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Three endangered South American grebes (Podiceps): case histories and the ethics of saving species by human intervention

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Investigations by the author on Neotropical grebes are reviewed with emphasis on threats to the populations and their management. *Podiceps andinus* died out in the 1970's due to habitat destruction. *Podiceps taczanowskii* (300 ind.) is threatened by environmental contamination and plans to regulate its only breeding lake. *P. gallardoi* (250 ind.) is apparently vanishing for natural reasons. The appropriateness of using strong manipulation for saving vanishing populations may depend on whether they are subject to man-made threats or to processes of natural community evolution.

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1. Introduction

In a world currently remodelled by the accelerating pace of human interference, a particular worry among biologists is for species threatened by total extinction. There is widespread agreement on our commitment to preclude such events, although the means, notably the use of manipulation on the population level, are debated (Myers 1979). One problem often neglected is that extinction and local extirpation are not always due to human pressure on nature, but also have natural causes. These may be anything from stochastic fluctuations in small populations or climatic catastrophes to long-term climatic trends. The paleontological record documents a current invasive replacement of archaic biota by modern ones and, according to modern community theories (if correct), diffuse competition in saturated communities should lead to an equilibrium state between the multiplication of species by speciation, and extinction (Rosenzweig 1975).

In the latter case, any manipulation done to rescue a vanishing species is an intervention in nature. Although ethical arguments exist for preventing extinctions of any kind, one may as well argue for restricting our conservation efforts to preventing the extinction rate from increasing above the natural level (see e.g. Terborgh 1974, Matthews 1983). This controversy is pertinent to us in Scandinavia in the case of the Lesser White-fronted Goose *Anser erythropus*, where drastic manipulation is considered (cross-fostering with another species in order to change the migratory habits) despite the fact, that the reasons for the decline are unknown.

I will not argue further on the theoretical level, but instead exemplify some of the problems by cases from my personal research on grebes, Podicipedidae. My primary goal is to study how ecological isolation of species evolves and to what degree faunas represent equilibrium situations caused by interspecific competition. Grebes are opportune for this study because they may be extremely sedentary when living in stable environments. Isolated under such conditions, they readily evolve local taxa, which in some cases are flightless or virtually so. These local stocks provide natural experiments on the significance of the addition of an extra species to a fauna. Besides, the study automatically brings me in contact with serious conservation problems.

My present examples are from South America, which altogether has no less than 440 bird species with less than 50 000 km^2 total range. Far outside the normal Scandinavian sphere of interest, the Neotropics nevertheless are worthy of our attention, because one of the

most profound environmental problems are illustrated so well: The inverse relationship, on the global plane, between the magnitude of environmental destruction and the professional ability, economic basis or political will to act against it. The first example is from one of the least efficient countries in fighting threats to the natural environment.

2. The Colombian Grebe

The vaste savannas which today cover the Bogotá and Ubaté plateaus at 2600 m elev. in the Eastern Cordillera of Colombia, were covered by large swamps and weedy lakes during the Pleistocene (van Geel & van der Hammen 1973). By the time of the Conquista, the lakes were strongly overgrown by rushes and floating-leaf vegetation, but still the entire savannas had a character of wetlands. The district is a core area for endemic taxa of wetland birds, and has apparently been one of the main centres of speciation among Neotropic waterbirds (Fjeldså in press). The area was the home of the Colombian Grebe *Podiceps andinus*.

Today the wetlands have been almost totally drained and turned into pasture, *Eucalyptus* groves and areas for greenhouses. The few remaining wetlands on the Bogotá savanna are marshes with very little open water (Laguna de la Herrera, Parque la Florida), temporarily dry (Embalse de Muña) or strongly polluted (places associated with Rio Bogotá). The Ubaté savanna still has two large lakes but, due to soil erosion after the clearing of all primary forest, they are so turbid as to be unsuitable for waterbirds. Only one potential birdlake, Lake Tota, is left, at 3040 m elev.

Although local biologists have been aware of the habitat destruction, no qualified ecological studies and no biological studies of endemic waterbirds have been made. The alarm was given by R. Ridgeley as late as in 1977 and Lake Tota was immediately placed on ICBP's top priority list. However, when the first detailed studies were made, Sep.-Oct. 1981 by myself and Jul.-Aug. 1982 by an ICBP-expedition under the leadership of J. Adams and P. J. Espin, the Colombian Grebe appeared to be extinct already (ICBP 1983:32; details still unpublished). 18 study skins, most of them in the main university of Bogotá, are all that is left of the once numerous species.

Notwithstanding the lack of previous ecological studies, the progress of the extinction can be reconstructed crudely from information from local people. The grebe disappeared from the Bogotá savanna in the 1940's, and from the Ubaté savanna as soil erosion became severe in the 1950's. In Lake Tota the decline happened rather suddenly around 1970, and as the observation of two specimens in 1977 by R. Ridgeley is several years after the time of disappearance given by local hunters, he may possibly have seen the very last individuals.

The Colombian Grebe closely resembles the Black-necked Grebe *P. nigricollis*, and may, like this species be specialized on picking tiny, rather slow arthropods from weedy shallows. Due to the small prey size, an abundant food supply is required, and possibly the extinction of the grebe was due to failing food supply due to habitat destruction, pollution by insecticides, sewage and suspended soil particles and the introduction of trout *Salmo gairdneri* to Lake Tota. The last fine breeding areas in Lake Tota were destroyed in the late 1960's by a lowering of the lake level made in order to enlarge the onion cultivations on the wet shore-meadows around the lake. The very last Colombian Grebes probably died due to shooting in the breeding colonies.

Also several other local waterbirds are vanishing (Fjeldså in press).

3. The Junín Flightless Grebe

The Junín Altiplano, at 4080 m elev. in Central Peru was a closed glacial refugium at least in the last cold Pleistocene period. 500 km^2 of wetlands were surrounded almost entirely by ice. Certainly, extreme temperatures have occurred, but due to the strong solar heating by day (11° S!) and strong nightly anticyclonic wind systems, the lake could remain icefree. Under these conditions, some organisms became efficiently isolated and evolved into endemic taxa, e.g. the 70 cm long toad *Batrachophrynus macrostomus* and the Junín Flightless Grebe *Podiceps taczanowskii* (Fjeldså 1981a, in press). In addition to having local endemics, the lake has the reputation of being probably the finest Andean bird-lake, with an almost complete repertoire of Andean waterbirds present (Harris 1981, Fjeldså 1983a).

Fig. 1. Vegetation zones in Lake Junín, Central Peru. The proposed regulation scheme would have had disastrous consequences for the bird-life of this habitat.

Unfortunately, Lake Junin (Fig. 1) has deteriorated due to pollution by mine-washing activities. Dourojeanni et al. (1968) could not find the endemic grebe at all, and it became classified by ICBP as a red sheet species. Fortunately censuses in September-October 1977, January 1978, May 1979 and October 1981 (myself and M. P. Harris) revealed the presence of ca. 300 individuals, which breed in the outermost fringes of the 2-5 km wide reed-marshes and "winter" in the lake centre (Fjeldså 1981b, 1983a).

My first observations gave suspicion of a strong interspecific food competition. The available museum specimens had suggested character displacement between the endemic grebe and the syntopic population of its apparent ancestor, the Silvery Grebe *Podiceps occipitalis* (Fjeldså 1981a, 1983b), and seasonal drought was seen to force several thousand White-tufted Grebes *Rollandis rolland* (which like the endemic grebe appeared to eat fish) to leave their typical haunt in the marsh-zones and invade the open habitats of the endemic, flightless grebe.

After three weeks of field-work I was informed that the lake had been decreed as a future water reserve for the capital (El Peruano September 3 1977 and December 13 1978). This scheme, which was planned to be carried out promptly, would cause 5.7 m annual fluctuations in water levels. Besides causing seasonal dissecation of the vast surrounding pastures, and in the long run probably disappearence of the reed-marshes, this might be expected also to accentuate the suspected competition. Maybe an introduction of the Junín Flightless Grebe to other lakes would be its only chance.

A responsible management plan requires a full understanding of the competitive situation and the optimal conditions for the species involved. As it was uncertain whether economic resources and time would suffice for making sufficient extra expeditions to get the necessary data by traditional observations (direct observations of feeding grebes give a highly distorted impression of their diet), it was judged unavoidable to supplement the main observation techiniques of the 1977-78 expedition by shooting. The sample of Flightless Grebes shot or found dead was 11 ad., 2 pull. In addition there were 86 spec. of other grebes shot in Junín and several other sites in the Peruvian puna. For all these birds, their potential of information was used maximally. Grebes were watched foraging before being shot, to ensure that quantitative samples of food supply could be taken in adequate places. All stomach contents were transferred to alcohol, and the birds were used as study skins, partial skeletons and alcohol specimens for functional anatomy analysis. For the Junín Flightless Grebe, 2182 identified prey are available; for other Peruvian grebes altogether 22 106 prey. This proved an adequate basis for studying how individual anatomic differences and food supply affects the diet and the dietary overlap between the species.

Grebes appear (according to studies in Australia, Europe, Colombia, Peru and southern Argentina) usually to show less than 10 % interspecific exploitation overlaps. Silvery and Junín Flightless Grebes use similar habitats but are specialists on different foods (tiny invertebrates and tiny shoal-fish, respectively). White-tufted Grebes live in the vegetation

zones, as a generalist feeder, but specializing on large fish whenever possible. However, when seasonal drought forces it into the rather unproductive and monotonous habitats of Junín Flightless Grebes, there are few alternatives to eating tiny fish, and the exploitation overlap amounts to c. 75%. Since the White-tufted Grebe is numerically superior, periods of drought indirectly impose a very strong food competition on the Flightless Grebe (Fjeldså 1981a).

4. The Hooded Grebe in southern Patagonia

The Hooded Grebe *Podiceps gallardoi* was discovered in 1974 on Laguna de las Escarchados on the foothill plateau south of Rio Santa Cruz in southern Patagonia, Argentina. For several years no other populations were known than the 150 birds on this open, wind-blown lake (Erize 1981, Lange 1981, Storer 1982). The breeding was exceedingly poor or nil. By 1979 the grebes had moved to other lakes, but continued to show poor breeding success. By 1981 only 75 birds were left in this area, but fortunately another population of 170 birds were found in 1982 near Lake Viedma further north (A. Johnson in litt.). (By Feb. 1984, the two known populations of Hooded Grebes had declined to 30 and 45 birds. At this time, however, I discovered (together with P. and S. Brehmer and N. Krabbe) the probable core area of the species. This lies on a so far unexplored mountain plateau between Lakes Cardiel and Strobel. Here, 500 small, volcanic lakes appear to hold fully 3000 Hooded Grebes. There are potential wintering localities in the vicinity.)

The area lies in the rain shadow of the southern Andes and the prevailing westerly "roaring forties", and has been drying up for millions of years. Wetlands form only where water from the melting snow accumulates in spring in areas of inner drainage. The lakes are generally alkaline and profilic, but too turbid and unstable to have macrovegetation of any kind. Only a few are stable and deep enough to have clear water and submerged vegetation of water millfoil *Myriophyllum elatinoides*, which by midsummer reaches the water surface and permits anchorage of floating grebe-nests. The nests are, however, totally exposed to the westerly gales. Another threat is predation on young by Kelp Gulls *Larus dominicanus* — a man-made problem, as the gulls moved inland to profit from modern human settlements. Finally, the breeding is sometimes completely spoiled by Red-gartered Coots *Fulica armillata*, which loaf on the large Hooded Grebe nests, and may then throw out grebes and their eggs (G. Nuechterlein pers. comm.).

My own studies in November-December 1981 were motivated by the fact that this area was the only place in the world with two grebes which both appeared to be specialized foliage-gleaners. Besides, there are more species of diving ducks here than elsewhere on the southern continents, and the known limnofauna has an exceedingly low diversity. All this made me suspect a strongly competitive situation. The Hooded Grebes were not collected but, being exceptionally tame, their feeding could be observed directly at very close range. Of its counterpart, the Silvery Grebe, seven were collected.

The Hooded Grebe appeared to be an extreme food specialist. While Silvery Grebes took zooplankton and the smallest arthropods that crawled on the weeds, the Hooded Grebes selected the largest available items: amphipods, leeches and above all the snail *Lymnaea diaphana*.

To examine whether the breeding of the species could be artificially improved, three artificial colony-sites, constructed by G. Nuechterlein (Fig.2), were erected. These were accepted immediately by the grebes and were used for promiscuous mating. First of all, this was an experiment and a basis for exceptionally fine prospects for short-range ethology-observations (see Fjeldså 1983b). However, the now relatively efficient Argentine Wildlife Foundation has determined to use this kind of protected, artificial site in the future management of the species (F. Erize pers. comm., ICBP 1983:41-42). This will be supplemented with attempts to reduce the gull and coot problems. It is also planned to use artificial incubation of the eggs while the grebes sit on egg-decoys, which may be replaced with a real egg in case of accidents. The manipulation is planned to go even further with cross-fostering of the second egg (normally abandoned) to nests of Silvery Grebes in lowland sites, in order to imprint the Hooded Grebes to habitats with sheltered reed-beds.

My study suggests, however, that the lack of safe nest-sites is only part of the Hooded Grebe's problem. The root of its rarity is, in my opinion, that interspecific competition has

Fig. 2. Artificial nest-sites for Hooded Grebes in a productive but very wind-exposed lake in Santa Cruz, southern Patagonia.

forced it to specialize on snails and to restrict itself to the most exposed habitat a grebe possibly could use. Apparently the Hooded Grebe requires a rich supply of snails to raise young. All 50 young hatched in 1982 on a lake without snails starved to death (A. Johnson in litt.) and in a rather unproductive lake with small snails, grebes feeding half-grown young had to bring 3–4000 prey daily to their sole chick, which took 90% of the day's light hours (G. Nuechterlein pers. comm.). Apparently the best growth conditions for snails are in lakes too turbid to have possible nesting vegetation for grebes, and another problem is that the grebes apparently manage to overexploit the available, rather slow-growing snails in the clear nesting lakes. The structure of the submerged vegetation permits the grebes to feed efficiently only in a rather narrow zone between the coastal shallows and the impenetrably dense offshore millfoil vegetation. Numerous quantitative samples seem to indicate that the grebes rapidly remove all prey of optimal size for young-raising from this zone (Fjeldså 1984). This may be the reason why the species changes breeding lakes at some year's interval. As there are very few lakes to choose in, the Hooded Grebe simply has to be rare.

5. Concluding remarks

To me, the Hooded Grebe is vanishing due to overspecialization and accelerating drought. For ethical and esthetical reasons, we may hope that this fascinating and very handsome bird remains alive. Seen against the Colombian example, however, where a species could die out from man-made threats without any action being taken, it is remarkable that almost any kind of manipulation was considered in the attempts to change an apparently natural process in Patagonia. It appears obvious to remove the man-made threat: the inland gulls. It also appears reasonable to keep coots away (such a banal means as a scare-crow works!); maybe also the introduction of amphipods to some isolated basins which they apparently have been unable to colonize would be reasonable. It may also seem just to erect sheltered, artificial nest-sites if the reproduction should continue to be poor. However, to try to imprint the species to lowland habitats is to intervene directly in the course of evolution, and must be considered most thoroughly before accomplished.

The Junín Flightless Grebes are a less controversial case. Sure enough even this bird is specialized, and may be facing a future natural extinction. But the immediate threats are man-made. Fortunately, worries on behalf of nature and local cattle-growing interests have, together with economic factors, prompted modifications of the original regulation scheme. It was modified to a more modest intervention with a higher general water level than first planned, and I have recently been informed by the Peruvian Ministry of Agriculture that the plan has now been postponed and fractioned in several alternatives.

The immediate needs for transferring the Junín Flightless Grebe to other lakes is thus over for the time being. Anyway, we are equipped now with data about the optimal conditions for the species. One goal of my field work in Peru in 1983-84 was to look for potential alternative haunts in case needs for an introduction arise again.

The relevance of moving species has been debated on several occasions (see e.g. Weller 1969, Rooth & Scott 1983). First of all it may be considered a "faunal falsification". Cases of uncontrolled expansions with unexpected ecological consequences may also appear (well known in Scandinavia after the introduction of Canada Geese *Branta canadensis*). Such situations are unlikely to occur if the Junìn Flightless Grebe is moved, as it is flightless and has to stay where it is placed. Other problems are break-down of reproductive isolation. Introduced waterfowl are notorious for giving rise to hybrids and contaminating natural gene pools. The Junín Flightless Grebe is virtually identical to the Silvery Grebe in display signals (the two sometimes display together as shown on photo in Fjeldså 1981b), and it is therefore too risky to try to move the species by cross-fostering with allopatric Silvery Grebes. The transfer has to consist in moving mature birds — a difficult but not unfeasible task. Other risks involved when working with small manipulated populations include genetic sampling errors, inbreeding etc. (see e.g. Kear & Berger 1980). They could be minimized by forming two or more new populations and securing "fresh blood" by occasional genetic exchange between them.

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