Mr. Paul G. Buxton P.Eng. June 19, 2002

As I understand,you had been advised by Dr. J. Lien, cetacean researcher at Memorial University of Newfoundland, to contact me for practical advice on marine mammal habitat issues. This involves a proposed basalt quarry site immediate to the Bay of Fundy shore at Whites Point, Digby Co., Nova Scotia.

As agreed, the consultation would consist of two days, involving a visit to the site with Mr. David Kern and to provide an initial appraisal of environmental impact issues related to marine mammals. This is in relation to the initial 4 hctr quarry site and potential blasting of the basalt, planned major expansion of the quarry, and the construction of a docking and loading facility for planned ship transport.

In this case, we are not dealing with site selection for an industrial activity, where it can be situated, so as to reduce any potential effects on the surrounding environment. The site is fixed, and quarrying activity is best described as aggressive restructuring. The site is on a shoreline where there does not appear to have been any previous industrial activity of the planned scale. Based upon past experience and the two hour onsite visit on June 12, 2002, I make these observations:

The basalt layer of the initial 4 hctr quarry is apparently 20m in thickness and appears to continue into water, fronting on a steep submerged slope ranging 20-30m in depth. Parallel with this, there is another abrupt slope circa 300m further off Whites Point (see colour illustration of multi-beam bathymetry). Both of these steep gradients can be generators of marine production and prey concentration that would be attractive to marine mammals.

A sloping beach in an extreme tidal area has the advantage of keeping mammals well offshore at lower tides. By contrast, these steep nearshore slopes, which make an ideal berth for large ships, can also accomodate whales at any level of the tide. Tidal drop would not disuade whales from either of these slopes, since the slope faces remain submerged, although they are that much closer to the exposed beach zone at low tide.

Marine mammals will often move along a coastline, exploiting chance concentrations of prey in alignment with structural features, such as abrupt slopes or prominences that are conducive to marine production and concentrating prey. Large whales are not adverse to feeding immediate to the shoreline, provided there is sufficient depth. This is an evolved feeding strategy, often conducted enroute to a more reliable or productive site. Whales feeding in the rip may stay submerged for longer periods and be more difficult to detect.

Observation of cormorants and seagulls in the longshore rip current and a single harbour seal in Whites Cove would indicate that there is local marine production. The Bay of Fundy hosts a broad representation of marine mammals: Large, filter feeding whales, from endangered Right whales , Fin whales, Humpback, Minke, occasionally Sei and Blue. Smaller marine mammals range from Harbour porpoise, several species of dolphins as well as Harbour seals and Grey seals. Species descriptions are readily available in the literature, and are time consuming in this brief report. What is important, is that the quarry site is proximal to an area known for marine mammals. What must be addressed here, is the potential for interaction.

While the Whites Point site may not necessarily be higher in production, there appears to be such an area, approximately 5km NNE of White's Point at Burns Point (opposite to Sandy Cove), where there is an abrupt ridge projecting to the west. This structure is well defined by multi-beam bathymetry conducted by research scientist Dr. Gordon Fader of Geological Survey of Canada, BIO. I attach a colour illustration of the bathymetry, which

covers the immediate shore area from Whites Cove to Burns Point. Tidal-driven upwelling and gyres are invariably associated with such structures, which generate and concentrate marine production, and have the potential to attract fish, seabirds and marine mammals.

There is potential for marine mammals to be within 10s of m to 300 m of from the undisturbed site as it now stands at Whites Point. This could be related to local production or as a corridor to the ridge at Burns Point. Whatever noise is ducted through the basalt is immediate to marine mammals on the two slopes.

I include copies of figures from publications on distribution and satellite tracking of Right whales. As you can see in Mate et al 1992, there is monitored movement of right whales (in this case, an adult female with calf, plotted on page 41), tracked to the vicinity between Whites Point and Burns Point. I should point out that most of the research on Right whales is based in the U.S., and there is free exchange of information since the population is transborder, and of major concern to both countries.

The proposed docking facility will use the nearshore slope for berthing large vessels and will be within 300 m of the further slope. Construction of a dock at this site should cause any cetaceans which may feed along the face of these slopes, to move further off, if they are enroute to more attractive feeding areas (as suggested for the ridge off Burns point). Seals, such as grey and harbour, tend to exhibit greater curiosity, once they gain assurance that there is no direct threat to them.

I have little information on ship activity, other than a vessel length of 800ft. is being considered. This would translate into 60,000-80,000 tonnes. A steel vessel of this size, berthed parallel to the shore, loading tens of thousands of tonnes of crushed stone by converors for long periods, would be a major source of continuous noise. This would be further exacerbated by the steep basalt slope shoreward of the vessel, deflecting noise seaward. I would expect that this could be a substantial determent to cetaceans attempting to feed in the area.

"Conditioning" of marine mammals to human activities, through gradual ramping up of any new source of noise, has been considered for some onshore and offshore activities. This can have two effects: to allow the animal to become familiar with the activity, or to cause them to leave the immediate area in advance of the planned higher noise levels. In short-term situations, this is sometimes carried out, in particular where the site of industrial activity is determined not to be of primary importance to marine mammals. In the case of marine mammals off White's Point, conditioning may not be an option when there is the potential for an endangered species to be in the immediate area, and the scale of general proximity marine mammals and coastal topography is so reduced. The general area of the lower bay of Fundy is the chosen habitat of the majority of north Atlantic right whales. Numbers of marine mammals must also be seen in the context of the small scale of the marine habitat.

The marine ecosystem of the Bay of Fundy is not static and represents one of the most dynamic marine sites in the world. Distribution and abundance of larger predators, from seabirds to marine mammals will vary from year to year, depending on changes in the distribution and type of prey.

The reliability of year-to-year presence of marine mammals in the lower Bay Fundy is underscored by the growth of the whale watching industry itself. Tours boats may not have to go that far along the coast, if they are looking for reliable concentrations and quick turnaround, therefore they may not frequent the Whites Point site.

Whales behave in much the same manner as whale-watchers, in terms of their prey. But there will always be solitary animals that explore other areas where prey may be less abundant, but where there is less competition.
Present protective measures in the U.S and Canada should result in an increase in the size of this population. With an increasing population, there is also an increased probability that animals will range further from the seasonal areas of concentration, thus increased forays into the present limits of their range.

Most cetaceans move out of the Bay of Fundy during the winter months, however there is no season when representative species are absent. Right whales have been reported in, what we might consider to be unusual areas, such as off Chebucto Head in the Halifax harbour shipping lanes in February 1987.
It is reasonable to assume that cetaceans remaining in colder waters maintain body condition against the increased gradient of heat loss in colder water, by feeding on the prey available. Thus, feeding opportunities for these remaining individuals is important to their survival.

Blasting, by what method: single shots, sequential, or ripple blasts: there is potential for additive effect of frequencies, especially in shallow water in a rock environment. The basalt layer in question appears to be continuous with the basalt of the two slopes. If it were uncoupled by sedimentary rock, this might dampen the transmission from blasting.
There does not appear to be much overburden on the submerged slope, which is consistent with a longshore tidal dynamics. There may be heavier gravel, but no light sediments. It appears that the basalt is directly exposed to the water, which could result in a large surface for transmission directly into seawater.

At distant levels, blasting may be no more disturbing than tectonic activity in some marine areas. However those animals in areas of tectonic activity have been conditioned to this ambient noise. There is no such tectonic activity in this area of the Bay of Fundy.

There is a growing body of research regarding marine mammal hearing, and the potential for trauma from various frequencies, amplitudes and pressure rises (characteristic of modern explosives). Temporary effects on hearing and orientation can have serious consequences in an area of extreme tides and complex coastlines, where there is fishing gear and commercial shipping.

The major sources of mortality for the North Atlantic Right Whale are collisions with ships and entanglement in fishing gear. The proposed 5.5 km shift in shipping lanes, away from Grand Manan Island and towards Nova Scotia, may substantially reduce shipstrikes.

Temporary hearing damage may compromise orientation in an already, busy area, and animals are less able to detect above ambient noise levels. With such a confined scale of activity by whales, fisheries and shipping, even short-term disorientation could have serious consequences. The seriousness of this possibility is further underscored by the presence of Right whale concentrations. In this risk assessment, the worst-case-scenario is used as the bottom line. The worst-case-scenario at this site would be the presence of an adult female right whale and calf in the immediate vicinity of the quarry when blasting is being conducted. An adult female right whale, capable of reproduction, represents the most critical parameter in the recovery of this population. With known concentrations of right whales 20-30 km from the proposed quarry site, the possibility that groups or individuals could visit the area, is not that remote(as illustrated in Mate et al, 1992; NOAA/ NEC Aerial Survey, Aug. 11/ 2000).

The response of various species of whales to human activity has changed over the past 25 years. In general, they have become more complacent with human activity, a complacency that seems to have its consequences, making them more vulnerable.

The increasing profile of marine mammals, and the North Atlantic Right whale in particular, require that a high level of caution is necessary in planning any long-term industrial venture within or proximal to their habitats. How we conduct ourselves in such a habitat evolved from acquired understanding, then phased into guidelines, which in turn, are changed to regulations as studies intensify by demand. That is a risk-factor involved in this marine area, whether it applies to the whale-watching industry, commercial fishing or industrial activity.

I do not wish to mislead the proponents of the quarry project into assuming that there are measures to mitigate the environmental consequences of blasting and ship-loading activity, sufficient to satisfy an informed review board. The example of a worst-case-scenario is not far from the reality, based on verified movements of Right whales alone.

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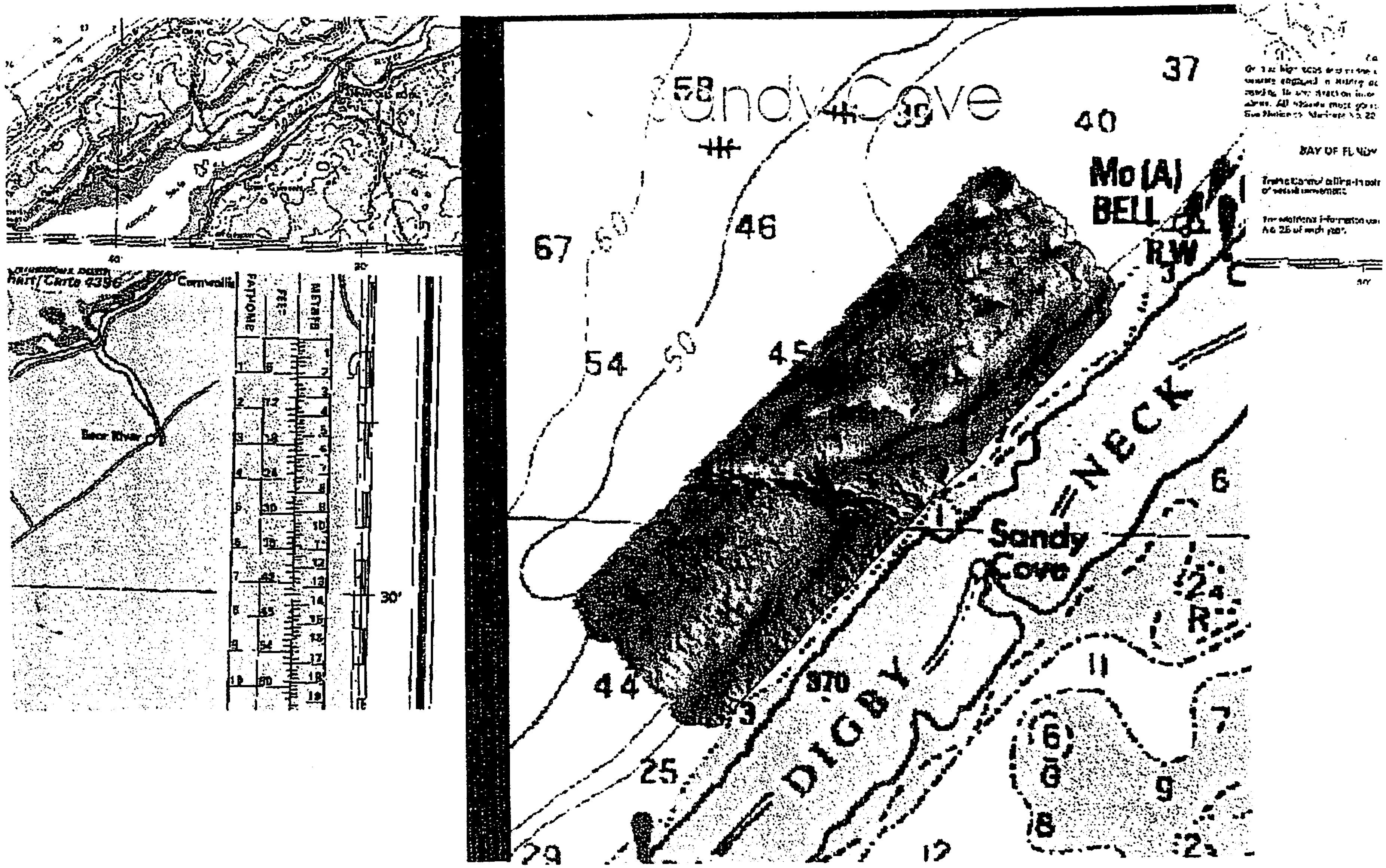
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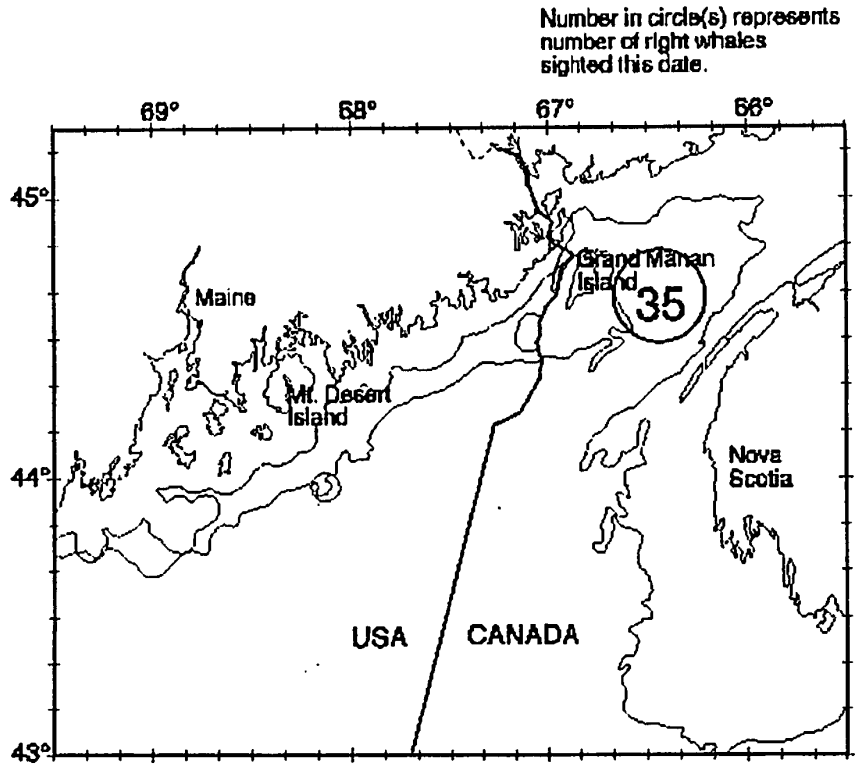

Right Whale Zones from NMFS NEC Aerial Survey, 11 August 2000

NOAA Fisheries
Northeast Regional Office
Gloucester, MA

OCS Study
MMS 91-0069

APPLICATION OF REMOTE SENSING METHODS FOR TRACKING LARGE CETACEANS: NORTH ATLANTIC RIGHT WHALES (Eubalaena glacialis)

FINAL REPORT - FEBRUARY 1992

Contract No. 14-12-0001-30411

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U.S. Department of the Interior
Minerals Management Service
Alaska and Atlantic OCS Regional Offices

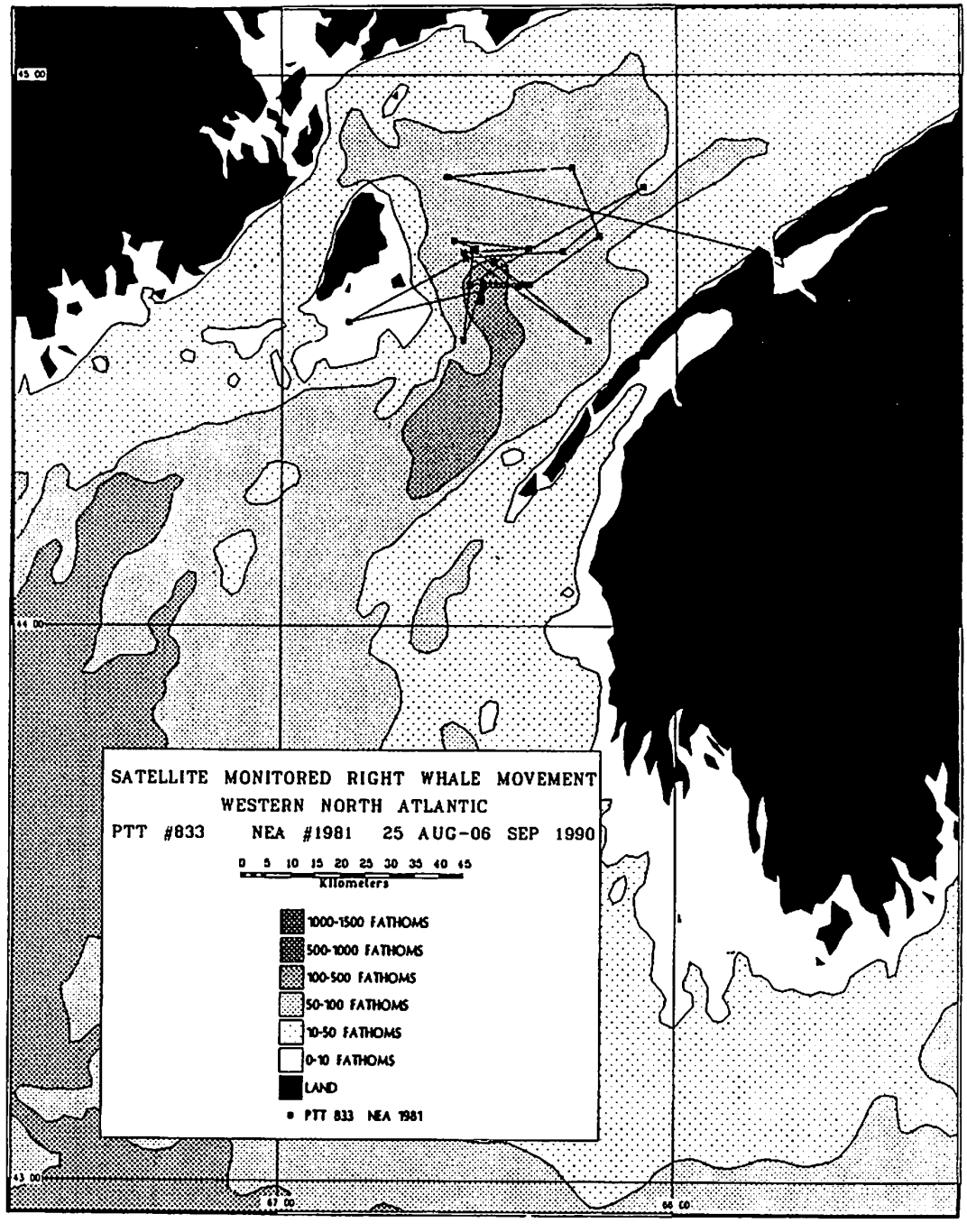

Figure 18. Details of satellite-monitored movements of PTT #833 (NEA #1981), a juvenile animal of unknown sex.

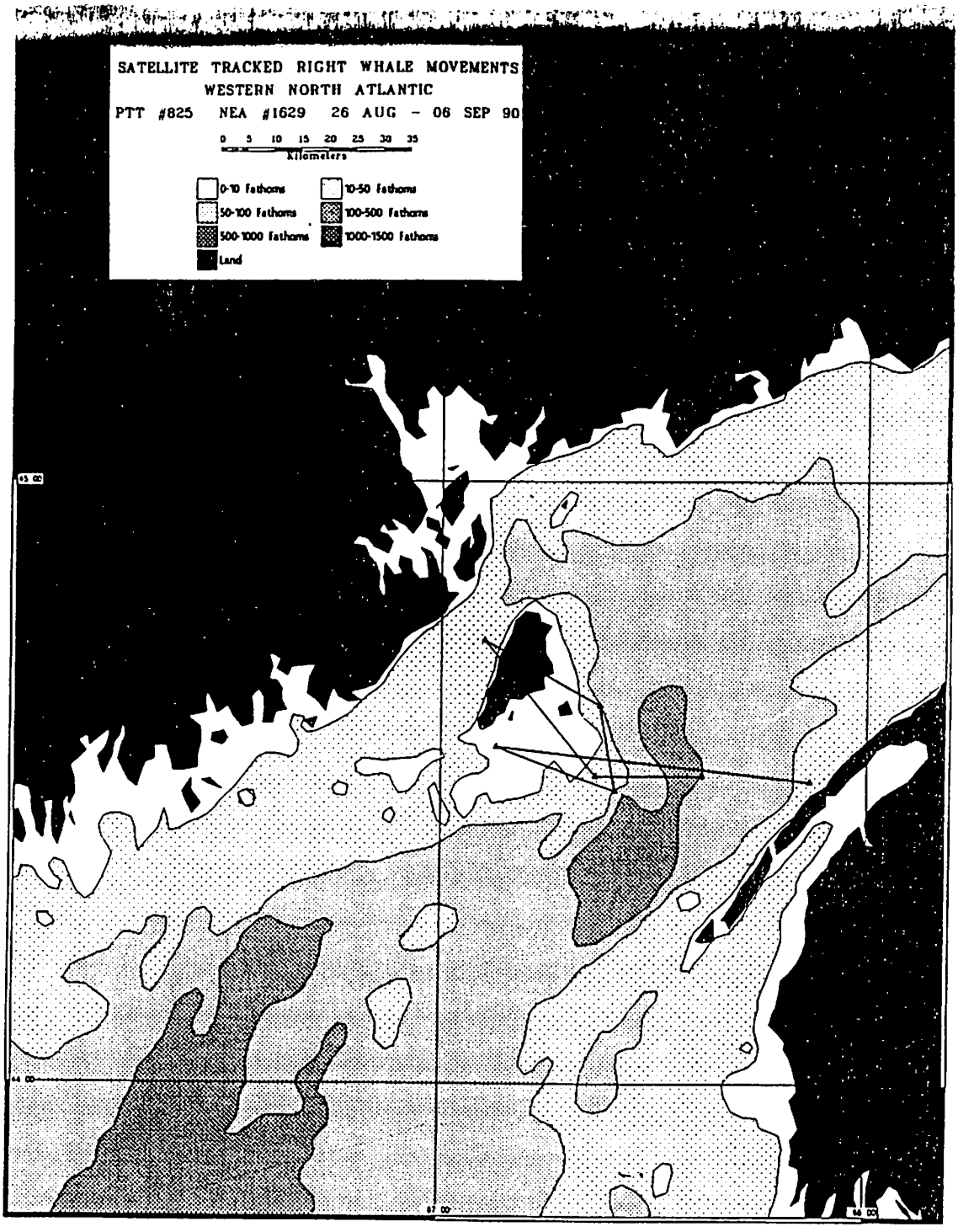

Figure 20. Satellite-monitored movements of PTT #825 (NEA #1629), an adult female with a calf. Note: lines show chronological order of locations and a minimum travel of 302 km.

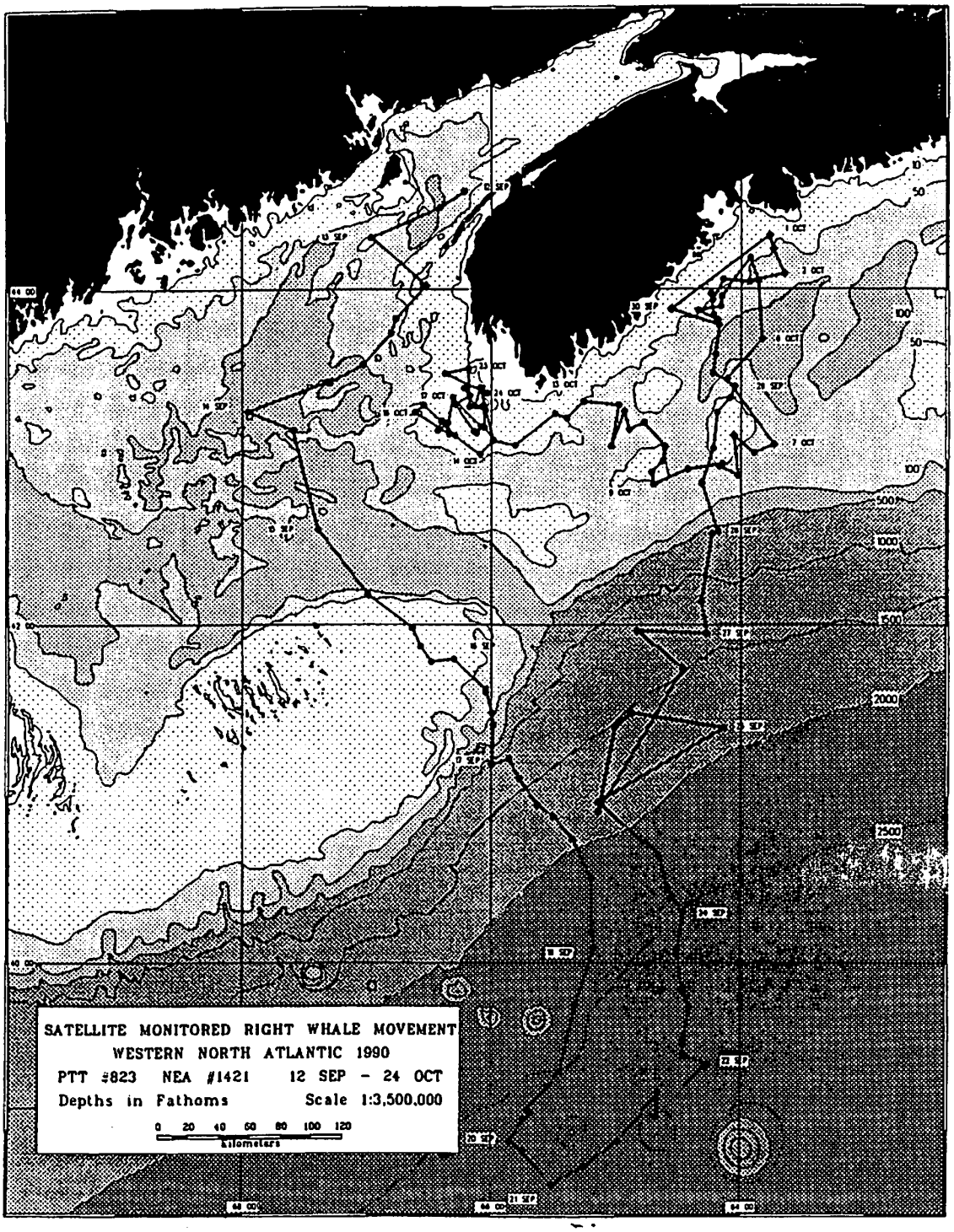

Figure 24. Satellite-monitored movements of PTT #823 (NEA #1421), an adult male. Note: lines show chronological order of locations and a minimum travel of 3,030 km.

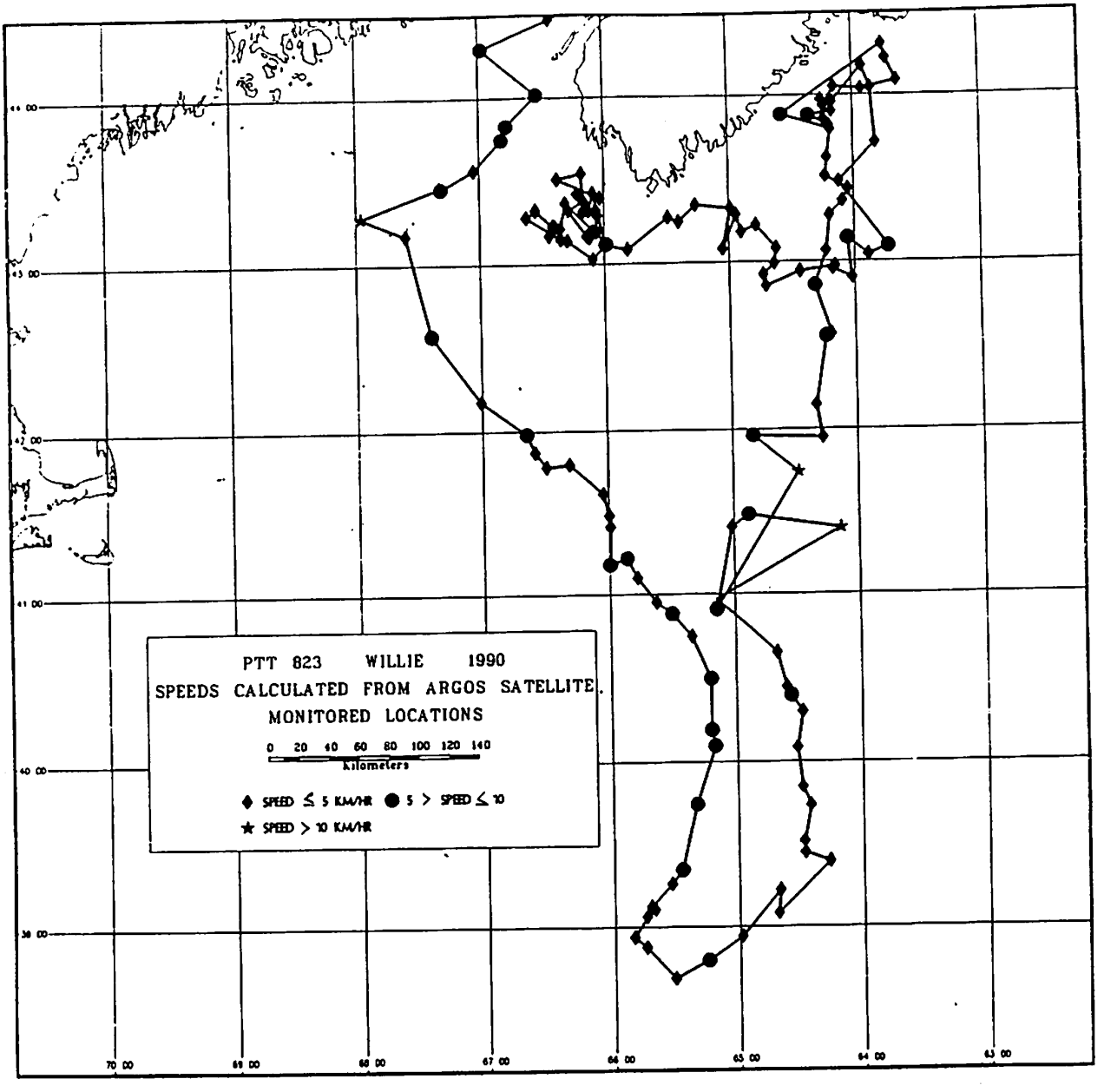

Figure 37. Speeds calculated from Argos satellite-monitored locations for PTT #823, a known adult male.

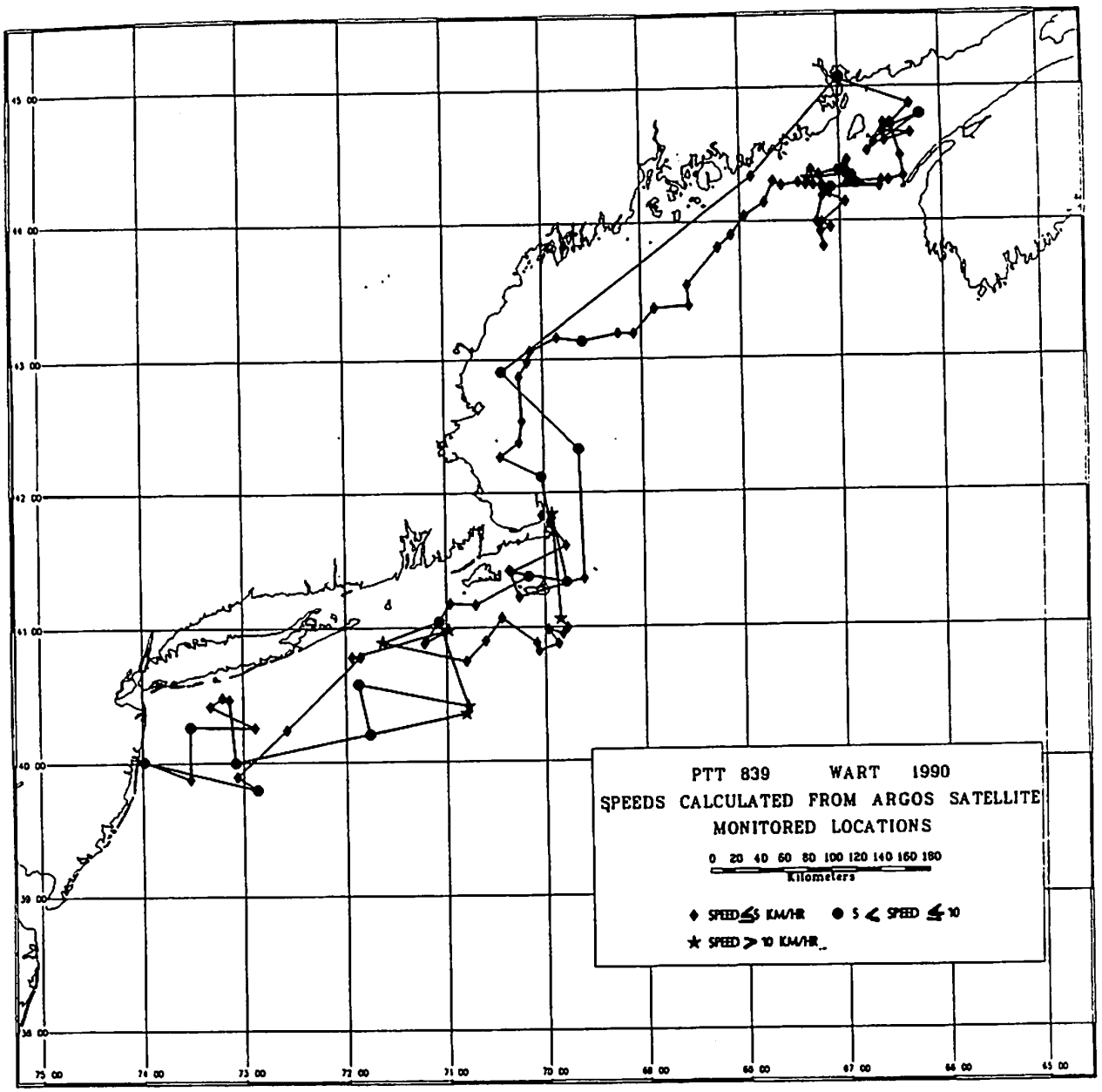

Figure 38. Speeds calculated from Argos satellite-monitored locations for PTT #839, a known female with a 1990 calf.