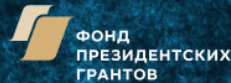Lava flows on the background of Ichinsky Volcano. G. Markevich

summer the water reaches the maximum level then gradually subsides while filtering through the lava dam. This results in the sustainably growing plankton crustacea concentration near the surface during summer reaching its maximum in autumn. It creates a stable food supply for planktivorous chars. At the same time the morphs stay reproductively isolated due to the presence of two separate spawning sites (in the lake and in the tributary). Thus the stable hydrological cycle replicating multiple times not only triggers but also maintains the specialization of Dolly Varden being the man behind the curtain of evolution.

The ecosystem of Lake Angre is particularly sensitive to human influence due to its diminutive size. In 2017 both chars endemic to Lake Angre were included in the regional Red Book by Kronotsky Nature Reserve.

G. Markevich, E. Esin

Shelihov Gulf
Karaginskiy Island
Lake Angre
Klyuchevskaya Sopka
Bering Island
Ichinsky volcano
Kronotsky Natural Reserve
Petropavlovsk-Kamchatskiy
South Kamchatkan wildlife sanctuary named after T.I. Shpilenok
Paramushir Island
Lake Angre location. G. Markevich

КРОНОЦКИЙ ЗАПОВЕДНИК

EVOLUTION UNDER MINIMAL CONDITIONS: CHARS FROM LAKE ANGRE
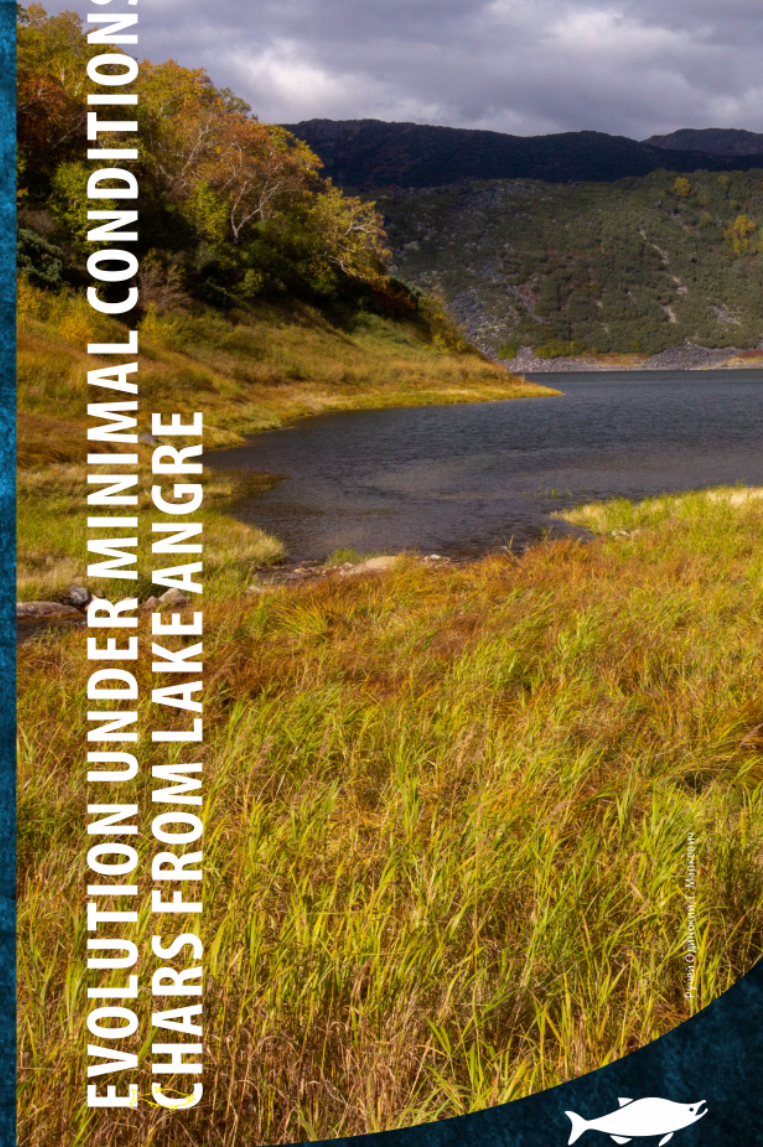
View of Lake Angre. G. Markevich

system be to maintain speciation arising from environmental diversity? Nowadays the emergence of two charr morphs is confirmed for an islandic lake Galtabol as small as 1,2 sq km, while the explosive divergence of cichlids proceeds in African crater lakes approximately reaching half of square km.

CHARRS OF LAKE ANGRE

Kamchatka witnessed a striking exemplar of charrs falling into two independent morphs in the extremely small Lake Angre at the piedmont of Ichinsky Volcano on the territory of Bystrinsky Nature Park. The lake was formed 6500 years ago when the valley was blocked by a lava flow. It is only 0.23 km in square with no surface runoff.

The only fish populating the lake is Dolly Varden, which has split into morphs with different lifestyle, feeding type and growth rate over a relatively short period of time.

The small-sized morph (up to 20 cm length and 140 g weight) lives in midwater, feeding on plankton crustacea. The large morph (up to 35 cm length and 350 g weight) feeds mainly on benthos, while switching to cannibalism in winter. The age structure of both morphs is similar. The spawning of the small ones takes place in winter on the slope of the lake hollow, while of the large one - in autumn in the sole tributary.
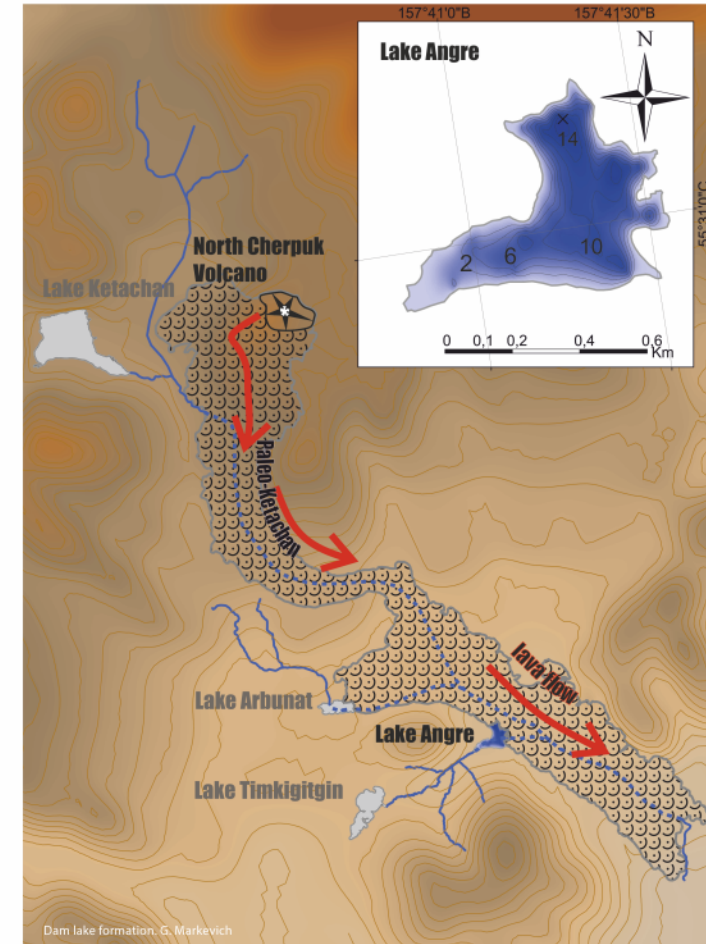

Dam lake formation. G. Markevich

NEW SPECIES IN SMALL ECOSYSTEMS

The enigma of how new species originate has generated heated debates and numerous hypothesis have been put forward. The evolutionary mechanisms have been on the agenda of biological thinking for more than 150 years as one of the key issues in biology. Even in the absence of geographical barriers new groups of animals frequently emerge under the influence of multiple environmental factors.

In northern fishes, evolution within an ecosystem has been particularly productive: in dozens of lakes several species (morphs) have evolved from a single ancestor. As a rule, there is a notable parallelism between genetically unrelated morphs as far as ecological niche, anatomy and morphology are concerned.

All these solely owe to the environment shaping the morphs in the direction complying with the surrounding nature. The striking similarity between historically recurrent morphs points to the existence of some universal evolutionary laws, which haven't been discovered yet. Thus, one of the fundamental questions is: How small can an eco-

Large morph

Small-sized morph

External appearance. E. Esin

THE FACTORS BEHIND THE EVOLUTIONARY CURTAIN

The planktivorous morph is unique among Kamchatkan Dolly Varden chars, as it has never been observed in any of the other water basins across the peninsula. Its emergence is thought to have been caused by the hydrological cycle of Lake Angre. Greater depth (up to 25 m) and significant water-level fluctuations over a year (up to 5-6 m) distinguish it from other lava-dam lakes of Kamchatka. By the beginning of