



CONTRIBUTIONS

Commentary

A History of the Ecological Sciences, Part 27: Naturalists Explore Russia and the North Pacific During the 1700s

While west European naturalists explored the Americas, Central European and Russian naturalists explored the Russian empire and the north Pacific lands. We have seen that colonial science in the Americas consisted mainly of exploration and inventory of natural resources (Egerton 2006, 2007c), and a similar pattern of research priorities developed in the East, where Siberia was a kind of Russian “colony.” However, Russian explorations were state sponsored, funded, and supervised, and consequently on a larger scale than the explorations in the Americas, which were mostly not government funded. More naturalists and expeditions were involved than can be surveyed here. Eduard I. Kolchinsky (2004) provides a convenient introduction to the others.

Central to the Russian explorations was the Academy of Arts and Sciences in St. Petersburg. Peter the Great began discussing plans for it with the German polymath Gottfried W. Leibniz in 1712, though plans for it were not finalized until 1724, and Peter died on 28 January 1725, before his plans were realized. He had recruited German scientists to lead it, and they began arriving in the summer of 1725 (Lipski 1953, Vucinich 1963:75–98, Kopelevich 1973, McClellan 1985:74–83).

Even earlier, in 1717, he invited a German physician from Danzig, Daniel Gottlieb Messerschmidt (1685–1735), to come to St. Petersburg. He arrived in 1718, and in 1719 Peter agreed to support his geographical, medical, and natural history explorations of Siberia. He was gone until 1727, exploring lands all the way to Argun, east of Lake Baikal. He was a diligent observer and collector, but the journey exhausted him, and in February 1728 he turned over his notes and collections to the Academy of Sciences. He never published his findings, did not become a member of the Academy, and died in poverty (Stejneger 1936:82–84). However, his seven years of daily journal entries survive and are now published, with excellent maps (Messerschmidt 1962–1977). According to his Russian biographer, M. G. Novlyanskaya (1970:159), he described 149 minerals, 1290 plants, 359 growing only in Russia, and 257 animals. However, according to Jahn (1989:113), he described 265 species of birds, with drawings of birds and eggs, some of which Jahn published and discussed, with a reprinted map showing where Messerschmidt collected them. He was the first to study Siberian mammals (Sokolov and Parnes 1993:54–69).

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Fig. 1. Male goat, *Capra campestris*, drawn 1 July 1724. Messerschmidt 1962–1977, III: Fig. 32.

Two days before Peter died, he also authorized the Danish sea captain Vitus Ionnasen Bering (1681–1741), who was in the Russian navy, to search for where and if Siberia joins America (Bobrick 1992:149–156, Lincoln 1994:100–106, Frost 2003:35–59). The first contingent left St. Petersburg on 24 January 1725 with 26 men and 25 sleds with horses, and on 6 February Bering left to join them with six men and eight sleds. On 23 July at Yeniseisk he met and was advised by Messerschmidt (Messerschmidt 1962–1977, IV:172–179, Frost 2003:43) and reached Okhotsk, a community of eleven huts, at the end of October 1726. He could only build a small boat, *Fortuna*, and repair an older one to sail to Kamchatka on 22 August, because there were only scrubby trees around Okhotsk. Kamchatka had good-sized trees that could provide timber for a larger ship for exploring the Pacific. He and his crew sailed into the Pacific in the newly built *Archangel Gabriel* on 14 July 1728, and in mid-August they sailed through what Captain Cook later named Bering Strait, without knowing it because of the fog. They had not found land by 16 August and turned back to avoid being frozen in for the winter. Again, they passed through Bering Strait in the fog without discovering it. They returned to St. Petersburg on 28 February 1730,

having established that Asia was not connected to America, and brought back a new map they had made of Siberia (Golder 1922:I, 6–20 + map, 1968). In 1731 Bering received a promotion, into nobility, and a reward, and he soon suggested a second expedition, vastly more ambitious than the first.

In 1727, two German members of the Academy of Sciences recruited one of their former star pupils, Johann Georg Gmelin (1709–1755). He was the son of a professor at the University of Tübingen, and had begun attending university lectures at age 14.

He received his medical degree in 1727 before traveling to St. Petersburg. He obtained a fellowship at the Academy in 1728, lectured there in 1730, and became an academician and professor of chemistry and natural history in 1731 (Gradmann 1911, Stejneger 1936:103–104, Vucinich 1963:99–101, Kruta 1972, Stafleu and Cowan 1976–1988, I:956–957). He became one of three professors who went on Vitus Bering's Second Kamchatka Expedition (1731–1742), also called the Great Northern Expedition, involving 600 people at the start, and hundreds of others added along the way. This expedition and the other academic ones later were very broad in scope, studying natural history, geography, ethnography, languages, crafts, and more. This one was a logistical nightmare (Golder 1922–1925, Bobrick 1992:161–210, Frost 1992*a*, 2003:65–269, Gibson 1992, Lincoln 1994:107–133). The naval section of the expedition left St. Petersburg in February and March 1733, in order to build ships at Okhotsk, and it traveled rapidly in sleds. The academic section only left in August, in much slower wagons and river boats. Gmelin and another professor, Gerhard Friedrich Müller, finally reached Bering's headquarters at Yakutsk (or Jakutsk) in September 1736 (Coats 1969:47–50). On 8 November, Gmelin was at Bering's residence when his own residence burned, destroying all his collections and notes and part of his library (Stejneger 1936:111–113). Gmelin went out next summer and re-collected specimens and notes. Later he published two important works based on his decade of observations and collections: *Flora Sibirica* (four volumes, 1747–1769; some of his herbarium specimens are in the Natural History Museum, London [Syty 1996]) and *Reise durch Sibirien von dem Jahr 1733 bis 1743* (four volumes, 1751–1752, partly reprinted in Posselt 1990:5–193). The Academy published his *Flora*, with 1178 species, 294 being illustrated. According to Kolchinsky (2004:109)



Fig. 2. Johann Georg Gmelin, sometime after returning from Siberia. Gradmann 1911: Frontispiece.

He paid attention to the high level of geographical variability of the species living in isolated regions, where migration seemed impossible (Gmelin 1747) and supposed that there had been independent creation of these species in different places. In his travel notes, Gmelin (1752) also wrote about the influence of habitat on the structure, functioning, and way of life of organisms. He described his unsuccessful attempts to acclimatize annual plants brought from Siberia in the gardens of St. Petersburg and Germany, where they usually failed to live long enough to flower and bear fruit.

Gmelin gave special attention to the comparison between European and Siberian species, and he rejected Linnaeus' idea that all species had been created in one place on an island mountain and had gradually spread out as dry land expanded (Egerton 2007a:80). Instead, Gmelin thought there had been multiple centers of species creation (Larson 1986:459).

Gmelin returned home to Tübingen in 1747 to become a professor at the university, and he published his *Reise* at Göttingen. It was translated into French and Dutch, but not into Russian, because it contained uncomplimentary observations and comments on Russians. A recent historian has high praise for it (Robel 1997:277): "This is one of the rare travel books that manages to unite *experience* with research, is excitingly entertaining yet informative, while all the time its attraction lies in the author's sincerity." Gmelin also made significant contributions to mammalogy (Sokolov and Parnes 1993:69–109).

Illustrative of the extensive preparation for the expedition was the recruitment of 12 students from the Slavino-Greko-Latin Academy in Moscow to study at the St. Petersburg Academy of Sciences, 1732–1733, as potential student interns or assistants for the expedition. One of the first students accepted for the expedition was Stepan Petrovich Krasheninnikov (1711–1755). He was to study plants, animals, and minerals, but he also developed a strong interest in Siberian history and geography. Gmelin was anxious not to arrive at places until they were prepared to receive the academics, and he sent Krasheninnikov to Kamchatka to build houses and collect preliminary information, an enormous responsibility. He sailed to Kamchatka on the *Fortuna*, which began leaking after nine hours. With constant bailing and jettisoning all baggage, they remained afloat until they attempted to enter the Bolshaya River, when the ship fell apart. Krasheninnikov became the member of the expedition with the most extensive knowledge of a peninsula the size of England. His *History of Kamtschatka* (Russian, 1755; see Krasheninnikov 1764) discussed the plants (Manojlenko 1996) and animals (Sokolov and Parnes 1993:109–127), but emphasized their human uses. At the request of the president of the Academy, he drew extensively upon the manuscripts of the deceased Georg W. Steller (discussed in the following paragraphs), and therefore Krasheninnikov's book was a collaborative effort. The first English translation of it (Krasheninnikov 1764) is abridged, has a large fold-out map, and eight illustrations of the geography and habits of the natives, and devotes 100 pages to the natural history of soils, volcanoes, minerals, plants, and animals. The modern unabridged translation (1972) has more maps, illustrations and notes. After his decade with the expedition, Krasheninnikov returned to the Academy, where he defended a dissertation on ichthyology in 1745 and received the title of adjunct. He became head of the Academy's botanical garden, and in 1747–1749 "grew the seeds of similar species that had been gathered in different regions (America, China, Kamchatka, and the surroundings of the river Don) to display the influence of climate on their variability" (Kolchinsky 2004:11). In 1750 he became professor of natural history and rector of the University (Stejneger 1936:115–120, Fedorov 1973). He was one of only 26 Russians who became Academy members in the 1700s (Schulze 1985:327, 332).

Georg Wilhelm Steller (1709–1746) was born the same year as Gmelin and grew up just 90 miles away, but was more adventurous than Gmelin. Steller's family name was Stöhler (he changed it to accommodate Russian pronunciation), and he had a great desire to become an explorer. He became a physician and then volunteered to serve as one for the Russian Army, besieging Danzig in 1734. He also volunteered in November to accompany wounded soldiers sent by ship to Kronstadt, the port for St. Petersburg. In St. Petersburg he found the botanic garden and its botanists, including Messerschmidt. Two years after Messerschmidt's death, Steller married his widow and acquired Messerschmidt's notes that were not given to the Academy. At the Academy of Sciences Steller helped the botany professor arrange and catalog the herbarium and assisted in compiling a catalog of its animal specimens. He heard about Bering's Second Kamchatka Expedition, already long gone. He volunteered to join it and was accepted. He and his wife left St. Petersburg by sled on 15 January 1738 and reached Moscow on the 30th, where she decided not to continue. Steller, during his three-year journey from St. Petersburg to Okhotsk (for a map of his travels, see Stejneger 1936: Plate 29), kept a journal, now lost. He probably stayed in Moscow into the spring, because he compiled a list of its plants. In late 1738 he reached Tomsk, where he became ill, but in early January 1739 he left for Yeniseisk, which he reached on the 20th. There Steller met Gmelin, who was impressed with him and decided that Steller could replace himself in exploring Kamchatka. Gmelin gave him instructions and seven reference works on botany and zoology (Stejneger 1936:46–156, Lindroth 1976, Frost 1988).



Fig. 3. Stepan Petrovich Krasheninnikov after he became professor at the Academy of Sciences. Stejneger 1936: Plate 5.

On 23 March Steller and his assistant Aleksey Fedorovitch Danilov and the illustrator Johann Christian Berckhan reached Irkutsk, on the Irkut River, 40 miles from Lake Baikal. They needed supplies to continue and had a requisition for them, but it took the Irkutsk authorities a year to collect resources to meet their demands. Meanwhile, Steller was busy exploring, collecting, dissecting, and writing observations. Although his travel journal has disappeared, his botanical and zoological observations survived and were later used by Gmelin, Krasheninnikov, and others (Coats 1969:50–51, Stafleu and Cowan 1976–88, V:881–882). Of the 53 Steller herbarium specimens now in the Komarov Botanical Institute, Russian Academy of Sciences, some were collected around Irkutsk (Bobrov 1996). Other Steller herbarium specimens are in the Natural History Museum, London (Sytn 1996). He and his associates took a 250-mile trip on Lake Baikal, where they saw the numerous seal, *Phoca siberica* Gmelin. Steller wondered how the species got there, 1000 miles from its Arctic relatives. On 21 August

they climbed into the Alpine region of the Barguzinian Mountains, where Steller was overwhelmed by the view and fascinated by the plants (quoted in Gmelin 1747–69, IV:106 and translated in Stejneger 1936:168)

Dwarf cedars, dwarf birches, elders and lowly willows creeping humbly along the ground gird the highest tops like garlands on the bald head of an old man. The summit or crest of the mountain, about 3 stadia [versts?] long and 1 wide, did not boast a single shrub or tree, it was covered only with an endless expanse of gray mosses like a blanket nearly a foot thick. In the very center rocks of immense size surrounded a lake of the purest water, but destitute of fishes or other living creatures, 1 Russian league [leuca] in diameter. Among these rocks and along the moss-covered shore of the lake our [new diaphanous] gentian was found, and with it such other plants as Geum, Androsace, Cariophyllata, Arenaria and Pedicularis.

The plants he collected on that trip included *Rhododendron chrysanthum*. (Peter Simon Pallas provided its modern scientific name in 1776; Steller admired Linnaeus, but he wrote before Linnaeus' binomial system became the standard for naming species.) Steller discovered that its leaves are toxic, because a tame deer ate some and fell into a four-hour convulsive stupor. Steller also collected various birds and studied the parasites in their plumage, preserving them between thin flakes of clear mica, common in the region. W. G. Tilesius (1815:401–402) examined these parasites 74 years later and found “they can be drawn and described as if they were alive” (translated in Stejneger 1936:169).



Fig. 4. Kamchatka Peninsula. Bell 1960:57.

On 6 March 1740 Steller's party, in sleds, began their 1624-mile journey to Yakutsk, which they reached on 24 May, after having given up sleds for boats on the Lena River. From there they continued overland to Okhotsk, where Steller met Bering and requested transportation on a ship to Bolsheretsk, 650 miles away. Meanwhile, in Okhotsk there were four boxes of Krasheninnikov's specimens from Kamchatka, which Steller cleaned, dried, repacked, and sent along to Yakutsk with his own collections. Steller also met in Okhotsk Friedrich Plenisner, the artist who would eventually sail to America with Bering (and Steller). On 1 September Steller and a servant boarded the *Nadezhda* for Kamchatka, but two days later it ran aground on a sandbar. They finally reached the Bolshaya River, on Kamchatka's east coast, on 21 September, with Bolsheretsk still many miles inland. In that town Steller met Krasheninnikov, who had explored the Kamchatkan peninsula since his arrival in October 1737. Without formal authority to do so, Steller assumed authority over Krasheninnikov and others, and in early 1741 Steller organized an expedition to explore the peninsula south of Bolsheretsk, using dogsleds. Afterwards Steller sent Krasheninnikov back to Okhotsk to assist Gmelin, if he wanted to come to Kamchatka. It was still unclear whether Bering would take Steller on his voyage to America, but he needed a physician and a mineralogist, and Steller qualified as both. Carpenters built two identical ships for the expedition, the *St. Peter* and *St. Paul*. (Two somewhat different modern models have been built: Gennadi A. Atavin's is in the Anchorage Museum of History and Art and photographed in Frost [2003:115]; D.A. Jensen's is photographed in Jacobsen [1993:35].)

In May, while they were being readied at Petropavlovsk, Steller explored Avatcha Bay and caught two new fish, which he carefully described; they were given modern scientific names later by Pallas (*Cyclopterus gelatinosus*, 1769) and by Tilesius (*Hexagrammos stelleri*, 1810). Altogether, he described more than 30 fish species from Kamchatka, and he first described the life history of Pacific salmon (*Oncorhynchus* [Posselt 1990:213–214, Dgebuadze 1996]). The ships sailed from Avatcha Bay on 4 June 1741, with Bering commanding the *St. Peter*, but they lost contact with each other in a storm (Stejneger 1936:180–256, Steller 1988:54, Frost 2003:128). Fortunately, Steller's *Reise von Kamtschatka nach Amerika* survives and was edited by Academician Peter Simon Pallas (1793), and there are two modern German editions (Steller 1974, Posselt 1990:235–323) and English translations (Steller 1925, 1988). Although I cite pages in the more recent translation, the earlier one contains valuable editor's notes and documents not included in the latter.

Steller's note-taking began immediately, with lists of seaweeds and animals observed, which led him to realize that the plants were drifting in an ocean current, since they often moved in a different direction than the wind. He pointed out this to others on deck but wrote that they thought his claim about sea currents was ridiculous. He saw that seals were much better adapted to hunt food away from land than sea-otters were. The latter stay close to the mainland or islands and were only found on the Kamchatka east coast near islands that connect back to Alaska. Therefore, he concluded that the sea-otter was an American species that spread westward (Steller 1899:212, 1988:57–59).

Assisted by westerly winds, they reached Kayak Island, off the Alaskan coast, on 18 July, and on the 20th Bering sent out an exploratory boat at 8 am but denied Steller permission to go along. Steller exploded in anger; Bering then relented and allowed him and his Cossack hunter, Thoma Lepiklin, aboard the second boat that went ashore at 10 am. Steller collected and dried about a dozen plant species,



Fig. 5. Bering's two voyages in the north Pacific and Bering Sea, 1727–1729 and 1741.

and his list of the first scientific collection of Alaskan plants survives (Frost 1992*b*, 1999, 2003:160–161, Thilenius 1992). He also discovered a native camp (its inhabitants having fled), and he took interesting artifacts that he sent back to the ship with a request that presents be supplied in exchange; this was done, since Bering ordered smoked salmon be taken from a storage pit (Frost 2003:157). The ravens and magpies Steller saw were similar to those in Eurasia, but other birds were unfamiliar, and Lepiklin collected one of them, a jay that resembled one Steller had seen pictured in Mark Catesby's *The Natural History of Carolina* (Egerton 2006:347). This jay indicated to Steller that they had reached America (Steller 1988:78). Steller's Jay (now Alaska's state bird) was given its scientific name, *Cyanocitta*

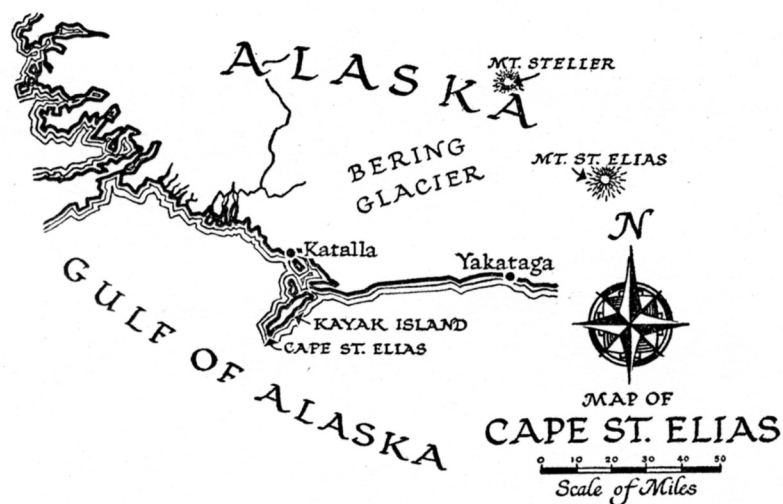


Fig. 6. Kayak Island, Cape St. Elias, and Mt. Steller, Alaska. Bell 1960:92.

stelleri, in 1778 by Johann Friedrich Gmelin. The frontispiece of Leonhard Stejneger's biography of Steller (1936) compares Catesby's drawing of a Blue Jay with a modern drawing of Steller's Jay in the same pose.

And that was the extent that Steller was allowed to explore America. They returned to the ship at sunset, and the next day Bering feared a change in the weather and headed back to Kamchatka. They had filled only 35 water casks and would have to find another island along the way to fill the others. The weather did change on the 22nd, and they sailed by Kodiak Island in fog without seeing it. They did see the Semidi Islands and Tchirikov Island on 4 August but did not stop. Steller saw numerous seals, sea-otters, and porpoises. On 10 August, the assistant surgeon reported that 21 men had scurvy, and Bering probably had it also. On the *St. Peter*, 32 of the 78 men would die of scurvy before the survivors returned to Kamchatka (Stejneger 1936:253–255, Fortune 1992). On 29 August they stopped for water at Nagai in the Shumagin Islands (named for a sailor, Nikita Shumagin, who was the first sailor to die of scurvy), and Steller was allowed to go ashore, where he found a good variety of sea and land birds (Steller 1988:91, 202–203), including the Razor-billed Auk (*Alca torda*; Siskin 1996). He also found several safe springs, but when he returned to the boat, he saw the crew filling casks from a pool near shore. He tried to stop them, pointing out that the water was brackish, but they ignored him, and the brackish water may have contributed to the decline in health of some of those aboard (Fortune 1992). On 4 September they finally saw, and interacted with, Americans (Aleutians), who were in kayaks. Steller thought they had originated in Asia since they wore the same kind of hats as the Kamchadals. He suspected that they only lived on the islands during summer and retreated to the mainland in winter (Steller 1988:97–107). By 26 October, there were 30 sick men, and it was interfering with sailing the ship (Stejneger 1936:290–301, Steller 1988:88–96, Fortune 1992).

On 5 November they sighted what would be named Bering Island; only six casks of bad water remained, and the officers wanted to land. Bering wanted to press on to Avatcha Bay, but they objected that it was impossible to do so. They dropped anchor, and violent waves broke the cable and carried the ship onto a reef. They were in danger of sinking, but a huge wave lifted the ship over the reef into a quiet channel. The crew had learned their mistake in ignoring Steller's advice, and he became one of the most respected leaders in their plight. He collected antiscorbutic plants, and others shot ptarmigans, sea-otters, and seals; with this new diet, some men slowly recovered from scurvy, though it was too late for others. It was assumed that Bering, who died on 8 December, also died of scurvy—until his grave was exhumed in August 1991, 250 years later. His remains were flown to Moscow, where they, along with Steller's report, indicated that he had died of heart failure (Frost 2003:7, Madsen, Petersen

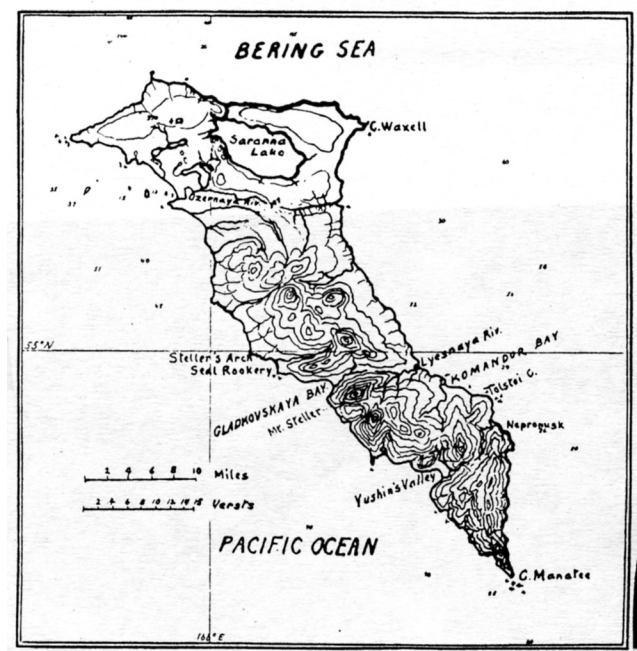


Fig. 7. Bering Island. Stejneger 1936: Plate 19.

and Schiørring 1992, Zviagin 1992). Practically everyone thought they had reached an uninhabited coastal area on Kamchatka, but Steller realized the animals were too fearless of humans for them to be on the mainland. Blue foxes were so fearless they became pests, and even killing some did not deter others from trying to steal food or eat the dead (Stejneger 1936:311–320, Steller 1988:124–141). Steller (1899:196) complained that they carried off his maps, books, and ink.

He had plenty of time to study the plants, animals, and geology of the island, because they were unable to leave Bering Island until 13 August 1742, 8.5 months after arriving. There he made the first thorough natural history survey of any island (and became an expert on the edibility of various plants and animals). He was not allowed to bring his specimens on board the small *St. Peter* that the crew built from the remains of their ship—half the size of the original one—yet his journal survived, as did his treatise *De Bestiis marinis* (Latin, 1751, German, 1753, partial English, 1899) and Pleisner's illustrations for the latter. Steller acquired a dynamic view of Bering Island geology, believing it had once been much larger and wider than in 1741, and he gave five reasons why he thought the rocks lying off-shore were debris indicating its former extent (1988:177–178).

Steller described a half-dozen new species of birds, including the now extinct flightless Spectacled Cormorant, known only from Bering Island (Stejneger 1936:350–351 + Plate 20). However, he made a much more substantial contribution to mammalogy (Sokolov and Parnes 1993:129–162). He provided detailed accounts of the anatomy and habits of Steller's sea cow (*Hydrodamalis gigas*), northern (or Steller's) sea lion (*Eumetopias jubata*), northern fur seal (*Callorhinus ursinus*), and the sea otter (*Enhydra lutris*), all of which he and the crew killed for their meat and (excepting the sea cow) their fur. His entire account of the sea cow is translated into English (Steller 1899:182–201), because he was the only naturalist ever to see one alive, before its extermination in 1768 (Stejneger 1887). He realized that the sea cow was related to the manatees from the Atlantic Ocean described by Georg Marcgraf (1648) and William Dampier (1697). The sea cow was the only vegetarian among these mammals, and Steller described (but did not name) four kinds of seaweed it ate. He noticed that after they fed along shore, uneaten roots and stems of these species washed ashore. He described the sea cow's gregarious habits, mating, care for young, and external parasites, which sea gulls picked from their half-submerged bodies as they fed. Because of its great size—up to 8000 pounds and 30 feet long—this species was the most difficult for him to study anatomically and take measurements. After the survivors reached Kamchatka, he learned that dead sea cows occasionally washed ashore there (Stejneger 1936:353–357, Steller 1988:158–164).

Although fur seals were known at Kamchatka, where they raised their young was unknown until Steller found them doing so on Bering Island. They began arriving in mid-April. To study their habits, he built a hut in the middle of a colony and spent six days observing male fights, mating, parental care, and the behavior of newborn pups. This was probably the first time a naturalist built a blind to observe the behavior of a species. His account was so detailed that his biographer commented that he provided more information on this species than was available for many familiar European species, and that the first modern accounts from the late 1800s added little to what he wrote (Stejneger 1936:358–361, Steller 1899:201–208). He gave similar information for the first time on the sea lion, though in less detail; they ate not only fish, but also sea otter and seals (Steller 1899:208–210). The sea otter was known to residents along the shore of Kamchatka between 50° and 56° latitude, but there they rarely went ashore because of the danger from hunters. Steller provided a detailed account of them, partly because of their

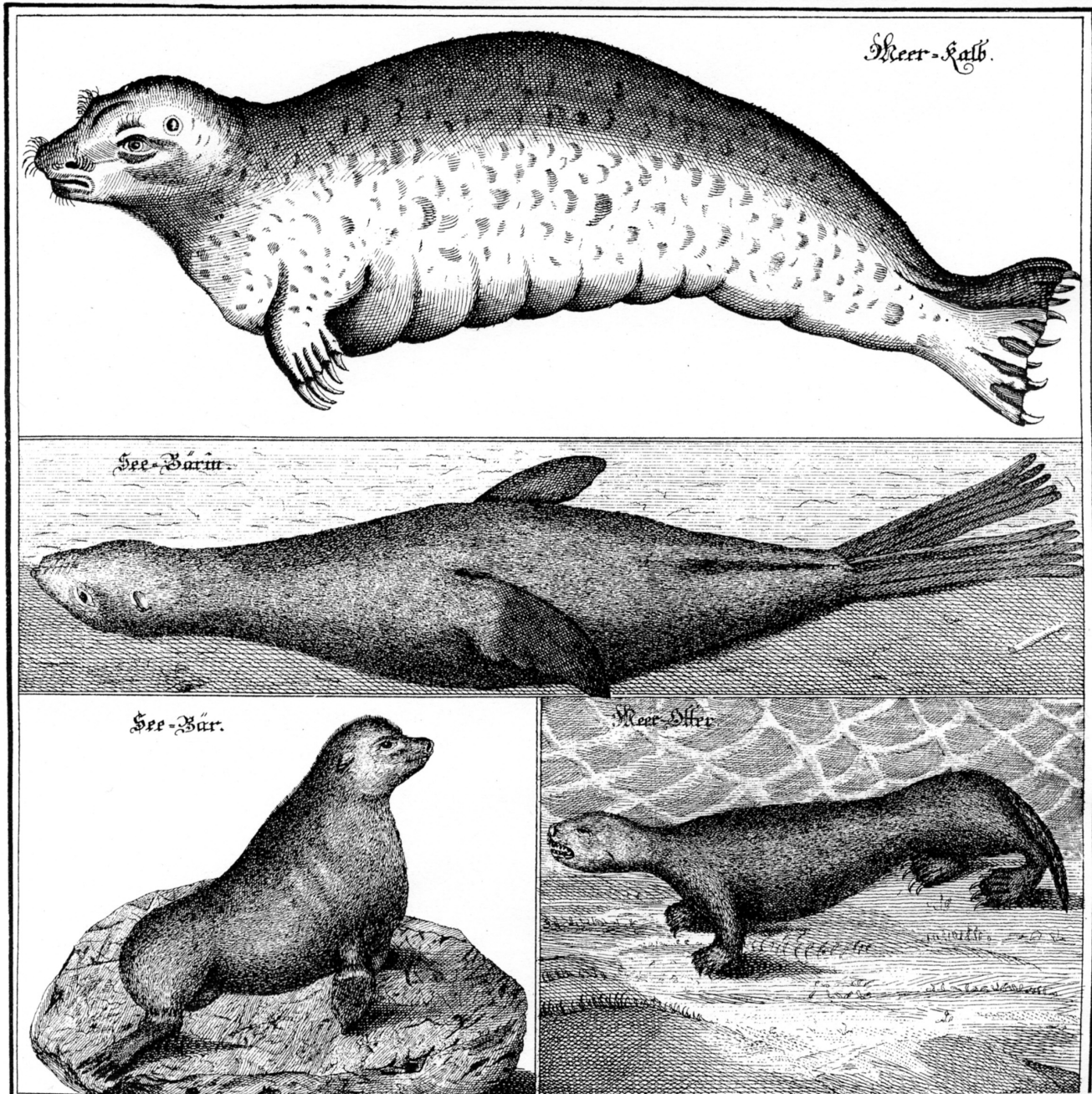


Fig. 8. Steller's sea cow, sea lion, northern fur seal, and sea-otter. Drawn by Friedrich Plenisner. Steller 1753, 1974.

valuable furs. There is nothing sentimental about his accounts of any marine mammals. He characterized sea otters as “stupid, sluggish, surly, sleepy; they lie forever asleep upon the icy rocks; they move slowly, and can be captured without any painstaking or ingenuity”(1899:210, 1988:144–148). Although Steller's accounts are generally reliable, a modern sea otter specialist (Kenyon 1969:285) thinks this statement exaggerates (Steller 1899:214)

When they are caught in the nets they are so frantic that in their despair they bite off their front feet; but if a male and a female are caught together they both lacerate their skins terribly and knock out their eyes.

The crew killed 800 otters in eight months and, if they could have carried more furs on their little *St. Peter*, they would have killed three times more (Steller 1899:215).

They escaped the island on 13 (ship's log) or 14 August (Steller's journal) 1742, and covered the 100 miles to Cape Kronotski on Kamchatka by the 17th, and reached Avacha Bay on the 27th. They had long been given up for dead and their possessions dispersed. On the 28th, Steller and his servant began a 30-mile hike across the peninsula to Bolsheretsk, which they reached on September 5 (Steller 1988:167–169). He worked on his manuscripts until the summer of 1743, when he sent them to St. Petersburg. Meanwhile, he discovered and described an unknown fish in the Utka River (17 miles north of the Bolshaya River) which is now named *Blepsias cirrhosus* (Pallas) (Stejneger 1936:393), and on 5 May he left to explore southern Kamchatka and the Kuril Islands. On 10 May he described a flounder, which Tilesius (1815) named *Pleuronectes stellatus*. He returned by 20 June with specimens and descriptions of other new species of fish and mollusks, which he named (details in Stejneger 1936:396–397 + Plate 24; Posselt 1990:213–214). On 27 July he began his northern exploration of the peninsula and spent the winter with the natives, whom he admired. He learned from them how they hunted whales with nets made from walrus hides (translated in Stejneger 1936:418–419). Robel, a historian of German travel books on Russia, states (1997:280) that Steller's *Beschreibung von dem Lande Kamtschatka* (1774) is "particularly valuable and interesting, when he describes the events at Kamchatka during the 20s and 30s of the century," though Steller had not been there during those decades.

In early 1744 he left for St. Petersburg by dogsled, but decided to take a side trip to Karaga Island, 15 nautical miles off the east coast. Unfortunately, the ice was not thick enough for his sled and dog team, which broke through and were lost. Undaunted, he continued his journey on snowshoes, collecting botanical and zoological specimens as he went. However, he had a dispute with a naval officer, and each sent complaints against the other to the Russian Senate. Although Steller was exonerated, word of it did not arrive from Moscow before he was arrested along the way and forced to return eastward for trial. Yet word finally caught up with him before he had traveled all the way back, and he resumed his journey toward St. Petersburg, but died before arriving (Stejneger 1936:422–487). Steller's heroic struggle inspired three popularizations of his saga in the 1960s (Bell 1960, Sutton and Sutton 1961, Ford 1966), welcomed by those wanting a condensed version of Stejneger's 647-page biography (1936). A more recent popularization (Littlepage 2006) is the best and has a fine bibliography.

There was an unsuccessful Russian revolt at the Academy of Arts and Sciences in 1742 against German dominance, but afterwards the relative numbers of Russians to Germans steadily increased until Russians predominated shortly after 1800 (Schulze 1985:315, 325). (The name changed in 1747 to Imperial Academy of Sciences and Arts.) During this period one of the leading academicians was German naturalist Peter Simon Pallas (1741–1811). He, like Gmelin, was the son of a college professor (at the Berlin Collegium Medico-Chirurgicum) and was a precocious student (Esakov 1974, Stresemann

1975:65–70, Wendland 1992, 1997, Sytin 1997, 1999). He received his medical doctorate at the University of Leiden in 1760, at age 19, with an important dissertation on parasitic worms (to be discussed in part 30 of this history, on invertebrate zoology and parasitology during the 1700s.) In 1767 he accepted an invitation to become an academician at the St. Petersburg Academy, and he retained that affiliation until the last year of his life, when he returned to Berlin. In 1768 he became “chief architect and guiding spirit” (Vucinich 1963:152) of another wave of Academy exploring expeditions, and he traveled to Lake Baikal and the Transbaikalia Mountains and back. Four other expeditions at the time were also led by capable naturalists, one of whom, Ivan I. Lepekhin (1740–1802) is included in the *Dictionary of Scientific Biography* (Fedoseev 1973). All these expeditions experienced difficult conditions and there were a number of casualties on them (Kolchinsky 2004:111).



Fig. 9. Peter Simon Pallas about 1767.
Engraved by Johann Conrad Krüger.

Pallas published his findings in *Reise durch verschiedenen Provinzen des russischen Reichs in den Jaren 1768–1773* (three volumes in five parts, 1771–1776 [Pallas 1967a]). The same historian who praised Gmelin’s and Steller’s travel volumes acknowledged that Pallas provided valuable information in his volumes on flora, fauna, and minerals, but complained that he “did not put the people at the centre of his work” (Robel 1997:279). Kolchinsky (2004:111) considers this work to be “the origin of biogeography and ecology.” Although I credit Buffon and Linnaeus with the origin of biogeography (Egerton 2007a, b), and the ancient Greeks with the origin of ecology (Egerton 2001a, b), Kolchinsky’s insistence on the importance of Pallas’ 1771–1776 volumes for the development of these two sciences is valid. Pallas divided the region he explored into six floral provinces on the basis of topography, which Larson (1986:462) summarizes

The first change in vegetation, he wrote, began east of the Urals, where a Pannonian flora was dominant. From Irtisch toward the foot of the Altaic Mountains the change was even more marked, while the mountains offered a flora comparable to that of the Jenissei. On the heights beyond the Ob grew plants found, to the west, only in the Altaic Mountains. Above the Jenissei were many mountain plants, some native, some common to a district south of the Baikal, which seemed to be their point of origin. The lower mountain area between the Jenissei and Baikal, however, was dominated by a cold forest and meadow flora. The mountain region around Baikal offered the most rare plants, some growing in warm, open fields and others on snowy peaks and in cold valleys. Finally, high alpine plants were found in east Siberia and Kamtschatka, on low mountains, plains, and in swamps.

In the 1770s Pallas made an important geological survey of the Ural Mountains and published a theory of the earth (Carozzi and Carozzi 1991, Wendland 1992, I:573–627, II:1068–1070). He began publishing a *Flora Rossia* (Volume 1, Parts 1–2, 1784–1788; Volume 2, Part 1, 1815), the first attempt to provide a guide to Russian, as opposed to Siberian, plants described by Gmelin (Stevenson 1961:436–439, 427–428, Shetler 1967:44, Coats 1969:52–56, Stafleu and Cowan 1976–1988, IV:20–27, Wendland 1992, I:391–438; his herbarium is now in the Natural History Museum, London [Sytn 1996]). Pallas' Russian biographer has retraced some of his journey and recollected some of the same plants (Sytn 1997).

Pallas' various zoological studies included *Spicilegia Zoologica* (14 fascicles, 1767–1779). In 1777 he argued that “The seals, some fish, and marine shells, which the Caspian Sea shares in common with the Black Sea makes this former communication [between them] almost indubitable, and these same circumstances also prove that Lake Aral must have been joined to the Caspian Sea” (translated in Larson 1986:484). Pallas' later *Zoographia Rosso-Asiatica* treats birds and mammals in Volumes 1–2 (1811) and fish, amphibians, and reptiles in Volume 3 (dated 1814–1827, according to Svetovidov 1981:48–50), with accounts of 872 species, mostly new to science (Sytn and Borkin 2007:67). Much of the delay in publishing the latter work was caused by the German artist C. G. H. Geissler, whom Pallas chose to illustrate the specimens he had collected. He may have been talented but was unreliable, as Svetovidov (1981:47–48) explains. The *Zoographia* made important contributions to biogeography and ecology (Hofsten 1916:256–257, Svetovidov 1981, Wendland 1992, I:366–414, 560–562), including important studies on geographic variation of species over their ranges (Walters 2003:69–72, 190–200). However, these studies did not lead him to believe in the evolution of species (Kolchinsky 2004:112). He summarized some of his zoological findings in letters to the British naturalist Thomas Pennant (Pallas 1967; we met Pennant in Part 26, as correspondent with Gilbert White [Egerton 2007d]). Pennant made good use of Pallas' data in his *Arctic Zoology* (two volumes + supplement, 1784–1787) which, despite its title, was mainly on northern birds and mammals and not limited to the Arctic.

Pallas also wrote (1781–1783) nine items on the history of Russian exploration in the North Pacific since Bering and Steller, which are translated in Masterson and Brower (1948, see also Belov 2000). In 1793–1794 Pallas explored near the Caspian Sea, the Caucasus Mountains, and the Crimea. He then settled in the Crimea and published *Reise in die sudlichen Statthalterschaften des russischen Reichs in den Jahren 1793 und 1794* (two volumes, 1799–1801). Since the English translation of Pallas' *Travels through the Southern Provinces* quotes extensively from his earlier *Travels through Different Provinces of the Russian Empire*, the later work (Pallas 1812, I:21), serves as an example of both works. His travel books follow in the geographical tradition of Messerschmidt, Gmelin, Krashennnikov, and Steller, in which natural history was part of the survey of natural resources that might be exploited for human use. That, however, was an adequate framework for observing plants and animals interacting with their environment, as Steller had well illustrated. Pallas' numerous illustrations and maps—practically all are fold-outs—are well executed. The landscapes tend to show how the people used the land, with domestic scenes in the foreground and natural landscapes usually in the background. Throughout the work, he commented on native plants and their affinity for certain soils and climates, but except for insect pests that infected crops, he discussed in one chapter all the animals encountered, wild or tame. Here is a

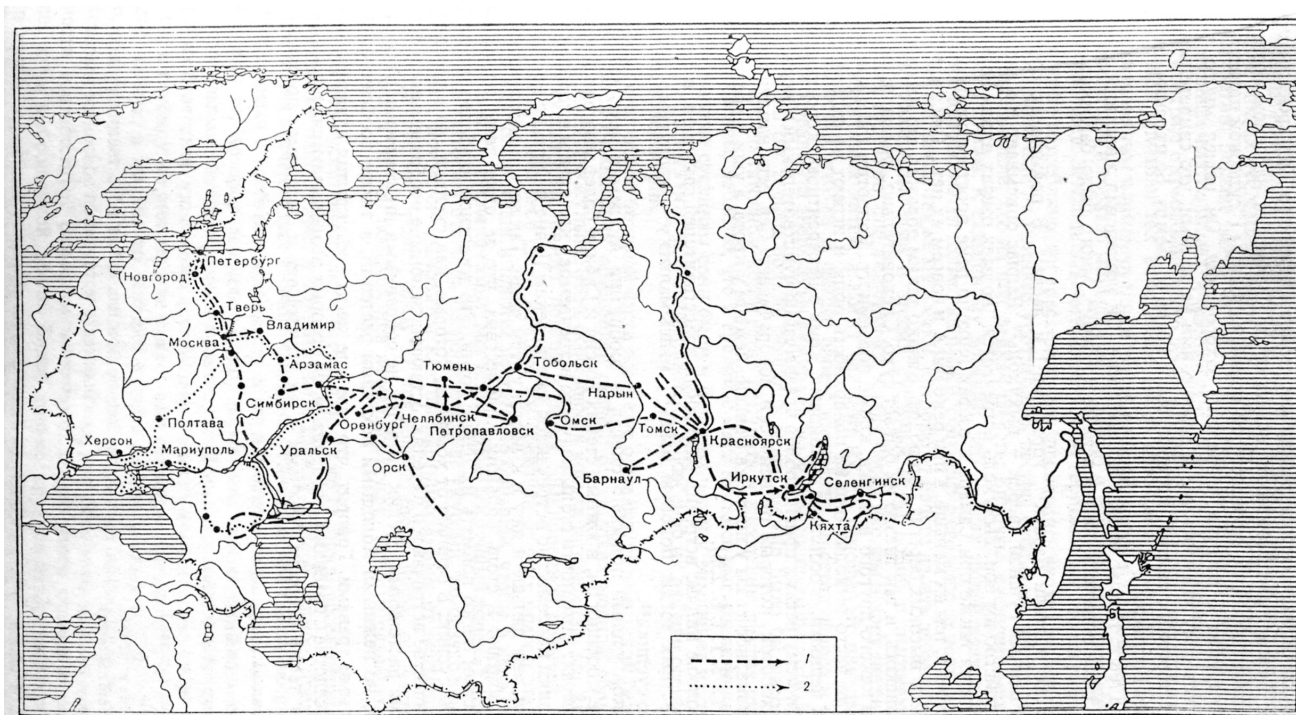


Fig. 10. Pallas' two expeditions: (1) Siberia, 1768–1774, and Crimea, 1793–1794. Sokolov and Parnes 1993:241.

summary of one of his general descriptions (Pallas 1812, I:29–33). On 22 September 1793 he reached the Soura River at Simbirsk; the soil was generally of loam or potter's clay, black in low situations and frequently sandy on eminences; woods on hills included pines, but in the valleys and on plains consisted of oak and linden; linden was good for honey bees; fields sown early with winter grain had been devastated by a caterpillar, *Phalaena frumentalis*, which had within a few years become a plague in Kasan; however, fields sown late escaped injury because damp and cold weather killed the insects before the plants grew above the soil; farmers should try burning straw from wheat, buckwheat, and peas and spreading the ashes over the fields; the black soil, up to two feet thick, originated from forests that formerly covered the region.

In the chapter on animals, Pallas (1812, II: Chapter 8:452–466) illustrated the Bactrian camel (two humps) that was native to the region and described its domestic use, but not its habits or physiology; he discussed the three varieties of sheep and the goats raised in the Crimea; about 20,000 wild hare skins were exported annually from Perekop; stag were found only in the Tshatyrdag, and bear were absent; wolves, foxes, and badgers were numerous in the hills; weasels, which here did not turn white in winter, were rare in the plains.

There were plenty of nuts and acorns, but no squirrels; a small shrew-mouse inhabited the banks of the Beeyouk-Ousehen River but was not seen elsewhere; the grey house rat and common mouse were



Fig. 11. Siberian mountain weasel (*Mustela sibirica*),
drawn by C. G. H. Geissler. Pallas 1786:493. Courtesy
of Lev Y. Borkin.

common around dwellings, but there were no black rats; in the Black Sea, small seals and dolphins were common. Although he itemized a good number of bird species he found in the Crimea, none were very abundant. Yet, even if cranes were scarce, he attributed the scarcity of snakes to crane predation. There were large frogs, *Rana ridibunda*, and abundant spotted croaking toads, *R. vespertina*. There were two species of land tortoises that he did not describe or name. He devoted three pages to freshwater and saltwater fish, but found none were abundant, perhaps due to heavy fishing. He named, but did not describe, over two dozen Crimean insects, some of which were abundant, but he was surprised that there was not a greater variety.

Like Steller, Pallas wondered how seals reached Lake Baikal, “so many hundred leagues up the rivers, that flow from this Lake into the northern Ocean...” (Pallas 1967b:31). He speculated that they

were left in the lake after the Deluge (of Noah). Pennant was especially interested in birds and mammals, and Pallas sent him annotated lists for the Russian Empire. The bird list is lost, but the mammal list of 107 species is published in his letters to Pennant (Pallas 1967b:58–95); later, he sent two addenda of six more species of mammals (Pallas 1967b:96, 137). Pallas thought the Russian squirrel differed from the Hudson Bay squirrel, but that the American bison seemed similar to the Lithuanian or Polish Urus (Pallas 1967b:100, 103). His comments about the Siberian weasel are representative of the data he sent to Pennant (Pallas 1967b:69)

More slender than the Polecat, in proportion nearer to the Ermine, all over of a bright yellow, nearly fox or orange coloured, with a bla[c]k & white face, tail pretty long & bushy. It begins in the Altaic mountains, between the Irtysh & Ob, from whence it is common in woody mountains to the very Amur & Lake Baykal; but nowhere spreads to the north so far as the Sable, with which it has great resemblance in manner & in the choice of its' food & haunts. None in Kamtschatka.

Pallas' substantial contributions to mammalogy are discussed in detail by Sokolov and Parnes (1993:233–391), with reproductions of 22 of his illustrations and substantial quotations (in Russian).

This partial survey of natural history explorations under Russian state sponsorship is roughly comparable to my survey of the informal explorations in America during the same period (Egerton 2006, 2007c). Conditions in Russia and the North Pacific were, however, much more difficult than in eastern America. Excepting the heroic achievements of the solitary Messerschmidt (who did receive state support and was permanently exhausted by his efforts), state sponsorship of a group endeavor was necessary to achieve in Russia what was done more informally in America. Bering was one of the greatest explorers in history, and his expeditions were among the largest. There were no scientists on his first expedition, but the second expedition made up for that. The records of these sponsored expeditions were much more extensive than the informal records for America.

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Acknowledgments

Dedicated to the memory of Vassily V. Babkoff (1946–2006), Moscow Institute for the History of Science and Technology, who suggested this subject to me, and who would have critiqued my manuscript had he lived until I finished it. I am very grateful for the numerous suggestions made by Dr. Eduard I. Kolchinsky, Director, Institute for the History of Science and Technology, St. Petersburg, and Dr. Leo J. Borkin, Department of Herpetology, Zoological Institute, Russian Academy of Sciences, St. Petersburg.

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