

A "NESTED DOLL" ANALOGY TO REPRESENT OUR ATTEMPTS TO HALT BIODIVERSITY LOSS

You've all seen Russian dolls. Open the first and largest doll and you find another doll inside, which opens again to reveal a smaller doll within and so on until you encounter the smallest and final doll.

I would like to use the analogy of a nested doll hierarchy¹ to illustrate our current feeble attempts to protect species at various levels of risk of extinction. The biodiversity losses we are now witnessing across our planet due to human activity is the sixth great global mass extinction in progress, an impact similar to that of the asteroid which killed the dinosaurs.

This article reflects my views on biodiversity matters as a lay person, a non-expert who has had the good fortune to learn about some of these issues from professional biologists. The advantage of this article being written by a non-expert is that it may render these concepts more comprehensible to other non-experts and the general public.



Level Z²: means they're dead

The last and smallest nested doll represents the shrivelled dead corpse of an extinct species. The end of the line. But all is not lost, say the wide eyed cornucopian optimists! Modern technology now allows us to cryogenically store the genetic material of recently dead species in deep freeze in perpetuity! Thus, so long as we can retain this faintest prospect of restoring³ those dead species at an unspecified later date in an unspecified later location, surely it matters not if we concrete over the entire planet? And power supplies to cryogenic storage facilities never ever fail, do they?

Level Y: they're next to die

At the next level out, let us consider species confined to captivity in zoos which are extinct or nearly extinct in the wild. Can we not keep them in zoos indefinitely, thus preserving them for the amusement of future human generations? A cosy pampered existence without having to face the selection pressures of survival can lead to longer and certainly more comfortable individual lives for such animals, so what is wrong with that? Quite apart from the fact that the important ecological role of that species will be lost to their original habitat (resulting in the degradation of that ecosystem), perverse selection pressures in an artificial environment combined with a limited gene pool can, after several generations, result in offspring which are only adapted to captivity and are unfit to survive in the wild. They will become a mere shadow, a mockery of their former selves.

One example that captive rearing followed by general release of fish (in an effort to boost numbers in the wild) reduces the fitness and sustainability of wild populations was demonstrated by Kinnison et al who state, "*captive rearing often alters the phenotypes of organisms that are destined for release into the wild. Natural selection on these unnatural phenotypes... may exacerbate problems in restoration efforts by impairing fry productivity and reducing effective population sizes by 13–81%.*"⁴

Of course, there will be no wilderness to release any threatened species into if their original habitats are not restored and protected.

Level X: in zones protect

Institutions such as the World Wildlife Fund use iconic images of charismatic animals such as cuddly pandas to highlight conservation issues and why not? Pandas have immense public appeal and as a flagship species they enable the donations to come rolling in. But conservation biology is not just about saving a few charismatic species, be they pandas, tigers, polar bears or orangutans. Here is where we introduce a basic concept: it is impossible to consider the conservation of a particular species without also addressing the conservation of its natural habitat and all the other animals and plants within that habitat. Animals and their habitats are intimately intertwined and are inseparable. Modern human beings have left the original habitat of the African savannah that we evolved in, to live in entirely different landscapes and climates, surviving though guile and artifice (clothes, air conditioning, imported food etc). Only indigenous people these days seem to appreciate that animals (and

the human animal in our natural state) are deeply tied to their natural habitats and simply cannot survive without it. Accordingly, if we are in any way serious about preventing the extinction of threatened species, it is absolutely necessary to establish protected areas within which sufficiently large genetically diverse populations of these animals can continue to propagate in perpetuity. Save the pandas? Impossible without also preserving their native bamboo forests and all the other flora and fauna within those forests down to the smallest micro-organisms. And keep the humans out, apart from a few biologists and lightly treading ecotourists.

Level W: pathways for the mobile few

The demise of "top of the food chain" predators is a major signal of ecosystem stress. Apex predators need large territories to support their existence and if their original habitats are degraded, they need to be able to travel to other territories to seek essential sustenance. Many animals cannot or will not cross highways or urban zones, or will die in the attempt. Thus is born the concept of preserving natural transit corridors between protected areas for these mobile animals, thus vastly extending their range and expanding their survival options.

Preserving the apex predators, even those not charismatically appealing to us, is of vital importance to ecosystems because bitter experience has taught us that eliminating such predators, even the scary ones, can result in terrible unforeseen consequences. One example is that of the grey wolf which was hunted to extinction in the lower continental United States, which resulted in the devastation of the Aspen forests. What was the connection? Disappearance of the wolves allowed their prey (deer) to multiply uncontrollably. The deer then consumed all the Aspen saplings before they could grow into trees. Old Aspens after they died were not being replaced by younger trees, resulting in vast areas of deforestation. The reintroduction of grey wolves from Canada (despite protestations from US farmers) is now enabling the restoration of the Aspen forests.

Bears are also important apex predators occupying their own vital ecologic niche and only menace humans when forced out of their original habitats by hunger.

Here is a statement from the Yellowstone to Yukon (Y2Y) website: *"Y2Y's vision is that the entire Yellowstone to Yukon region will be managed so that this world-renowned mountain ecosystem and its inhabitants (both wild and human) remain healthy and connected for centuries to come. This does not require the entire region to become a*

park, only that wild animals are able to travel safely through the lands adjacent to and between parks."

Artificial corridors originally created for other purposes can also help species facing environmental stress in one area move to other protected areas, one example being the old cattle stock routes in outback Australia, now being used by wildlife as transit lanes.

Level V: don't fell the trees

The Amazon basin has been described as the lungs of the planet and 40% of the world's rainforests reside in Brazil. In 2006, Amazon land clearing was occurring at the rate of an area the size of New York's Central Park disappearing every *hour*⁵. The main purpose of Amazon clear felling was for cattle rearing (unfortunately livestock produce methane which is more than 20 times more potent a greenhouse gas than CO₂). Other reasons have included logging and the establishment of more sugar cane plantations. Brazil produces the largest amount of ethanol from sugar cane than any other country, which they now depend on for fuel.

Misguided attempts to promote first generation biofuels in Europe have led to rampant land clearing in Indonesia (which exports palm oil to be turned into biodiesel) and the greenhouse gas emissions here have been even worse. The greatest repositories of biologic carbon sequestration are the tropical rainforests and burning those forests down emits massive quantities of CO₂. Replacing those forests with oil palm monoculture facilitates only a small amount of carbon capture, minuscule in comparison to the original highly biodiverse dense primary rainforest. In addition, exposed peat soil, now no longer covered by forest litter, liberates even more historically sequestered CO₂.

Peak Oil has therefore directly led to deforestation in the above examples, further illustrations of how our fossil fuel addiction is causing global warming.

Ecuadorian rainforests are also being threatened by petroleum companies, salivating at the thought of all that oil underground. So far the Yasuni National Park has had a stay of execution, but for how long?

Even better than establishing small protected areas for particular species, even better than establishing transit corridors for mobile animals between protected areas, would be to establish country sized, even continent sized contiguous protected ecosystems which are quarantined from human encroachment. How can we achieve this? A multifaceted approach is needed, however the intimate links between land clearing and

our fossil fuel dependency means that we must find more sensible ways to free ourselves from our petroleum addiction (e.g. rail transport powered by renewable electricity, biofuels from algae for aviation). We must also stabilise and humanely reduce our population, our footprint on this planet.

Save the orangutan? Yes! Save the Sumatran tiger? Yes! But only possible if we can stop and reverse deforestation in Indonesia.

Level U: fix a climate askew

Level V (don't fell the trees) may well be the most optimistic (if somewhat unlikely) outcome we can hope for given our present situation. But what about level U all the way back to level A? Have we gone so far down the path of planetary degradation that we now face the very end of the alphabet? Unfortunately we have and it will take massive efforts to claw ourselves back. Level A, the largest, the first, the outermost Russian doll, represents a world completely devoid of humans which of course none of us would advocate, beneficial though it may be for all other species⁶. Nevertheless, a robustly sustainable planet will require that we draw circumstances back somewhere before level V, at least to level U. Why? Because even if we are able to quarantine vast continental or oceanic areas from human incursion, it may all still come to nought, there could still be relentless runaway environmental and ecosystem devastation. Why? Because pollutants know no boundaries. Carbon dioxide knows no boundaries. Climate change knows no boundaries. Simply preventing human encroachment into protected forests or marine zones will not be enough. Climate scientists tell us that keeping the average global temperature rise within two degrees Celsius of the pre-industrial mean is the maximum acceptable "safe" rise. However even at this level, scientists predict 20-40% of the Amazon will die off within 100 years.⁷ Unfortunately business as usual will cause us to grossly overshoot two degrees. A three degree rise will almost certainly lead to more runaway warming⁸, perhaps a five degree rise, due to positive feedback loops. Five degrees will guarantee desiccation then conflagration then desertification of the Amazon, death of the coral reefs with all their attendant biodiversity and acidification of the oceans, rendering vast marine areas sterile. Such a planet will be unable to support human civilisation and the remaining survivors will lead nasty, brutish, short and poor lives.

CONCLUSION:

Halting and reversing ecosystem destruction is ultimately in our own best interests. Our cavalier neglect of and refusal to place economic value on the "free" services provided by intact ecosystems will be our own undoing. To the brainless knuckle-dragging economist, hillside forests only have value after the trees are cut down and the wood harvested. To the ecological economist, hillside forests protect soil cover (loss of topsoil from deforested slopes exacerbates flooding of rivers), hillside forests retain water (thus reducing rapid run-off during heavy rain, also preventing riverine flooding), hillside forests generate clouds by transpiration and preserve the water cycle, hillside forests are important habitats for local species which themselves have environmentally important economic value. Intact hillside forests are far more valuable than one-off clear felling, which benefits only the logging company tycoons and their ilk (and even then, only in the short term). Preserving native forests does not however preclude the establishment of sustainable commercial forests in selected historically cleared areas for timber, paper and pulp production.

What is the purpose of this little essay? It is my simplistic layman's thumbnail sketch, which I am using to highlight to the general public one basic fact: that the serious business of trying to halt this ongoing anthropogenic global mass extinction goes far beyond cryogenically preserving the genetic material of recently dead species. It goes far beyond captive breeding programmes in zoos. It goes far beyond setting aside token protected areas. It goes far beyond preserving transit corridors between protected areas. It even goes far beyond halting our physical encroachment on large continental forests or oceanic marine zones. All those initiatives are important and must be pursued but they are not enough.

Halting and reversing ecosystem destruction requires we address other big picture issues. The reduction of carbon emissions and land clearing by transitioning from fossil fuels to renewable energy. The reduction of excessive mining and manufacturing industries (which should be replaced by recycling and refurbishing industries), the reduction of excessive consumption and waste generation in rich countries and the (humane) reduction of total human population. We need to turn away from insane "endless growth" economic delusions to sustainable steady state economies, to aim for prosperity without growth. We need national and international policies to facilitate these outcomes. A price on carbon will be one such policy. The revenue gathered, properly applied, must be used

to repair the damage we have caused and used to spearhead our renewable energy future. Naysayers argue we cannot afford such a tax. Here is what we cannot afford: the billions of dollars of overt and covert subsidies that governments hand out to fossil fuel companies. That is undoubtedly an obscene misuse of taxpayers money which we cannot afford.

What can you, as an individual, do to help with national and global biodiversity initiatives? Support a price on carbon and demand we stop subsidising the fossil fuel companies.

Geoffrey Chia, Cardiologist, Brisbane
written to commemorate world biodiversity day, 22 May 2011

Footnotes:

1. Dr. Kees Hulsman, Ecologist, Griffith University, Brisbane states that ecological systems are organised as a nested hierarchy. I have borrowed this concept from him to represent our various responses to species under threat in the form of a nested hierarchy.
2. For American readers, this letter is pronounced "zed"
3. Just such a project is being collaboratively pursued between the San Diego zoo and The Scripps Research Institute in La Jolla, California
4. http://kinnison.umaine-biology.net/pages/pub_pdfs/Bailey_Lachapelle_Kinnison_2010_Evol_Appl.pdf
5. <http://www.newscientist.com/article/dn9963-top-10-conservation-successes-and-failures.html>
6. All other species, that is, which do not directly benefit from humans. Our urban beneficiaries include rats, cockroaches and pigeons, the latter which have been described by Woody Allen as "rats with wings"
7. <http://www.guardian.co.uk/environment/2009/mar/11/amazon-global-warming-trees>
8. <http://climatecodered.blogspot.com/2010/09/what-would-3-degrees-mean.html>