An appraisal of the report by Einar Lönnberg (1905) on fishes collected by the Swedish South Polar Expedition

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…qu'enfin l'art de la critique était aussi
peu connu alors des naturalistes que des
historiens, ce qui est beaucoup dire…
George Cuvier, Discours préliminaire,
Recherches sur les ossements fossiles de
cuadrupèdes.

ABSTRACT: During 1901 and 1903 the Swedish South Polar Expedition collected 52 fish species from Tierra del Fuego, Malvinas Islands, South Georgia and Antarctica. Axel Johan Einar Lönnberg, who later also studied other Magellanic fishes, reported these species in 1905[1]. He described 23 new species. Only three of them, *Notothenia karlandrea*, *N. dubia* and *N. brevipes*, resulted synonyms of *Patagonothen sima*, *Trematomus vicarius* and *N. tessellata*, respectively. Lönnberg described the following new species: two from Tierra del Fuego, Isla de los Estados (Staaten Island) and adjacent seas (*Patagonotothen brevicauda* and *Muraenolepis microps*), two from Islas Malvinas (Falkland Islands) and the Burdwood Bank (*Crossostomus fasciatus* and *Careproctus falklandicus*), seven from South Georgia Islands (*Careproctus georgianus, Trematomus vicarius, Trematomus hansoni georgianus, Lepidonotothen larseni, Gobionotothen gibberifrons, Artedidraco mirus,* and *Champsocephalus gunnari*) and three from the "true" Antarctic Region (*Chionodraco hamatus, Artedidraco skottsbergi* and *Lindbergichthys nudifrons*). He also described six new pelagic or benthopelagic species (*Sio nordenskjoldi, Krefftichthys andersoni, Protomyctophum paralellum, Gymnoscopelus braueri, Borostomias antarcticus* and *Bathylagus gracilis*). This work has been considered a valuable addition to the systematics and biology of the Graham Land and neighbouring islands.[2] It is also an important contribution to the ichthyology of the Magellanic area and the Subantarctic islands. Lönnberg also contributed to the biological concept of Antarctica as a "*life zone*" and to its zoogeography. The contribution of the Swedish South Polar Expedition and Lönnberg to the knowledge of the diversity of the South Atlantic and Antarctic fishes is substantial, and is widely recognised.

1 INTRODUCTION

During 1901 and 1903 the Swedish South Polar Expedition collected 52 fish species from Tierra del Fuego, Islas Malvinas (Falkland Islands), South Georgia and Antarctica.

Axel Johan Einar Lönnberg, who later also studied other Magellanic fauna, made the report on these fishes,[1] describing 20 new species.

In his review of the Antarctic fish fauna, Andriashev[2] considered Lönnberg's work a valuable addition to the systematics and biology of the Graham Land and neighbouring islands. But Lönnberg greatly contributed also to the knowledge of the Magellanic fauna, which is the one living around the southern tip of South America, particularly off Argentina.[3,4,5,6]

Ringuelet,[7] in a brief historical essay on Argentine marine ichthyology, wrote that "*During 1901 and 1903, the Swedish South Polar Expedition ship Antarctic, under the*

direction of Dr. Otto Nordenskjöld, obtained fishes from Fuegia, Malvinas Islands, the Burdwood Bank and neighbouring waters"…[1] "*increase the list [of Argentine fishes] with seven species of which two resulted synonyms*". This author, two years later (1907), studied the Magellanic fishes collected by captain R. Paessler (1886–1904), and those obtained by Dr. W. Michaelsen (1892, 1893) with the ship Sara from the Naturhistorischen Museum of Hamburg. He added nine species to Magellanic waters. Miller,[8] quoted 12 species reported by Lönnberg[1,9] from the Weddell Sea and adjacent waters.

2 LÖNNBERG'S CONTRIBUTIONS

A summary of new fish species resulting from the work of Lönnberg, based on material collected by the expedition, according to his own exposition and taxonomic studies made subsequently, is given in Table 1.

Though in his own words "*the expedition could not afford to spend much time for exploring the deep sea and it was not especially fit out for such work*", Lönnberg described

Table 1. Number of species obtained by the Swedish South Polar Expedition from southern South America, the Subantarctic islands and Antarctica, and new species described by Lönnberg.

Sample area	Number of species collected	New species/genus
Tierra del Fuego, Isla de los Estados (Staaten Island) and adjacent seas	12 species	2 new species: *Patagonotothen brevicauda* *Muraenolepis microps*
Islas Malvinas/Falkland Islands and Burdwood Bank	14 species	2 new species: *Crossostomus fasciatus* *Careproctus falklandicus*
South Georgia Island	10 species	7 new species: *Careproctus georgianus* *Trematomus vicarius* *Trematomus hansoni georgianus* *Lepidonotothen larseni* *Gobionotothen gibberifrons* *Artedidraco mirus* *Champsocephalus gunnari* *Artedidraco* is also a new genus.
"True" Antarctic Region	7 species	3 new species: *Chionodraco hamatus* *Artedidraco skottsbergi* *Lindbergichthys nudifrons*
Pelagic and benthopelagic species	9 species	6 new species: *Sio nordenskjoldi* *Krefftichthys andersoni* *Protomyctophum paralellum* *Gymnoscopelus braueri* *Borostomias antarcticus* *Bathylagus gracilis*

six new species of four families including ridgeheads (Melamphaidae), lantern fishes (Myctophidae), snaggletooth (Astronesthidae) and deep sea smelts (Bathylagidae). So his statement is a bit modest. These species were captured mainly at 49° 56' S, 49° 56' W in waters 2700 m deep, and were reported also in Lönnberg.[10]

The fish species described in the report are only a part of the material obtained by the expedition, as a considerable amount was lost during the wreck of the "*Antarctic*". This did not impede that the remaining one formed the basis of a more than considerable contribution to the ichthyology of South America and Antarctica.

Illustrations in Figure 1 show the general aspect and morphology that are rather common in Subantarctic and Antarctic fishes, as can be seen in some species described by Lönnberg. Different geographic areas are often inhabited by different groups of organisms, and in each one fishes look different. Cold waters have many of their own. This is because animals exposed to similar selection pressures are likely to evolve similar adaptations. This principle of convergence states that where pressures on the organisms are particularly extreme, they will converge – be alike- in morphology, physiology, behaviour and ecology, approaching optimal designs for that particular set of environmental forces.[11]

Though we are considering research work made a century ago, the results look very positive nowadays. Moreover, the style of the writer is very concise and to the point, in so to speak, a modern fashion; or may be, in a classic one. Günther style was similar. Several observations on nomenclature, meaning the manner and rules for naming the organisms, are rather clearer and more serious than many written presently.

Most of Lönnberg statements on zoogeography are still valid, not in a historical but in a factual sense. Gon and Heemstra[12] state that Lönnberg and Regan (some years later), were the first to define the Antarctic Region on the basis of physical and biological characteristics. Lönnberg defines the region considering summer temperatures of the sea below 0ºC from the surface to 1450 m, including coastal Antarctica and the South Shetland Islands. Lönnberg disagreed with Dollo on the position of the South Shetlands, considering that they were truly Antarctic, a criterion followed at present.[13] He also noted the high endemism of fish species around South Georgia, and attribute it to a long and complete isolation from other shores or shallow waters (the island is surrounded by water more than 3000 m deep).[13] On 1906 Lönnberg published a report on the fishes of South Georgia, adding the new species *Chaenichthys aceratus* (now in the genus *Chaenocephalus*), and the new genus *Chionodraco*, for his previous species *Chaenichthys hamatus*. One of Lönnberg's species, *Lindbergichthys nudifrons*, was recently reported from the Beagle Channel, Tierra del Fuego, and is considered an example of "*The very limited interchange between the fish faunas of the Patagonian – Falkland and the Antarctic regions…*".[14]

We particularly like Lönnberg's discussion on the relationship between geographic distribution and taxonomic level, and his noticeable advanced form of discussing isolation. Lönnberg wrote that:

"*The localities group themselves, however, naturally round certain geographical areas, viz. Tierra del Fuego with Staaten Island and surrounding seas, the Falklands with the Burdwood Bank, South Georgia and finally the South Shetlands-Graham Land complex of islands and lands. I have therefore found it most suitable to treat the fishes of these areas separately, the more so as, as will be shown in the following, these areas from a zoogeographical point of view, to a certain degree, form units. By this I mean that the fishes of one such area are not all of them wholly identical with those of another area, but at least some of them represented by similar fishes which in certain instances, although in many respects corresponding, are*

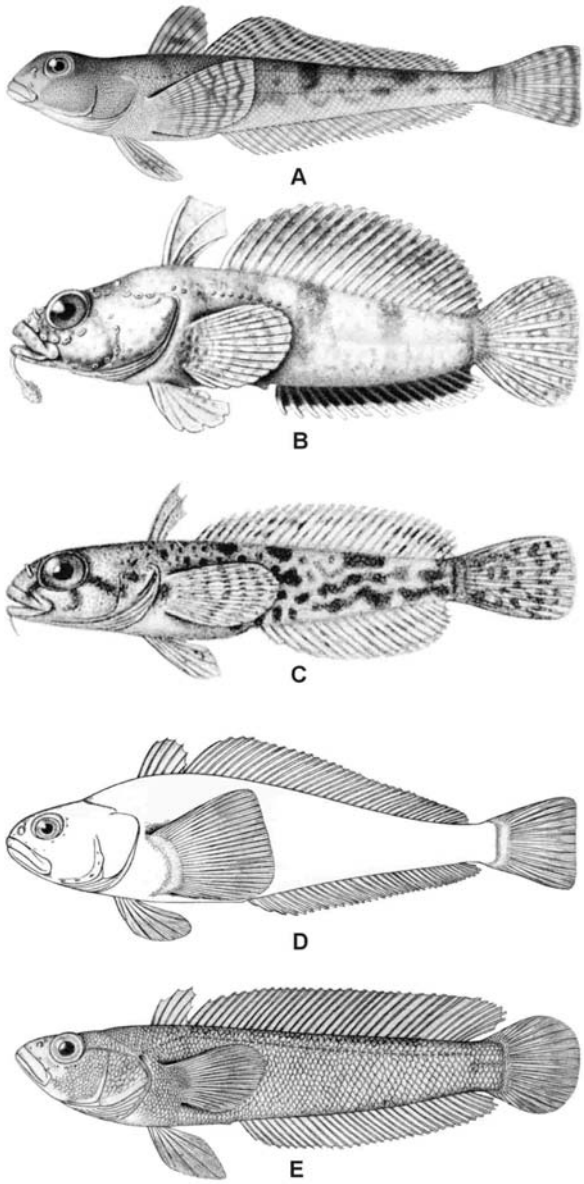

Figure 1. A: *Gobionotothen gibberifrons*, B: *Artedidraco mirus*, C: *Artedidraco skottsbergi*, D: *Patagonotothen brevicauda*, E: *Trematomus hansoni georgianus*.
All after Lönnberg, 1905a.

specifically different, in others only subspecifically, or racially. This difference is a natural result of isolation, because the shore fishes of one district have been prohibited by wide interjacent areas of deep water to interbreed with their congeners in another district".

He combines these arguments with biological ones, particularly the presence of demersal eggs in many shore cold water fishes.

Lönnberg also provides valuable observations on the biology, particularly reproduction and anatomy of cod icefishes or nototheniids. There is also evidence of ecological thinking, in the insistence on the kinds of bottoms and on the importance of temperature, widely accepted today. This is charmingly shown in his description of "Fishing at Paulet Island" through holes in the ice, where he considers abundance, size of fishes, depth (8 m to 20 m), kind of bottom (stony with a rich growth of algae), and constancy of temperature at surface and under the ice (respectively −1.9°C and −2.0°C). This is probably the best place to remember that most fishes were obtained and many observations were made by K.A. Anderson, zoologist of the expedition.

3 FINAL CONSIDERATIONS

From 23 species that Lönnberg described in his report, 20 are still valid. Only 3 resulted synonyms, meaning that they were already described. So, the expedition and its ichthyologist, discovered a nice fauna, composed by 20 species including a new genus. It is interesting to see how a work made so long ago has not been affected by time. According to Knox,[15] there are 120 fish species in Antarctica. Being so, Lönnberg described over 16% of them. This is a wonderful contribution by any standard, old or new. May be the only advantage Lönnberg had was to be a pioneer. Only thirty years before the Swedish Expedition, in places like Madeira during the voyage of the Challenger, "*fish almost unknown to the naturalist might be found in the market*".[16]

Moreover, these results allow us to treat some points related with understanding of science, particularly, the close relationship between science and the real world as we perceive it.

Lönnberg deplored the lost of material collected in the Bransfield Strait, but several notes and color sketches on that material subsist, and he included them in the report, because "*these notes are, although incomplete, of great interest*". This is an important trait in which science differs from other disciplines. We may have the near absolute security that there will be new specimens which will correspond to descriptions, figures and information of Lönnberg. In fact, the revision of modern sources shows that this is so.

In a more general sense, the Swedish Expedition is an example of a part of science somewhat forgotten in the heavy philosophical web of modern epistemology. This aspect is the role of discovery in the advancement of science. We refer to the situation in which certain facts may not always be previewed, and that there is often a lot of chance in the process of research. New facts or new places, or new communities, they were often unexpected. The discovery of x-rays was always cited in this context. As Dyson[17] says, talking about the discovery of gamma-ray bursts, "*it was totally unexpected; it was totally unintended; it arose from a new tool of observation, rather than from a new idea*". Borges[18] mentions that in ancient Greek literature a black swan means an impossibility; they did not know that there are black swans in Australia. In the case of great expeditions, it can be said that there is an active belief in that exploration will provide new facts and material, but the existence of new species is only forwarded in a rather generalised form.

The richness of fish species discovered by the expedition, and the fact that the validity of practically all of them survived during near a century of revision, examination and testing, many of them indeed without even nomenclature changes, is the best proof of the consistency of the work of Lönnberg.

The contribution of the Swedish South Polar Expedition, and Lönnberg, to the knowledge of the diversity of the South Atlantic and Antarctic fishes is substantial, and is widely recognised.

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