

STUDY REPORT

Abundance, Distribution and Behavior of Gray Whales (*Eschrichtius robustus*) Offshore North-Eastern Sakhalin in 2002

Russian Federation
Fisheries Committee

Federal National Unitary Enterprize
"Pacific Research Fisheries Center"
(TINRO-Center)

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July 2003

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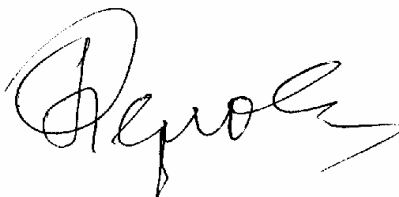
**REPORT
ON THE RESEARCH PROJECT**

**The abundance, distribution, and behavior of gray whale
(*Eschrichtius robustus*) in coastal waters of the northeast Sakhalin in 2002
(vessel-based observations)**

Theme 1.26

Agreement № C-60326 (Y-00566) between Sakhalin Energy Investment Company and
Exxon Neftegaz Limited

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INTRODUCTION

During the last few years, the north-eastern coast of Sakhalin Island has been closely scrutinized by the scientific, public and industrial organizations as a result of active commercial development of oil and gas deposits and large-scale construction of associated facilities, both on and offshore, in the immediate vicinity of the Okhotsk-Korean, or western gray whale (*Eshrichtius robustus*) feeding habitat. This last consideration is cause for special concern with regard to western gray whale population recovery and requires joint efforts on behalf of both scientific and production organizations to intensify mitigation studies in order to reduce technological impacts on this whale population and on marine biota of this region as a whole.

In recent years, a number of state scientific organizations (SakhNIRO, Yuzhno-Sakhalinsk; TINRO-Center, TOI, DVNIGMI, Marine Biology Institute under FAD RAS, Vladivostok) conducted monitoring of marine ecosystems in the vicinity of Sakhalin Energy Investment Company (SEIC) Molikpaq fixed offshore platform, and in the areas of western gray whale feeding habitat. Studies off Sakhalin Island include the effects of seismic survey operations on the behavior of gray whales; aerial, vessel, and land-based surveys documenting the abundance and distribution of gray whales; gray whale prey and feeding ecology studies; gray whale behavioral observations; gray whale photo-identification and site-fidelity studies; and acoustic monitoring of industrial noise. These studies were financed by the oil companies SEIC and Exxon Neftegas Limited (ENL).

In furtherance of this work, in August-October 2002 a research expedition took place aboard the tugboat *Nevelskoy* (Shipowner Epron LLC., Vladivostok) to study aspects of western gray whale feeding ecology off north-eastern Sakhalin Island. In addition to gray whale foraging and photo-identification studies, the study program also included investigations of species composition and abundance of marine mammals, their distribution along the north-eastern coast of the Island, and gathering of information about general gray whale behavior.

SHIPBOARD OBSERVATIONS

In conjunction with the vessel-based prey sampling and photo-identification programs, trained marine mammal observers (MMOs) aboard the *Nevelskoy* conducted dedicated marine mammal surveys in both the Piltun and Offshore feeding areas. The *Nevelskoy* conducted dedicated surveys of marine mammals both in the Offshore feeding area (6 September 2002) and the coastal survey in the better known Piltun feeding area (7 September 2002). Two longitudinal transects were surveyed in the offshore feeding area. These transects were oriented longitudinally along the lines 143°58' and 143°66' (Figure 1). The transects extended from latitudes 52°09'N to 52°50'N. In the Piltun feeding area, a single transect line was surveyed along the coast from the mouth of Piltun Bay to 53°50' (Figure 2).

The MMOs also continuously recorded gray whales and other marine mammals observed daily during all daylight vessel activities (traveling, prey sampling, photo-identification) (Table 1). It was also the MMO's responsibility to advise the captain of the *Nevelskoy* to maintain a 1km buffer distance between the ship and observed gray whales while the ship was moving.

Observers used reticule binoculars to detect marine mammals at distances, resolve details during marine mammal sightings, and estimate ranges to marine mammals. The MMO conducted observations from the highest suitable observation point on the *Nevelskoy*. Information on sightability, weather, species, heading, distance from the vessel and general behavior were recorded. MMOs completed, proofread, and entered the daily datasheets into a laptop computer at the end of each day and data was backed up.

ABUNDANCE AND DISTRIBUTION OF MARINE MAMMALS

Ten species of marine mammals were encountered in the course of the study, including five species of cetaceans: gray whale (*Eschrichtius robustus*), minke whale (*Balaenoptera acutorostrata*), killer whale (*Orcinus orca*), harbor porpoise (*Phocoena phocoena*), Dall's porpoise (*Phocoenoides dallii*), and five species of pinnipeds: northern fur seal (*Callorhinus ursinus*), northern sea lion (*Eumetopias jubatus*), ringed seal (*Pusa hispida*), spotted seal (*Phoca largha*), and bearded seal (*Erignathus barbatus*).

Gray Whales

During all MMO observations aboard the *Nevelskoy*, 333 sightings of 576 individual gray whales were recorded (Figure 3). Group sizes ranged from one to eight individuals with an average group size of two whales.

Offshore Feeding Area

For many years it was believed that Piltun Bay was the only gray whale feeding area near the coast of Sakhalin Island. However, in 2001 studies showed that in the nearby "marine" or Offshore area there was another aggregation of feeding gray whales, with individuals possibly numbering as high as 83 (Blokhin et. al. 2002, Maminov & Yakovlev 2002), however, it was likely that some individuals were counted twice and that the actual number of animals was less than 83.

A dedicated vessel survey was conducted in the Offshore feeding area on 6 September 2002. During this survey, MMOs observed 21 sightings of 50 individual gray whales (see Figure 1). Group size of gray whale sightings ranged from one to seven animals with an average group size of two individuals. During all MMO observations in the Offshore area in 2002, including the dedicated vessel survey on 6 September, 204 sightings of 310 individual gray whales were recorded (see Figure 3). It is important to note that the effort changed daily as the MMOs recorded observations during other vessel-based study activities, the location of which continuously changed.

From observations made of gray whales throughout the summer in the Offshore feeding area, the general distribution in the south and west was limited to the area between 52°05' N, 143°30' E, in the north – 52°29' N, 143°42' E, and in the east – 52°22' N, 143°45' E (see Figure 3). In other words, the area where gray whales were observed stretched from south-west to the north-east, same as in 2001 (Maminov & Yakovlev 2002). Distribution of whales within these boundaries was extremely uneven. As much as 40% of all whale sightings were concentrated in a limited area, approximately 15 square miles, in the center of the Offshore area. Subsequent numerous visits to this high use area for the purposes of prey sampling and photo-identification did not reveal any significant changes in the distribution of these animals. In October, the distribution of gray whales appeared to shift to the south, to 51°55' N (Figure 4).

In 2002, as in 2001, gray whales in the Offshore feeding area were actively moving in different directions. Judging from this movement and the typical fluking behavior prior to submerging, it was assumed that many animals were feeding. As some of the whales surfaced, food could be observed washing out of their mouth and most of it consisted of tube-dwelling amphipods together with their tubes. These crustaceans are one of the major food sources of the western gray whale (Blokhin & Pavlyuchnikov 1996) and eastern gray whales (Nerini 1984, Moore *et al.* 2003). They are also one of the major groups of macrobenthos along the north-eastern coast of Sakhalin Island (Koblikov 1986) reaching significant biomass, up to 1 kg/m², (based on preliminary data collected during the 2002 expedition aboard the *Nevelskoy*, Fadeev pers. comm. 2003) in the Offshore feeding area. A large number of gray whales and the high intensity of feeding activity in combination with large biomass of food benthos in the Offshore area indicates that this zone is one of the main gray whale feeding areas off the northeast coast of the Sakhalin Island and is consistent with the observed relationship between eastern gray whales and their prey (Dunham & Duffus 2001, 2002; Moore *et al.* 2003).

Piltun Feeding Area

A dedicated vessel survey was conducted in the Piltun feeding area on 7 September 2002. During this survey, MMOs observed 16 sightings of 28 individual gray whales (see Figure 2). Group size of gray whale sightings ranged from one to five animals with an average group size of two individuals. During all MMO observations in the Piltun feeding area, including the dedicated vessel survey on 7 September, 124 sightings of 198 individual gray whales were recorded (see Fig. 3). It is important to note that the effort differed daily as the MMOs recorded observations during other vessel-based study activities, the location of which continuously changed.

In the Piltun feeding area, gray whales were encountered no farther than 4 km, and in most cases not farther than 1 km from shore. They were not found at all to the south of 52°40' N and north of 53°23' N. Within the boundaries of this area the animals moved in various directions, many of them actively benthic feeding, as confirmed by the behavior of fluking or the presence of mud plumes. Gray whales exhibited high mobility and this mobility determined their distribution in space and time. Consequently, daily observations of gray whales in small localized areas are hardly informative in regards to changes in their abundance and distribution in the entire feeding area. However, even

such data, most of which is shown on Figure 5, are sufficient to conclude that during the first 10 days of September, the maximum number gray whales observed in one day was approximately 27-28 individuals and the distribution of whales during this time appeared relatively uniform along the coast. However, in late September and in the first 10 days of October, the number of gray whales observed decreased. On 7 October, only 16 individuals were encountered in the observed areas. Reduction of their numbers during this period vs. early September may also be surmised from their infrequent presence, or extreme scarcity (no more than 6 individuals), in the southern end of the Piltun feeding area between 52°44' and 53°00' N. Constant presence of the animals was noted only in the northern part of the area (53°23' – 53°08' N) where their numbers varied from 7 to 20 individuals observed in a given day (Figure 6). Concurrent shore-based behavioral observations of gray whales in the Piltun feeding area in 2002 conducted by Würsig *et al.* (2003) concluded that more gray whales occurred in the northern part of the area compared to the southern part. A shift in the gray whale feeding area in September-October from south to north had been observed before (Sobolevsky 2000), but it is not considered to be a rule (Perlov *et al.* 2002). Würsig *et al.* (2003) speculated that within- and between-season changes in the abundance and distribution of gray whale prey may have influenced the distribution of whales in this feeding area.

Thus, the 2002 surveys proved that in early September, gray whales were widely observed along the east coast of Sakhalin Island – from Terpeniya Peninsula to Piltun Bay. All in all, 81 gray whales were observed during this period, 62% of which concentrated in the Offshore area, and 34% in the Piltun area. The manner of time-space distribution of these animals is quite region-specific and was more dynamic in the Piltun feeding area. From September to October, the distribution of gray whales in the Piltun feeding area shifted toward the north (see Figure 4), and in the Offshore feeding area the distribution shifted toward the south (See Figure 6).

Other Areas

On 3 September, in the process of steaming from Vladivostok to the main study area along the north-eastern coast of Sakhalin Island, to the east of Terpenia Point; a group of three gray whales was encountered at 49°16' N, 144°38' E where water depth ranges from 110 to 120 m (see Figure 3). Gray whales have never been documented so far south from their main feeding habitat areas. The weather was calm with 1-2 point sea state. Animal movement was omnidirectional and the animals were not fluking, suggesting that they were not feeding, but instead traveling through the area. The distance between individuals did not exceed 500-1000 m. Unfortunately, the schedule of the expedition made it impossible to investigate this area that day. This area was checked on 19 October during the return voyage to Vladivostok. The wind was strong (12-15 m/sec) and no whales were observed. Consequently, the reason for gray whale occurrence in this area remains unexplained.

Other Mammals

Significant numbers of other mammals were observed throughout the Sakhalin coast, including northern fur seal (178 individuals), porpoise (116 individuals), and ringed seal (46 individuals) (Figures 7 & 8). Their areas of concentration varied. Gatherings of fur seals were noted near their rookeries (Tyulenix Island). Concentrations of porpoises were found in the south of the Sakhalin Island, near Aniva Peninsula, while the ringed seals stayed along the north-eastern portion of the Sakhalin coast and were observed both near the coast line and far out to sea. Spotted seals, killer whales, minke whales, bearded seals and Steller sea lions appeared occasionally.

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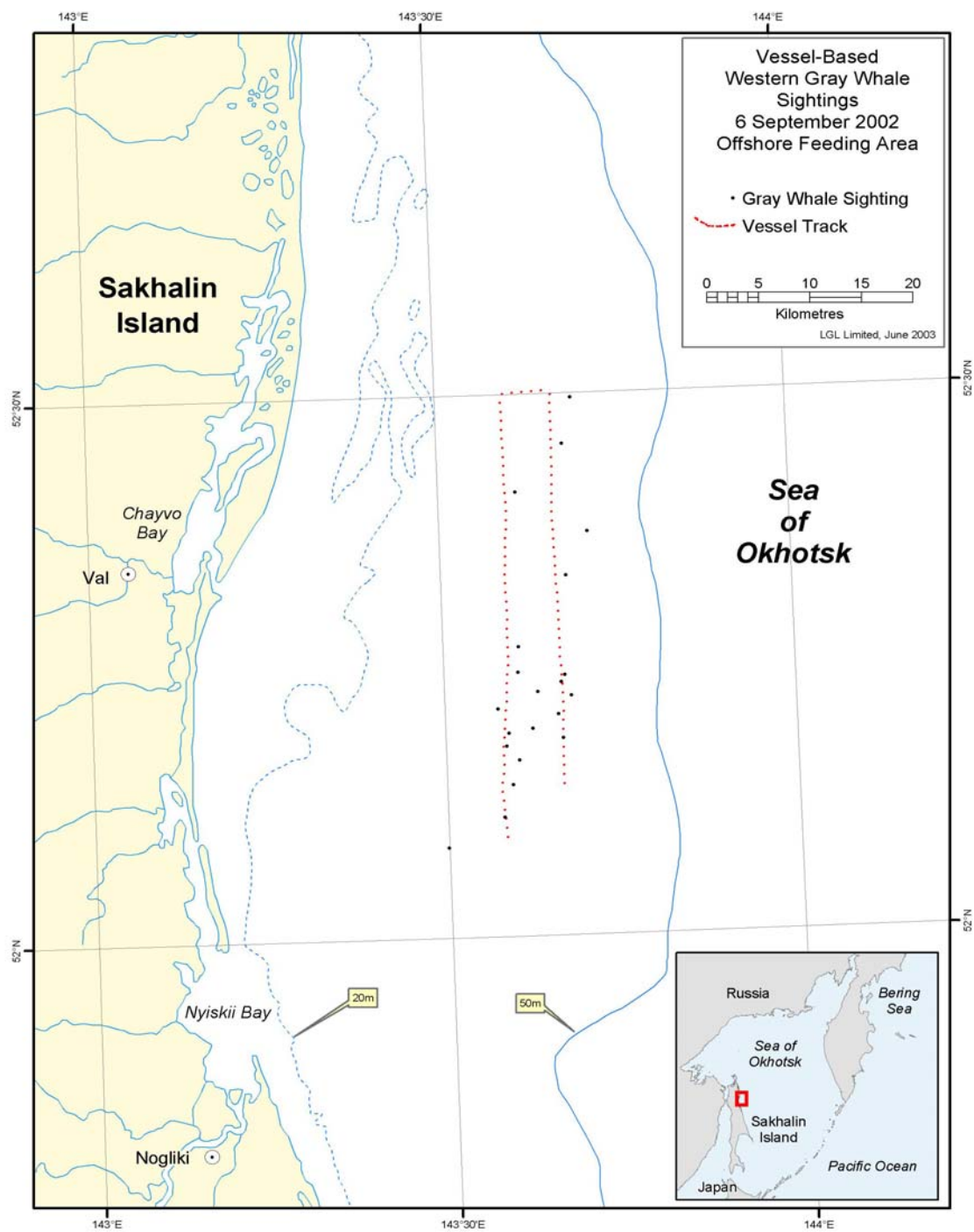


Figure 1. Gray whale sightings recorded during a vessel survey conducted in the Offshore or “Marine” gray whale feeding area, 6 September 2002.

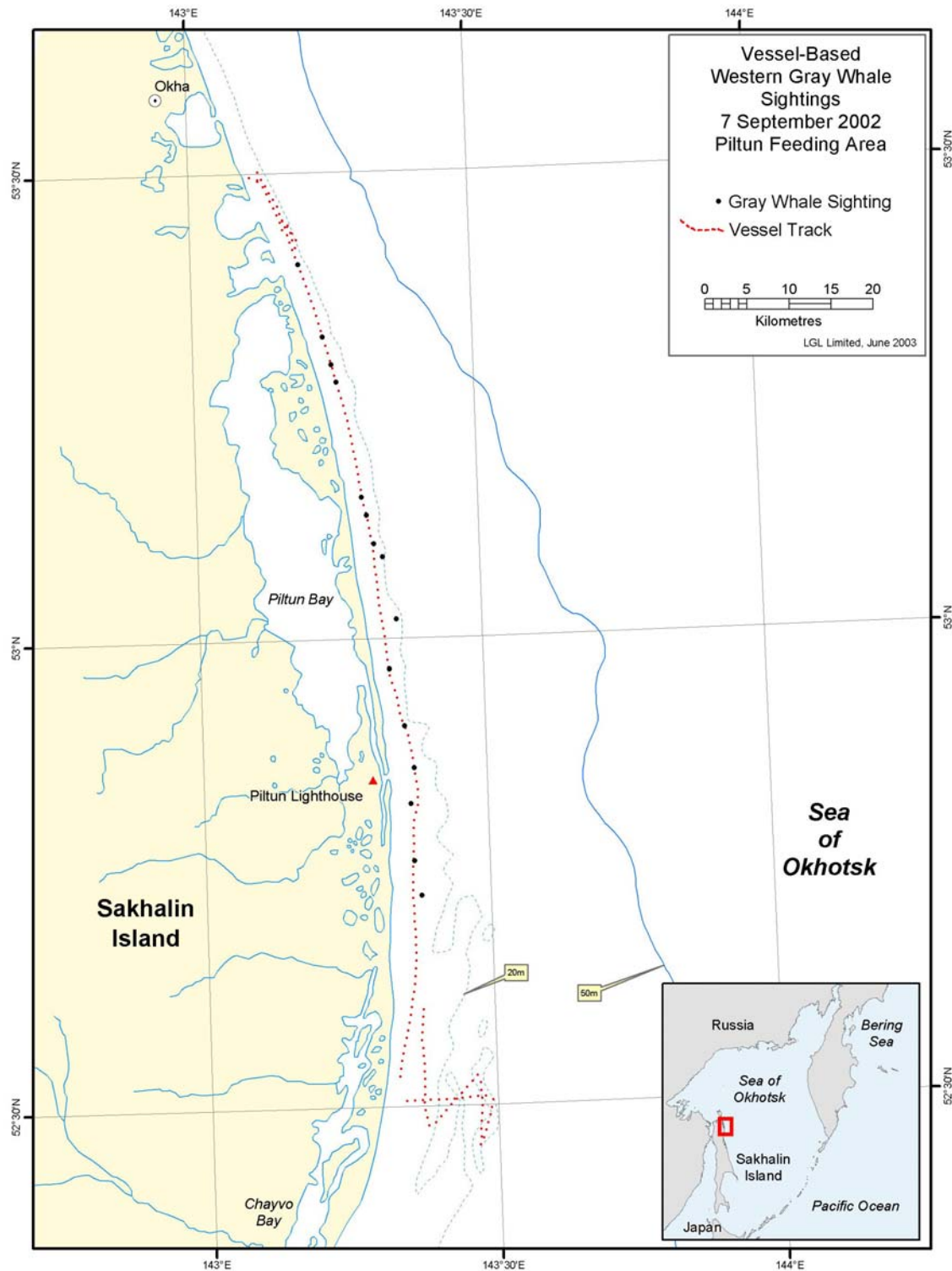


Figure 2. Gray whale sightings recorded during a vessel survey conducted in the Piltun gray whale feeding area, 7 September 2002.

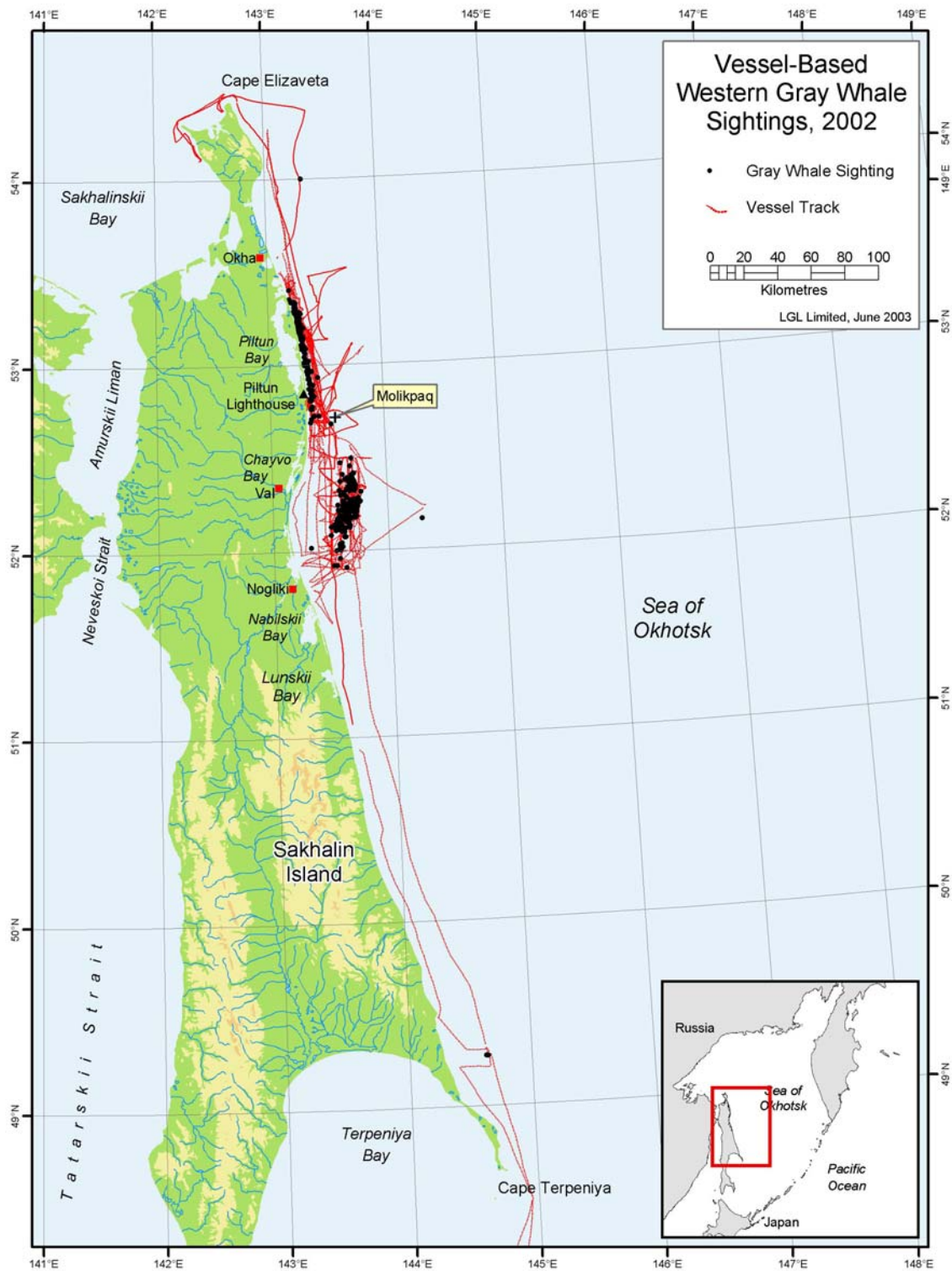


Figure 3. Gray whale sightings recorded during all vessel-based activities along the northeast coast of Sakhalin Island, Russia, 2002.

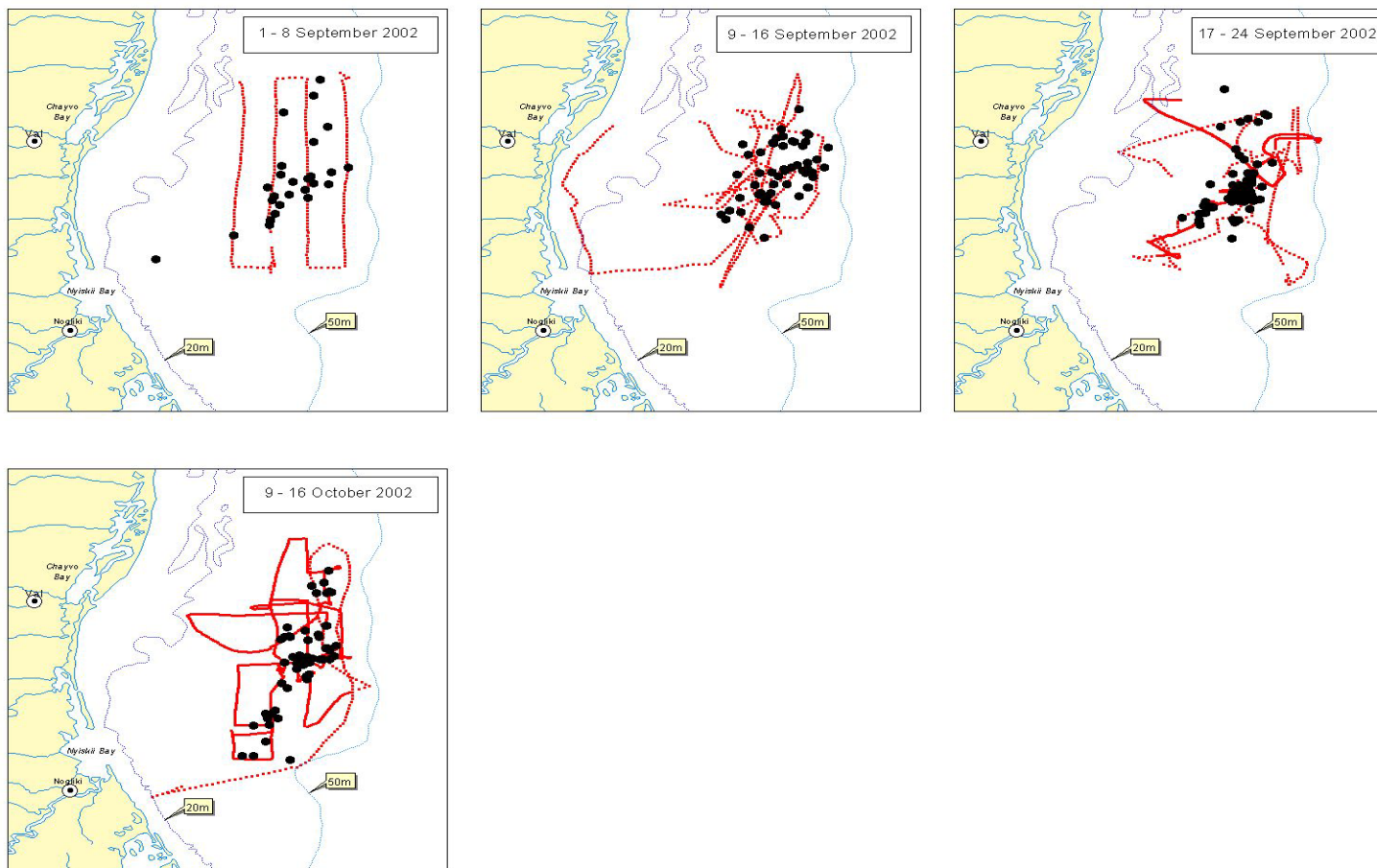


Figure 4. Locations of gray whale sightings in the Offshore feeding area over weekly sampling periods. Tracklines of the *Nevelskoy* during each period are shown in red.

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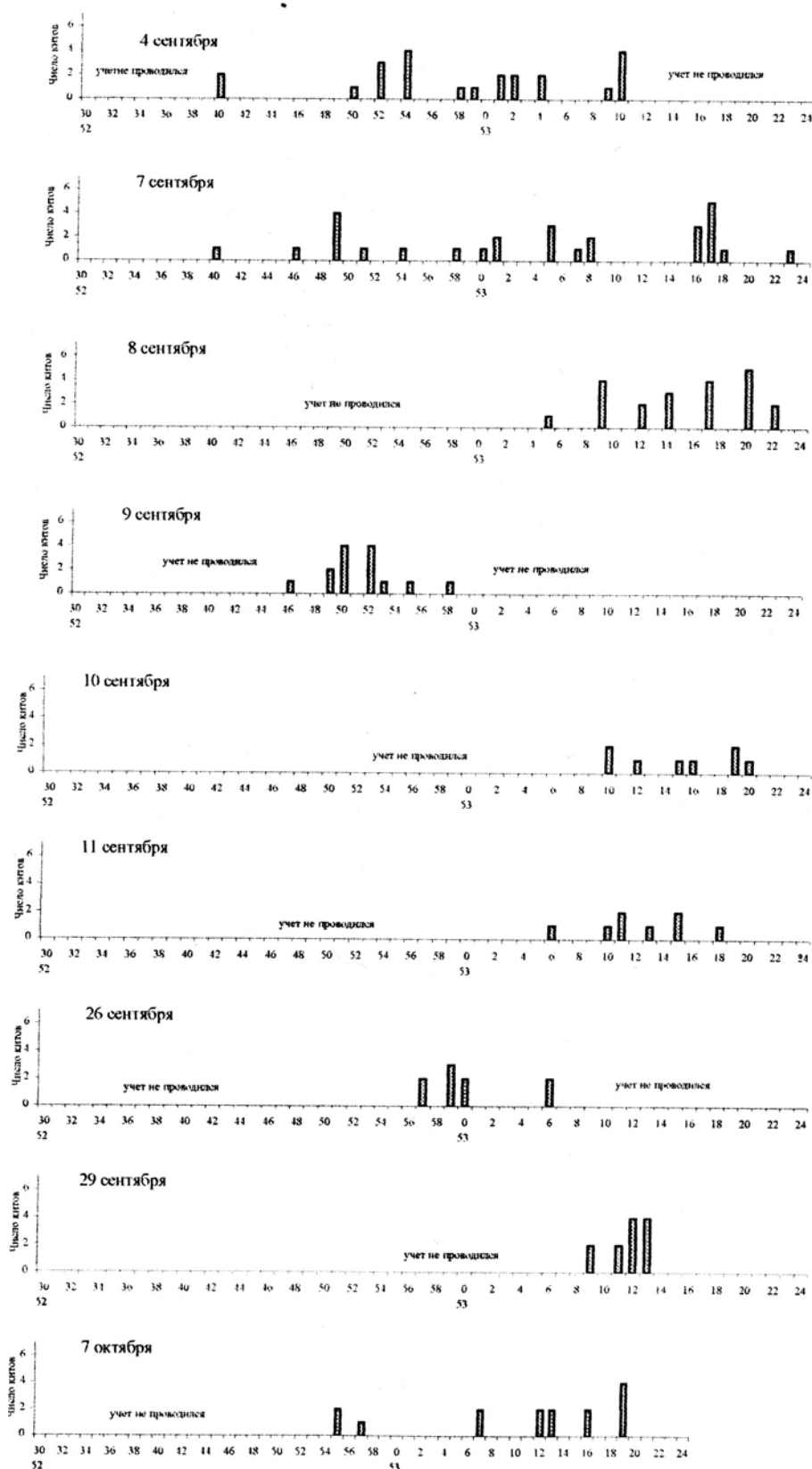


Figure 5. Distribution and numbers of gray whales near Piltun Bay feeding area in September -October, 2002.

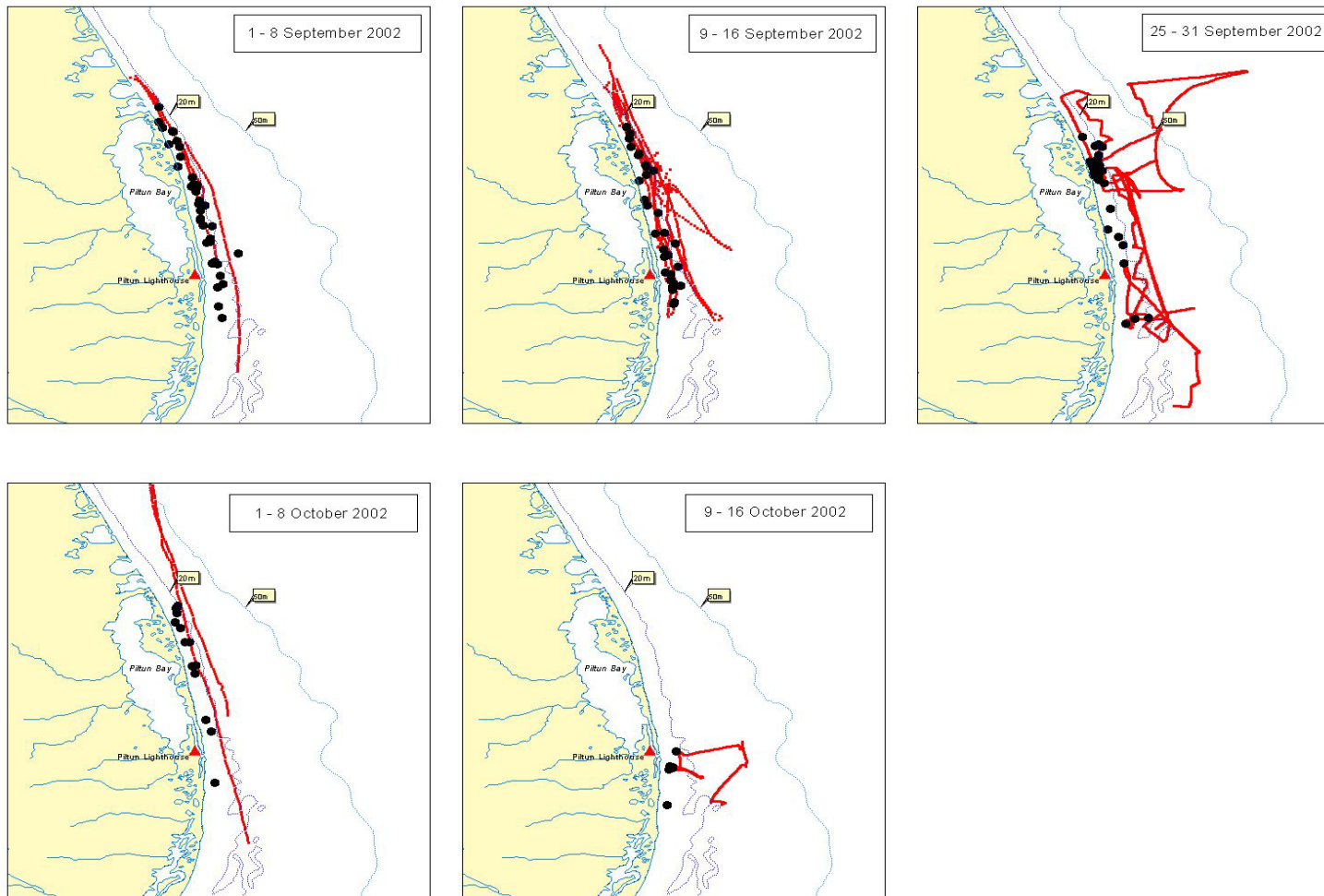


Figure 6. Locations of gray whale sightings in the Piltun feeding area over weekly sampling periods. Tracklines of the *Nevelskoy* during each period are shown in red.

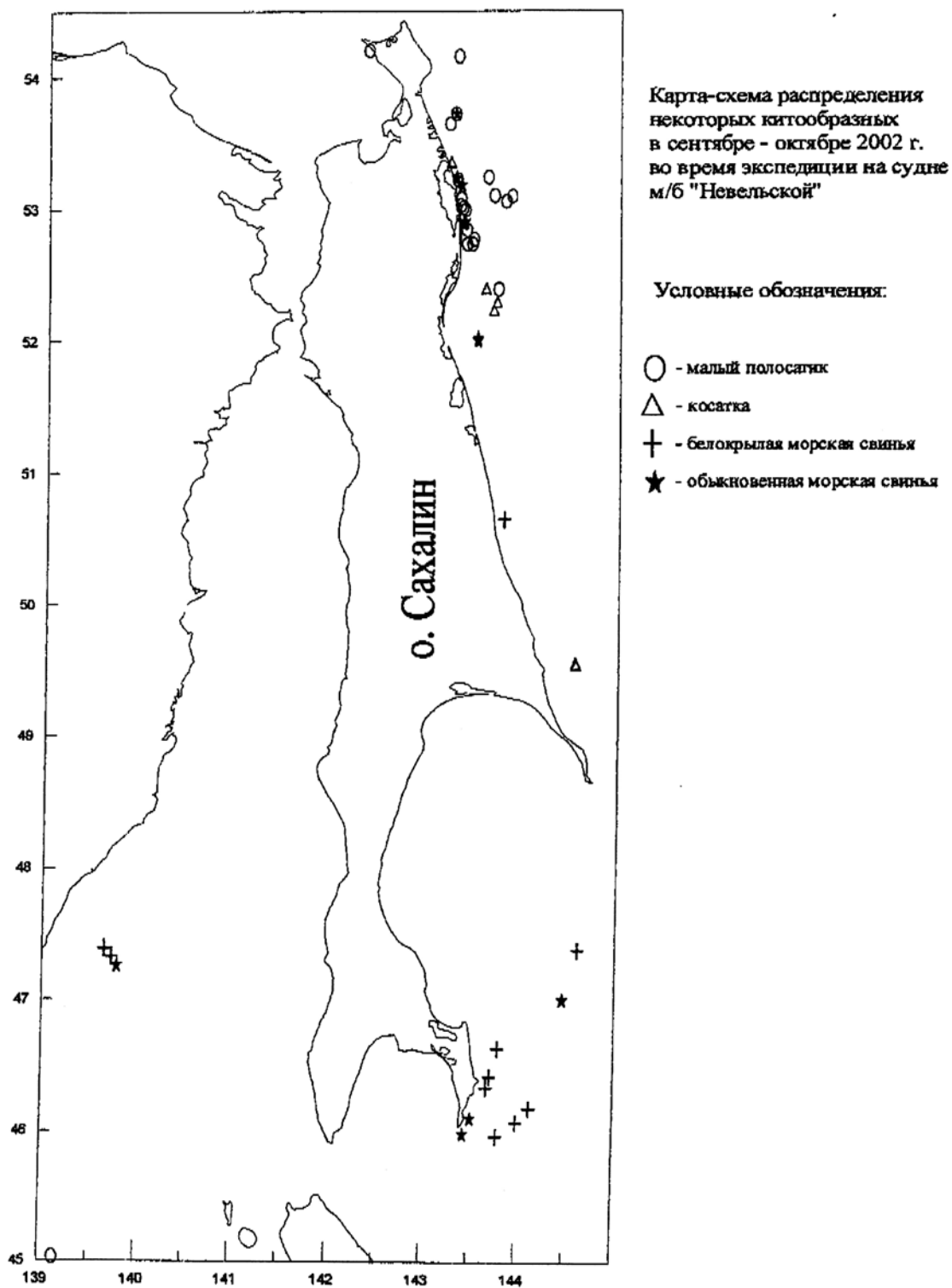


Figure 7. Distribution diagram of certain cetaceans in September – October 2002 during the expedition aboard the *Nevelskoy*.

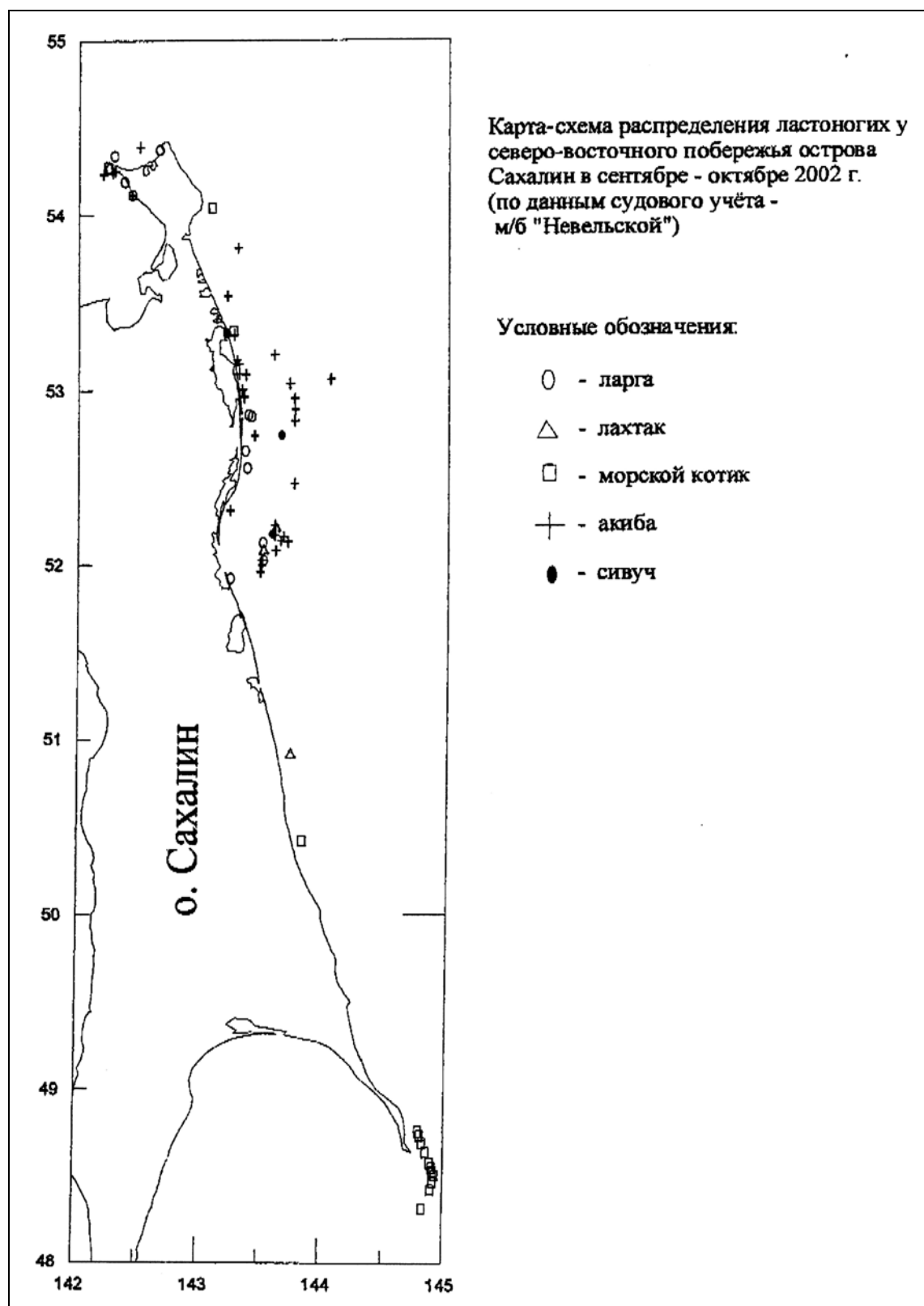


Figure 8. Distribution diagram of pinnipeds near the north-eastern coast of Sakhalin Island in September – October, 2002 during the expedition aboard the *Nevelskoy*.

Table 1. Number of gray whale sightings recorded during daily research activities aboard the Nevelskoy, 2002.

Date	Area	Activity	Number of Gray Whale Sightings	Total Number of Individual Gray Whales¹
03-Sep	Terpenie Point	Traveling to study area	2	3
04-Sep	Piltun	arrive to study area	15	27
05-Sep	Offshore	Traveling to Offshore area	4	12
06-Sep	Offshore	Vessel Survey	21	50
07-Sep	Piltun	Vessel Survey	16	28
08-Sep	Piltun	Prey Sampling	9	21
09-Sep	Piltun	Prey Sampling	16	25
10-Sep	Piltun	Prey Sampling/Storm	6	8
11-Sep	Piltun	Storm	9	11
12-Sep	Offshore	Prey Sampling/Storm	2	4
13-Sep	Offshore	Prey Sampling/Photo-ID	15	23
14-Sep	Offshore	Prey Sampling	19	33
15-Sep	Offshore	Prey Sampling	3	5
16-Sep	Offshore	Prey Sampling/Photo-ID	15	21
17-Sep	Offshore	Prey Sampling/Photo-ID	25	33
18-Sep	Offshore	Prey Sampling/Fog	1	1
19-Sep	Intermediate	Prey Sampling	0	0
20-Sep	Intermediate	Prey Sampling/Storm	0	0
21-Sep	Offshore	Storm	0	0
22-Sep	Offshore	Storm	0	0
23-Sep	Offshore	Prey Sampling/Photo-ID	19	54
24-Sep	Offshore	Prey Sampling/Photo-ID	22	49

Date	Area	Activity	Number of Gray Whale Sightings	Total Number of Individual Gray Whales¹
25-Sep	Intermediate	Prey Sampling	5	5
26-Sep	Piltun	Prey Sampling	4	9
27-Sep	Piltun	Prey SamplingMolikpaq	3	3
28-Sep	Piltun	Prey Sampling	12	18
29-Sep	Piltun	Prey Sampling	9	14
30-Sep	Piltun	Prey Sampling	7	12
01-Oct	Sakhalin Bay	Storm	0	0
02-Oct	Sakhalin Bay	Storm	0	0
03-Oct	Sakhalin Bay	Storm	0	0
04-Oct	Sakhalin Bay	Storm	0	0
05-Oct	Traveling	Traveling to Piltun	0	0
06-Oct	Piltun	Storm	0	0
07-Oct	Piltun	Prey Sampling/Photo-ID	12	16
08-Oct	Piltun	Storm	1	1
09-Oct	Offshore	Prey Sampling/Storm	8	11
10-Oct	Offshore	Prey Sampling/Photo-ID	29	45
11-Oct	Offshore	Prey Sampling/Photo-ID	10	14
12-Oct	Offshore	Prey Sampling/Photo-ID	4	6
13-Oct	Offshore	Prey Sampling	4	7
14-Oct	Offshore	Storm	0	0
15-Oct	Piltun	Prey Sampling/Photo-ID	6	7
16-Oct	Traveling	Traveling to Vladivostok	0	0

¹Number of individuals presented here not confirmed with photo-identification methods.
Individual whales may have been counted multiple times.

Appendix 1. Locations of vessel-based gray whale sightings off the northeast coast of Sakhalin Island, Russia, 2002.

Date	Hour	Min	Number of Gray Whales	Latitude	Longitude
03.09.	7	25	1	49.270	144.626
03.09.	7	40	2	49.270	144.641
04.09.	8	0	2	52.681	143.531
04.09.	9	0	1	52.835	143.382
04.09.	9	40	3	52.898	143.364
04.09.	10	0	4	52.933	143.427
04.09.	16	22	2	52.900	143.351
04.09.	14	47	2	52.971	143.345
04.09.	16	53	1	52.982	143.344
04.09.	17	10	1	53.998	143.331
04.09.	17	27	2	53.024	143.323
04.09.	17	34	1	53.038	143.316
04.09.	17	37	1	53.044	143.314
04.09.	17	54	1	53.070	143.314
04.09.	18	0	1	53.085	143.320
04.09.	18	35	1	53.155	143.304
04.09.	18	50	4	53.177	143.291
05.09.	16	45	7	52.124	143.582
05.09.	19	45	2	52.218	143.713
05.09.	19	55	2	52.250	143.720
05.09.	20	0	1	52.263	143.758
06.09.	7	35	1	52.372	143.711
06.09.	11	17	4	52.182	143.667
06.09.	11	22	1	52.192	143.624
06.09.	11	27	2	52.205	143.661
06.09.	11	34	3	52.222	143.680
06.09.	11	37	3	52.234	143.667
06.09.	11	40	3	52.241	143.672
06.09.	12	12	2	52.332	143.679
06.09.	12	55	1	52.453	143.680

Date	Hour	Min	Number of Gray Whales	Latitude	Longitude
06.09.	13	10	3	52.496	143.695
06.09.	14	0	1	52.410	143.611
06.09.	15	0	2	52.268	143.607
06.09.	15	10	2	52.244	143.606
06.09.	15	17	2	52.226	143.633
06.09.	15	22	2	52.211	143.575
06.09.	15	30	4	52.188	143.589
06.09.	15	35	7	52.176	143.586
06.09.	15	42	3	52.163	143.603
06.09.	15	50	1	52.141	143.593
06.09.	16	0	1	52.111	143.580
06.09.	17	38	2	52.084	143.499
07.09.	8	35	1	52.824	143.365
07.09.	9	10	1	52.763	143.367
07.09.	9	25	4	52.725	143.378
07.09.	9	39	1	52.862	143.372
07.09.	10	0	1	52.907	143.357
07.09.	10	20	1	52.968	143.334
07.09.	10	30	1	52.020	143.323
07.09.	10	37	2	53.021	143.349
07.09.	11	0	1	53.088	143.328
07.09.	11	3	2	53.102	143.314
07.09.	11	13	1	53.133	143.302
07.09.	11	20	2	53.152	143.294
07.09.	12	5	3	53.276	143.255
07.09.	12	13	5	53.295	143.247
07.09.	12	25	1	53.325	143.233
07.09.	13	0	1	53.403	143.193
08.09.	10	0	2	53.354	143.192
08.09.	11	0	3	53.338	143.203
08.09.	11	10	2	53.324	143.236
08.09.	13	0	4	53.283	143.223

Date	Hour	Min	Number of Gray Whales	Latitude	Longitude
08.09.	14	20	3	53.242	143.257
08.09.	15	0	2	53.211	143.248
08.09.	16	32	1	53.149	143.288
08.09.	16	44	3	53.145	143.305
08.09.	17	15	1	53.094	143.310
09.09.	10	0	1	52.890	143.380
09.09.	10	16	2	52.866	143.359
09.09.	11	0	2	52.872	143.345
09.09.	11	15	2	52.848	143.360
09.09.	11	27	2	52.831	143.388
09.09.	13	13	2	52.817	143.366
09.09.	13	33	1	52.772	143.368
09.09.	15	15	2	52.776	143.370
09.09.	15	35	3	52.828	143.366
09.09.	16	0	2	52.837	143.369
09.09.	17	30	1	52.924	143.342
09.09.	17	35	1	52.928	143.353
09.09.	17	52	1	52.948	143.339
09.09.	18	0	1	52.965	143.374
09.09.	19	0	1	52.996	143.315
09.09.	19	0	1	52.999	143.342
10.09.	10	39	2	53.187	143.172
10.09.	11	30	1	53.199	143.309
10.09.	13	20	1	53.249	143.265
10.09.	13	40	1	53.274	143.243
10.09.	15	30	2	53.318	143.242
10.09.	16	35	1	53.338	143.230
11.09.	10	45	1	53.301	143.237
11.09.	11	0	2	53.254	143.266
11.09.	11	16	1	53.218	143.287
11.09.	11	30	2	53.184	143.288
11.09.	11	36	1	53.167	143.266

Date	Hour	Min	Number of Gray Whales	Latitude	Longitude
11.09.	12	0	1	53.105	143.283
11.09.	14	25	1	53.062	143.322
11.09.	14	36	1	53.087	143.291
11.09.	15	30	1	53.211	143.288
12.09.	18	52	2	52.343	143.657
12.09.	19	0	2	52.328	143.649
13.09.	7	45	3	52.217	143.607
13.09.	8	0	1	52.187	143.636
13.09.	8	0	1	52.172	143.635
13.09.	8	15	2	52.149	143.549
13.09.	8	55	2	52.076	143.629
13.09.	10	17	2	52.104	143.596
13.09.	11	27	1	52.144	143.575
13.09.	14	20	1	52.182	143.573
13.09.	14	35	2	52.183	143.629
13.09.	15	0	2	52.172	143.629
13.09.	15	0	2	52.191	143.615
13.09.	15	10	1	52.196	143.643
13.09.	16	0	1	52.305	143.619
13.09.	16	10	1	52.325	143.580
13.09.	19	22	1	52.366	143.666
14.09.	8	13	1	52.346	143.671
14.09.	8	13	1	52.329	143.648
14.09.	8	40	3	52.355	143.723
14.09.	8	40	3	52.332	143.696
14.09.	8	40	2	52.332	143.722
14.09.	9	0	2	52.316	143.772
14.09.	9	36	1	52.321	143.715
14.09.	9	36	2	52.321	143.670
14.09.	10	0	2	52.259	143.727
14.09.	10	7	2	52.251	143.737
14.09.	10	25	1	52.210	143.728

Date	Hour	Min	Number of Gray Whales	Latitude	Longitude
14.09.	10	45	1	52.238	143.739
14.09.	11	9	2	52.187	143.708
14.09.	14	0	1	52.218	143.650
14.09.	14	45	1	52.255	143.674
14.09.	14	55	2	52.254	143.715
14.09.	15	35	4	52.248	143.722
14.09.	18	30	1	52.219	143.680
14.09.	19	47	1	52.163	143.653
15.09.	17	0	2	52.250	143.646
15.09.	17	30	2	52.239	143.661
15.09.	17	30	1	52.211	143.726
16.09.	9	30	2	52.137	143.531
16.09.	9	40	1	52.126	143.541
16.09.	10	35	1	52.245	143.567
16.09.	10	35	1	52.195	143.620
16.09.	11	30	1	52.298	143.592
16.09.	11	35	2	52.247	143.617
16.09.	16	40	2	52.269	143.702
16.09.	16	55	2	52.259	143.674
16.09.	17	0	1	52.276	143.726
16.09.	18	22	1	52.263	143.689
16.09.	18	39	1	52.264	143.764
16.09.	18	49	1	52.284	143.746
16.09.	19	0	1	52.334	143.691
16.09.	19	10	2	52.350	143.728
16.09.	19	45	2	52.417	143.707
17.09.	9	46	3	52.124	143.619
17.09.	9	46	2	52.117	143.622
17.09.	9	46	1	52.124	143.631
17.09.	10	30	2	52.075	143.617
17.09.	10	30	1	52.156	143.566
17.09.	12	0	1	52.197	143.655

Date	Hour	Min	Number of Gray Whales	Latitude	Longitude
17.09.	12	0	1	52.184	143.659
17.09.	12	0	1	52.204	143.635
17.09.	12	0	1	52.189	143.659
17.09.	13	0	1	52.231	143.656
17.09.	13	0	2	52.229	143.649
17.09.	13	0	2	52.212	143.683
17.09.	13	0	1	52.219	143.653
17.09.	13	0	1	52.222	143.659
17.09.	14	0	1	52.248	143.665
17.09.	14	0	1	52.248	143.652
17.09.	14	42	1	52.296	143.633
17.09.	15	0	2	52.313	143.624
17.09.	15	0	1	52.285	143.643
17.09.	16	45	1	52.384	143.674
17.09.	16	45	1	52.392	143.653
17.09.	17	0	2	52.406	143.690
17.09.	17	30	1	52.401	143.695
17.09.	17	47	1	52.384	143.634
17.09.	18	0	1	52.372	143.591
18.09.	11	40	1	52.219	143.566
23.09.	11	30	2	52.141	143.541
23.09.	11	30	2	52.141	143.544
23.09.	11	30	2	52.143	143.556
23.09.	12	0	2	52.129	143.502
23.09.	13	22	2	52.172	143.616
23.09.	13	22	2	52.181	143.607
23.09.	14	5	5	52.189	143.629
23.09.	14	5	4	52.178	143.651
23.09.	15	22	6	52.202	143.642
23.09.	17	35	1	52.210	143.653
23.09.	17	35	3	52.200	143.643
23.09.	18	0	8	52.191	143.616

Date	Hour	Min	Number of Gray Whales	Latitude	Longitude
23.09.	18	30	2	52.180	143.665
23.09.	18	30	4	52.179	143.680
23.09.	18	30	1	52.179	143.680
23.09.	18	30	2	52.174	143.665
23.09.	18	42	2	52.154	143.657
23.09.	19	12	3	52.116	143.541
23.09.	19	15	1	52.110	143.543
24.09.	11	20	1	52.122	143.541
24.09.	11	36	2	52.159	143.566
24.09.	11	36	2	52.159	143.571
24.09.	11	36	2	52.157	143.574
24.09.	11	36	2	52.161	143.552
24.09.	11	36	1	52.172	143.556
24.09.	14	15	2	52.173	143.643
24.09.	14	15	1	52.173	143.632
24.09.	15	0	3	52.197	143.635
24.09.	15	0	1	52.194	143.644
24.09.	16	0	5	52.182	143.633
24.09.	17	0	4	52.197	143.619
24.09.	18	0	4	52.198	143.624
24.09.	18	47	2	52.202	143.641
24.09.	18	47	2	52.198	143.658
24.09.	18	47	2	52.193	143.658
24.09.	18	52	2	52.197	143.656
24.09.	18	52	3	52.190	143.656
24.09.	19	0	3	52.217	143.618
24.09.	19	0	2	52.217	143.632
24.09.	19	5	2	52.246	143.617
24.09.	19	26	1	52.273	143.672
25.09.	8	21	1	52.276	143.706
25.09.	8	51	1	52.234	143.660
25.09.	8	52	1	52.241	143.656

Date	Hour	Min	Number of Gray Whales	Latitude	Longitude
25.09.	12	0	1	52.471	143.598
25.09.	19	0	1	52.727	143.426
26.09.	14	35	2	52.961	143.351
26.09.	15	0	3	52.987	143.339
26.09.	15	10	2	53.011	143.307
26.09.	18	0	2	53.075	143.315
27.09.	10	0	1	52.708	143.360
27.09.	14	0	1	52.724	143.387
27.09.	15	22	1	52.903	143.355
28.09.	9	9	2	53.198	143.292
28.09.	9	50	1	53.196	143.285
28.09.	10	20	2	53.181	143.279
28.09.	13	0	2	53.178	143.275
28.09.	14	0	1	53.221	143.276
28.09.	14	0	2	53.223	143.261
28.09.	14	0	1	53.208	143.272
28.09.	14	0	2	53.230	143.271
28.09.	15	15	1	53.250	143.281
28.09.	15	43	1	53.277	143.269
28.09.	15	43	2	53.283	143.281
28.09.	15	43	1	53.277	143.290
29.09.	12	10	2	53.309	143.233
29.09.	12	45	2	53.215	143.283
29.09.	12	45	1	53.215	143.275
29.09.	12	45	1	53.215	143.262
29.09.	12	55	2	53.197	143.274
29.09.	12	55	2	53.197	143.273
29.09.	12	55	1	53.197	143.270
29.09.	12	55	2	53.200	143.270
29.09.	13	0	1	53.169	143.279
30.09.	14	32	1	53.237	143.278
30.09.	14	40	2	53.229	143.273

Date	Hour	Min	Number of Gray Whales	Latitude	Longitude
30.09.	14	44	1	53.229	143.254
30.09.	15	0	2	53.205	143.264
30.09.	16	42	2	53.201	143.266
30.09.	17	0	2	53.185	143.265
30.09.	18	53	2	53.158	143.297
07.10.	10	40	2	53.332	143.249
07.10.	10	40	1	53.323	143.243
07.10.	11	20	1	53.309	143.247
07.10.	13	32	1	53.278	143.240
07.10.	13	43	1	53.258	143.256
07.10.	14	0	2	53.214	143.284
07.10.	14	52	2	53.214	143.271
07.10.	15	22	1	53.137	143.292
07.10.	15	26	1	53.114	143.298
07.10.	16	26	1	52.964	143.331
07.10.	16	40	2	52.929	143.348
07.10.	17	45	1	52.763	143.357
08.10.	16	22	1	53.141	143.302
09.10.	8	0	1	51.911	143.627
09.10.	10	0	1	51.923	143.543
09.10.	10	12	1	51.923	143.519
09.10.	15	33	2	52.179	143.703
09.10.	15	40	2	52.202	143.715
09.10.	16	0	1	52.243	143.691
09.10.	17	0	1	52.355	143.686
09.10.	18	34	2	52.373	143.675
10.10.	9	42	2	52.126	143.664
10.10.	9	45	2	52.134	143.665
10.10.	9	48	3	52.137	143.668
10.10.	9	48	2	52.133	143.662
10.10.	12	0	1	52.164	143.657
10.10.	12	0	1	52.168	143.641

Date	Hour	Min	Number of Gray Whales	Latitude	Longitude
10.10.	12	10	2	52.180	143.657
10.10.	12	15	3	52.180	143.677
10.10.	12	32	2	52.184	143.664
10.10.	12	35	1	52.188	143.647
10.10.	12	35	1	52.185	143.633
10.10.	12	53	1	52.230	143.666
10.10.	13	0	1	52.240	143.624
10.10.	13	3	2	52.254	143.661
10.10.	14	26	1	52.264	143.621
10.10.	14	36	1	52.237	143.627
10.10.	14	36	1	52.237	143.613
10.10.	14	39	1	52.231	143.605
10.10.	15	0	2	52.170	143.614
10.10.	15	0	2	52.160	144.296
10.10.	15	19	2	52.153	143.641
10.10.	18	18	1	52.102	143.619
10.10.	18	18	1	52.114	143.607
10.10.	18	47	2	52.034	143.571
10.10.	18	47	2	52.034	143.584
10.10.	18	47	2	52.043	143.593
10.10.	18	52	1	52.022	143.576
10.10.	18	52	1	52.022	143.598
10.10.	18	57	1	52.005	143.579
11.10.	9	22	1	51.961	143.571
11.10.	9	50	1	52.003	143.544
11.10.	11	32	2	52.170	143.671
11.10.	13	0	2	52.178	143.698
11.10.	13	0	2	52.178	143.716
11.10.	13	0	1	52.178	143.695
11.10.	13	18	2	52.187	143.726
11.10.	15	0	1	52.208	143.711
11.10.	15	0	1	52.209	143.707

Date	Hour	Min	Number of Gray Whales	Latitude	Longitude
11.10.	15	15	1	52.214	143.731
12.10.	12	5	1	52.415	143.713
12.10.	15	36	2	52.358	143.716
12.10.	15	36	2	52.354	143.709
12.10.	15	36	1	52.356	143.719
13.10.	10	50	2	52.238	143.691
13.10.	13	0	2	52.267	143.709
13.10.	13	0	2	52.268	143.707
13.10.	15	0	1	52.383	143.702
15.10.	8	0	1	52.691	143.351
15.10.	9	30	2	52.806	143.353
15.10.	10	0	1	52.810	143.366
15.10.	11	0	1	52.818	143.358
15.10.	14	15	1	52.815	143.365
15.10.	15	48	1	52.864	143.377