

Distribution and abundance of seabirds over the Commander Islands area

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Представлены данные о видовом составе, численности и распределении птиц в 30-мильной морской зоне Командорского заповедника на основе результатов судовых учетов, выполненных летом 2004 г. Наблюдения проводили с 30 июня по 7 июля (общая протяженность учетных трансект – 994 км) и с 13 по 19 августа (767 км) по методике, разработанной американскими специалистами (Gould, Forsell, 1989). Всего учтено более 71 тыс. особей 35 видов морских птиц. Плотность распределения птиц всех видов составила в среднем 148,4 и 123,2 особи/км² в июне – июле и в августе соответственно. Самыми многочисленными были представители семейства буревестниковые (65 % всех отмеченных птиц), главным образом, глупыш и тонкоклювый буревестник. Плотность распределения птиц оказалась значительно выше в шельфовой зоне, чем в сопредельных открытых водах. На шельфе обнаружены два района стабильных массовых кормовых концентраций птиц, которые имеют принципиальное значение для сохранения популяций. Один из них находится на мелководьях от Китоловной банки до северо-западной оконечности о. Медного, другой – у северо-западного побережья о. Беринга. Морская зона заповедника играет важную роль в жизни не только гнездящихся на Командорских о-вах птиц, но и других видов (особенно трубконосых), прилетающих сюда из различных районов Тихого океана. В ходе наблюдений в непосредственной близости от побережья впервые отмечены пестрый тайфунник и серый буревестник, на основании чего эти виды заносятся в фаунистический список птиц Командорских о-вов. Показано, что особенности распределения птиц в течение летнего периода подвержены временной динамике. Предполагается наличие межгодовой изменчивости, в связи с чем необходимо продолжение исследований.

INTRODUCTION

In the Commander Archipelago nesting avian fauna no group is of greater abundance and or diversity of species composition than seabirds. Every year about one million individual seabirds, identified as 19 species (Artukhin, 1999), have been nesting on the Commander Islands. Much suitable for nesting steep rocky shores and cliffs and the aquatic zone of high biological productivity, adjacent to the islands, create exclusively favorable conditions for the large community of seabirds, which plays an important role for the off-shore archipelago ecosystems in the whole.

The Commander Islands seabird population sustainability is determined mostly by the state of forage base in the waters adjacent to the colonies. Since 1958 any economic activity, including commercial fisheries of fish and shellfishes, has been prohibited within the 30-miles marine zone around the Commander Islands. Thus, the local shelf has been safe from permanent large-scale commercial fishery for almost a half of century, and is one of the last safe large shelf zones in North Pacific. At the same time, the waters adjacent to this protected area have been the area of intense fisheries of marine resources, which can affect extensively the forage resources of seabirds and can also cause mass mortality of seabirds from fishing gear like gill-nets and long lines.

In 1993 when the Commander State Reserve was established, the boundaries of the Reserve's marine buffer zone were already set at 30-miles of protected zone. The features of the seabird distribution at sea were not taken into account for projecting this zone because there were no any data on these features. Because of this gap, the studies of the features of seabird distribution over the aquatic area of the Commander Islands, assessment and mapping the plots of feeding seabirds aggregations during the nesting period, have been very important; the studies are of principal importance for conservation of their populations.

MATERIAL AND METHODS

Results of studying the seabird distribution over the aquatic zone of the Commander Islands (Fig. 1), the studying I was accomplishing in the course of two cruises in summer 2004, are represented in this paper. The first shipboard survey was carried out for the period from June 30 to July 7 aboard the cruise boat (CB) «Tayfun», the second one – by August 13–19 aboard the STR «Shipunsky».

In June and July we made observation along transects (Table 1; Fig. 2A) designed to distribute the observations evenly and maximize completeness throughout the off-shore and marine areas off the Commander Reserve's

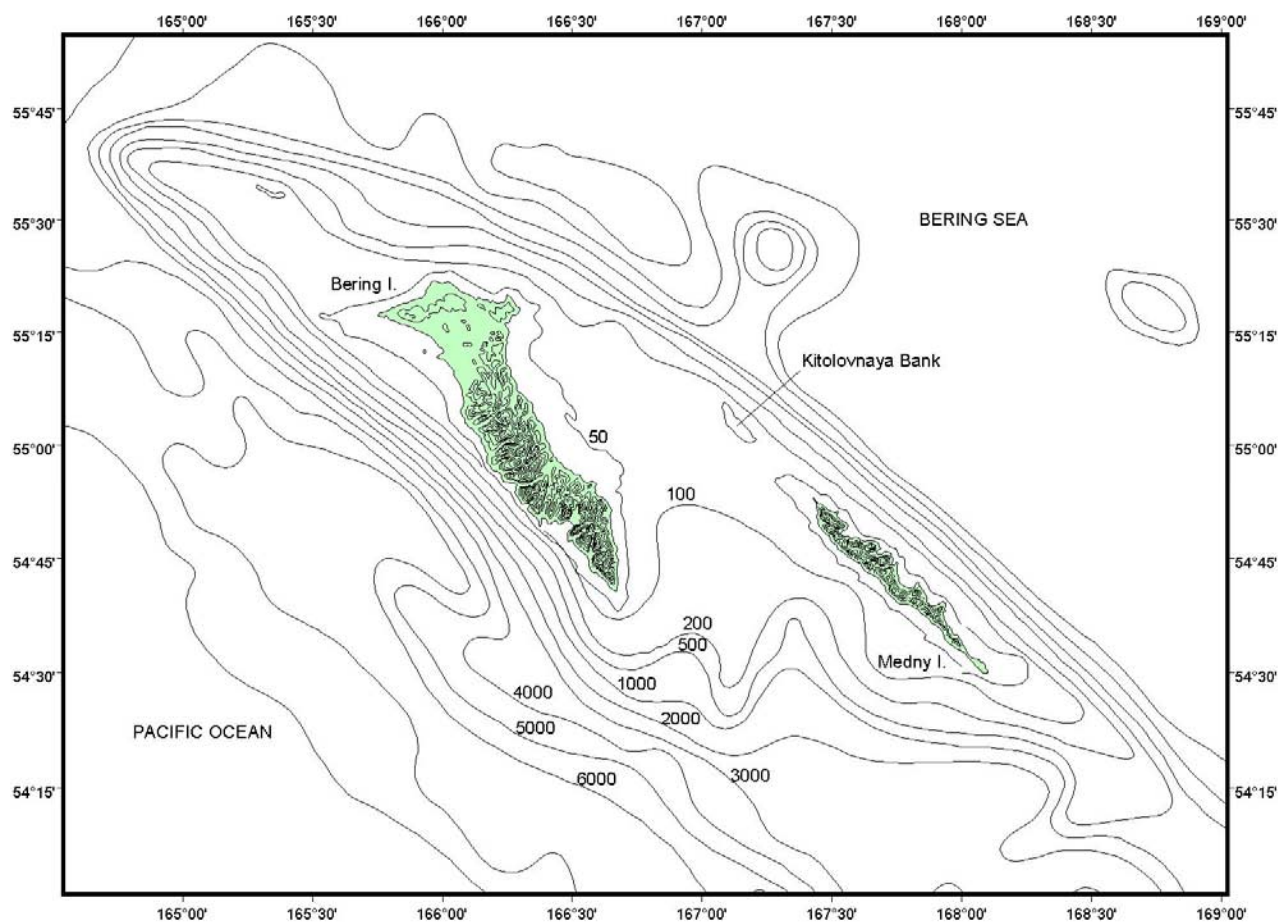


Figure 1. The study area showing bathymetry (m).

Рис. 1. Батиметрия района исследований.

30-mile buffer zone. We had to accommodate the limited time of the cruise. The ratio between the observation transects over the off-shore shelf (the depths less 200 m) and over the marine area (deeper than 200 m) was approximately equal. During the second cruise in August we arranged the transects to be closer to the islands (Table 1; Fig. 2B).

To assess seabirds we used the method of transects, widely used by American specialists in the adjacent Bering Sea and the north-east part of the Pacific Ocean (Gould, Forsell, 1989). According to this method the seabirds we observed continuously within 300 m wide area (by 150 m from each side) of the moving ship. We divided the transect into 10-minute intervals, by which the data have been summarized. One observer accomplished the work all the time. The observation point was situated at the height 6 m above the sea on the CB «Tayfun» and at the 10 m height on the STR «Shipunsky». To identify taxa to species and make quantitative assessment correct we used 12-fold field-glasses.

We checked the coordinates of the ship, the speed and the course at 15 sec intervals on a «GPSMap 76S» portable receiver. All assessments were recorded perma-

nently into a digital Dictaphone time-synchronized to the GPS receiver.

During the first survey in June and July on the CB «Tayfun» the speed of the ship in the course of observation was 17–20 km/hour (19.0 km/hour averaged). The ship moved with a constant speed along the transects, usually making a brief stops in the turn-points to collect the samples of plankton. The total length of observation transects was 993.82 km, and the area (under the width 300 m) was 298.15 km². Total observation time was 52 hours 20 minutes or 314 observation intervals by 10 minutes each. 160 observation intervals were accomplished over the shelf waters (the depth less 200 m) and 154 over the high sea waters (seaward from the 200-m isobaths).

During the survey in August on the STR «Shipunsky» the speed was from 14 to 17 km/hour, on average 15.7 km/hour. The total length of observation transects was 766.84 km, the area (under the width 300 m) was 230.05 km². Total observation time was 49 hours 00 minutes or 294 observation intervals by 10 minutes each. 157 observation intervals were accomplished over the shelf waters (the depth less 200 m) and 137 over the high sea waters (deeper than 200 m).

Table 1. Data on surveys of transects used for seabird observations near the Commander Islands in 2004.
Таблица 1. Данные по транsekтам наблюдения морских птиц в акватории Командорских о-вов в 2004 г.

№ transects № трансект	Date Дата	Start time* Начало учета	Stop time Конец учета	Length, km Длина, км
June – July 2004, CB «Tayfun» Июнь – июль 2004 г., РК «Тайфун»**				
1–2–3–4	30 June	12:17	21:21	153.88
5–6–7	1 July	8:33	18:38	136.69
8–9–10	2 July	6:15	16:57	182.28
10–11–12	3 July	6:30	18:23	196.46
13–14–15–16	4 July	6:25	16:44	195.07
17–18	7 July	7:57	10:37	52.66
19–20	7 July	11:48	15:48	76.78
August 2004, STR «Shipunsky» Август 2004 г., СТР «Шипунский»***				
1–2	13 August	11:45	17:50	75.07
3–4	14 August	9:39	19:57	130.15
5–6	15 August	6:00	17:22	152.13
7–8	16 August	6:06	19:08	171.23
9–10	17 August	12:13	19:40	96.16
11–12	18 August	6:06	15:10	113.57
13–14	19 August	6:08	14:02	28.53

* Kamchatka local summer time (камчатское летнее время).

** See Fig 2A (см. рис. 2A).

*** See Fig 2B (см. рис. 2B).

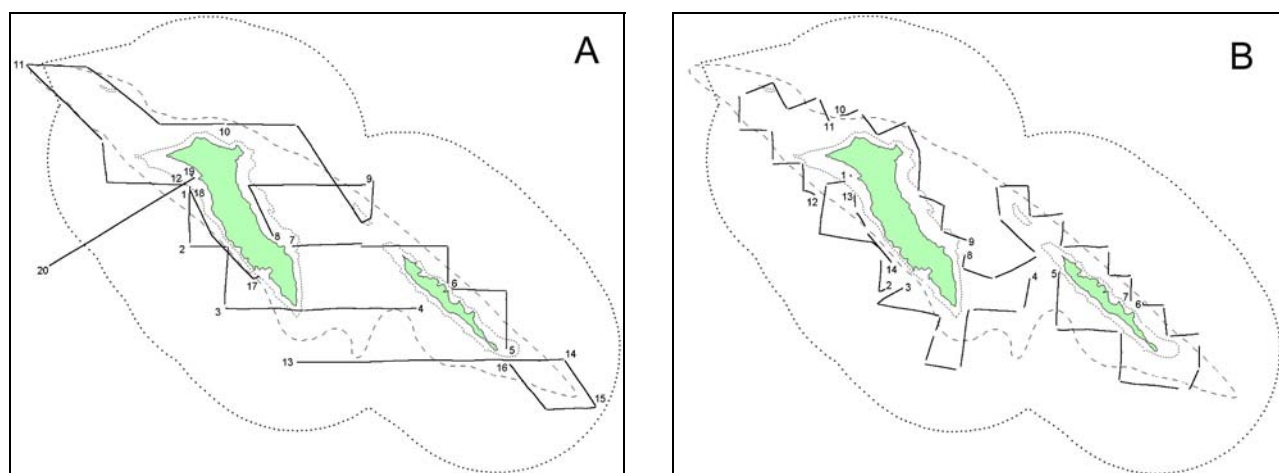


Figure 2. Map of Commander Islands transects surveyed in June – July (A) and August (B) 2004. Continuous line – transects, internal contour points – 50 m isobaths, dotted line – 200 m isobaths, external contour points – 30-mile buffer zone of the Commander Islands Reserve.

Рис. 2. Размещение учетных трансект в акватории Командорских о-вов в июне – июле (А) и в августе (В) 2004 г. Обозначения: непрерывная линия – трансекты, внутренний контур точками – 50 м изобата, пунктир – 200 м изобата, наружный контур точками – 30-мильная зона Командорского заповедника.

To characterize the abundance of seabirds we classified the species as: very rare, if its density was less than 0.01 individuals/km², rare – 0.01–0.1 individuals/km², uncommon – 0.1–1 individuals/km², common – 1–10 individuals/km², and abundant – over 10 individuals/km².

RESULTS

We recorded 71,257 individuals of 35 species of seabirds for the observation time in summer 2004, in-

cluding 43,128 individuals of 27 species in June – July and 28,129 individuals of 29 species in August (Table 2, 3). The dominance among the families was Procellariidae, their contribution was more than 65 %. The next taxonomic group in the abundance was Alcidae (20.1 and 16.3 % in June – July and August respectively), than Laridae (9.1 and 10.9 %) and Hydrobatidae (4.1 and 7.0 %). Representatives of the other families (Diomedidae, Phalacrocoracidae, Anatidae, Scolopacidae and Stercorariidae) contributed by portions of percent.

A short review of distribution peculiarities at sea by species, based on the results of the surveys accomplished is represented below.

Short-tailed albatross. A very rare species. Two birds were seen on 15 August; they kept over the depth slope in vicinity of Medny Island (54.58°N, 167.42°E and 54.69°N, 168.11°E). One else bird was seen on 18 August at the north-west coast of Bering Island (55.17°N, 165.60°E), however it was outside the assessment area. All 3 were juvenile birds.

Laysan albatross. It was seen regularly in June and July and demonstrated even distribution along the outer edge of shelf and seaward (Fig. 3). In August the abundance of this species was significantly less – 17 individuals met.

Black-footed albatross. This very rare species was met only once on 4 July near the south-east shore of Medny Island (54.46°N, 168.37°E).

Northern fulmar. Abundant species, widely distributed everywhere over the Commander Islands aquatic zone. This is the only species seen during most 10-minute observations. The northern fulmar distribution density was significantly higher over the shelf zone, compared to that over the waters seaward (Table 2, 3). In June and July the most mass feeding aggregations were observed in vicinity of the Kitolovnaya Bank, at the north-west and south-east shores of Medny Island and near the north-west coast of Bering Island (Fig. 4). In August the distribution of fulmars was less dense; the abundance of feeding aggregations was 10 times less, compared to that observed during the first survey. The maximum number of fulmars was observed along the north-east coast of Bering Island; these birds were feeding on wing, flying actively in the Bering Sea in the north direction. Among the birds observed the dark morph dominated absolutely (99.6 %).

Mottled petrel was rare, at 1–2 individuals per 10-minute observation. In June and July it was seen mostly over the areas of 200 m depth and more, in August actively visited the shallow water strait between Bering and Medny islands.

Short-tailed shearwater. It is one of the most abundant species over the aquatic zone of the Commander Islands. The abundance of this species in August was higher compared to that in June and July, especially over the waters off (Table 2, 3). The principal areas of mass concentrations of shearwaters mostly coincided to those of fulmars (Fig. 5). During the observation no one principal direction to migrate was evident. Mass migrations of shearwaters were often observed along one coast during 1–2 days, the migrations being in one direction, then in the opposite directions.

Sooty shearwater. A rare species, and only during the observation in August. There were 7 singles observed on 18 August near the north-west coast of Bering Island at the aggregations of short-tailed shearwaters.

Leach's storm-petrel. We observed it only in June and July, in most cases over the open waters at the southern part of observation area in number of 1–3 individuals per observation. The birds observed were mostly on wing, moving seaward from the islands.

Fork-tailed storm-petrel. A common species, mostly aggregating over the depth slope. The largest feeding aggregations (hundreds of birds per observation) were observed in vicinity of the Kitolovnaya Bank and over the shallow waters north-westward from Bering Island (Fig. 6).

Pelagic cormorant. Only singles of this species were observed in the course of surveys when the transects went close to the shoreline: on 2 July near the Commander Bay, on 7 July near the Lisinskaya Bay and two times near Toporkov Island, and on 16 August near the North-West Cape on Medny Island.

Red-faced cormorant. An uncommon shelf species (Table 2, 3). Most birds was observed at the shoreline transects.

Harlequin duck was observed twice, both times the birds flying approximately 25 km from the north-west coast of Bering Island, including the individual seen on 3 July and two individuals met on 18 August.

Common eider was seen once, on 15 August, that was a single female flying in the direction to the shore near the north-west coast of Medny Island.

Red phalarope. In June and July this species was met only on 1 July. That was a single bird on the water surface in the strait between Bering and Medny islands. In August migrating red phalaropes were usually observed over the aquatic zone around the islands; in this time red phalarope was uncommon species in general.

Red-necked phalarope. The only record was on 19 August; a group of 13 individuals near the south-west coast of Bering Island.

Pomarine jaeger was met only in the course of observation in August. Migrating birds were regularly observed at the transects; this species was uncommon in general (Table 3). Among 62 pomarine jaegers observed 4 (6.5 %) individuals were dark and the rest were a light morph.

Parasitic jaeger. In the whole there were 9 individuals of this rare species observed in August only (Table 3); all individuals were of a light morph.

Long-tailed jaeger. Single migrants of this rare species (Table 2, 3) were observed, including 4 in July 1–3 and 5 in August 15–18.

Herring gull. There were 2 single birds observed on 17 and 18 August over the Bering Island off-shore waters.

Slaty-backed gull. There were 5 individuals observed: on 30 June near the Monati Cape, on 1 July in the strait between Bering and Medny islands (twice), on 3 July near the north-west coast of Bering Island and on 15 August southward from Medny Island.

Glaucous-winged gull. This common species was mostly distributed over the shelf zone (Fig. 7). In June and July among 299 glaucous-winged gulls observed 93 (31.1 %) individuals were 1–4-year old immature birds. In August among 232 gulls observed, the immature birds were 22.4 %; moreover, there were 4.3 % of juveniles.

Black-legged kittiwake definitely preferred the off-shore waters, where this species was the most abundant; being less frequent outside the shelf zone (Table 2, 3). The most abundant feeding aggregations were discovered

Table 2. Species composition and density of seabirds (individuals/km²) observed on transects near the Commander Islands in June – July 2004.

Таблица 2. Видовой состав и плотность (особи/км²) морских птиц, учтенных на трансектах в акватории Командорских о-вов в июне – июле 2004 г.

Species Вид	Counted Учтено		Density of birds Плотность птиц					
			Coastal waters Прибрежные воды		Open waters Открытые воды		Total Всего	
	Individuals	%	X	SE	X	SE	X	SE
Laysan albatross	409	0.93	1.043	0.122	1.736	0.139	1.383	0.094
<i>Phoebastria immutabilis</i>								
Black-footed albatross	1	< 0.01	0.006	0.006	0.000	0.000	0.003	0.003
<i>Phoebastria nigripes</i>								
Northern fulmar	18,982	44.89	111.776	45.566	19.705	1.149	66.620	23.335
<i>Fulmarus glacialis</i>								
Mottled petrel	22	0.05	0.053	0.020	0.096	0.025	0.074	0.016
<i>Pterodroma inexpectata</i>								
Short-tailed shearwater	9,066	20.75	52.932	15.807	7.803	2.252	30.798	8.217
<i>Puffinus tenuirostris</i>								
Leach's storm-petrel	22	0.05	0.006	0.006	0.143	0.040	0.073	0.020
<i>Oceanodroma leucorhoa</i>								
Fork-tailed storm-petrel	1,736	4.00	4.601	1.553	7.326	2.205	5.938	1.340
<i>Oceanodroma furcata</i>								
Pelagic cormorant	4	0.01	0.020	0.015	0.007	0.007	0.014	0.008
<i>Phalacrocorax pelagicus</i>								
Red-faced cormorant	18	0.04	0.101	0.059	0.020	0.012	0.061	0.031
<i>Phalacrocorax urile</i>								
Harlequin duck	1	< 0.01	0.007	0.007	0.000	0.000	0.003	0.003
<i>Histrionicus histrionicus</i>								
Red phalarope	1	< 0.01	0.007	0.007	0.000	0.000	0.003	0.003
<i>Phalaropus fulicarius</i>								
Long-tailed jaeger	4	0.01	0.013	0.013	0.015	0.010	0.014	0.008
<i>Stercorarius longicaudus</i>								
Slaty-backed gull	4	0.01	0.027	0.016	0.000	0.000	0.014	0.008
<i>Larus schistisagus</i>								
Glaucous-winged gull	299	0.68	1.530	0.175	0.458	0.091	1.004	0.104
<i>Larus glaucescens</i>								
Black-legged kittiwake	3,123	7.17	19.349	5.214	1.594	0.287	10.641	2.703
<i>Rissa tridactyla</i>								
Red-legged kittiwake	556	1.27	2.109	0.314	1.654	0.255	1.886	0.203
<i>Rissa brevirostris</i>								
Common tern	1	< 0.01	0.000	0.000	0.007	0.007	0.003	0.003
<i>Sterna hirundo</i>								
Common and thick-billed murres	3,933	8.91	16.400	2.275	9.919	2.324	13.221	1.634
<i>Uria aalge, Uria lomvia</i>								
Pigeon guillemot	26	0.06	0.143	0.047	0.028	0.022	0.087	0.027
<i>Cephus columba</i>								
Ancient murrelet	8	0.02	0.019	0.019	0.035	0.023	0.027	0.015
<i>Synthliboramphus antiquus</i>								
Crested auklet	1	< 0.01	0.000	0.000	0.007	0.007	0.003	0.003
<i>Aethia cristatella</i>								
Whiskered auklet	1,641	3.81	10.514	5.644	0.612	0.504	5.658	2.896
<i>Aethia pygmaea</i>								
Least auklet	9	0.02	0.059	0.059	0.000	0.000	0.030	0.030
<i>Aethia pusilla</i>								
Parakeet auklet	1	< 0.01	0.007	0.007	0.000	0.000	0.004	0.004
<i>Cyclorhynchus psittacula</i>								
Horned puffin	173	0.40	0.916	0.176	0.249	0.070	0.589	0.098
<i>Fratercula corniculata</i>								
Tufted puffin	3,087	6.90	14.996	3.481	5.308	0.496	10.245	1.808
<i>Lunda cirrhata</i>								
All birds Все виды	43,128	100.0	236.634	54.172	56.722	5.160	148.397	28.140

Table 3. Species composition and density of seabirds (individuals/km²) observed on transects near the Commander Islands in August 2004.
Таблица 3. Видовой состав и плотность (особи/км²) морских птиц, учтенных на трансектах в акватории Командорских о-вов в августе 2004 г.

Species Вид	Counted Учтено		Density of birds Плотность птиц					
			Coastal waters Прибрежные воды		Open waters Открытые воды		Total Всего	
	Individuals	%	X	SE	X	SE	X	SE
Short-tailed albatross <i>Phoebastria albatrus</i>	2	0.01	0.000	0.000	0.018	0.013	0.009	0.006
Laysan albatross <i>Phoebastria immutabilis</i>	17	0.06	0.071	0.028	0.084	0.030	0.077	0.020
Northern fulmar <i>Fulmarus glacialis</i>	6,418	22.52	33.456	3.918	21.191	1.373	27.741	2.214
Mottled petrel <i>Pterodroma inexpectata</i>	21	0.08	0.141	0.040	0.039	0.019	0.094	0.023
Short-tailed shearwater <i>Puffinus tenuirostris</i>	11,855	42.42	49.996	10.858	54.829	14.060	52.248	8.735
Sooty shearwater <i>Puffinus griseus</i>	7	0.03	0.018	0.018	0.049	0.029	0.032	0.017
Fork-tailed storm-petrel <i>Oceanodroma furcata</i>	1,927	7.02	9.077	3.976	8.150	4.314	8.645	2.919
Pelagic cormorant <i>Phalacrocorax pelagicus</i>	1	< 0.01	0.009	0.009	0.000	0.000	0.005	0.005
Red-faced cormorant <i>Phalacrocorax urile</i>	34	0.12	0.277	0.121	0.010	0.010	0.152	0.065
Harlequin duck <i>Histrionicus histrionicus</i>	2	0.01	0.016	0.016	0.000	0.000	0.009	0.009
Common eider <i>Somateria mollissima</i>	1	< 0.01	0.008	0.008	0.000	0.000	0.004	0.004
Red phalarope <i>Phalaropus fulicarius</i>	60	0.22	0.453	0.260	0.062	0.038	0.270	0.140
Red-necked phalarope <i>Phalaropus lobatus</i>	13	0.04	0.000	0.000	0.114	0.114	0.053	0.053
Pomarine jaeger <i>Stercorarius pomarinus</i>	62	0.22	0.327	0.072	0.202	0.049	0.269	0.045
Parasitic jaeger <i>Stercorarius parasiticus</i>	9	0.03	0.033	0.020	0.046	0.029	0.039	0.017
Long-tailed jaeger <i>Stercorarius longicaudus</i>	5	0.02	0.017	0.012	0.030	0.017	0.023	0.010
Herring gull <i>Larus argentatus vegae</i>	2	0.01	0.016	0.011	0.000	0.000	0.008	0.006
Slaty-backed gull <i>Larus schistisagus</i>	1	< 0.01	0.000	0.000	0.009	0.009	0.004	0.004
Glaucous-winged gull <i>Larus glaucescens</i>	232	0.83	1.360	0.136	0.623	0.107	1.016	0.090
Black-legged kittiwake <i>Rissa tridactyla</i>	1,769	6.20	10.069	0.937	4.855	0.643	7.640	0.602
Red-legged kittiwake <i>Rissa brevirostris</i>	1,097	3.84	6.014	0.530	3.265	0.303	4.733	0.326
Arctic tern <i>Sterna paradisaea</i>	1	< 0.01	0.000	0.000	0.009	0.009	0.004	0.004
Common and thick-billed murre <i>Uria aalge, Uria lomvia</i>	1,938	6.78	9.832	1.965	6.641	1.663	8.345	1.306
Pigeon guillemot <i>Cephus columba</i>	1	< 0.01	0.008	0.008	0.000	0.000	0.004	0.004
Whiskered auklet <i>Aethia pygmaea</i>	283	1.02	2.278	0.881	0.074	0.058	1.251	0.475
Parakeet auklet <i>Cyclorhynchus psittacula</i>	1	< 0.01	0.000	0.000	0.009	0.009	0.004	0.004
Horned puffin <i>Fratercula corniculata</i>	170	0.62	0.705	0.163	0.822	0.194	0.759	0.126
Tufted puffin <i>Lunda cirrhata</i>	2,200	7.89	12.228	3.513	6.850	0.719	9.722	1.909
All birds Все виды	28,129	100.00	136.408	13.741	107.981	14.980	123.162	10.145

in June and July over the shallow waters near the north-west coast of Medny Island and at the Kitolovnaya Bank (Fig. 8). Judging from flight directions this should be the area of feeding for black-legged kittiwakes nesting not only on Medny Island, but also at the southern part of Bering Island. The latter often leave for feeding in the Pacific waters in the south or south-east directions. In June and July among 3,123 kittiwakes observed 445 (14.2 %) individuals were immature yearlings, in August the yearlings took 12.1 % (214 individuals among 1,769 birds).

Red-legged kittiwake was common over the shelf waters and over the open marine waters (Table 2, 3). Over both areas the largest feeding aggregations were seen at the Kitolovnaya Bank (Fig. 9), where representatives of principal colonies of this species at southern Bering Island used to feed intensively. At the same time, judged on the directions of flights, kittiwakes often used to leave for feeding outside the 30-mile buffer zone, to the Bering Sea, and to the Pacific Ocean. The most abundant foraging trips of kittiwakes were observed in August along the north-east coast of Bering Island and north-westward from this island. Among 556 red-legged kittiwakes observed in June and July 36 (6.5 %) individuals were immature yearlings.

Common tern was once observed on 7 July in 45 km south-westward from Nikolskoye Settlement.

Arctic tern was observed on 18 August in 17 km northward from the North-Western Cape, Bering Island.

Common and thick-billed murres. On the results of observations in June and July these were abundant species, to be common in August. Murres were more frequent over the shelf zone, than over the open sea waters (Table 2, 3). These birds were in the maximum number near the north-west coast of Medny Island and southern Bering Island bearing abundant colonies of murres (Fig. 10).

Pigeon guillemot. In June and July it was rather rare species in general, also uncommon over the off-shore area (Table 2); 26 birds were observed mostly at the shallow water transects not far from shoreline. In August pigeon guillemot was observed one time.

Ancient murrelet was rare, seen four times only during the first survey in June – July, there were 8 individuals met in the total.

Crested auklet. There was one on the water surface on 1 July on the beam of Peresheyek Bay, Medny Island.

Whiskered auklet. Common species, definitely strongly attracted to the off-shore shelf waters (Table 2, 3). The most abundant aggregations of feeding auklets were seen near northern Medny Island and over the Kitolovnaya Bank (Fig. 11). In August the feeding birds were seen rather distant from the land over the shallow waters in 43 km north-westward from Bering Island.

Least auklet was seen once, on 4 July, in number of 9 individuals they being on the water surface, approximately 20 km westward from Toporkov Island, where the only known on the Commander Islands nesting colony of this species is situated.

Parakeet auklet. Based on transect observations this species is very rare. Two birds observed swimming: on 3 July, 70 km north-westward from Ariy Kamen Island,

and on 18 August, 40 km north-westward from the same one island, where the most abundant colony of parakeet auklets on the Commander Islands is situated.

Horned puffin was uncommon (Table 2, 3). Most observations were made within the area adjacent to the coasts and bearing principal nesting colonies of this species (Fig. 12). There were a number (17 among 170 what is 10.0 %) of immature yearlings among puffins observed in August.

Tufted puffin. This species was high abundant over the shelf zone and common over the open sea (Table 2, 3). The maximum number of the birds was near the north-west coast of Bering Island (Fig. 13), where, in the Toporkov and Ariy Kamen islands, the most abundant colonies of this species are situated. Judging by the direction of flights, puffins, nesting in southern Bering Island, used to visit there for feeding. The visitors from Toporkov and Ariy Kamen islands also used to search food everywhere outside the area of our observations; it is most likely that even outside the boundaries of the Reserve's marine buffer zone. Among 2,200 tufted puffins observed in August 26 (1.2 %) individuals were immature yearlings.

DISCUSSION

Our observations indicate mass feeding aggregations of seabirds over the aquatic zone of the Commander Islands in summer. The density of seabird distribution has gotten significantly higher in the off-shore shelf zone, compared to that over the adjacent open sea waters (Table 2, 3). The off-shore shelf zone plays an especially important role in aggregation process. As it was demonstrated in recent studies (Buslov, Tepnin, 2002), favorable conditions for plankton development and spawning of walleye pollock in particular have been created at the Commander Islands shelf due to the specifics of local water dynamics. Apparently, such hydrological situation provides a rich and stable forage base for seabirds. The shelf zone almost totally is situated within the Commander Reserve's 30-mile buffer zone.

Two plots over the shelf with especially abundant aggregations of feeding birds (thousands of individuals per 1 km²) have been revealed as a result of the observations during two survey cruises. The first one is the area of shallow waters spread from the Kitolovnaya Bank to Medny Island. For the periods of our observations the abundance of the feeding aggregations over this area was high and sustainable among varying the composition of the birds. Fulmars and short-tailed shearwaters dominated there in June – July, shearwaters and fork-tailed storm-petrels – in August. Thus, we conclude that this plot is an usual feeding area for whiskered auklets, murres, kittiwakes and the others. The second plot spreads over the shelf waters near the north-west coast of Bering Island. There have been observed stably high concentrations of tufted puffins, aggregations of fulmars, shearwaters and some other species. It is notable that cetaceans used to aggregate in both these plots.

It can be rather asserted that forage biotopes of most species of the seabirds nesting on the Commander Is-

lands, are mostly situated in the off-shore and adjacent open sea waters within the Reserve's buffer zone. Common and abundant nesting birds such as pelagic and red-faced cormorants, glaucous-winged gull, pigeon guillemot, whiskered auklet, which certainly are strongly attracted to the off-shore zone and rarely leave for open sea. Some species, for which the distant flights are known (fulmar, fork-tailed storm-petrel, black-legged and red-legged kittiwakes, murre, tufted puffin), also occur within the Commander Islands, and are feeding intensively in the Reserve's buffer zone too. Although it is obvious, that some of these species (fulmar, fork-tailed storm-petrel, red-legged kittiwake, puffin) move away from the islands more than in 30 miles while searching for food. Judging by rare observations of Leach's storm-petrel, this ocean species feeds mostly in open sea waters far from the land.

The Reserve's buffer zone in summer becomes very important as the area of feeding and rest not for the nesting birds only, but for the other species, the origin of which is not associated with the Commander Islands. High abundances of migrating species of Procellariiformes, like short-tailed shearwater and Laysan albatross, indicate this. During summer migrations the aquatic area of the islands has been visited by mottled petrel, black-footed and short-tailed albatrosses, sooty shearwater. As for the latter of these species, this species, based on our observations of sooty shearwater described above, is included into the Commander Islands list of avian fauna first time (according to the last revised version of the list by Yu. B. Artukhin (2003)). Our observations of mottled petrel, strictly speaking, are the first reliable records of this species on the Commander Islands. It was in the list of birds of these islands before as observed by V. P. Shuntov (1998) in summer 1991 in the adjacent waters (Artukhin, 2002). In the whole, 1/5 of all the birds observed (21.7 %) in June and July was represented by Procellariiformes, migrating from the other areas of the Pacific Ocean, also in August when these birds occur two times as often (up to 42.6 %).

Judging by the observations mentioned above for the species seen at various ages, not only the birds nesting on the islands, but also non-breeding immature birds use the aquatic area around the islands in summer.

Distribution density and species composition of the seabirds vary extensively in the course of summer period. By the second half of summer the number of short-tailed shearwaters increases during their maximum migration to the Bering Sea (Shuntov, 1998). At the same time, from our data, the abundance of Laysan albatrosses declines. Apparently only in this time sooty shearwaters, which are more heat-loving compared to short-tailed shearwaters, go there. In August a number of migrants (jaegers, red phalarope) appear to the South from their nesting area situated northward from the Commander Islands.

Dynamism of seabird distribution at sea, of northern fulmar in particular, is also characteristic for nesting

species. In June and July a great number of fulmars were feeding in the area of the Kitlovnaya Bank. The density of seabirds assessed was very high either over this area and over the aquatic zone studied in summer period in the whole. In August fulmars were not observed in such number; it is likely that in the period mentioned many fulmars left for feeding in the Bering Sea, their foraging trips following along the north-east coast of Bering Island.

It is known, that seabird distribution at sea is mostly determined by oceanographic and hydrobiological factors, fluctuating extensively from year to year, especially in vicinity of the archipelagos where water circulation is intense. We have suggested for this reason that the description of seabirds around the Commander Islands provided can vary extensively from year to year. The studies of the seabirds distribution features within the aquatic zone of the Commander Reserve should be continued clarify these variations.

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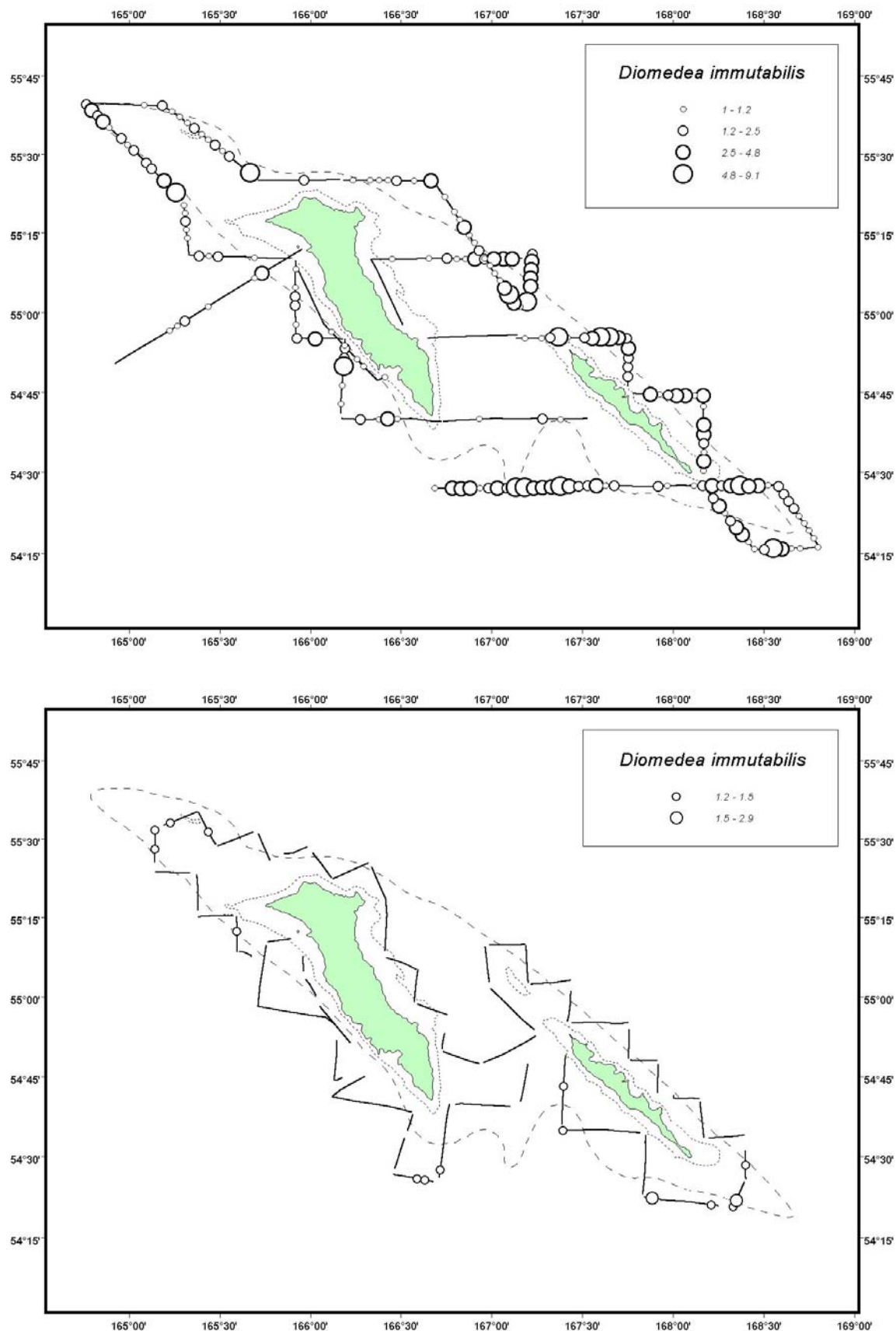


Figure 3. Densities (individuals/km²) of Laysan albatrosses on transects surveyed at the Commander Islands in June – July (above) and August (below) 2004.

Рис. 3. Плотность (особи/км²) темноспинного альбатроса на учетных трансектах в акватории Командорских о-вов в июне – июле (вверху) и в августе (внизу) 2004 г.

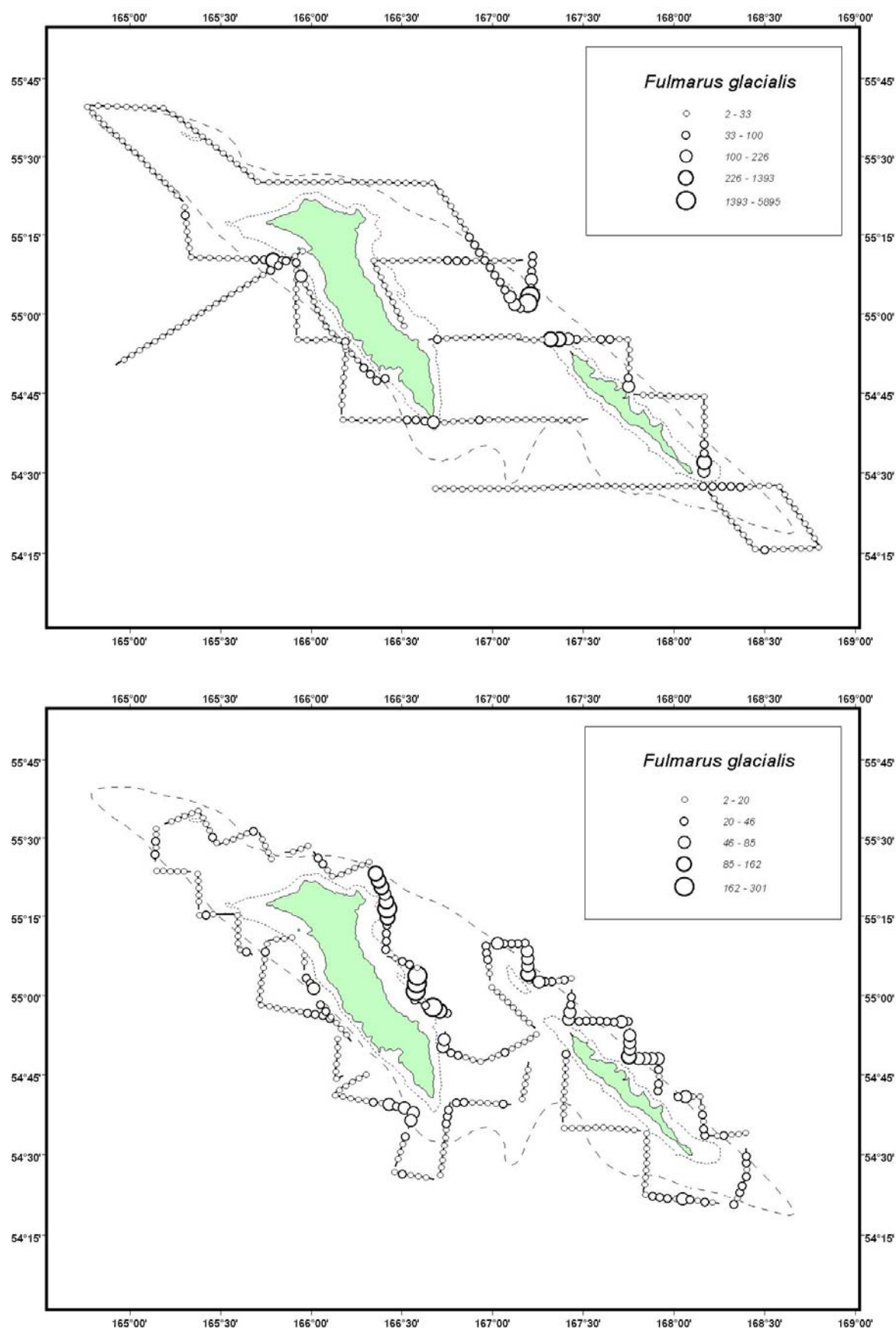
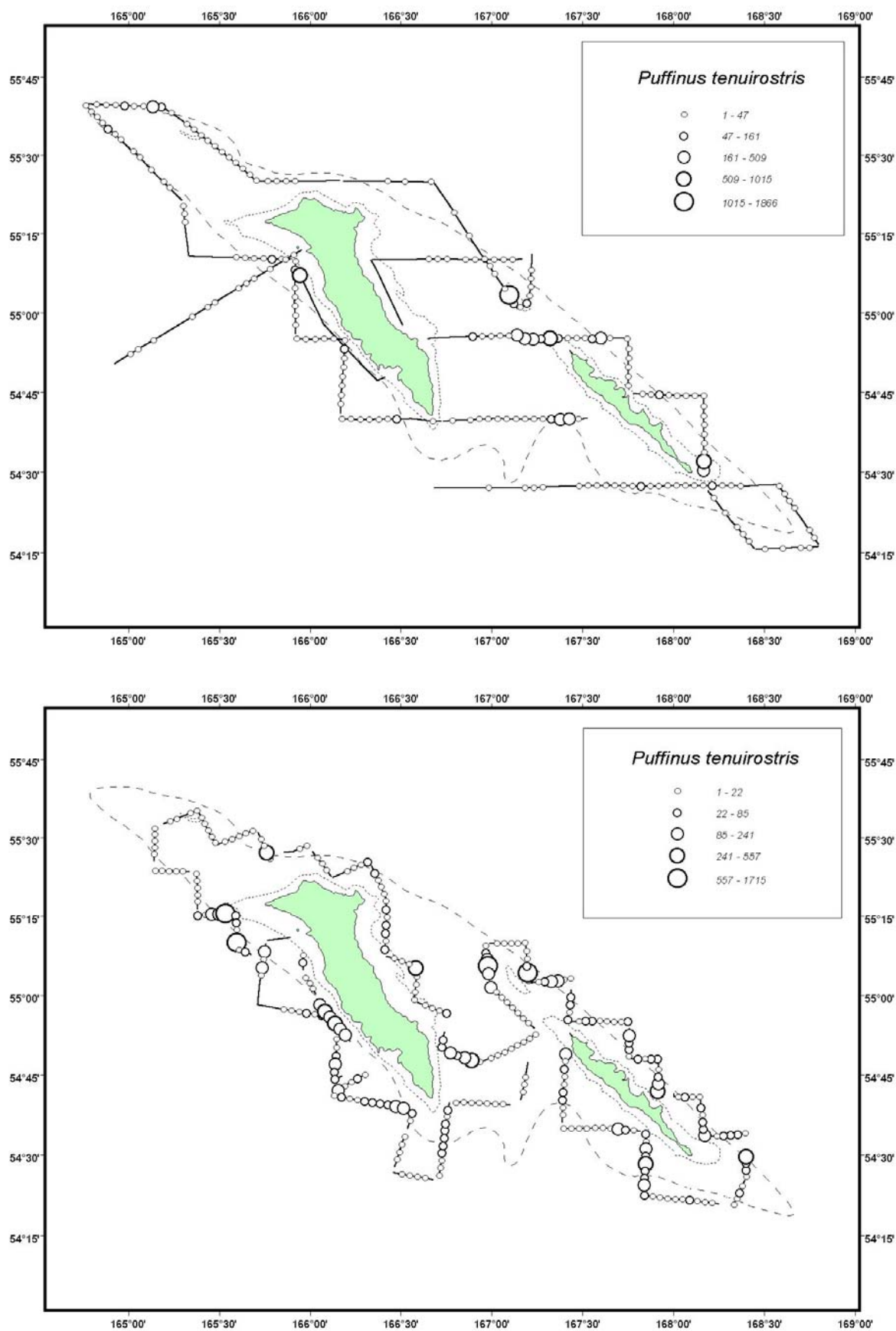


Figure 4. Densities (individuals/km²) of northern fulmars on transects surveyed at the Commander Islands in June – July (above) and August (below) 2004.

Рис. 4. Плотность (особи/км²) глупыша на учетных трансектах в акватории Командорских о-вов в июне – июле (вверху) и в августе (внизу) 2004 г.



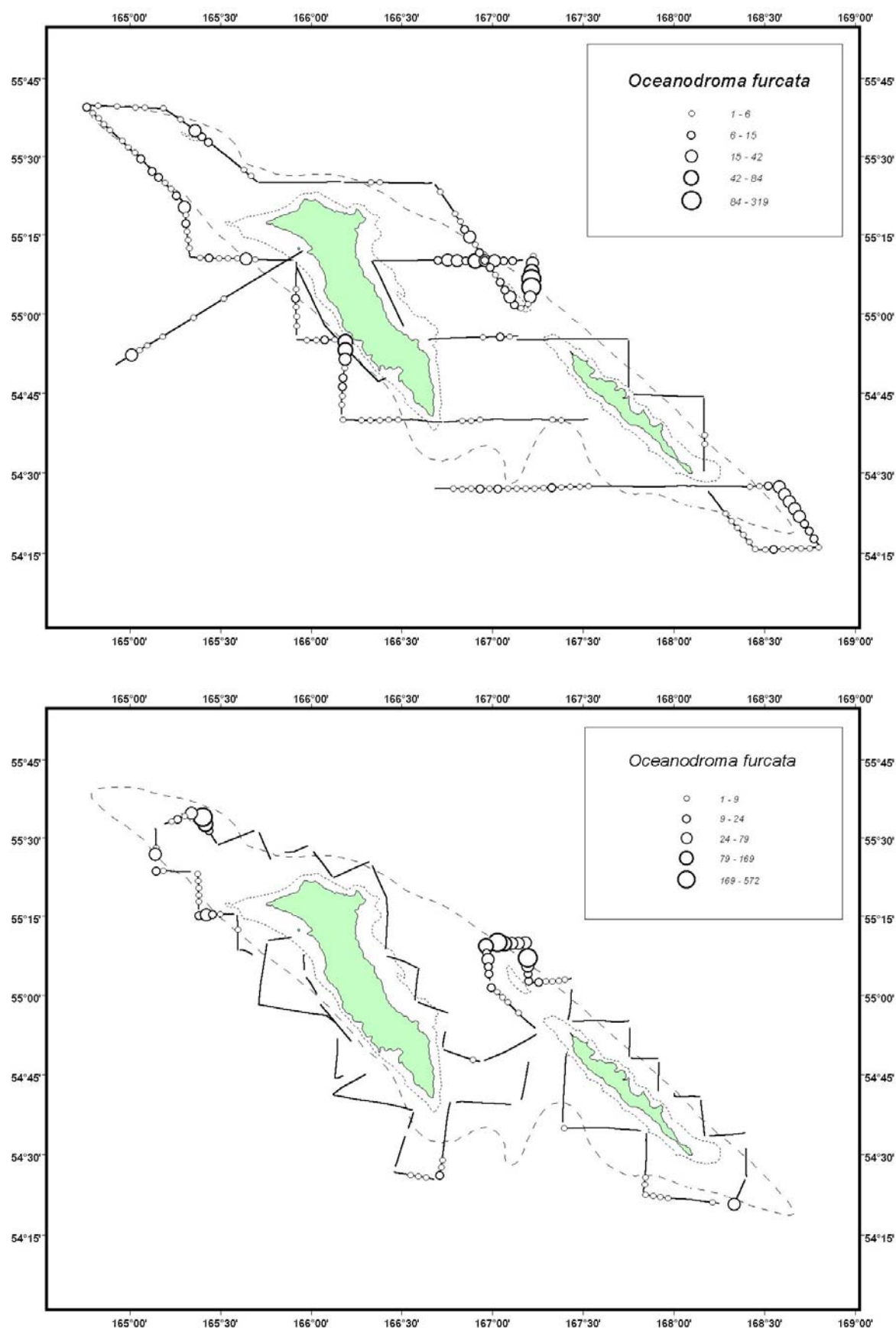


Figure 6. Densities (individuals/km²) of fork-tailed storm-petrels on transects surveyed at the Commander Islands in June – July (above) and August (below) 2004.

Рис. 6. Плотность (особи/км²) сизой качурки на учетных трансектах в акватории Командорских о-вов в июне – июле (вверху) и в августе (внизу) 2004 г.

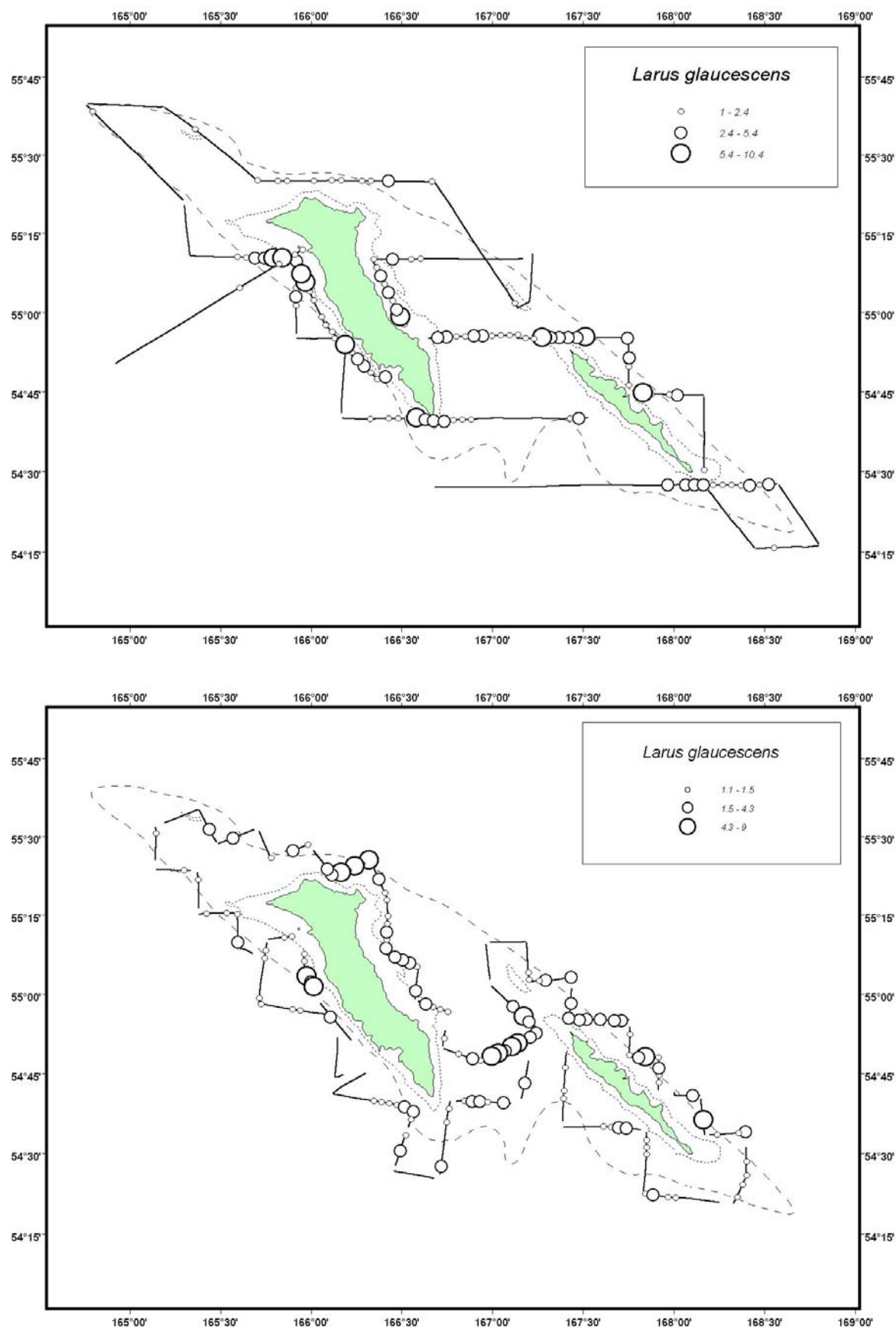


Figure 7. Densities (individuals/km²) of glaucous-winged gulls on transects surveyed at the Commander Islands in June – July (above) and August (below) 2004.

Рис. 7. Плотность (особи/км²) серокрылой чайки на учетных трансектах в акватории Командорских о-вов в июне – июле (вверху) и в августе (внизу) 2004 г.

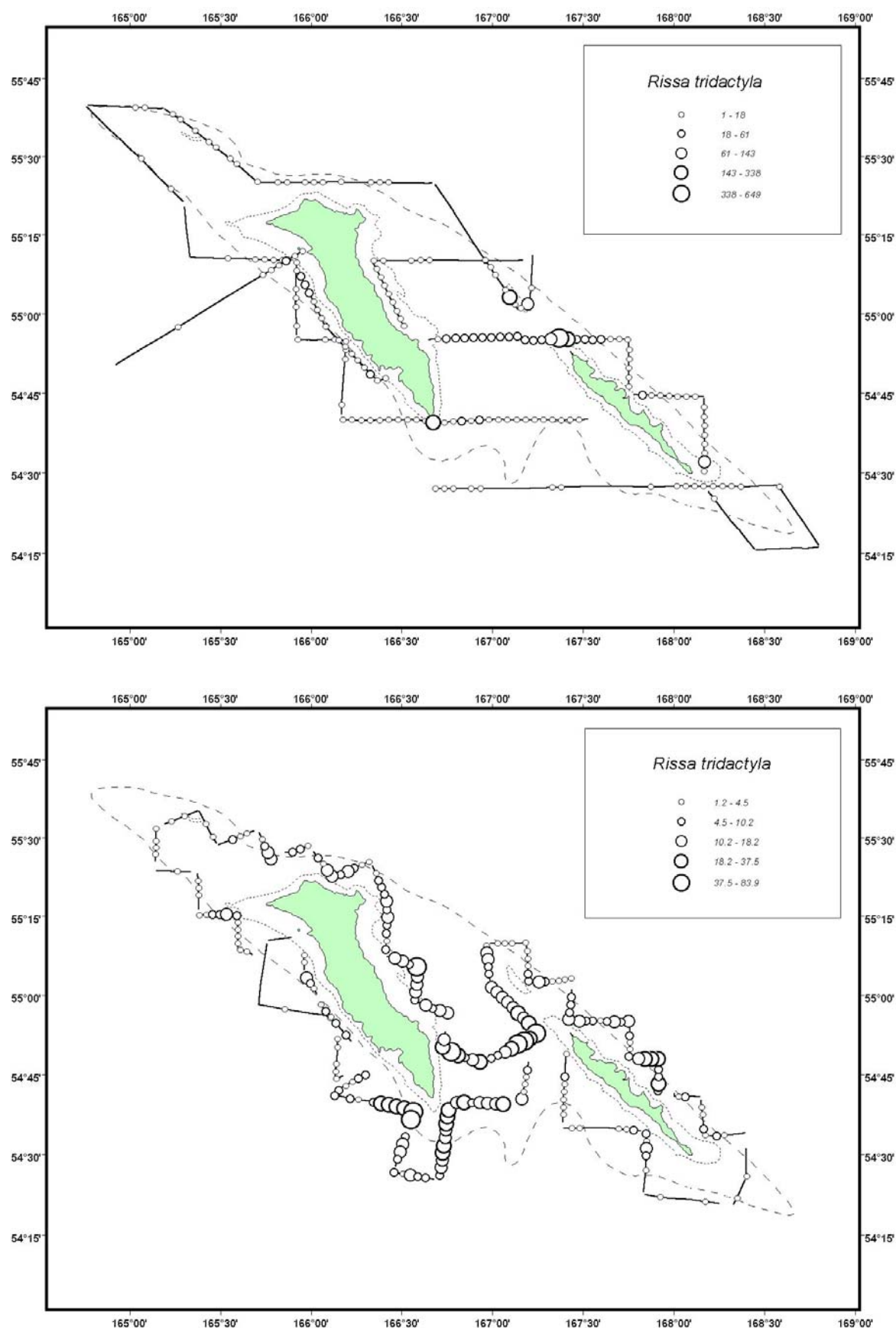
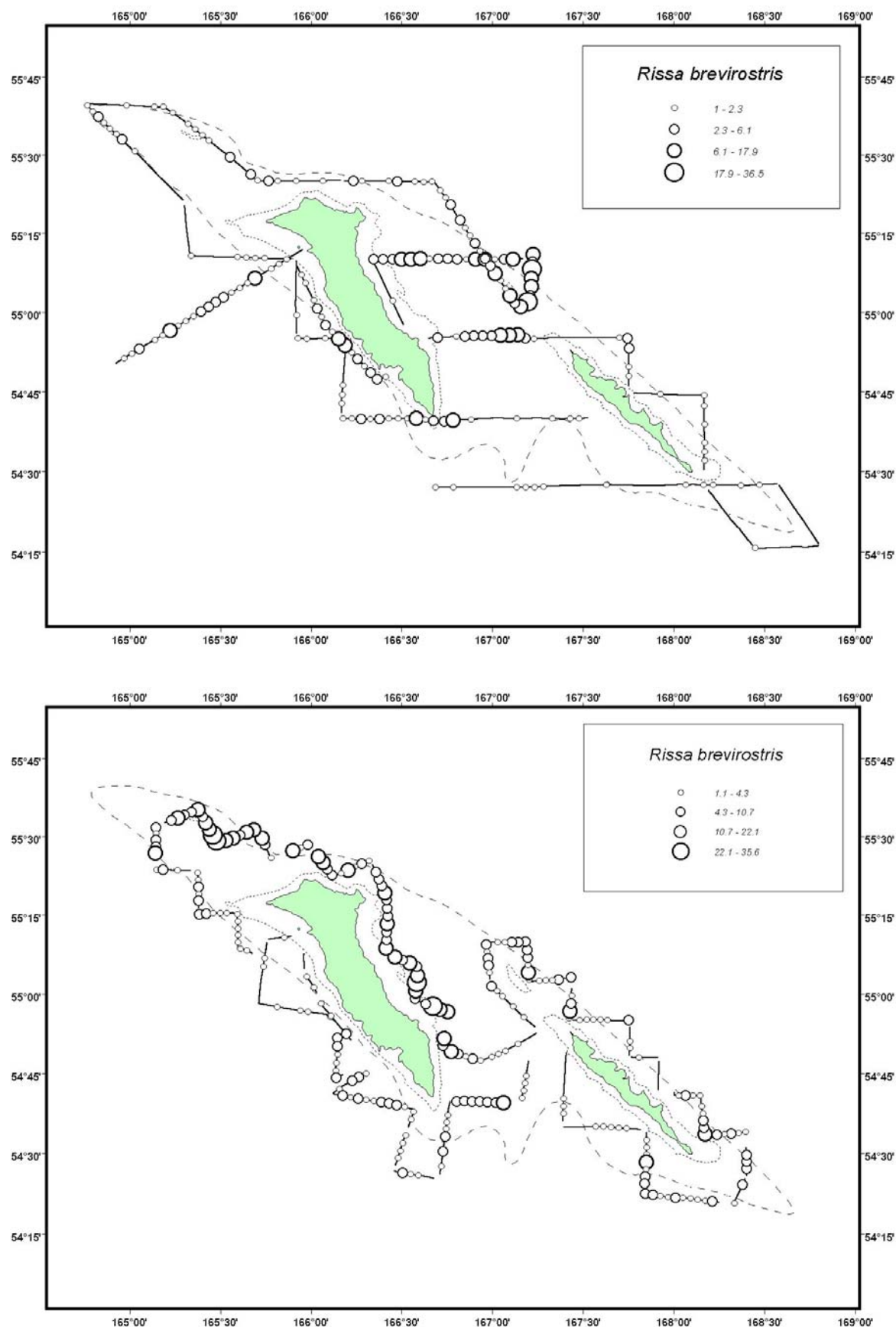


Figure 8. Densities (individuals/km²) of black-legged kittiwakes on transects surveyed at the Commander Islands in June – July (above) and August (below) 2004.

Рис. 8. Плотность (особи/км²) моевки на учетных трансектах в акватории Командорских о-вов в июне – июле (вверху) и в августе (внизу) 2004 г.



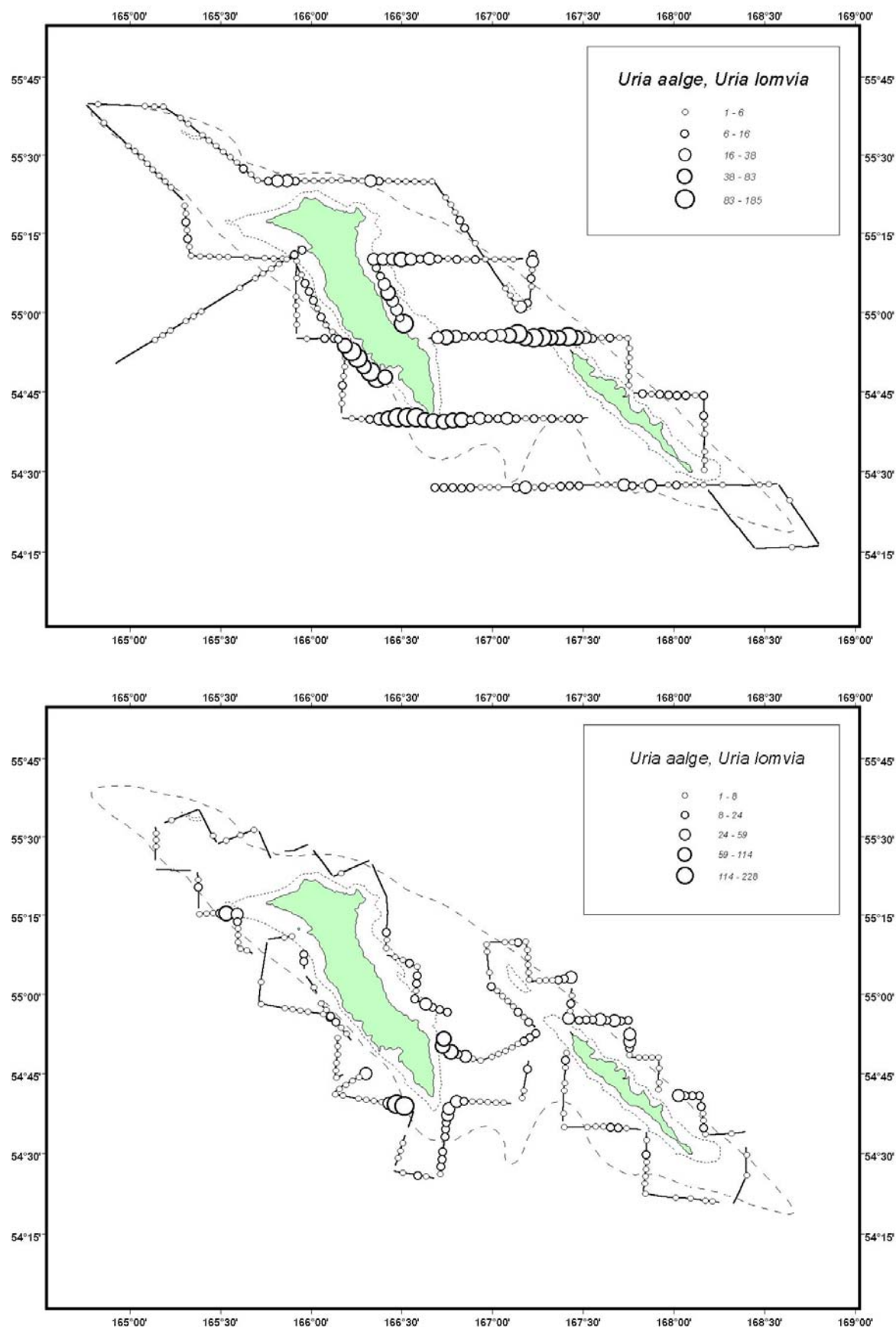


Figure 10. Densities (individuals/km²) of murre on transects surveyed at the Commander Islands in June – July (above) and August (below) 2004.

Рис. 10. Плотность (особи/км²) кайр на учетных трансектах в акватории Командорских о-вов в июне – июле (вверху) и в августе (внизу) 2004 г.

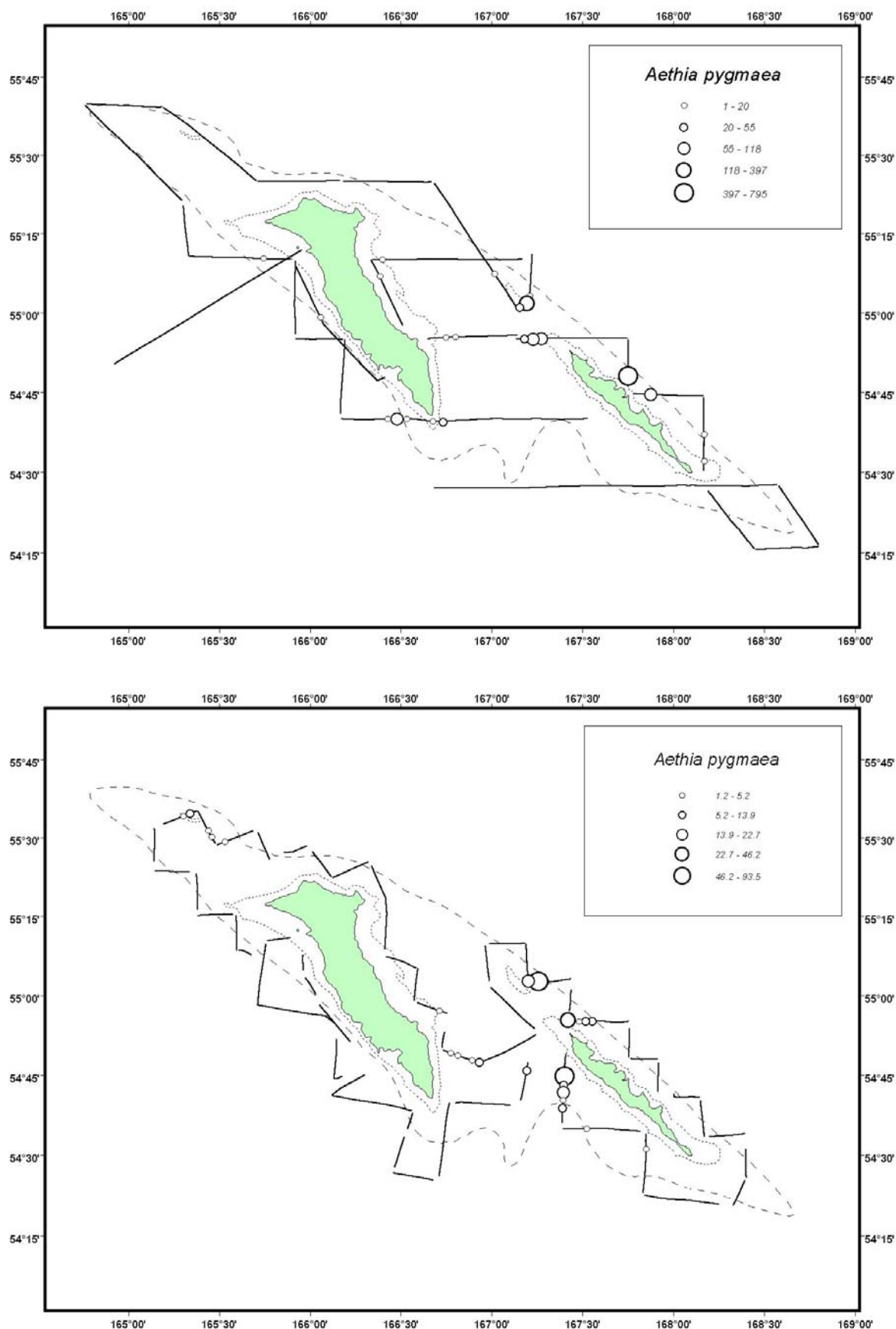


Figure 11. Densities (individuals/km²) of whiskered auklets on transects surveyed at the Commander Islands in June – July (above) and August (below) 2004.

Рис. 11. Плотность (особи/км²) малой конюги на учетных трансектах в акватории Командорских о-вов в июне – июле (вверху) и в августе (внизу) 2004 г.

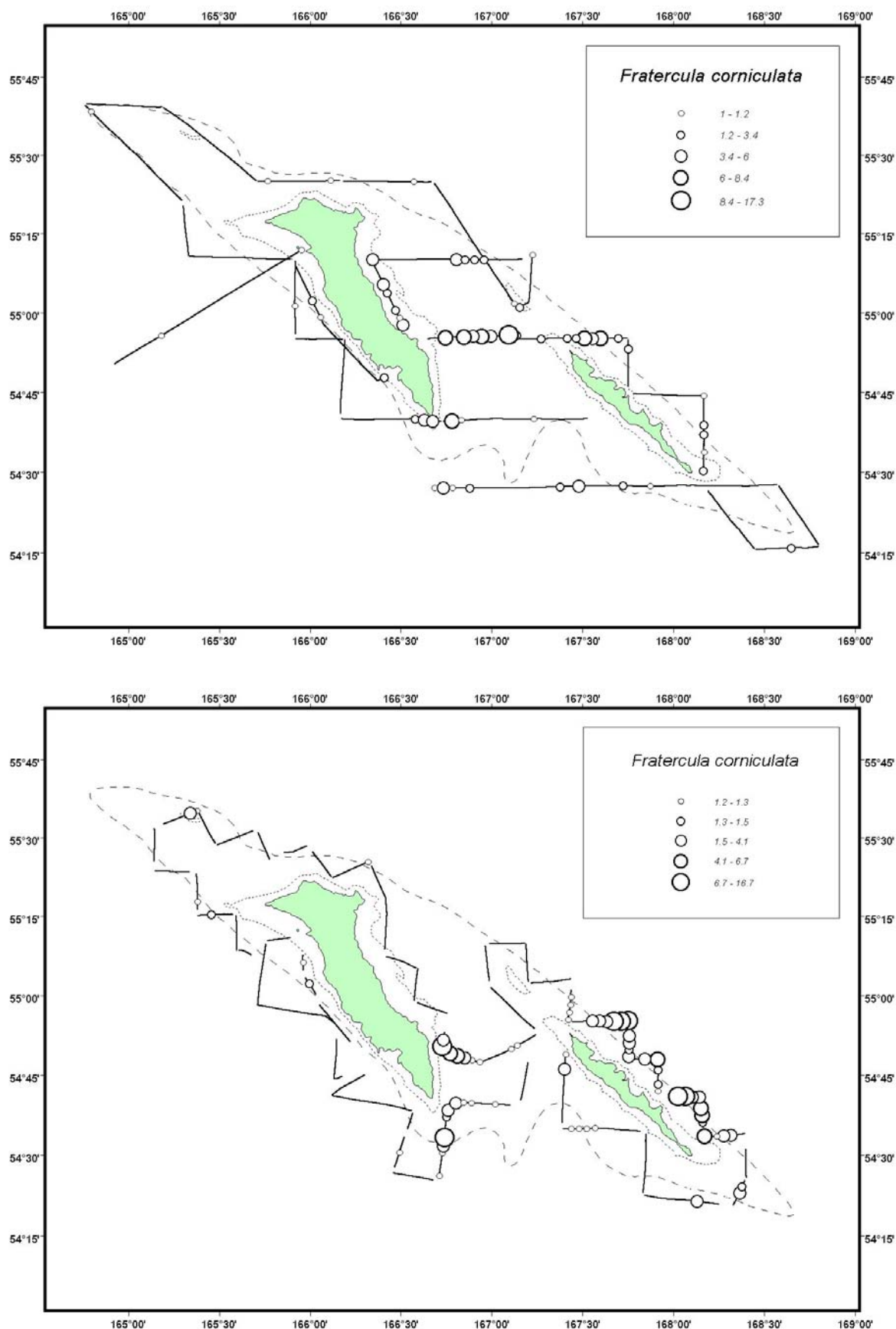


Figure 12. Densities (individuals/km²) of horned puffins on transects surveyed at the Commander Islands in June – July (above) and August (below) 2004.

Рис. 12. Плотность (особи/км²) ипатки на учетных трансектах в акватории Командорских о-вов в июне – июле (вверху) и в августе (внизу) 2004 г.

