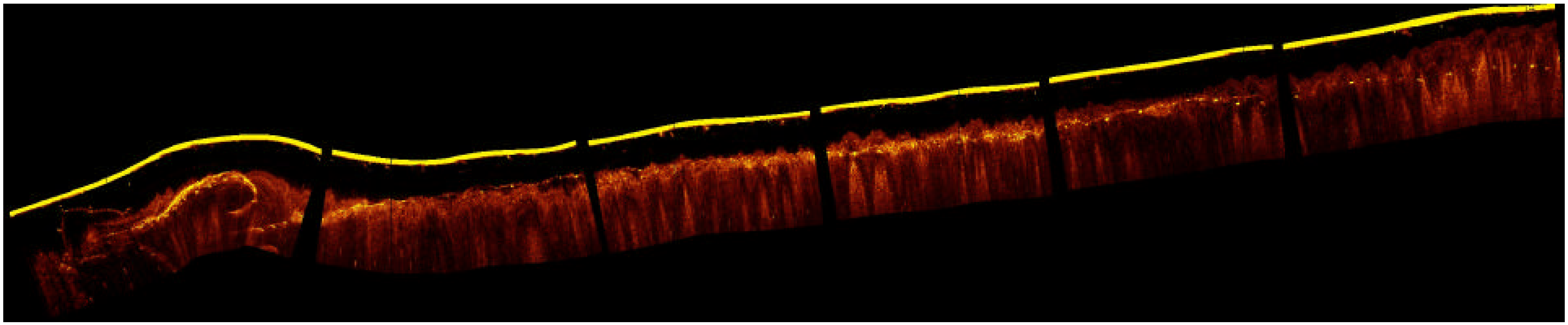


Net 2002-52 (37^0 47.48, 76^0 15.53) mouth of Great Wicomico River

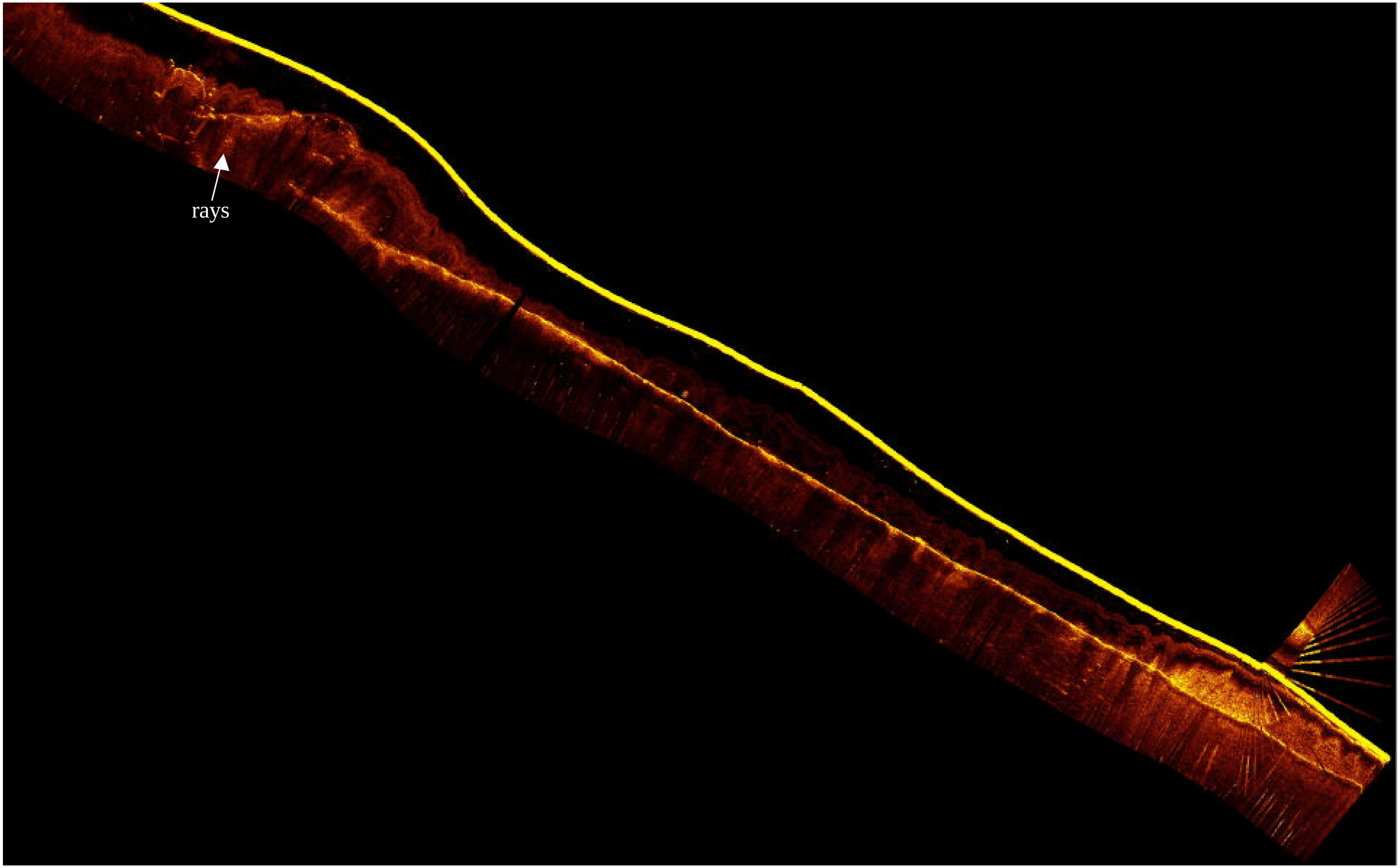


Net 2002-70 (37^0 38.65, 76^0 17.14) off Fleets Island

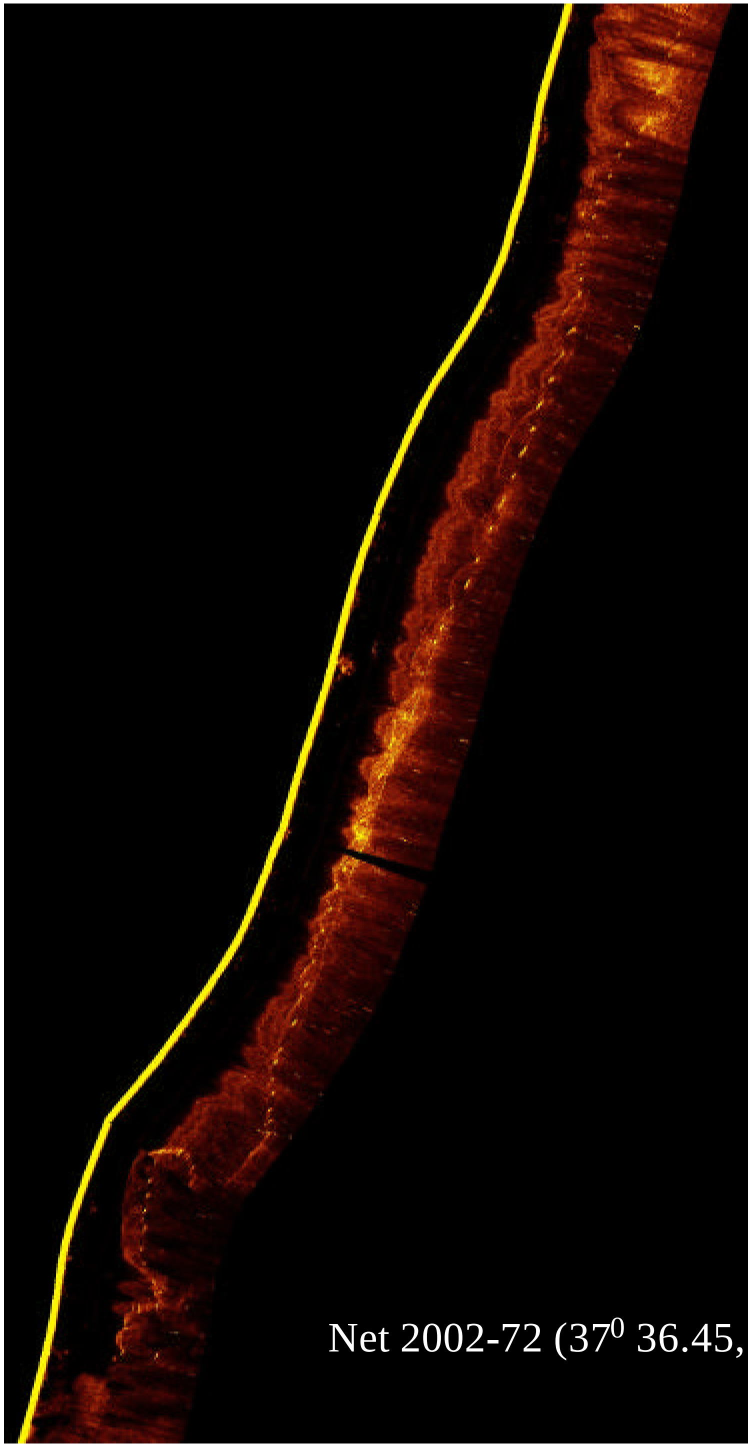

Net 2002-75 (37^0 38.64, 76^0 19.17) off Fleet's Island



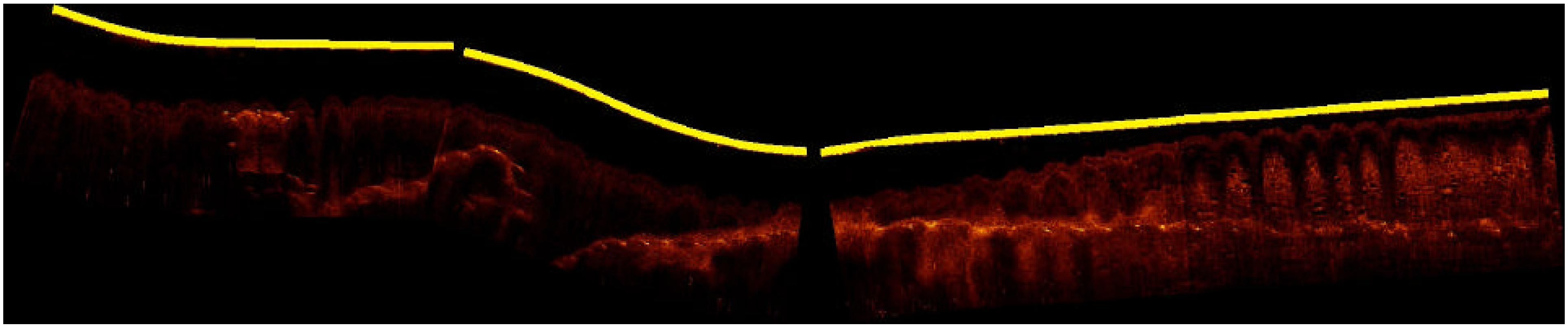
Net 2002-73 (37^{0} 36.94, 76^{0} 18.95) north shore of Windmill Point



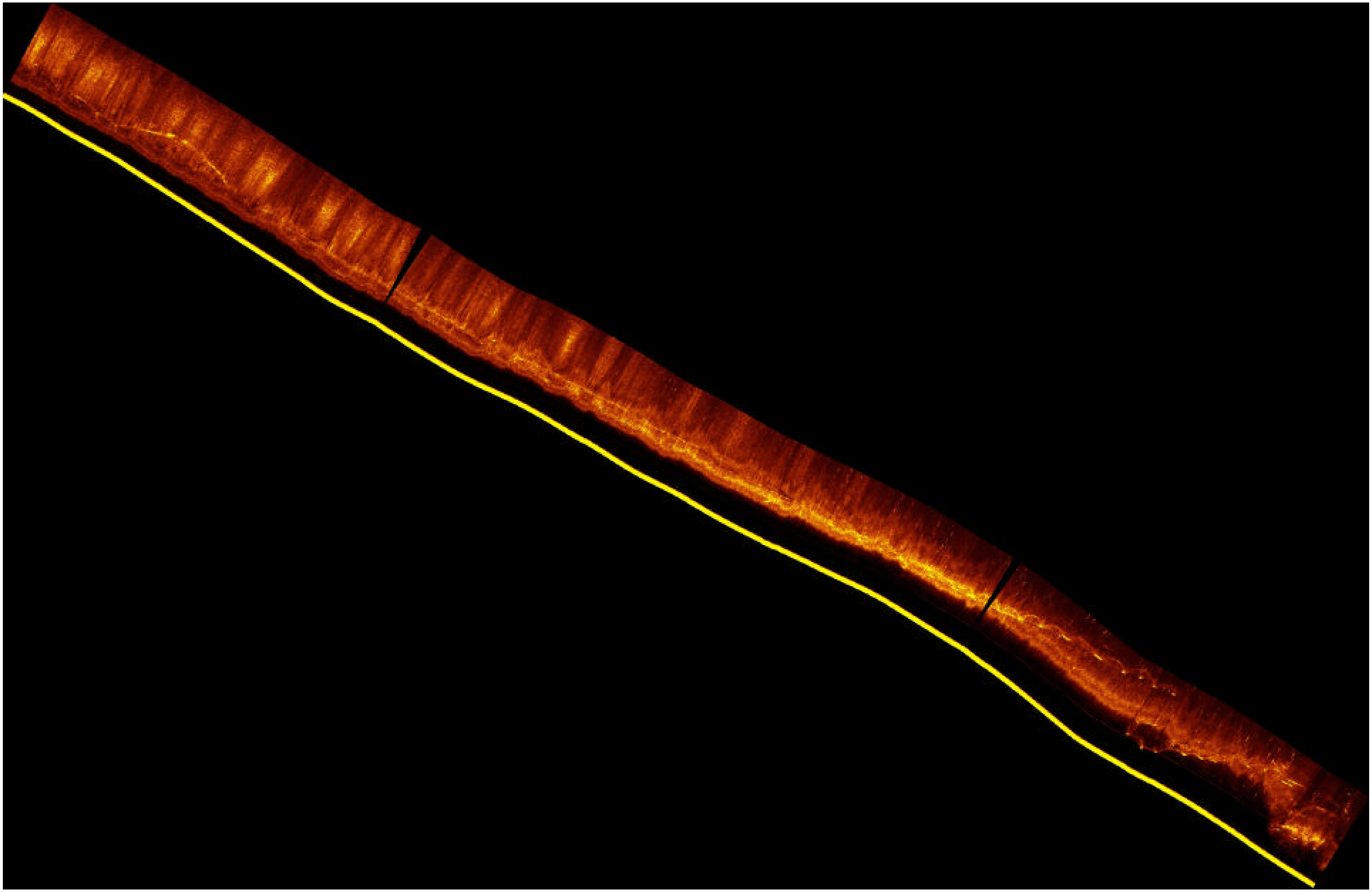
Net 2002-69 (37^0 36.84, 76^0 17.74) north shore of Windmill Point



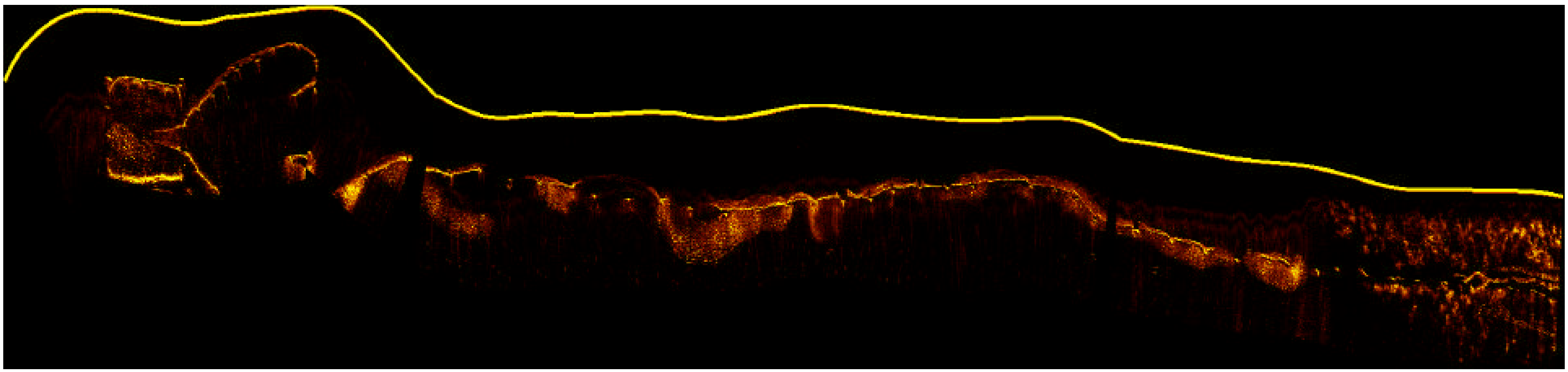
Net 2002-72 (37^0 36.45, 76^0 17.43) north shore of Windmill Point



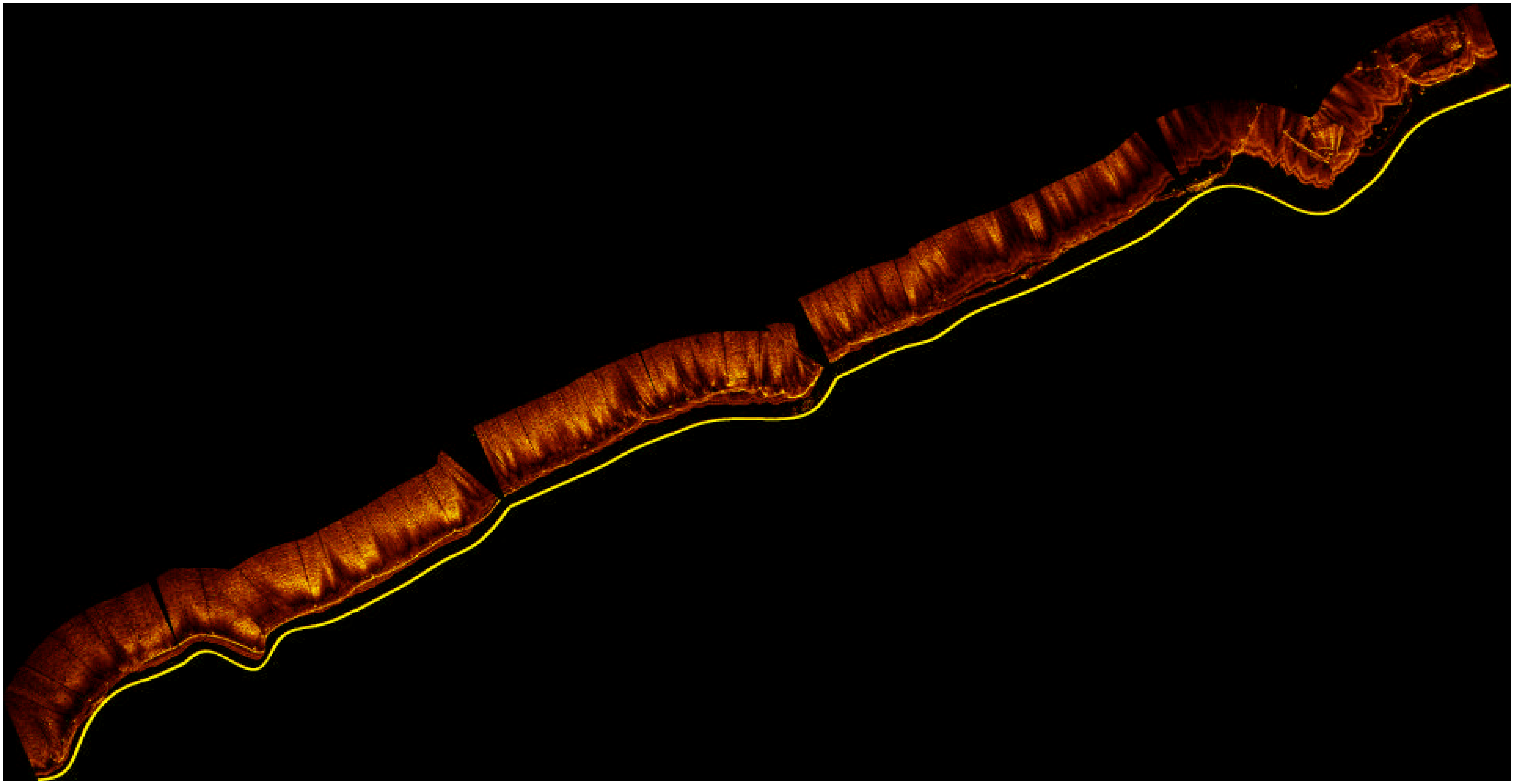
Net 2002-116 (37^0 34.64, 76^0 21.14) in Rappahannock River



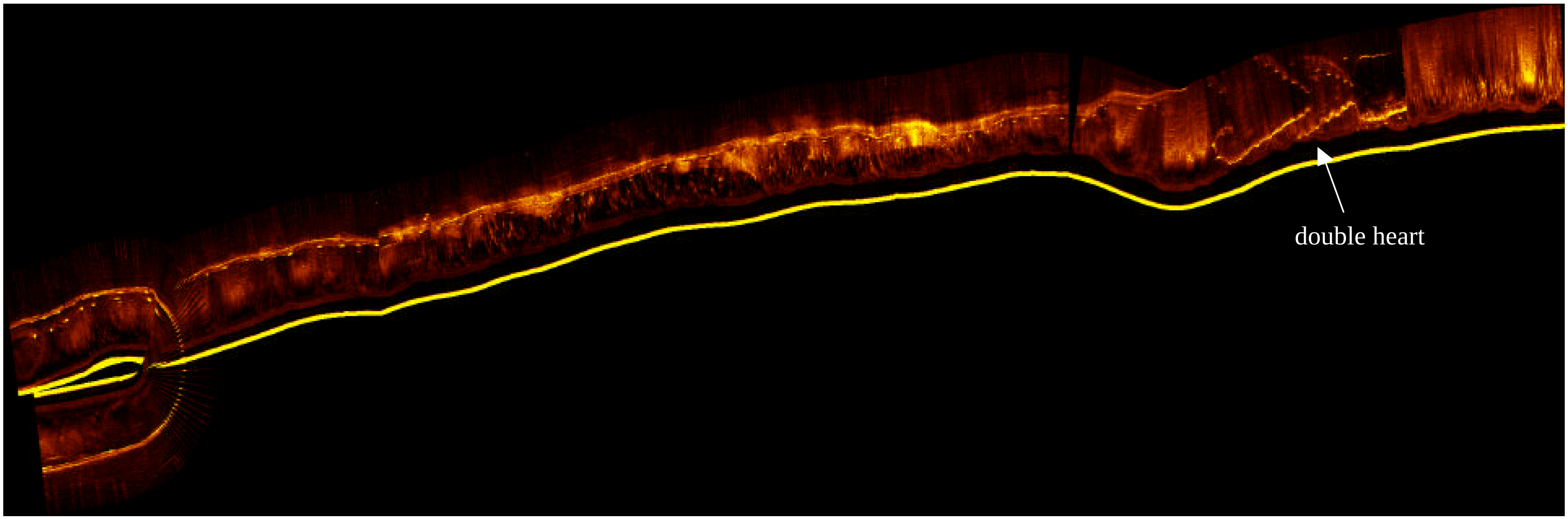
Net 2002-101 (37^0 31.407, 76^0 17.47) off Cherry Point



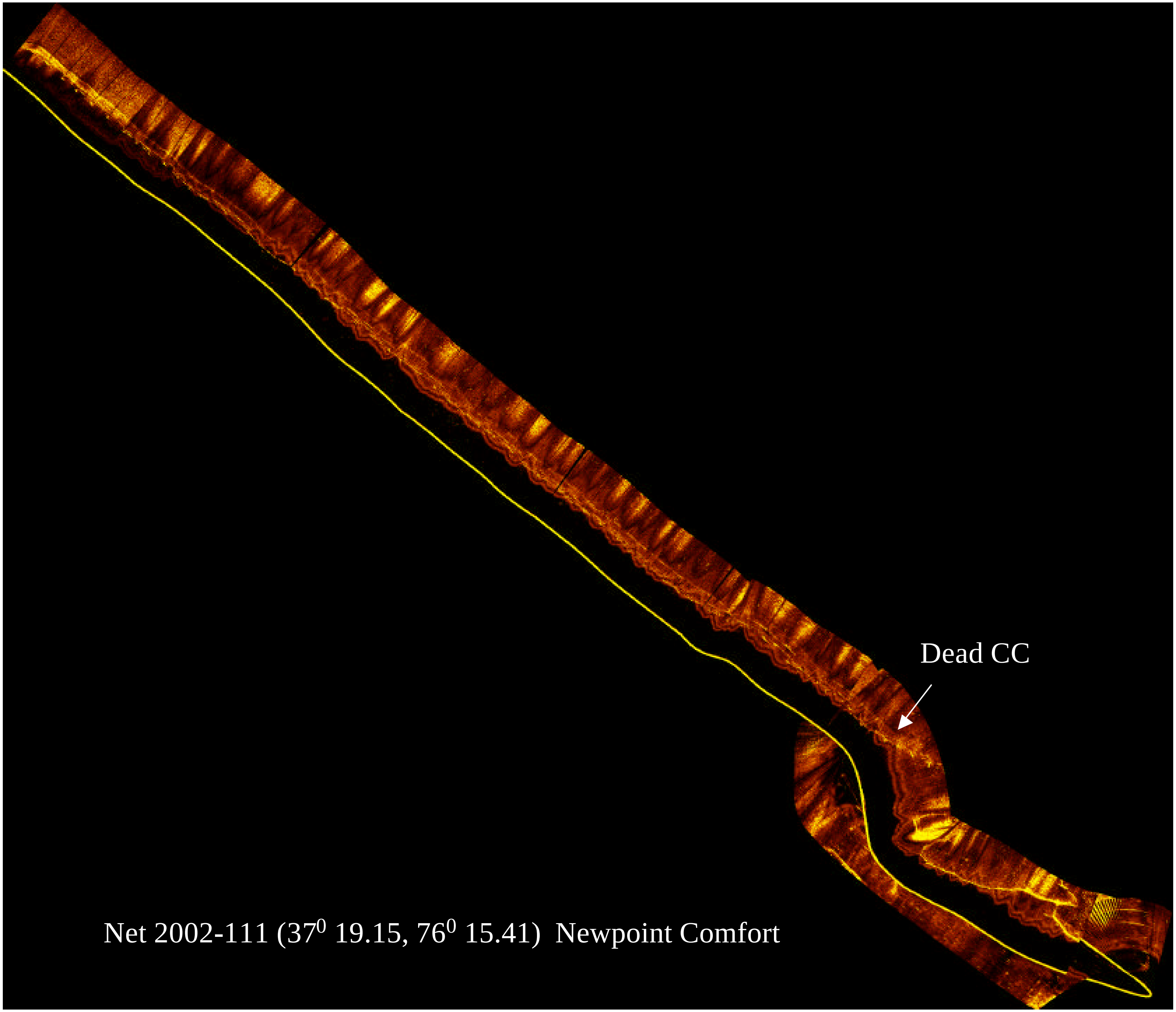
Net 2002-109? (37^0 30.88, 76^0 18.48) off Gwynn's Island



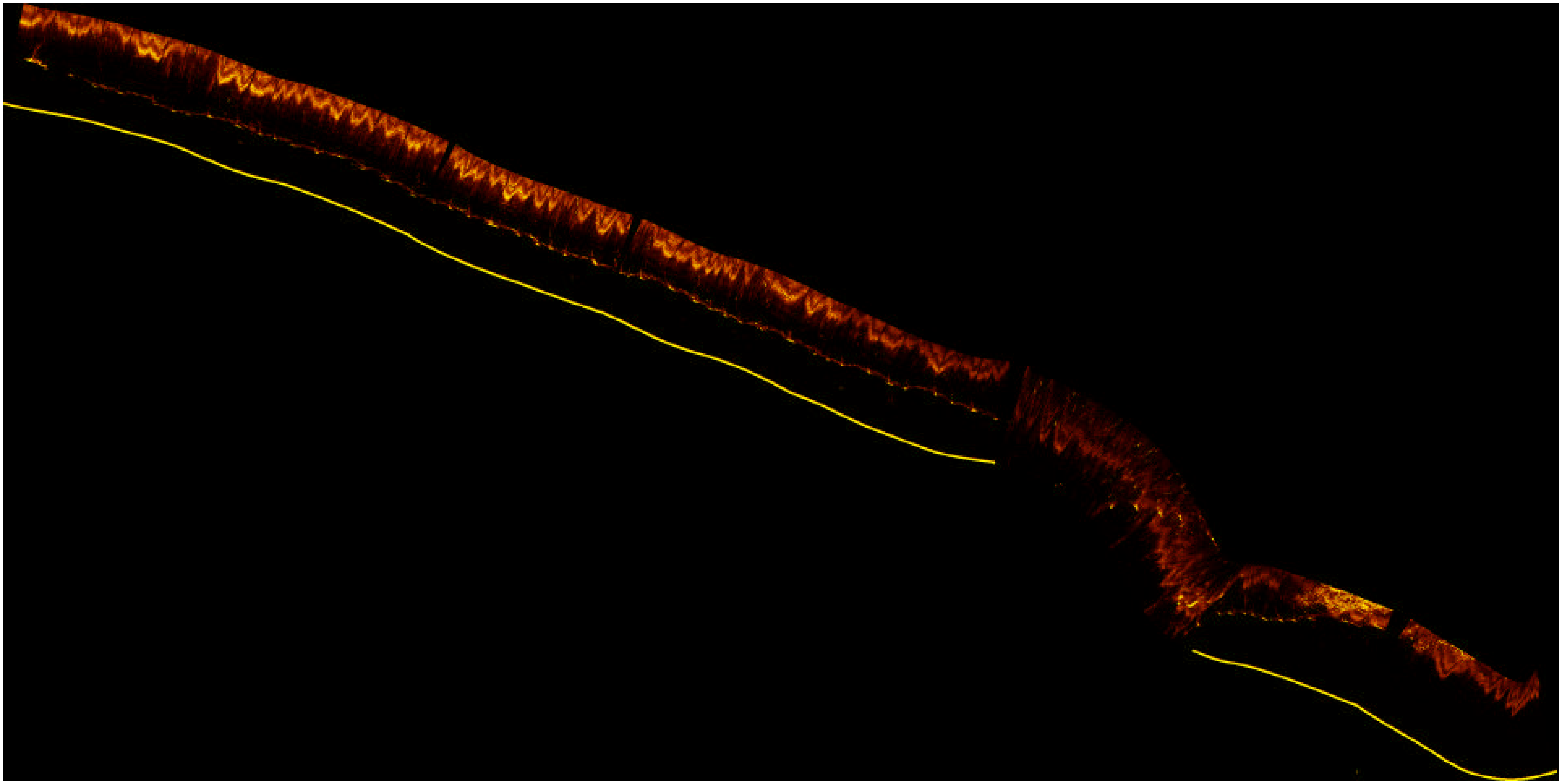
Net 2002-105 (37^0 30.09, 76^0 16.16) off Cherry Point



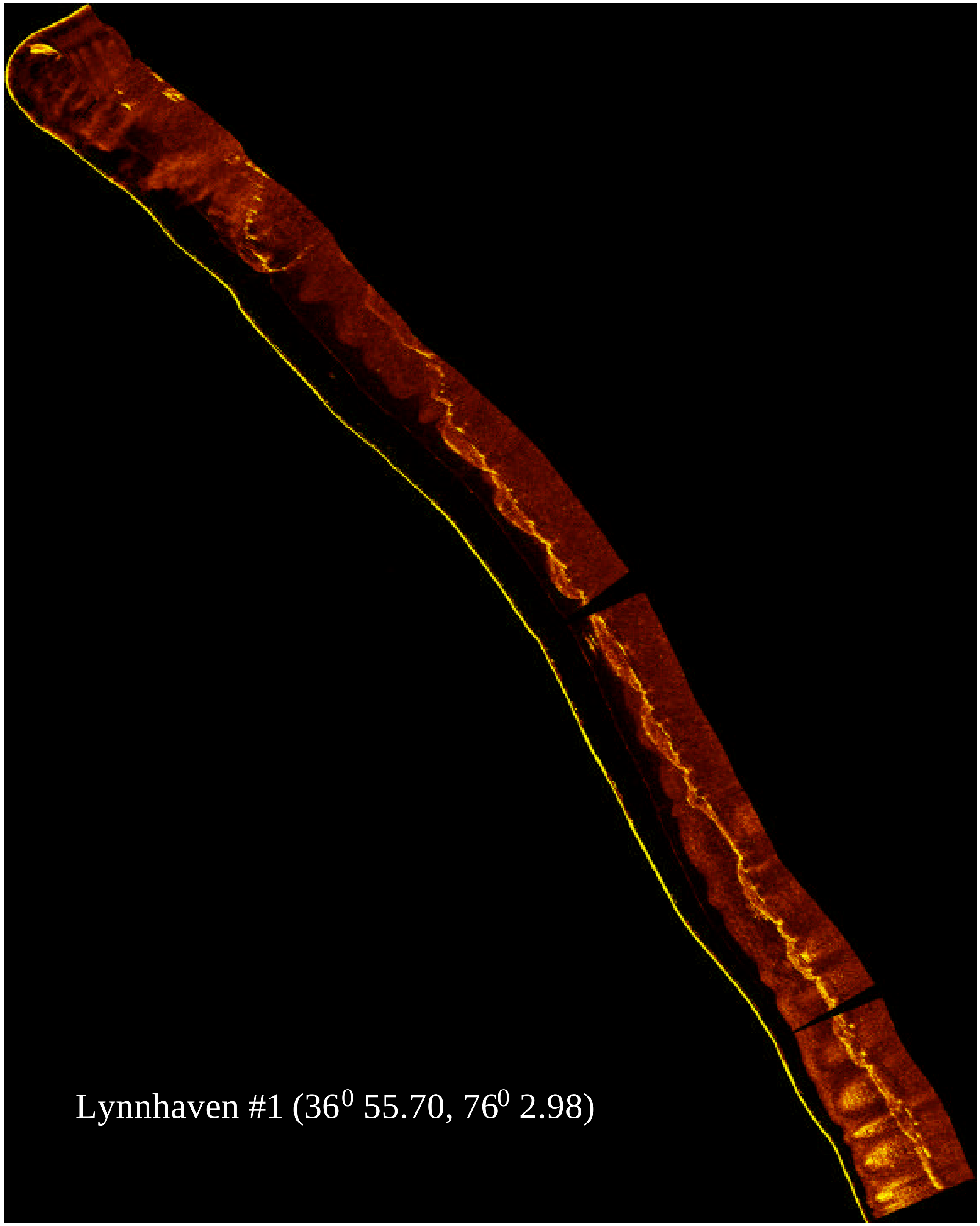
Net 2002-109? (37^0 25.68, 76^0 14.86) off Haven's beach



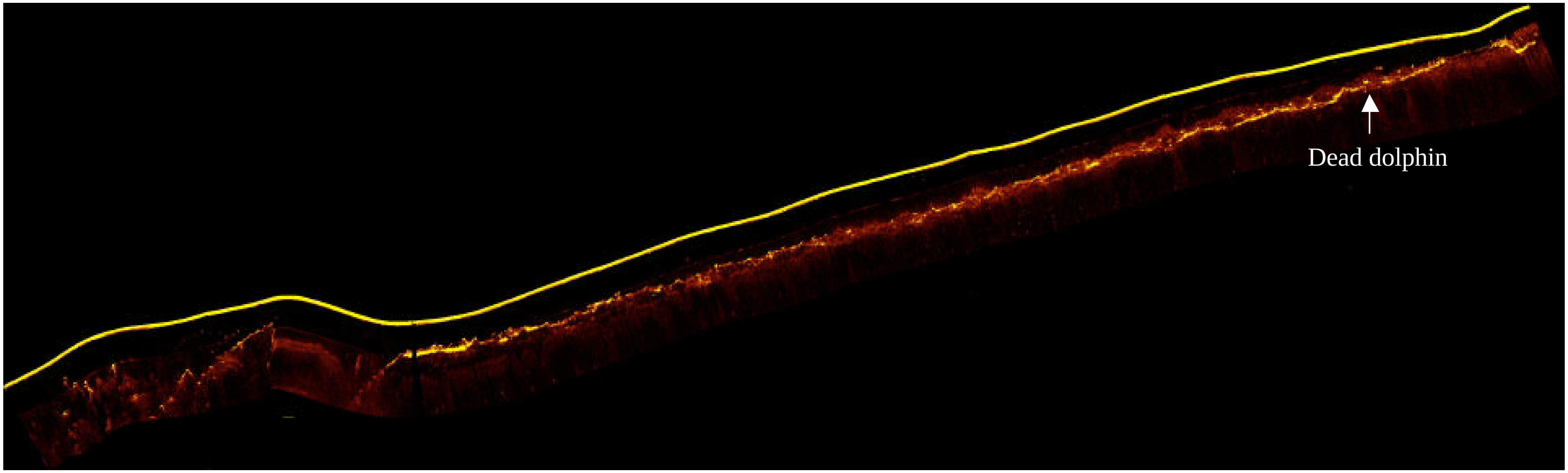
Net 2002-111 (37^0 19.15, 76^0 15.41) Newpoint Comfort



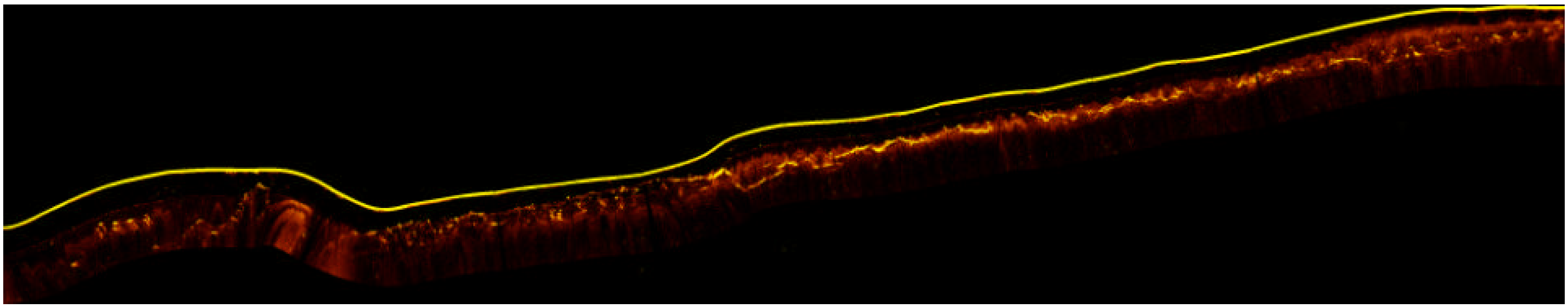
Net 2002-114 (37^0 18.51, 76^0 13.60) Newpoint Comfort



Lynnhaven #1 (36^0 55.70, 76^0 2.98)



Lynnhaven #2 (36^0 55.26, 76^0 3.89)



Lynnhaven #3 (36^0 55.15, 76^0 4.35)

APPENDIX B.

Aerial sightings of fishing gear, commercial boats, and recreational fishing boats, May - July 2002.

Codes:

CB	CRAB BOAT
CBBT	CHESAPEAKE BAY BRIDGE TUNNEL
CD	CRAB DREDGE
CFISH	GENERAL COMMERCIAL FISHING BOAT
DGE	DREDGE
GN	GILLNET (USUALLY REPRESENTING ONE FLAG)
GNB	GILLNET FISHING BOAT (FLAGS NOTED ON DECK)
MH	MENHADEN BOAT
OYD	OYSTER DREDGE
PN-A	POUND NET -ACTIVE
PN-I	POUND NET -INACTIVE
POTS	UNIDENTIFIED POTS (CRAB, WHELK OR SEABASS)
POTS-B	POTS FROM BEGINNING OF TRANSECT TO TIME INDICATED
POTS-E	POTS FROM TIME INDICATED TO END OF TRANSECT
PP	PEALER POUNDS
RFISH	RECREATIONAL FISHING BOAT (HOOK AND LINE)
STKGR	STAKED GEAR

DATE	OBSV.	REGION	TRANSECT	CATEGORY	COMMENTS
7-May-02	1	Lower Bay	1	CFISH	
7-May-02	1	Lower Bay	1	POTS	2 OBSERVED
7-May-02	1	Lower Bay	1	POTS	3 OBSERVED
7-May-02	2	Lower Bay	1	RFISH	
7-May-02	1	Lower Bay	1	RFISH	
7-May-02	2	Lower Bay	1	POTS	
7-May-02	1	Lower Bay	6	RFISH	
7-May-02	1	Lower Bay	6	RFISH	3 OBSERVED
7-May-02	2	Lower Bay	6	CB	
7-May-02	2	Lower Bay	9	CB	TRANSIT
7-May-02	1	Lower Bay	9	GNB	
7-May-02	2	Lower Bay	13	POTS	
7-May-02	2	Lower Bay	13	POTS	
7-May-02	2	Lower Bay	13	GN, GNB	
7-May-02	2	Lower Bay	13	GN, GNB	
7-May-02	1	Lower Bay	13	POTS	LINE OF 5 OBSERVED
7-May-02	2	Lower Bay	13	POTS-B	20+ OBSERVED
7-May-02	1	Lower Bay	13	POTS	3 OBSERVED
7-May-02	2	Lower Bay	13	POTS-E	
15-May-02	1	Lower Bay	12	POTS	
15-May-02	1	Lower Bay	12	POTS	
15-May-02	1	Lower Bay	12	POTS	
15-May-02	1	Lower Bay	16	POTS	
15-May-02	1	Lower Bay	16	CFISH	
15-May-02	1	Lower Bay	16	POTS	

15-May-02	1	Lower Bay	16	POTS-B	
15-May-02	1	Lower Bay	16	CB	
15-May-02	1	Lower Bay	16	POTS-E	
15-May-02	1	Lower Bay	18	POTS-B	
15-May-02	1	Lower Bay	18	POTS-E	
15-May-02	1	Lower Bay	18	POTS	
24-May-02	2	Lower Bay	3	CFISH	
24-May-02	1	Lower Bay	3	RFISH	GROUP
24-May-02	2	Lower Bay	3	RFISH	15+ OBSERVED
24-May-02	1	Lower Bay	3	RFISH	8+ OBSERVED
24-May-02	2	Lower Bay	8	RFISH	2 OBSERVED
24-May-02	1	Lower Bay	8	RFISH	40+ OBSERVED
24-May-02	1	Lower Bay	8	RFISH	3 OBSERVED
24-May-02	2	Lower Bay	8	RFISH	9 OBSERVED
24-May-02	2	Lower Bay	8	POTS	5 OBSERVED
24-May-02	2	Lower Bay	8	POTS	3 OBSERVED
24-May-02	2	Lower Bay	8	POTS	2 OBSERVED
24-May-02	1	Lower Bay	8	POTS	8 OBSERVED
24-May-02	2	Lower Bay	8	POTS	LINE OF POTS
24-May-02	2	Lower Bay	19	PN-I, RFISH	3 OBSERVED
24-May-02	2	Lower Bay	19	RFISH	
24-May-02	2	Lower Bay	19	CFISH	TRANSIT
24-May-02	2	Lower Bay	19	CFISH	TRANSIT
24-May-02	2	Lower Bay	19	POTS	10 OBSERVED
24-May-02	2	Lower Bay	19	CFISH	TRANSIT
24-May-02	2	Lower Bay	19	CFISH, GN	TRANSIT
24-May-02	1	Lower Bay	19	GNB	
24-May-02	2	Lower Bay	19	GNB	
24-May-02	1	Lower Bay	19	RFISH	10 OBSERVED
24-May-02	1	Lower Bay	25	POT	
24-May-02	2	Lower Bay	25	RFISH	
24-May-02	2	Lower Bay	25	RFISH	
24-May-02	1	Lower Bay	25	RFISH	
24-May-02	2	Lower Bay	25	POTS-B	
24-May-02	1	Lower Bay	25	POTS	10 OBSERVED
24-May-02	1	Lower Bay	25	POTS	6 OBSERVED
24-May-02	2	Lower Bay	25	POTS-E	
24-May-02	2	Lower Bay	25	POTS-B	
24-May-02	1	Lower Bay	25	POTS-B	100+ OBSERVED
24-May-02	1	Lower Bay	25	POTS-E	
24-May-02	2	Lower Bay	25	CFISH	
24-May-02	2	Lower Bay	25	POTS-E	
24-May-02	2	Lower Bay	25	POTS-B	
24-May-02	1	Lower Bay	25	POTS-B	SCATTERED
24-May-02	2	Lower Bay	25	CFISH	
24-May-02	2	Lower Bay	25	RFISH	
24-May-02	2	Lower Bay	25	POTS-E	
24-May-02	1	Lower Bay	25	POTS-E	
24-May-02	2	Lower Bay	25	POTS	2 OBSERVED
24-May-02	2	Upper Bay	31	POTS,PN-A	LINE OF POTS

24-May-02	1	Upper Bay	31	POTS-B	SCATTERED
24-May-02	2	Upper Bay	31	POTS-B	2 LINES OBSERVED
24-May-02	1	Upper Bay	31	POTS-E	
24-May-02	2	Upper Bay	31	POTS-E	
24-May-02	1	Upper Bay	31	POTS	LINE OF POTS
24-May-02	2	Upper Bay	31	POTS	LINE OF POTS
24-May-02	2	Upper Bay	31	CFISH	
24-May-02	2	Upper Bay	31	RFISH	22 OBSERVED
24-May-02	2	Upper Bay	31	RFISH	10 OBSERVED
24-May-02	2	Upper Bay	37	POTS-B	
24-May-02	1	Upper Bay	37	CB	
24-May-02	2	Upper Bay	37	POTS-E	
24-May-02	1	Upper Bay	37	POTS	LINE OF POTS
24-May-02	1	Upper Bay	37	RFISH	
24-May-02	2	Upper Bay	37	POTS	3 LINES OF POTS
24-May-02	1	Upper Bay	37	GNB	
24-May-02	1	Upper Bay	37	RFISH	3 OBSERVED
24-May-02	2	Upper Bay	37	RFISH	2 OBSERVED
24-May-02	2	Upper Bay	37	RFISH	9 OBSERVED
24-May-02	2	Upper Bay	37	RFISH	
24-May-02	1	Upper Bay	37	POTS, RFISH	LINE OF POTS, 2 OBSERVED
24-May-02	2	Upper Bay	37	POTS-B	
24-May-02	1	Upper Bay	37	POTS	2 LINES OF POTS E-W
24-May-02	1	Upper Bay	37	POTS, CB	20 OBSERVED
24-May-02	2	Upper Bay	37	POTS-E	
24-May-02	1	Upper Bay	39	POTS-B, RFISH, CFISH	50+ OBSERVED
24-May-02	2	Upper Bay	39	POTS-B	
24-May-02	2	Upper Bay	39	POTS-E	
24-May-02	2	Upper Bay	39	POTS-B	
24-May-02	1	Upper Bay	39	GN	
24-May-02	1	Upper Bay	39	POTS-E	
24-May-02	2	Upper Bay	39	RFISH	
24-May-02	2	Upper Bay	37	POTS	3 OBSERVED
24-May-02	2	Upper Bay	39	POTS-E	
24-May-02	1	Upper Bay	39	POTS	10 OBSERVED
24-May-02	2	Upper Bay	39	POTS	LIINE OF POTS
24-May-02	1	Upper Bay	39	POTS-B	LINE OF POTS-7 TOTAL
24-May-02	2	Upper Bay	39	POTS	LINE OF POTS
24-May-02	2	Upper Bay	39	POTS	2 LINES OF POTS
24-May-02	2	Upper Bay	39	POTS	LINE OF POTS
24-May-02	2	Upper Bay	39	RFISH	6 OBSERVED
24-May-02	1	Upper Bay	39	POTS-E	
24-May-02	2	Upper Bay	39	RFISH	
24-May-02	1	Upper Bay	39	GN	
24-May-02	1	Upper Bay	39	GN-B	
24-May-02	2	Upper Bay	39	RFISH	
24-May-02	2	Upper Bay	43	POTS-B	
24-May-02	2	Upper Bay	43	POTS-E	
24-May-02	2	Upper Bay	43	POTS	LINE OF POTS
24-May-02	1	Upper Bay	43	POTS	5 OBSERVED

24-May-02	2	Upper Bay	43	POTS	
24-May-02	1	Upper Bay	43	POTS	LINE OF POTS
24-May-02	2	Upper Bay	43	POTS-B	2 LINES OF POTS
24-May-02	2	Upper Bay	43	POTS-E	
24-May-02	1	Upper Bay	43	POTS-B	4 LINES OF POTS
24-May-02	2	Upper Bay	43	POTS-B	
24-May-02	1	Upper Bay	43	POTS-E	
24-May-02	2	Upper Bay	43	CFISH	3 OBSERVED
24-May-02	2	Upper Bay	43	POTS-E	
24-May-02	2	Upper Bay	43	POTS-B	
24-May-02	2	Upper Bay	43	POTS-E	
29-May-02	1	Lower Bay	3	POTS	LINE OF POTS
29-May-02	1	Lower Bay	3	RFISH	3 OBSERVED
29-May-02	1	Lower Bay	3	GNB	
29-May-02	1	Lower Bay	3	CBBT, RFISH	3 OBSERVED
29-May-02	1	Lower Bay	3	CFISH	
29-May-02	1	Lower Bay	13	POTS	
29-May-02	1	Lower Bay	13	GN	
29-May-02	1	Lower Bay	13	POTS	
29-May-02	1	Lower Bay	13	RFISH	
29-May-02	1	Lower Bay	13	POTS	
29-May-02	1	Lower Bay	15	POTS	
29-May-02	1	Lower Bay	15	POTS	
29-May-02	1	Lower Bay	15	POTS-B	
29-May-02	1	Lower Bay	15	POTS-e	
29-May-02	1	Lower Bay	15	CFISH	
29-May-02	1	Lower Bay	15	POTS-B	
29-May-02	1	Lower Bay	15	GN	
29-May-02	1	Lower Bay	15	POTS-E	
29-May-02	1	Lower Bay	15	GN	
29-May-02	1	Lower Bay	15	RFISH	
29-May-02	1	Lower Bay	15	RFISH	
29-May-02	1	Lower Bay	15	RFISH	
29-May-02	1	Upper Bay	30	RFISH	6 VESSELS
29-May-02	1	Upper Bay	30	RFISH	
29-May-02	1	Upper Bay	30	POTS-E	
29-May-02	1	Upper Bay	37	POTS	
29-May-02	1	Upper Bay	37	POTS-B	
29-May-02	1	Upper Bay	37	POTS-E	
29-May-02	1	Upper Bay	37	CFISH, RFISH	
29-May-02	1	Upper Bay	37	GN	
29-May-02	1	Upper Bay	37	POTS	
29-May-02	1	Upper Bay	37	CP-E	
29-May-02	1	Upper Bay	40	POTS	
29-May-02	1	Upper Bay	40	RFISH	
29-May-02	1	Upper Bay	40	RFISH	
29-May-02	1	Upper Bay	40	RFISH	
29-May-02	1	Upper Bay	40	RFISH	
29-May-02	1	Upper Bay	40	POTS	
29-May-02	1	Upper Bay	47	POTS	

29-May-02	1	Upper Bay	47	POTS-B	
29-May-02	1	Upper Bay	47	POTS-E	
29-May-02	1	Upper Bay	47	POTS-B	
29-May-02	1	Upper Bay	47	POTS-E	
29-May-02	1	Upper Bay	47	POTS	
29-May-02	1	Upper Bay	47	POTS	
29-May-02	1	Upper Bay	47	POTS-E	
29-May-02	1	Upper Bay	47	CFISH	IN TRANSIT
29-May-02	1	Upper Bay	47	POTS	
11-Jun-02	2	Lower Bay	3	RFISH	
11-Jun-02	1	Lower Bay	3	POTS-E	
11-Jun-02	2	Lower Bay	3	POTS	LINE OF POTS
11-Jun-02	2	Lower Bay	3	CBBT, RFISH	20+ OBSERVED
11-Jun-02	1	Lower Bay	3	POTS-B	GROUP
11-Jun-02	2	Lower Bay	3	RFISH	10 OBSERVED
11-Jun-02	1	Lower Bay	5	CFISH	
11-Jun-02	1	Lower Bay	5	RFISH	
11-Jun-02	1	Lower Bay	5	CFISH	
11-Jun-02	1	Lower Bay	5	CFISH	
11-Jun-02	1	Lower Bay	5	RFISH, CBBT	
11-Jun-02	2	Lower Bay	5	CBBT, RFISH	3 OBSERVED
11-Jun-02	1	Lower Bay	5	RFISH	
11-Jun-02	2	Lower Bay	5	RFISH	
11-Jun-02	2	Lower Bay	13	POTS	LINE OF POTS
11-Jun-02	1	Lower Bay	13	CB	
11-Jun-02	1	Lower Bay	13	POTS-B	SCATTERED
11-Jun-02	1	Lower Bay	13	POTS-E	
11-Jun-02	2	Lower Bay	13	POTS-B	
11-Jun-02	2	Lower Bay	13	RFISH	2 OBSERVED
11-Jun-02	2	Lower Bay	13	POTS-E	
11-Jun-02	2	Lower Bay	13	RFISH	4 OBSERVED
11-Jun-02	1	Lower Bay	13	CFISH	
11-Jun-02	2	Lower Bay	13	RFISH	7 OBSERVED
11-Jun-02	1	Lower Bay	13	RFISH	
11-Jun-02	1	Lower Bay	13	CFISH	
11-Jun-02	1	Lower Bay	13	CFISH	2 OBSERVED
11-Jun-02	2	Lower Bay	13	BGE, PN-A	3 OBSERVED
11-Jun-02	1	Lower Bay	13	PN-I	
11-Jun-02	1	Lower Bay	13	PN-A	
11-Jun-02	1	Lower Bay	13	PN-A	
11-Jun-02	2	Lower Bay	26	CFISH, BGE	5 OBSERVED
11-Jun-02	1	Lower Bay	26	CFISH	
11-Jun-02	1	Lower Bay	26	CFISH	
11-Jun-02	1	Lower Bay	26	CFISH	
11-Jun-02	1	Lower Bay	26	RFISH	2 OBSERVED
11-Jun-02	2	Lower Bay	26	CFISH, RFISH	
11-Jun-02	1	Lower Bay	26	PN-I	
11-Jun-02	1	Lower Bay	26	POTS-B	
11-Jun-02	2	Lower Bay	26	PN-I, POTS-B	OLD PN STAND

11-Jun-02	1	Lower Bay	26	POTS-E	
11-Jun-02	2	Lower Bay	26	POTS-E	
11-Jun-02	2	Lower Bay	26	POTS-B, GN	
11-Jun-02	1	Lower Bay	26	PN-A	
11-Jun-02	2	Lower Bay	26	POTS-E	
11-Jun-02	1	Lower Bay	26	POTS-B	SEVERAL OBSERVED
11-Jun-02	2	Lower Bay	26	POTS	LINE OF POTS
11-Jun-02	1	Lower Bay	26	POTS-E	
11-Jun-02	2	Lower Bay	26	POTS-B	
11-Jun-02	2	Lower Bay	26	POTS-E	
11-Jun-02	1	Lower Bay	26	POTS	3 OBSERVED
11-Jun-02	2	Lower Bay	26	POTS	20+ OBSERVED
11-Jun-02	2	Lower Bay	26	RFISH	2 OBSERVED
11-Jun-02	2	Lower Bay	26	POTS	3 OBSERVED
11-Jun-02	2	Lower Bay	26	POTS	7+ OBSERVED
11-Jun-02	2	Upper bay	31	POTS-B	
11-Jun-02	2	Upper bay	31	POTS-E	
11-Jun-02	2	Upper bay	31	CFISH, RFISH	4 OBSERVED
11-Jun-02	1	Upper bay	31	CFISH	
11-Jun-02	2	Upper bay	31	CFISH, RFISH	20+ OBSERVED
11-Jun-02	1	Upper bay	31	RFISH	
11-Jun-02	2	Upper bay	31	RFISH	8 OBSERVED
11-Jun-02	2	Upper bay	33	PN-A, POTS	
11-Jun-02	2	Upper bay	33	POTS-E	
11-Jun-02	2	Upper bay	33	RFISH	
11-Jun-02	1	Upper bay	33	RFISH	
11-Jun-02	2	Upper bay	33	RFISH	
11-Jun-02	1	Upper bay	33	CFISH	3 OBSERVED
11-Jun-02	1	Upper bay	33	CFISH	
11-Jun-02	2	Upper bay	33	POTS-B	
11-Jun-02	2	Upper bay	33	POTS-E	
20-Jun-02	1	Lower Bay	1	CFISH	
20-Jun-02	1	Lower Bay	1	POTS	
20-Jun-02	2	Lower Bay	6	RFISH	
20-Jun-02	1	Lower Bay	6	CFISH	
20-Jun-02	2	Lower Bay	10	RFISH	
20-Jun-02	1	Lower Bay	10	RFISH	
20-Jun-02	2	Lower Bay	10	RFISH	
20-Jun-02	2	Lower Bay	10	RFISH	
20-Jun-02	1	Lower Bay	10	RFISH	
20-Jun-02	1	Lower Bay	10	PN	
20-Jun-02	2	Lower Bay	23	POTS=B	
20-Jun-02	1	Lower Bay	23	RFISH	
20-Jun-02	2	Lower Bay	23	PN-A	
20-Jun-02	1	Lower Bay	23	POTS	
20-Jun-02	2	Lower Bay	23	POTS-B	
20-Jun-02	1	Lower Bay	23	RFISH	
20-Jun-02	2	Lower Bay	23	POTS-E	
20-Jun-02	2	Lower Bay	23	POTS-E	
26-Jun-02	2	Lower Bay	2	CFISH	

26-Jun-02	2	Lower Bay	2	RFISH	
26-Jun-02	1	Lower Bay	2	RFISH	
26-Jun-02	2	Lower Bay	2	RFISH	
26-Jun-02	1	Lower Bay	7	RFISH	
26-Jun-02	1	Lower Bay	7	RFISH	
26-Jun-02	2	Lower Bay	7	RFISH	
26-Jun-02	2	Lower Bay	15	POTS-B	
26-Jun-02	2	Lower Bay	15	POTS-E	
26-Jun-02	1	Lower Bay	15	POTS-B	
26-Jun-02	2	Lower Bay	15	CB	
26-Jun-02	1	Lower Bay	15	POTS-E	
26-Jun-02	2	Lower Bay	15	CFISH	
26-Jun-02	2	Lower Bay	15	RFISH	
26-Jun-02	2	Lower Bay	15	RFISH	
26-Jun-02	1	Lower Bay	15	PN-I	
26-Jun-02	1	Lower Bay	15	PN-A	
26-Jun-02	2	Lower Bay	15	PN-A	
26-Jun-02	2	Lower Bay	20	POTS	
26-Jun-02	2	Lower Bay	20	POTS	
26-Jun-02	2	Lower Bay	20	POTS-B	
26-Jun-02	1	Lower Bay	20	POTS-B	
26-Jun-02	1	Lower Bay	20	POTS-E	
26-Jun-02	2	Lower Bay	20	POTS-E	
26-Jun-02	2	Lower Bay	20	POTS-E	
26-Jun-02	1	Lower Bay	20	PN-A	
26-Jun-02	2	Upper Bay	37	POTS	
26-Jun-02	2	Upper Bay	37	RFISH	
26-Jun-02	1	Upper Bay	37	RFISH	
26-Jun-02	2	Upper Bay	37	RFISH	
26-Jun-02	2	Upper Bay	43	POTS-B	3 LINES N-S
26-Jun-02	2	Upper Bay	43	POTS-E	
26-Jun-02	2	Upper Bay	43	CFISH	2 LG + 2 SM
26-Jun-02	1	Upper Bay	43	POTS-B	
26-Jun-02	2	Upper Bay	43	POTS-B	
26-Jun-02	1	Upper Bay	43	POTS-E	
26-Jun-02	2	Upper Bay	43	POTS-E	
26-Jun-02	1	Upper Bay	49	POTS-B	
26-Jun-02	1	Upper Bay	49	POTS-E	
26-Jun-02	1	Upper Bay	49	CFISH	
26-Jun-02	2	Upper Bay	56	POTS-B	
26-Jun-02	2	Upper Bay	56	POTS-E	
26-Jun-02	2	Upper Bay	56	POTS-B	
26-Jun-02	2	Upper Bay	56	POTS-E	
26-Jun-02	2	Upper Bay	56	GN	1 FLAG
26-Jun-02	2	Upper Bay	56	GN	1 FLAG
26-Jun-02	2	Upper Bay	56	GN	2 FLAGS
26-Jun-02	2	Upper Bay	56	GN	1 FLAG
26-Jun-02	2	Upper Bay	56	GN	2 FLAGS
26-Jun-02	2	Upper Bay	56	POTS-B	
26-Jun-02	1	Upper Bay	56	CFISH	

26-Jun-02	2	Upper Bay	56	POTS-E	
26-Jun-02	2	Upper Bay	56	POTS-B	
26-Jun-02	2	Upper Bay	56	POTS-E	
26-Jun-02	2	Upper Bay	56	POTS-B	
26-Jun-02	2	Upper Bay	56	POTS-E	
26-Jun-02	1	Upper Bay	56	PN-A	
26-Jun-02	2	Upper Bay	56	PN-A	
26-Jun-02	2	Upper Bay	56	PN-A	FULL OF RAYS
2-Jul-02	2	Lower Bay	3	RFISH	
2-Jul-02	1	Lower Bay	3	RFISH	2 OBSERVED
2-Jul-02	1	Lower Bay	3	CBBT, RFISH	
2-Jul-02	1	Lower Bay	14	PN-A	
2-Jul-02	2	Lower Bay	14	PN-A	
2-Jul-02	2	Lower Bay	14	RFISH	5 OBSERVED
2-Jul-02	1	Lower Bay	14	RFISH	6 OBSERVED
2-Jul-02	1	Lower Bay	14	CFISH	
2-Jul-02	1	Lower Bay	14	RFISH	
2-Jul-02	1	Lower Bay	14	GN	
2-Jul-02	1	Lower Bay	14	POTS-B	
2-Jul-02	2	Lower Bay	14	CFISH	
2-Jul-02	1	Lower Bay	14	POTS-E	
2-Jul-02	1	Lower Bay	14	POTS-B	
2-Jul-02	1	Lower Bay	14	POTS-E	
2-Jul-02	1	Lower Bay	14	POTS-B	
2-Jul-02	1	Lower Bay	14	POTS-E	
2-Jul-02	1	Lower Bay	17	CFISH	
2-Jul-02	1	Lower Bay	17	POTS	A FEW OBSERVED
2-Jul-02	1	Lower Bay	17	CFISH	3 OBSERVED, 1 TRANSIT
2-Jul-02	2	Lower Bay	17	POTS-B	
2-Jul-02	1	Lower Bay	17	POTS-B	
2-Jul-02	1	Lower Bay	17	CFISH	3 OBSERVED
2-Jul-02	2	Lower Bay	17	POTS-E	
2-Jul-02	2	Lower Bay	17	CFISH	
2-Jul-02	1	Lower Bay	17	POTS-E, CFISH	3 OBSERVED
2-Jul-02	1	Lower Bay	17	RFISH	
2-Jul-02	2	Lower Bay	17	RFISH	
2-Jul-02	1	Lower Bay	17	RFISH	2 OBSERVED
2-Jul-02	2	Lower Bay	28	POTS-B	
2-Jul-02	1	Lower Bay	28	POTS-B	
2-Jul-02	2	Lower Bay	28	POTS-E	
2-Jul-02	1	Lower Bay	28	POTS-E	
2-Jul-02	2	Lower Bay	28	RFISH	
2-Jul-02	2	Lower Bay	28	RFISH	MANY OBSERVED
2-Jul-02	1	Lower Bay	28	RFISH	7 OBSERVED
2-Jul-02	2	Lower Bay	28	RFISH	
2-Jul-02	1	Lower Bay	28	POTS-B	
2-Jul-02	1	Lower Bay	28	CB	TRANSIT
2-Jul-02	2	Lower Bay	28	POTS-B	
2-Jul-02	1	Lower Bay	28	POTS-E	

2-Jul-02	2	Lower Bay	28	POTS-E	
2-Jul-02	1	Upper Bay	33	POTS-B	
2-Jul-02	2	Upper Bay	33	POTS-B	
2-Jul-02	1	Upper Bay	33	RFISH	5 OBSERVED
2-Jul-02	2	Upper Bay	33	POTS-E	
2-Jul-02	1	Upper Bay	33	POTS-E	
2-Jul-02	1	Upper Bay	33	POTS-B	
2-Jul-02	1	Upper Bay	33	POTS-E	
2-Jul-02	2	Upper Bay	33	CFISH	
2-Jul-02	2	Upper Bay	33	CFISH	
2-Jul-02	1	Upper Bay	33	RFISH	3 OBSERVED
2-Jul-02	2	Upper Bay	33	RFISH	
2-Jul-02	1	Upper Bay	33	POTS-B	
2-Jul-02	2	Upper Bay	33	RFISH	
2-Jul-02	1	Upper Bay	33	POTS-E, PN-A	
2-Jul-02	2	Upper Bay	43	POTS-B	
2-Jul-02	2	Upper Bay	43	POTS-E	UN
2-Jul-02	1	Upper Bay	43	GN	
2-Jul-02	1	Upper Bay	43	POTS-B	
2-Jul-02	1	Upper Bay	43	POTS-E	
2-Jul-02	1	Upper Bay	45	POTS-B	
2-Jul-02	2	Upper Bay	45	POTS-B	
2-Jul-02	1	Upper Bay	45	POTS-E	
2-Jul-02	1	Upper Bay	45	POTS-B	
2-Jul-02	1	Upper Bay	45	POTS-E	
2-Jul-02	2	Upper Bay	45	POTS-E	
2-Jul-02	1	Upper Bay	45	POTS	3 OBSERVED
2-Jul-02	2	Upper Bay	45	RFISH	
2-Jul-02	1	Upper Bay	45	POTS-B	
2-Jul-02	1	Upper Bay	45	POTS-E	
2-Jul-02	1	Upper Bay	53	POTS-B	
2-Jul-02	2	Upper Bay	53	POTS-B	
2-Jul-02	1	Upper Bay	53	POTS-E	
2-Jul-02	2	Upper Bay	53	POTS-E	
2-Jul-02	2	Upper Bay	53	POTS-B	
2-Jul-02	1	Upper Bay	53	POTS-B	
2-Jul-02	1	Upper Bay	53	POTS-E	
2-Jul-02	2	Upper Bay	53	POTS-E	
2-Jul-02	1	Upper Bay	53	POTS-B	
2-Jul-02	1	Upper Bay	53	POTS-E	
2-Jul-02	1	Upper Bay	53	POTS-B	
2-Jul-02	1	Upper Bay	53	POTS-E	
2-Jul-02	2	Upper Bay	53	POTS-B	
2-Jul-02	1	Upper Bay	53	CFISH	TRANSIT
2-Jul-02	1	Upper Bay	53	POTS-B	
2-Jul-02	1	Upper Bay	53	POTS-E	
2-Jul-02	2	Upper Bay	53	POTS-E	
2-Jul-02	1	Upper Bay	53	POTS	LINE OF POTS N-S
2-Jul-02	2	Upper Bay	53	POTS-B	
2-Jul-02	2	Upper Bay	53	POTS-E	

2-Jul-02	2	Upper Bay	53	PN-I	
2-Jul-02	1	Upper Bay	53	CFISH	
2-Jul-02	2	Upper Bay	53	POTS-B	
2-Jul-02	1	Upper Bay	53	POTS	LINE OF POTS
2-Jul-02	2	Upper Bay	53	POTS-E	
2-Jul-02	2	Upper Bay	53	CFISH	
2-Jul-02	2	Upper Bay	53	CFISH	
2-Jul-02	1	Upper Bay	53	CFISH	
2-Jul-02	2	Upper Bay	53	PN-A	3 OBSERVED
2-Jul-02	2	Upper Bay	53	PN-A	3 OBSERVED
2-Jul-02	1	Upper Bay	53	PN-A	3 OBSERVED
2-Jul-02	2	Upper Bay	53	PN-A	
2-Jul-02	1	Upper Bay	53	CFISH	TRANSIT
2-Jul-02	2	Upper Bay	53	PN-A	
2-Jul-02	1	Upper Bay	53	PN-A	
2-Jul-02	2	Upper Bay	53	POTS-B	
2-Jul-02	2	Upper Bay	53	POTS-E	
9-Jul-02	2	Lower Bay	3	CD	
9-Jul-02	2	Lower Bay	3	CBBT, RFISH	9 OBSERVED
9-Jul-02	2	Lower Bay	3	POT	
9-Jul-02	1	Lower Bay	12	PN-A	
9-Jul-02	2	Lower Bay	12	BGE, PN-A	9 OBSERVED
9-Jul-02	1	Lower Bay	12	PN-A	
9-Jul-02	2	Lower Bay	12	POT	
9-Jul-02	1	Lower Bay	12	RFISH	
9-Jul-02	2	Lower Bay	12	POTS-B	
9-Jul-02	2	Lower Bay	12	POTS-E	
9-Jul-02	1	Lower Bay	22	RFISH	
9-Jul-02	1	Lower Bay	22	RFISH	
9-Jul-02	2	Lower Bay	22	CB	
9-Jul-02	2	Lower Bay	22	POTS	POTS IN LINE
9-Jul-02	1	Lower Bay	22	PN-A	
9-Jul-02	1	Lower Bay	22	POTS-B	
9-Jul-02	2	Lower Bay	22	POTS-B	
9-Jul-02	1	Lower Bay	22	POTS-E	
9-Jul-02	2	Lower Bay	22	GN	
9-Jul-02	2	Lower Bay	22	POTS-E	
9-Jul-02	1	Lower Bay	22	RFISH	
9-Jul-02	2	Lower Bay	27	POTS-B	
9-Jul-02	2	Lower Bay	27	POTS-B	
9-Jul-02	1	Lower Bay	27	POTS-B	
9-Jul-02	1	Lower Bay	27	POTS-E	
9-Jul-02	2	Lower Bay	27	POTS-E	
9-Jul-02	2	Upper Bay	35	POTS-B	
9-Jul-02	1	Upper Bay	35	RFISH	
9-Jul-02	2	Upper Bay	35	POTS-E	
9-Jul-02	1	Upper Bay	35	RFISH	
9-Jul-02	1	Upper Bay	35	POTS-B	
9-Jul-02	2	Upper Bay	35	GN	
9-Jul-02	1	Upper Bay	35	POTS-E	

9-Jul-02	2	Upper Bay	35	POTS-B	
9-Jul-02	2	Upper Bay	35	POTS-E	
9-Jul-02	2	Upper Bay	42	POTS-B	
9-Jul-02	2	Upper Bay	42	POTS-E	
9-Jul-02	2	Upper Bay	42	POTS-B	
9-Jul-02	2	Upper Bay	42	POTS-E	
9-Jul-02	2	Upper Bay	48	POTS-B	
9-Jul-02	1	Upper Bay	48	POTS-B	
9-Jul-02	2	Upper Bay	48	POTS-E	
9-Jul-02	1	Upper Bay	48	POTS-E	
9-Jul-02	2	Upper Bay	48	POTS	
9-Jul-02	2	Upper Bay	48	POTS	
9-Jul-02	2	Upper Bay	48	POTS-B	
9-Jul-02	1	Upper Bay	48	POTS-B	
9-Jul-02	1	Upper Bay	48	POTS-E	
9-Jul-02	2	Upper Bay	48	POTS-E	
9-Jul-02	2	Upper Bay	57	POTS-B	
9-Jul-02	2	Upper Bay	57	POTS-E	
9-Jul-02	2	Upper Bay	57	POTS-B	
9-Jul-02	2	Upper Bay	57	POTS-E	
9-Jul-02	2	Upper Bay	57	POTS-B	
9-Jul-02	2	Upper Bay	57	POTS-E	
9-Jul-02	2	Upper Bay	57	POTS-B	
9-Jul-02	2	Upper Bay	57	POTS-E	
9-Jul-02	2	Upper Bay	57	POTS-B	
9-Jul-02	2	Upper Bay	57	POTS-E	
9-Jul-02	2	Upper Bay	57	POTS	LINE OF POTS
9-Jul-02	2	Upper Bay	57	POTS	LINE OF POTS
9-Jul-02	2	Upper Bay	57	POTS-B	
9-Jul-02	2	Upper Bay	57	POTS-E	
9-Jul-02	2	Upper Bay	57	POTS-B	
9-Jul-02	2	Upper Bay	57	POTS-E	
9-Jul-02	2	Upper Bay	57	POTS-B	
9-Jul-02	1	Upper Bay	57	PN-A	
9-Jul-02	2	Upper Bay	57	POTS-E	
9-Jul-02	1	Upper Bay	57	PN-A	2 OBSERVED
17-Jul-02	2	Lower Bay	3	CFISH	
17-Jul-02	2	Lower Bay	3	RFISH	
17-Jul-02	1	Lower Bay	3	POTS	10 OBSERVED
17-Jul-02	2	Lower Bay	3	CBBT, RFISH	
17-Jul-02	1	Lower Bay	3	CBBT, RFISH	6 OBSERVED
17-Jul-02	2	Lower Bay	3	CFISH	
17-Jul-02	2	Lower Bay	3	DGE	
17-Jul-02	1	Lower Bay	3	RFISH	
17-Jul-02	2	Lower Bay	3	RFISH	3 OBSERVED
17-Jul-02	2	Lower Bay	3	RFISH	3 OBSERVED
17-Jul-02	1	Lower Bay	12	PN-A	
17-Jul-02	2	Lower Bay	12	PN-A, PN-I	6 ACTIVE,1 INACTIVE
17-Jul-02	2	Lower Bay	12	RFISH	
17-Jul-02	2	Lower Bay	12	RFISH	15 OBSERVED

17-Jul-02	1	Lower Bay	12	CFISH	5 OBSERVED
17-Jul-02	2	Lower Bay	12	POTS-B	
17-Jul-02	2	Lower Bay	12	CB	TRANSIT
17-Jul-02	2	Lower Bay	12	PN-E	
17-Jul-02	1	Lower Bay	12	POTS	70-100 OBSERVED
17-Jul-02	2	Lower Bay	17	CFISH	
17-Jul-02	1	Lower Bay	17	POTS	20 OBSERVED POTS IN LINE
17-Jul-02	2	Lower Bay	17	POTS-B	
17-Jul-02	1	Lower Bay	17	POTS	10 OBSERVED
17-Jul-02	2	Lower Bay	17	CFISH	2 OBSERVED
17-Jul-02	2	Lower Bay	17	POTS-E	
17-Jul-02	1	Lower Bay	17	POTS	6 OBSERVED POTS IN LINE
17-Jul-02	2	Lower Bay	17	GN	2-3 OBSERVED
17-Jul-02	2	Lower Bay	17	POTS	10 OBSERVED
17-Jul-02	1	Lower Bay	17	RFISH	3 OBSERVED
17-Jul-02	2	Lower Bay	17	RFISH	3 OBSERVED
17-Jul-02	2	Lower Bay	17	RFISH	
17-Jul-02	1	Lower Bay	17	CB	
17-Jul-02	2	Lower Bay	17	POTS	10 OBSERVED
17-Jul-02	2	Lower Bay	26	POTS	LINE OF POTS
17-Jul-02	1	Lower Bay	26	RFISH	2 OBSERVED
17-Jul-02	2	Lower Bay	26	RFISH	
17-Jul-02	2	Lower Bay	26	RFISH	
17-Jul-02	1	Lower Bay	26	POTS	10 OBSERVED POTS IN LINE
17-Jul-02	2	Lower Bay	26	POTS	4 OBSERVED POTS IN LINE
17-Jul-02	2	Lower Bay	26	POTS-B	
17-Jul-02	2	Lower Bay	26	RFISH	
17-Jul-02	1	Lower Bay	26	RFISH	2 OBSERVED
17-Jul-02	1	Lower Bay	26	POTS	
17-Jul-02	2	Lower Bay	26	POTS-E	
17-Jul-02	1	Lower Bay	26	RFISH	3 OBSERVED
17-Jul-02	2	Lower Bay	26	POTS-B	
17-Jul-02	1	Lower Bay	26	POTS	20 OBSERVED
17-Jul-02	2	Lower Bay	26	PN-A	3 OBSERVED
17-Jul-02	2	Lower Bay	26	POTS-E	
17-Jul-02	2	Lower Bay	26	POTS-B	
17-Jul-02	2	Lower Bay	26	POTS-E	
17-Jul-02	1	Lower Bay	26	POTS-B	
17-Jul-02	2	Lower Bay	26	POTS-B	
17-Jul-02	1	Lower Bay	26	POTS-E	
17-Jul-02	2	Lower Bay	26	POTS-E	
17-Jul-02	2	Lower Bay	26	POTS	12 OBSERVED POTS IN LINE
17-Jul-02	2	Lower Bay	26	POTS	5 OBSERVED
17-Jul-02	2	Lower Bay	26	POTS	5 OBSERVED
17-Jul-02	1	Lower Bay	26	POTS	10 OBSERVED
17-Jul-02	2	Lower Bay	26	POTS-B	
17-Jul-02	2	Lower Bay	26	POTS-E	
17-Jul-02	1	Upper Bay	33	POTS	25 OBSERVED
17-Jul-02	1	Upper Bay	33	POTS	6 OBSERVED POTS IN LINE
17-Jul-02	2	Upper Bay	33	POTS-B	

17-Jul-02	2	Upper Bay	33	RFISH	
17-Jul-02	1	Upper Bay	33	POTS	20 OBSERVED
17-Jul-02	2	Upper Bay	33	POTS-E	
17-Jul-02	1	Upper Bay	33	POTS	15 OBSERVED
17-Jul-02	2	Upper Bay	33	RFISH, CFISH, POTS-B	
17-Jul-02	2	Upper Bay	33	POTS-E	
17-Jul-02	2	Upper Bay	33	CB	
17-Jul-02	1	Upper Bay	33	RFISH	2 OBSERVED
17-Jul-02	1	Upper Bay	33	RFISH	2 OBSERVED
17-Jul-02	2	Upper Bay	33	RFISH	
17-Jul-02	2	Upper Bay	33	POTS-B	
17-Jul-02	2	Upper Bay	33	POTS-E	
17-Jul-02	1	Upper Bay	33	PN-A, POTS	10 OBSERVED
17-Jul-02	2	Upper Bay	39	POTS-B	
17-Jul-02	1	Upper Bay	39	POTS	17 OBSERVED POTS IN LINE
17-Jul-02	2	Upper Bay	39	POTS-E	
17-Jul-02	2	Upper Bay	39	POTS-B	
17-Jul-02	1	Upper Bay	39	POTS	9 OBSERVED POTS IN LINE
17-Jul-02	2	Upper Bay	39	POTS-E	
17-Jul-02	1	Upper Bay	39	RFISH	
17-Jul-02	2	Upper Bay	39	POTS	3 OBSERVED
17-Jul-02	1	Upper Bay	39	POTS-B	
17-Jul-02	2	Upper Bay	39	POTS-B	
17-Jul-02	1	Upper Bay	39	POTS-E	
17-Jul-02	1	Upper Bay	39	POTS-B	
17-Jul-02	1	Upper Bay	39	POTS-E	
17-Jul-02	1	Upper Bay	39	POTS	8 OBSERVED POTS IN LINE
17-Jul-02	2	Upper Bay	39	POTS-E	
17-Jul-02	2	Upper Bay	39	POTS-B	
17-Jul-02	2	Upper Bay	39	PN-A, RFISH	
17-Jul-02	2	Upper Bay	39	RFISH	2 OBSERVED
17-Jul-02	2	Upper Bay	39	POTS-E	
17-Jul-02	1	Upper Bay	45	POTS	15 OBSERVED POTS IN LINE
17-Jul-02	2	Upper Bay	45	POTS-B	
17-Jul-02	2	Upper Bay	45	POTS-E	
17-Jul-02	2	Upper Bay	45	RFISH	
17-Jul-02	1	Upper Bay	45	POTS	4 LINES OF POTS WITH 20 EACH
17-Jul-02	2	Upper Bay	45	CFISH	
17-Jul-02	1	Upper Bay	45	RFISH	
17-Jul-02	1	Upper Bay	45	POTS	25+ OBSERVED POTS IN LINE
17-Jul-02	2	Upper Bay	45	POTS	5 OBSERVED
17-Jul-02	1	Upper Bay	45	POTS	17 OBSERVED SCATTERED
17-Jul-02	2	Upper Bay	45	POTS-B	
17-Jul-02	2	Upper Bay	45	POTS-E	
17-Jul-02	1	Upper Bay	53	POTS-B	
17-Jul-02	2	Upper Bay	53	POTS-B	
17-Jul-02	1	Upper Bay	53	POTS-E	
17-Jul-02	1	Upper Bay	53	POTS-B	2 LINES OF POTS WITH 25-30 EACH
17-Jul-02	2	Upper Bay	53	POTS-E	
17-Jul-02	1	Upper Bay	53	POTS-E	

17-Jul-02	2	Upper Bay	53	POTS-B	
17-Jul-02	2	Upper Bay	53	POTS-E	
17-Jul-02	1	Upper Bay	53	POTS	10 OBSERVED POTS IN LINE
17-Jul-02	2	Upper Bay	53	GN	2 FLAGS OBSERVED
17-Jul-02	2	Upper Bay	53	POTS-B	
17-Jul-02	2	Upper Bay	53	POTS-E	
17-Jul-02	2	Upper Bay	53	POTS	3 OBSERVED
17-Jul-02	2	Upper Bay	53	POTS	2 LINES OF POTS WITH 20 EACH
17-Jul-02	2	Upper Bay	53	CFISH	5 OBSERVED
17-Jul-02	2	Upper Bay	53	POTS-B	
17-Jul-02	1	Upper Bay	53	POTS-B	5 LINES OF POTS WITH 15 EACH
17-Jul-02	2	Upper Bay	53	POTS-E	
17-Jul-02	1	Upper Bay	53	POTS-E	
17-Jul-02	2	Upper Bay	53	PN-A, POTS-B	
17-Jul-02	1	Upper Bay	53	PN-A	
17-Jul-02	2	Upper Bay	53	POTS-E	
17-Jul-02	2	Upper Bay	53	POTS-B	
17-Jul-02	2	Upper Bay	53	POTS-E	
17-Jul-02	1	Upper Bay	53	POTS-B	4 LINES OF POTS WITH 10 EACH
17-Jul-02	2	Upper Bay	53	POTS-B	
17-Jul-02	1	Upper Bay	53	POTS-E	
17-Jul-02	2	Upper Bay	53	POTS-E	
17-Jul-02	1	Upper Bay	53	POTS	15 OBSERVED POTS IN LINE
17-Jul-02	1	Upper Bay	53	RFISH	2 OBSERVED
17-Jul-02	2	Upper Bay	53	CFISH	TRANSIT
17-Jul-02	1	Upper Bay	53	POTS	5 OBSERVED
17-Jul-02	1	Upper Bay	53	POTS	8 OBSERVED
17-Jul-02	2	Upper Bay	53	POTS	10 POTS IN LINE
17-Jul-02	2	Upper Bay	53	POTS-B	
17-Jul-02	1	Upper Bay	53	POTS-B	5 LINES OF POTS WITH 10 EACH
17-Jul-02	2	Upper Bay	53	POTS-E	
17-Jul-02	1	Upper Bay	53	POTS-E	
17-Jul-02	2	Upper Bay	53	POTS-B	
17-Jul-02	2	Upper Bay	53	PN-A	3 OBSERVED
17-Jul-02	1	Upper Bay	53	PN-A	
17-Jul-02	2	Upper Bay	53	PN-A	3 OBSERVED
17-Jul-02	1	Upper Bay	53	PN-A	
17-Jul-02	1	Upper Bay	53	PN-A	
17-Jul-02	2	Upper Bay	53	PN-A	
17-Jul-02	2	Upper Bay	53	PN-A	
17-Jul-02	2	Upper Bay	53	POTS-E	
17-Jul-02	1	Upper Bay	53	PN-I, POTS	20 OBSERVED
17-Jul-02	2	Upper Bay	53	POTS-B	
17-Jul-02	2	Upper Bay	53	POTS-E	
17-Jul-02	2	Upper Bay	53	POTS-B	
17-Jul-02	2	Upper Bay	53	POTS-E	
30-Jul-02	1	Lower Bay	1	RFISH	GROUP
30-Jul-02	2	Lower Bay	1	POTS-B	
30-Jul-02	2	Lower Bay	1	POTS-E	
30-Jul-02	2	Lower Bay	1	POTS	4 OBSERVED

30-Jul-02	1	Lower Bay	8	RFISH	
30-Jul-02	2	Lower Bay	8	POTS	2 OBSERVED
30-Jul-02	1	Lower Bay	19	POTS-B	
30-Jul-02	2	Lower Bay	19	POTS-B	
30-Jul-02	2	Lower Bay	19	PN-I	
30-Jul-02	1	Lower Bay	19	POTS-E	
30-Jul-02	2	Lower Bay	19	POTS-E	
30-Jul-02	2	Lower Bay	19	PN-I	
30-Jul-02	1	Lower Bay	19	POTS-B	
30-Jul-02	1	Lower Bay	19	POTS-E	
30-Jul-02	1	Lower Bay	19	POTS-B	
30-Jul-02	1	Lower Bay	19	POTS-E	
30-Jul-02	2	Lower Bay	19	POTS	LINE OF CPS
30-Jul-02	1	Lower Bay	19	CFISH	
30-Jul-02	2	Lower Bay	19	PN-I	SCATTERED
30-Jul-02	2	Lower Bay	24	POTS-B	
30-Jul-02	1	Lower Bay	24	POTS	SCATTERED
30-Jul-02	1	Lower Bay	24	PN-I	
30-Jul-02	2	Lower Bay	24	POTS-E	
30-Jul-02	1	Lower Bay	24	PN-I	3 OBSERVED
30-Jul-02	1	Lower Bay	24	POTS-B	
30-Jul-02	1	Lower Bay	24	PN-I	
30-Jul-02	1	Lower Bay	24	POTS-E	
30-Jul-02	2	Lower Bay	24	POTS-B	
30-Jul-02	2	Lower Bay	24	POTS-E	
30-Jul-02	2	Upper Bay	34	POTS-B	
30-Jul-02	2	Upper Bay	34	POTS-E	
30-Jul-02	1	Upper Bay	34	CB	
30-Jul-02	1	Upper Bay	34	POTS	SCATTERED
30-Jul-02	2	Upper Bay	34	POTS	
30-Jul-02	2	Upper Bay	34	POTS	2 OBSERVED
30-Jul-02	1	Upper Bay	34	POTS-B	
30-Jul-02	2	Upper Bay	34	PN-A	
30-Jul-02	1	Upper Bay	34	POTS-E	
30-Jul-02	2	Upper Bay	40	POTS	CP LINE
30-Jul-02	2	Upper Bay	40	POTS-B	
30-Jul-02	2	Upper Bay	40	POTS-E	
30-Jul-02	2	Upper Bay	40	POTS	
30-Jul-02	1	Upper Bay	40	CFISH	
30-Jul-02	2	Upper Bay	40	POTS	2 OBSERVED
30-Jul-02	2	Upper Bay	40	POTS	
30-Jul-02	1	Upper Bay	40	CFISH	
30-Jul-02	1	Upper Bay	40	CFISH	
30-Jul-02	2	Upper Bay	40	MH	
30-Jul-02	1	Upper Bay	40	PN-I	
30-Jul-02	1	Upper Bay	40	GN	
30-Jul-02	2	Upper Bay	40	POTS-B	
30-Jul-02	2	Upper Bay	40	POTS-E	
30-Jul-02	2	Upper Bay	55	PN-A	
30-Jul-02	1	Upper Bay	55	PN-A	2 OBSERVED

30-Jul-02	2	Upper Bay	55	POTS-B	
30-Jul-02	2	Upper Bay	55	POTS-E	
30-Jul-02	2	Upper Bay	60	POTS-B	
30-Jul-02	2	Upper Bay	60	POTS-E	
30-Jul-02	2	Upper Bay	60	POTS-B	
30-Jul-02	2	Upper Bay	60	POTS-E	
30-Jul-02	2	Upper Bay	60	POTS-B	
30-Jul-02	2	Upper Bay	60	PP	
30-Jul-02	2	Upper Bay	60	POTS-E	
30-Jul-02	2	Upper Bay	60	PP	2 OBSERVED
30-Jul-02	2	Upper Bay	60	PP	
30-Jul-02	1	Upper Bay	60	RFISH	
30-Jul-02	2	Upper Bay	60	PP	
30-Jul-02	1	Upper Bay	60	PP	SCATTERED
30-Jul-02	2	Upper Bay	60	POTS-B	
30-Jul-02	2	Upper Bay	60	POTS-E	
30-Jul-02	2	Upper Bay	60	POTS-B	
30-Jul-02	2	Upper Bay	60	POTS-E	
30-Jul-02	2	Upper Bay	60	POTS-B	
30-Jul-02	2	Upper Bay	60	POTS-E	
30-Jul-02	1	Upper Bay	60	PN-A	
30-Jul-02	1	Upper Bay	60	PN-A	2 OBSERVED
30-Jul-02	2	Upper Bay	60	PN-A	
30-Jul-02	2	Upper Bay	60	POTS-B	
30-Jul-02	2	Upper Bay	60	POTS-E	

APPENDIX C. **Aerial sightings of sea turtles and marine mammals, May - July 2002.**

Codes:

CC	LOGGERHEAD (*Caretta caretta*)
LK	KEMP'S RIDLEY (*Lepidochelys kempi)*
MM	MARINE MAMMAL
MM POD	MARINE MAMMAL POD
ST	SEA TURTLE
ST-DEAD	DEAD SEA TURTLE
UN	UNIDENTIFIED SEA TURTLE SPECIES

DATE	OBSERVER	REGION	TRANSECT	CATEGORY	COMMENTS
7-May-02	1	Lower Bay	9	MM POD	6 OBSERVED
24-May-02	1	Lower Bay	3	ST	CC
24-May-02	1	Lower Bay	8	ST	CC
24-May-02	2	Lower Bay	25	ST	UN, SUBMERGED
24-May-02	2	Lower Bay	25	MM	DOLPHIN
24-May-02	2	Upper Bay	31	ST	LK
24-May-02	2	Upper Bay	37	ST	UN
24-May-02	2	Upper Bay	37	ST	SUBMERGED
24-May-02	2	Upper Bay	37	ST	SUBMERGED
24-May-02	2	Upper Bay	37	MM	TURSIOPS
24-May-02	2	Upper Bay	37	MM	2 TURSIOPS OBSERVED
24-May-02	1	Upper Bay	37	ST	UN
24-May-02	1	Upper Bay	39	ST	CC
24-May-02	2	Upper Bay	39	ST	CC
24-May-02	1	Upper Bay	39	ST	UN
29-May-02	2	Lower Bay	13	ST	
29-May-02	2	Lower Bay	13	ST	
29-May-02	2	Lower Bay	13	ST	
29-May-02	1	Lower Bay	13	ST	
29-May-02	1	Lower Bay	13	ST	LK
29-May-02	1	Upper Bay	37	ST	
29-May-02	1	Upper Bay	37	ST	
29-May-02	1	Upper Bay	40	ST	
29-May-02	2	Upper Bay	40	ST	
29-May-02	2	Upper Bay	47	ST-DEAD	DEAD
29-May-02	1	Upper Bay	47	ST	SUBSURFACE
29-May-02	1	Upper Bay	47	ST	SUBSURFACE
29-May-02	1	Upper Bay	47	ST	SUBSURFACE
29-May-02	1	Upper Bay	47	ST	SUBSURFACE
29-May-02	1	Upper Bay	47	ST	SURFACE
29-May-02	1	Upper Bay	47	ST	SURFACE
29-May-02	1	Upper Bay	47	ST	SUBSURFACE
29-May-02	1	Upper Bay	47	ST	SURFACE
29-May-02	1	Upper Bay	47	ST	SUBSURFACE
29-May-02	1	Upper Bay	47	ST	SUBSURFACE

29-May-02	2	Upper Bay	47	ST	
29-May-02	2	Upper Bay	47	ST	
11-Jun-02	1	Lower Bay	3	ST	UN
11-Jun-02	2	Lower Bay	5	MM	
11-Jun-02	2	Lower Bay	5	MM	20+ OBSERVED
11-Jun-02	2	Lower Bay	5	MM	10+ OBSERVED
11-Jun-02	1	Lower Bay	5	ST	CC
11-Jun-02	1	Lower Bay	5	MM	GROUP
11-Jun-02	1	Lower Bay	5	MM	2 OBSERVED
11-Jun-02	1	Lower Bay	13	ST	UN
11-Jun-02	1	Lower Bay	13	MM	3+ OBSERVED
11-Jun-02	1	Lower Bay	13	ST	CC
11-Jun-02	2	Lower Bay	26	ST	UN
11-Jun-02	1	Lower Bay	26	ST	CC
11-Jun-02	1	Upper bay	31	MM	
20-Jun-02	1	Lower Bay	1	MM	3 OR SO OBSERVED
20-Jun-02	1	Lower Bay	10	ST	
26-Jun-02	1	Lower Bay	2	ST	
26-Jun-02	1	Lower Bay	7	MM	
26-Jun-02	1	Lower Bay	7	MM	
26-Jun-02	2	Lower Bay	7	ST	
26-Jun-02	2	Lower Bay	7	ST	
26-Jun-02	1	Lower Bay	15	ST	
26-Jun-02	1	Lower Bay	20	ST	
26-Jun-02	1	Upper Bay	37	ST	
26-Jun-02	1	Upper Bay	43	ST	CC or LK
26-Jun-02	1	Upper Bay	56	ST	CC
2-Jul-02	1	Lower Bay	3	ST	LK
2-Jul-02	2	Lower Bay	14	ST	CC
2-Jul-02	2	Upper Bay	43	ST	UN
2-Jul-02	1	Upper Bay	45	ST	CC
2-Jul-02	2	Upper Bay	53	ST	UN
2-Jul-02	2	Upper Bay	53	ST	UN
9-Jul-02	2	Lower Bay	27	ST	CC
9-Jul-02	1	Upper Bay	48	ST	CC
9-Jul-02	2	Upper Bay	57	MM	2 DOLPHINS OBSERVED
17-Jul-02	2	Lower Bay	3	ST	CC
17-Jul-02	2	Lower Bay	3	ST	CC
17-Jul-02		Lower Bay	12	ST	CC
17-Jul-02	1	Lower Bay	12	ST	CC
17-Jul-02	1	Lower Bay	12	ST	CC
17-Jul-02	2	Lower Bay	17	MM	40 OBSERVED
17-Jul-02	1	Lower Bay	17	MM	2 DOLPHINS OBSERVED
17-Jul-02	2	Lower Bay	17	MM	

17-Jul-02	2	Lower Bay	17	ST	CC
17-Jul-02	1	Lower Bay	17	MM	8 OBSERVED
17-Jul-02	1	Lower Bay	17	ST	CC
17-Jul-02	2	Lower Bay	17	MM	5 OBSERVED
17-Jul-02	1	Lower Bay	17	ST	UN
17-Jul-02	2	Lower Bay	26	MM	10 OBSERVED
17-Jul-02	1	Upper Bay	33	ST	CC
17-Jul-02	1	Upper Bay	39	ST	CC
17-Jul-02	2	Upper Bay	45	MM	2 OBSERVED
17-Jul-02	1	Upper Bay	45	ST	CC
30-Jul-02	2	Lower Bay	1	MM	3 DOLPHINS
30-Jul-02	2	Lower Bay	1	ST	CC
30-Jul-02	1	Lower Bay	8	ST	CC
30-Jul-02	2	Lower Bay	19	ST	CC
30-Jul-02	2	Lower Bay	24	ST	CC
30-Jul-02	2	Upper Bay	40	ST	CC
30-Jul-02	2	Upper Bay	40	MM	3 OBSERVED
30-Jul-02	1	Upper Bay	60	ST	UN